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UNITED STATES SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 20-F

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE
SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2019

Commission file number 1-13202

Nokia Corporation

(Exact name of Registrant as specified in its charter)

Republic of Finland

(Jurisdiction of incorporation)

Karakaari 7 FI-02610 Espoo, Finland

(Address of principal executive offices)

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Karakaari 7, FI-02610 Espoo, Finland

(Name, Telephone, E-mail and/or Facsimile number and Address of Company Contact Person)

Securities registered pursuant to Section 12(b) of the Securities Exchange Act of 1934 (the "Exchange Act"):

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
American Depositary Shares	NOK	New York Stock Exchange
Shares		New York Stock Exchange ⁽¹⁾

(1) Not for trading, but only in connection with the registration of American Depositary Shares representing these shares, pursuant to the requirements of the Securities and Exchange Commission.

Securities registered pursuant to Section 12(g) of the Exchange Act: **None**

Securities for which there is a reporting obligation pursuant to Section 15(d) of the Exchange Act: **None**

Indicate the number of outstanding shares of each of the registrant's classes of capital or common stock as of the close of the period covered by the annual report. Shares: **5 640 536 159**.

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

If this report is an annual or transition report, indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Exchange Act. Yes No

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Exchange Act during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" or "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer Accelerated filer
Non-accelerated filer Smaller reporting company
Emerging growth company

Indicate by check mark which basis of accounting the registrant has used to prepare the financial statements included in this filing:

U.S. GAAP
International Financial Reporting Standards as issued by the International Accounting Standards Board
Other

If "Other" has been checked in response to the previous question, indicate by check mark which financial statement item the registrant has elected to follow. Item 17 Item 18

If this is an annual report, indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

Cross-reference table to Form 20-F

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Forward-looking statements

Certain statements contained in this Annual Report constitute "forward-looking statements". Forward-looking statements provide Nokia's current expectations of future events based on certain assumptions and include any statement that does not directly relate to any current or historical fact. The words "believe", "expect", "expectations", "anticipate", "foresee", "see", "target", "estimate", "designed", "aim", "plan", "intend", "influence", "assumption", "focus", "continue", "project", "should", "is to", "will", "strive", "may" or similar expressions as they relate to us or our management are intended to identify these forward-looking statements, as well as statements regarding:

- A) business strategies including the four pillars of Lead, Expand, Build and Create, market expansion, growth management, and future industry trends and megatrends and our plans to address them, including Future X;
- B) future performance of our businesses and any future distributions and dividends;
- C) expectations and targets regarding financial performance, results, operating expenses, cash flows, taxes, currency exchange rates, hedging, cost savings and competitiveness, as well as results of operations including targeted synergies and those related to market share, prices, net sales, income and margins;
- D) expectations, plans, timelines or benefits related to changes in our organizational and operational structure;
- E) market developments in our current and future markets and their seasonality and cyclicalities, including the communication service provider market, as well as general economic conditions and future regulatory developments;
- F) our position in the market, including product portfolio and geographical reach, and our ability to use the same to develop the relevant business or market and maintain our order pipeline over time;
- G) any future collaboration or business collaboration agreements or patent license agreements or arbitration awards, including income from any collaboration or partnership, agreement or award;
- H) timing of the development and delivery of our products and services, including our short term and longer term expectations around the deployment of 5G and our ability to capitalize on such deployment as well as use our global installed base as the platform for success in 5G, and the overall readiness of the 5G ecosystem;
- I) the outcome of pending and threatened litigation, arbitration, disputes, regulatory proceedings or investigations by authorities;
- J) restructurings, investments, capital structure optimization efforts, divestments and our ability to achieve the financial and operational targets set in connection with any such restructurings, investments, and capital structure optimization efforts including our 2019-2020 cost savings program;
- K) future capital expenditures, temporary incremental expenditures or other R&D expenditures to develop or rollout new products, including 5G; and
- L) the sustainability and corporate responsibility contained in the sustainability and corporate responsibility section of this annual report on Form 20-F.

These statements are based on management's best assumptions and beliefs in light of the information currently available to it and are subject to a number of risks and uncertainties, many of which are beyond our control, which could cause actual results to differ materially from such statements. These statements are only predictions based upon our current expectations and views of future events and developments and are subject to risks and uncertainties that are difficult to predict because they relate to events and depend on circumstances that will occur in the future. Risks and uncertainties that could affect these statements include but are not limited to the risk factors specified under "Operating and financial review and prospects" Risk factors" of this annual report on Form 20-F and in our other filings or documents furnished with the U.S. Securities and Exchange Commission. Other unknown or unpredictable factors or underlying assumptions subsequently proven to be incorrect could cause actual results to differ materially from those in the forward-looking statements. We do not undertake any obligation to publicly update or revise forward-looking statements, whether as a result of new information, future events or otherwise, except to the extent legally required.

Introduction and use of certain terms

Nokia Corporation is a public limited liability company incorporated under the laws of the Republic of Finland. In this annual report on Form 20-F, any reference to “we,” “us,” “the Group,” “the company” or “Nokia” means Nokia Corporation and its consolidated subsidiaries and generally Nokia’s Continuing operations, except where we separately specify that the term means Nokia Corporation or a particular subsidiary or business segment only or our Discontinued operations. References to “our shares” matters relating to our shares or matters of corporate governance refer to the shares and corporate governance of Nokia Corporation.

Nokia Corporation has published its consolidated financial statements in euro for periods beginning on or after January 1, 1999. In this annual report on Form 20-F, references to “EUR,” “euro” or “€” are to the common currency of the European Economic and Monetary Union, references to “dollars”, “U.S. dollars”, “USD” or “\$” are to the currency of the United States, and references to “Chinese yuan” or “Chinese yuan renminbi” or “CNY” are to the official currency of the People’s Republic of China. Solely for the convenience of the reader, this annual report on Form 20-F contains conversions of selected euro amounts into U.S. dollars at specified rates or, if not so specified, at the year-end rate of 1.1234 U.S. dollars per euro, and conversions of selected euro amounts into Chinese yuan renminbi at specified rates or, if not specified, at the year-end rate 7.8205 Chinese yuan renminbi per euro. The referred year-end rates were the European Central Bank reference rates on December 31, 2019. No representation is made that the amounts have been, could have been or could be converted into U.S. dollars or Chinese yuan at the rates indicated or at any other rates.

Additional terms are defined in the “Glossary of terms”.

The information contained in, or accessible through, the websites linked throughout this annual report on Form 20-F is not incorporated by reference into this document and should not be considered a part of this document.

Nokia Corporation furnishes Citibank, N.A., as Depositary, with its consolidated financial statements and a related audit opinion of our independent auditors annually. These financial statements are prepared on the basis of International Financial Reporting Standards as issued by the International Accounting Standards Board and in conformity with IFRS as adopted by the European Union (IFRS). In accordance with the rules and regulations of the SEC, we do not provide a reconciliation of net income and shareholders’ equity in our consolidated financial statements to the generally accepted accounting principles in the United States, or U.S. GAAP. We also furnish the Depositary with quarterly reports containing unaudited financial information prepared on the basis of IFRS, as well as all notices of shareholders’ meetings and other reports and communications that are made available generally to our shareholders. The Depositary makes these notices, reports and communications available for inspection by record holders of American Depositary Receipts (ADRs), evidencing American Depositary Shares (ADSs), and distributes to all record holders of ADRs notices of shareholders’ meetings received by the Depositary.

In addition to the materials delivered to holders of ADRs by the Depositary, holders can access our consolidated financial statements, and other information included in our annual reports and proxy materials, at nokia.com/financials. This annual report on Form 20-F is also available at nokia.com/financials as well as on Citibank’s website at <https://app.irdirect.net/company/49733/hotline/>. Holders may also request a hard copy of this annual report by calling the toll-free number 1-877-NOKIA-ADR (1-877-665-4223), or by directing a written request to Citibank, N.A., Shareholder Services, PO Box 43077, Providence, RI 02940-3081, United States. With each annual distribution of our proxy materials, we offer our record holders of ADRs the option of receiving all of these documents electronically in the future.

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We create the technology to connect the world

5G is changing how people live, work and communicate. Whole industries are being transformed. Networks are becoming faster and more responsive. Artificial intelligence and machine learning are allowing systems to sense their environment and react instantaneously. Digitalization and automation are making Industry 4.0 a reality.

Nokia is addressing these changes around the globe. Our end-to-end portfolio of solutions and services is unique; our ability to partner with customers anywhere and address their needs is clearly demonstrated; and we are absolutely committed to quality, sustainability and integrity. Security is built in everything we do.

We are driving the innovation for tomorrow and delivering the technology today to make businesses more productive, environments cleaner, workplaces safer, economies stronger, and lives enriched. These are the expectations our customers trust us to deliver.

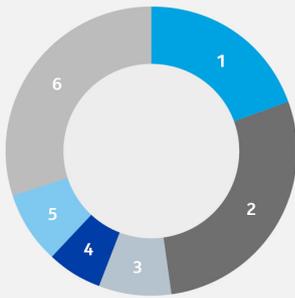
Financial highlights

For the year ended December 31, Continuing operations	2019 EURm	2018 EURm	2017 EURm
Net sales	23 315	22 563	23 147
Gross profit	8 326	8 446	9 139
Gross margin	35.7%	37.4%	39.5%
Operating profit/(loss)	485	(59)	16
Operating margin	2.1%	(0.3)%	0.1%
Profit/(loss) for the year	18	(549)	(1 437)
	EUR	EUR	EUR
Earnings per share, diluted	0.00	(0.10)	(0.26)
Dividend per share(1)	0.00	0.10	0.19
	EURm	EURm	EURm
As of December 31			
Net cash and current financial investments	1 730	3 053	4 517

(1) No dividend is proposed by the Board of Directors related to the financial year 2019.

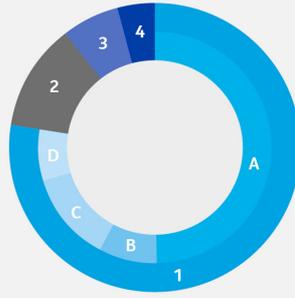
A global technology leader

Net sales 2019 by region



1 Asia-Pacific	EUR 4 556m (+12%)
2 Europe ⁽¹⁾	EUR 6 620m (+2%)
3 Greater China	EUR 1 843m (-15%)
4 Latin America	EUR 1 472m (+7%)
5 Middle East & Africa	EUR 1 876m (0%)
6 North America	EUR 6 948m (+6%)

Net sales 2019 by business⁽²⁾



1 Networks	EUR 18 209m (+5%)
2 Nokia Software	EUR 2 767m (+2%)
3 Nokia Technologies	EUR 1 487m (-1%)
4 Group Common and Other	EUR 952m (-7%)
1 Networks	
A Mobile Access	EUR 11 655m (+3%)
B Fixed Access	EUR 1 881m (-5%)
C IP Routing	EUR 2 921m (+15%)
D Optical Networks	EUR 1 752m (+9%)

(1) All Nokia Technologies IPR and Licensing net sales are allocated to Finland.
 (2) Includes net sales to other segments.
 The figures are derived from our consolidated financial statements prepared in accordance with IFRS.
 Year-on-year change is in parenthesis.

We have combined global leadership in mobile and fixed network infrastructure with the software, services and advanced technologies to serve customers in approximately 200 countries around the world.

Net sales in 2019

EUR 23.3bn

Countries of operation

~120

Average number of employees in 2019

~98 000



Business groups

1 **Mobile Networks**
Higher quality and more reliable mobile broadband experiences

3 **Fixed Networks**
Using intelligent access to create networks that are faster, better, smarter

5 **Nokia Software**
Intelligent software platforms optimizing and automating network performance

7 **Nokia Technologies**
Technology designed to bring the human family closer together

2 **Global Services**
Helping customers navigate complexity to transform and digitalize their business

4 **IP/Optical Networks**
Massively scalable networks that underpin the digital world's dynamic interconnectivity

6 **Nokia Enterprise**
Digitalizing asset-intensive industries with mission and business critical needs

Reportable segments

As of January 2019 Nokia has three reportable segments. Nokia also discloses segment-level data for Group Common and Other.

Networks

Nokia provides net sales disclosure for the following businesses i.e. reportable businesses: Mobile Access, Fixed Access, IP Routing, Optical Networks

Nokia Software

Nokia Technologies

Group Common and other

For more information on our business performance:

Our strategy: See pages 10–16

Our business groups: See pages 22–39

Results of operations: See pages 46–51

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Financial statements: See page 139–214

Letter from our President and CEO

“2019 was the year 5G took off. We saw the first commercial 5G rollouts, and Nokia played a significant role helping customers in all leading markets. Many of our businesses performed very well – such as Nokia Enterprise delivering double-digit sales growth, IP Routing gaining significant market share and increasing profitability, and Nokia Software substantially expanding its profitability. We faced challenges in our Mobile Access and cash generation but know what we need to fix, and expect to improve over the course of 2020 and start 2021 in a much stronger position.”

Connectivity with a purpose

If Nokia creates the technology to connect the world, then in 2019 the world got that little bit better connected.

2019 was the year 5G was launched into the mass market – and we were in the pilot’s seat. We are the only company working with all the operators who have chosen their 5G vendor in the early adopter markets of the US, South Korea and Japan. That gave us firsthand experience of the enthusiastic welcome consumers are giving 5G – in Korea, for example, we expected around 3 million users by the end of the year, but the final total was closer to 5 million.

Those would be great figures at any time. But remember that this new technology cycle is still in its early stages – and consumer appetite is only part of the picture. As 5G becomes established in more markets, its increased capacity, reliability and responsiveness will unlock the Fourth Industrial Revolution, profoundly changing the way cities, businesses and governments operate, and creating unprecedented opportunities for economic growth, human wellbeing and environmental sustainability.

That last point is critical. The evidence is clear: 5G can provide solutions to the pressing issue of climate change. Over time, 5G will improve material efficiency, resource efficiency and energy efficiency. The gains will be particularly striking in resource-intensive industries, such as mining and manufacturing.

And we are starting to get a taste of the potential of meaningful connectivity already before 5G fully arrives. In 2019, for instance, we helped small-scale farmers in Algeria automate their irrigation lines, leading not only to healthier crops but to less wasted water and greater crop yields. We helped the Japanese city of Sendai develop their crisis response system by using automated drones. And in Peru we are working with mining companies to reduce their environmental impact and improve employee safety.

The journey towards a better-connected, sustainable future also presents a huge business opportunity. According to World Economic Forum estimates, 5G alone can create over \$13 trillion of global economic value across every conceivable industry, as well as over 22 million jobs, by 2035. Nokia is well positioned to benefit from this opportunity.

I will come back to that later in this letter, but first I want to explore our 2019 financial performance and explain what we are doing to improve in the areas where we have challenges.

Progress in a challenging year

Overall, we cannot be content with our financial performance in 2019. Nokia Group net sales were up 1 percent globally (5 percent excluding China) excluding the impact of changes in foreign currency exchange rates, and our operating margin was up by about 2 percentage points versus 2018.

But, at the same time, we had areas of remarkable strength across our business groups. IP Routing continued its strong momentum, gaining significant market share and improving profitability. Nokia Software delivered on its promise, with an operating margin that was up sharply from 2018. Nokia Enterprise also delivered exceedingly well, hitting its double-digit sales growth target and considerably outperforming the market. And Nokia Technologies increased its already excellent profitability.

Also, taking a regional perspective, we saw many good areas of performance. Our sales increased in Asia Pacific, Europe, Latin America, and North America. Excluding the impact of changes in foreign currency exchange rates, sales were down by 2 percent in Middle East and Africa but that was still a good performance in the context of challenging market dynamics. In Greater China the market presents some unique challenges, and we saw a sales decline of 16 percent excluding the impact of changes in foreign currency exchange rates.

As mentioned above, we were also chosen by early adopter operators in the leading 5G markets – from Sprint and Verizon in the US, to Softbank in Japan, to Korea Telecom in South Korea, amongst others; additionally, we were selected by Orange France and O2 in the UK. This was down to some admirable work across business groups and our customer organization teams. In 2020 we will work hard to maintain and increase the trust our customers have in us.

Improving execution in our access business

In 2019 the Nokia Group results were, however, impacted by the difficulties across our Mobile and Fixed Access businesses. Fixed Access continued to face challenges in the market transition from copper to fiber despite some initial signs of progress towards the end of the year. Going forward, we will continue to have a sharp focus on costs, and we have targeted selective expansion in new areas, particularly fixed wireless access.

The core of our profitability issues came from Mobile Access (a combination of our Mobile Networks and Global Services business groups), and in particular from high radio product costs in the early stages of 5G. Action is underway to overcome these challenges. First, teams across the company are working hard to optimize 5G product costs by addressing every possible part of product bills of materials, including semiconductors, where a transition to our system-on-chip "5G Powered by ReefShark" portfolio is critical.

Second, we want to maintain necessary scale in mobile radio products. This requires that we continue to convert existing 4G customers to 5G and confirm new ones. In 2019 we did well here and ended the year with a 4G+5G market share in the range of 27 percent excluding China. Going forward, we want to stabilize this at approximately the same level.

Third, in 2019 we took significant steps to enhance commercial management and deal discipline to drive better performance in current contracts and improve outcomes in new ones. We will continue to push hard for further improvements this year and expect to see positive impact on the profitability of Mobile Access gradually over the year.

Finally, we further strengthened operational improvements in services, including increases in operational discipline and enhanced efforts to manage for margin and cash. I was pleased to see that in 2019 our hard work started to take hold, and we saw improvement in our Global Services operating margin in 2019 compared to 2018, even if we were still below what we believe we can achieve.

In 2020 we will publish quarterly updates on our operational progress in Mobile Access, as well as on cash generation, which will continue to be an additional area of focus.

Strengthening cash generation

In 2019 we put a structured program in place to improve our cash position, including a company-wide focus on free cash flow and release of working capital, strengthened relevant contractual terms with customers and suppliers, and reinforced controls across our supply chain and inventory management. As a result, we were able to reduce inventories to the lowest levels since the beginning of 2018 and ended the year with a solid net cash position.

Going forward, we will continue to push hard to generate cash, and even though there may be headwinds related to the timing of Nokia Technologies' cash flow and cash outflows related to restructuring in 2020, we expect these to be mitigated in the coming years.

Creating long-term value

In 2019 we made good progress against our strategic pillars and I am confident our strategy remains the right one and enables long-term value creation for our shareholders, customers, partners and employees.

In the **first pillar** of our strategy – leading in high-performance, end-to-end networks with communication service providers – we continued to progress in 5G despite the aforementioned challenges in Mobile Access. By the end of 2019 we reached 62 5G commercial deals and launched 18 live networks with our customers. We demonstrated the power of our unique global end-to-end portfolio with an increased number of multi-business group deals in our sales pipeline. Our broad portfolio also means that even though 5G product costs negatively impact our near-term margins, we are well positioned to benefit from the longer 5G investment cycle.

Our **second pillar** is about growing our enterprise and webscale business and leading the digitalization of industries with private networks and industrial automation. In recent years we have successfully delivered what we promised we would: we expanded network sales into select vertical markets and positioned ourselves well in the industrial automation market, which we expect will be critical in the Fourth Industrial Revolution. And Nokia Enterprise's results again in 2019 show high promise for the future.

The **third pillar** is about strengthening our software business with one Common Software Foundation. As noted above, 2019 was another strong year for us in this space, with leading industry analysts describing Nokia Software as the world's leading telco software business. Through hard work in recent years, Nokia has grown into the overall market share leader across both telecom software and services combined.

We have also made good progress against our **fourth pillar**, diversifying our licensing business with new opportunities in patents, IoT and brand. Nokia Technologies has done a great job in creating new licensing opportunities in the consumer ecosystem, and we see meaningful growth opportunities in expanding our scope.

Operational excellence is the foundation for our strategic priorities. In addition to the aforementioned actions in cash, commercial discipline and operational improvements in services, we are continuing with various actions across Nokia that will contribute to our commitment to reduce costs in 2020 by EUR 500 million compared to 2018. This will make us smarter, leaner and more competitive going forward.

Working with integrity

One area bringing us added value – as well as a strong sense of pride – is the high level of integrity in the way we work. We will discuss our achievements in more detail in our People and Planet report published in April, but I want to mention a couple of highlights from 2019.

In February our culture of integrity and our positive impact on the business community and wider ecosystems received recognition, with Ethisphere naming Nokia one of the World's Most Ethical Companies for the third year. And in 2020, we are happy to see that recognition renewed for the fourth time.

In September we were among the frontrunner companies announcing our intention to recalibrate our emissions targets in line with the scientific consensus that the world needs to limit average rises in temperature to 1.5°C in order to avoid irreversible environmental damage.

In May we published our plan to close the “unexplained pay gap” in the company – a gap that cannot be explained by factors that drive pay at Nokia, such as performance, experience, job grade or location. By July that gap was closed, and we have regular checks in place to make sure it never returns.

Looking ahead

We continue to work hard to create long-term value for Nokia and our customers, and more widely for industries, communities and societies. And, as explained in this letter, we have a clear set of drivers to deliver on that promise.

Despite our short-term challenges in execution in our access business, I remain confident that we are taking the right steps over the course of this year to deliver progressive improvement and to position us for a stronger 2021.

Rajeev Suri

President and CEO

Market trends driving our strategy

Nokia aims at enabling massive consumer broadband and the industrial automation revolution with large networks at scale.

In 2016 we identified six global megatrends that we believe continue to impact our current and potential customers, change the lives of people and impact business operations on a global scale. The Nokia Bell Labs Future X vision is aligned to these megatrends, providing opportunities for us to diversify into new growth areas.

The megatrends we have identified are:

- (1) **Network, compute and storage:** Ever present broadband capacity coupled with a distributed cloud for ubiquitous compute and near infinite storage, allowing limitless connectivity and imperceptible latency as well as subscription-based and asset-less business models.
- (2) **Internet of Things:** In addition to people, trillions of things are connected to the internet and amongst themselves, collecting unprecedented amounts of data in a private and business context.
- (3) **Augmented Intelligence:** Artificial intelligence combined with human intelligence transforms the collected data into actionable insights, fundamentally changing the way decisions are made by businesses, governments and individuals, resulting in time savings, less waste, higher efficiency and new business models.
- (4) **Human and machine interaction:** A range of new form factors that transform the way humans interact with each other and with machines, e.g. voice-based digital assistance, gesture control, smart clothes, implantable chips, robotics and augmented and virtual reality.
- (5) **Social and trust economics:** Ubiquitous connectivity, compute and storage, as well as technologies such as artificial intelligence and blockchain, enabling new business models based on sharing assets and distributed trust, allowing rapid scalability on a global level.
- (6) **Digitalization and ecosystems:** Next level of digitalization beyond content and information, digitizing atoms with additive printing in an industrial, consumer and medical context, digitizing logistics and production processes, transforming global supply chains by massive-scale automation.

Nokia Bell Labs has developed Future X, our vision of a future network architecture that addresses these megatrends in a holistic way. This is our guide to building networks that meet the future needs of our customers and address the inherent opportunities in the megatrends. The Future X vision encompasses the key domains of future networks: emerging devices and sensors, massive-scale access, converged edge cloud, smart network fabric, universal adaptive core, programmable network operating systems, augmented cognition systems, digital value platforms and dynamic data security. Besides this, we have defined five end-to-end solutions on the basis of Future X: 5G, distributed cloud, network slicing, security and industrial automation.

Simultaneously, driven by the megatrends and the resulting increasing relevance of networks to digitize business operations, we see a shift in who is investing in technology. Our primary market with communication service providers (CSPs), in which we have a leadership position, is very large in size, but expected to provide a limited estimated growth opportunity, with growth mainly driven by 5G.

However, the megatrends are increasing the demand for large high-performance networks in other key industries. Web-scale companies are investing in cloud technology and network infrastructure at an increasing scale. As other vertical market segments such as transportation, energy, manufacturing and logistics, and governments and cities digitize their operations, they need high-performing, low-latency mission-critical networks as well.

Our "Future X for Industries" network architecture combines the technologies that drive dramatic productivity improvements across a wide range of industry sectors. As technologies such as edge cloud supporting augmented intelligence and advanced security analytics as well as end-to-end 5G-capable networks become a reality, they will radically speed up the digital transformation of industries such as manufacturing, logistics, transportation and energy, as well as governments and cities. Nokia's holistic approach is helping to drive a new era of productivity and human-machine interaction that is expected to unlock trillions of dollars of economic value in the next decade.

We are addressing both our primary CSP market and the newly identified growth opportunities in the Industrial IoT with our "Rebalancing for Growth" strategy. The strategy builds on our core strength of delivering large high-performance networks by expanding our business into targeted, higher-growth and higher-margin vertical markets.

Our strategy

Our key priorities

Our “Rebalancing for growth” strategy sets the right direction for Nokia. We have focused it to reflect the progress so far and to accelerate further execution.

1. Lead

Lead in high-performance, end-to-end networks with communication service providers

Our aspiration, strategy and position

Nokia intends to become the leading, trusted network equipment provider for end-to-end networks and the leader in customer intimacy. Our comprehensive portfolio of access, transport and software allows us to leverage our existing global customer sales channel to generate incremental sales opportunities across multiple network domains, and secure value throughout the network investment cycle. Over the long term, we aim to differentiate with end-to-end solutions that allow us to offer our customers guaranteed mission-critical performance, total cost of ownership savings, time-to-market gains and higher reliability. We expect our technology leadership to protect against the sustained price pressure in the CSP industry, where we focus our Mobile and Fixed Networks as well as our Global Services business on optimizing profit and cash and maximizing Nokia's end-to-end 5G value proposition. We work relentlessly to drive advantage through strong technology, time to market and significantly lowering product costs in 5G. In addition, we leverage our differentiation in superior 4G network performance, the most comprehensive small cell portfolio and the leading position in 5G fixed wireless access and ultrabroadband optical fiber access solutions. We manage our IP Routing and Optical Networks businesses for growth, based on technological differentiation and leadership as well as market momentum. We strive to expand IP Routing based on product leadership with the FP4 chipset. Optical Networks is in a position of technological strength that will be further improved with the recently launched PSE-3 chipsets.

Our focus areas

- § We aim to differentiate with our end-to-end networks portfolio that delivers benefits for our customers in automation and orchestration, total cost of ownership and time to market.
- § We have defined and are implementing five end-to-end solutions: 5G, distributed cloud, network slicing, security, and industrial automation.
- § We invest in the architecture and 5G system-on-chip capabilities for our mobile radio network products to improve product cost competitiveness, essential to improving Nokia Group's profitability and gross margins over time.
- § We invest and innovate in digital service architecture, advanced analytics, machine learning, automation and serviceability for fast and flawless delivery of our network infrastructure services.
- § We provide industry-leading cognitive network services to improve network performance, operational efficiency and subscriber experience, and develop service business models to open new revenue streams for CSPs.
- § We maintain our leading market share in copper and fiber access and accelerate momentum in fixed wireless access for 5G and simplify network operations for our customers.
- § We leverage our superior products and the next-generation IP routing portfolio based on our FP4 chipset to grow in both edge and core routing, where we have a broad portfolio that is differentiated by performance, flexibility, security and quality.
- § We build technology leadership in our Optical Networks portfolio leveraging our PSE-3 chipset.
- § We develop the next-generation technological disruptions in close collaboration between our business groups and Nokia Bell Labs.

Progress

- § By the end of 2019, Nokia had won 62 commercial 5G deals and launched 18 commercial 5G networks with leading operators, in particular in North America, Korea, Japan, Australia and New Zealand, Europe and Middle-East and Africa.
- § Regarding our conversion rate from 4G to 5G based on actual radio business volume, we are at a strong 93.5%. Excluding mainland China, where local players have a dominant market share, we have a weighted conversion rate of 103%. Therefore, excluding mainland China, we have won more share in 5G than we had in 4G, amongst all those 4G customers who have decided on their 5G vendors.
- § We are making progress with Mobile Networks radio design-to-cost reduction, with significant annualized product cost and procurement savings. To address 5G product cost issues and meet higher performance requirements, we have introduced a new generation of radio chipsets that will reduce the size, weight and power consumption of our mMIMO products. We have started rolling out Nokia's new system-on-chip, “5G Powered by ReefShark” base station portfolio.
- § The first cloud-based (vRAN 1.0) 5G/New Radio (NR) system in North America has been launched with Nokia. This launch is the first commercial Nokia Cloud RAN deployment.

- § In our copper business, we maintained our strong market position with a market share of around 32% and we have significantly increased our market share in G.Fast (+13 percentage points), the technology for the next generation of copper-based broadband access. We have built strong traction in fixed wireless access with deployments at several customers, for example, Optus in Australia, and are selected by relevant new players, for example, Rakuten.
- § In IP Routing, our FP4 chipset is getting strong market momentum. We have won more than 140 projects with 119 customers including over 61 new projects and 34 replacements of competitors.
- § In Optical, we have our PSE-3 chipsets deployed in production networks with select customers.

2. Grow

Grow the enterprise and webscale business and lead the digitalization of industries with private networks and industrial automation.

Our aspiration, strategy and position

In 2019, Nokia accelerated its engagement with the enterprise customer market. Recognizing the growth potential of our business within this market, we created a new business group, Nokia Enterprise, effective January 1, 2019. Our Nokia Enterprise business group addresses mission and business critical networking requirements for asset-intensive industries. We build hyperscale cloud and private networks for our customers, and serve the following segments: webscale, transportation, energy, manufacturing and logistics, governments and cities.

The Nokia Enterprise growth strategy is based on three focus areas – scaling our enterprise networks business, further growing in the webscale segment, and expanding into industrial automation with private networks.

Our focus areas

- § We scale up our existing business in transportation, energy, government and cities segments by augmenting our IP/MPLS, Optics, GSM-R and other existing portfolios with private networks, providing customers with the performance and security they require as they digitize and transform their communications infrastructure and applications. We also continue to drive the adoption of multi-cloud, Internet of Things (IoT) and automation with strategic investments in emerging technologies such as Software Defined Networks (SDN), Software Defined Wide-Area network (SD-WAN) applications, and data centers.
- § We continue to grow our market share in the webscale segment with IP and Optical portfolios where we are building large high performance networks that drive hyperscale cloud connectivity.
- § We see a private wireless inflection point in the market that is driven by the need for high performance private wireless networks. Driven by the convergence of operational technology (OT), information technology (IT) and networks, customers in these domains need a higher level of network performance in order to automate and digitize their operations. We are implementing a strategy to enter and grow in the manufacturing and logistics segments where the opportunity for high performance private wireless networks is significant. Our strategy is to address these customers with our Nokia Digital Automation Cloud platform and our modular private wireless solution.

Progress

- § In 2019, we built strong market momentum in our target vertical markets with more than 120 new customers and we now have more than 1 300 enterprise customers, deploying our networks globally.
- § We have accelerated our private wireless networks (4G/LTE) business growth with more than 130 customers across the globe and cross-industries.
- § We continue to expand our ecosystem of technology and go-to-market partners to increase our scale and coverage especially towards the new manufacturing and logistics segments.
- § We implemented a new simplified and efficient delivery model for our enterprise projects that we believe will improve the enterprise customer experience and further support the growth in our revenues.
- § In the initial year of execution against this strategy, we delivered sales growth of 21% in the enterprise space, excluding the third-party integration business that we are exiting, and posted good margin quality and solid profitability.

3. Strengthen

Strengthen the software business with one Common Software Foundation.

Our aspiration, strategy and position

Nokia is recognized as the number 1 leader in telecoms software with a broad portfolio covering most segments of this growth market. Our aspiration is to further strengthen this position and consistently perform at par with the global leaders in enterprise software. Our strategy is to help our customers modernize from slow, siloed and monolithic systems that weigh them down today towards more agile, intelligent and lightweight solutions. Our multi-network and multi-vendor solutions enable our customers to run their business fast and intelligently based on closed-loop automation and smart cognitive technologies. Key to our differentiation is continued investment in our Common Software Foundation and leading architecture, and a product-centric business model. We have seen strong progress in building a standalone software business beyond the product-attached software model. We have implemented significant improvements: re-architecting many of our products, moving to become truly cloud-native, and creating a strong, experienced software sales force. Based on this foundation, we strengthen the business and aim for growth.

Our focus areas

- § **Build:** We accelerate our R&D by focusing our investment on key growth topics of 5G applications, automation, software suites, and digital innovation platforms; building foundational innovation and leveraging it to lead with a cloud-native portfolio; and streamlining towards more efficient and simple processes.
- § **Sell:** We focus our go-to-market to deliver success for our customers with a consultative selling approach, to drive new business in new accounts, and to increase our recurring revenue.
- § **Deliver:** We optimize our services and delivery with investments in people and digital & cloud skills, by driving tooling and automation, and by evolving the services we offer to meet new market needs.
- § **Basis for our execution:** We are leveraging a strong partner ecosystem of system integrators, independent software vendors (ISV), and technology players, as well as applying consistent commercial and operational discipline.

Progress

- § We have successfully integrated the mobile core portfolio into the Nokia Software business group.
- § Analysys Mason, a leading telco software consultancy firm, has ranked Nokia as the top telecom software provider by revenue.
- § We won important deals in both applications and core networks – including Bharti, China Unicom, and MTN South Africa – and started delivering 5G capabilities to a number of customers, such as Ooredoo Qatar, Three UK, and U.S. Cellular.
- § We closed the year with record operating margin and healthy organic growth in Nokia Software, demonstrating successful execution of our strategy.

4. Diversify

Diversify the licensing business with new opportunities in automotive, consumer electronics, IoT and brand.

Our aspiration, strategy and position

We intend to consolidate our position as a leader in patent licensing. We own one of the broadest and strongest patent portfolios in the mobile communications sector, built from the innovation of Nokia, Nokia Siemens Networks and Alcatel Lucent. At the end of 2019, our patent portfolio included around 20 000 patent families, and we filed patents on more than 1 300 new inventions during 2019. We have successfully generated recurring revenue streams from all major mobile device players. We continue to invest in fundamental R&D from which we also file patents relevant to the 5G cellular standard to ensure our continuing leadership position and portfolio renewal. Our approach is to keep our patent licensing business with mobile device players strong and to target significant cash generation. At the same time, we diversify into new licensing domains in automotive, consumer electronics, and the Internet of Things, together with expanding our brand licensing, and manage these domains for growth.

Our focus areas

- § We continue to invest in and renew the portfolio through innovation in multiple areas, especially cellular standard essential patents, in part as a result of the extensive research activities of Nokia Bell Labs.
- § We focus on renewing existing patent licenses on favorable terms and work to sign the remaining uncontracted mobile device players.
- § We continue to expand patent licensing into new segments, such as automotive, consumer electronics, and Internet of Things.
- § We license our unique audio/visual technologies to device creators.
- § We are expanding our brand partnerships business beyond mobile phones.

Progress

- § We continued to sign multi-year patent license agreements with smartphone companies, such as Vivo, TCL, Tinno, and Wiko.
- § We made good progress in the automotive segment, and currently more than a dozen automotive brands from companies such as BMW Group, Volkswagen Group and Volvo Cars are licensed under Nokia patents for their connected vehicles.
- § We have expanded our licensing activities through new license agreements in the Internet of Things segment.
- § We have progressed in licensing our leading portfolio of OZO technologies to smartphone and camera manufacturers, including products shipping from companies such as OPPO, Axon and HMD Global.
- § We announced collaborations with GE Licensing and Innventure to monetize inventions originating from Nokia Bell Labs, creating additional revenue streams for Nokia while enabling others to build on Nokia innovations.
- § Nokia brand partnerships focused on supporting HMD Global, our exclusive brand licensee for phones and tablets, and on expanding brand licensing to new categories. In November, India's leading online retailer, Flipkart, announced a brand licensing agreement to create Nokia branded smart TVs for the Indian market and launched the first 55" Nokia branded smart TV.

5.Operational Excellence

Operational excellence for new levels of efficiency, productivity and industry cost leadership

Our aspiration, strategy and position

Nokia takes action to improve its productivity and efficiency to assume the industry cost leadership position.

Operational excellence remains a source of competitive advantage for us and is the foundation of our strategy. Given the challenge of our main customers, the communication service providers, to monetize the strongly increasing traffic growth, their focus will remain on deploying and managing their networks in the most cost-efficient way. This leads to a focus on total cost of ownership for them and sustained price pressure for us as their supplier. To cope with this price pressure, we must continuously improve our efficiency, productivity and cost position.

Our efforts will continue with accelerated speed and focus to ensure sustainable profitability, cost efficiency and cash generation.

We are making progress in improving our performance and expect our turnaround to have firmly taken hold by the end of 2020.

Our focus areas

- § We strengthen cash management, through improved governance and reinforced cash culture.
- § We improve our commercial management and deal discipline.
- § We work closely with our suppliers to reduce the total cost of ownership of our equipment.
- § We modernize IT and simplify and digitalize our key processes to modernize our ways of working and increase productivity.
- § We invest in digitalization and automation in the service business to increase our productivity in deploying networks.
- § We strategically consolidate our site footprint to improve collaboration and efficiency of the R&D.
- § We execute our workforce strategy to ensure we have a future-fit set of capacity and capabilities.
- § We embed productivity and effectiveness culture at the heart of our company for the long term.

Progress

- § We have implemented structural changes to strengthen cash generation across Nokia, and we saw solid cash performance in the fourth quarter with a 1.4 billion euro improvement in our net cash position, allowing us to end the year with a net cash balance of 1.73 billion euros.
- § We have a structured central program in place to drive a company-wide focus on free cash flow and release of working capital, including project asset optimization, strengthened contractual terms with customers and suppliers, and reinforced controls across our supply chain and management of inventory. With the work done in 2019, we were able to reduce inventories to the lowest levels since the beginning of 2018.
- § We strengthened commercial management process over the course of 2019 to drive better performance in current contracts and improve outcomes in new ones. Deal decisions now include a sharp focus on cash and return-on-capital-employed metrics, and improved contractual terms.
- § We realize ongoing productivity improvements across our top company processes with digitalization.
- § We further strengthen operational performance in services, as we increase operational discipline and enhance our efforts to manage for margin and cash, with execution discipline and enforcement of standard delivery models for fast and first-time-right network deployments, investments in digitalization and automation-driven productivity, and tighter control of inventories.
- § We have set up a separate governance for tracking operational excellence initiatives, with strategic priorities defined for all Nokia units and close execution tracking.
- § We are implementing a refreshed investment strategy and portfolio capital allocation approach to steer R&D investment decisions.
- § We continue our site optimization strategy, reducing real estate spend while creating modern workplaces for our employees.
- § We have defined our culture strategy to drive cash and margin performance, with incentives aligned to refreshed performance management structure.

Innovation

Technology innovation will play a key role in achieving a more sustainable planet and better, healthier lives for all people.

We are driving the future of technology and transforming the way people and things communicate. Our leading research and development efforts, including the pioneering Nokia Bell Labs, are enabling innovations that will redefine our customers' businesses as they deliver extraordinary experiences for individuals and enterprises. The fourth industrial revolution will enrich lives, economies and societies and we are dedicated to assuring that its unprecedented impact will be delivered in ethical and sustainable ways.

Research & development

As one of the industry's leading investors in communication technology R&D, we drive innovation across entire networks, end-to-end. Our continuous product development in 5G, private wireless, intelligent analytics and automation, Internet of Things (IoT), and next generation software-defined networks enables our customers to address the needs of a digitally connected world.

We have a global network of R&D centers, each with individual technology and competence specialties. The main R&D centers are located in Belgium, Canada, China, Finland, France, Germany, Greece, Hungary, India, Italy, Japan, Poland, the Philippines, Portugal, Romania, Slovakia, the United Kingdom and the US. The ecosystems around each R&D center helps us to connect with experts on a global scale and our R&D network is further complemented by cooperation with universities and other research facilities. In Belgium, China, Finland, France, Germany and the US, we have significant Nokia Bell Labs research activities where we are conducting disruptive research that focuses on the next phase of the connected world.

Nokia Bell Labs is the world-renowned industrial research and innovation arm of Nokia

Over its nearly 100-year history, Nokia Bell Labs has invented many of the foundational technologies that underpin information and communication networks and all digital devices and systems.

This research has resulted in nine Nobel Prizes, four Turing Awards, three Japan Prizes and a plethora of National Medals of Science and Engineering, as well three Emmys, two Grammys and an Oscar for technical innovations. Nokia Bell Labs continues to conduct disruptive research focused on solving the challenges of the new digital era and innovating the technology that will define the next industrial revolution.

With Nokia Bell Labs, we search for the fundamental limits of what is possible, rather than being constrained by the current state of the art.

We look to the future to understand essential human needs and the potential barriers to enabling this new human existence. We then use our unique diversity of research intellects, disciplines and perspectives to solve key problems through disruptive innovations with the power to enable new economic capabilities, societal behaviors, business models and types of services – in other words, we drive human and technological revolutions.

Our research is focused on key scientific, technological, engineering or mathematical areas that require ten times or more improvement in one or more dimensions. We then combine these areas of research into the Future X Network architecture, which aims to bring these disruptive research elements together into industry-redefining solutions. These innovations are brought to market through our business groups or through technology and patent licensing. Nokia Bell Labs also engages directly with the market and customers through our consulting practice to help define the path to the future network with business model innovation and the optimum techno-economics.

This model of defining future needs and inventing game-changing solutions to critical problems while advising the market on the path forward has been the constant mission of Nokia Bell Labs.

Nokia Bell Labs focuses on three core areas of disruption:

- § **Patents & standards leadership:** Nokia Bell Labs funnels a constant stream of innovation into Nokia's intellectual property portfolio. Those innovations are used not only to create the building blocks for Nokia products, but also as significant sources of licensing revenue and the basis of our standards leadership, which aims to create value for new and existing ecosystems.
- § **Research leadership:** Nokia Bell Labs is researching the software, hardware and applied sciences that will define the societies of the future. We are helping to usher in a new industrial revolution, where augmented humans achieve enormous gains in productivity while amplifying their innate potential for creativity.
- § **End-to-end leadership:** Nokia Bell Labs is building end-to-end solutions for Nokia's business groups, which will be key to supporting the network and service orchestration required of highly automated and massively scalable networks in the future. Bell Labs Consulting leads our end-to-end strategy, providing independent advice to service providers, enterprises and industries, while our Future X Labs showcase the countless possibilities of end-to-end architectures.

2019 highlights

- The world's first end-to-end 5G Future X Lab, which opened in late 2018 at Nokia Bell Labs headquarters in Murray Hill, NJ, attracted approximately 1 700 visitors in 2019. Building upon this success, a new Future X Lab was opened at Nokia's global headquarters in September 2019. Each Lab enables communication service providers, enterprises and infrastructure providers to learn and understand the techno-economic power of a 5G end-to-end network to better serve their customers and unleash new value.
- Nokia Bell Labs and Etisalat established a new world record for optical capacity of 1.3 Tbps (1 300 000 000 000 bits per second) over a single fiber. The field trial in the United Arab Emirates was the first time the 1 terabit milestone was achieved in a real network.
- In March, the Association for Computing Machinery recognized two former Bell Labs researchers with the ACM A.M. Turing Award, often referred to as the "Nobel Prize of Computing". Yann LeCun and Yoshua Bengio worked together at Bell Labs in the early 1990s on artificial intelligence research, and shared – along with Geoffrey Hinton – the 2018 Turing Award for their conceptual and engineering breakthroughs in deep neural networks.
- Through Nokia Bell Labs, Nokia in 2019 extended its commitment to the highest standards in network security by unveiling an enhanced security program and establishing an advanced security testing and verification laboratory – both designed to address the critical security needs of 5G end-to-end networks.
- Nokia Bell Labs continues to pioneer many of the fundamental technology innovations that are being adopted into 5G standards. In 2019 these innovations enabled Nokia to declare to the European Telecommunications Standards Institute (ETSI) more than 2 100 patent families as essential for the 5G standard, reflecting its continuing leadership in cellular technology R&D and standardization.
- Researchers at Nokia Bell Labs were part of a research team including the Advanced Materials and BioEngineering Research (AMBER) at Trinity College Dublin that created a new, innovative formula for battery composition that makes batteries more powerful by packing 2.5 times more battery life than anything currently on the market. This new game-changing battery design has the potential to help power the 5G connected world of the future.
- Artificial intelligence and machine learning technologies were applied to create new industry tools in 2019, including Code Compass, which augments software development with natural language processing to recognize the behavioral similarities of software libraries and automatically recommend open source modules to drastically accelerate development.
- Nokia Bell Labs in 2019 continued to develop advanced vectoring for wireline broadband. Dubbed Vectoring 2.5, the latest R&D is being incorporated into fixed network products to expand the performance of G.fast products, especially on ill-conditioned lines. This will further improve the productive lifetime of existing copper for network service providers.

Sales and marketing

Nokia considers its customers in two distinct markets. Our primary addressable market consists of communication service providers (CSPs). Our current enterprise business is relatively small in comparison with our operator business, but is growing fast.

Our Customer Operations (CO) organization is the primary interface with our CSP customers. CO Americas is dedicated to our markets in North America and Latin America, while the CO EMEA & APAC organization is responsible for our Asia Pacific, Europe, Greater China, and Middle East and Africa markets.

The CO organization has a comprehensive global presence and is active in approximately 120 countries. Its organizational structure ensures that our customers benefit from dedicated management attention and from our teams' deep understanding of local markets. This approach enables Nokia to maintain strong customer relationships.

In addition to sales, Customer Operations is also responsible for project delivery, ensuring strong alignment between our customer-facing sales and delivery teams in each account. Our "One CDM" (customer delivery manager) model provides a strong counterpart to our sales-focused customer team setup, ensuring that customers have a seamless experience when working with Nokia. This is particularly important given the value our customers place on Nokia's approach, which provides end-to-end fully integrated solutions to a pre-defined set of customer needs, for example, in the area of end-to-end security, or mission-critical systems.

Nokia also has a dedicated enterprise sales force with global presence, focused on selling to enterprise customers both directly and via channel partners. Partners include system integrators, consulting companies, distributors and value-added resellers.

The CO organization also works very closely with Nokia Software to ensure the right level of customer focus and expertise in this crucial area, and with Nokia Enterprise to make sure that we are efficient in developing and selling the solutions that will benefit both our CSP and enterprise customers. We strongly support our "Service-Provider-as-a-Partner" (SPaaP) sales approach, in which we work in partnership with operators to address customers in the enterprise space. This model is proving to be a successful route to market for CSPs as well as for Nokia.

Mobile Networks

Market overview

The primary market for our Mobile Networks business group includes technologies for mobile access and microwave transport. This encompasses access network technologies ranging from 2G to 5G licensed and unlicensed spectrum for both macro and small cell deployments.

Business overview and organization

In Mobile Networks our goal is to be a leader in 5G and provide the best value to our customers as they evolve their networks. We continue to develop our 5G portfolio according to the latest 3GPP specifications, we have declared more than 2 100 patent families as essential for 5G, and are proud of the number of industry firsts that we have completed on the path to 5G commercialization. In November 2019 the independent analytics firm, IPLytics GmbH, ranked Nokia number 2 for ownership of granted patents declared as essential for 5G. We see a strong appetite for 5G across mobile markets, and we are the only end-to-end mobile network vendor working with the major operators in the United States, China, South Korea and Japan. Nokia is rolling out technology today as our customers launch 5G networks.

We have a large global installed base in 2G/3G/4G that is expected to provide us with the platform for success in 5G. We have more than 350 customers in 4G/LTE and a robust AirScale platform, which can be upgraded from 4G to 5G. We built our AirScale portfolio and small cells, software and mobile transport solutions to work across all generations of technology and all relevant spectrum bands for efficient, simplified and optimized sites for our customers. In radio networks we build our access portfolio based on one architecture: Future X is the foundation of our reference architecture for all deployment models. The Nokia 5G Future X end-to-end product and services portfolio combines high-capacity 5G New Radio (NR), core, software-defined network (SDN) -controlled "Anyhaul" transport, edge clouds, and software orchestration to provide a complete set of network capabilities for commercial 5G. At the Future X Lab Nokia enables customers to experience Nokia's full end-to-end portfolio of 5G equipment, software and services, allowing communication service providers, enterprises and infrastructure providers to learn and understand the techno-economic power of a 5G end-to-end network to better serve their customers and unleash new value.

Nokia was involved in more than 100 5G technical engagements in 2019, with the total number of 5G commercial deals at 62 at the end of 2019. A total of 18 of those 5G networks were live in 2019 in Asia Pacific, the United States, Europe, Middle East and Africa. Among them, we had live networks operating for SK Telecom, KT, and LGU+ in South Korea serving 5 million 5G subscriptions at the end of 2019; and AT&T, T-Mobile, Sprint and Verizon in the United States. At the end of 2019, we also had two 5G deals with enterprise customers beyond communication service providers.

Competition

The mobile networks market is a highly consolidated market, and our main competitors are Huawei and Ericsson. Additionally, there are four regional vendors, ZTE, Samsung, Fujitsu and NEC, as well as some new, small entrants, such as AltioStar, Mavenir, Parallel Wireless, JMA Wireless and Airspan. The microwave transport market segment is more fragmented. There, besides Huawei and Ericsson, our key competitors include, for example, Ceragon, NEC and Aviat.

2019 highlights

- At the end of 2019, we had 62 commercial 5G deals and 18 launched 5G networks.
- We have launched mid-band 5G/NR networks in 2.5GHz and 3.5GHz, high-band mmWave networks in 28GHz and 39GHz and low-band networks in 600MHz and 850MHz.
- We have launched networks with 20MHz, 60MHz, 80MHz and 100MHz carriers, as well 200MHz (2*100MHz 2CCA) and 400MHz (4*100MHz 4CCA).
- We are expanding sub 6GHz capabilities to 40MHz, and mmWave to 800MHz (8*100MHz).
- Our cloud-native AirFrame product has reached +100 commercial customers.
- We delivered the first cloud-based 5G/NR (virtual RAN 1.0) system in the world and it is live in Washington D.C.
- We have more than 130 private LTE customers and two private NR customers.
- The digitalization of our 5G factory in Oulu, Finland was recognized by the World Economic Forum as an "Advanced 4th Industrial Revolution Lighthouse".

Global Services

Market overview

The Global Services business group deploys, supports and operates communication service providers' (CSP) and enterprise networks. This includes network infrastructure services and professional services for mobile networks and managed operations for fixed, mobile, IP and optical domains. In addition, new growth areas are network cognitive services and analytics, deploying and operating networks in public sector, energy and transport markets and introducing new business models for CSPs, such as our Worldwide IoT Network Grid (WING).

Business overview and organization

The services, solutions and multivendor capabilities of Global Services business group guide CSPs in their digital transformation journey and help navigate through the evolving technology landscape, network complexity and data growth. We work with CSPs to improve end user experience while providing support in day-to-day network planning, implementation, operations and maintenance.

The Global Services offering allows Nokia to differentiate in the 5G market while helping CSPs prioritize their 5G investments and bring 5G-based services to the market faster. Nokia 5G digital services portfolio helps CSPs assess the technical choices, design and deploy end-to-end 5G networks that meet the needs of diverse 5G use cases such as cloud gaming, connected cars and autonomous factory robots.

A key focus area in Global Services is empowering CSPs to transform to digital service providers. We are building a new digital architecture for the full life cycle of network design, deployment, operations and technical support – for both legacy and cloud-based networks. The Nokia AVA framework provides advanced AI and analytics as well as a common data lake to help boost network performance, operational efficiency and customer experience. We also help digital service providers to seize the possibilities of Internet of Things (IoT) and enter new markets using Nokia Worldwide IoT Network Grid (WING), which provides seamless connectivity across geographical borders and technologies. We enable our customers to enter new markets rapidly and with low risk through pay-as-you-grow or revenue share models.

Enterprise is a strategic growth area for Global Services. We are enabling the digitalization of asset-intensive industries with connectivity-driven services and digital automation solutions. Our new digital service framework shortens sales cycles and drives rapid, repeatable service delivery helping our enterprise customers to minimize complexity. We deploy private broadband networks to accelerate the digitalization of industries, enabling higher productivity, operational efficiency and increased worker and asset safety. Our global expertise in managed services enables our enterprise customers to reap the benefits of operational transformation, managed security and network operations support for their new IP/MPLS and mission-critical private LTE networks.

Competition

In a market segment that combines products and services as well as managed services, Nokia competes against traditional network equipment providers such as Ericsson and Huawei, while for the service-led businesses like cognitive, IoT and enterprise services, we see other competitors such as Cisco, HPE, and IBM emerging.

2019 highlights

- Global Services played a crucial role in more than 100 5G technical engagements in 2019 and in 62 commercial 5G agreements, along with 532 enterprise opportunities.
- Nokia launched industry's first 5G Maturity Index, produced in partnership with Analysys Mason, which provides operators with best practices for planning, deploying and monetizing 5G services.
- Nokia WING, a managed service for global IoT deployments that provides seamless connectivity across geographical borders and technologies, saw continued momentum with Hutchison 3 Indonesia, Telecom Egypt and TIM Brazil signing up for the service. We had 10 customers for WING at the end of 2019. In addition, four new off-the-shelf WING packages were launched to help operators win new business in vertical IoT markets.
- Nokia and AT&T jointly launched a new Munich-based IoT Innovation Studio to support the growing global adoption of current and next-generation IoT solutions. The studio allows companies to see first-hand how IoT solutions can solve business problems, and acts as a hub for the next-generation of innovators coming from start-ups, universities and the wider European technology ecosystem.
- Nokia launched Cognitive Collaboration Hubs to help operators design 5G networks and create AI-enabled use cases. The Cognitive Collaboration Hubs bring together an industry-leading mix of data science, telco and cloud expertise from more than 75 partners.
- GlobalData, a data analytics company, rated Nokia as 'Leader' in managed services, a testimony to our advanced operations capabilities.

Fixed Networks

Market overview

The primary market of Fixed Networks is the communication service providers (CSP). Fiber-to-the-home (FTTH) is now established as the main deployment model, but fiber-based access technologies, such as fixed wireless access (FWA), xDSL upgrades or cable upgrades, continue to be a valid complement. The key to make the universal “gigabit to the home” business case work – and connect more people, sooner – is to select the right tool for the job. 5G FWA is a new “tool” in the broadband toolkit, and sees significant interest. We build solutions not only to deliver a gigabit to every home, but also to bring that gigabit experience into the home using meshed Wi-Fi solution. Fixed Networks has been diversifying into new segments, including cable MSOs, non-traditional players like infrastructure wholesalers, and enterprise.

Business overview and organization

The Fixed Networks strategy is based on three pillars: fiber-based access infrastructure to bring a gigabit to every home; Wi-Fi solutions to bring a gigabit into the home; and cloud/virtualization solutions to automate and simplify the network. Innovation and thought leadership are a cornerstone of all three areas.

The first pillar of Fixed Networks strategy is about offering the right technology mix to deliver gigabit access to more people, everywhere. It includes fiber, fixed wireless access, xDSL upgrades, and cable upgrades. Nokia is a leader in fiber access with a number 1 position in next-generation XGS-PON technology and remains a market leader in copper technologies, such as VDSL and G.fast. In 2019, we have expanded our portfolio with new fixed wireless access solutions, including 4G/5G outdoor receivers and indoor gateways. For cable operators, Nokia offers a similar toolkit consisting of FTTH and cable upgrades, and started to see traction across the globe.

The second pillar, delivering a gigabit to and into the home, is about ensuring the perfect connectivity throughout the home. Our Nokia Wi-Fi portfolio includes meshed Wi-Fi solutions to provide Wi-Fi coverage in every corner of the building. In 2019, we also added cloud-based controllers to not only manage and optimize Wi-Fi performance in single home, but also across buildings. We also introduced several new options (entry-level beacons and high-end beacons), resulting in 34 CSP references to date.

Finally, as networks combine different technologies and deployment models, they also become more complex. The third pillar of Fixed Networks strategy looks at simplifying and automating operations, with the cloud and virtualization playing a key role. Our Software-Defined Access Network (SDAN) solution takes an open and pragmatic approach, with concrete use cases like slicing and a smooth evolution path for the installed base. 2019 saw the first deployments.

Competition

The competitive landscape in fixed access for CSPs has two major key players, Nokia and Huawei, who have the bulk of market share. ZTE, in third position, has been impacted by the United States components ban, although to a fairly limited degree. Smaller players like Calix and Adtran in North America and Fiberhome in China have limited footprint and have an estimated market share smaller than 10% and no comparable breadth of portfolio.

2019 highlights

- Nokia continued to be a market leader in fiber and copper access. We are the only vendor with a leading market share in all regions worldwide, and the only Western supplier in China.
- For Fixed Networks, our strategy of growth through diversification is paying off. Our portfolio diversification is opening growth opportunities in cable, whole-home Wi-Fi, fixed wireless access and virtualization; our geographical diversification has delivered breakthroughs in countries like South Korea, India and Japan, with good growth opportunity; and our market diversification is opening new business opportunities in new segments and with non-traditional customers.
- We expanded our portfolio with new fixed wireless access solutions, including 4G/5G outdoor receivers and indoor gateways. Rain and Optus have already deployed our 5G FWA products.
- We introduced several new Wi-Fi options, both entry-level beacons and high-end beacons, resulting in 34 communication service provider references to date.
- We deployed our Software-Defined Access Network (SDAN) solution commercially for the first time in 2019.

IP/Optical Networks

Market overview

The primary market for our IP/Optical Networks business group includes IP, optical and network automation technologies and related services sold to communication service providers (CSPs). Our comprehensive wide area networking (WAN) solutions enable CSPs to build and operate automated, secure, and high-performance networks at massive scale. They use them to interconnect people and things from any broadband access modality to – and among – edge clouds, central clouds, the Internet, and other services and data centers. This market includes technologies such as: IP routers, IP service gateways, packet optical switches, optical line systems, and network automation platforms.

A growing portion of our IP/Optical Networks revenue is derived from adjacent markets, which include customer segments like webscale companies and enterprises. In the enterprise segment, we address verticals like transport, energy and the public sector as well as software-defined networking for health care, finance and retail enterprises. We address these mission-critical markets with the same solution sets augmented with purpose-built variants to address unique requirements.

Business overview and organization

For our IP/Optical Networks business group, we provide the high-performance and massively scalable networks that underpin the digital world's dynamic interconnectivity. Our portfolio of robust and innovative software, systems and services play across multiple domains, from programmable IP and optical transport networks for the smart network fabric to analytics and software-defined capabilities for the programmable network operating system and more.

CSP networks are under tremendous pressure from cloud-based applications, ultra-broadband evolution and the Industrial IoT. Our IP and optical networking solutions reduce time to market and risk as CSPs launch new services, rapidly scale them to meet surging demands, and add new features and functions in future. Our insight-driven network automation solutions help to further ensure that network services are delivered with consistent quality, reliability and security and that restorative actions are automatically initiated when any parameter varies beyond set limits. These carrier-grade attributes also address the needs of – and are valued by – our webscale, transport, energy, public sector and large enterprise customers.

The IP/Optical Networks product portfolio includes:

- Comprehensive family of IP routers for aggregation, edge, core, data center, and Internet peering applications.
- Comprehensive family of packet optical switches, DWDM multiplexers, and optical line systems for metro access and aggregation, data center interconnection, and core, subsea and longhaul applications.
- Advanced cloud-optimized IP service gateways for residential, business, mobile and Industrial IoT services and unique hybrid solutions enabling a converged services future.
- Advanced network automation platforms that analyze, automate, manage and control multi-vendor IP and optical networks.
- Advanced data center automation and software-defined WAN solutions that configure network connectivity among clouds and to any enterprise branch office with the ease and efficiency of cloud compute using products from our Nuage portfolio.
- An extensive portfolio of professional services to accelerate the benefits of integrating new technologies to transform networks and leverage the latest innovations in SDN, virtualization and programmable IP and optical networks.

Competition

Our competitive landscape in this space includes Cisco, Juniper Networks, Huawei, and Ciena.

2019 highlights

- BT deployed Nokia's 7750 SR-s platform, based on our FP4 silicon, giving BT's network the enhanced capabilities and automation needed to address continuously mounting capacity demands as it moves towards 5G. Our exclusive agreement will allow BT's converged core network to grow, and move to a programmable, insight-driven network architecture, creating a platform for BT's growth to continue as demand for its services in fiber-to-the-premises (FTTP) and 5G expands.
- Probabilistic Constellation Shaping (PCS), a Nokia Bell Labs innovation at the heart of our next generation Photonic Service Engine (PSE) family of super-coherent digital signal processors, set new optical performance records during trials by Etisalat, Telecom Italy, Netia, and M-net. The Nokia PSE-3 is now shipping to customers and will be instrumental in the evolution of CSP and webscale networks to meet the surging traffic demands of video, cloud and 5G by maximizing the capacity and performance of every link in their optical networks.
- Softbank selected Nokia's Cloud Packet Core to benefit consumers by bringing them a 5G enhanced Mobile BroadBand (eMBB) service. Businesses will benefit from multiple new applications and services for industries in the 5G era including 5G Ultra Reliable Low Latency Connectivity (URLLC) and enhanced Machine Type Communication (eMTC).
- Telefónica Spain selected our Deepfield Cloud Intelligence analytics solution to improve user experience and troubleshoot content delivery in real time. The solution will equip Telefónica Spain with previously unattainable visibility into application and service traffic on its network. This provides vital, data-driven insight and analytics into the capacity being used and enables automated actions to significantly improve service assurance and performance.
- Bahrain's leading digital service provider, Batelco, selected the Nuage Networks SD-WAN 2.0 solution to support cloud connectivity, automation and digital transformation services for its Bahrain and international enterprise customers. Batelco will complement its existing business services by providing customers with simplified management of, and dynamic support for, cloud and IoT applications.

Nokia Software

Market overview

Nokia Software is the leading solutions provider in the telecoms software market.

The telecoms software market is driven by large-scale service and network operations automation, and by digital business transformation in support of communication service providers' shift to 5G. At the same time, 4G modernization will continue to drive investment in less developed markets. These market drivers are countered by 3G legacy decline and pricing pressure.

Business overview and organization

Built on Nokia's cloud-native Common Software Foundation (CSF), Nokia's multi-vendor and multi-network software solutions enrich and secure user experiences; automate operations and infrastructure; and enable new revenue streams and cost efficiencies. Nokia's CSF ensures our software solutions are easy to deploy, integrate, use, scale and service. Nokia was the first to build a cloud-native software platform at scale in the telecoms software market.

Nokia Software's business has two parts, Applications and Core. Nokia software applications provide solutions for digital experience, digital intelligence and digital operations, all designed to connect service providers' business to their network. In January 2019, Nokia core networks portfolio was aligned inside Nokia Software. Nokia's core network solutions span 5G, mobile broadband, and IoT; and simplify operations and enable new services and revenue streams.

Our strategy is to strengthen our software business at scale by further evolving our R&D and delivery functions and focusing our investments in the strategic areas of 5G, automation, portfolio integration, and digital innovation platforms.

Investment in a cloud-native CSF and our multi-vendor, multi-network agnostic approach sets us apart from most large competitors. Against smaller players, Nokia has the advantage of global delivery capabilities and a large installed base, backed by a broad, end-to-end portfolio.

Competition

Nokia's software competitors fall into two categories: independent software vendors (ISVs) and network equipment providers (NEPs). The main ISV competitors are Amdocs, Netcracker and Oracle; in addition, we see increasing competition from niche, boutique software players. The main NEP competitors are Huawei and Ericsson, which sell software as part of large infrastructure deals.

Many large telco software competitors are struggling to generate near-term growth until 5G deployments scale up; while the high number of small boutique software players adds competitive intensity to this market. Like most telecoms-related markets, telecom software is a buyers' market with significant pricing pressure. It does, however, provide significant long-term opportunity for those vendors that can drive technology and operational leadership and set the pace of transformation in the industry.

Due to the fragmentation of the market, there remains significant growth opportunities for those companies able to consolidate the market through organic growth and/or acquisitions.

Nokia's software business is number 1 in applications with about 9% estimated market share, while in core networks we have 25% estimated market share.

2019 highlights

- We have made solid strides in scaling our software business, including the successful integration of the core portfolio into the software business.
- Analysts at Analysys Mason ranked Nokia in October 2019 as the top telecoms software provider by market share across both telecoms software and services combined.
- Nokia announced that its Common Software Foundation platform supports Amazon Web Services (AWS), offering communication service providers additional deployment choice and faster time to service when rolling out new 5G or digital services.
- Nokia and VMware announced an expanded partnership that includes the development of integrated solutions to support communication service providers' drive for operational improvements and cost efficiency through large-scale, multi-cloud operations.
- Three UK and Nokia launched the world's first 5G-ready fully integrated cloud core network. The new 5G-ready core network, which sits in a virtual environment, offers increased security, flexibility and cost savings, allowing Three to scale more quickly and efficiently, and is a critical building block for Three to deliver the UK's fastest 5G network.
- We announced the launch of the NetGuard Adaptive Security Operations solution to give communication service providers a highly automated end-to-end system to meet the demands of 5G network connectivity and to address the rising cybersecurity threat posed by internet-connected devices.
- We continued to demonstrate the strength and breadth of our software portfolio with deal-wins across geographies and product units. These wins included Bharti, China Unicom, Grameenphone, M1, MTN South Africa, Orange, Ooredoo Qatar, Rakuten, Telefonica Brazil, U.S. Cellular, and Vodafone Egypt.

Nokia Enterprise

Market overview

In 2019, Nokia accelerated its engagement with the enterprise customer market. Recognizing the growth potential of our business within this market, we created a new business group, Nokia Enterprise, effective January 1, 2019. Our Enterprise business group addresses mission and business critical networking requirements for asset-intensive industries. We build hyperscale cloud and private networks for our customers, and serve the following segments: webscale, transportation, energy, manufacturing, logistics, governments and cities.

Business overview and organization

Nokia has a strong track record of helping enterprises modernize the communications networks they rely on to manage and control a range of operations, incorporating technologies from across Nokia's Mobile and Fixed Access, IP/Optical Networks, Software and Global Services portfolios, coupled with enterprise-specific products for digital automation, analytics and Internet of Things (IoT). High-performance networking is at the nexus of these critical customer requirements, addressing the demand for ubiquitous connectivity with private network infrastructure (with an increased importance of wireless) that delivers seamless connectivity, data management and analytics to drive relevant and tangible business outcomes. Enterprise customers seek to harness advances in communications and Industrial Internet of Things (IIoT) technology and benefit from digitalization, efficient asset management, improved processes, deeper levels of network security, worker safety, and new business models that will arise from ubiquitous connectivity. Our proven enterprise portfolio provides the foundation for more than 1 300 mission-critical networks deployed across industries.

Nokia's enterprise portfolio supports our Future X for Industries network architecture developed by Nokia Bell Labs, a blueprint for future industrial networks that intelligently combines high-performance, ubiquitous access and intelligent IP/optical networks with agile multi-cloud-enabled solutions, analytics-driven digital value platforms and business applications – with security capabilities embedded at all levels – to support industrial automation. Future X for Industries provides a strategic framework for our enterprise portfolio.

A significant and strategic accomplishment in 2019 has been the acceleration of our enterprise portfolio with specific advances in private networks. By augmenting our IP/MPLS, Optics, GSM-R and other existing portfolios with private networks, we are providing customers with the performance and security they require as they digitize and transform their communications infrastructure and applications. We also continue to drive the adoption of multi-cloud, IoT and automation with strategic investments in emerging technologies such as Software Defined Networks (SDN), Software Defined Wide-Area network (SD-WAN) applications, and data centers.

Transportation

In the transportation segment, Nokia continues to expand market penetration of the railway, highway, aviation and maritime industries. We deliver mission-critical networks and analytics that enable and support railway signaling, airport communications, air traffic control, digital signage and toll collection, and on-board broadband and infotainment.

Energy

In the energy sector, Nokia provides the mission-critical information network infrastructure and automation that is foundational in the transformation to next generation automated energy grids. We also provide oil, gas and mining companies with private networks that deliver new levels of performance and security to a range of mission-critical operations, protecting lives and increasing productivity.

Government and Cities

Nokia addresses the public sector from multiple principal perspectives. Nokia's public safety portfolio provides first responders with real-time, broadband mission-critical communications that help to save lives and manage crisis situations. These solutions support traditional two-way radio communications, while laying the foundation for advanced control centers and the data-rich mobile broadband services to enhance situational awareness and operational intelligence.

Additionally, as cities seek to deliver safer and higher quality of life for citizens, Nokia offers a platform-based approach to support the connectivity, data sharing and usage control capabilities needed for services such as smarter parking, lighting, traffic management and other municipal services. We continue to partner with governments and new network providers to bring broadband to remote, unserved and under-served communities.

Manufacturing and Logistics

Nokia continues to diversify into the industrial sector by enabling Industry 4.0 transformations with private networks and digital automation solutions in the segments of manufacturing and logistics. Our IIoT platforms, automation platforms and private wireless networking solutions help these customers to increase productivity and reduce costs through the digitalization and automation of their operational systems.

Webscale companies

The webscale companies are a select group of enterprises that handle millions of transactions per day, demand hyper-efficiency in content delivery and support exceptional online experiences. We enable these companies to intelligently and instantaneously scale their services through automated cloud-based global service delivery platforms with robust cybersecurity features by leveraging our intelligent IP and optical networking solutions.

Competition

The competitive landscape for the enterprise space is broad and includes many specialized players focused on specific markets. From this broad perspective, the primary players who supply high-performance networking and mission-critical fixed and mobile communications technologies across a range of market industries include Nokia, Cisco, Juniper, Huawei and Ericsson. Reflecting more on Nokia's strategic focus, the landscape can be more finely bifurcated between traditional private networks and private wireless. Within the private wireless area the key players are Nokia, Ericsson, Huawei and Commscope. From a technology perspective, private wireless competes with, and to some extent displaces, Wi-Fi technology. As such, Wi-Fi providers such as Cisco, HPE Aruba and Ruckus also appear on our competitive landscape.

2019 highlights

- Acceleration of our private wireless networks (4G/LTE) business growth with more than 130 customers across the globe and cross-industries.
- In Energy, Nokia solidified its leadership position in the private wireless market with the digitalization and automation of mines. This is an important use-case to make mines safer, more productive and sustainable. In 2019 Nokia demonstrated these capabilities for both underground mining vehicles and open-pit, building private wireless networks for Minera Las Bambas S.A. with Telefonica in Peru and with Komatsu in the United States for the first-ever system of unmanned trucks in Arizona called Autonomous Haulage Systems (AHS), which are also enabled by private LTE.
- We launched a variety of innovative smart city projects, including the City of Sendai in Japan, where Nokia conducted the world's first test of private wireless connected drones for tsunami evacuation alerts or other disasters to help in prevention and mitigation efforts. The private LTE network was provided by Nokia Digital Automation Cloud (NDAC).
- In transportation, we are building private wireless networks for Port of Kokkola, Port of Oulu and Vienna Airport.
- We also partnered with Deutsche Messe AG, with whom we powered the 5G arena using mobile test devices by Qualcomm Technologies during Hannover Messe, the world's largest industrial fair. Our live 5G network enabled sixteen industrial automation use-cases with marquee players in the manufacturing segment from Bosch Rexroth to Zeiss, Siemens and Weidmuller.
- Our Oulu 5G "factory of the future" was selected by the World Economic Forum as an Advanced 4th Industrial Revolution Lighthouse factory. A very proud moment for us given that one of the most modern factories in the world is equipped by our own Nokia Digital Automation Cloud. Our Oulu factory increased 30% in productivity and reduced time to market for new products by 50%.
- Nokia and Microsoft announced a strategic collaboration: the first between the two companies. The partnership will bring together Microsoft's cloud solutions (Azure, Azure IoT, Azure IT and machine learning solutions) and Nokia's mission-critical networking expertise (LTE/5G-ready private wireless solutions, IP, SD-WAN and IoT connectivity offerings), serving service providers and enterprises.
- In hyperscale enterprise, we signed a memorandum of understanding with Marubeni to provide global IoT services to its enterprise customers across its five business groups, including food and consumer products, chemical and forest products, energy and metals, utilities and transportation and industrial machinery. Such services could include fleet management, remote monitoring of industrial machinery, asset management and international logistics. We will develop, test, and deliver the next generation of IoT based on Nokia's Worldwide IoT Network Grid (WING).

Nokia Technologies

Market overview

Nokia Technologies is focused on licensing Nokia intellectual property, including patents, technologies and the Nokia brand, building on Nokia's continued innovation and decades of R&D leadership in technologies used in virtually all connected devices used today.

Business overview and organization

Nokia Technologies is focused on licensing.

- We continue to grow our patent licensing and monetization activities, which drive most of Nokia Technologies' net sales. This includes our successful mobile devices licensing program, which currently has most of the major smartphone vendors under license.
- We also have patent licensing programs for other markets which use our standardized technologies, including consumer electronics and broadcast, connected cars, smart meters, payment terminals, asset tracking and other Internet of Things devices and related industries.
- Nokia Technologies enables the commercialization of selected fundamental innovations from Nokia Bell Labs and other Nokia business groups in new areas via strategic collaboration with other companies.
- We continue to license our innovative OZO spatial audio and visual technologies to smartphone and camera manufacturers through our Technology Licensing business.
- Our Brand Partnerships business continues to work with HMD Global, our exclusive licensee for Nokia branded phones and tablets, and is exploring further opportunities to license the brand in other product categories.
- Nokia Technologies manages the Nokia patent portfolio, working with all other Nokia businesses, also driving advanced audio and video research and standardization through our Media Technologies Research unit.

Sales and marketing

Nokia Technologies is responsible for monetizing Nokia's intellectual property by making our innovations available to the markets through licensing activities and transactions.

Nokia Technologies continues to engage in global sales and marketing activities supporting the technology licensing of our innovative audiovisual solutions such as OZO Audio.

Research and development

The applied nature of our R&D in the Finland-based Media Technologies Research unit in Nokia Technologies has resulted in various relevant and valuable inventions in areas that we believe are important for emerging consumer experiences, such as audio and video standardization.

Patents and licenses

For more than 20 years, we have defined many of the fundamental technologies used in virtually all mobile devices and taken a leadership role in standards setting. As a result, we own a leading share of standard essential patents (SEPs) for the 2G, 3G, 4G and 5G standards. Our portfolio of cellular SEPs has continued to grow in recent years and comprises more than 2 800 patent families declared to one or more of the standards, including more than 2 100 for 5G.

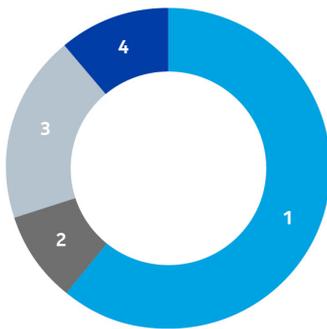
As part of our active portfolio management approach, we are continuously evaluating our collective assets and taking actions to optimize the size of our overall portfolio while preserving the high quality of our patents. At the end of 2019, our portfolio stands at around 20 000 patent families, built on combined R&D investments of more than EUR 129 billion over the last two decades.

We continue to refresh our portfolio from R&D activities across all Nokia businesses, filing patent applications on more than 1 300 new inventions in 2019.

2019 highlights

- During the year, Nokia signed a number of patent licensing agreements with smartphone companies, including Vivo, TCL, Tinno and Wiko.
- Nokia continued to advance its automotive licensing program so that currently more than a dozen automotive brands from companies such as BMW Group, Volkswagen Group and Volvo Cars are licensed under Nokia patents for their connected vehicles.
- Nokia has expanded its licensing activities through new license agreements in the Internet of Things segment.
- We have progressed in licensing our leading portfolio of OZO technologies to smartphone and camera manufacturers, including products shipping from companies such as OPPO, Axon and HMD Global.
- We announced collaborations with GE Licensing and Innventure to monetize inventions originating from Nokia Bell Labs, creating additional revenue streams for Nokia while enabling others to build on Nokia innovations.
- In November, India's leading online retailer, Flipkart, announced a brand licensing agreement to create Nokia branded smart TVs for the Indian market and launched the first 55" Nokia branded smart TV.

Breakdown of patent filings in 2019 by technology



1 Connectivity	61%
2 Fixed & optical networks	9%
3 Services, applications & multimedia	19%
4 Emerging technologies & hardware	11%

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Operating and financial review and prospects

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Principal industry trends affecting operations

Business-specific trends

Networks and Nokia Software

We are a leading vendor in the network and IP infrastructure, software, and the related services market. We provide a broad range of products, from the hardware components of networks used by communication service providers and increasingly by customers in other select verticals, to software solutions, as well as services to plan, optimize, implement, run and upgrade networks. Our Networks reportable segment is comprised of the following businesses: Mobile Access, Fixed Access, IP Routing and Optical Networks. Together with Nokia Software, these businesses provide an end-to-end portfolio of hardware, software and services to enable us to deliver the next generation of leading networks solutions and services to our customers. We aim to be innovation leaders, drawing on our frontline R&D capabilities to deliver leading products and services for our customers, and ultimately ensure our long-term value creation.

Industry trends

The network and IP infrastructure, software and related services industry has witnessed three main trends in recent years, which have also affected our Networks and Nokia Software segments. First, the increase in the use of data services and the resulting exponential growth in data traffic has led to an increased need for high-performance, high-quality and highly reliable networks. This trend is one of the leading drivers for the start of the 5G cycle, which has been accelerated by communication service providers. The rise in data traffic has, however, not been directly reflected in growth of communication service providers' revenue. Consequently, there is an imperative to be efficient and cost competitive for both communication service providers and network infrastructure and services vendors.

Second, we are witnessing continued consolidation among communication service providers, driven by their desire to provide a wider scope of services, especially through the convergence of disparate network technologies across mobile, fixed, and IP and optical networks. In order to improve networks in terms of coverage, capacity and quality, communication service providers are continuing their transition to all-IP architectures, with an emphasis on fast access to their networks through fiber, LTE and 5G access and new digital services delivery. We are also seeing similar trends with cable operators, who are investing in the deployment of high-speed networks.

Third, we see a stronger demand for large high-performance networks in some key areas outside the traditional communication service provider space. Webscale companies and extra-large enterprises - such as Apple, Facebook, Google, Alibaba and Amazon - are investing in cloud technology and network infrastructure to build these high-performing, secure networks. In addition, other target vertical markets such as energy, transportation and the public sector are investing to build carrier-grade, mission-critical networks.

The first three pillars of our strategy are aligned with these industry trends for our Networks and Nokia Software segments. We continue to execute well on our strategy, with a particular focus on high-performance, end-to-end networks, expansion into new select verticals and building a strong software business at scale. More information about our strategy can be found in "Business Overview – Our Strategy".

Additionally in 2019, we witnessed some customers reassessing their vendor selection strategies, in light of on-going security concerns. We have not seen any material business or market share impact of this in 2019, but it has the potential to slightly shift the vendor balance in certain regions and technology domains.

Specifically in China, where pursuing market share presents significant profitability challenges and the region has some unique market dynamics, we are executing against a clear strategic goal to improve our overall business mix in the region. Therefore, we expect to be prudent in 5G, while targeting more attractive opportunities with communication service providers in other parts of our business such as core, routing, transport, fixed access and LTE, as well as with enterprise and webscale customers.

Pricing and price erosion

While we experience varying levels of price erosion across our businesses, it is particularly evident in our Mobile Networks business group, given the highly standardized nature of the business. In 2019, we witnessed increased competitive intensity in some accounts, as certain competitors sought to take share in the early stages of 5G. Generally, at this stage of the cycle, strong 4G margins would be expected to offset the 5G competitive pressure. However, as early 5G deals often include 4G, we experienced declines in our 4G margins in 2019.

Product mix

The profitability of our Networks and Nokia Software segments is affected by our product mix, including the share of software in the sales mix. This is particularly evident during large technology cycles, as initial deployments consist of a larger portion of hardware and services and less software. As the initial phases of deployments tend to be lower margin, this is offset by the ongoing deployment of previous generation technologies, which tend to be higher margin. This ratio shifts more towards higher-margin software further into the cycle, as additional capacity and features are deployed. In 2019, we experienced relatively high 5G product costs in Networks, as well as elevated levels of deployment services, consistent with being in the initial phase of 5G.

Products and services also have varying profitability profiles. For instance, our Networks and Nokia Software segments offer a combination of hardware, software and services. Hardware and software products generally have higher gross margins, but require significant R&D investment, whereas services are typically labor-intensive, while carrying low R&D investment, and have relatively low gross margins compared to the hardware and software products.

Seasonality and cyclical nature of projects

Net sales in our Networks and Nokia Software segments are affected by seasonality in the spending cycles of communication service providers, with generally higher sales in the fourth quarter, followed by generally lower sales in the first quarter. Also, we have recently witnessed that Networks and Nokia Software segments generate the majority of their respective operating profit and free cash flow in the fourth quarter. In addition to normal industry seasonality, there are normal peaks and troughs in the deployment of large infrastructure projects. As an example, the 5G technology cycle has accelerated over the past year, as commercial deployments ramped up in 2019 and are expected to continue in 2020 and

beyond. The timing of these projects depends on a number of factors, including new radio spectrum allocation, network upgrade cycles and the availability of new consumer devices and services, which in turn could affect the net sales of our businesses.

Continued operational efficiency improvements

In 2018, following the completion of the Alcatel Lucent integration and the related cost savings program, we announced a new cost reduction program where we intend to target substantial savings while continuing to make further investments to drive future growth and higher returns. The savings are expected to come from a wide range of areas, including investments in digitalization to drive more automation and productivity, further process and tool simplification, significant reductions in central support functions to reach best-in-class cost levels, prioritization of R&D programs to best create long-term value, a sharp reduction of R&D in legacy products, driving efficiency from further application of our Common Software Foundation and innovative software development techniques, the consolidation of selected cross-company activities and further reductions in real estate and other overhead costs.

In 2019, we made strong progress in generating cost savings through the actions listed above. Given the need to increase investment in 5G in order to accelerate product roadmaps and product cost reductions, and in the digitalization of internal processes to improve overall productivity, we now expect this cost savings program to yield EUR 500 million of net benefits, compared to our previous expectation of EUR 700 million.

Cost of components and raw materials

There are several important factors driving the profitability and competitiveness of our Networks segment: scale, operational efficiency, pricing, and cost discipline. The costs of our networks products are comprised of, among others, components, manufacturing, labor and overheads, royalties and licensing fees, depreciation of product machinery, logistics and warranty and other quality costs. In 2019, margins in our Networks segment were negatively impacted by relatively high 5G product costs.

Profitability can be affected by changes in the sales volume, as well as the requirement to source large volumes of components on short notice, which can impact the cost of sales, or in cases where component shortages emerge, the net sales.

Product Design and Serviceability

Factors such as product design and serviceability also have an impact on our cost structure with Networks. For example, product design decisions, such as the use of system-on-chip, or "SoCs" in our Mobile Networks products, allow us to improve our product costs as the proportion of SoCs increases within our products. Additionally, costs can be reduced through improved product serviceability. In 2019, these were contributing factors to the relatively high 5G product costs that impacted our Networks segment.

Nokia Technologies

Nokia Technologies is focused on pursuing new licensing opportunities for our valuable intellectual property, including patents, innovative technologies and know-how, and the Nokia brand.

General trends in IPR licensing

In general, there has been increased focus on IPR protection and licensing in the market, and this trend is expected to continue. As such, new agreements are generally a product of lengthy negotiations and occasionally through arbitration or litigation, and therefore the timing and outcome may be difficult to forecast. Due to the structure of patent license agreements, the payments may be infrequent, at times may be partly retrospective, and the lengths of license agreements can vary.

Additionally, there are clear regional differences in the ease of protecting and licensing patented innovations. We have seen some licensees actively avoiding making license payments, and some licensors using aggressive methods to collect them; both behaviors have attracted regulatory attention. We expect discussion of the regulation of licensing to continue at both global and regional level. Some of those regulatory developments may be adverse to the interests of technology developers and patent owners, including us.

Financial markets trends

We are a company with global operations and net sales derived from various countries, invoiced in various currencies. Therefore, our business and results from operations are exposed to changes in exchange rates between the euro, our reporting currency, and other currencies, such as the U.S. dollar and the Chinese yuan. The magnitude of foreign exchange exposures changes over time as a function of our net sales and costs in different markets, as well as the prevalent currencies used for transactions in those markets. Significant changes in exchange rates may also impact our competitive position and related price pressures through their impact on our competitors.

To mitigate the impact of changes in exchange rates on our results, we hedge material net foreign exchange exposures (net sales less costs in a currency) typically with a hedging horizon of approximately 12 months. For the majority of these hedges, hedge accounting is applied to reduce income statement volatility.

In 2019, approximately 25% of Group net sales and total costs were denominated in euro, and approximately 50% of Group net sales and 45% of Group total costs were denominated in U.S. dollars. In 2019, approximately 5% of Group net sales and 10% of Group total costs were denominated in Chinese yuan.

The average currency mix for Group net sales and total costs:

Currency	2019		2018	
	Net sales	Total costs	Net sales	Total costs
EUR	~25 %	~25 %	~25 %	~30 %
USD	~50 %	~45 %	~45 %	~45 %
CNY	~5 %	~10 %	~10 %	~10 %
Other	~20 %	~20 %	~20 %	~15 %
Total	~100 %	~100 %	~100 %	~100 %

During 2019, the U.S. dollar appreciated against the euro on a year-on-year basis and this had significantly positive impact on our net sales reported in euros. However, the stronger U.S. dollar also contributed to higher costs of sales and slightly higher operating expenses on a year-on-year basis. In total, before hedging, the stronger U.S. dollar on a year-on-year basis had a slightly positive effect on our operating profit in 2019.

For the full year 2019 compared to the previous year, the Chinese yuan was slightly stronger against the euro. The slightly stronger Chinese yuan in 2019 on a year-on-year basis had an approximately neutral impact on our net sales, cost of sales, operating expenses, as well as operating profit before hedging.

For a discussion of the instruments used by us in connection with our hedging activities, refer to Note 36, Financial risk management, of our consolidated financial statements included in this annual report on Form 20-F. Refer also to "Operating and financial review and prospects – Risk factors".

Results of operations

The financial information included in this "Operating and financial review and prospects" section as of December 31, 2019 and 2018 and for each of the three years ended December 31, 2019, 2018 and 2017 has been derived from our audited consolidated financial statements included in this annual report on Form 20-F. The financial information as of December 31, 2019 and 2018 and for each of the three years ended December 31, 2019, 2018 and 2017 should be read in conjunction with, and is qualified in its entirety by reference to, our audited consolidated financial statements.

In 2019, we had three reportable segments for financial reporting purposes: (1) Networks, (2) Nokia Software and (3) Nokia Technologies. We also present certain segment-level information for Group Common and Other as well as for Discontinued operations. We adopted our current operational and reporting structure on January 1, 2019. The reporting structure was revised to better reflect our strategy, organizational structure and the way the management evaluates operational performance and allocates resources. Previously we had two businesses: Nokia's Networks business and Nokia Technologies, and four reportable segments for financial reporting purposes: (1) Ultra Broadband Networks, (2) Global Services and (3) IP Networks and Applications within Nokia's Networks business; and (4) Nokia Technologies. Segment information for 2018 and 2017 presented throughout this annual report on Form 20-F has been recast for comparability purposes according to the new operating and reporting structure. For more information on our operational and reporting structure, refer to Note 5, Segment information, in the consolidated financial statements.

In 2019 we applied IFRS 16, Leases, for the first time. The financial information as of December 31, 2018 and for the years ended December 31, 2018 and 2017 has not been restated for the effects of IFRS 16. Refer to Note 3, New and amended standards and interpretations, in the consolidated financial statements.

Continuing operations

For the year ended December 31, 2019 compared to the year ended December 31, 2018

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2019		2018		Year-on-year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	23 315	100.0	22 563	100.0	3
Cost of sales	(14 989)	(64.3)	(14 117)	(62.6)	6
Gross profit	8 326	35.7	8 446	37.4	(1)
Research and development expenses	(4 411)	(18.9)	(4 620)	(20.5)	(5)
Selling, general and administrative expenses	(3 101)	(13.3)	(3 463)	(15.3)	(10)
Other operating income and expenses	(329)	(1.4)	(422)	(1.9)	–
Operating profit/(loss)	485	2.1	(59)	(0.3)	–
Share of results of associated companies and joint ventures	12	0.1	12	0.1	–
Financial income and expenses	(341)	(1.5)	(313)	(1.4)	9
Profit/(loss) before tax	156	0.7	(360)	(1.6)	–
Income tax expense	(138)	(0.6)	(189)	(0.8)	(27)
Profit/(loss) for the year	18	0.1	(549)	(2.4)	–
Attributable to:					
Equity holders of the parent	14	0.1	(554)	(2.5)	–
Non-controlling interests	4	–	5	–	(20)

Net sales

Net sales in 2019 were EUR 23 315 million, an increase of EUR 752 million, or 3%, compared to EUR 22 563 million in 2018. The increase in net sales was primarily due to an increase in Networks net sales, and, to a lesser extent, Nokia Software net sales. This was partially offset by a decrease in Group Common and Other and Nokia Technologies net sales.

The following tables set forth distribution of net sales by geographical area and net sales by customer type for the years indicated.

For the year ended December 31	2019	2018	Year-on-year change %
	EURm	EURm	
Asia-Pacific	4 556	4 081	12
Europe ⁽¹⁾	6 620	6 489	2
Greater China	1 843	2 165	(15)
Latin America	1 472	1 380	7
Middle East & Africa	1 876	1 874	–
North America	6 948	6 574	6
Total	23 315	22 563	3

(1) All Nokia Technologies IPR and licensing net sales are allocated to Finland.

For the year ended December 31	2019 EURm	2018 EURm	Year-on-year change %
Communication service providers	19 558	18 955	3
Enterprise	1 409	1 167	21
Licensees	1 487	1 476	1
Other ⁽¹⁾	861	965	(11)
Total	23 315	22 563	3

(1) Includes net sales of Alcatel Submarine Networks and Radio Frequency Systems, both of which are being managed as separate entities, and certain other items, such as eliminations of inter-segment revenues and certain items related to purchase price allocation. Alcatel Submarine Networks and Radio Frequency Systems net sales include also revenue from communications service providers and enterprise customers.

Gross profit

Gross profit in 2019 was EUR 8 326 million, a decrease of EUR 120 million, or 1%, compared to EUR 8 446 million in 2018. The decrease in gross profit was primarily due to lower gross profit in Networks, Group Common and Other and Nokia Technologies, partially offset by lower product portfolio integration-related costs and higher gross profit in Nokia Software. Gross margin in 2019 was 35.7%, compared to 37.4% in 2018. In 2019, gross profit included product portfolio integration-related costs of EUR 123 million, compared to EUR 548 million in 2018.

Operating expenses

Our research and development expenses in 2019 were EUR 4 411 million, a decrease of EUR 209 million, or 5%, compared to EUR 4 620 million in 2018. Research and development expenses represented 18.9% of our net sales in 2019 compared to 20.5% in 2018. The decrease in research and development expenses were due to a decrease in Networks, and, to a lesser extent, Nokia Software and Nokia Technologies research and development expenses. This was partially offset by an increase in Group Common and Other research and development expenses.

Our selling, general and administrative expenses in 2019 were EUR 3 101 million, a decrease of EUR 362 million, or 10%, compared to EUR 3 463 million in 2018. Selling, general and administrative expenses represented 13.3% of our net sales in 2019 compared to 15.3% in 2018. The decrease in selling, general and administrative expenses was primarily due to a decrease in Networks selling, general and administrative expenses, lower transaction and integration-related costs and, to a lesser extent, lower Nokia Software and Nokia Technologies selling, general and administrative expenses. This was partially offset by higher Group Common and Other selling, general and administrative expenses. Selling, general and administrative expenses included transaction and integration-related costs of EUR 50 million, compared to EUR 207 million in 2018.

Other operating income and expenses in 2019 was a net expense of EUR 329 million, a decrease of EUR 93 million, compared to a net expense of EUR 422 million in 2018. The net positive fluctuation in our other operating income and expenses was primarily due to a gain related to a defined benefit plan amendment, as well as the absence of charges related to fair value changes of a legacy IPR fund and lower charges related to divestments of businesses. This was partially offset by higher restructuring and associated charges and a net negative fluctuation in Group Common and Other operating income and expenses. Other operating income and expenses included restructuring and associated charges of EUR 435 million in 2019 compared to EUR 319 million in 2018.

In 2019, we recorded a non-cash impairment charge to other operating income and expenses of EUR 29 million, compared to EUR 48 million in 2018.

Operating profit/loss

Our operating profit in 2019 was EUR 485 million, a change of EUR 544 million, compared to an operating loss of EUR 59 million in 2018. The change in operating result was primarily due to lower selling, general and administrative expenses, research and development expenses and a net positive fluctuation in other operating income and expenses, partially offset by lower gross profit. Our operating margin in 2019 was 2.1%, compared to approximately breakeven in 2018.

The following table sets forth the impact of unallocated items on operating profit/loss:

EURm	2019	2018
Total segment operating profit⁽¹⁾	2 003	2 180
Amortization and depreciation of acquired intangible assets and property, plant and equipment	(924)	(940)
Restructuring and associated charges	(502)	(321)
Gain on defined benefit plan amendment	168	–
Product portfolio strategy costs	(163)	(583)
Transaction and related costs, including integration costs relating to the acquisition of Alcatel Lucent	(48)	(220)
Impairment of assets, net of impairment reversals	(29)	(48)
Operating model integration	(12)	–
Release of acquisition-related fair value adjustments to deferred revenue and inventory	(6)	(16)
Divestment of businesses	(2)	(39)
Fair value changes of legacy IPR fund	–	(57)
Other	–	(15)
Total operating profit/(loss)	485	(59)

(1) Excludes costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

Financial income and expenses

Financial income and expenses was a net expense of EUR 341 million in 2019, an increase of EUR 28 million, or 9%, compared to a net expense of EUR 313 million in 2018. The net negative fluctuation in financial income and expenses was primarily due to an impairment charge related to loans extended to a certain emerging market customer, a recognition of interest expenses on lease liabilities within financial expenses, following the adoption of IFRS 16, Leases, in 2019, as well as an increase in the costs related to the sale of receivables in 2019 compared to 2018. We sell trade receivables to various financial institutions without recourse in the normal course of business, in order to manage our credit risk and working capital cycle. The negative fluctuation was partially offset by income due to a change in the fair value of the financial liability related to Nokia Shanghai Bell, which positively impacted other financial income.

Profit/loss before tax

Our profit before tax in 2019 was EUR 156 million, an increase of EUR 516 million compared to a loss of EUR 360 million in 2018.

Income tax

Income taxes was a net expense of EUR 138 million in 2019, a decrease of EUR 51 million compared to a net expense of EUR 189 million in 2018. The change in net income taxes was primarily attributable to the deferred tax expense recorded in 2018 resulting from the write-off of certain deferred tax assets, primarily related to foreign withholding tax credits in Finland. This was partially offset by higher income taxes due to increased profitability and our regional profit mix in 2019 compared to 2018.

Profit/loss attributable to equity holders of the parent and earnings per share

The profit attributable to equity holders of the parent in 2019 was EUR 14 million, an increase of EUR 568 million, compared to a loss of EUR 554 million in 2018. The change in profit attributable to equity holders of the parent was primarily due to the improvement in operating profit, and, to a lesser extent, lower income tax expenses. This was partially offset by a net negative fluctuation in financial income and expenses.

Our EPS from continuing operations in 2019 was EUR 0.00 (basic) and EUR 0.00 (diluted) compared to negative EUR 0.10 (basic) and negative EUR 0.10 (diluted) in 2018.

Cost savings program

In 2018, following the completion of the Alcatel Lucent integration and the related cost savings program, we announced a new cost reduction program where we intend to target substantial savings while continuing to make further investments to drive future growth and higher returns. This cost savings program is expected to yield EUR 500 million of net benefits. Through the end of 2019, we made strong progress towards our 2020 target, realizing approximately EUR 200 million of savings. The remainder is expected in 2020.

In 2019, we recognized restructuring and associated charges of approximately EUR 450 million related to the current and past cost savings programs. In 2019, we had restructuring and associated cash outflows of approximately EUR 450 million related to the cost savings program.

For the year ended December 31, 2018 compared to the year ended December 31, 2017

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2018		2017		Year-on-year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	22 563	100.0	23 147	100.0	(3)
Cost of sales	(14 117)	(62.6)	(14 008)	(60.5)	1
Gross profit	8 446	37.4	9 139	39.5	(8)
Research and development expenses	(4 620)	(20.5)	(4 916)	(21.2)	(6)
Selling, general and administrative expenses	(3 463)	(15.3)	(3 615)	(15.6)	(4)
Other operating income and expenses	(422)	(1.9)	(592)	(2.6)	—
Operating (loss)/profit	(59)	(0.3)	16	0.1	—
Share of results of associated companies and joint ventures	12	0.1	11	—	9
Financial income and expenses	(313)	(1.4)	(537)	(2.3)	(42)
Loss before tax	(360)	(1.6)	(510)	(2.2)	(29)
Income tax expense	(189)	(0.8)	(927)	(4.0)	(80)
Loss for the year	(549)	(2.4)	(1 437)	(6.2)	(62)
Attributable to:					
Equity holders of the parent	(554)	(2.5)	(1 473)	(6.4)	(62)
Non-controlling interests	5	—	36	0.2	(86)

Net sales

Net sales in 2018 were EUR 22 563 million, a decrease of EUR 584 million, or 3%, compared to EUR 23 147 million in 2017. The decrease in net sales was primarily due to a decrease in Networks net sales, and, to a lesser extent, a decrease in Nokia Technologies, Group Common and Other and Nokia Software net sales.

The following tables set forth distribution of net sales by geographical area and net sales by customer type for the years indicated.

For the year ended December 31	2018		2017		Year-on-year change %
	EURm		EURm		
Asia-Pacific	4 081		4 228		(3)
Europe ⁽¹⁾	6 489		6 833		(5)
Greater China	2 165		2 516		(14)
Latin America	1 380		1 279		8
Middle East & Africa	1 874		1 907		(2)
North America	6 574		6 384		3
Total	22 563		23 147		(3)

(1) All Nokia Technologies IPR and licensing net sales are allocated to Finland.

For the year ended December 31	2018		2017		Year-on-year change %
	EURm		EURm		
Communication service providers	18 955		19 378		(2)
Enterprise	1 167		1 135		3
Licensees	1 476		1 606		(8)
Other ⁽¹⁾	965		1 028		(6)
Total	22 563		23 147		(3)

(1) Includes net sales of Alcatel Submarine Networks and Radio Frequency Systems, both of which are being managed as separate entities, and certain other items, such as eliminations of inter-segment revenues and certain items related to purchase price allocation. Alcatel Submarine Networks and Radio Frequency Systems net sales include also revenue from communications service providers and enterprise customers.

Gross profit

Gross profit in 2018 was EUR 8 446 million, a decrease of EUR 693 million, or 8%, compared to EUR 9 139 million in 2017. The decrease in gross profit was primarily due to lower gross profit in Networks, Nokia Technologies and Nokia Software, as well as higher product portfolio integration-related costs, partially offset by lower working capital-related purchase price allocation adjustments. Gross margin in 2018 was 37.4%, compared to 39.5% in 2017. In 2018, gross profit included product portfolio integration-related costs of EUR 548 million and working capital-related purchase price allocation adjustments of EUR 16 million. In 2017, gross profit included product portfolio integration-related costs of EUR 453 million and working capital-related purchase price allocation adjustments of EUR 55 million.

Operating expenses

Our research and development expenses in 2018 were EUR 4 620 million, a decrease of EUR 296 million, or 6%, compared to EUR 4 916 million in 2017. Research and development expenses represented 20.5% of our net sales in 2018 compared to 21.2% in 2017. The decrease in research and development expenses were due to decreases in Nokia Technologies, Nokia Software and Networks research and development expenses, as well as lower amortization and depreciation of acquired intangible assets and property, plant and equipment and product portfolio integration-related costs. In 2018, research and development expenses included amortization and depreciation of acquired intangible assets and property, plant and equipment of EUR 576 million, compared to EUR 633 million in 2017, as well as product portfolio integration-related costs of EUR 28 million, compared to EUR 57 million in 2017.

Our selling, general and administrative expenses in 2018 were EUR 3 463 million, a decrease of EUR 152 million, or 4%, compared to EUR 3 615 million in 2017. Selling, general and administrative expenses represented 15.3% of our net sales in 2018 compared to 15.6% in 2017. The decrease in selling, general and administrative expenses was primarily due to a decrease in Nokia Technologies selling, general and administrative expenses, lower amortization and depreciation of acquired intangible assets and property, plant and equipment, and lower Networks and Group Common and Other selling, general and administrative expenses. Selling, general and administrative expenses included amortization and depreciation of acquired intangible assets, and property, plant and equipment of EUR 358 million in 2018 compared to EUR 394 million in 2017.

Other operating income and expenses in 2018 was a net expense of EUR 422 million, a decrease of EUR 170 million, compared to a net expense of EUR 592 million in 2017. The net positive fluctuation in our other operating income and expenses was primarily due to lower restructuring and associated charges, lower impairment charges and a net positive fluctuation in Group Common and Other operating income and expenses. These were partially offset by a net negative fluctuation in Networks other operating income and expenses, charges related to fair value changes of a legacy IPR fund and charges related to the divestment of businesses. Other operating income and expenses included restructuring and associated charges of EUR 319 million in 2018 compared to EUR 576 million in 2017.

In 2018, we recorded a non-cash impairment charge to other operating income and expenses of EUR 48 million, compared to EUR 141 million in 2017. In 2017, the charge was due to the impairment of goodwill related to our digital health business, which was part of Nokia Technologies. The impairment charge was allocated to the carrying amount of goodwill held within the digital health cash generating unit, which was reduced to zero.

Operating loss/profit

Our operating loss in 2018 was EUR 59 million, a change of EUR 75 million, compared to an operating profit of EUR 16 million in 2017. The change in operating result was primarily due to a lower gross profit, partially offset by lower research and development expenses, a net positive fluctuation in other operating income and expenses and lower selling, general and administrative expenses. Our operating margin in both 2018 and 2017 was approximately breakeven.

The following table sets forth the impact of unallocated items on operating profit/loss:

EURm	2018	2017
Total segment operating profit⁽¹⁾	2 180	2 587
Amortization and depreciation of acquired intangible assets and property, plant and equipment	(940)	(1 033)
Restructuring and associated charges	(321)	(579)
Product portfolio strategy costs	(583)	(536)
Transaction and related costs, including integration costs relating to the acquisition of Alcatel Lucent	(220)	(206)
Impairment of assets, net of impairment reversals	(48)	(173)
Release of acquisition-related fair value adjustments to deferred revenue and inventory	(16)	(55)
Divestment of businesses	(39)	–
Fair value changes of legacy IPR fund	(57)	–
Other	(15)	11
Total operating (loss)/profit	(59)	16

(1) Excludes costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

Financial income and expenses

Financial income and expenses was a net expense of EUR 313 million in 2018 compared to a net expense of EUR 537 million in 2017, a decrease of EUR 224 million, or 42%. The net positive fluctuation in financial income and expenses was primarily due to the absence of EUR 220 million of costs related to the offer to purchase the 6.50% notes due January 15, 2028, the 6.45% notes due March 15, 2029, the 6.75% notes due February 4, 2019 and the 5.375% notes due May 15, 2019, that negatively impacted 2017; lower losses from foreign exchange fluctuations; and the absence of a loss on the sale of financial assets that negatively impacted 2017. This was partially offset by the absence of gains from venture fund investments, as they were no longer recognized in financial income and expenses in 2018 following the adoption of IFRS 9, Financial Instruments, and the inclusion of expenses associated with customer receivables and overdue payments in financial income and expenses as a result of the adoption of IFRS 15, Revenue from Contracts with Customers.

Loss before tax

Our loss before tax in 2018 was EUR 360 million, a decrease of EUR 150 million compared to a loss of EUR 510 million in 2017.

Income tax

Income taxes was a net expense of EUR 189 million in 2018, a decrease of EUR 738 million compared to a net expense of EUR 927 million in 2017. The change in net income taxes was primarily attributable to the following expenses recorded in 2017: deferred tax expense of EUR 777 million from re-measurement of deferred tax assets resulting from the tax rate change in the United States, a non-recurring tax expense of EUR 245 million related to the integration of the former Alcatel Lucent and Nokia operating models, and income taxes for prior years of EUR 139 million related to the disposal of the former Alcatel Lucent railway signaling business in 2006 to Thalès. This was partially offset by three factors: higher income taxes due to increased profitability and our regional profit mix in 2018 compared to 2017, Base Erosion and Anti-Abuse Tax in the United States, enacted as part of the tax reform and applicable from 2018 onwards, and deferred tax expense resulting from the write-off of certain deferred tax assets in 2018, primarily related to foreign withholding tax credits in Finland. Refer to Note 12, Income taxes, of our consolidated financial statements included in this annual report on Form 20-F.

Loss attributable to equity holders of the parent and earnings per share

The loss attributable to equity holders of the parent in 2018 was EUR 554 million, a decrease of EUR 919 million, compared to a loss of EUR 1 473 million in 2017. The change in loss attributable to equity holders of the parent was primarily due to lower income tax expenses and a net positive fluctuation in financial income and expenses. This was partially offset by an operating loss in 2018, compared to an operating profit in 2017.

Our EPS from continuing operations in 2018 was negative EUR 0.10 (basic) and negative EUR 0.10 (diluted) compared to negative EUR 0.26 (basic) and negative EUR 0.26 (diluted) in 2017.

Cost savings program

On April 6, 2016, we launched a cost savings program, targeting approximately EUR 1 200 million of recurring annual cost savings to be achieved in full year 2018. At the end of 2018, we completed the restructuring activities related to this cost savings program and achieved the EUR 1 200 million of recurring annual cost savings targeted. Upon completion of the Alcatel Lucent integration cost savings program as of the end of 2018, we announced a new cost savings program, where we intend to target substantial savings while continuing to make further investments to drive future growth and higher returns. The new program is expected to be completed at the end of 2020.

In 2018, we recognized restructuring and associated charges of approximately EUR 300 million related to the cost savings program. Cumulative recognized restructuring and associated charges were approximately EUR 1 600 million. In 2018, we had restructuring and associated cash outflows of approximately EUR 500 million related to the cost savings program. Cumulative restructuring and associated cash outflows were approximately EUR 1 450 million.

Discontinued operations

Discontinued operations include the continuing financial effects of the HERE business and the D&S business. The Group sold its HERE digital mapping and location services business to a German automotive industry consortium comprised of AUDI AG, BMW Group and Daimler AG in a transaction that was completed on December 4, 2015. The Group sold substantially all of its Devices & Services business to Microsoft in a transaction that was completed on April 25, 2014. The timing and amount of financial effects are largely dependent upon external factors such as final outcomes of uncertain tax positions. Refer to Note 6, Discontinued operations, of our consolidated financial statements included in this annual report on Form 20-F.

For the year ended December 31, 2019 compared to the year ended December 31, 2018

Discontinued operations loss for the year was EUR 7 million in 2019 compared to a profit of EUR 214 million in 2018. In 2019, the loss for the year included an addition of EUR 7 million to and a deduction of EUR 1 million from gain on the sale related to D&S business and HERE business, respectively, due to tax indemnification. Profit for the year in 2018 mostly related to a resolution reached in the tax dispute concerning the applicability of withholding tax in respect of payments by Nokia India Private Limited to Nokia Corporation for the supply of operating software in D&S business as well as a release of uncertain tax positions related to HERE business.

For the year ended December 31, 2018 compared to the year ended December 31, 2017

Discontinued operations profit for the year was EUR 214 million in 2018 compared to a loss of EUR 21 million in 2017. Profit for the year in 2018 mostly related to a resolution reached in the tax dispute concerning the applicability of withholding tax in respect of payments by Nokia India Private Limited to Nokia Corporation for the supply of operating software in D&S business as well as a release of uncertain tax positions related to HERE business.

Results of segments

Networks

For the year ended December 31, 2019 compared to the year ended December 31, 2018

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2019		2018		Year-on-
	EURm	% of net sales	EURm	% of net sales	year change %
Net sales	18 209	100.0	17 404	100.0	5
Cost of sales	(12 632)	(69.4)	(11 369)	(65.3)	11
Gross profit	5 577	30.6	6 035	34.7	(8)
Research and development expenses	(2 943)	(16.2)	(3 091)	(17.8)	(5)
Selling, general and administrative expenses	(1 929)	(10.6)	(2 140)	(12.3)	(10)
Other operating income and expenses	(40)	(0.2)	(31)	(0.2)	-
Operating profit	665	3.7	773	4.4	(14)

(1) In 2019, net sales include Mobile Access net sales of EUR 11 655 million, Fixed Access net sales of EUR 1 881 million, IP Routing net sales of EUR 2 921 million and Optical Networks net sales of EUR 1 752 million. In 2018, net sales include Mobile Access net sales of EUR 11 273 million, Fixed Access net sales of EUR 1 980 million, IP Routing net sales of EUR 2 545 million and Optical Networks net sales of EUR 1 606 million.

Net sales

Networks net sales in 2019 were EUR 18 209 million, an increase of EUR 805 million, or 5%, compared to EUR 17 404 million in 2018. The increase in Networks net sales was primarily due to Mobile Access, IP Routing and, to a lesser extent, Optical Networks, partially offset by Fixed Access. Mobile Access net sales were EUR 11 655 million in 2019, an increase of EUR 382 million, or 3%, compared to EUR 11 273 million in 2018. IP Routing net sales were EUR 2 921 million in 2019, an increase of EUR 376 million, or 15%, compared to EUR 2 545 million in 2018. Optical Networks net sales were EUR 1 752 million in 2019, an increase of EUR 146 million, or 9%, compared to EUR 1 606 million in 2018. Fixed Access net sales were EUR 1 881 million in 2019, a decrease of EUR 99 million, or 5%, compared to EUR 1 980 million in 2018.

The increase in Mobile Access net sales was primarily due to 5G radio technologies and network deployment services, partially offset by decreases in legacy radio technologies.

The increase in IP Routing net sales was primarily driven by our market-leading portfolio, as well as improved supply chain execution.

The increase in Optical Networks net sales was primarily related to our market-leading portfolio.

The decrease in Fixed Access net sales was primarily due to broadband access, digital home and services.

Gross profit

Networks gross profit in 2019 was EUR 5 577 million, a decrease of EUR 458 million, or 8%, compared to EUR 6 035 million in 2018. Networks gross margin in 2019 was 30.6%, compared to 34.7% in 2018. The decrease in Networks gross profit was primarily due to Mobile Access and, to a lesser extent, Fixed Access, partially offset by IP Routing and Optical Networks. The decrease in Mobile Access gross profit was primarily due to lower gross margin, partially offset by higher net sales. The lower gross margin in Mobile Access was primarily due to relatively high 5G product costs, as well as elevated levels of deployment services, consistent with being in the initial phase of 5G. The decrease in Fixed Access gross profit was primarily due to lower gross margin and lower net sales. The increase in IP Routing gross profit was primarily due to higher net sales and higher gross margin. The increase in Optical Networks gross profit was primarily due to higher net sales and higher gross margin. In 2019, Networks gross profit also benefitted from lower incentive accruals, compared to 2018.

Operating expenses

Networks research and development expenses were EUR 2 943 million in 2019, a decrease of EUR 148 million, or 5%, compared to EUR 3 091 million in 2018. The decrease in Networks research and development expenses was primarily due to Mobile Access. The lower research and development expenses in Mobile Access was primarily due to continued progress related to Nokia's cost savings program, partially offset by higher 5G investments. In 2019, Networks research and development expenses also benefitted from lower incentive accruals, compared to 2018.

Networks selling, general and administrative expenses were EUR 1 929 million in 2019, a decrease of EUR 211 million, or 10%, compared to EUR 2 140 million in 2018. The decrease in Networks selling, general and administrative expenses was primarily due to Mobile Access. The decrease in Mobile Access selling, general and administrative expenses was primarily due to progress related to Nokia's cost savings program. In 2019, Networks selling, general and administrative expenses also benefitted from lower incentive accruals, compared to 2018.

Networks other operating income and expenses was an expense of EUR 40 million in 2019, a change of EUR 9 million compared to an expense of EUR 31 million in 2018.

Operating profit

Networks operating profit was EUR 665 million in 2019, a decrease of EUR 108 million, or 14%, compared to EUR 773 million in 2018. Networks operating margin in 2019 was 3.7% compared to 4.4% in 2018. The decrease in operating margin was primarily attributable to the decrease in Mobile Access and to a lesser extent, Fixed Access, partially offset by higher IP Routing and Optical Networks operating margin.

For the year ended December 31, 2018 compared to the year ended December 31, 2017

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2018		2017		Year--on- -year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	17 404	100.0	17 725	100.0	(2)
Cost of sales	(11 369)	(65.3)	(11 194)	(63.2)	2
Gross profit	6 035	34.7	6 531	36.8	(8)
Research and development expenses	(3 091)	(17.8)	(3 163)	(17.8)	(2)
Selling, general and administrative expenses	(2 140)	(12.3)	(2 162)	(12.2)	(1)
Other operating income and expenses	(31)	(0.2)	91	0.5	-
Operating profit	773	4.4	1 297	7.3	(40)

(1) In 2018, net sales include Mobile Access net sales of EUR 11 273 million, Fixed Access net sales of EUR 1 980 million, IP Routing net sales of EUR 2 545 million and Optical Networks net sales of EUR 1 606 million. In 2017, net sales include Mobile Access net sales of EUR 11 457 million, Fixed Access net sales of EUR 2 075 million, IP Routing net sales of EUR 2 694 million and Optical Networks net sales of EUR 1 499 million.

Net sales

Networks net sales in 2018 were EUR 17 404 million, a decrease of EUR 321 million, or 2%, compared to EUR 17 725 million in 2017. The decrease in Networks net sales was due to Mobile Access, IP Routing and Fixed Access, partially offset by Optical Networks. Mobile Access net sales were EUR 11 273 million in 2018, a decrease of EUR 184 million, or 2%, compared to EUR 11 457 million in 2017. IP Routing net sales were EUR 2 545 million in 2018, a decrease of EUR 149 million, or 6%, compared to EUR 2 694 million in 2017. Fixed Access net sales were EUR 1 980 million in 2018, a decrease of EUR 95 million, or 5%, compared to EUR 2 075 million in 2017. Optical Networks net sales were EUR 1 606 million in 2018, an increase of EUR 107 million, or 7%, compared to EUR 1 499 million in 2017.

The decrease in Mobile Access net sales was primarily due to radio networks and network implementation, partially offset by small cells, microwave and managed services.

The decrease in IP Routing net sales was primarily driven by component shortages in our supply chain, which showed signs of improvement in the latter part of 2018.

The decrease in Fixed Access net sales was primarily due to broadband access, services and digital home.

The increase in Optical Networks net sales was primarily related to our strong product portfolio, as well as progress with targeted large enterprise vertical and webscale customers.

Gross profit

Networks gross profit in 2018 was EUR 6 035 million, a decrease of EUR 496 million, or 8%, compared to EUR 6 531 million in 2017. Networks gross margin in 2018 was 34.7%, compared to 36.8% in 2017. The decrease in Networks gross profit was primarily due to Mobile Access and, to a lesser extent, IP Routing, partially offset by Optical Networks. The decrease in Mobile Access gross profit was primarily due to lower gross margin and lower net sales. The decrease in IP Routing gross profit was primarily due to lower net sales and lower gross margin. The increase in Optical Networks gross profit was primarily due to higher net sales, partially offset by lower gross margin.

Operating expenses

Networks research and development expenses were EUR 3 091 million in 2018, a decrease of EUR 72 million, or 2%, compared to EUR 3 163 million in 2017. The decrease in Networks research and development expenses was primarily due to Mobile Access and IP Routing, partially offset by Optical Networks. The lower research and development expenses in Mobile Access was primarily due to lower personnel expenses, reflecting progress related to our cost savings program, as well as lower incentive accruals. The lower research and development expenses in IP Routing was primarily due to net positive foreign exchange fluctuations, as well as lower incentive accruals. The higher research and development expenses in Optical Networks was primarily due to higher investments to drive future growth and higher returns.

Networks selling, general and administrative expenses were EUR 2 140 million in 2018, a decrease of EUR 22 million, or 1%, compared to EUR 2 162 million in 2017. The decrease in Networks selling, general and administrative expenses was primarily due to Mobile Access, partially offset by Optical Networks. The decrease in Mobile Access selling, general and administrative expenses was primarily due to progress related to Nokia's cost savings program, partially offset by higher costs related to 5G customer trials. Mobile Access selling, general and administrative expenses also benefitted from lower incentive accruals in 2018. The higher selling, general and administrative expenses in Optical Networks was primarily due to higher investments to drive future growth and higher returns.

Networks other operating income and expenses was an expense of EUR 31 million in 2018, a change of EUR 122 million compared to an income of EUR 91 million in 2017. The net negative fluctuation in other operating income and expenses was primarily related to foreign exchange hedging and higher doubtful account allowances.

Operating profit

Networks operating profit was EUR 773 million in 2018, a decrease of EUR 524 million, or 40%, compared to EUR 1 297 million in 2017. Networks operating margin in 2018 was 4.4% compared to 7.3% in 2017. The decrease in operating margin was primarily attributable to the decrease in Mobile Access and to a lesser extent, IP Routing operating margin, partially offset by higher Fixed Access operating margin.

Nokia Software

For the year ended December 31, 2019 compared to the year ended December 31, 2018

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2019		2018		Year-on-year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	2 767	100.0	2 713	100.0	2
Cost of sales	(1 314)	(47.5)	(1 346)	(49.6)	(2)
Gross profit	1 453	52.5	1 367	50.4	6
Research and development expenses	(458)	(16.6)	(485)	(17.9)	(6)
Selling, general and administrative expenses	(395)	(14.3)	(429)	(15.8)	(8)
Other operating income and expenses	(11)	(0.4)	(3)	(0.1)	-
Operating profit	589	21.3	450	16.6	31

Net sales

Nokia Software net sales in 2019 were EUR 2 767 million, an increase of EUR 54 million, or 2%, compared to EUR 2 713 million in 2018. The increase in Nokia Software net sales was primarily due to applications, and, to a lesser extent, core networks. In applications, growth was driven by digital intelligence, self-organizing networks and services.

Gross profit

Nokia Software gross profit in 2019 was EUR 1 453 million, an increase of EUR 86 million, or 6%, compared to EUR 1 367 million in 2018. Nokia Software gross margin in 2019 was 52.5%, compared to 50.4% in 2018. The increase in Nokia Software gross profit was primarily due to higher net sales in applications, higher gross margin and higher net sales in core networks, as well as lower incentive accruals in 2019, compared to 2018.

Operating expenses

Nokia Software research and development expenses were EUR 458 million in 2019, a decrease of EUR 27 million, or 6%, compared to EUR 485 million in 2018. The decrease in Nokia Software research and development expenses was primarily due to an increase in R&D productivity achieved through our investments in a Common Software Foundation and the further optimization of resources, as well as lower incentive accruals in 2019, compared to 2018.

Nokia Software selling, general and administrative expenses were EUR 395 million in 2019, a decrease of EUR 34 million, or 8%, compared to EUR 429 million in 2018. The decrease in Nokia Software selling, general and administrative expenses was primarily due to the integration and streamlining of core networks into our existing specialized software salesforce, as well as lower incentive accruals in 2019, compared to 2018.

Nokia Software other operating income and expenses was an expense of EUR 11 million in 2019, a change of EUR 8 million compared to an expense of EUR 3 million in 2018.

Operating profit

Nokia Software operating profit was EUR 589 million in 2019, an increase of EUR 139 million, or 31%, compared to EUR 450 million in 2018. Nokia Software operating margin in 2019 was 21.3% compared to 16.6% in 2018. The increase in Nokia Software operating margin in 2019 was primarily due to higher gross profit, as well as lower research and development and selling, general and administrative expenses.

For the year ended December 31, 2018 compared to the year ended December 31, 2017

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2018		2017		Year-on-year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	2 713	100.0	2 798	100.0	(3)
Cost of sales	(1 346)	(49.6)	(1 396)	(49.9)	(4)
Gross profit	1 367	50.4	1 402	50.1	(2)
Research and development expenses	(485)	(17.9)	(567)	(20.3)	(14)
Selling, general and administrative expenses	(429)	(15.8)	(425)	(15.2)	1
Other operating income and expenses	(3)	(0.1)	4	0.1	-
Operating profit	450	16.6	414	14.8	9

Net sales

Nokia Software net sales in 2018 were EUR 2 713 million, a decrease of EUR 85 million, or 3%, compared to EUR 2 798 million in 2017. The decrease in Nokia Software net sales was primarily due to core networks. This was partially offset by applications, which witnessed growth in digital networks, CloudBand NFV management and orchestration, NetGuard security, network management and self-organizing network (SON). The net sales performance of Nokia Software continued to benefit from the investments to build a dedicated software sales force and increasingly strong demand for our market leading software portfolio built on a 5G ready and cloud-native Common Software Foundation.

Gross profit

Nokia Software gross profit in 2018 was EUR 1 367 million, a decrease of EUR 35 million, or 2%, compared to EUR 1 402 million in 2017. Nokia Software gross margin in 2018 was 50.4%, compared to 50.1% in 2017. The decrease in Nokia Software gross profit was primarily due to lower net sales and lower gross margin in core networks, partially offset by higher gross margin and higher net sales in applications.

Operating expenses

Nokia Software research and development expenses were EUR 485 million in 2018, a decrease of EUR 82 million, or 14%, compared to EUR 567 million in 2017. The decrease in Nokia Software research and development expenses was primarily due to improved productivity, particularly in applications, following the ongoing implementation of a Common Software Foundation.

Nokia Software selling, general and administrative expenses were EUR 429 million in 2018, an increase of EUR 4 million, or 1%, compared to EUR 425 million in 2017.

Nokia Software other operating income and expenses was an expense of EUR 3 million in 2018, a change of EUR 7 million compared to an income of EUR 4 million in 2017.

Operating profit

Nokia Software operating profit was EUR 450 million in 2018, an increase of EUR 36 million, or 9%, compared to EUR 414 million in 2017. Nokia Software operating margin in 2018 was 16.6% compared to 14.8% in 2017. The increase in Nokia Software operating margin in 2018 was primarily due to lower research and development expenses, partially offset by lower gross profit.

Nokia Technologies

For the year ended December 31, 2019 compared to the year ended December 31, 2018

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2019		2018		Year-on-year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	1 487	100.0	1 501	100.0	(1)
Cost of sales	(28)	(1.9)	(22)	(1.5)	27
Gross profit	1 459	98.1	1 479	98.5	(1)
Research and development expenses	(111)	(7.5)	(145)	(9.7)	(23)
Selling, general and administrative expenses	(101)	(6.8)	(127)	(8.5)	(20)
Other operating income and expenses	(8)	(0.5)	(4)	(0.3)	–
Operating profit	1 239	83.3	1 203	80.1	3

Net sales

Nokia Technologies net sales in 2019 were EUR 1 487 million, a decrease of EUR 14 million, or 1%, compared to EUR 1 501 million in 2018. In 2019, the EUR 1 487 million of net sales related entirely to patent and brand licensing. In 2018, EUR 1 476 million of net sales related to patent and brand licensing and EUR 25 million of net sales related to digital health and digital media. The decrease in Nokia Technologies net sales was primarily due to the sale of our digital health business in 2018, partially offset by higher one-time catch-up net sales related to a new license agreement and the sale of certain patents.

Gross profit

Nokia Technologies gross profit in 2019 was EUR 1 459 million, a decrease of EUR 20 million, or 1%, compared to EUR 1 479 million in 2018. The lower gross profit in Nokia Technologies was primarily due to lower net sales and lower gross margin. The lower gross margin reflects costs associated with a one-time sale of patent assets, partially offset by the absence of costs related to digital health, following the sale of our digital health business in 2018.

Operating expenses

Nokia Technologies research and development expenses in 2019 were EUR 111 million, a decrease of EUR 34 million, or 23%, compared to EUR 145 million in 2018. The decrease in Nokia Technologies research and development expenses was primarily due to the absence of costs related to digital health, following the sale of our digital health business in 2018, as well as lower patent portfolio costs.

Nokia Technologies selling, general and administrative expenses in 2019 were EUR 101 million, a decrease of EUR 26 million, or 20%, compared to EUR 127 million in 2018. The decrease in Nokia Technologies selling, general and administrative expenses was primarily due to the absence of costs related to digital health, following the sale of our digital health business in 2018, lower licensing-related litigation costs and lower business support costs.

Nokia Technologies other operating income and expenses in 2019 was a net expense of EUR 8 million, a change of EUR 4 million compared to a net expense of EUR 4 million in 2018.

Operating profit

Nokia Technologies operating profit in 2019 was EUR 1 239 million, an increase of EUR 36 million, or 3%, compared to an operating profit of EUR 1 203 million in 2018. The increase in Nokia Technologies operating profit was primarily due to lower research and development and selling, general and administrative and expenses, partially offset by lower gross profit. Nokia Technologies operating margin in 2019 was 83.3% compared to 80.1% in 2018.

For the year ended December 31, 2018 compared to the year ended December 31, 2017

The following table sets forth selective line items and the percentage of net sales for the years indicated.

For the year ended December 31	2018		2017		Year-on-year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	1 501	100.0	1 654	100.0	(9)
Cost of sales	(22)	(1.5)	(71)	(4.3)	(69)
Gross profit	1 479	98.5	1 583	95.7	(7)
Research and development expenses	(145)	(9.7)	(235)	(14.2)	(38)
Selling, general and administrative expenses	(127)	(8.5)	(218)	(13.2)	(42)
Other operating income and expenses	(4)	(0.3)	(6)	(0.4)	–
Operating profit	1 203	80.1	1 124	68.0	7

Net sales

Nokia Technologies net sales in 2018 were EUR 1 501 million, a decrease of EUR 153 million, or 9%, compared to EUR 1 654 million in 2017. In 2018, EUR 1 476 million of net sales related to patent and brand licensing and EUR 25 million of net sales related to digital health and digital media. In 2017, EUR 1 602 million of net sales related to patent and brand licensing and EUR 52 million of net sales related to digital health and digital media. The decrease in Nokia Technologies net sales was primarily due to lower one-time net sales, partially offset by higher recurring licensing net sales.

Gross profit

Nokia Technologies gross profit in 2018 was EUR 1 479 million, a decrease of EUR 104 million, or 7%, compared to EUR 1 583 million in 2017. The lower gross profit in Nokia Technologies was primarily due to lower net sales, partially offset by higher gross margin, reflecting the discontinuation of our digital media product business and the absence of costs related to digital health, following the sale of our digital health business in 2018.

Operating expenses

Nokia Technologies research and development expenses in 2018 were EUR 145 million, a decrease of EUR 90 million, or 38%, compared to EUR 235 million in 2017. The decrease in Nokia Technologies research and development expenses was primarily due to reduced investments in digital media and the absence of costs related to digital health, following the sale of our digital health business in 2018, as well as lower patent portfolio costs.

Nokia Technologies selling, general and administrative expenses in 2018 were EUR 127 million, a decrease of EUR 91 million, or 42%, compared to EUR 218 million in 2017. The decrease in Nokia Technologies selling, general and administrative expenses was primarily due to lower licensing-related litigation costs and lower costs due to the discontinuation of our digital media and digital health businesses.

Nokia Technologies other operating income and expenses in 2018 was a net expense of EUR 4 million, a change of EUR 2 million compared to a net expense of EUR 6 million in 2017.

Operating profit

Nokia Technologies operating profit in 2018 was EUR 1 203 million, an increase of EUR 79 million, or 7%, compared to an operating profit of EUR 1 124 million in 2017. The increase in Nokia Technologies operating profit was primarily due to lower selling, general and administrative and research and development expenses, partially offset by lower gross profit. Nokia Technologies operating margin in 2018 was 80.1% compared to 68.0% in 2017.

Group Common and Other

For the year ended December 31, 2019 compared to the year ended December 31, 2018

The following table sets forth selective line items for the years indicated.

For the year ended December 31	2019		2018		Year-on-year change %
	EURm	% of net sales	EURm	% of net sales	
Net sales	952	100.0	1 025	100.0	(7)
Cost of sales	(918)	(96.4)	(871)	(85.0)	5
Gross profit	34	3.6	154	15.0	(78)
Research and development expenses	(312)	(32.8)	(293)	(28.6)	6
Selling, general and administrative expenses	(269)	(28.3)	(200)	(19.5)	35
Other operating income and expenses	57	6.0	93	9.1	–
Operating loss	(490)	(51.5)	(246)	(24.0)	99

Net sales

Group Common and Other net sales in 2019 were EUR 952 million, a decrease of EUR 73 million, or 7%, compared to EUR 1 025 million in 2018. The decrease in Group Common and Other net sales was primarily due to Radio Frequency Systems, partially offset by Alcatel Submarine Networks.

Gross profit

Group Common and Other gross profit in 2019 was EUR 34 million, a decrease of EUR 120 million, or 78%, compared to EUR 154 million in 2018. The lower gross profit was primarily due to Radio Frequency Systems, Alcatel Submarine Networks, as well as investments to drive digitalization of internal processes. Group Common and Other gross margin in 2019 was 3.6% compared to 15.0% in 2018.

Operating expenses

Group Common and Other research and development expenses in 2019 were EUR 312 million, an increase of EUR 19 million, or 6%, compared to EUR 293 million in 2018. The increase in Group Common and Other research and development expenses was primarily due to investments to drive digitalization of internal processes, partially offset by lower incentive accruals in 2019, compared to 2018.

Group Common and Other selling, general and administrative expenses in 2019 were EUR 269 million, an increase of EUR 69 million, or 35%, compared to EUR 200 million in 2018. The increase in Group Common and Other selling, general and administrative expenses was primarily due to investments to drive digitalization of internal processes, partially offset by lower incentive accruals in 2019, compared to 2018.

Group Common and Other other operating income and expense in 2019 was a net income of EUR 57 million, a change of EUR 36 million compared to a net income of EUR 93 million in 2018. The net negative fluctuation in other operating income and expenses was primarily due to lower gains in venture fund investments.

Operating loss

Group Common and Other operating loss in 2019 was EUR 490 million, an increase of EUR 244 million, compared to an operating loss of EUR 246 million in 2018. The change in Group Common and Other operating loss was primarily attributable to lower gross profit, higher selling, general and administrative expenses, a negative fluctuation in other operating income and expense, and higher research and development expenses.

For the year ended December 31, 2018 compared to the year ended December 31, 2017

The following table sets forth selective line items for the years indicated.

For the year ended December 31	2018 EURm	% of net sales	2017 EURm	% of net sales	Year-on-year change %
Net sales	1 025	100.0	1 114	100.0	(8)
Cost of sales	(871)	(85.0)	(956)	(85.8)	(9)
Gross profit	154	15.0	158	14.2	(3)
Research and development expenses	(293)	(28.6)	(260)	(23.3)	13
Selling, general and administrative expenses	(200)	(19.5)	(219)	(19.7)	(9)
Other operating income and expenses	93	9.1	73	6.6	-
Operating loss	(246)	(24.0)	(248)	(22.3)	(1)

Net sales

Group Common and Other net sales in 2018 were EUR 1 025 million, a decrease of EUR 89 million, or 8%, compared to EUR 1 114 million in 2017. The decrease in Group Common and Other net sales was primarily due to Alcatel Submarine Networks, partially offset by Radio Frequency Systems.

Gross profit

Group Common and Other gross profit in 2018 was EUR 154 million, a decrease of EUR 4 million, or 3%, compared to EUR 158 million in 2017. The lower gross profit was primarily due to Alcatel Submarine Networks, partially offset by Radio Frequency Systems. Group Common and Other gross margin in 2018 was 15.0% compared to 14.2% in 2017.

Operating expenses

Group Common and Other research and development expenses in 2018 were EUR 293 million, an increase of EUR 33 million, or 13%, compared to EUR 260 million in 2017. The increase in Group Common and Other research and development expenses was primarily due to higher costs related to Nokia Bell Labs.

Group Common and Other selling, general and administrative expenses in 2018 were EUR 200 million, a decrease of EUR 19 million, or 9%, compared to EUR 219 million in 2017. The decrease in Group Common and Other selling, general and administrative expenses was primarily due to lower support function costs, reflecting progress related to our cost savings program.

Group Common and Other other operating income and expense in 2018 was a net income of EUR 93 million, a change of EUR 20 million compared to a net income of EUR 73 million in 2017. The net positive fluctuation in other operating income and expenses was primarily due to higher gains in venture fund investments, partially offset by the absence of the unwinding of a reinsurance contract and an expiration of a former Alcatel Lucent stock option liability, both of which benefitted 2017.

Operating loss

Group Common and Other operating loss in 2018 was EUR 246 million, a decrease of EUR 2 million, compared to an operating loss of EUR 248 million in 2017. The change in Group Common and Other operating loss was primarily attributable to a positive fluctuation in other operating income and expense, and lower selling, general and administrative expenses, partly offset by higher research and development expenses.

Liquidity and capital resources

Financial position

As of December 31, 2019, our total cash and current financial investments (defined as cash and cash equivalents and current financial investments) equaled EUR 6 007 million, a decrease of EUR 866 million, compared to EUR 6 873 million as of December 31, 2018. The decrease was primarily attributable to capital expenditure of EUR 690 million and payment of dividends of EUR 570 million. As of December 31, 2017, our total cash and current financial investments equaled EUR 8 280 million.

As of December 31, 2019, our net cash and current financial investments (defined as total cash and current financial investments less long-term and short-term interest-bearing liabilities) equaled EUR 1 730 million, a decrease of EUR 1 323 million, compared to EUR 3 053 million as of December 31, 2018. The decrease was mainly attributable to drivers affecting our total cash and current financial investments as described above. As of December 31, 2017, our net cash and current financial investments equaled EUR 4 517 million.

As of December 31, 2019, our cash and cash equivalents equaled EUR 5 910 million, a decrease of EUR 351 million compared to EUR 6 261 million as of December 31, 2018. As of December 31, 2017, our cash and cash equivalents equaled EUR 7 369 million.

Cash flow

2019

Our cash inflow from operating activities in 2019 was EUR 390 million, an increase of EUR 30 million compared to a cash inflow of EUR 360 million in 2018. The increase was primarily attributable to net profit, adjusted for non-cash items, of EUR 2 638 million, an increase of EUR 880 million compared to EUR 1 758 million in 2018, partially offset by EUR 1 788 million cash tied-up to net working capital in 2019 compared to EUR 943 million cash tied-up in 2018. The primary driver for the increase in net working capital tied-up was related to a decrease in liabilities of EUR 2 232 million compared to a decrease of EUR 645 million in 2018, and a decrease in inventories of EUR 285 million compared to an increase of EUR 544 million in 2018. The decrease in liabilities was primarily attributable to a decrease in trade payables, restructuring and associated cash outflows, a decrease in liabilities related to employee benefits and a decrease in deferred revenue. The decrease in inventories was attributable to improved inventory management. The decrease in receivables was EUR 159 million compared to a decrease of EUR 246 million in 2018.

In 2019, cash flow from operating activities included paid taxes of EUR 516 million, an increase of EUR 152 million compared to EUR 364 million in 2018; interest received of EUR 57 million, a decrease of EUR 11 million compared to EUR 68 million in 2018; and interest paid of EUR 1 million, a decrease of EUR 158 million compared to EUR 159 million in 2018.

The cash outflow from investing activities equaled EUR 167 million in 2019, a decrease of EUR 148 million compared to EUR 315 million cash outflow in 2018. Cash outflow from investing activities was primarily driven by cash outflow due to the capital expenditure of EUR 690 million partially offset by net cash inflow of EUR 518 million resulting from proceeds from maturities and sale of current financial investments of EUR 991 million and purchase of current financial investments of EUR 473 million.

Major items of capital expenditure in 2019 included investments in R&D equipment, test equipment, hardware for telecommunication and cloud environment, plants, buildings and construction for transformation projects, and repair or improvements of sites.

In 2019, our cash outflow from financing activities was EUR 479 million a decrease of EUR 490 million in comparison to EUR 969 million cash outflow in 2018. The decrease in cash outflow was primarily driven by paid dividends of EUR 570 million compared to EUR 1 081 million in 2018, partially offset by net cash from long-term borrowings of 273 million and by payments of lease liabilities of EUR 221 million. In 2019, following the adoption of IFRS 16, Leases, the cash outflows related to the majority of the Group's lease contracts are presented within financing activities as opposed to operating activities in 2018.

2018

Our cash inflow from operating activities in 2018 was EUR 360 million, a decrease of EUR 1 451 million compared to a cash inflow of EUR 1 811 million in 2017. The decrease was primarily attributable to EUR 943 million cash tied-up to net working capital in 2018 compared to EUR 504 million cash release in 2017 and net profit, adjusted for non-cash items, of EUR 1 758 million, a decrease of EUR 460 million compared to EUR 2 218 million in 2017. The primary driver for the increase in net working capital was related to a decrease in liabilities of EUR 645 million compared to an increase of EUR 1 221 million in 2017, and an increase in inventories of EUR 544 million compared to an increase of EUR 296 million in 2017. The decrease in liabilities was primarily attributable to a restructuring and associated cash outflows, decrease in deferred revenue and the payment of employee incentives related to Nokia's business performance in 2017, partially offset by an increase in trade payables. The increase in inventories was attributable to a decision to ensure sufficient flexibility to deliver higher levels of equipment sales, particularly related to 5G. The decrease in liabilities and the increase in inventories were partially offset by a decrease in receivables of EUR 246 million.

Cash flow from operating activities included interest paid of EUR 159 million, a decrease of EUR 250 million compared to EUR 409 million in 2017; paid taxes of EUR 364 million, a decrease of EUR 191 million compared to EUR 555 million in 2017; and interest received of EUR 68 million, an increase of EUR 15 million compared to EUR 53 million in 2017. In 2018, out of EUR 364 million paid taxes, approximately EUR 100 million were non-recurring in nature and related to the resolution of a tax dispute in India. In 2018, out of EUR 159 million interest paid, approximately EUR 40 million were non-recurring in nature and primarily related to the disposal of the former Alcatel Lucent railway signaling business to Thalés in 2006.

In 2018, our cash outflow from investing activities equaled EUR 315 million, a decrease of EUR 325 million compared to EUR 10 million cash inflow in 2017. Cash outflow from investing activities was primarily driven by cash outflow due to the capital expenditure of EUR 672 million partially offset by net cash inflow of EUR 293 million resulting from proceeds from maturities and sale of current financial investments of EUR 2 397 million and purchase of current financial investments of EUR 2 104 million.

Major items of capital expenditure in 2018 included investments in R&D equipment, test equipment, hardware for telecommunication and cloud environment, plants, buildings and construction for transformation projects, and repair or improvements of sites.

In 2018, our cash outflow from financing activities was EUR 969 million a decrease of EUR 780 million in comparison to EUR 1 749 million cash outflow in 2017. The decrease in cash outflows was primarily due to the absence of repurchases of shares related to the two-year capital structure optimization program completed in 2017. The decrease in cash outflow was partially offset by paid dividends of EUR 1 081 million compared to EUR 970 million in 2017.

Financial assets and debt

As of December 31, 2019, our net cash and current financial investments equaled EUR 1 730 million consisting of EUR 6 007 million in total cash and current financial investments, and EUR 4 277 million of long-term and short-term interest-bearing liabilities.

We hold our total cash and current financial investments predominantly in euro. Our current financial investments mainly include high-quality money market and fixed income instruments with strict maturity limits. We also have a EUR 1 500 million undrawn revolving credit facility available for liquidity purposes.

As of December 31, 2019, our interest-bearing liabilities consisted of EUR 500 million notes due 2021, USD 500 million notes due 2022, EUR 750 million notes due 2024, a EUR 250 million R&D loan from Nordic Investment Bank with final maturity in 2025, EUR 750 million notes due 2026, USD 500 million notes due 2027, USD 74 million notes due 2028, USD 206 million notes due 2029, USD 500 million notes due 2039 and EUR 332 million of other liabilities. The notes maturing in 2021, 2022, 2024, 2026, 2027 and 2039 are issued by Nokia Corporation, while the notes maturing in 2028 and 2029 are issued by Lucent Technologies Inc., a predecessor to Nokia of America Corporation (Nokia's wholly-owned subsidiary, formerly known as Alcatel-Lucent USA Inc.). Refer to Note 23, Interest-bearing liabilities, of our consolidated financial statements included in this annual report for further information regarding our interest-bearing liabilities.

The EUR 500 million R&D loan facility agreement with the European Investment Bank signed in August 2018 was not disbursed as of December 31, 2019 and will have an average maturity of approximately five years after disbursement. The availability period of the loan facility ends in February 2020.

In 2019, we repaid EUR 231 million senior notes and USD 581 million senior notes at maturity dates in February and May, respectively.

In March 2019, we issued EUR 750 million senior notes due in 2026 under our EUR 5 billion Euro Medium-Term Note Programme.

In May 2019, we drew a EUR 250 million amortizing R&D loan from Nordic Investment Bank. The loan facility agreement was signed in December 2018 and the loan is repayable in three equal annual installments in 2023, 2024 and 2025.

In June 2019, we refinanced our undrawn EUR 1 579 million revolving credit facility maturing in June 2020 with a new facility in size of EUR 1 500 million maturing in June 2024. The new facility has two one-year extension options, its pricing is linked to two of Nokia's key sustainability targets in addition to credit ratings, it has no financial covenants and the facility remains undrawn as of December 31, 2019.

We consider that with EUR 6 007 million of total cash and current financial investments and our undrawn credit facilities, we have sufficient funds to satisfy our future working capital needs, capital expenditures, R&D investments, structured finance, venture fund commitments, acquisitions and debt service requirements, at least through 2020. We further consider that with our current credit ratings of BB+ by Standard & Poor's, Ba2 by Moody's and BBB- by Fitch, we have access to the capital markets should any funding needs arise in 2020.

We aim to re-establish investment grade credit ratings.

Off-balance sheet arrangements

There are no material off-balance sheet arrangements that have, or are reasonably likely to have, a current or future effect on our financial condition, changes in financial condition, revenues or expenses, results of operations, liquidity, capital expenditures or capital resources that are material to investors, except for the purchase obligations and leasing commitments, as well as guarantees and financing commitments disclosed in Note 30, Commitments and contingencies, of our consolidated financial statements included in this annual report.

Structured finance

Structured finance includes customer financing and other third-party financing. Network operators occasionally require their suppliers, including us, to arrange, facilitate or provide long-term financing as a condition for obtaining infrastructure projects.

As of December 31, 2019, our total customer financing, outstanding and committed, equaled EUR 579 million, an increase of EUR 80 million as compared to EUR 499 million in 2018. As of December 31, 2017, our total customer financing, outstanding and committed, equaled EUR 655 million. Customer financing primarily consisted of financing commitments to network operators. We expect our customer financing commitments to be financed mainly from cash and current financial investments and through cash flow from operations.

Refer to Note 36, Financial risk management, of our consolidated financial statements included in this annual report on Form 20-F for further information relating to our committed and outstanding customer financing.

As of December 31, 2019, guarantees of our performance consisted of bank guarantees given on behalf of Nokia to its customers for EUR 1 721 million (EUR 1 570 million as of December 31, 2018). In addition, Nokia issued corporate guarantees directly to our customers with primary obligation for EUR 969 million (EUR 1 041 million as of December 31, 2018). These instruments entitle our customers to claim payments as compensation for non-performance by Nokia of its obligations under supply agreements. Depending on the nature of the instrument, compensation is either payable on demand, or is subject to verification of non-performance.

Refer to Note 30, Commitments and contingencies, of our consolidated financial statements included in this annual report for further information regarding commitments and contingencies.

Venture fund investments and commitments

We make financing commitments to a number of unlisted venture funds that make technology-related investments. The majority of the investments are managed by NGP Capital, a global venture capital firm backing companies that are creating the connected world through sensors, 5G mobile, hybrid cloud and intelligent technology.

As of December 31, 2019, our unlisted venture fund investments equaled EUR 740 million, compared to EUR 682 million as of December 31, 2018. Refer to Note 24, Fair value of financial instruments, of our consolidated financial statements included in this annual report for further information regarding fair value of our unlisted venture fund investments.

As of December 31, 2019, our venture fund commitments equaled EUR 244 million, compared to EUR 314 million as of December 31, 2018. As a limited partner in venture funds, we are committed to capital contributions and entitled to cash distributions according to the respective partnership agreements and underlying fund activities. Refer to Note 30, Commitments and contingencies, of our consolidated financial statements included in this annual report for further information regarding commitments and contingencies.

Treasury policy

Treasury activities are governed by the Nokia Treasury Policy approved by the President and CEO and supplemented by operating procedures approved by the CFO, covering specific areas such as foreign exchange risk, interest rate risk, credit risk and liquidity risk. The objective of treasury's liquidity and capital structure management activities is to ensure that we have sufficient liquidity to go through unfavorable periods without being severely constrained by the availability of funds to execute Nokia's business plans and implement Nokia's long-term business strategy. We are risk-averse in our treasury activities.

Significant subsequent events

Financing transactions

On February 24, 2020, the Group drew a loan of EUR 500 million from European Investment Bank (EIB). The loan facility agreement was signed in August 2018 and the loan will mature in February 2025.

Change of President and Chief Executive Officer

On March 2, 2020 Nokia's Board of Directors appointed Pekka Lundmark as President and Chief Executive Officer of Nokia and he is expected to start in his new role on September 1, 2020. Rajeev Suri will leave his current position as President and Chief Executive Officer on August 31, 2020 and continue to serve as an advisor to the Nokia Board until January 1, 2021.

Sustainability and corporate responsibility

We create the technology to connect the world in a responsible way.

We believe the positive impact of the technology we create and deliver far outweighs the potential negative impacts. Communications technologies provide access to better healthcare, education and greater economic opportunity, enable more efficient industrial, agricultural and resource use, and contribute to a more equitable, secure society, and a cleaner, safer planet.

Our products and solutions are designed to drive social, environmental, and economic progress. We continue to develop processes, policies and programs that align with globally recognized ethical and responsible business practices and frameworks. We recognize and aim to mitigate the potential risks and negative impacts associated with our business whether related to technology, supply chain, climate or people, while also driving the opportunities within and beyond our business in order to contribute to achieving the UN Sustainable Development Goals (SDGs).

In short, we believe our technology provides our greatest positive contribution to the SDGs. 5G, IoT, cloud and AI will provide the fabric for smart cities that are more efficient, safer, cleaner and more secure as well as better management of natural resources through digitalized utilities, building towards a purpose-driven economic model. We also understand the importance of providing technological innovation in an ethical and responsible manner.

Climate change and the depletion of natural resources are perhaps the most pressing social and business risks of our time. The potential effects of climate change could affect our customers, our own operations, supply chain and the world economy, potentially causing rising energy prices, greater regulation, and materials and natural resource scarcity affecting production.

Other potential risks to our business and reputation are unethical behavior by our customers, suppliers or own employees, potential human rights abuse through misuse of the technology we provide, and lack of proper respect for human rights, fair labor conditions, the environment and communities in our operations and supply chains.

We have a systematic and structured approach to risk management across our business operations and processes. Our Code of Conduct defines our way of working and we have clear policies, processes and KPIs for each identified sustainability risk. These are discussed further in the relevant topics below.

We have a strong and proven sustainability governance model in place from the Board of Directors to action owners. Review and feedback are provided as needed by the Board of Directors and Group Leadership Team. The Chief Marketing Officer is responsible for sustainability in the Group Leadership Team. Actions and programs all have a named responsible owner, while sustainability issues and activities are orchestrated by a dedicated corporate team and specific areas of expertise have their own nominated owners.

2019 main achievements

Our key sustainability priorities remained: to improve people's lives with technology, to protect the environment, to conduct our business with integrity, and to respect our people.

In 2019, we focused on climate, ethics, human rights as well as gender and equality issues. We supported initiatives and activities around diversity and inclusion, energy efficiency, modern slavery, mitigating technology misuse, supply chain responsibility and transparency, health & safety, and employee engagement.

We had 28 short and long term targets. Our key targets include helping our customers to connect the next billion subscribers by 2022, compared to approximately 5.5 billion at the end of 2016. The target is measured by number of subscriptions in Nokia radio customers' networks. In 2019 our customers' radio networks served around 6.4 billion subscriptions worldwide, an increase of 0.3 billion on the previous year. In energy efficiency, the networks we modernized in 2019 brought on average energy savings of 46% for our customers. Other targets are set for specific material sustainability topics and can be found as part of our 2019 People and Planet reporting.

Protecting the environment

Climate change remains a key risk to society while we believe key mitigation activities could also provide a business opportunity for more environmentally friendly technologies. We recognize that we provide products and services globally which may affect the environment as manufacturing, distributing, and operating these products require energy and other resources. However, we believe that the opportunities our technology provides to our customers, industry and society, and the measures we have taken in our operations can positively contribute to the fight against climate change.

We constantly strive to drive down the energy required by our products in use in our customers' communications networks, helping them to reduce their carbon footprint as this is by far the greater part of our own carbon footprint. In September 2019 we joined 86 other companies and announced our commitment to reset our science-based emission reduction targets in line with the goal to limit average rises in temperatures to 1.5°C. We committed to recalibrate our existing long-term science-based targets which seek to reduce emissions from sold products in use by 75% and to reduce operational emissions by 41% by 2030, as compared to the 2014 baseline. In 2019, we delivered zero emission products to around 150 customers globally, helping them reduce their emissions. Modernization of legacy networks drives improved energy efficiency. The customer base station sites we modernized in 2019 used on average 46% less energy than those where our customers did not modernize. Not only does this reduce environmental impacts, it also provides an improved financial upside for our customers.

We have aligned our climate related disclosures, including risks, in our CDP report according to the guidance of the Task Force on Climate-related Financial Disclosures (TCFD). CDP is a leading global organization that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts.

We have in place a robust environmental management system and Environmental policy, supported by documented processes and procedures globally to ensure implementation. The system helps us to monitor our progress and identify needed improvements. Our own operational footprint is certified under ISO 14001:2015 environmental management system standard and in 2019 the coverage of employees within the scope of that certification was 85%. Circular economy and waste reduction are also key in our work and we offer refurbishment, reuse and recycling of older equipment as an integral component of the product lifecycle management. In 2019, we sent around 4 000 metric tons of old telecommunications equipment for materials recovery and we refurbished or reused approximately 56 300 units.

Conducting our business with integrity

Our long-standing reputation for acting with integrity is our most important asset. We remain committed to a culture of high integrity, where each and every employee is responsible and accountable for our ethical values. The need for greater transparency and increased integrity are growing as is increased regulation. Our compliance program and processes remain agile in challenging times, where privacy, data security and trade compliance grow ever more complicated. Corruption, unethical behavior, and a lack of respect for human rights and fair labor conditions are major obstacles to development in many countries. We believe these issues cannot be neglected. Around the globe, we aim to uphold high standards of ethics and human rights in our own activities as well as throughout our value chain.

Our Code of Conduct is applied across our operations to protect our reputation, mitigate risks, and enable greater personal integrity from top management to individual employees. This is further supplemented with a Code of Ethics applicable to our President and Chief Executive Officer, Chief Financial Officer, Deputy Chief Financial Officer and Corporate Controller. The Code of Conduct sets down the key principles and practices of our ethical business approach and provides clear guidance to our employees as well as other stakeholders with whom we work. The Code of Conduct is further enhanced by 14 key business policy statements which cover: Improper Payments/Anti-Corruption, Conflict of Interests, Fair Competition, Privacy, Dealing with Government Officials, Intellectual Property & Confidential Information, Working with Suppliers, Trade Compliance, Insider Trading, Health, Safety & Labor Conditions, Controversial Business Practices, Fair Employment Practices, Human Rights, and Environment. In addition, operational guidance is provided on third-party screening and corporate hospitality. Finally, our Commercial Third-Party Code of Conduct applies to the third parties with which we work and clearly states our expectations from them on ethical conduct.

In 2019 we also continued our employee engagement on ethical practices. Our Ethical Business Training was again mandatory for all employees. In 2019, the training was completed by 96.7% of our employees, surpassing the target of 95%.

Anti-corruption and bribery

Our Code of Conduct sets forth our position that we will not tolerate corrupt behavior by our employees or suppliers. It also provides guidance on anti-corruption and bribery issues. The Anti-Corruption Policy provides further internal guidance and support for ethical behavior. We employ a multi-faceted approach to anti-corruption issues. We have clear and unequivocal policies concerning improper payments, facilitation payments, gifts and hospitality, sponsorships and donations, and other areas of risk for public and private corruption. We carry out training and regularly communicate to our employees regarding risks, and we review these risks and our mitigation measures with the company's senior leadership and Audit Committee. We conduct periodic audits and risk assessments to ensure that we identify and respond to corruption risks. Our Compliance Controls Framework (CCF) reviews are comprehensive bottom-up audits that include internal gap analysis workshops and localized risk mitigation plans. In 2019 we carried out 23 CCF reviews with relevant senior leaders. We carry out risk-based due diligence and monitoring procedures for different categories of third parties (suppliers and business partners) to assess and to manage potential risks related to engaging and working with them. In addition, we screen our end-customers to assess possible legal, compliance and reputational risks associated with them (including, but not limited to sanctions and money laundering risks).

We provide a range of trainings and resources that include comprehensive online courses, targeted micro-learnings, compliance job aids, and face-to-face training. In 2019, anti-corruption training was delivered to business groups, to relevant stakeholders, to regional groups, including country engagement sessions, and to service companies, with over 8 900 individuals receiving face-to-face training in the 231 live training sessions held across the globe. We also celebrated Nokia Integrity Day on September 17, 2019, conducting face-to-face events at more than 130 sites around the world with around 10,000 employees enthusiastically participating in our numerous events that are aimed at creating awareness.

Oversight and grievance mechanisms

In 2019, leadership involvement and oversight of ethics and compliance were provided by the Board and the Audit Committee, which covered ethics and compliance topics in its meetings in 2019. Employees and external stakeholders are urged to report any ethical misconduct using our dedicated Nokia EthicsPoint channels via email, phone or online, anonymously if desired.

In 2019, our Ethics & Compliance office received 994 concerns, of which 289 were investigated by our Business Integrity group as alleged violations of our Code of Conduct. We also implemented corrective actions including 32 dismissals and 30 written warnings following these and other investigations. Specifically, two concerns were received as alleged violations of our anti-bribery policies, involving third parties, but neither of these concerns was substantiated. The Ombuds Program continues to strengthen our speak-up culture. The vast network of 225+ Local Ombuds Leaders actively promotes the program and provides confidential and neutral resources for employees who have compliance questions and concerns. In 2019, 65 of Ethics Helpline cases were reported through our ombuds channels.

Data privacy and security

We have established a comprehensive company-wide privacy program based on relevant laws, best practices, and standards. This program is supported by, and aligned with corporate, business-group, and central functions-level policies and processes. We aim to mitigate privacy risk in relation to the data we collect, process, and store. We observe the concept of data minimization, meaning we endeavor only to collect personal data that is necessary for the purposes for which they are collected and to retain such data for no longer than is necessary. We implement appropriate controls to ensure that only persons with a clear and justifiable need to know can access personal data. We have formal processes and procedures in place to manage and mitigate any related risk to data subjects in the event of a personal data breach. These processes also include mechanisms to communicate in a timely fashion with supervisory authorities, should that be required. A program of privacy awareness and training ensures we continuously and effectively address areas of highest privacy impact.

Security is a key concern in 5G, IoT and other new technologies. We aim to develop products and services that meet or surpass the applicable security standards. Nevertheless, we and our products may be subject to cybersecurity breaches, including those resulting from hacking, viruses, malicious software, unauthorized modifications, or other activities that may cause potential security risks and other harm to us, our customers or consumers, and other end users of our products and services. We have developed and implemented processes and tools for use in product development, referred to as Design for Security or DfSec, which underlies all product development. We maintain internal IT security and cybersecurity operations, including monitoring our internal network resources. We have also implemented policies, processes and tools to enhance the security of our products and services, including managing the security risks in third parties.

Human rights – Freedom of expression and privacy

We are committed to the principles of the Universal Declaration of Human Rights and the United Nations Global Compact, and we encourage our suppliers and business partners to share these values. We endorsed the United Nations Guiding Principles on Business and Human Rights in 2011. Our Code of Conduct together with our Human Rights Policy sets out our approach to human rights. Our human rights processes cover the whole value chain, from supplier management to product end usage and we have set clear targets for all areas separately. Our Human Rights Due Diligence process, which is embedded in our global sales process, provides the mechanism and tools to effectively deal with our most salient human rights risks arising from the potential misuse of the products and technology we provide. We aim to ensure the technology we provide is not used to infringe human rights, including the right to privacy, freedom of expression and assembly. In addition to potential product misuse, human rights risks appear in our global supply chain. Our supply chain risks and activities are further discussed in the Responsible Sourcing section below and in a separate modern slavery statement.

In 2019, we completed an internal product-related Human Rights Impact Assessment performed by an external human rights expert. This assessment underlined the overall efficacy of our human rights approach and also identified areas for further improvement. We are a member of the Global Network Initiative (GNI), a multi stakeholder group of companies, civil society organizations (including human rights and press freedom groups), investors, and academics working together to protect and advance freedom of expression and privacy in the ICT sector. A condition of membership for companies is agreement to adhere to the GNI Principles and allowing GNI to conduct an independent assessment of the member company's progress towards implementing the GNI Principles. In October 2019 we completed our first ever GNI assessment by the independent assessor Foley Hoag LLP. We are honored to report that the GNI Board found Nokia has made good faith efforts over time to implement the GNI Principles on freedom of expression and privacy.

Responsible sourcing

We encourage our suppliers to adhere to our Code of Conduct and also provide them with our Supplier Requirements. Our Supplier Requirements are included in supplier contract appendices detailing our requirements related to suppliers. The requirements cover such topics as environment, security, privacy, risk management, human rights management and health. We also run assessments and audits of our suppliers, and provide training to ensure they meet our ethical requirements and continuously improve on their performance.

In 2019, we implemented 332 supply chain audits (364 in 2018), including 45 onsite audits on corporate responsibility topics, 46 onsite audits against our supplier requirements and 241 supplier assessments conducted using the EcoVadis scorecards. We also ran training workshops for suppliers operating in high-risk countries, including online training for example on climate change, conflict-free sourcing and corporate responsibility topics, and arranged face-to-face training workshops establishing improvement plans and actions. These trainings covered altogether 255 suppliers. We continued our work with the Joint Audit Cooperation (JAC), a group of our major customers who collaborate to drive improvement and transparency in supply chain management.

Our health and safety (H&S) management system is the basis for our overall program and an integral part of how we manage health and safety. We are certified with the internationally recognized OHSAS 18001 standard by third party, Bureau Veritas. The certification covers activities within all networks business groups, customer operations and supporting corporate functions. Health and safety issues remain a key priority for us. We implement training, analysis, assessments and consequence management to address job-related health and safety risks. We run a wide range of programs targeted at constantly improving our health and safety performance, while also encouraging employees and contractors to report near misses and dangerous incidents. We see the highest risk in the health and safety of our contractors who for example work at height, drive or work with electricity. Consequently, we have set stringent key performance indicators related to the supplier Health and Safety Maturity Assessment Process. By the end of 2019, 97% of suppliers delivering high-risk activity had been assessed using our H&S Maturity Assessment Process and 99% of the assessed suppliers met H&S compliant supplier status. In 2019, we also carried out impact assessments on 99% of all high-risk projects. 100% of those projects were found to meet our minimum non-negotiable requirements.

The potential risks associated with the mining and trade of metals that provide key minerals in electronic components may include impacts related to military conflict, human rights violations, as well as negative environmental impacts. This is one reason why the traceability of our materials and ensuring our products are conflict-free is a priority for us, as evident in our updated Responsible Minerals Policy which can be found online. Tin, tantalum, tungsten, gold and cobalt are in scope of our due diligence.

In 2019, 96% of our suppliers have achieved full visibility to the smelters in our supply chain. 82% of smelters identified as part of our supply chain have been validated as conflict-free or are active in the validation process. Our latest Conflict Minerals Report was also updated during the year.

We continued our CDP Supply Chain Program, creating environmental improvement programs and improving our upstream indirect emissions that occur in the chain. In 2019, 404 of our key suppliers responded to the CDPs request to disclose their climate performance information and 234 also provided emission reduction targets. We also had 237 suppliers responding on the water aspect via the CDP program.

Respecting our people

The market for skilled employees in our business is extremely competitive. Our workforce has fluctuated over recent years as we have introduced changes in our strategy to respond to our business targets and our activities. These changes may in the future cause disruption and fatigue amongst employees. It is imperative that we work to create and sustain a corporate culture that is motivational, inclusive, and encourages creativity and continuous learning to meet challenges.

In 2019, the average number of employees was 98 322 (103 083 in 2018 and 101 731 in 2017). The table below shows the average number of employees in 2019, by geographical location:

Region	Average number of employees
Finland	5 992
Other European countries	33 710
Middle East & Africa	3 538
China	15 707
Asia-Pacific	22 230
North America	13 013
Latin America	4 132
Total	98 322

In 2019, we again measured the favorability of employee perceptions about company and culture with an anonymous employee survey. The survey result was 78.2% favorable towards the company, down by 1.3 percentage points from 2018, as measured by the average of the two target questions about overall direction. The target question "Overall, as a company, Nokia is heading in the right direction" was 76.7% favorable, down by 3.2 percentage points from 2018 and the other target question "Overall, Nokia's culture is heading in the right direction" was 79.6% favorable, up by 0.6 percentage points from 2018.

We are committed to employee development and career growth. In 2019, we delivered our corporate leadership programs which target new line managers to executives; 74 deliveries with over 2 000 participants from NokiaEDU (line managers to senior leaders) and 22 deliveries for high potential and executive trainings and our women leader program. Additionally, over 8 000 employees have studied leadership related online solutions and videos. Furthermore, we have facilitated over a hundred 360° feedbacks and over 70 teams have used the team insights model. We have over 300 internal coaches who are made available to all employees. We also focused on ensuring that our employees were fit for the future with knowledge and skill sets in business-critical areas. NokiaEDU partnered with business group leaders to determine learning priorities and enabled employees to track their personal learning commitments through the Learning Index. In May 2019, NokiaEDU's Skills for the Future employee event attracted over 20 000 participants.

Inclusion and diversity were 2019 business priorities. We believe that by acting inclusively, we can leverage the differences to achieve better business results and growth. To make sure that people at Nokia embrace the full talent pool in the company we focused on education. We launched a mandatory introductory training for all employees this year, a gamified solution for teams to discuss and better understand what exclusion and inclusion look like in everyday situations, and a workshop for leaders to understand how bias can adversely impact their decision. As a manifest of our commitment to diversity, a pay equity analysis we conducted with Mercer, a consulting firm, found a small but statistically significant unexplained pay gap in the company. A special budget was authorized, and the gap was closed for 2019. We plan to hold annual pay equity reviews to ensure that the gaps that we close, stay closed. In 2019, 1 512 managers were trained on inclusive leadership best practices. In 2019, 15% of Nokia's leadership positions were held by women. In total, women accounted for 22% of our workforce.

Labor conditions

Our Code of Conduct is the basis for labor conditions, enhanced by a full set of global human resources policies and procedures that enable fair employment. We adhere to the International Labor Organization (ILO) Declaration on Fundamental Principles and Rights at Work and we meet, or where possible exceed, the requirements of labor laws and regulations wherever we have operations. We work hard to ensure decent working conditions and fair employment, taking into account both international and local laws and guidelines.

The health and safety of our own employees is also a key priority. Our Personal Support Service (Nokia's EAP) provides employees with the opportunity to join learning events throughout the year on a broad range of health and wellbeing related topics, as well as providing professional, confidential support.

Shares and share capital

Share details

Nokia has one class of shares. Each Nokia share entitles the holder to one vote at General Meetings of Nokia.

As of December 31, 2019, the total number of Nokia shares was 5 640 536 159 and our share capital equaled EUR 245 896 461.96. As of December 31, 2019, Nokia and its subsidiary companies owned a total of 34 954 869 Nokia shares, representing approximately 0.6% of the total number of the shares and voting rights of the company.

For information on remuneration and shares held by the Board of Directors, the President and CEO and the other members of the Group Leadership Team, refer to "Corporate governance—Corporate governance statement and —Compensation". For more information regarding corporate governance at Nokia, refer to "Corporate governance—Corporate governance statement" or to our website at http://www.nokia.com/en_int/investors/corporate-governance.

In 2019, under the authorization held by the Board of Directors, we issued 23 000 new shares following the holders of stock options issued in 2013 exercising their option rights. In addition, we issued 4 568 000 new shares without consideration to Nokia to be transferred to fulfil our obligation under the Nokia Equity Programs.

In 2019, under the authorization held by the Board of Directors, we issued a total of 12 396 097 treasury shares to our employees, including certain members of the Group Leadership Team, as settlement under Nokia's equity-based incentive plans as well as Alcatel Lucent's employee equity compensation arrangement. The shares were issued without consideration and in accordance with the plan rules. The total number of treasury shares issued represented 0.2% of the total number of shares and the total voting rights as of December 31, 2019. The issuances did not have a significant effect on the relative holdings of other Nokia shareholders, or on their voting power.

Information on the authorizations held by the Board of Directors in 2019 to issue shares and special rights entitling to shares, to transfer shares and repurchase own shares, as well as information on related party transactions, the shareholders, stock options, shareholders' equity per share, dividend yield, price per earnings ratio, share prices, market capitalization, share turnover and average number of shares is available in the "Corporate Governance—Compensation", "Financial Statements" and "General facts on Nokia—Shares" sections.

Refer to Note 20, Shares of the Parent Company, of our consolidated financial statements included in this annual report on Form 20-F for further information regarding Nokia shares.

Dividend

Beginning with the distribution for 2018, Nokia has and plans to pay any dividends in quarterly instalments. For the financial year 2018 Nokia distributed a total dividend of EUR 0.10 per share in two quarterly instalments. On October 24, 2019, our Board of Directors resolved to not distribute the third and fourth quarterly instalments of the dividend for the financial year 2018, in order to: a) guarantee Nokia's ability to increase 5G investments, b) continue investing in growth in strategic focus areas of enterprise and software and c) strengthen Nokia's cash position. The Board expects to resume dividend distributions after Nokia's net cash position improves to approximately EUR 2 billion. The Board of Directors has proposed to the 2020 Annual General Meeting that no dividend will be paid for the financial year 2019 and the Board will not seek an authorization to pay out dividends.

The dividend to shareholders is Nokia's principal method of distributing earnings to shareholders. Over the long term, Nokia targets to deliver an earnings-based growing dividend by distributing approximately 40% to 70% of diluted earnings per share (EPS), excluding unallocated items⁽¹⁾, taking into account Nokia's cash position and expected cash flow generation.

We distribute distributable funds, if any, within the limits set by the Finnish Companies Act as defined below. We make and calculate the distribution, if any, in the form of cash dividends, assets from the reserve for invested unrestricted equity, share buy-backs, or in some other form, or a combination of these. There is no specific formula by which the amount of a distribution is determined, although some limits set by law are discussed below. The timing and amount of future distributions of retained earnings and/or assets from the reserve for invested unrestricted equity, if any, will depend on our future results and financial conditions.

Under the Finnish Companies Act, we may distribute retained earnings and/or assets from the reserve for invested unrestricted equity on our shares only upon a shareholders' resolution and subject to limited exceptions in the amount proposed by the Board. The amount of any distribution is limited to the amount of distributable earnings of the Parent Company pursuant to the last accounts approved by our shareholders, taking into account the material changes in the financial situation of the Parent Company after the end of the last financial period and a statutory requirement that the distribution of earnings must not result in insolvency of the Parent Company. Subject to exceptions relating to the right of minority shareholders to request a certain minimum distribution, the distribution may not exceed the amount proposed by the Board of Directors.

⁽¹⁾ Includes costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

Articles of Association

Our Articles of Association are available on our website www.nokia.com/about-us/investors/corporate-governance. Amendment of the Articles of Association requires a resolution of the general meeting of shareholders, supported by two-thirds of the votes cast and two-thirds of the shares represented at the meeting. For information on our Articles of Association, refer to "General facts on Nokia—Memorandum and Articles of Association".

Our Articles of Association include provisions for obligations to redeem our shares. Amendment of the provisions of Article 13 of the Articles of Association, "Obligation to purchase shares", requires a resolution supported by three-quarters of the votes cast and three-quarters of the shares represented at the meeting.

Risk factors

Set forth below is a description of risk factors that could affect our business. Shareholders and potential investors should carefully review the following risk factors, in addition to other information contained in this annual report on Form 20-F. The risk factors described below should not be construed as exhaustive. There may be additional risks that are unknown to us and other risks currently believed to be immaterial that could turn out to be material.

These risks, either individually or collectively, could adversely affect our business, sales, profitability, results of operations, financial condition, competitiveness, costs, expenses, liquidity, market share, brand, reputation and share price. Unless otherwise indicated or the context otherwise requires, references in these risk factors to “Nokia”, the “Nokia Group”, “Group”, “we”, “us” and “our” mean Nokia’s consolidated operating segments. Certain risks or events may be more prevalent with respect to Nokia or a certain business group, business or part of the Group.

This annual report on Form 20-F also contains forward-looking statements that involve risks and uncertainties presented in “Forward-looking statements” above.

Risks related to our strategy and its execution

We may be unable to successfully implement our strategic plans, sustain or improve the operational and financial performance of our business groups, correctly identify or successfully pursue business opportunities or otherwise grow our business.

We operate in rapidly changing and innovative industries and the opportunities we pursue require significant investments in innovation in order to generate growth, profitability or other targeted benefits across our business.

Our strategy, which includes targeted investments in our business and pursuing new business opportunities based on identified trends and opportunities, even if successful, may not yield a return on our investment as planned or at all. There can be no assurance that we will correctly identify trends or opportunities to pursue or be able to achieve the goals or targets we have set. Furthermore, there can be no assurance that our investments will result in technologies, products or services that achieve or retain broad or timely market acceptance, answer to the expanding needs or preferences of our customers or consumers, or break-through innovations that we could otherwise utilize for value creation.

We target on a continuous basis various improvements in our operations and efficiencies through investing in R&D, entering into licensing arrangements, acquiring businesses and technologies, recruiting expert employees and partnering with third parties or forming joint ventures. There can be no assurance that our efforts will generate the expected results or improvements in our operations or that we will achieve our intended targets or financial objectives related to such efforts. For instance, the underlying business case in terms of profits, revenue, strategic impact or otherwise justifying the creation or continuation of the arrangement may not be realized.

We may be unable to successfully implement planned transactions or transactions may result in liabilities.

From time to time, as part of our strategy, we may consider possible transactions that could complement our existing operations and enable us to grow our business or shift focus via divestitures of our existing businesses or operations. We may engage in further transactions, such as acquisitions, divestments, mergers or joint ventures in the future. Additionally, we may make investments in companies through certain investment funds, including NGP Capital.

The transactions that we initiate may not ultimately be completed on favorable terms or at all or provide the benefits or return on investment that we had originally anticipated. After reaching an agreement for a transaction, we may need to satisfy pre-closing conditions on acceptable terms, which may prevent us from completing the transaction or result in changes to the scope of the transaction. Furthermore, our initial assumptions may be incorrect in evaluating a transaction. Therefore, we may be exposed to unknown, larger or contingent liabilities of acquired businesses, such as those related to contractual obligations, taxes, pensions, environmental liabilities, disputes and compliance matters. Transactions may result in claims between the parties (including, but not limited to, any indemnification or breach of contract claims), which can consume time and management attention, and the outcome of any claims related to transactions may be difficult to predict. Additionally, there are multiple other events or conditions that can hamper or delay a transaction, including;

- § unanticipated delays or inability to proceed with transactions as planned, for instance, due to issues in obtaining regulatory or shareholder approvals, completing public offers or proposals, the imposition of conditions on the acquirer of a business to divest certain assets or impose other obligations due to competition laws or other regulations;
- § unanticipated costs or changes in scope, for instance, due to issues with regulators or courts imposing terms on a transaction or obstacles that result in changes required in the scope of the transaction;
- § the potential loss of key employees, customers and suppliers;
- § unanticipated changes in business, industry or general economic conditions that affect the assumptions underlying the acquisition;
- § potential disputes with sellers, purchasers or other counterparties;
- § impairments related to goodwill and other intangible assets, for instance, due to business performance after an acquisition or differences in evaluating the goodwill with respect to the acquired businesses;
- § potential limitations on our ability to control any joint ventures; accordingly, such transactions may result in increased exposure to operational, compliance, legal or financial risks;
- § unexpected costs associated with the separation of the business which is to be divested or with the integration of the business which is acquired;
- § additional payment obligations and higher costs resulting from non-performance by divested businesses;

- § exposure to contingent liabilities in connection with any indemnity we provide to the purchaser in connection with such divestment;
- § potential post-closing claims for indemnification;
- § our dependence on some of the divested businesses as our suppliers in the future; and
- § high transaction costs.

Past divestments may entail residual liability risk. For example, in 2018 we sold the Digital Health business and focused the Nokia Technologies business group on licensing. Although we divested the Digital Health business and no longer own or control it, the possibility of continuing liabilities remains, be it from the buyer of the business, consumers or other purchasers of digital health products bearing the Nokia name, or regulatory or enforcement bodies seeking to hold Nokia responsible for regulatory or compliance failures relating to the products that occurred prior to the divestiture. The outcome of any such claims or proceedings may be difficult to predict and could have a material adverse effect on our financial condition.

We may be unable to realize the anticipated benefits, synergies, cost savings or efficiencies from acquisitions, and we may encounter issues or inefficiencies related to our organizational and operational structure, including being unable to successfully implement our business plans.

The level of effort required for successful integration of acquired businesses or assets depends on the complexity of the acquired business or asset. There can be no assurance that we will be able to realize the intended organizational and operational benefits and potentially targeted cost savings related to our business plans in the manner or within the timeframe currently anticipated. Such risks and uncertainties include, among others, the distraction of our management's attention from our business resulting in performance shortfalls, the disruption of our ongoing business, interference with our ability to maintain our relationships with customers, vendors, regulators and employees and inconsistencies in our services, standards, quality, product road maps, controls, procedures and policies, any of which could have a material adverse effect on our business, financial condition and results of operations.

These failures could be triggered, among others, by the following factors impacting the integration process and operations:

- § adverse contractual issues with respect to various agreements with third parties (including joint venture agreements, customers, vendors, licensees or other contractual parties), certain financing facilities, pension fund agreements, agreements for the performance of engineering and related work/services, IT agreements, technology, intellectual property rights and licenses, employment agreements, or pension and other post-employment benefits-related liability issues;
- § our failure to identify issues and liabilities at the target business or assets during the due diligence and pre-acquisition process;
- § disruptions caused, for instance, by reorganizations, which may result in inefficiency within the new organization through loss of key employees or delays in implementing our intended structural changes, among other issues;
- § inability to achieve the targeted organizational changes, efficiencies or synergies in the targeted time or to the extent targeted or with targeted implementation costs, for instance due to inability to streamline overlapping products and services efficiently, rationalize our organization and overheads, reduce overheads and costs or achieve targeted efficiencies, and the risk of new and additional costs associated with implementing such changes;
- § inability to rationalize or streamline our organization or product lines or to retire legacy products and related services as a result of pre-existing customer commitments;
- § loss of, or lower volume of, business from key customers, or the inability to renew agreements with existing customers or establish new customer relationships, including limitations linked to customer policies with respect to aggregate vendor share or supplier diversity policies or increased efforts from competitors aiming to capitalize on disruptions;
- § conditions and burdens imposed by laws, regulators or industry standards on our business or adverse regulatory or industry developments or litigation affecting us;
- § issues relating to fraud, non-compliance with applicable laws and regulations, improper accounting policies, improper internal control or other improper activities;
- § challenges relating to the consolidation or ongoing integration of corporate, financial data and reporting, control and administrative functions, including cash management, foreign exchange/hedging operations, internal and other financing, insurance, financial control and reporting, IT, communications, legal and compliance and other administrative functions;
- § the coordination of R&D, marketing and other support functions may fail or cause inefficiencies or other administrative burdens caused by operating the combined business; and
- § our inability to eliminate the complexity of our corporate structure following the acquisition.

As previously disclosed, we were made aware of certain practices relating to compliance practices at the former Alcatel Lucent business that have raised concerns. We voluntarily reported the matter to the relevant regulatory authorities and have continued to work on our internal investigation and cooperate with the relevant authorities with a view to resolving the matter. We have seen no evidence that would suggest that criminal penalties would apply in this case, and we believe it is highly likely that any penalties that might apply would be limited and immaterial.

Additionally, the anticipated cost reductions and other benefits expected to arise from the acquisitions and integration of businesses, as well as related costs to implement such measures, are derived from our estimates, which are uncertain. The underlying assumptions are inherently uncertain and subject to a variety of significant business, economic, and competitive factors, risks and uncertainties that could cause our actual results to differ materially from those contained in the expected synergy benefits and related cost estimates.

Risks related to the general economic and financial market conditions and the industries and markets in which we operate

We may be materially and adversely affected by general economic and financial market conditions and other developments in the economies where we operate.

As we are a company with global operations and sales in many countries around the world, our sales and profitability are dependent on general economic and financial market conditions both globally and locally. We have manufacturing facilities and suppliers located in various countries around the world which may equally be impacted by these conditions. Adverse developments in, or the general weakness of, economic conditions, such as unemployment or consumer spending, may have an adverse impact on the spending patterns of end-users. This, in turn, may affect demand of consumables, such as mobile devices, mobile subscriptions and related services which would have an adverse effect on Nokia Technologies. In our Networks and Nokia Software segments, this may also affect both the services that end-users subscribe to and the usage levels of such services, which may lead service providers to invest less in related infrastructure and services or to invest in low-margin products and services. Likewise, adverse developments in economic conditions may lead certain customer segments, such as webscale companies, TXLE, transportation, energy and public safety, to invest less in infrastructure and services to digitize their operations or to invest in low-margin products and services. Negative market developments affecting our customers and their end-users may also be caused by other adverse conditions such as natural or man-made disasters, geopolitical disruptions, civil unrest or health crises (such as the novel coronavirus).

General uncertainty and adverse developments in the financial markets and the general economy could have a material adverse effect on our or our partners' or suppliers' ability to obtain sufficient or affordable financing on satisfying terms, having in turn an adverse effect on our ability to deliver our products and services in time and with acceptable quality. Uncertain market conditions may increase the price of financing or decrease its availability. We or our suppliers could also encounter difficulties in raising funds or accessing liquidity necessary to maintain financial condition and results of operations.

We face intense competition and are dependent on development of the industries and markets in which we operate. The information technology and communications industries and related services market are cyclical and are affected by many factors, including the general economic environment, technological changes, competitor behavior, purchase and spending behavior of service providers and vertical customers, consumers and businesses, deployments and roll-out timing.

The competitive environment in the markets where we operate, including the information technology and communications and related services market in numerous markets around the world, continues to be intense and is characterized by maturing industry technologies, equipment price erosion and aggressive price competition. For instance, we are particularly dependent on the investments made by service providers in network infrastructure and related services. The pace and size of such investments are in turn dependent on the ability of service providers to increase their subscriber numbers, reduce churn, maintain or increase their average revenue per user, and compete with business models eroding revenue from traditional voice, messaging and data transport services, as well as the financial condition of such service providers. Further, the purchasing power of our customers, particularly in developing markets, depends to a greater extent on the price development of basic commodities and currency fluctuations, which may render our products or services unaffordable.

Service providers' cost reductions and network sharing, and industry consolidation among operators have reduced the amount of available business, resulting in further competition and pressure on pricing and profitability. Consolidation of operators may result in vendors and service providers concentrating their business in certain service providers and increasing the possibility that agreements with us are terminated or not renewed. Merger activity between our customers has in the past and may continue to constrict such customers' capital expenditure. In addition, the investments of the service providers in the new spectrum assets may reduce their funds available for investing the new network infrastructure and related services. Furthermore, the level of demand by service providers and other customers that purchase our products and services can change quickly and can vary over short periods of time. In addition, a portion of our revenues is driven by the timing of completion and customer acceptances, which particularly in relation to 5G are further dependent on maturity of the whole 5G ecosystem. As a result of the uncertainty and variations in the telecommunications and vertical industries, accurately forecasting revenues, results and cash flow remains difficult.

We may be unable to respond successfully to competitive challenges in the markets in which we operate. Market developments favoring new technological solutions, such as SDN, cloud and virtualization may result in reduced spending for the benefit of our competitors who have, or may have, a stronger position in such technologies. The technological viability of standardized, low-margin hardware products in combination with the virtualization of functions can induce a change in purchase behavior, resulting in favoring other vendors or in higher bargaining power versus Nokia due to more alternative vendors. Additionally, new competitors may enter the industry as a result of acquisitions or shifts in technology. For example, the virtualization of core and radio networks and the convergence of IT and telecommunications may lower barriers of entry for IT and webscale companies in the traditional telecommunications industry or they may build up tight strategic partnerships with our traditional competitors or our communication service provider customers. Additionally, some companies, including webscale companies, may drive a faster pace of innovation in telecommunication infrastructure through more collaborative approaches and open technologies across access, backhaul, core and management.

We expect to generate a significant share of our growth from new customers, including webscale companies and vertical customers in energy, transport, public sector, manufacturing and TXLEs. Each of these sectors may face adverse industry developments which may significantly impact the size of investments addressable by us and our ability to address these investments, in terms of both having the right products available and being able to attain new customers and having the right go-to-market capabilities and expertise to address the specific needs of these sectors. Furthermore, there are various incumbent and new players competing with Nokia in these customer groups we strategically target. With these types of customers, the nature of competition and the required capabilities can be significantly different from the communication service provider market, including competition based on access network, core network, Cloud infrastructure, platforms, applications and devices, and related services.

We compete with companies that have large overall scale, which affords such companies more flexibility, for instance, with respect to pricing. We also continue to face intense competition globally, including from companies based in China which endeavor to gain further market share and broaden their presence in new areas of the network infrastructure and related services business, for instance, by providing lower-cost products and services. Competition for new customers, as well as for new infrastructure deployment, is particularly intense and focused on the favorability of price and agreement terms.

Examples of other risks and uncertainties impacting our success in the industries we operate, include:

- § our ability to correctly estimate technological developments, including the impending turn to 5G, or adapt successfully to such developments;
- § the development of the relevant markets and/or industry standards in directions that leave us deficient in certain technologies and industry areas that impact our overall competitiveness;
- § the choice of our customers to turn to alternative vendors to maintain end-to-end services from such vendors, and the choice of our customers between an end-to-end solution from one vendor and best-of-breed from multiple vendors;
- § our ability to successfully develop market recognition as a leading provider of software and services in the information technology and communications and related services market, as well as with our vertical customers in energy, transport, public sector, webscale, manufacturing and TXLEs;
- § our ability to sustain or grow net sales in our business and areas of strategic focus, which could result in the loss of benefits related to economies of scale and reduced competitiveness;
- § our ability to identify opportunities and enter into agreements that are commercially successful;
- § pricing products and services appropriately, which is crucial in the networks infrastructure business due to the typical long-term nature and complexity of the agreements; and
- § our ability to continue utilizing current customer relations to advance our sales of related services, or pursue new service-led growth opportunities.

We may be adversely affected by developments with respect to customer financing or extended payment terms that we provide our customers.

Requests for customer financing and extended payment terms are typical for our industry. Service providers in certain markets may require their suppliers, including us, to arrange, facilitate or provide financing in order to obtain sales or business. Similarly, operators may require extended payment terms. In certain cases, the amounts and duration of these financings and trade credits, and the associated impact on our working capital, may be significant. Furthermore, reduced availability of export credits supporting our sales could affect our ability to enter new customers or markets.

Among other things, uncertainty in the financial markets may result in increased customer financing requests. As a strategic marketing requirement, we arrange and facilitate financing or provide extended payment terms to a number of our customers, typically supported by export credit agencies or through the sale of related deferred receivables. In the event that export credit agencies face future constraints on their ability or willingness to provide guarantees or financing to our customers, or there is insufficient demand to purchase receivables, such events could have a material adverse effect on our business and financial condition. We have agreed to extended payment terms for a number of our customers, and may continue to do so in the future. Extended payment terms may result in a material aggregate amount of trade credits. Even when the associated risk is mitigated by a diversified customer portfolio, defaults in the aggregate could have a material adverse effect on us.

We may not be successful in arranging, facilitating or providing required financing, including extended payment terms to our customers, particularly in difficult financial conditions on the market. Additionally, certain of our competitors may have greater access to arranging such financing, which could adversely affect our ability to compete in similar manner for business opportunities in the markets in which we operate. Our ability to manage our total customer financing and trade credit exposure depends on a number of factors, including capital structure, market conditions affecting our customers, the levels and terms of credit available to us and our customers, the cooperation of export credit agencies and our ability to mitigate exposure on acceptable terms. We may be unsuccessful in managing the challenges associated with the customer financing and trade credit exposure that we may face from time to time. While defaults under financings, guarantees and trade credits to our customers resulting in impairment charges and credit losses have not been significant for us in the past, these may increase in the future, in particular in markets such as India with increased risks potentially affecting our customers. Further, commercial banks may not continue to be able or willing to provide sufficient long-term financing, even if backed by export credit agency guarantees, due to their own constraints.

We have sold certain receivables to banks or other financial institutions to mitigate the payment risk and improve our liquidity, and any significant change in our ability to continue this practice could impair our capability to mitigate such payment risk and to manage our liquidity.

Nokia arranges bank guarantees and issues commercial guarantees in customers' favor in relation to our business. We may not be able to collect outstanding guarantees and bonds that could limit our possibilities to issue new guarantees and/or bonds, which are required in customer agreements or practices. We also face risks that such commercial guarantees and bonds may be unfairly called.

We are dependent on a limited number of customers and large multi-year agreements. The loss of a single customer or contract, operator consolidation, unfavorable contract terms or other issues related to a single agreement may have a material adverse effect on our business and financial condition.

A significant proportion of the net sales and profits that we generate have historically been derived from a limited number of customers. As consolidation among existing customers continues, it is possible that an even greater portion of our net sales will be attributable to a smaller number of large service providers operating in multiple markets. These developments are also likely to increase the impact on our net sales based on the outcome of certain individual agreement tenders. We may lose existing agreements, or we may be unable to renew or gain new agreements due to customer diversity policies that limit the ability of customers to have one network provider exceeding a certain threshold of business in a given market.

Service providers are increasingly entering into network sharing arrangements, as well as joint procurement agreements, which may reduce their investments and the number of networks available for us to service. Furthermore, procurement organizations of certain large service providers sell consulting services to enhance the negotiating position of small operators with their vendors. As a result of these trends and the intense competition in the industry, we may be required to agree to increasingly less favorable terms in order to remain competitive. Any unfavorable developments in relation to, or any change in the agreement terms applicable to, a major customer may have a material adverse effect on our business, results of operations and financial condition. Also, due to the long-term nature of the agreements, it is possible that the contract terms of the agreement may prove less favorable to us than originally expected, for instance due to changes in costs and product portfolio decisions.

The loss of a single customer or contract, or other issues related to a single agreement may have a material adverse effect on our business and financial condition. Any suspension, termination or non-performance by us under an agreement's terms may have a material adverse effect on us, for example due to penalties for breaches, early termination or, reduced orders or customer footprint.

Furthermore, there is a risk that the timing of sales and results of operations associated with large multi-year agreements or turnkey projects, which are typical in the mobile infrastructure and related services business, will differ from expectations. For instance, recognition of sales and related costs in network implementation projects is often linked with achievement of customer acceptances, which may delay for reasons contributable or not contributable to us. Moreover, such agreements often require dedication of substantial amounts of working capital and other resources, which may adversely affect our cash flow, particularly in the early stages of an agreement's term, or may require us to continue to sell certain products and services, or to sell in certain markets, that would otherwise be discontinued or exited, thereby diverting resources from developing more profitable or strategically important products and services, or focusing on more profitable or strategically important markets. Furthermore, our customer agreements may involve complex transformation of the networks as the customers deploy new technologies and the related costs and scope of required deliverables may differ from our expectations at the time we enter into these such agreements.

Risks impacting our competitiveness

We may fail to effectively and profitably invest in new competitive high-quality products, services, upgrades and technologies or bring them to market in a timely manner. We also may fail to adapt to changing business models.

Our business and the markets where we operate are characterized by rapidly evolving technologies, frequent new technological requirements, product feature introductions and evolving industry standards. The participants in the information technology, communications and related services market compete on the basis of product offerings, technical capabilities and quality in addition to price and affordability through consumer financing arrangements. As a result, our business performance depends on the timely and successful introduction of new products, services and upgrades of current products to meet the evolving requirements of customers, comply with emerging industry standards and address competing technological and product developments carried out by competitors while keeping prices and costs at competitive levels.

The R&D of new and innovative, technologically advanced products, as well as upgrades to current products and new generations of technologies, is a complex and uncertain process requiring high levels of innovation and investment, in addition to accurate anticipation of technological, regulatory and market trends. We may focus our resources on products and technologies that do not become widely accepted or ultimately prove unviable. Additionally, many of our current and planned products are highly complex and may contain defects or errors that are, for instance, detected only after deployment in telecommunications networks. Our results of operations will depend to a significant extent on our ability to succeed in the following areas:

- § maintaining and developing a competitive product portfolio and service capability that are attractive to our customers, for instance by keeping pace with technological advances in our industry and pursuing the technologies that become commercially accepted and price competitive;
- § continuing to introduce new products and product upgrades successfully and on a cost-efficient and timely basis;
- § developing new or enhancing existing tools for our services offerings;
- § optimizing the amount of customer or market specific technology, product and feature variants in our product portfolio;
- § continuing to meet expectations and enhance the quality of our products and services as well as introducing products and services that have desired features and attributes, such as energy efficiency;
- § maintaining and building up strategic partnerships in our value creation chain (e.g. in product creation and in project delivery); and
- § leveraging our technological strengths.

Certain of our competitors have significant resources to invest in market exploration and may seek new monetization models or drive industry development and capture value in areas where we may not currently be competitive or do not have similar resources available to us. These areas may include monetization models linked to large amounts of consumer data, large connected communities, home or other entertainment services, alternative payment mechanisms or marketing products. We also face competition from various companies that may be able to develop technologies or products that become preferred over those developed by us or result in adverse effects on us through, for instance, developing technological innovations that make our innovations less relevant. In addition, reduced government funding and support for our R&D activities could affect our ability to develop new technology or products.

We must invest effectively and profitably in new competitive products, services, upgrades or technologies (such as 5G, IoT, the cloud or software) and manage proactively the costs related to our portfolio of products and services, including component sourcing, manufacturing, logistics and other operations. We may fail to maintain or improve our market position, competitiveness or scale, or we may fail to leverage our scale to the fullest extent and keep prices and costs at competitive levels or provide high-quality products and services.

We may encounter difficulties and challenges in the development of 5G technology and the roll-out and commercialization of 5G services.

One of our primary operational objectives is the roll-out of our 5G networks. Our 5G-related R&D efforts as well as product roll-outs require us to devote financial and operational resources, and we expect to continue to make substantial investments in 5G and 5G related technology. However, the 5G roll-out and commercialization has not and may not develop in the manner or in the time periods we anticipate. The acceleration of the 5G roll-out and commercialization requires us and our partners to accelerate the related R&D efforts which has and may risk our readiness to meet the timelines of our customers. Further, competitive intensity has increased in the market as some competitors seek to take share in the early stage of 5G which has and may negatively impact the price levels. If domestic and global economic conditions worsen, overall spending on 5G infrastructure may be reduced or spending in our other networks products and services might be reduced to preserve the customer investment in 5G, which would adversely impact demand for our products and services in these markets.

Even if the 5G infrastructure market develops in the manner or in the time periods we anticipate, if we do not have timely, competitively priced, market-accepted products available to meet our customers' planned roll-out of 5G networks, we may miss significant opportunities. We have and may face challenges with respect to the R&D roadmaps, chipset development and cost competitiveness of our 5G products and our actions and investments to accelerate those roadmaps and improve our cost competitiveness to address those challenges may prove to be insufficient. Further, any reduction in our market share in 5G compared to our installed base in 4G due to decisions to protect our profitability, inability to meet the customers' requirements or other reasons, may have a material negative effect on our scale and profitability.

Our efforts aimed at managing and improving our competitiveness, financial or operational performance may not lead to targeted results, benefits, cost savings or improvements.

We operate in highly competitive industries and we are continuously targeting increased efficiency of our operations through various initiatives. For instance, we have announced targeted operating cost and production overheads savings by the end of 2020 and plan for these savings to come from a wide range of areas, including investments in digitalization to drive more automation and productivity, further process and tool simplification, significant reduction in central support functions to reach best-in-class cost levels, prioritization of R&D programs to best create long-term value, a reduction of R&D in legacy products, driving efficiency from further application of our Common Software Foundation and innovative software development techniques, the consolidation of selected cross-company activities, and further reductions in real estate and other overhead costs. These planned savings are expected to result in a net reduction of employees globally. We may also institute new plans for restructuring measures. Restructuring measures may be costly, potentially disruptive to operations, and may not lead to sustainable (or any) improvements in our overall competitiveness and profitability. In October 2019, we announced a reduction of the estimated savings related to this cost saving program primarily due to expectation to make additional investments in 5G and digitalization of our operations.

We have also implemented various programs aimed at improving cost savings and financial performance, and there can be no assurance that such programs will be met as planned in contemplated timeframes or at all, or result in sustainable improvements. Factors that may prevent a successful implementation or cause adverse effects on us include the following:

- § need to make additional investments in other areas such as 5G and digitalization of our operations;
- § inaccuracy in our expectations with respect to market growth, customer demand and other trends in the industry in which we operate;
- § our ability to benefit from industry trends may prove to be inaccurate and changes in the general economic conditions, whether globally, nationally or in the markets in which we operate, may impact our ability to implement such plans;
- § a down-turn in global or regional economic conditions may have an adverse effect on our ability to achieve the cost savings contemplated;
- § legislative constraints or unfavorable changes in legislation in the markets in which we operate may influence timing, costs and expected savings of certain initiatives contemplated;
- § our ability to swap equipment of certain customers in line with our future product lines development. We might not be successful in securing continued business from such customers, leading to sunk cost impacting our business and results of operations;
- § organizational changes related to the implementation plans require the alignment and adjustment of resources, systems and tools, including digitalization and automation, which if not completed in a structured manner could impact our ability to achieve our goals, projected cost savings and ability to achieve the efficiencies contemplated;
- § the costs to implement the initiatives contemplated by our plans may exceed our estimates and we may not be able to realize the targeted cash inflows or other expected proceeds;
- § our cost saving initiatives, including R&D, may negatively affect our ability to develop new or improve existing products and compete effectively in certain markets, and there is no guarantee that we will continue to be able to successfully innovate or remain technologically competitive;

- § disruptions to regular business operations caused by the plans, including to unaffected parts of Nokia;
- § intended business plans may require us to inform or consult with employees and labor representatives, and such processes may influence the timing, costs and extent of expected savings and the feasibility of certain of the initiatives contemplated;
- § skilled employees may leave, or we may not be able to recruit employees as a result of planned initiatives, and loss of their expertise may cause adverse effects on our business or limit our ability to achieve our goals and lead to an overall deterioration of brand value among potential and current employees or as a preferred employer; and
- § bargaining power of our suppliers may prevent us from achieving targeted procurement savings.

We need to manage our operating expenses and other internal costs to maintain cost efficiency and competitive pricing of our products and services. We may be unable to determine the appropriate prioritization of operating expenses and other costs, to identify and implement the appropriate measures to adjust our operating expenses and other costs on a timely basis, or to maintain achieved cost reduction levels. While we are implementing and have implemented various cost savings and other initiatives in the past, and may implement such initiatives in the future, there can be no assurance that we will be able to complete those successfully or that we will realize the projected benefits. Our plans may be altered in the future, including adjusting any projected financial or other targets. The anticipated costs or the level of disruption expected from implementing such plans or restructurings may be higher than expected.

Efforts to plan and implement cost saving initiatives may divert management attention from the rest of the business and adversely affect our business.

Risks associated with Intellectual Property Rights, technology and brand licensing

Our patent licensing income and other intellectual property-related revenues are subject to risks and uncertainties such as our ability to maintain our existing sources of intellectual property-related revenue, establish new sources of revenue and protect our intellectual property from infringement. A proportionally significant share of the current patent licensing income is generated from the smartphone market which is rapidly changing and features a limited number of large vendors. To enforce our patents against unlawful infringement, we may engage in legal actions, the outcomes of which are uncertain.

We have a long history of investing significantly in R&D to develop new relevant technologies, products and services for our business, and continue to do so. Our R&D activities have resulted in us having one of the industry's strongest intellectual property portfolios, on which our products and services and future cash generation and income depend. We believe our innovations that are protected by IPR are a strong competitive advantage for our business. Many of our products and services use or are protected by patents in our portfolio.

We also generate revenue by licensing, and we seek to renew existing license agreements and negotiate new license agreements. We also seek to expand the scope of our licensing activities to other industries, in particular those that implement mobile communication technologies. The players in some of these industries may not have traditionally paid intellectual property-related royalties, which may hamper the expansion of our licensing activities. The continued strength of our portfolios depends on our ability to create new relevant technologies, products and services through our R&D activities and to protect our IPR. If those technologies, products and services do not become relevant, and therefore attractive to licensees, the strength of our intellectual property portfolios could be reduced, which could adversely affect our ability to use our intellectual property portfolios for revenue generation. Our intellectual property-related revenue can vary considerably from time to time based on factors such as the terms of agreements we enter into with licensees, and there is no assurance that past levels are indicative of future levels of intellectual property-related revenue.

Despite the steps that we have taken to protect our technology investments with IPR, we cannot be certain that any rights or pending applications will be granted or that the rights granted in connection with any future patents or other IPR will be sufficiently broad to protect our innovations. Third parties may infringe our intellectual property relating to our proprietary technologies or disregard their obligation to seek necessary licenses under our patents or seek to pay less than reasonable license fees. As a result, we may be unable to continue to develop or protect our intellectual property-related revenue or establish new sources of revenue.

Nokia Technologies business group's sales and profitability are currently largely derived from patent licensing. Patent licensing income may be adversely affected by general economic conditions or adverse market developments, as well as regulatory and other developments with respect to protection awarded to technology innovations or compensation trends with respect to licensing. For example, our patent licensing business may be adversely affected if a licensee's ability to pay is reduced or they become insolvent or bankrupt. Additionally, poor performance of potential or current licensees may limit a licensee's motivation to seek new or renew existing licensing arrangements with us. In certain cases, patent licensing income is dependent on the sales of the licensee, where the reduced sales of the licensee have a direct effect on the patent licensing income received by the Nokia Technologies business group.

We generate revenue through realizing the value of our intellectual property by entering into license agreements and occasionally through business transactions. Patent license agreements can cover both licensees' past and future sales. The portion of the income that relates to licensees' past sales is not expected to have a recurring benefit and ongoing patent income from licensing is generally subject to various factors that we have little or no control over, for instance sales by the licensees.

In certain cases, we have initiated litigation to enforce our patents or used arbitration proceedings to establish the terms of license compensation between the parties. Due to the nature of any litigation or arbitration proceedings, there can be no assurances as to the final outcome or timing of any outcome of litigation, arbitration or other resolution.

Our ability to protect and monetize our intellectual property may depend on regulatory developments in various jurisdictions and the actions or implementation of the regulations by administrative bodies. Any patents or other IPR may be challenged, invalidated or circumvented, and any right granted under our patents may not provide competitive advantages for us. Our ability to protect, license or divest our patented innovations may vary by region. In the technology sector generally, certain licensees are actively avoiding license payments, while some licensors are using aggressive methods to collect license payments, with both behaviors attracting regulatory attention. Authorities in various countries have increasingly monitored patent monetization and may aim to influence the terms on which patent licensing arrangements or patent divestments may be executed, which could compromise control over or protection of our technology and proprietary information. Such terms may be limited to a certain country or region; however, authorities could potentially seek to widen the scope and even impose global terms, potentially resulting in an adverse effect on us or limiting our ability to monetize our patent portfolios.

Intellectual property-related disputes and litigation are common in the technology industry and are often used to enforce patents and seek licensing fees. Other companies have commenced and may continue to commence actions seeking to establish the invalidity of our intellectual property, including our patents. In the event that one or more of our patents is challenged, a court may invalidate the patent or determine that the patent is not enforceable, which could have an impact on our competitive position. The outcome of court proceedings is difficult to predict and, consequently, our ability to use intellectual property for revenue generation may from time to time depend on favorable court rulings. Additionally, if any of our patents is invalidated, or if the scope of the claims in any patents is limited by a court decision, we could be prevented from using such patents as a basis for product differentiation or from licensing the invalidated or limited portion of our IPR. Even if such a patent challenge is not successful, the related proceedings could be expensive and time-consuming, divert the attention of our management and technical experts from our business and have an adverse effect on our reputation. Any diminution in the protection of our IPR could cause us to lose certain benefits of our R&D investments.

We retained our patent portfolio after the sale of Devices & Services business in 2014. Following the sale of Devices & Services business, Nokia Technologies is no longer required to agree cross-licenses to cover its handset business, which has contributed to growing our licensing revenue. While this has been our practice, there can be no guarantee that this can be continued in future. In the past, parts of our intellectual property development were driven by innovation from the Devices & Services Business. As we no longer own this business, our future intellectual property relating to the mobile phone sector may lessen and our ability to influence industry trends and technology selections may reduce.

We also enter into business agreements separately within our business groups which may grant certain licenses to our patents. Some of these agreements may inadvertently grant licenses to our patents with a broader scope than intended, or they may otherwise make the enforcement of our patents more difficult.

Our Nokia Technologies business group aims to generate net sales and profitability primarily through licensing of the Nokia patents, technologies and the Nokia brand. We are also engaged with other business ventures including technology innovation and incubation. Expected net sales and profitability for these businesses may not materialize as planned or at all.

In addition to patent licensing and other patent monetization, the Nokia Technologies business group generates net sales and profits through business ventures related to Nokia brand and technology licensing. Nokia Technologies has a strategic agreement covering branding rights and intellectual property licensing with HMD Global. Under the agreement, Nokia receives royalty payments from HMD Global for sales of Nokia branded mobile phones and tablets, covering both brand and patent licensing. As such, the amount of income and royalty payments for Nokia are dependent on the sales volumes and financial position of HMD Global and HMD Global continuing to make payments to Nokia. Nokia is also exploring new opportunities to license the brand beyond mobile devices and tablets. However, there can be no assurance that we will successfully reach additional new brand licensing arrangements at all or on terms that prove satisfactory to us. The agreement with HMD Global limits Nokia's possibilities to license the Nokia brand for certain types of devices over an agreed time and as such limiting Nokia's licensing possibilities with respect to such devices.

Additionally, licensing the Nokia brand to HMD Global or to other companies could – in cases where the licensee acts inconsistently with our ethical, compliance or quality standards – negatively affect our reputation and the value of our brand, thus diminishing the business potential with respect to utilizing our brand for licensing opportunities or otherwise having a negative effect on our business. Nokia has limitations in its ability to influence HMD Global or other brand licensees in their business and other operations, exposing us to potential adverse effects from the use of the Nokia brand by HMD Global or other brand licensees or other adverse developments encountered by brand licensees that become attributable to Nokia.

There can be no assurances that our Nokia Technologies business group, or any other part of Nokia, will be successful in innovation and incubation or in generating net sales and profits through its business plans, for instance in patent, technology and brand licensing. The industries in which we operate, or may operate in the future, are generally fast-paced, rapidly evolving and innovative. Such industries are at different levels of maturity, and there can be no assurances that any investment we make will yield an expected return or result in the intended benefits. Additionally, we are entering into new business areas based on our technology assets and may explore new business ventures. Such business areas or plans may be adversely affected by adverse industry and market developments in the numerous diverse markets in which we operate, as well as by general economic conditions globally and regionally. As such, the investments may not be profitable or achieve the targeted rates of return.

Our products, services and business models depend on technologies that we have developed as well as technologies that are licensed to us by certain third parties. As a result, evaluating the rights related to the technologies we use or intend to use is increasingly challenging, and we expect to continue to face claims that we have allegedly infringed third parties' IPR. The use of these technologies may also result in increased licensing costs for us, restrictions on our ability to use certain technologies in our products and/or costly and time-consuming litigation.

Our products and services include increasingly complex technologies that we have developed or that have been licensed to us by certain third parties. The amount of such proprietary technologies and the number of parties claiming to own relevant IPR continue to increase. The holders of patents and other IPR potentially relevant to these complex technologies may be unknown to us, may have different business models, may refuse to grant licenses to their proprietary rights or may otherwise make it difficult for us to acquire a license on commercially acceptable terms. Additionally, although we endeavor to ensure that we and the companies collaborating with us possess appropriate IPR or licenses, we cannot fully avoid the risks of IPR infringement by suppliers of components, processes and other various layers in our products, or by companies with which we collaborate. Similarly, we and our customers may face claims of infringement in connection with the use of our products.

In line with standard practice in our industry, we generally indemnify our customers for certain intellectual property-related infringement claims initiated by third parties relating to products or services purchased from us. These may include claims from non-practicing entities having no product or service business. If such claims are made directly against our customers, we may have limited opportunities to participate in the processes including in negotiations and in defenses, or to evaluate the outcomes and resolutions in advance. All IPR indemnifications can result in significant payment obligations for us that are difficult to estimate in advance. Moreover, our indemnification responsibilities typically arise whether or not the IPR assertions against our customers have merit.

The business models for many areas in our industry may not be clearly established. The lack of availability of licenses for copyrighted content, delayed negotiations or restrictive IPR license terms may have a material adverse effect on the cost or timing of content-related services and products offered by us, mobile network operators or third-party service providers.

Since all technology standards that we use and rely on, including mobile communication technologies such as UMTS, LTE and upcoming 5G, or fixed line communication technologies, include certain IPR, we cannot avoid risks of facing claims for infringement of such rights due to our reliance on such standards. We believe the number of third parties declaring their patents to be potentially relevant to these standards is increasing, which may increase the likelihood that we will be subject to such claims in the future. As the number of market entrants and the complexity of technologies increases, it remains likely that we will need to obtain licenses with respect to existing and new standards from other licensors. While we believe most of such IPR declared or actually found to be essential to a particular standard carries an obligation to be licensed on fair, reasonable and non-discriminatory terms, not all intellectual property owners agree to apply such terms, nor do all owners agree on what is fair, reasonable and non-discriminatory. As a result, we have experienced costly and time-consuming litigation proceedings against us and our customers or suppliers over such issues and we may continue to experience such litigations in the future.

From time to time, certain existing patent licenses may expire or otherwise become subject to renegotiation. The inability to renew or finalize such arrangements or renew licenses with acceptable commercial terms may result in costly and time-consuming litigation, and any adverse result in any such litigation may lead to restrictions on our ability to sell certain products and could result in payments that could be significant. These legal proceedings may continue to be expensive and time-consuming and divert the efforts of our management and technical experts from our business and, if decided against us, could result in unfavorable judgements, restrictions on our ability to sell our products, require us to pay increased licensing fees, costly settlements, fines or other penalties and expenses.

Our patent license agreements may not cover all the future businesses that we may enter, our existing business may not necessarily be covered by our patent license agreements if there are changes in our corporate structure or our subsidiaries, or our newly-acquired businesses may already have patent license agreements with terms that differ from similar terms in our patent license agreements. This may result in increased costs, restrictions in the use of certain technologies or time-consuming and costly disputes whenever there are changes in our corporate structure or our subsidiaries, or whenever we enter into new business areas or acquire new businesses.

We make accruals and provisions to cover our estimated total direct IPR costs for our products. The total direct IPR costs consist of actual payments to licensors, accrued expenses under existing agreements and provisions for potential liabilities. We believe our accruals and provisions are appropriate for all technologies owned by third parties. The ultimate outcome, however, may differ from the provided level, which could have an adverse impact on us.

Any restrictions on our ability to sell our products due to expected or alleged infringements of third-party IPR and any IPR claims, regardless of merit, could result in a material loss of profits, costly litigation, the obligation to pay damages and other compensation, the diversion of the attention of our key employees, product shipment delays or the need for us to develop non-infringing technology or to enter into a licensing agreement on unfavorable commercial terms. If licensing agreements are not available on commercially acceptable terms, we could be precluded from making and selling the affected products, or could face increased licensing costs. As new features are added to our products, we may need to acquire further licenses, including from new and sometimes unidentified owners of intellectual property. The cumulative costs of obtaining any necessary licenses are difficult to predict and may be significant.

Risks stemming from geopolitical, legal, regulatory and compliance environment

We conduct our business globally, being subject to direct and indirect regulation and exposed to geopolitical and regulatory risks, such as unfavorable or unpredictable treatment in relation to trade sanctions, tariffs, tax matters, export controls, exchange controls, and other restrictions. Changes in various types of regulations or their application, applicable to current or new technologies or products, may adversely affect us. Our governance, internal controls and compliance processes could fail to prevent regulatory penalties at corporate level, in operating subsidiaries and joint ventures.

Our business and activities cover multiple jurisdictions and are subject to complex regulatory frameworks. We generate sales from, collaborate and have R&D and manufacturing facilities and suppliers located in various countries around the world. As a result, political, regulatory and economic developments - sometimes dramatic and unexpected, impacting our ability to timely react to such developments - such as political turmoil, trade barriers, tariffs, military actions, labor unrest, civil unrest, and public health and safety threats, could have a material adverse effect on us, our supply chain, our ability to supply products and services, including network infrastructure equipment manufactured in such countries, and on our sales and results of operations. Furthermore, we have observed an increase in the adoption of surveillance, data localization, national sourcing and national hiring requirements regulations and policies. Current international trends show increased enforcement activity in areas such as national security, competition law, export control and sanctions, privacy, cybersecurity and anti-corruption. Despite our Group-wide compliance measures, including annual ethical business training and other measures, we may not be able to prevent breaches of law or governance standards within our business, subsidiaries or joint ventures. If we fail to or are unable to comply with applicable law and regulations, we could experience penalties and adverse rulings in enforcement and other proceedings.

We develop our products based on existing regulations and technical standards, our interpretation of unfinished technical standards or, in certain cases, in the absence of applicable regulations and standards. Changes in various regulations or their application, applicable to current or new technologies, products or telecommunication sector in general, may adversely affect our business and results of operations. For example, changes in regulation or standards affecting the construction of base stations and other network infrastructure could adversely affect the timing and costs of new network constructions or the expansion and commercial launch and ultimate commercial success of such networks. An increase in regulation of digital telecommunications and the failure by governments to achieve a uniform and reasonable common position on 5G spectrum licensing in various parts of the world, including, especially in the European Union, might impose additional costs or burdens on our customers and on Nokia itself.

Changes in applicable privacy-related regulatory frameworks, such as EU General Data Protection Regulation effective as of May 2018, the exit of UK from EU without an agreement on the treatment of personal data, the upcoming eEvidence and e-Privacy Regulations or their application may adversely affect our business, including possible changes that increase costs, limit or restrict possibilities to offer products or services, or reduce or could be seen to reduce the privacy aspects of our offerings. Further, although we monitor for such changes and implement updates to applicable policies and compliance measures, we cannot ensure that violations will not occur. For instance, countries could require governmental interception capabilities or regulations aimed at allowing direct governmental access to data for the products and services we offer that could adversely affect us, if, among other things, by way of our human rights policy we decide to reduce our sales to such markets or limiting our ability to use components or software that we have developed or sourced from other companies. Our current business models and operations rely on certain centralized data processing solutions and cloud or remote delivery-based services for distribution of services and software or data storage which have certain inherent risks, including those stemming from applicable regulatory regimes, including data protection or data localization, that may cause limitations in implementing such business models or conducting business. An increase in the protectionist stances of governments around the world, which impact the free flow of data across borders, is already affecting our global service delivery model. Furthermore, we observe that enforcement actions and investigations by regulatory authorities related to data security incidents and privacy violations continue to increase. Unauthorized disclosure or transfer of sensitive or confidential data, whether through systems failure, employee negligence, fraud or misappropriation, by the company, our vendors or other parties with whom we do business (if they fail to meet the standards we impose) could subject us to significant litigation, monetary damages, regulatory enforcement actions, fines and criminal prosecution in one or more jurisdictions.

Our business and results of operations may be adversely affected by regulation favoring the local industry participants, as well as other measures with potentially protectionist objectives or outcomes that host governments in various countries may take. The impact of changes in or uncertainties related to regulation and trade policies could adversely affect our business and results of operations even in cases where the regulations do not directly apply to us or our products and services.

In June 2016, the UK held a referendum in which voters approved an exit from the European Union, commonly referred to as "Brexit". The UK departed the EU on January 31, 2020 but the terms of its withdrawal and the nature of its future relationship with the EU are still being decided. The long-term effects of Brexit will depend on the agreements, if any, the UK makes to retain access to the European markets either during a transitional period or permanently as well as on the agreements the UK makes with other trading partners. Any of the potential effects of Brexit could have an unpredictable effect on our business, both in the UK and outside the UK.

The U.S. has implemented certain new tariffs during 2019 and is reportedly also considering additional tariffs. In response, certain foreign governments have implemented or are reportedly considering implementing additional tariffs on U.S. goods. Implementation of or uncertainties with respect to any tariffs, trade agreements, or further escalation of a trade war could negatively impact the global economic markets and could affect our customers' ability to invest in capital expenditures, which may in turn result in reduced demand for our products and services. Changes in tariffs have, and may continue to, result in changes in supply and manufacturing.

Our competitors have employed and will likely continue to employ significant resources to shape the legal and regulatory regimes in countries where we have significant operations. Governments and regulators, particularly after changes in political regimes, may make legal and regulatory changes or interpret and apply existing laws in ways that make our products and services less appealing to end users or require us to incur substantial costs, change our business practices or prevent us from offering our products and services. For example, many countries have adopted new competition laws in recent years. These laws can be applied unpredictably or in ways that favor local suppliers, creating obstacles to our business activities. Restrictive government policies or actions, such as limitations on visas or work permits for certain foreign workers may make it difficult for us to move our employees into and out of these jurisdictions. Our operations and employee recruitment and retention depend on our ability to obtain the necessary visas and work permits for our employees to travel and work in the jurisdictions in which we operate.

The regulatory, trade controls and sanctions legal environment can be difficult to navigate for companies with global operations, impacting our ability to grow business in specific markets or enter new markets. Export controls, tariffs or other fees or levies imposed on our products and environmental, health, product safety and data protection, security, consumer protection, money laundering and other regulations that adversely affect the export, import, technical design, pricing or costs of our products could also adversely affect our sales and results of operations. We may be subject to new, existing or tightened export control regulations, sanctions, embargoes or other forms of economic and trade restrictions imposed on certain countries and entities.

As a global operator, Nokia conducts business in countries subject to various sanctions. Although we strive to conduct all operations of Nokia, and in particular any operations undertaken in countries targeted by sanctions, in accordance with our comprehensive and robust Internal Compliance Program to ensure that they are in full compliance with all applicable laws and regulations, we cannot ensure that breaches will not occur. We continuously monitor international developments and assess the appropriateness of our presence and business in various markets. As an example, the U.S.' unilateral withdrawal from the international agreement on Iran's nuclear activities has led to the reimposition of U.S. sanctions while the EU and other signatories remain fully committed to the international agreement relaxing the sanctions against Iran. The diverging EU and U.S. regulatory framework governing business activities in Iran continue to be complex and as a European company, it will require reconciling the opposing foreign policy regimes of the U.S. and the EU.

We have a significant presence in emerging markets in which the political, economic, legal and regulatory systems are less predictable than in countries with more developed institutions. These markets represent a significant portion of our total sales, and a significant portion of expected future industry growth. Most of our suppliers are located in, and our products are manufactured and assembled in, emerging markets, particularly in Asia. Our business and investments in emerging markets may also be subject to risks and uncertainties, including unfavorable or unpredictable treatment in relation to tax matters, exchange controls, restrictions affecting our ability to make cross-border transfers of funds, regulatory proceedings, unsound or unethical business practices, challenges in protecting our IPR, nationalization, inflation, currency fluctuations or the absence of or unexpected changes in regulation, as well as other unforeseeable operational risks. The purchasing power of our customers in developing markets depends to a greater extent on the price development of basic commodities and currency fluctuations, which may render our products or services unaffordable.

In recent years, we have witnessed political unrest in various markets in which we conduct business or in which we have operations, which in turn has adversely affected our sales, profitability or operations in these markets, and also in certain cases affected us outside these countries or regions. Any reoccurrence or escalation of such unrest could have a further material adverse effect on our sales or results of operations. For instance, instability and conflict in regions such as the Middle East, parts of Africa and the Ukraine have in the past adversely affected, and may in the future adversely affect, our business or operations in these or related markets, for instance, through increased economic uncertainty or a slowdown or downturn attributable to current or increased economic and trade sanctions. Should we decide to exit or otherwise alter our presence in a particular market, this may have an adverse effect on us through, for example, triggering investigations, tax audits by authorities, claims by contracting parties or reputational damage. The results and costs of investigations or claims against our international operations may be difficult to predict and could lead to lengthy disputes, fines or fees, indemnities or costly settlements.

Nokia is a publicly listed company and, as such, subject to various securities and accounting rules and regulations. Nokia must monitor and assess its internal control over financial reporting and its compliance with the applicable rules and regulations. Our corporate function's, our operating subsidiaries' or our joint ventures' failure to maintain effective internal controls over financial reporting or to comply with the applicable securities and accounting rules and regulations, could adversely affect the accuracy and timeliness of our financial reporting, which could result, for instance, in loss of confidence in us or in the accuracy and completeness of our financial reports, or otherwise in the imposition of fines or other regulatory measures, which could have a material adverse effect on us.

We operate in many jurisdictions around the world, and we are subject to various legal frameworks regulating corruption, fraud, trade policies, and other risk areas. At any given time, we may be subject to inspections, investigations, claims, and government proceedings, and the extent and outcome of such proceedings may be difficult to estimate with any certainty. We may be subject to material fines, penalties and other sanctions as a result of such investigations.

Bribery and anti-corruption laws in effect in many countries prohibit companies and their intermediaries from making improper payments to public officials or private individuals for the purpose of obtaining new business maintaining existing business relationships or gaining any material advantage. Certain anti-corruption laws such as the United States Foreign Corrupt Practices Act (FCPA) also require the maintenance of proper books and records, and the implementation of controls and procedures in order to ensure that a company's operations do not involve corrupt payments. Since we operate throughout the world, and given that some of our customers are government-owned entities and that our projects and agreements often require approvals from public officials, there is a risk that our employees, suppliers, consultants or commercial third party representatives may take actions that are in violation of our compliance policies and of applicable anti-corruption laws.

In many parts of the world where we operate, local practices and customs may be inconsistent with our policies, including the Nokia Code of Conduct, and could violate anti-corruption laws, including the FCPA and the UK Bribery Act 2010, and applicable European Union regulations, as well as applicable economic sanctions and embargoes. Our employees, or other parties acting on our behalf, could violate policies and procedures intended to promote compliance with anti-corruption laws or economic sanctions. Violations of these laws by our employees or other parties acting on our behalf, regardless of whether we had participated in such acts or had knowledge of such acts, could result in us or our employees becoming subject to criminal or civil enforcement actions, including fines or penalties, disgorgement of profits and suspension or disqualification of sales. Additionally, violations of law or allegations of violations may result in reputational harm and loss of business and adversely affect our brand and reputation. Detecting, investigating and resolving such situations may also result in significant costs, including the need to engage external advisers, and consume significant time, attention and resources from our management and other key employees. The results and costs of such investigations or claims may be difficult to predict and could lead to, for instance, lengthy disputes, fines, fees or indemnities, costly settlement or the deterioration of the Nokia brand. Furthermore, even without allegations of misconduct against us, our employees or other parties acting on our behalf, we may face loss of business as a result of improper conduct or alleged improper conduct by our competitors.

We may be subject to claims, fines, investigations or assessments for conduct that we failed to or were unable to discover or identify in the course of performing our due diligence investigations of Alcatel Lucent, including unknown or unasserted liabilities and issues relating to fraud, trade compliance, non-compliance with applicable laws and regulations, improper accounting policies or other improper activities. With the acquisition of Alcatel Lucent, any historical issues with Alcatel Lucent's operations may be attributed to or the responsibility of Nokia. In the past, Alcatel Lucent has experienced both actual and alleged violations of anti-corruption laws. As a result of FCPA violations in the past, Alcatel Lucent had to pay substantial amounts in fines, penalties and disgorgement of profits to government enforcement agencies in the United States and elsewhere.

We are subject to litigation proceedings, which may be disruptive and expensive. In addition, an unfavorable outcome of litigation, arbitrations, agreement-related disputes or product liability-related allegations against our business could have a material adverse effect on us.

We are a party to lawsuits, arbitrations, agreement-related disputes and product liability-related allegations in the normal course of our business. Litigation, arbitration or agreement-related disputes can be expensive, lengthy and disruptive to normal business operations and divert the efforts of our management. Moreover, the outcomes of complex legal proceedings or agreement-related disputes are difficult to predict. An unfavorable resolution of a particular lawsuit, arbitration or agreement-related dispute could have a material adverse effect on us. The investment or acquisition decisions we make may subject us to litigation arising from minority shareholders' actions and investor dissatisfaction with the activities of our business. Shareholder disputes, if resolved against us, could have a material adverse effect on us.

We record provisions for pending claims when we determine that an unfavorable outcome is likely and the loss can reasonably be estimated. Due to the inherent uncertain nature of legal proceedings, the ultimate outcome or actual cost of settlement may materially differ from estimates. We believe our provisions for pending claims are appropriate. The ultimate outcome, however, may materially differ from the provided estimate.

Although our products are designed to meet all relevant safety standards and other recommendations and regulatory requirements globally, we cannot guarantee we will not become subject to product liability claims or be held liable for such claims or be required to comply with future regulatory changes in this area, which could have a material adverse effect on us. We have been involved in several lawsuits alleging adverse health effects associated with our products, including those caused by electromagnetic fields, and the outcome of such procedures is difficult to predict, including potentially significant fines or settlements. Even a perceived risk of adverse health effects of mobile devices or base stations could have a material adverse effect on us through a reduction in the demand for mobile devices having an adverse effect, for instance, through a decreased demand for mobile networks or increased difficulty in obtaining sites for base stations.

For a more detailed discussion of litigation to which we are a party, refer to Note 29, Provisions, of our consolidated financial statements included in this annual report on Form 20-F.

Risks related to management and operations

We may face problems or disruptions in our manufacturing, service creation, delivery, logistics or supply chain. Additionally, adverse events may have a profound impact on production sites or the production sites of our suppliers, which are geographically concentrated.

Our product manufacturing, service creation and delivery, as well as our logistics, or the components of such activities that we have outsourced to third parties, are continuously monitored and modified in an effort to improve the efficiency and flexibility of our manufacturing, service creation and delivery, as well as our logistics function and ability to produce, create and distribute continuously changing volumes. We, or third parties that we outsource services to, may experience difficulties in adapting our supply to meet the changing demand for our products and services, ramping up and down production at our facilities, adjusting our network implementation capabilities as needed on a timely basis, maintaining an optimal inventory level, adopting new manufacturing processes, finding the most timely way to develop the best technical solutions for new products, managing the increasingly complex manufacturing process, service creation and delivery process or achieving required efficiencies and flexibility. In addition, these operations are exposed to various risks and potential liabilities, including those related to compliance with laws and regulations, exposure to environmental liabilities or other claims.

Our manufacturing operations depend on obtaining sufficient quantities of fully functional products, components, sub-assemblies, software and services on a timely basis. Our principal supply requirements for our products are for electronic components, mechanical components and software, which all have a wide range of applications in our products. In certain cases, a particular component or service may be available only from a limited number of suppliers or from a single supplier in the supply chain. Suppliers may from time to time extend lead times, limit supplies, change their partner preferences, increase prices, provide poor quality supplies or be unable to adapt to changes in demand due to capacity constraints or other factors, which could adversely affect our ability to deliver our products and services on a timely basis. For example, our efforts to meet our customer needs during major network roll-outs in certain markets may require sourcing large volumes of components and services from suppliers and vendors at short notice and at the same time with our competitors. If we fail to properly anticipate customer demand, an over-supply or under-supply of components and production or services delivery capacity could occur. In many cases, some of our competitors utilize the same contract manufacturers, component suppliers and service vendors. If they have purchased capacity or components ahead of us, or if there is significant consolidation in the relevant supplier base, this could prevent us from acquiring the required components or services, which could limit our ability to supply our customers or increase our costs.

Our suppliers or a supplier may fail to meet our supplier requirements, such as our and our customers' product quality, safety, security and other standards. Certain suppliers may not comply with local laws, including, among others, local labor laws. Consequently, some of our products may be unacceptable to us or to our customers. Our products are highly complex and defects in their design, manufacture and associated hardware, software and content have occurred in the past and may continue to occur in the future. Defects and other quality issues may result from, among other things, failure in our own product manufacturing and service creation and delivery, as well as failure of our suppliers to comply with our requirements, or failures in products and services created jointly with business partners or other third parties where the development and manufacturing process is not fully within our control. For instance, usage of FOSS (free and open-source software) libraries to develop source code is common within our sector and without appropriate quality controls, products could be shipped with malware components inside it.

Quality issues may cause, for instance, delays in deliveries, loss of intellectual property, liabilities for network outages, court fees and fines due to breaches of significantly increasing regulatory privacy requirements and related negative publicity, and additional repair, product replacement or warranty costs to us, and harm our reputation and our ability to sustain or obtain business with our current and potential customers. With respect to our services, quality issues may relate to the challenges of having the services fully operational at the time they are made available to our customers and maintaining them on an ongoing basis. We may also be subject to damages due to product liability claims arising from defective products and components. We make provisions to cover our estimated warranty costs for our products and pending liability claims. We believe our provisions are appropriate, although the ultimate outcome may materially differ from the provisions that are provided for, which could have a material adverse effect on us.

We may be subjected to negative publicity with respect to the activities that we manage or that are managed by third parties for us. For instance, we may experience challenges caused by third parties, or other external difficulties in connection with our efforts to modify our operations to improve the efficiency and flexibility of our manufacturing, service creation and delivery, as well as our logistics, including, but not limited to, strikes, purchasing boycotts, public harm to our brand and claims for compensation resulting from our decisions on where to place and how to utilize our manufacturing facilities. Such difficulties may result from, among other things, delays in adjusting production at our facilities, delays in expanding production capacity, failures in our manufacturing, service creation and delivery, as well as logistics processes, failures in the activities we have outsourced, and interruptions in the data communication systems that run our operations. Any of these events could delay our successful and timely delivery of products that meet our and our customers' quality, safety, security and other requirements, cause delivery of insufficient or excess volumes compared to our own estimates or customer requirements, or otherwise have a material adverse effect on our sales and results of operations or our reputation and brand value.

Many of our production sites or the production sites of our suppliers are geographically concentrated, with a majority of our suppliers based in Asia. We rely on efficient logistic chain elements, such as regional distribution hubs or transport chain elements (main ports, streets, and airways). In the event that any of these geographic areas are affected by any adverse conditions, such as severe impacts of climate change or other environmental events, natural or man-made disasters, geopolitical disruptions, civil unrest or health crises (such as the novel coronavirus) that disrupt production or deliveries from our suppliers, our ability to deliver our products on a timely basis could be adversely affected, which may have a material adverse effect on our business and results of operations.

Inefficiencies, breaches, malfunctions or disruptions of information technology systems and processes could have a material adverse effect on our business and results of operations. As our business operations, including those we have outsourced, rely on complex IT systems, networks and related services, our reliance on the precautions taken by external companies to ensure the reliability of our and their IT systems, networks and related services is increasing. Consequently, certain disruptions in IT systems and networks affecting our external providers could also have a material adverse effect on our business.

Our operations rely on the efficient and uninterrupted operation of complex and centralized IT systems, networks and processes, which are integrated with those of third parties. All IT systems, networks and processes are potentially vulnerable to damage, breaches, malfunction or interruption from a variety of sources. We are, to a significant extent, relying on third parties for the provision of IT services. We may experience disruptions if our partners do not deliver as expected or if we are unable to successfully manage systems and processes together with our business partners. The ongoing trend to cloud-based architectures and network function virtualization has introduced further complexity and associated risk.

We are constantly seeking to improve the quality and security of our IT systems. For instance, we have introduced new significant IT solutions in recent years and outsourced certain functions, increasing our dependence on the reliability of external providers as well as the security of communication with them. We will often need to use new service providers and may, due to technical developments or choices regarding technology, increase our reliance on certain new technologies, such as cloud or remote delivery on demand-based services and certain other services that are used over the internet rather than using a traditional licensing model. Switching to new service providers and introducing new technologies is inherently risky and may expose us to an increased risk of disruptions in our operations, for instance, due to network inefficiency, a cybersecurity breach, malfunctions or other disruptions resulting from IT systems and processes.

We pursue various measures in order to manage our risks related to system and network malfunctions and disruptions, including the use of multiple suppliers and their strong technical and contractual engagements in IT security. However, despite precautions taken by us, any malfunction or disruption of our current or future systems or networks, such as an outage in a telecommunications network used by any of our IT systems, or a breach of our cybersecurity, such as an attack, malware or other event that leads to an unanticipated interruption or malfunction of our IT systems, processes, networks or data leakages, could have a material adverse effect on our business, results of operations and brand value. Additionally, we may fail to successfully secure our IT. A disruption of services relying on our IT, for instance, could cause significant discontent among users resulting in claims, contractual penalties or deterioration of our brand value. Further, while we are increasing our investments in digitalizing our operations and transforming our IT, the legacy IT systems may be more vulnerable to malfunction, disruptions or security breaches than the new IT systems replacing them.

Performance failures of our partners, as well as failures to agree to partnering arrangements with third parties could adversely affect us.

If any of the companies we partner and collaborate with were to fail to perform as expected, or if we fail to achieve the collaboration or partnering arrangements needed to succeed, we may be unable to bring our products, services or technologies to market successfully or in a timely manner. We are increasingly collaborating and partnering with third parties to develop technologies, products and services, as well as seeking new revenue streams through partnering arrangements. We also depend on third-party partners in our efforts to monetize our brands, including the Nokia and Nokia Bell Labs brands and technologies, for instance, through arrangements where the brands are licensed to third-party products and the product development and distribution are handled partly or in full by third parties. Additionally, we have outsourced various functions to third parties and are relying on them to provide certain services to us. These arrangements involve the commitment of certain resources, including technology, R&D, services and employees. Although the objective of the collaborative and partnering arrangements is a mutually beneficial outcome for each party, our ability to introduce and provide products and services that are commercially viable and meet our, our customers' and consumers' quality, safety, security and other standards in a timely manner could be hampered from performance or other failures. For instance, if a partner acts inconsistently with our ethical, sustainability, compliance, brand, or quality standards, this can negatively affect our reputation, the value of our brand, and the business outcome of our partnerships.

Our dependence on third-party suppliers has increased as a result of our strategic decisions to outsource certain activities. In many areas, including IT, finance and human resources-related arrangements, a failure to maintain an efficient relationship with the selected partner may lead to ongoing operational problems or even to severe business disruptions, and the availability of the processes and services upon which we rely on may be interrupted. Performance problems may result in missed reporting deadlines, internal controls challenges, financial losses, missed business opportunities and reputational harm. In addition, as management's focus shifts from a direct to an indirect operational control in these areas, there is a risk that without active management and monitoring of the relationship, the services provided may be below appropriate quality standards. Partners may not meet agreed service levels, in which case, depending on the impacted service, our contractual remedies may not fully cure all of the damages we may suffer. This is particularly true for any deficiencies that would impact the reporting requirements applicable to us as a company listed on multiple stock exchanges.

In order to implement outsourcing arrangements, we may be required to implement changes in our business practices and processes, for instance, to capture economies of scale and operational efficiencies, and to reflect a different way of doing business. Consequently, business processes that were customized for individual business groups or for us generally may be converted to a more standardized format. During a transition to outsourcing, our employees may need to train the partner's staff or be trained in the partners' systems, potentially resulting in the distraction of our employees. Adjustments to staff size and transfer of employees to the partner's companies could have an adverse effect on us, for instance, through impacting the morale of our employees and raising complex labor law issues and resulting in the loss of key personnel. Additionally, partnering and outsourcing arrangements can create a dependency on the outsourcing company, causing issues in our ability to learn from day-to-day responsibilities, gain hands-on experience, adapt to changing business needs and properly transfer the specific know-how to the new outsourcing partners. Concerns could equally arise from giving third parties access to confidential data, strategic technology applications and books and records. There is also a risk that we may not be able to determine whether controls have been effectively implemented, and whether the partner company's performance monitoring reports are accurate.

We are exposed to risks related to information security. Our business model relies on solutions for distribution of services and software or data storage, which entail inherent risks relating not only to applicable regulatory regimes, but also to cybersecurity breaches and other unauthorized access to network data or other potential security risks that may adversely affect our business and/or compromise personal data.

Our business and operations rely on confidentiality of proprietary information as well as sensitive information, for instance related to our employees, consumers and our customers. Our business models rely on certain centralized data processing solutions and cloud or remote delivery-based services for distribution of services and software or data storage, accessible by our partners or subcontractors according to the roles and responsibilities defined.

Although we endeavor to develop products and services that meet the appropriate security standards, including effective data protection, we or our products and online services, marketing and developer sites may be subject to cybersecurity breaches, including hacking, viruses, worms and other malicious software, unauthorized modifications, or illegal activities that may cause potential security risks and other harm to us, our customers or consumers and other end-users of our products and services. IT is rapidly evolving, the techniques used to obtain unauthorized access or sabotage systems change frequently and the parties behind cyber-attacks and other industrial espionage are believed to be sophisticated and have extensive resources, and it is not commercially or technically feasible to mitigate all known vulnerabilities in a timely manner or to eliminate all risk of cyber-attacks and data breaches. Further, while we are increasing our investments in digitalizing our operations and transforming our IT, the legacy IT systems may be more vulnerable to malfunction, disruptions or security breaches than the new IT systems replacing them. Additionally, we contract with multiple third parties in various jurisdictions who collect and use certain data on our behalf. Although we have processes in place designed to ensure appropriate collection, handling and use of such data, third parties may use the data inappropriately or breach laws and agreements in collecting, handling or using or leaking such data. This could lead to lengthy legal proceedings or fines imposed on us, as well as adverse effects to our reputation and brand value. Additionally, cyber-attacks can be difficult to prevent, detect or contain. We cannot rule out the possibility that there may have been cyber-attacks that have been successful and/or evaded our detection. We continue to invest in risk mitigating actions; however, there can be no assurance that such investments and actions will prevent or detect future cyber-attacks.

In connection with providing products and services to our customers and consumers, certain customer feedback, information on consumer usage patterns and other personal and consumer data are collected, stored and processed through us, either by us or by our business partners or subcontractors. We have outsourced a significant portion of our IT operations, as well as the network and information systems that we sell to third parties or for whose security and reliability we may otherwise be accountable. Loss, improper disclosure or leakage of any personal or consumer data collected by us or which is available to our partners or subcontractors, made available to us or stored in or through our products, could have a material adverse effect on us and harm our reputation and brand. Additionally, governmental authorities may use our networks products to access the personal data of individuals without our involvement; for example, through the so-called lawful intercept capabilities of network infrastructure, impairing our reputation.

Our business is also vulnerable to theft, fraud or other forms of deception, sabotage and intentional acts of vandalism by third parties and employees. Unauthorized access to or modification, misappropriation or loss of our intellectual property and confidential information, including personal data, could result in litigation and potential liability to customers, suppliers and other third parties, harm our competitive position, reduce the value of our investment in R&D and other strategic initiatives or damage our brand and reputation. Additionally, the cost and operational consequences of implementing further information system protection measures, especially if prescribed by national authorities, could be significant. We may not be successful in implementing such measures in due time, which could cause business disruptions and be more expensive, time consuming and resource-intensive.

We engage in the installation and maintenance of undersea telecommunications cable networks. During this activity, we may cause damage to existing undersea infrastructure, for which we may ultimately be held responsible.

We supply, install and maintain submarine optical fiber cable networks linking mainland to islands, island to island or several points along a coast. Our activities also include the provision of optical fiber infrastructure to oil and gas platforms and other offshore installations. Expert personnel, specialist equipment and an independently certified management system are integral to our management of risk throughout the entire planning and execution phases of such activities. We perform surveys, follow rigorous permit processes and use third-party cartographic databases maintained by recognized hydrographic institutes. However, there is a risk that previously-laid infrastructure, such as third-party fiber optic cables, electrical power lines or hydrocarbon pipelines, may go undetected despite such precautions, and be damaged during the process of laying or maintaining the telecommunications cables. Such an event could potentially cause temporary business interruption to third parties operating in the same area, environmental incidents, safety accidents, unwanted media or regulatory attention, loss of reputation, litigation, repair costs or compensation payments for the affected parties. While we have contractual limitations in place and maintain insurance coverage to limit our exposure, these protections may be insufficient to cover such exposure entirely.

We may be unable to retain, motivate, develop and recruit appropriately skilled employees or may fail in workforce balancing.

Our success is dependent in part on our ability to retain, motivate, develop and recruit appropriately skilled employees. The market for skilled employees and leaders in our business is extremely competitive. We continuously work on developing a corporate culture that is motivational, based on equal opportunities and encourages creativity and continuous learning to meet the challenges.

Our workforce has fluctuated over recent years as we have introduced changes in our strategy to respond to our business targets and endeavors. Such changes and uncertainty have caused and may in the future cause disruption and dissatisfaction among employees, as well as fatigue due to the cumulative effect of several reorganizations over the past years, our efforts to continue to evolve our business, and maximize operational efficiency. These efforts might include implementing new organizational structures such as reorganization, strategic changes, M&A activity, competence development, relocation of employees, the closing or consolidation of sites, or insourcing/outourcing parts of the business operations. As a result, employee motivation, energy, focus, morale and productivity may be reduced, causing inefficiencies and other problems across the organization resulting in the loss of key employees and increased costs in resolving and addressing such matters. The loss of key employees could result in resource gaps, some of which may only be noticed after a certain period of time or which negatively impact our relationship with customers, vendors or other business partners. Accordingly, we may need to take measures to attract, retain and motivate skilled employees.

Succession planning, especially with respect to key employees and leaders, is crucial to avoid business disruptions and to ensure the appropriate transfer of knowledge. We have, and may from time to time, acquire businesses or complete other transactions where retaining key employees may be crucial to obtain the intended benefits of such transactions. We must ensure that key employees of such acquired businesses are retained and appropriately motivated. However, there can be no assurances that we will be able to implement measures successfully to retain or hire the required employees. We believe this will require significant time, attention and resources from our senior management and other key employees within our organization and may result in increased costs. We have encountered, and may in the future encounter, shortages of appropriately skilled employees or lose key employees or senior management, which may hamper our ability to implement our strategies and may have a material adverse effect on us.

Having skillful, motivated people in the right places is a key factor for the success of our strategy. However, we may fail in our efforts to rebalance our workforce as planned and may result in larger than expected costs, or we may not be able to complete such efforts, for instance, due to legal restrictions, resulting in a non-optimal workforce that could hinder our ability to reach targeted cost savings. Relationships with employee representatives are generally managed at the site level in accordance with country-specific legislation and most collective bargaining agreements have been in place for several years. Our inability to negotiate successfully with employee representatives or failures in our relationships with such representatives could result in strikes by the employees, increased operating costs as a result of higher wages or benefits paid to employees as the result of such strike or other industrial action or inability to implement changes to our organization and operational structure in the planned timeframe or expense level, or at all. If our employees were to engage in a strike or other work stoppage, we could experience a significant disruption in our day-to-day operations and higher ongoing labor costs.

We are involved in joint ventures and are exposed to risks inherent to companies under joint management.

We have a number of joint ventures in various parts of the world. The agreements related to our joint ventures may require unanimous consent or the affirmative vote of a qualified majority of the shareholders to take certain actions, thereby possibly slowing down the decision-making process. In addition, joint venture companies involve inherent risks such as those associated with a complex corporate governance structure, including lack of transparency and consequent risks of compliance breaches or other similar issues, or issues in dissolving such entities or divesting their shareholdings, assets and liabilities, and also may involve negative public perceptions caused by the joint venture partner that are adverse to us.

Taxes-related uncertainties

We have operations in many countries with different tax laws and rules, which may result in complex tax issues and disputes.

Taxation or other fees collected by governments or governmental agencies may result in unexpected payment obligations, and in response to prevailing difficult economic conditions in the public sector, coupled with already enacted and proposed fundamental changes in international tax regulations, there may be an increased aggressiveness in collecting such fees or taxes. We may be obliged to pay additional taxes for past periods as a result of changes in law, or changes of tax authority practice or interpretation (possibly with retroactive effect in certain cases), or inaccurate interpretations of tax laws by us resulting potentially in a material adverse effect on our cash flow and financial position. Our business and activities cover multiple jurisdictions and are subject to complex tax laws and rules as well as diverse tax authority practices and interpretations. Despite our governance and compliance procedures, there might be unintended consequences from changes in interpretation of complex tax regulations or retroactive implications in tax reforms to our business, subsidiaries and joint ventures. For instance, the U.S. government passed a comprehensive set of tax reforms in 2017 that impact many multinational businesses, including ours. The U.S. tax authority continues to issue regulatory guidance on many of these reforms, and interpretation of the reform package's provisions is likewise on-going. Such regulatory guidance or new interpretations may have an unfavorable impact on us. As a company with global operations we are subject to tax investigations in various jurisdictions, and such proceedings can be lengthy, involve actions that can hinder local operations and affect unrelated parts of our business, and the outcome of such proceedings is difficult to predict. While we have made provisions for certain tax issues, the provisions we have made may not be adequate to cover such increases.

The taxes for which we make provisions, such as income taxes, indirect taxes and social taxes, could increase significantly in the future as a result of changes in applicable tax laws or global guidance in the area of transfer pricing in the countries in which we operate. Our business and the investments we make globally, especially in emerging markets, are subject to uncertainties, including unfavorable or unpredictable changes in tax laws (possibly with retroactive effect in certain cases), taxation treatment and regulatory proceedings, including tax audits. The impact of these factors is dependent on the types of revenue and mix of profit we generate in various countries, for instance, income from sales of products or services may have different tax treatments.

We may face adverse tax consequences due to our past acquisitions and divestments, including, but not limited to, stamp duties, land transfer taxes, franchise taxes and other levies. Additionally, there may be other potential tax liabilities of which we are not currently aware but which may result in significant tax consequences now or in the future.

In the context of our sale of Devices & Services business to Microsoft, we are required to indemnify Microsoft for certain tax liabilities, including (i) tax liabilities of the Nokia entities acquired by Microsoft in connection with the closing of the sale of Devices & Services business, (ii) tax liabilities associated with the assets acquired by Microsoft and attributable to tax periods ending on or prior to the closing date of the sale of Devices & Services business, and (iii) tax liabilities relating to the pre-closing portion of any taxable period that includes the closing date of the sale of Devices & Services business.

There may also be unforeseen tax expenses that turn out to have an unfavorable impact on us. As a result, and given the inherently unpredictable nature of taxation, our tax rate may change from its current level and our cash flows regarding taxes may not be stable.

Our actual or anticipated performance, among other factors, could reduce our ability to utilize our deferred tax assets.

Deferred tax assets recognized on tax losses, unused tax credits and tax deductible temporary differences are dependent on our ability to offset such items against future taxable income within the relevant tax jurisdiction. Such deferred tax assets are also based on our assumptions on future taxable earnings and these may not be realized as expected, which may cause the deferred tax assets to be materially reduced. There can be no assurances that an unexpected reduction in deferred tax assets will not occur. Any such reduction could have a material adverse effect on us. Additionally, our earnings have been unfavorably affected in the past, and may continue to be in the future, in the event that no tax benefits are recognized for certain deferred tax items.

Financial risks

We may not have access to sources of funding on favorable terms, or at all.

Our business requires a significant amount of cash. In recent quarters, Nokia has had to spend significant amounts of cash in relation to R&D and 5G roll-out and we expect this trend to continue. We rely on multiple sources of funding for short-term and long-term capital and aim to minimize the liquidity risk by maintaining a sufficient cash position and having committed credit lines in place. However, there can be no assurances that we will be able to generate sufficient amounts of capital or to maintain an efficient capital structure from time to time.

We also may not be able to have access to additional sources of funds that we may need from time to time with reasonable terms, or at all. If we cannot access capital or sell receivables on a commercially viable basis, our business, financial condition and cash flow could materially suffer.

We may not be able to re-establish investment grade rating or maintain our credit ratings.

Moody's, Standard & Poor's, Fitch and other credit rating agencies have assigned credit ratings to us and we have set a goal of re-establishing investment grade credit ratings. There can be no assurances that we will be able to achieve investment grade credit ratings.

In the event our credit rating is downgraded, it could have a material adverse effect, for instance, on our cost of funds and related margins, our business and results of operations, financial condition, liquidity, or access to capital markets.

Due to our global operations, our net sales, costs and results of operations, as well as the U.S. dollar value of our dividends and market price of our ADSs, are affected by exchange rate fluctuations.

We operate globally and are therefore exposed to foreign exchange risks in the form of both transaction risks and translation risks. Our policy is to monitor and hedge exchange rate exposure, and we manage our operations to mitigate, but not to eliminate, the impacts of exchange rate fluctuations. Our hedging activities may prove unsuccessful in mitigating the potentially negative impact of exchange rate fluctuations. Additionally, significant volatility in the relevant exchange rates and interest rates may increase our hedging costs, as well as limit our ability to hedge our exchange rate exposure. In particular, we may not adequately hedge against unfavorable exchange rate movements, including those of certain emerging market currencies. Furthermore, exchange rate fluctuations may have an adverse effect on our net sales, costs and results of operations, as well as our competitive position, through their impact on our customers, suppliers and competitors.

We also experience other financial market-related risks, including changes in interest rates and in prices of marketable securities that we own. We may use derivative financial instruments to reduce certain of these risks. If our strategies to reduce such risks are not successful, our financial condition and results of operation may be harmed.

Additionally, exchange rate fluctuations may materially affect the U.S. dollar value of any dividends or other distributions that are paid in euro, as well as the market price of our ADSs.

We are exposed to pension and post-employment cost related risks and we may be unsuccessful in our ability to avoid or control costs resulting from a need for increased funding.

We are exposed to various employee cost related risks, including those related to pension, and post-employment healthcare and life insurance cost related risks. In the U.S., we maintain significant employee pension benefit plans and a significant retiree welfare benefit plan (providing post-employment healthcare benefits and post-employment life insurance coverage). Outside the U.S., we contribute to pension schemes for large numbers of current and former employees. The U.S. and non-U.S. plans and schemes have funding requirements that depend on, among other things, various legal requirements, how assets set aside to pay for those obligations are invested, the performance of financial markets, interest rates, assumptions regarding the life expectancy of covered employees and retirees, and medical cost inflation and medical care utilization. To the extent that any of those variables change, the funding required for those plans/schemes may increase, and we may be unsuccessful in our ability to avoid or control costs resulting from such increased funding requirements.

With respect to our pension and other post-employment obligations, we face the following risks, among others:

- § financial market performance and volatility in asset values and discount rates affect the funded status of our pension obligations and could increase funding requirements, including legally required minimum contributions;
- § our pension plan participants and post-employment health plan participants may live longer than has been assumed, which would result in an increase in our benefit obligations. We cannot be certain that the longevity of the participants in our pension plans or retiree healthcare plan will not exceed that indicated by the mortality tables we currently use or that future updates to those tables will not reflect materially longer life expectancies;
- § we currently fund, and expect to be able to continue to fund, our U.S. post-employment healthcare and group life insurance costs for our formerly represented retirees with excess pension assets in our (U.S.) formerly represented pension plan, as permitted under Section 420 of the U.S. Internal Revenue Code. A deterioration in the funded status of that pension plan could negatively affect our ability to continue making Section 420 transfers. Section 420 is currently set to expire in 2025; and
- § we currently provide post-employment group life insurance coverage for a closed group of former non-represented employees who meet stated age and service criteria. This benefit obligation is largely insured through an experience-rated group life insurance policy issued by a reputable insurer, the premiums for which are paid from a voluntary employees' beneficiary association (veba) trust. Based on current actuarial and return-on-asset assumptions and the present level and structure of this group life insurance obligation, we believe that we can continue to fund the premiums for this policy from this trust for several more years. Once the trust's assets are depleted, however, the company will bear the annual premium cost associated with this benefit. Although we expect to be able, in the future, to fund this cost from excess pension assets in our (U.S.) non-represented pension plan, the level of excess pension assets in that plan in any given year may be insufficient to cover the annual premium cost.

The carrying amount of our goodwill may not be recoverable.

We assess the carrying amount of goodwill annually, or more frequently if events or changes in circumstances indicate that such carrying amount may not be recoverable. We assess the carrying amount of other identifiable assets if events or changes in circumstances indicate that their carrying amounts may not be recoverable. If we do not generate revenues from our businesses as anticipated, our businesses may not generate sufficient positive operating cash flows. This, or other factors, may lead to a decrease in the value of our assets, including intangible assets and the goodwill attributed to our businesses, resulting in impairment charges that may adversely affect our net profit for the year. While we believe the estimated recoverable values are reasonable, actual performance in the short- and long-term and our assumptions on which we base our calculations could materially differ from our forecasts, which could impact future estimates of our businesses' recoverable values, and may result in impairment charges.

Risks associated with our Shares

The amount of dividend and/or repayment of capital distributed to shareholders for each financial period is uncertain.

As announced on October 24, 2019 and February 6, 2020, in order to (a) guarantee our ability to increase 5G investments, (b) continue investing in growth in strategic focus areas of enterprise and software and (c) to strengthen our cash position, our Board has resolved to not distribute the third and fourth quarterly instalments of the dividends for the financial year 2018 and has proposed not to pay any dividend for the financial year 2019. We cannot assure that we will distribute dividends and/or capital repayments on the shares issued by us, nor is there any assurance as to the amount of any dividend and/or repayment of capital we may pay, including but not limited to situations where we make commitments to increase our dividends. The payment and the amount of any dividend and/or repayment of capital is subject to the discretion of the general meeting of our shareholders and our Board, and will depend on available cash balances, expected cash flow generation, anticipated cash needs, retained earnings, the results of our operations and our financial condition and terms of outstanding indebtedness, as well as other relevant factors such as restrictions, prohibitions or limitations imposed by applicable law. Further, even if any conditions or factors to issue or distribute dividends are met the Board or the shareholders have in the past and may going forward decide not to issue or distribute dividends.

Shareholders may be required to provide detailed information to obtain advantageous withholding tax treatment for dividends.

As described in more detail under General facts on Nokia – Taxation, non-Finnish shareholders are required to provide certain information in order to benefit from the reduced dividend withholding tax rates set out in the applicable tax treaties. If such information is not received, a higher withholding tax rate will apply. The Finnish tax authorities have in their recent guidance taken a strict position on the required information, and, additionally, a new tax regime will enter into force on January 1, 2021 that will tighten the conditions for the application of the reduced withholding tax rates set out in the applicable tax treaties. Consequently, there is currently uncertainty on what information non-Finnish shareholders will be required to provide to benefit from the reduced dividend withholding tax rates under the applicable tax treaties. Strict interpretation of the current regime and the requirements of the new regime may impose an additional administrative burden on shareholders or result in the higher withholding rate becoming applicable for non-Finnish shareholders.

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Corporate governance statement

This corporate governance statement is prepared in accordance with Chapter 7, Section 7 of the Finnish Securities Markets Act (2012/746, as amended) and the Finnish Corporate Governance Code 2020 (the “Finnish Corporate Governance Code”).

Introduction

In 2019, we continued on delivering on Nokia’s commitment to strong corporate governance and related practices. To do that, the Board activities were structured to develop the Company’s strategy and to enable the Board to support the management on the delivery of it within a transparent governance framework. In addition to regular business and financial updates at each Board meeting, the table below sets out a high-level overview of the key areas of focus for the Board’s and its Committees’ activities during the year.

	January	March	April	May	July	September/ October	December
Board	<ul style="list-style-type: none"> China strategy update Compliance Leadership succession planning Board evaluation 	<ul style="list-style-type: none"> China strategy and market deep-dive Board proposals and convening of the AGM 		<ul style="list-style-type: none"> Area and business unit updates and strategies China strategy Enterprise strategy CSP market industry analysis Appointment of the Chairs and Board Committees 	<ul style="list-style-type: none"> Transformation update Sustainability review IT-update Privacy and cybersecurity 	<ul style="list-style-type: none"> Annual strategy meeting Talent development and leadership succession planning 	<ul style="list-style-type: none"> Annual Plan for 2020 and Long-Range Plan Enterprise Risk Management Treasury and liquidity Transformation update China risk
CGN Committee	<ul style="list-style-type: none"> Board composition and remuneration Board evaluation results Corporate Governance Statement Annual review of Corporate Governance Guidelines and Corporate Governance and Nomination Committee Charter 	<ul style="list-style-type: none"> AGM proposals 		<ul style="list-style-type: none"> Proposal for the organization of the Board and its Committees Future composition of the Board 		<ul style="list-style-type: none"> Board remuneration Board composition Board evaluation planning Corporate governance update 	<ul style="list-style-type: none"> Board composition Board evaluation update AGM update
Personnel Committee	<ul style="list-style-type: none"> CEO compensation Incentive targets and objectives Nokia Equity Program Leadership succession planning 				<ul style="list-style-type: none"> GLT compensation Say on Pay Talent development Workforce demographics and diversity updates Compensation market 	<ul style="list-style-type: none"> Risk review Investor feedback Compensation benchmarking 	<ul style="list-style-type: none"> Corporate culture survey 2020 incentive program framework Remuneration statement and report for 2019
Audit Committee	<ul style="list-style-type: none"> Q4 and full year 2018 financials Tax update Compliance, internal audit and internal controls updates Review of auditor services Litigation update Cybersecurity 	<ul style="list-style-type: none"> Review of annual reports Auditor report AGM proposals 	<ul style="list-style-type: none"> Q1 financials Compliance, internal audit and internal controls updates Annual audit plan Review of auditor services 		<ul style="list-style-type: none"> Q2 financials Review of auditor services Compliance, internal audit and internal controls updates 	<ul style="list-style-type: none"> Q3 financials Review of auditor services Compliance, internal audit and internal controls updates IT and cybersecurity Audit firm rotation 	<ul style="list-style-type: none"> Financial update Pension update 20-F and annual report update
Technology Committee	<ul style="list-style-type: none"> Review of strategic technology initiatives Updates on major innovation and technology trends 			<ul style="list-style-type: none"> Review of strategic technology initiatives Updates on major innovation and technology trends 		<ul style="list-style-type: none"> Future strategic vision Future portfolio evolution 	

Furthermore, we engaged with our shareholders at the Annual General Meeting held in May where shareholders exercised decision-making power and their right to present questions to the Board and management. We also finalized the audit firm rotation process. Nokia had an obligation to organize an audit firm selection procedure in accordance with the EU Audit Regulation concerning the audit for the financial year 2020 (mandatory auditor rotation). The practical requirements for arranging the selection procedure under the EU Audit Regulation and the obligation to include at least two candidates in the recommendation of the Audit Committee caused the Board of Directors to re-evaluate the timing of the auditor election. Consequently, the shareholders elected new auditor for the financial year 2020 already in the 2019 Annual General Meeting. The Board intends in forthcoming Annual General Meetings to continue to make a proposal for the election of the auditor in the same sequence, whereby each Annual General Meeting would elect the auditor for the financial year commencing next after the election. In addition, during 2019, the Chair of the Personnel Committee continued to engage with our largest investors to discuss executive remuneration as well as the related governance and disclosure practices. In December 2019, Risto Siilasmaa informed the Board that he will step down from the Nokia Board of Directors at the Annual General Meeting 2020 after serving 12 years as a Director and the last eight years as the Chair. Following a nearly one-year succession planning process, the Board's Corporate Governance & Nomination Committee proposes the Vice Chair, Sari Baldauf, to be the new Chair of the Nokia Board and Kari Stadigh to be the new vice Chair of the Board, subject to their re-election to the Board by the Annual General Meeting.

Regulatory framework

Our corporate governance practices comply with Finnish laws and regulations as well as with our Articles of Association. We also comply with the Finnish Corporate Governance Code, available at www.cgfinland.fi. Under the Finnish Corporate Governance Code a company is deemed to be in compliance with the Corporate Governance Code even if it departs from individual recommendations, provided that the departures are reported and explained.

In 2019, we complied with the Finnish Corporate Governance Code, with the exception that we were not in full compliance with the recommendation 24 as our restricted share plans did not include performance criteria but were time-based only. Restricted Shares are and will be granted on a limited basis for exceptional purposes related to retention and recruitment to ensure Nokia is able to retain and recruit vital talent for the future success of the company. The Board approves, upon recommendation from the Board's Personnel Committee, any long-term incentive compensation and all equity plans, programs or similar arrangements of significance that the company establishes for its employees.

We comply with the corporate governance standards of Nasdaq Helsinki which are applicable to us due to the listing of our shares on the exchange. Furthermore, as a result of the listing of our American Depositary Shares on the New York Stock Exchange (the NYSE) and our registration under the U.S. Securities Exchange Act of 1934, we must comply with the applicable U.S. federal securities laws and regulations, including the Sarbanes-Oxley Act of 2002 as well as the rules of the NYSE, in particular the corporate governance standards under Section 303A of the NYSE Listed Company Manual available at <http://nysemanual.nyse.com/lcm/>. We comply with these standards to the extent such provisions are applicable to us as a foreign private issuer.

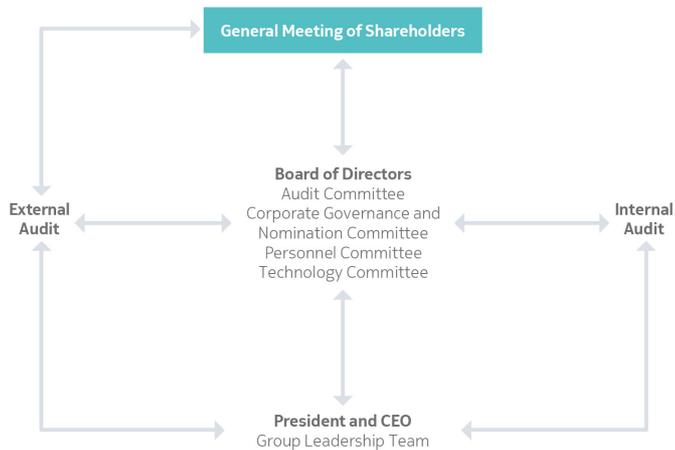
To the extent any non-domestic rules would require a violation of the laws of Finland, we are obliged to comply with Finnish law. There are no significant differences in the corporate governance practices applied by Nokia compared to those applied by the U.S. companies under the NYSE corporate governance standards with the exception that Nokia complies with Finnish law with respect to the approval of equity compensation plans. Under Finnish law, stock option plans require shareholder approval at the time of their launch. All other plans that include the delivery of company stock in the form of newly issued shares or treasury shares require shareholder approval at the time of the delivery of the shares unless a shareholder approval has been granted through an authorization to the Board, a maximum of five years earlier. The NYSE corporate governance standards require that the equity compensation plans are approved by the company's shareholders. Nokia aims to minimize the necessity for, or consequences of, conflicts between the laws of Finland and applicable non-domestic corporate governance standards.

The Board has also adopted corporate governance guidelines (Corporate Governance Guidelines) to reflect our commitment to good corporate governance. The Corporate Governance Guidelines include the directors' responsibilities, the composition and election of the members of the Board, its committees and certain other matters relating to corporate governance. In addition, the Committees of the Board have adopted charters that define each committee's main duties and operating principles. We also have a Code of Conduct that is applicable to all of our employees, directors and management and the Code of Ethics applicable to the President and CEO, Chief Financial Officer, Deputy Chief Financial Officer, and Corporate Controller. All of the mentioned documents are available on our website at http://www.nokia.com/en_int/investors/corporate-governance.

Main corporate governance bodies of Nokia

Pursuant to the provisions of the Finnish Limited Liability Companies Act (2006/624, as amended) (the Finnish Companies Act) and Nokia's Articles of Association, the control and management of Nokia are divided among the shareholders at a general meeting, the Board, the President and CEO and the Group Leadership Team, chaired by the President and CEO.

Corporate governance framework



General Meeting of Shareholders

Nokia shareholders play a key role in corporate governance, with our Annual General Meeting offering a regular opportunity to exercise their decision-making power in the company. In addition, at the meeting the shareholders may exercise their right to speak and ask questions. Each Nokia share entitles a shareholder to one vote at general meetings of Nokia. The Annual General Meeting decides, among other things, on the election and remuneration of the Board, the adoption of the annual accounts, the distribution of profit shown on the balance sheet, and discharging the members of the Board and the President and CEO from liability, as well as on the election and fees of the external auditor. Starting from the 2020 Annual General Meeting the remuneration policy shall be presented to the general meeting at least every four years and the remuneration report annually from 2021. Resolutions regarding the policy and report are advisory.

In addition to the Annual General Meeting, an Extraordinary General Meeting may be convened when the Board considers such meeting to be necessary, or when the provisions of the Finnish Companies Act mandate that such a meeting must be held.

Board of Directors

The operations of Nokia are managed under the direction of the Board, within the framework set by the Finnish Companies Act and Nokia's Articles of Association as well as any complementary rules of procedure as defined by the Board, such as the Corporate Governance Guidelines and the charters of the Board's committees.

Election and composition of the Board of Directors, election of the Chair and Vice Chair of the Board and the Chairs and members of the Board's Committees

Pursuant to the Articles of Association of Nokia Corporation, we have a Board that is composed of a minimum of seven and a maximum of 12 members. The Board is elected at least annually at each Annual General Meeting with a simple majority of the shareholders' votes cast at the meeting. The term of a Board member begins at the closing of the general meeting at which he or she was elected, or later as resolved by the general meeting, and expire at the closing of the following Annual General Meeting. The Annual General Meeting convenes by June 30 annually.

Our Board's leadership structure consists of a Chair and Vice Chair elected annually by the Board, and confirmed by the independent directors of the Board from among the Board members upon the recommendation of the Corporate Governance and Nomination Committee. The Chair of the Board has certain specific duties as stipulated by Finnish law and our Corporate Governance Guidelines. The Vice Chair of the Board assumes the duties of the Chair of the Board in the event he or she is prevented from performing his or her duties.

The independent directors of the new Board also confirm the election of the members and chairs for the Board's committees from among the Board's independent directors upon the recommendation of the Corporate Governance and Nomination Committee and based on each committee's member qualification standards. These elections take place at the Board's assembly meeting following the general meeting.

Board diversity

The Board has adopted principles concerning Board diversity describing our commitment to promoting diverse Board composition and how diversity is embedded into our processes and practices when identifying and proposing new Board candidates as well as re-election of current Board members.

At Nokia, the Board diversity consists of a number of individual elements, including gender, age, nationality, cultural and educational backgrounds, skills and experience. At Nokia, diversity is not a static concept but rather a relevant mix of required elements for the Board as a whole that evolves with time based on, among other things, the relevant business objectives and future needs of Nokia. The Board diversity is treated as a means of improvement and development rather than an end in itself.

Nokia acknowledges and supports the resolution adopted by the Finnish Government on February 17, 2015 on gender equality on the boards of directors of Finnish large and mid-cap listed companies. We report annually our objectives relating to both genders being represented on our Board, the means to achieve them, and the progress we have made in achieving them. We have met our aim to have representation of at least 40% of both genders on our Board.

Currently there are six different nationalities represented in the Board and 40% of the Board members are female.

	Risto Siilasmaa	Sari Baldauf	Bruce Brown	Jeanette Horan	Edward Kozel	Elizabeth Nelson	Olivier Piou	Søren Skou	Carla Smits-Nusteling	Kari Stadigh
Gender	Male	Female	Male	Female	Male	Female	Male	Male	Female	Male
Year of birth	1966	1955	1958	1955	1955	1960	1958	1964	1966	1955
Nationality	Finnish	Finnish	American	British	American	American	French	Danish	Dutch	Finnish
On Board since	2008	2018	2012	2017	2017	2012	2016	2019	2016	2011
Tenure at AGM 2019	11	1	7	2	2	7	3	-	3	8

Experience and skills of the Board members

General management and business operations		Finance and accounting	
Chief executive officer		Communications Service Provider market	
Chief financial officer		Enterprise business	
Chief technology officer		Technology	

Members of the Board of Directors

The Annual General Meeting held on May 21, 2019 elected ten members Sari Baldauf, Bruce Brown, Jeanette Horan, Edward Kozel, Elizabeth Nelson, Olivier Piou, Risto Siilasmaa, Søren Skou, Carla Smits-Nusteling and Kari Stadigh to the Board for a term ending at the close of the next Annual General Meeting. Following the meeting, the Board also re-elected Risto Siilasmaa to continue to serve as the Chair. Sari Baldauf was elected as the new Vice Chair of the Board.

The current members of the Board are all non-executive. For the term of the Board that began at the Annual General Meeting, all Board member candidates were determined to be independent from Nokia and significant shareholders under the Finnish corporate governance rules and the rules of the NYSE, as applicable.

We do not have a policy concerning the combination or separation of the roles of the Chair of the Board and the President and CEO. Our leadership structure is dependent on our needs, shareholder value and other relevant factors applicable from time to time, while respecting the highest corporate governance standards. In 2019, Rajeev Suri served as the President and CEO while Risto Siilasmaa served as the Chair of the Board.

Biographical details of our current Board members

Chair Risto Siilasmaa

b. 1966

Chair of the Nokia Board. Board member since 2008. Chair since 2012. Chair of the Corporate Governance and Nomination Committee and member of the Technology Committee.

Master of Science (Eng.), Helsinki University of Technology, Finland.

President and CEO of F-Secure Oyj 1988–2006.

Chairman of the Board of Directors of F-Secure Oyj. Member of the Board of Directors of Futurice Oy and the Technology Industries of Finland. Member of European Roundtable of Industrialists. Member of the Global Tech panel, an initiative of EU High Representative Federica Mogherini.

Member 2013–2016 and Vice Chairman of the Board of Directors of the Confederation of Finnish Industries (EK) 2017–2018. Vice Chairman 2013–2015 and Chairman of the Board of Directors of Technology Industries of Finland 2016–2018. Chairman of the Board of Directors of Elisa Corporation 2008–2012.

Vice Chair Sari Baldauf

b. 1955

Vice Chair of the Nokia Board. Board member since 2018. Vice Chair since 2019. Member of the Personnel Committee and the Corporate Governance and Nomination Committee.

Master of Business Administration, Helsinki School of Economics and Business Administration. Bachelor of Science, Helsinki School of Economics and Business Administration. Honorary doctorates in Technology (Helsinki University of Technology) and Business Administration (Turku School of Economics and Business Administration and Aalto University School of Business).

Executive Vice President and General Manager, Networks Business Group, Nokia, 1998–2005. Various executive positions at Nokia in Finland and the United States 1983–1998.

Member of the Supervisory Board and Member of the Nomination Committee of Daimler AG. Member of Supervisory Board of Daimler Trucks AG. Member of the Board of Directors and Chair of the Audit Committee of Aalto University. Chair of the Board of Directors of Vexve Armatury Oy. Senior Advisor of DevCo Partners Oy. Member of the Board of Directors of Demos Helsinki.

Member of the Supervisory Board of Deutsche Telekom AG 2012–2018. Chair of the Board of Directors of Fortum Oyj 2011–2018. Member of the Board of Directors of Akzo Nobel 2012–2017.

Bruce Brown

b. 1958

Nokia Board member since 2012. Chair of the Personnel Committee. Member of the Corporate Governance and Nomination Committee and the Technology Committee.

MBA Xavier University, the United States. BS (Chemical Engineering), Polytechnic Institute of New York University, the United States.

Retired from The Procter & Gamble Company in 2014. Chief Technology Officer of the Procter & Gamble Company 2008–2014. Various executive and managerial positions in Baby Care, Feminine Care, and Beauty Care units of The Procter & Gamble Company since 1980 in the United States, Germany and Japan.

Member of the Board of Directors, the Audit Committee and the Nominating and Corporate Governance Committee of P. H. Glatfelter Company.

Member of the Board of Directors, the Audit Committee and the Compensation Committee of Medpace Inc 2016–2019. Member of the Board of Directors of Agency for Science, Technology & Research (A*STAR) in Singapore 2011–2018.

Jeanette Horan

b. 1955

Nokia Board member since 2017. Member of the Audit Committee and the Technology Committee.

MBA, Business Administration and Management, Boston University, the United States. BSc, Mathematics, University of London, United Kingdom.

Various executive and managerial positions in IBM 1998–2015. Vice President of Digital Equipment Corporation 1994–1998. Vice President, Development, of Open Software Foundation 1989–1994.

Member of the Supervisory Board at Wolters Kluwer, and the Chair of the Remuneration Committee. Member of the Board of Advisors at Jane Doe No More, a non-profit organization.

Member of the Board of Advisors of Cybereason 2017–2018. Member of the Board of Directors of West Corporation 2016–2017 and Microvision 2006–2017.

Edward Kozel

b. 1955

Nokia Board member since 2017. Chair of the Technology Committee and member of the Audit Committee.

Degree in Electrical Engineering and Computer Science, University of California, the United States.

President and CEO of Range Networks 2013–2014, Owner of Open Range 2000–2013, Chief Technology and Innovation Officer and member of the Board of Management of Deutsche Telekom 2010–2012, CEO of Skyrider 2006–2008, Managing Director of Integrated Finance 2005–2006, Senior Vice President, Business development and Chief Technology Officer and Board Member of Cisco 1989–2001.

Member of the Advisory Board at Telia Ventures.

Various Board Memberships in 1999–2009.

Elizabeth Nelson

b. 1960

Nokia Board member since 2012. Member of the Audit Committee and the Personnel Committee.

MBA (Finance), the Wharton School, University of Pennsylvania, the United States. BS (Foreign Service), Georgetown University, the United States.

Executive Vice President and Chief Financial Officer, Macromedia, Inc. 1997–2005. Vice President, Corporate Development, Macromedia, Inc. 1996–1997. Various roles in Corporate Development and International Finance, Hewlett-Packard Company 1988–1996.

Chairman of the Board of Directors of DAI. Independent Director and Chair of the Audit Committee of Upwork Inc.

Independent Lead Director and Chair of the Audit Committee of Zendesk Inc 2013-2019. Member of the Board of Directors of Pandora Media 2013-2017.

Olivier Piou

b. 1958

Nokia Board member since 2016. Member of the Audit Committee and the Technology Committee.

Engineer, École Centrale de Lyon, France.

Chief Executive Officer of Gemalto N.V. 2006–2016. Chief Executive Officer of Axalto N.V. 2004–2006. With Schlumberger Ltd 1981–2004, including numerous management positions in the areas of technology, marketing and operations, in France and the United States.

Member of the Board of Directors of TechnipFMC, Valeo S.A. and the PESH foundation.

Member of the Board of Directors of Gemalto N.V. 2006–2019 and Alcatel Lucent SA 2008–2016.

Søren Skou

b. 1964

CEO of A.P. Møller Mærsk A/S. Nokia Board member since 2019. Member of the Personnel Committee.

MBA (honours), IMD, Switzerland, Business Administration, Copenhagen Business School, Denmark. Maersk International Shipping Education (M.I.S.E.).

Maersk Line Copenhagen CEO 2012–2016. Maersk Tankers Copenhagen CEO 2001–2011. Maersk Tankers Copenhagen Head of Crude and Product 1999–2001. Maersk Line Copenhagen Head of Department 1997–1998. Maersk Line Beijing Operations Manager 1994–1996. Maersk Line Copenhagen and New Jersey, Charterer and other roles 1983–1994.

Member of International Council of Containership Operators (ICCO).

Carla Smits-Nusteling

b. 1966

Nokia Board member since 2016. Chair of the Audit Committee and member of the Corporate Governance and Nomination Committee.

Master's Degree in Business Economics, Erasmus University Rotterdam, the Netherlands. Executive Master of Finance and Control, Vrije University Amsterdam, the Netherlands.

Member of the Board of Directors and Chief Financial Officer of KPN 2009–2012. Various financial positions in KPN 2000–2009. Various financial and operational positions in TNT/PTT Post 1990–2000.

Member of the Supervisory Board since 2013 and Chair of the Audit Committee of ASML. Chair of the Board of Directors of TELE2 AB. Lay Judge in the Enterprise Court of the Amsterdam Court of Appeal since 2015.

Kari Stadigh

b. 1955

Nokia Board member since 2011. Member of the Personnel Committee and the Corporate Governance and Nomination Committee.

Master of Science (Eng.), Helsinki University of Technology, Finland. Bachelor of Business Administration, Hanken School of Economics, Helsinki, Finland.

Group CEO and President of Sampo plc 2009–2019. Deputy CEO of Sampo plc 2001–2009. President of Sampo Life Insurance Company Limited 1999–2000. President of Nova Life Insurance Company Ltd 1996–1998. President and COO of Jaakko Pöyry Group 1991–1996.

Member of the Board of Directors of Metso Corporation and Waypoint Capital Group Holdings SA.

Chairman of the Board of Directors of Mandatum Life Insurance Company Limited 2001-2019. Chairman of the Board of Directors of If P&C Insurance Holding Ltd 2002–2019. Member of the Board of Directors of Nordea Bank AB (publ) 2010–2018. Chair of the Board Risk Committee (BRIC) of Nordea Bank AB (publ) 2011–2018. Member of the Board of Directors of Niilo Helanderin Säätiö 2005–2018.

Operations of the Board of Directors

The Board represents and is accountable to the shareholders of Nokia. While its ultimate statutory accountability is to the shareholders, the Board also takes into account the interests of the Company's other stakeholders. The Board's responsibilities are active, not passive, and include the responsibility to evaluate the strategic direction of Nokia, its management policies and the effectiveness of the implementation of such by the management on a regular basis. It is the responsibility of the members of the Board to act in good faith and with due care, so as to exercise their business judgment on an informed basis, in a manner which they reasonably and honestly believe to be in the best interests of Nokia and its shareholders. In discharging that obligation, the members of the Board must inform themselves of all relevant information reasonably available to them. The Board and each Board committee also have the power to appoint independent legal, financial or other advisers as they deem necessary. The Company will provide sufficient funding to the Board and to each committee to exercise their functions and provide compensation for the services of their advisers.

The Board is ultimately responsible for monitoring and reviewing Nokia's financial reporting process, effectiveness of related control and audit functions and the independence of Nokia's external auditor, as well as for monitoring the statutory audit of the annual and consolidated financial statements. The Board's responsibilities also include overseeing the structure and composition of our top management and monitoring legal compliance and the management of risks related to our operations. In doing so, the Board may set annual ranges and/or individual limits for capital expenditures, investments and divestitures and financial and non-financial commitments that may not be exceeded without a separate Board approval.

In risk management policies and processes, the Board's role includes risk analysis and assessment in connection with financial, strategy and business reviews, updates and decision-making proposals. Risk management policies and processes are integral parts of Board deliberations and risk-related updates are provided to the Board on a recurring basis. For a more detailed description of our risk management policies and processes, refer to "—Risk management, internal control and internal audit functions at Nokia—Main features of risk management systems" below.

The Board has the responsibility for appointing and discharging the President, the Chief Executive Officer, Chief Financial Officer and Chief Legal Officer. Since May 2014, Rajeev Suri has served as the President and CEO. His rights and responsibilities include those allotted to the President under Finnish law and he also chairs the Group Leadership Team.

On March 2, 2020 Nokia's Board of Directors appointed Pekka Lundmark as President and Chief Executive Officer of Nokia and he is expected to start in his new role on September 1, 2020. Suri will leave his current position on August 31, 2020 and continue to serve as an advisor to the Nokia Board until January 1, 2021.

Subject to the requirements of Finnish law, the independent directors of the Board confirm the compensation and terms of employment of the President and CEO upon the recommendation of the Personnel Committee of the Board. The compensation and employment conditions of the other members of the Group Leadership Team are approved by the Personnel Committee upon the recommendation of the President and CEO.

Board evaluation

In line with our Corporate Governance Guidelines, the Board conducts annual performance evaluation which also include evaluation of the Board committees' work, the Board and Committee Chairs and individual Board members. In connection with the same, the Board conducts an evaluation of the President and CEO. In 2019, the Board's evaluation processes consisted of Board self-evaluations, peer evaluations and interviews as well as the evaluation of the President and CEO. The evaluation process included both numeric assessments and the possibility to provide more detailed written and verbal comments. Feedback was also requested from selected members of management as part of the Board evaluation process. Each year, the results of the evaluation are discussed and analyzed by the entire Board and improvement actions are agreed based on such discussion.

Meetings of the Board of Directors

The Board held 20 meetings excluding committee meetings during 2019, of which approximately 50% were regularly scheduled meetings held in person, occasionally complemented by access via video or conference calls. The other meetings were held in writing.

	Number of meetings in person	Number of meetings in writing	Attendance in all meetings %
Full Board	10	10	98
Audit Committee	9	1	96
Corporate Governance and Nomination Committee	5	—	100
Personnel Committee	4	1	96
Technology Committee	3	—	100

Directors' attendance at Board and Committee meetings in 2019 is set forth in the table below:

	Board meetings %	Audit Committee meetings %	Corporate Governance and Nomination Committee meetings %	Personnel Committee meetings %	Technology Committee meetings %
Risto Siilasmaa (Board Chair)	100		100		100
Sari Baldauf (Board Vice Chair)	100		100	100	
Bruce Brown	100		100	100	100
Jeanette Horan	100	100			100
Louis Hughes (until May 21, 2019)	83	67			
Edward Kozel	100	100			100
Elizabeth Nelson	100	100		100	
Olivier Piou	100	90			100
Søren Skou (from May 21, 2019)	79			75	
Carla Smits-Nusteling	100	100	100		
Kari Stadigh	100		100	100	

Additionally, many of the directors attended, as non-voting observers, meetings of a committee of which they were not a member.

Directors meet without management in connection with each regularly scheduled meeting. According to Board practices, meetings without management present would only be attended by non-executive directors and be chaired by the non-executive Chair of the Board. If the non-executive Chair of the Board is unable to chair these meetings, the non-executive Vice Chair of the Board chairs the meeting. Additionally, the independent directors would meet separately at least once annually. In 2019 all members of the Board were non-executive and determined to be independent from Nokia and significant shareholders under the Finnish corporate governance standards and the rules of the NYSE.

All the directors, excluding Louis Hughes, who served on the Board for the term until the close of the Annual General Meeting in 2019 attended Nokia's Annual General Meeting held on May 21, 2019.

Committees of the Board of Directors

The Board has four committees: the Audit Committee, Corporate Governance and Nomination Committee, Personnel Committee and Technology Committee. These committees assist the Board in its duties pursuant to their respective committee charters. The Board may also establish ad hoc committees for detailed reviews or consideration of particular topics to be proposed for the approval of the Board. Any director who so wishes may attend, as a non-voting observer, meetings of committees of which they are not members.

The Audit Committee

The Committee consists of a minimum of three members of the Board who meet all applicable independence, financial literacy and other requirements as stipulated by Finnish law and the rules of Nasdaq Helsinki and the NYSE. From May 21, 2019, the Audit Committee has consisted of the following five members of the Board: Carla Smits-Nusteling (Chair), Jeanette Horan, Edward Kozel, Olivier Piou and Elizabeth Nelson.

The Audit Committee is established by the Board primarily for the purpose of oversight of the accounting and financial reporting processes of Nokia and the audits of its financial statements. The Committee is responsible for assisting the Board in the oversight of:

- § the quality and integrity of the company's financial statements and related disclosures;
- § the statutory audit of the company's financial statements;
- § the external auditor's qualifications and independence;
- § the performance of the external auditor subject to the requirements of Finnish law;
- § the performance of the company's internal controls and risk management and assurance function;
- § the performance of the internal audit function; and
- § the company's compliance with legal and regulatory requirements, including the performance of its ethics and compliance program.

In discharging its oversight role, the Audit Committee has full access to all company books, records, facilities and personnel. Audit Committee also maintains procedures for the receipt, retention and treatment of complaints received by the company regarding accounting, internal controls, or auditing matters and for the confidential, anonymous submission by our employees of concerns relating to accounting or auditing matters. Nokia's disclosure controls and procedures, which are reviewed by the Audit Committee and approved by the President and CEO and the Chief Financial Officer, as well as the internal controls over financial reporting, are designed to provide reasonable assurance regarding the quality and integrity of the company's financial statements and related disclosures. For further information on internal control over financial reporting, refer to "–Risk management, internal control and internal audit functions at Nokia–Description of internal control procedures in relation to the financial reporting process" below.

Under Finnish law, an external auditor is elected by a simple majority vote of the shareholders at the Annual General Meeting for one year at a time. The Audit Committee prepares the proposal to the shareholders, upon its evaluation of the qualifications and independence of the external auditor, of the nominee for election or re-election. Under Finnish law, the fees of the external auditor are also approved by the shareholders by a simple majority vote at the Annual General Meeting. The Committee prepares the proposal to the shareholders in respect of the fees of the external auditor, and approves the external auditor's annual audit fees under the guidance given by the Annual General Meeting. For information about the fees paid to Nokia's external auditor, PricewaterhouseCoopers Oy, during 2019, refer to "–Auditor fees and services" below.

The Board has determined that all members of the Audit Committee, including its Chair, Carla Smits-Nusteling, are "audit committee financial experts" as defined in the requirements of Item 16A of the annual report on Form 20-F filed with the U.S. Securities and Exchange Commission (SEC). Ms. Smits-Nusteling and each of the other members of the Audit Committee are "independent directors" as defined by Finnish law and Finnish Corporate Governance Code and in Section 303A.02 of the NYSE Listed Company Manual.

The Audit Committee meets a minimum of four times a year based on a schedule established at the first meeting following the appointment of the Committee. The Committee meets separately with the representatives of Nokia's management, heads of the internal audit, and ethics and compliance functions, and the external auditor in connection with each regularly scheduled meeting. The head of the internal audit function has, at all times, direct access to the Audit Committee, without the involvement of management. Additionally, any director who so wishes may attend meetings of the Audit Committee as a non-voting observer.

Audit Committee pre-approval policies and procedures

The Audit Committee of the Board is responsible, among other matters, for oversight of the external auditor's independence, subject to the requirements of applicable legislation. The Audit Committee has adopted a policy regarding an approval procedure of audit services performed by the external auditors of Nokia Group and permissible non-audit services performed by the principal external auditor of the Nokia Group (the "Pre-approval Policy").

Under the Pre-approval Policy, proposed services either: (i) may be pre-approved by the Audit Committee in accordance with certain service categories described in the Pre-approval Policy (general pre-approval); or (ii) require the specific pre-approval of the Audit Committee (specific pre-approval). The Pre-approval Policy sets out the audit, audit-related, tax and other services that have received the general pre-approval of the Audit Committee. All other audit, audit-related (including services related to internal controls and significant mergers and acquisitions projects), tax and other services are subject to specific pre-approval by the Audit Committee. All service requests concerning generally pre-approved services will be submitted to an appointed Audit Committee delegate within management, who will determine whether the services are within the services generally pre-approved. The Pre-approval Policy is subject to annual review by the Audit Committee.

The Audit Committee establishes budgeted fee levels annually for each of the categories of audit and non-audit services that are pre-approved under the Pre-approval Policy, namely, audit, audit-related, tax and other services. At each regular meeting of the Audit Committee, the auditor provides a report in order for the Audit Committee to review the services that the auditor is providing, as well as the cost of those services.

The Corporate Governance and Nomination Committee

The Committee consists of three to five members of the Board who meet all applicable independence requirements as stipulated by Finnish law and the rules of Nasdaq Helsinki and the NYSE. From May 21, 2019 the Corporate Governance and Nomination Committee has consisted of the following five members of the Board: Risto Siilasmaa (Chair), Sari Baldauf, Bruce Brown, Carla Smits-Nusteling and Kari Stadigh.

The Corporate Governance and Nomination Committee's purpose is to prepare the proposals for the general meetings in respect of the composition of the Board and the director remuneration to be approved by the shareholders, and to monitor issues and practices related to corporate governance and to propose necessary actions in respect thereof.

The Committee fulfills its responsibilities by:

- § actively identifying individuals qualified to be elected members of the Board as well as considering and evaluating the appropriate level and structure of director remuneration;
- § preparing proposal to the shareholders on the director nominees for election at the general meetings as well as director remuneration;
- § monitoring significant developments in the law and practice of corporate governance and of the duties and responsibilities of directors of public companies;
- § assisting the Board and each Committee of the Board in its annual performance evaluations, including establishing criteria to be applied in connection with such evaluations;
- § developing and recommending to the Board and administering Nokia's Corporate Governance Guidelines; and
- § reviewing Nokia's disclosure in the corporate governance statement.

The Committee has the power and practice to appoint a recruitment firm to identify appropriate new director candidates.

The Personnel Committee

The Committee consists of a minimum of three members of the Board who meet all applicable independence requirements as stipulated by Finnish law and the rules of Nasdaq Helsinki and the NYSE. From May 21, 2019 the Personnel Committee has consisted of the following five members of the Board: Bruce Brown (Chair), Sari Baldauf, Elizabeth Nelson, Søren Skou and Kari Stadigh.

The primary purpose of the Personnel Committee is to oversee the personnel-related policies and practices at Nokia, as described in the Committee charter. It assists the Board in discharging its responsibilities in relation to all compensation, including equity compensation, of the company's executives and their terms of employment. The Committee has overall responsibility for evaluating, resolving and making recommendations to the Board regarding:

- § compensation of the company's top executives and their terms of employment;
- § all equity-based plans;
- § incentive compensation plans, policies and programs of the company affecting executives; and
- § other significant incentive plans.

The Committee is responsible for overseeing compensation philosophy and principles and ensuring the above compensation programs are performance-based, and designed to contribute to long-term shareholder value creation and alignment to shareholders' interests, properly motivate management, and support overall corporate strategies.

The Technology Committee

The Committee consists of a minimum of three members of the Board who meet applicable independence requirements as stipulated by Finnish law and the rules of Nasdaq Helsinki and the NYSE and have such skills in innovation, technology and science matters as the Board determines adequate from time to time. From May 21, 2019 the Technology Committee has consisted of the following five members of the Board: Edward Kozel (Chair), Bruce Brown, Jeanette Horan, Olivier Piou and Risto Siilasmaa.

The primary purpose of the Technology Committee is to engage in a dialogue with and provide opinions and advice to management with respect to significant innovation and technology strategies of the Company which are formulated and executed by the management of the Company, as described in the Committee charter.

In its dialogue with and provision of opinions and advice to the management, the Committee will periodically review:

- § the Company's approach to major technological innovations;
- § key technology trends that may result in disruptive threats or opportunities;
- § high-level risks and opportunities associated with the Company's Research and Development Programs; and
- § the Company's technologic competitiveness and new strategic technology initiatives.

Group Leadership Team and the President and CEO

We have a Group Leadership Team that is responsible for the operative management of Nokia. The Group Leadership Team is chaired by the President and CEO. The President and CEO's rights and responsibilities include those allotted to the President under Finnish law.

Biographical details of current and appointed members of the Nokia Group Leadership Team

Rajeev Suri **b. 1967**

President and Chief Executive Officer of Nokia Corporation, Chair of the Group Leadership Team, until August 31, 2020. Joined Nokia in 1995.

Bachelor of Engineering (Electronics and Communications), Manipal Institute of Technology, Karnataka, India.

CEO, Nokia Solutions and Networks 2009–2014. Head of Services, Nokia Siemens Networks 2007–2009. Head of Asia Pacific, Nokia Siemens Networks April 2007. Senior Vice President, Nokia Networks Asia Pacific 2005–2007. Vice President, Hutchison Customer Business Team, Nokia Networks 2004–2005. General Manager, Business Development, Nokia Networks Asia Pacific 2003. Sales Director–BT, O2 and Hutchison Global Customers, Nokia Networks 2002. Director, Technology and Applications, BT Global Customer, Nokia Networks 2000–2001. Head of Global Competitive Intelligence, Nokia Networks 1999–2000. Head of Product Competence Center, Nokia Networks South Asia 1997–1999. System Marketing Manager, Cellular Transmission, Nokia Networks India 1995–1997. Head of Group Procurement, imports and special projects, Churchgate Group, Nigeria 1993–1995. National Account Manager–Transmission/Manager–Strategic Planning, ICL India (ICIM) 1990–1993. Production Engineer, Calcom Electronics 1989.

Member of the Board of Directors of Stryker Corporation.

Pekka Lundmark **b. 1963**

Appointed President and Chief Executive Officer of Nokia Corporation. Expected to start in his role on September 1, 2020.

Master of Science, Department of Technical Physics, Helsinki University of Technology, Finland.

President and CEO of Fortum Corporation (until August 31, 2020).

President and CEO of Konecranes Plc 2005–2015 and Group Executive Vice President 2004–2005. President and CEO of Hackmann Oyj Abp 2002–2004. Managing Partner of Startupfactory Oy 2000–2002. Various executive positions at Nokia 1990–2000.

Chairman of the Board of Confederation of Finnish Industries. Member of the Board of East Office of Finnish Industries, Climate Leadership Council and Finnish Athletics Federation. Chairman of the Board of Fortum Foundation.

Nassib Abou-Khalil **b. 1972**

Chief Legal Officer. Group Leadership Team member since 2019. Joined Nokia in 2014.

Bachelor of Arts (Political Sciences), Civil Law (LL.L.), Common Law (LL.B.) and Master of Law (LL.M), University of Ottawa, Canada.

General Counsel, Customer Operations, Nokia 2016–2019. Head of Legal & compliance, MEA, Nokia 2014–2015. Head of Public Policy, MEA & General Counsel, MEA, Yahoo! 2010–2014. Regional Counsel, Middle East, Africa and India, GE Oil & Gas 2007–2010. Regulatory Counsel, Etisalat 2006–2007. Various legal counsel roles, TMF Netherlands 2002–2006. Legal articling – Fasken Martineau 1999–2001.

Basil Alwan **b. 1962**

Co-president of IP/Optical Networks. Group Leadership Team member since 2016. Joined Nokia in 2016.

Bachelor in Computer Engineering, University of Illinois at Urbana-Champaign, the United States.

Previously President of IP Routing and Transport, Alcatel Lucent 2012–2016. President of IP Division, Alcatel Lucent 2003–2012. Founder, President and CEO, TiMetra Networks 2000–2003. Vice President and General Manager, Bay Networks (acquired by Nortel) Enterprise Products Division (EPD) 1997–2000. Vice President of Product Management and Marketing, Rapid City Communications 1996–1997.

Kathrin Buvac **b. 1980**

President of Nokia Enterprise. Group Leadership Team member since 2016. Joined Nokia Siemens Networks in 2007.

German Diplom in Computer Science from the University of Cooperative Education, Germany. Bachelor's Degree in Business Administration from Open University London, the United Kingdom.

Chief Strategy Officer, Nokia 2016–2019. Vice President, Corporate Strategy, Nokia Networks 2014–2016. Chief of staff to the CEO, Nokia Solutions and Networks 2011–2013. Head of Strategic Projects, Business Solutions, Nokia Siemens Networks 2009–2011. General Manager, Integration Programme, Nokia Siemens Networks 2007–2009. General Manager, Corporate Audit, Siemens Holding S.p.A. 2006–2007. Head of

Controlling International Businesses, Siemens Communications 2003–2006. Head of Performance Controlling USA, Siemens Communications 2002–2003. Business Process Manager Global IT Strategy, Siemens Communications 2001–2002. Business Analyst, EADS Aerospace and Defence 1999–2000.

Ricky Corker

b. 1967

President of Customer Operations, Americas. Group Leadership Team member since 2019. Joined Nokia in 1993.

Bachelor in Communications and Electronic Engineering from the Royal Melbourne Institute of Technology, Australia.

Executive Vice President and President of North America, Nokia 2011–2018. Head of APAC, Nokia Siemens Networks 2009–2011. Head of Sales, APAC, Nokia Siemens Networks 2009. Head of Asia North Region, Nokia Siemens Networks 2008–2009. Head of Hutchison Global Customer Business Team, Nokia Siemens Networks 2007–2008. Vice President APAC, Nokia Networks 2005–2007. Lead Sales Director APAC, Nokia Networks 2004–2005. Account Director Telstra, Nokia Networks 2002–2003. Account Director Vodafone Australia and New Zealand, Sales Director Vodafone APAC Customer Business Team, Nokia Networks 2001–2002. Commercial Director Global Accounts British Telecom, Nokia Networks 2001. Held senior sales and marketing positions at Nokia 1993–2001.

Barry French

b. 1963

Chief Marketing Officer. Group Leadership Team member since 2016. Joined Nokia in 2006.

Master's Degree in International Affairs from Columbia University's School of International and Public Affairs, New York, the United States. Bachelor of Arts degree in Political Science, Bates Colleges, Lewiston, Maine, the United States.

Chief Marketing Officer and Executive Vice President, Marketing and Corporate Affairs, Nokia 2014–2016. Head of Marketing and Corporate Affairs, Nokia Siemens Networks 2010–2014. Head of Communications, Nokia Siemens Networks 2006–2010. Vice President, Corporate Communications, United Airlines 2004–2006. Director, Corporate Communications, Dell 2000–2004. Additional roles included communications, government relations and management positions, Engineering Animation, Raytheon, KRC Research and the Sawyer/Miller Group.

Member of the Board of Directors of HMD Global.

Sanjay Goel

b. 1967

President of Global Services and President of Nokia Operations. Group Leadership Team member since 2018. Joined Nokia Networks in 2001.

Bachelor's Degree in Engineering in Electronics and Telecommunications from Manipal Institute of Technology, Karnataka, India.

Senior Vice President, Global Services Sales, Global Services 2015–2018. Vice President, Services, Customer Operations, Asia, Middle East & Africa, Nokia Networks 2012–2015. Head of Global Services, Asia Pacific & Japan, Nokia Siemens Networks 2009–2012. Head of Managed Services, Asia Pacific (including India & Japan), Nokia Siemens Networks 2007–2009. Several director and manager level positions in Nokia Networks 2001–2007. Manager in IBM India 1996–2001. Several engineer positions in Asea Brown Boveri Ltd 1990–1996.

Bhaskar Gorti

b. 1966

President of Nokia Software and Chief Digital Officer. Group Leadership Team member since 2016. Joined Nokia in 2016.

Master's degree in Electrical Engineering from Virginia Polytechnic Institute and State University, Blacksburg, the United States. Bachelor's degree in Technology and Electrical Engineering from National Institute of Technology, Warangal, India.

Previously President of IP Platforms, Alcatel Lucent 2015–2016. Senior Vice President and General Manager, Communications Global Business Unit, Oracle 2006–2015. Senior Vice President, Portal Software 2002–2006.

Telemanagement Forum - Industry Standard Body Board Member.

Federico Guillén

b. 1963

President of Customer Operations, EMEA & APAC. Group Leadership Team member since 2016. Joined Nokia in 2016.

Degree in Telecommunications Engineering, ETSIT at Universidad Politécnica de Madrid, Spain. Master's degree in Switching & Communication Architectures, ETSIT at Universidad Politécnica de Madrid, Spain. Master's Degree in International Management, ESC Lyon and Alcatel, France.

President of Fixed Networks, Nokia, 2016–2018. President of Fixed Networks, Alcatel Lucent 2013–2016. President and CEO of Alcatel Lucent Spain & Global Account Manager Telefonica, Alcatel Lucent 2009–2013. Vice President Sales of Vertical Market Sales in Western Europe, Alcatel Lucent 2009. Head of Regional Support Centre within Alcatel Lucent's Fixed Access Division for South Europe, MEA, India and CALA 2007–2009. CEO, Alcatel Mexico & Global Account Manager, Telmex 2003–2007. Various R&D, Portfolio and Sales Management Positions, Telettra and then Alcatel in Spain, Belgium and the United States. 1989–2003.

Jenni Lukander

b. 1974

President of Nokia Technologies. Group Leadership Team member since 2019. Joined Nokia in 2007.

Master of Law, University of Helsinki, Finland.

Senior Vice President, head of Patent Business, Nokia 2018–2019. Vice President, head of Patent Licensing, Nokia 2018. Vice President, head of Litigation and Competition Law, Nokia 2016–2018. Director, head of Regulatory and Competition Law, Nokia 2015–2016. Director, head of Competition Law, Nokia 2011–2015. Senior Legal Counsel, Nokia 2007–2011. Lawyer, Roschier Ltd. 1999–2007.

Sandra Motley

b. 1959

President of Fixed Networks. Group Leadership Team member since 2019. Joined Nokia in 2016.

Master of Business Administration (Finance), Farleigh Dickinson University, New Jersey, the United States. Executive Business Program graduate, Smith College, Massachusetts, the United States. Post-Masters Mechanical Engineering studies at Columbia University, New York. Bachelor of Science and Master of Science degrees in Mechanical Engineering from State University of New York at Buffalo.

Chief Operating Officer, Fixed Networks, Nokia 2017–2018. Chief Operating Officer, Wireless Business, Alcatel Lucent 2011–2013. Vice President Sales, U.S. Wireless Accounts, Alcatel Lucent 2009–2011. Vice President and General Manager of the CDMA Product Unit, Alcatel Lucent 2007–2009. Various roles in North America & CALA in pre- and post-sales and business operations for Alcatel Lucent's Wireless business.

Member of the Board of Advisors for Light Reading's Women in Communications.

Kristian Pullola

b. 1973

Chief Financial Officer. Group Leadership Team member since 2017. Joined Nokia in 1999.

Master of Science (Economics), the Hanken School of Economics, Helsinki, Finland. Finance diploma, the Stockholm School of Economics, Stockholm, Sweden.

Senior Vice President, Corporate Controller, Nokia 2011–2016. Vice President, Treasury & Investor Relations, Nokia 2009–2011. Vice President, Corporate Treasurer, Nokia 2006–2008. Director, Treasury Finance & Control, Nokia 2003–2006. Various roles in Nokia Treasury 1999–2003. Associate, Citibank International 1998–1999.

Member of the Board of Directors of Ilmarinen Mutual Pension Insurance Company.

Sri Reddy

b. 1964

Co-president of IP/Optical Networks. Group Leadership Team member since 2018. Joined Nokia in 2016.

Master of Business Administration (Finance), Santa Clara University, the United States. Masters of Science (Electrical Engineering), Oregon State University, the United States. Bachelor of Science (Electrical Engineering), Jawaharlal Nehru Technological University, India.

Senior Vice President and General Manager, IP Routing and Packet Core Business Unit, Nokia, 2016–2018. Vice President, Engineering, IP Routing, Alcatel Lucent, 2003–2016. Vice President, Engineering, Timetra, 2000–2003. Vice President, Engineering, Bay Networks, 1991–1999.

Gabriela Styf Sjöman

b. 1969

Chief Strategy Officer. Group Leadership Team member since 2019. Joined Nokia in 2019.

Master of Business Administration, University of Durham Business School, the United Kingdom. Degree in Electrical Power Engineering, Thorildsplan College, Sweden. Degree in Basic Commercial Law and Social Political Studies, University of Uppsala, Sweden.

Vice President, Head of Group Network Systems and Delivery, Telia Company, Sweden 2019. Vice President, Head of Group Networks and Deputy Head of Global Services and Operations (COO), Telia Company, Sweden 2017–2019. Vice President, Engineering & TIM Labs, Telecom Italia, Italy 2015–2017. Vice President, Product Line IP Network Management, Ericsson, USA 2011–2014. Vice President, Product Development Unit Mobile Core, Ericsson, Germany 2007–2011. General Manager, Service Layer & Systems Integration, Ericsson, China 2004–2007. Director, Product Marketing, Teligent AB, Sweden, 2004. Managing Director, Athena Solutions/Ansi Consult, Sweden 2002–2004. Manager, Sales & Marketing, Melody Solutions, Sweden 2000–2002. Strategic Product Manager, Ericsson, Sweden 2000. Product Manager, Ericsson, Hong Kong 1995–1998. Field Support Engineer, Project Manager, Product Manager, Ericsson, USA, Spain, Netherlands 1989–1995.

Tommi Uitto

b. 1969

President of Mobile Networks. Group Leadership Team member since 2019. Joined Nokia in 1996.

Master's degree in industrial management, Helsinki University of Technology, Finland. Master's degree in operations management, Michigan Technological University, the United States.

Senior Vice President, Global Product Sales, Mobile Networks, Nokia 2016–2018. Senior Vice President, Global MBB Sales, Customer Operations, Nokia Networks, 2015–2016. Senior Vice President, West Europe, Customer Operations, Nokia Networks, 2013–2015. Head of Radio Cluster (SVP), Mobile Broadband, Nokia Siemens Networks, 2012–2013. Head of Global LTE Radio Access Business Line (VP), Mobile Broadband, Nokia Siemens Networks, 2011–2012. Head of Quality, Mobile Broadband, 2012. Head of Product Management, Network Systems, Nokia Siemens Networks, 2010. Head of Product Management, Radio Access, Nokia Siemens Networks, 2009. Head of WCDMA/HSPA and Radio Platforms Product Management, Nokia Siemens Networks, 2008. Head of WCDMA/HSPA Product Line Management, Nokia Siemens Networks, 2007. General Manager, Radio Controller Product Management, Nokia Networks 2005–2007. Director, Sales & Marketing (Lead Sales Director), France Telecom/Orange Nokia Networks, 2002–2005. Operations Director, Northeast Europe, Central & Eastern Europe and Middle East, Nokia Networks, 1999–2002.

Marcus Weldon
b. 1968

Corporate Chief Technology Officer and President of Nokia Bell Labs. Group Leadership Team member since 2017. Joined Nokia in 2016.

Ph.D (Physical Chemistry) degree, Harvard University, Cambridge, Massachusetts, the United States. Bachelor of Science (Computer Science and Chemistry) joint degree, King's College, London, the United Kingdom.

Corporate Chief Technology Officer and President of Bell Labs, Alcatel Lucent (then Nokia) 2013–2016. Corporate Chief Technology Officer, Alcatel Lucent 2009–2013. Chief Technology Officer, Broadband Networks & Solutions, Alcatel Lucent 2006–2009. Member of Technical Staff, Bell Labs, Lucent Technologies 1997–2006.

Network Partner to Keen Venture Partners. Advisor to Mundi Ventures.

Stephanie Werner
b. 1972

Chief Human Resources Officer. Group Leadership Team as of 2020. Joined Nokia in 1998.

Diploma in Applied business languages (Chinese) and International business studies, University of Applied Sciences, Bremen, Germany.

Vice President, Global Center of Expertise, Germany, Nokia, 2018–2019. Vice President, Business HR Head for Nokia Corporate Functions, Germany, Nokia, 2016–2018. Managing Director, International Management GmbH, Germany, Nokia, 2013–2017. Head of Business Human Resources for Chief Finance Officer/Organization, Germany, Nokia, 2012–2015. Head of NSN Business Talent, Leadership & Organization Development, Germany, Nokia Siemens Networks, 2011–2012. Head of Business Human Resources of Nokia Radio Access, Germany, Nokia 2007–2011. Head of HR Emerging Markets, Romania, Nokia, 2007. Senior HR Manager, Strategic Projects, USA, Nokia, 2004–2006. HR Manager Global Platforms, Germany, Nokia, 2001–2004. HR Country Manager Philippines, Philippines, Nokia, 1999–2001. HR Manager Nokia Networks for Switzerland, Nokia, 1998–1999.

During 2019 and thereafter, the following new appointments were made to the Group Leadership Team:

- § Ricky Corker was appointed President of Customer Operations, Americas and member of the Group Leadership Team as of January 1, 2019;
- § Tommi Uitto, President of Mobile Networks, was appointed to the Group Leadership Team as of January 31, 2019;
- § Sandra Motley, President of Fixed Networks, was appointed to the Group Leadership Team as of January 31, 2019;
- § Nassib Abou-Khalil was appointed Chief Legal Officer and member of the Group Leadership Team as of August 1, 2019;
- § Jenni Lukander was appointed President of Nokia Technologies and member of the Group Leadership Team as of August 1, 2019;
- § Gabriela Styf Sjöman was appointed Chief Strategy Officer and member of the Group Leadership Team as of December 1, 2019;
- § Stephanie Werner was appointed Chief Human Resources Officer and member of the Group Leadership Team as of January 1, 2020; and
- § Pekka Lundmark was appointed President and CEO on March 2, 2020. He is expected to start in his role on September 1, 2020.

During 2019 and thereafter, the following members of the Group Leadership Team resigned:

- § Maria Varsellona, President of Nokia Technologies and Chief Legal Officer, stepped down from the Group Leadership Team as of July 31, 2019;
- § Joerg Erlemeier, Chief Operating Officer, stepped down from the Group Leadership Team as of December 31, 2019;
- § Hans-Jürgen Bill, Chief Human Resources Officer, stepped down from the Group Leadership Team as of December 31, 2019; and
- § Rajeev Suri, President and CEO and the Chair of the Group Leadership Team, will step down from the Group Leadership Team as of August 31, 2020.

Furthermore, during 2019 and thereafter, the following changes took place within the Group Leadership Team:

- § Kathrin Buvac, Chief Strategy Officer (until 30 November 2019) and member of the Group Leadership Team was appointed President of Nokia Enterprise as of January 1, 2019;
- § Federico Guillén, President of Fixed Networks and member of the Group Leadership Team was appointed President of Customer Operations, EMEA & APAC as of January 1, 2019;
- § Sanjay Goel, President of Global Services and member of the Group Leadership Team was in addition to this appointed President of Operations as of January 1, 2020; and
- § Bhaskar Gorti, President of Nokia Software and member of the Group Leadership Team was in addition to this role appointed Chief Digital Officer as of January 1, 2020.

Risk management, internal control and internal audit functions at Nokia

Main features of risk management systems

We have a systematic and structured approach to risk management. Key risks and opportunities are primarily identified against business targets either in business operations or as an integral part of strategy and financial planning. Risk management covers strategic, operational, financial and hazard risks. Key risks and opportunities are analyzed, managed and monitored as part of business performance management with the support of risk management personnel and the centralized Enterprise Risk Management function.

The principles documented in the Nokia Enterprise Risk Management Policy, which is approved by the Audit Committee of the Board, require risk management and its elements to be integrated into key processes. One of the core principles is that the business or function head is also the risk owner, although all employees are responsible for identifying, analyzing and managing risks, as appropriate, given their roles and duties. Our overall risk management concept is based on managing the key risks that would prevent us from meeting our objectives, rather than solely focusing on eliminating risks. In addition to the principles defined in the Nokia Enterprise Risk Management Policy, other key policies reflect implementation of specific aspects of risk management.

Key risks and opportunities are reviewed by the Group Leadership Team and the Board in order to create visibility on business risks as well as to enable prioritization of risk management activities. Overseeing risk is an integral part of the Board's deliberations. The Board's Audit Committee is responsible for, among other matters, risk management relating to the financial reporting process and assisting the Board's oversight of the risk management function. The Board's role in overseeing risk includes risk analysis and assessment in connection with financial, strategy and business reviews, updates and decision-making proposals.

Description of internal control procedures in relation to the financial reporting process

The management is responsible for establishing and maintaining adequate internal control over financial reporting for Nokia. Our internal control over financial reporting is designed to provide reasonable assurance to the management and the Board regarding the reliability of financial reporting and the preparation and fair presentation of published financial statements.

The management conducts a yearly assessment of Nokia's internal controls over financial reporting in accordance with the Committee of Sponsoring Organizations framework (the "COSO framework", 2013) and the Control Objectives for Information and Related Technology (COBIT) framework of internal controls. The assessment is performed based on a top-down risk assessment of our financial statements covering significant accounts, processes and locations, corporate-level controls and information systems' general controls.

As part of its assessment the management has documented:

- § the corporate-level controls, which create the "tone from the top" containing the Nokia values and Code of Conduct and which provide discipline and structure to decision-making processes and ways of working. Selected items from our operational mode and governance principles are separately documented as corporate-level controls;
- § the significant processes: (i) give a complete end-to-end view of all financial processes; (ii) identify key control points; (iii) identify involved organizations; (iv) ensure coverage for important accounts and financial statement assertions; and (v) enable internal control management within Nokia;
- § the control activities, which consist of policies and procedures to ensure the management's directives are carried out and the related documentation is stored according to our document retention practices and local statutory requirements; and
- § the information systems' general controls to ensure that sufficient IT general controls, including change management, system development and computer operations, as well as access and authorizations, are in place.

Further, the management has also:

- § assessed the design of the controls in place aimed at mitigating the financial reporting risks;
- § tested operating effectiveness of all key controls; and
- § evaluated all noted deficiencies in internal controls over financial reporting in the interim and as of year-end.

In 2019, Nokia has followed the procedures as described above and has reported on the progress and assessments to the management and to the Audit Committee of the Board on a quarterly basis.

Description of the organization of the internal audit function

We also have an internal audit function that acts as an independent appraisal function by examining and evaluating the adequacy and effectiveness of our system of internal control. Internal audit reports to the Audit Committee of the Board. The head of the internal audit function has direct access to the Audit Committee, without involvement of the management. The internal audit staffing levels and annual budget are approved by the Audit Committee. All authority of the internal audit function is derived from the Board. The internal audit aligns to the business regionally and by business and function.

Annually, an internal audit plan is developed with input from the management, including key business risks and external factors. This plan is approved by the Audit Committee. Audits are completed across the business focused on site level, customer level, business project level, IT system implementation, IT security, operations activities or at a Group function level. The results of each audit are reported to the management identifying issues, financial impact, if any, and the correcting actions to be completed. Quarterly, the internal audit function communicates the progress of the internal audit plan completion, including the results of the closed audits, to the Audit Committee.

Internal audit also works closely with our Ethics and Compliance office to review any financial concerns brought to light from various channels and, where relevant, works with Enterprise Risk Management to ensure priority risk areas are reviewed through audits.

In 2019, the internal audit plan was completed and all results of these reviews were reported to the management and to the Audit Committee.

Related party transactions

We determine and monitor related parties in accordance with the International Accounting Standards (IAS 24) and other applicable regulations. We maintain information of our related parties as well as monitor and assess related party transactions. As a main principle all transactions are conducted at arm's-length and are considered to be part of ordinary course of business. In an exceptional case where these principles would be deviated from, the company would set up a separate process to determine related parties and seek relevant approvals in accordance with internal guidelines and applicable regulations.

Main procedures relating to insider administration

Our insider administration is organized according to the applicable European Union and Finnish laws and regulations. In addition, the Board of Directors has approved Nokia Insider Policy which sets out Nokia-wide rules and practices to ensure full compliance with applicable rules and that inside information is recognized and treated in an appropriate manner and with the highest integrity. The policy is applicable to all Nokia employees.

Persons discharging managerial responsibilities

Nokia has identified members of the Board of Directors and the Group Leadership Team as persons discharging managerial responsibilities who, along with persons closely associated with them, are required to notify Nokia and the Finnish Financial Supervisory Authority of their transactions with Nokia's financial instruments. Nokia publishes the transaction notifications.

In addition, under the Nokia Insider Policy, persons discharging managerial responsibilities are obligated to clear with the Deputy Chief Legal Officer, Corporate, a planned transaction in Nokia's financial instruments in advance. It is also recommended that trading and other transactions in Nokia's financial instruments are carried out in times when the information available to the market is as complete as possible.

Closed window

Persons discharging managerial responsibilities are subject to a closed window period of 30 calendar days preceding the disclosure of Nokia's quarterly or annual result announcements, as well as the day of the disclosure. During the closed window period, persons discharging managerial responsibilities are prohibited from dealing in Nokia's financial instruments.

Nokia has imposed this closed window period also on separately designated financial reporting persons who are recurrently involved with the preparation of Nokia's quarterly and annual results announcements. These persons are separately notified of their status as designated financial reporting persons.

Insider registers

Nokia does not maintain a permanent insider register. Insiders are identified on a case-by-case basis for specific projects and are notified of their insider status. Persons included in a project-specific insider register are prohibited from dealing in Nokia's financial instruments until the project ends or is made public.

Supervision

Our insider administration's responsibilities include internal communications related to insider matters and trading restrictions, setting up and maintaining our insider registers, arranging related trainings as well as organizing and overseeing compliance with the insider rules.

Violations of the Nokia Insider Policy must be reported to the Deputy Chief Legal Officer, Corporate. Nokia employees may also use channels stated in the Nokia Code of Conduct for reporting incidents involving alleged violations of the Nokia Insider Policy.

Share ownership of the Board of Directors and the Nokia Group Leadership Team

The following table sets forth the number of shares and ADSs held by the members of the Board at December 31, 2019 when they held a total of 2 496 107 shares and ADSs in Nokia, which represented approximately 0.04% of our total shares and voting rights excluding shares held by Nokia Group.

Name	Shares ⁽¹⁾	ADSs ⁽¹⁾
Risto Siilasmaa (Board Chair)	1 386 629	
Sari Baldauf (Board Vice Chair)	114 697	
Bruce Brown		144 835
Jeanette Horan	41 331	
Edward Kozel	44 669	20 525
Elizabeth Nelson		88 239
Olivier Piou	295 575	
Søren Skou	14 063	
Carla Smits-Nusteling	57 755	
Kari Stadigh	287 789	

(1) The number of shares or ADSs includes shares and ADSs received as director compensation as well as shares and ADSs acquired through other means. Stock options or other equity awards that are deemed as being beneficially owned under the applicable SEC rules are not included. For the number of shares or ADSs received as director compensation, refer to section "–Compensation" and Note 35, Related party transactions, of our consolidated financial statements included in this annual report on Form 20-F.

The following table sets forth the number of shares and ADSs held by the President and CEO and the other members of the Group Leadership Team in office at December 31, 2019 when they held a total of 5 520 978 shares and ADSs in Nokia, which represented approximately 0.10% of our total shares and voting rights excluding shares held by Nokia Group.

Name	Position in 2019	Shares ⁽¹⁾	ADSs ⁽¹⁾
Rajeev Suri	President and CEO	2 798 146	
Nassib Abou-Khalil	Chief Legal Officer	32 863	
Basil Alwan	Co-president of IP/Optical Networks	206 333	81 000
Hans-Jürgen Bill	Chief Human Resources Officer	261 742	
Kathrin Buvac	President of Nokia Enterprise	147 570	
Rick Corker	President of Customer Operations, Americas	175 597	
Joerg Erlemeier	Chief Operating Officer	136 833	
Barry French	Chief Marketing Officer	302 789	
Sanjay Goel	President of Global Services	175 963	
Bhaskar Gorti	President of Nokia Software	269 698	
Federico Guillén	President of Customer Operations Officer, EMEA & APAC	194 767	
Jenni Lukander	President of Nokia Technologies	7 609	
Sandra Motley	President of Fixed Networks	15 298	
Kristian Pullola	Chief Financial Officer	347 029	
Sri Reddy	Co-president of IP/Optical Networks	171 150	100 000
Gabriela Styf Sjöman	Chief Strategy Officer	4 000	
Tommi Uitto	President of Mobile Networks	27 364	
Marcus Weldon	Chief Technology Officer and President of Bell Labs	65 227	

(1) The number of shares or ADSs includes shares received as executive compensation as well as shares and ADSs acquired through other means. Stock options or other equity awards that are deemed as being beneficially owned under the applicable SEC rules are not included. For further information on compensation refer to section " –Compensation".

Auditor fees and services

PricewaterhouseCoopers Oy has served as our auditor for each of the financial years in the three-year period ended December 31, 2019. The auditor is elected annually by our shareholders at the Annual General Meeting for the financial year in question. The Audit Committee of the Board prepares the proposal to the shareholders in respect of the appointment of the auditor based upon its evaluation of the qualifications and independence of the auditor to be proposed for election or re-election on an annual basis.

The following table presents fees by type paid to PricewaterhouseCoopers' network of firms for the years ended December 31:

EURm	2019	2018
Audit fees ⁽¹⁾	22.7	24.9
Audit-related fees ⁽²⁾	1.2	2.1
Tax fees ⁽³⁾	1.9	1.8
All other fees ⁽⁴⁾	–	0.2
Total	25.8	29.0

(1) Audit fees consist of fees incurred for the annual audit of the Group's consolidated financial statements and the statutory financial statements of the Group's subsidiaries.

(2) Audit-related fees consist of fees billed for assurance and related services that are reasonably related to the performance of the audit or review of the Group's financial statements or that are traditionally performed by the independent auditor, and include consultations concerning financial accounting and reporting standards; advice and assistance in connection with local statutory accounting requirements; due diligence related to mergers and acquisitions; and audit procedures in connection with investigations in the pre-litigation phase and compliance programs. They also include fees billed for other audit services, which are those services that only the independent auditor can reasonably provide, and include the provision of comfort letters and consents in connection with statutory and regulatory filings and the review of documents filed with the SEC and other capital markets or local financial reporting regulatory bodies.

(3) Tax fees include fees billed for: (i) services related to tax compliance including preparation and/or review of tax returns, preparation, review and/or filing of various certificates and forms and consultation regarding tax returns and assistance with revenue authority queries; compliance reviews, advice and assistance on other indirect taxes; and transaction cost analysis; (ii) service related to tax audits; (iii) services related to individual compliance (preparation of individual tax returns and registrations for employees (non-executives), assistance with applying visa, residency, work permits and tax status for expatriates); (iv) services related to technical guidance on tax matters; (v) services related to transfer pricing advice and assistance with tax clearances; and (vi) tax consultation and planning (advice on stock-based remuneration, local employer tax laws, social security laws, employment laws and compensation programs and tax implications on short-term international transfers).

(4) Other fees include fees billed for company establishments; liquidations; forensic accounting, data security, other consulting services and reference materials and services.

Auditor rotation

The Board of Directors is responsible for proposing the external auditor for election by the shareholders, upon recommendation from the Audit Committee of the Board of Directors. Under applicable auditor rotation rules, Nokia must change auditors from its current auditor PricewaterhouseCoopers Oy (PwC) no later than for the financial year 2020. Accordingly, PwC declined to stand for re-election for the financial year 2020. Therefore in 2018, Nokia initiated a tendering process, overseen by the Audit Committee, for appointment of Nokia Corporation's auditor for the financial year 2020. To give the elected auditor time to prepare for the new audit engagement, the Board of Directors decided to propose the appointment of auditor for the financial year 2020 already at the 2019 Annual General Meeting of shareholders. Based on the recommendation of the Audit Committee, the Board of Directors proposed to the AGM that Deloitte Oy be elected as the Company's auditor for the financial year 2020. On May 21, 2019, the AGM resolved to appoint PwC as auditors of Nokia Corporation for the financial year 2019 and Deloitte Oy for the financial year 2020.

In respect of financial years 2019 and 2018 and the subsequent interim period ended March 5, 2020:

§ PwC has not issued any report on the financial statements or on the effectiveness of internal control over financial reporting of Nokia or any of its subsidiaries that contained an adverse opinion or a disclaimer of opinion. The relevant PwC auditor's reports were not qualified or modified as to uncertainty, audit scope or accounting principles.

§ There has not been any disagreement with PwC on any matter of accounting principles or practices, financial statement disclosure, or auditing scope or procedure, which disagreement, if not resolved to PwC's satisfaction, would have caused PwC to make reference to the subject matter of the disagreement in connection with its auditor's reports.

§ There has not been any "reportable event" as described in Item 16F(a)(1)(v) of Form 20-F except for the material weakness in the design of controls related to the reporting of contract assets, contract liabilities and related balances in accordance with IFRS 15, Revenue from Contracts with Customers, which was identified by management during Q3 2018 and subsequently remediated as of December 31, 2018.

Nokia has provided PwC with a copy of the foregoing disclosure and has requested that they furnish it with a letter addressed to the U.S. Securities and Exchange Commission stating whether it agrees with such disclosure and, if not, stating the respects in which it does not agree. A copy of PwC's letter dated 5 March 2020, in which they stated that they agree with such disclosure, is filed as Exhibit 15.2.

Compensation

This section sets out our remuneration governance, policies and how they have been implemented within Nokia and includes our Remuneration Report where we provide disclosure of the compensation of our Board, the President and CEO and aggregated compensation information for the Group Leadership Team, other than the President and CEO, for 2019. We report information applicable to executive compensation in accordance with Finnish regulatory requirements and with requirements set forth by the U.S. Securities and Exchange Commission that are applicable to us.

Highlights

- § 2019 Compensation for the President and CEO declined by 16% to EUR 3 897 625, driven by below target payout from the 2016 long term incentive award and a below target 2019 short term incentive award (39% of target), reflecting the below target performance of the business. We remain very positive about the outlook for the business given the expected growth in our 5G business.
- § For the 2019 Performance Share plan, the performance period was increased to three years, reflecting input from shareholders.
- § Shareholders will be asked to adopt Nokia's remuneration policy as part of a "Say on Pay" vote in the 2020 AGM. The policy has remained relatively stable after the changes made in 2018. We reached out to our largest shareholders once again in 2019, and they acknowledged the changes made in 2018, and were supportive of some minor technical amendments to facilitate operational flexibility in the plan for the next four years. The remuneration policy to be presented to shareholders is available on our website.
- § Importantly, we now have no unexplained gender pay gap in Nokia meaning that women and men are paid fairly and in line with the market and their skills and experience. There was a small historic difference in the pay of women and men in Nokia and in 2019 we took active measures and eliminated this gap. We continue to monitor this position.
- § We remain confident in our business and program to deliver the returns our shareholders expect, and our compensation programs will: work to incentivize the management to deliver the desired strategy and results; reward management for results; ensure the interest of shareholders and employees are aligned; and ensure retention of key employees.

Word from the Chair of the Personnel Committee of the Board

Dear Fellow Shareholder,

2019 was a year of mixed fortunes seeing 5G really take off and good performance from some of our business groups. It also presented challenges to us at an operational level for Nokia with profits and cash flow below target. This was illustrated by the impact on our share price. Given the cash challenges in the business and the need for incremental R&D investment to support 5G, the Board decided to pause dividends in order to a) guarantee Nokia's ability to increase 5G investments, b) continue investing in growth in strategic focus areas of enterprise and software and c) strengthen Nokia's cash position. The Board expects to resume dividend distributions after Nokia's net cash position improves to approximately EUR 2 billion.

The below target performance is reflected in the results of the compensation programs with a 2019 short term incentive award for the CEO at 39% of target. We remain very positive about the outlook for the business given the expected growth in our 5G business, and the encouraging progress in our strategic areas of Nokia Enterprise, Nokia Software, IP Routing, and the continued success of Nokia Technologies.

Shareholders will be asked to adopt Nokia's remuneration policy as part of a "Say on Pay" vote in the 2020 AGM. The 2019 remuneration policy has remained relatively stable after the changes made in 2018. We reached out to our largest shareholders once again in 2019, and they acknowledged the changes made in 2018, and were supportive of some minor technical amendments to facilitate operational flexibility in the plan for the next four years. Our updated 2020 policy will be available on our website prior to the AGM.

Business context

Below target performance was driven by market pressure in China, slower than expected 5G growth, and some product development challenges in 5G. Success in IP Routing, Nokia Enterprise, Nokia Software, and Nokia Technologies was insufficient to offset the challenges in Mobile Access.

Strategy and compensation

At the core of Nokia's philosophy lie two principles:

§ pay for performance; and aligning the interests of employees with shareholders; and

§ ensuring that compensation programs and policies support the delivery of the corporate strategy and create long-term sustainable shareholder value.

Over the mid to long term, it is our intent to deliver earnings growth based on improved operating performance, and to deliver cash growth to resume the dividend for our shareholders, as well as fund investments in the future growth of the business. To support this, the metrics in our short term incentive plans focus on revenue, profit and cash flow, and our long-term incentive plans focus on value creation for shareholders (measured by absolute total shareholder return).

The committee considered whether and how our incentive structures incentivise environmental, sustainability, and governance (ESG) priorities. Our view is that these key priorities are supported by a focus on the share price element of the long term incentives which forms a significant element of the overall compensation for our senior leaders. The interaction of ESG initiatives with the way we operate our business is complex and as no single ESG metric on its own defines our business, the view of the Board is that this is best managed by Nokia's senior leaders in consultation with key stakeholders. To better understand the breadth and depth of Nokia's ESG Program, please see Nokia's People & Planet report.

Shareholder outreach

During 2019 we met with some of our shareholders to hear their views on our compensation policies, programs and associated disclosures. We have taken these views into account in both the measures for the 2020 incentive plans and also in the policy that will be presented to shareholders at the Annual General Meeting.

2019 compensation structure

Changes were made during 2019 to the compensation arrangements, in two main areas, to better align with our stated intent and to align senior managers interests further with those of our shareholders.

Three year performance period

Having changed the performance measures in 2018 to market share, earnings per share and free cash flow it was decided that the measurement period for the plan should be extended to three years for the 2019 awards which will be based on the performance of financial years 2019 to 2021.

Change in CEO pay

For 2019 the total target compensation for the CEO was increased by 2% which represents his first increase since January 2016. As part of the exercise we also changed the mix of the compensation to re-set the leverage which had risen above 85%. It should be noted that although his opportunity increased, the direct linkage of some 80% of his compensation to company results meant that his actual compensation decreased.

2019 remuneration outcomes

Overall the compensation received by the President and CEO declined to EUR 3 897 625 down by over 16% from 2018, directly related to company performance.

§ A lower short-term incentive of EUR 637 163, or 39% of target incentive reflecting the challenging year.

§ A lower long-term incentive of EUR 1 841 843 being 46.25% of the target based on performance for financial years 2016 and 2017.

The President and CEO also received the final tranche of a special long-term incentive award granted in 2016 to incentivize the delivery of synergies from the Alcatel Lucent acquisition. This award is payable in Nokia shares so whilst the number of shares has not changed, the value of the award has reduced in line with the fall in Nokia's share price.

Share ownership requirement

The President and CEO is required to own three times his base salary in Nokia shares and currently exceeds this requirement significantly. Mr Suri currently owns 2 951 551 Nokia shares. Of these, he has purchased over 1 million shares since 2016 over and above those received under Nokia incentive plans. Together with his performance linked compensation, this personal shareholding means that Mr Suri is strongly aligned to the interests of shareholders.

Looking forward to 2020

Changes in 2018 and 2019 to our compensation structure, together with refocusing the metrics for 2020, have now aligned the compensation for the President and CEO against the right peer group, the strategic needs of the business, and investor expectations. Changes to incentives for 2020 are clearly focused on driving cash and profitable business results, and we believe that rewarding delivery of the measures in our incentive plans will deliver the desired longer term outcomes for Nokia. While our markets remain challenging, focusing on operating discipline and driving growth in areas such as Nokia Enterprise, Nokia Software and IP Routing, will bear fruit as we address the challenges in the 5G space.

Remuneration Policy

Whilst results in 2019 have been disappointing, our current policy has ensured that management compensation is aligned with company performance. The proposed 2020 Remuneration Policy will be very similar to the current policy and will be presented to the Annual General Meeting. I hope that you will give it your full support.

Short and long-term incentives in 2020.

Our 2020 incentive plans follow this structure:

Delivering sustainable value – Long-term incentive		
Absolute Total Shareholder Return 100%		
Focus on increase in share price and restoration of the dividend		
Delivering the next year's step in the strategic plan – Short-term incentive		
Revenue 20%	Operating profit 40%	Free cash flow 40%
Deliver annual plan revenue	Deliver annual plan profitability	Deliver planned annual free cash flow

The 2020 long-term incentive is based on performance over the life of the three-year plan vesting in 2023. The metric will be absolute total shareholder return. By using this metric, we will incentivize executives to deliver the desired business results and support the restoration of the dividend.

The 2018 long-term incentive will payout at 56.82% of target award, based on the achievement against the revenue and earnings per share targets during the performance period of financial years 2017 and 2018. The shares will vest on January 1, 2021. The 2018 plan was the last of the two year performance period programs.

These changes to our incentives for 2020 mean that short-term plans are more focused now on profit and cash flow and long-term incentives are focused on growing share price and restoring the dividend.

It is of little comfort that our incentive plans had a reduced pay out this year given the performance of the company, but it is reassuring to know that there is alignment between the interests of our executives, employees and shareholders. Our focus remains on improving the Company's performance and delivering the returns that our Shareholders expect. We will continue to work to ensure our compensation programs properly incentivize the management to deliver the strategy, and to ensure shareholder and management interests remain aligned. We will also continue to strive to increase transparency and understanding of our compensation plans and policies and share our analysis of their effectiveness. We work to improve our disclosures and engagement and look forward to working with you, our shareholders, as we move toward a new era in Finland and Europe with the Say on Pay becoming a reality.

Bruce Brown, Chair of the Personnel Committee

Pay overview of the President and CEO

Element	Year ended 31 December 2020, subject to and in accordance with the separately published Remuneration Policy to be presented to the Annual General Meeting 2020.	Year ended 31 December 2019
Base salary	EUR 1 300 000	EUR 1 300 000
Short-term incentives ⁽¹⁾	<p>Target award: 125% of base salary</p> <p>Minimum 0% of base salary Maximum 281.25% of base salary</p> <p>Measures:</p> <ul style="list-style-type: none"> ■ 100% Nokia scorecard <ul style="list-style-type: none"> □ 20% revenue □ 40% operating profit □ 40% free cash flow <p>Achievement against measures is multiplied by the business results multiplier (operating profit), the overriding affordability measure.</p>	<p>Target award: 125% of base salary</p> <p>Minimum 0% of base salary Maximum 281.25% of base salary</p> <p>Measures:</p> <ul style="list-style-type: none"> ■ 80% Nokia scorecard <ul style="list-style-type: none"> □ 1/3 revenue □ 1/3 operating profit □ 1/3 free cash flow (excluding restructuring) ■ 20% Personal strategic objectives <p>Achievement against measures is multiplied by the business results multiplier (operating profit), the overriding affordability measure.</p>
Long-term incentives (Performance Shares) ⁽²⁾	<p>Target award: 200% of base salary (EUR 2 600 000)</p> <p>Minimum payout 0% of base salary Maximum payout 400% of base salary²</p> <p>Metrics: Absolute Total Shareholder Return</p>	<p>Target award: 200% of base salary (EUR 2 600 000)</p> <p>Minimum payout 0% of base salary maximum payout of 400% of base salary²</p> <p>Metrics:</p> <ul style="list-style-type: none"> ■ Market share ■ Earnings per share ■ Free cash flow
Pension	Contribution to the mandatory TyEL pension plan in Finland.	Contribution to the mandatory TyEL pension plan in Finland.
Benefits & mobility	Mobility related benefits, life and critical illness insurance and private medical insurance.	Mobility related benefits, life and critical illness insurance and private medical insurance.
Total Target Remuneration	EUR 7 541 000	EUR 7 541 000
Share ownership requirement	Target: 3 times base salary Target (amount): EUR 3 900 000	Target: 3 times base salary Target (amount): EUR 3 900 000

(1) Revenue, operating profit and earnings per share measures exclude costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

(2) The maximum payout from the long-term incentive plan is 200% of the units awarded. At a target award of 200% of base salary this could result in a maximum payout of 400% of base salary ignoring share price movement.

Remuneration Policy 2019

In this section, we describe our Remuneration Policy for the President and CEO and the Board of Directors in effect in 2019.

As we approach our first Say on Pay at the Annual General Meeting in 2020, we publish on our website as part of the Annual General Meeting documents the new 2020 remuneration policy, applicable to the President and CEO and the Board of Directors which has only minor modifications to the policy in place in 2019. As with current practice, the Board remuneration will be resolved annually by shareholders.

Below we also describe the principles of remunerating our Group Leadership Team, excluding the President and CEO.

While we are a Finnish company we compete in a global market for talent in the technology sector. In forming the policy we take into account the views of shareholders and the needs of the company to attract, retain and motivate individuals of suitable caliber and experience to lead Nokia. We also take into account the performance of the company, and where appropriate the individuals when assessing any potential changes against market practices and conditions and the compensation paid to our employees more broadly.

The Board regularly monitors the effectiveness of the measures used in our incentive plans to ensure that they align with and drive the strategy of the company.

Revenue, operating profit, and earnings per share measures referred to in the Remuneration Policy exclude costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items as applicable.

The President and CEO

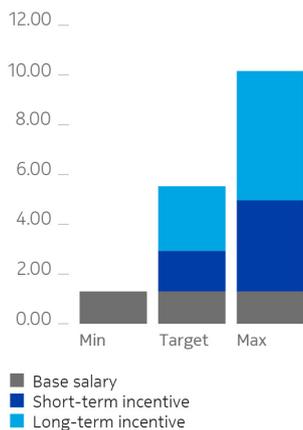
The table below summarizes the main components of the compensation for the President and CEO in 2019.

Element	Purpose	Operation	Opportunity
Base pay	Provide competitive base salary to attract and retain individual with the requisite level of knowledge, skills and experience to lead our businesses.	<p>Base pay is normally reviewed annually taking into consideration a variety of factors, including, for example, the following:</p> <ul style="list-style-type: none"> ■ performance of the company and the individual; ■ remuneration of our external comparator group; ■ changes in individual responsibilities; and ■ employee salary increases across Nokia and in the local market. 	Pay reviews are set within the context of employee increases and changes within the Nokia peer group. Changes reflect not only improving performance but also improving competence and skills as would be applied to any other employee in Nokia.
Short-term incentives	To incentivize and reward performance against delivery of the annual business plan.	<p>Short-term incentives are based on performance against single year targets and normally paid in cash.</p> <p>Targets for the short-term incentives are set at the start of the year, in the context of analyst expectations and the annual plan, selecting measures that align to the delivery of Nokia's strategy.</p> <p>Achievement is assessed at the end of the year.</p> <p>Short-term incentives are subject to the clawback policy (see below).</p>	<p>Minimum 0% of base salary.</p> <p>Target 125% of base salary.</p> <p>Maximum 281.25% of base salary.</p>
Long-term incentives	To reward for delivery of sustainable long-term performance, align the President and CEO's interests with those of shareholders and aid retention.	<p>Annual long-term incentive awards are normally made in performance shares and paid for performance against longer-term targets.</p> <p>Targets are set in the context of the Nokia long-term plans and analyst forecasts ensuring that they are considered both demanding and motivational.</p> <p>Long-term incentives are subject to the clawback policy (see below).</p>	<p>Minimum 0% of base salary.</p> <p>Target award level is 200% of base salary.</p> <p>Maximum 400% of base salary.</p> <p>The Personnel Committee retains discretion to make awards up to twice that level in exceptional circumstances such as for example upon recruitment, significant change in responsibilities, significant strategic change or other similar events. The use of discretion would be explained at the time.</p>
Benefits & perquisites	To attract, retain and protect the President and CEO.	Benefits are made available as part of the same policy that applies to employees more broadly in the relevant country, with additional security provisions, as appropriate.	The value will be the cost to the company.
Relocation & mobility	To support international mobility and ensure the right person is in the right location to meet business needs.	Support may be offered to cover additional costs related to relocation to and working in a location other than home country based on business need. The policy supports the mobility needs of an individual and their dependents or the reasonable costs of commuting.	Benefits are market specific and are not compensation for performing the role but provided to defray costs or additional burdens of a relocation or residence outside the home country.
Retirement plans	To provide for retirement with a level of certainty.	<p>Retirement age is defined and pensions are provided in line with local country arrangements; in Finland this is the statutory Finnish pension system (Finnish TyEL).</p> <p>Under the TyEL arrangements, base salary, incentives and other taxable benefits are included in the definition of earnings while gains from equity related plans are not.</p> <p>No supplemental pension arrangements are provided in Finland.</p>	Pursuant to Finnish legislation, Nokia is required to make contributions to the Finnish TyEL pension arrangements in respect of the President and CEO. Such payments can be characterized as defined contribution payments. The amount is disclosed in the Remuneration Report.

Illustration of the earning opportunity for the President and CEO

The illustration below shows the pay components of the President and CEO at minimum, target and maximum payout.

Earning opportunity of the President and CEO (EURm)



Share ownership requirement

Nokia believes that it is desirable for its executives to own shares in Nokia to align their interests with those of shareholders and to ensure that their decisions are in the long-term interest of the company. The President and CEO is required to own three times his base salary in Nokia shares and is given a period of five years from appointment to achieve the required level of share ownership.

Remuneration on recruitment

Our policy on recruitment is to offer a compensation package which is sufficient to attract, retain and motivate the individual with the right skills for the required role. Any offer would be expected to fit within the framework described above.

On occasion, we may offer compensation to buy out awards or other lost compensation which the candidate held prior to joining Nokia, but which lapsed upon the candidate leaving their previous employer. Due consideration is given to the potential value and timing of such awards, taking into account any conditions attached to the awards and the likely performance against such conditions.

Clawback

The President and CEO is subject to a clawback policy where any restatement of financial results may result in the reclaiming of amounts previously paid which had been based on numbers which have since been materially restated. Any such reclaimed amount, and the period over which payments can be reclaimed, will take into account the circumstances and duration of any misstatement. In the case of unintentional misstatement payments made within the last three years may be subject to the policy at the discretion of the Personnel Committee.

Termination provisions

In the event of a termination of employment, any payable compensation is determined in line with legal advice regarding local legislation, country policies, contractual obligations and the rules of the applicable incentive and benefit plans. Current termination provisions of the President and CEO's service agreement are described under "Termination provisions of the President and CEO".

Change of control arrangements are offered on a very limited basis only and are based on a double trigger structure, which means that both a specified change of control event and termination of the individual's employment must take place for any change of control-based severance payment to materialize.

Board of Directors

The Board's Corporate Governance and Nomination Committee periodically reviews the remuneration for the Chair and members of the Board against companies of similar size and complexity to ensure Nokia is able to attract a suitably diverse and relevant mix of skills and experience in order to maximize the value creation for shareholders.

The Annual General Meeting resolves annually on the remuneration to the Chair and members of the Board. The Chair of the Board's remuneration was last changed in 2008. The Board members' annual fees were last changed in 2016 with the previous change in 2007. The structure of the Board remuneration for the current term of the Board is set out in the table below.

Fees	Fees consist of annual fees and meeting fees. Approximately 40% of the annual fee is paid in Nokia shares purchased from the market on behalf of the Board members or alternatively delivered as treasury shares held by the Company. The balance is paid in cash, most of which is typically used to cover taxes arising from the paid remuneration. Meeting fees are paid in cash. Meeting fees are not paid to the Chair of the Board.
Incentives	Non-executive directors are not eligible to participate in any Nokia incentive plans and do not receive performance shares, restricted shares or any other equity-based or other form of variable compensation for their duties as members of the Board.
Pensions	Non-executive directors do not participate in any Nokia pension plans.
Share ownership requirement	Members of the Board shall normally retain until the end of their directorship such number of shares that corresponds to the number of shares they have received as Board remuneration during their first three years of service in the Board (the net amount received after deducting those shares needed to offset any costs relating to the acquisition of the shares, including taxes).
Other	Directors are compensated for travel and accommodation expenses as well as other costs directly related to Board and Committee work. The compensation is paid in cash.

Remuneration for the term that began at the Annual General Meeting held on May 21, 2019 and ends at the close of the Annual General Meeting in 2020 consists of the following fees:

Annual fee	EUR
Chair	440 000
Vice Chair	185 000
Member	160 000
Chair of Audit Committee	30 000
Member of Audit Committee	15 000
Chair of Personnel Committee	30 000
Chair of Technology Committee	20 000
Meeting fee ⁽¹⁾	EUR
Meeting requiring intercontinental travel	5 000
Meeting requiring continental travel	2 000

(1) Paid for a maximum of seven meetings per term. Not paid to the Chair of the Board.

Remuneration Report

The Remuneration Report prepared in accordance with regulations applicable to Nokia for the financial year 2019 provides information on the remuneration of the President and CEO and the Board of Directors between January 1, 2019 and December 31, 2019. We also describe the remuneration to our Group Leadership Team, excluding the President and CEO, on aggregate level below. Revenue, operating profit and earnings per share measures referred to in the Remuneration Report exclude costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

The President and CEO

The following table shows the remuneration received by the President and CEO in 2019 and 2018. The long-term incentive payments reflect actual payments in the respective years attributable to the vesting of the 2016 plan in 2019 (comparative figure show the payment of the 2015 Nokia performance share plan in 2018) and a special long-term incentive related to delivery of synergies from the Alcatel Lucent acquisition which pays in three tranches, in 2017, 2018 and 2019.

EUR	2019	2018
Salary	1 300 000	1 050 000
Short-term incentive ⁽¹⁾	637 163	873 862
Long-term incentive	1 841 843	2 597 426
Other compensation ⁽²⁾	118 619	129 721
Total	3 897 625	4 651 009

(1) Short-term incentives represent amounts earned in respect of the financial year, but that are paid in April of the following year.

(2) Other compensation includes compensation for housing equaling EUR 48 049 (2018: EUR 45 890); travel assistance equaling EUR 16 813 (2018: EUR 35 454); Tax services equaling EUR 16 826 (2018: EUR 12 230) and other benefits including mobile phone, driver and supplemental medical and disability insurance equaling EUR 36 931 (2018: EUR 36 147).

Pursuant to Finnish legislation, Nokia is required to make contributions to the Finnish TyEL pension arrangements in respect of the President and CEO. Such payments can be characterized as defined contribution payments. In 2019, payments to the Finnish state pension system equaled EUR 353 846 (EUR 312 607 in 2018).

Short-term incentive

The 2019 short-term incentive framework for the President and CEO was based on three core metrics: revenue, operating profit and free cash flow.

The short-term incentive for the President and CEO were based on the achievement of key financial targets and other strategic objectives, as defined above. Performance against these defined targets was then multiplied by a business results multiplier, which acts as a funding factor (based on operating profit) for the incentive plan for most employees, to determine the final payment.

Short-term incentive targets and achievements reflect the challenging market conditions yet also show the operational resilience of our business. In line with Nokia's performance in 2019, the short-term incentive of the President and CEO equaled EUR 637 163 or 39% of the target award, reflecting the over-delivery on revenue, but below target delivery of operating profit and free cash flow. Achievement by each element of the short-term incentive plan was as follows:

Metric	Weight	Target EURm	Achievement
Revenue	27%	22 748	100.56 %
Operating profit	27%	2 423	34.92 %
Free cash flow	27%	1 028	25.00 %

Long-term incentive

In 2019, the President and CEO's 2016 performance share award vested at 46.25% of the target award valued at EUR 1 618 530. This was based on performance of financial years 2016 and 2017.

In 2016, the President and CEO was granted a share award subject to the fulfillment of predetermined and demanding performance conditions related to the successful integration of Nokia and Alcatel Lucent. This award vested in three equal tranches, the last of which was in 2019 and worth EUR 223 313.

In 2019, the President and CEO was awarded the following equity awards under the Nokia equity program:

Performance share awards	Units awarded	Grant date fair value (EUR)	Grant date	Vesting date
Awarded as regular performance share award ⁽¹⁾	650 699	2 627 002	3 July 2019	1 January 2022

(1) The 2019 performance share plan has a three-year performance period based on financial targets. There is no minimum payout at below threshold performance for the President and CEO. The maximum payout would be 200% subject to maximum performance against all the performance criteria. Vesting is subject to continued employment.

Share ownership

Our share ownership policy requires that the President and CEO holds a minimum of three times his base salary in Nokia shares in order to ensure alignment with shareholder interests over the long term. This requirement has been met.

	Units	Value ⁽²⁾ (EUR)
Beneficially owned shares as of December 31, 2019	2 798 146	9 233 882
Vested shares under the 2017 performance share plan delivered on February 13, 2020 ⁽²⁾	153 405	506 237
Unvested shares under outstanding Nokia equity plans ⁽³⁾	1 689 492	5 575 323
Total	4 641 043	15 315 442

(1) The values are based on the closing price of a Nokia share of EUR 3.30 on Nasdaq Helsinki on December 30, 2019.

(2) The value of the shares at delivery was based on fair market value of a Nokia share of EUR 3.99 on Nasdaq Helsinki on February 13, 2020 giving a total value delivered of EUR 612 086. The number of shares delivered reflects the net number of shares delivered after the applicable taxes were withheld from the number of shares that vested to the President and CEO.

(3) The number of units represents the number of unvested awards as of December 31, 2019 including the payout factor of the 2018 performance share plan and excluding the 2017 performance share plan that vested on January 1, 2020.

Termination provisions of the President and CEO

Currently the termination provisions for the President and CEO's service agreement specify alternatives for termination and associated compensation in accordance with the following table:

Termination by	Reason	Notice	Compensation
Nokia	Cause	None	The President and CEO is entitled to no additional compensation and all unvested equity awards would be forfeited after termination.
Nokia	Reasons other than cause	Up to 18 months	The President and CEO is entitled to a severance payment equaling up to 18 months of compensation (including annual base salary, benefits, and target incentive) and unvested equity awards would be forfeited after termination.
President and CEO	Any reason	Six months	The President and CEO may terminate his service agreement at any time with six months' prior notice. The President and CEO would either continue to receive salary and benefits during the notice period or, at Nokia's discretion, a lump sum of equivalent value. Additionally, the President and CEO would be entitled to any short or long-term incentives that would normally vest during the notice period. Any unvested equity awards would be forfeited after termination.
President and CEO	Nokia's material breach of the service agreement	Up to 18 months	In the event that the President and CEO terminates his service agreement based on a final arbitration award demonstrating Nokia's material breach of the service agreement, he is entitled to a severance payment equaling up to 18 months of compensation (including annual base salary, benefits and target incentive). Any unvested equity awards would be forfeited after termination.

The President and CEO's service agreement includes special severance provisions in the event of a termination of employment following a change of control event. Such change of control provisions are based on a double trigger structure, which means that both a change of control event and the termination of the President and CEO's employment within a defined period of time must take place in order for any change of control-based severance payment to become payable. More specifically, if a change of control event has occurred, as defined in the service agreement, and the President and CEO's service with Nokia is terminated by either Nokia or its successor without cause, or by the President and CEO for "good reason", in either case within 18 months from such change of control event, the President and CEO would be entitled to a severance payment equaling up to 18 months of compensation (including annual base salary, benefits, and target incentive) and cash payment (or payments) for the pro-rated value of his outstanding unvested equity awards, restricted shares, performance shares and stock options (if any), payable pursuant to the terms of the service agreement. "Good reason" referred to above includes a material reduction of the President and CEO's compensation and a material reduction of his duties and responsibilities, as defined in the service agreement and as determined by the Board.

The President and CEO is subject to a 12-month non-competition obligation that applies after the termination of the service agreement or the date when he is released from his obligations and responsibilities, whichever occurs earlier.

Board of Directors

In 2019, the aggregate amount of compensation paid to the members of the Board for their services on the Board and its committees equaled EUR 2 219 000.

The Annual General Meeting held on May 21, 2019 resolved to elect ten members to the Board. The following members of the Board were re-elected for a term ending at the close of the Annual General Meeting in 2019: Sari Baldauf, Bruce Brown, Jeanette Horan, Edward Kozel, Elizabeth Nelson, Olivier Piou, Risto Siilasmaa, Carla Smits-Nusteling and Kari Stadigh. Søren Skou was elected as a new member of the Board for the same term. For director remuneration resolved by the Annual General Meeting for the current term refer to "Remuneration Policy 2019—Board of Directors" above.

The following table outlines the total annual compensation paid in 2019 to the members of the Board for their services, as resolved by the shareholders. The table does not include the meeting fees as resolved by the Annual General Meeting in 2019 since those fees for the ongoing term will be paid in 2020. For details of Nokia shares held by the members of the Board, refer to "Corporate Governance Statement—Share ownership of the Board of Directors" above.

	Annual fee (EUR)	Meeting fees (EUR)	Total remuneration paid (EUR)	Number of Shares Approximately 40% of the annual fee
Risto Siilasmaa, Board Chair	440 000	–	440 000	38 675
Sari Baldauf, Vice Chair	185 000	12 000	197 000	16 261
Bruce Brown	190 000	27 000	217 000	16 700
Jeanette Horan	175 000	22 000	197 000	15 382
Louis R. Hughes	–	22 000	22 000	–
Edward Kozel	195 000	20 000	215 000	17 140
Elizabeth Nelson	175 000	25 000	200 000	15 382
Olivier Piou	175 000	14 000	189 000	15 382
Søren Skou	160 000	–	160 000	14 063
Carla Smits-Nusteling	190 000	20 000	210 000	16 700
Kari Stadigh	160 000	12 000	172 000	14 063
Total			2 219 000	179 748

Remuneration governance

We manage our remuneration through clearly defined processes, with well-defined governance principles, ensuring that no individual is involved in the decision-making related to their own remuneration and that there is appropriate oversight of any compensation decision. Remuneration of the Board is annually presented to shareholders for approval at the Annual General Meeting and the remuneration of the President and CEO is approved by the Board.

Remuneration of the Board is annually presented to shareholders for approval at the Annual General Meeting. The Board submits its proposal to the Annual General Meeting on the recommendation of the Board's Corporate Governance and Nomination Committee, which actively considers and evaluates the appropriate level and structure of directors' remuneration. Shareholders also authorize the Board to resolve to issue shares, for example, to settle the company's equity-based incentive plans based on the proposal of the Board.

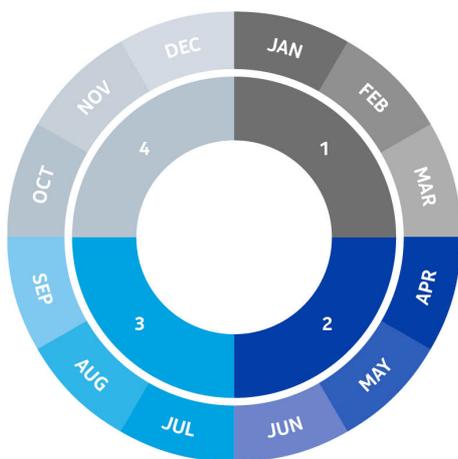
The Board of Directors approves, and the independent members of the Board confirm, the compensation of the President and CEO, upon recommendation of the Personnel Committee. The Personnel Committee consults regularly with the President and CEO and the Chief Human Resources Officer though they are not present when their own compensation is reviewed or discussed. This enables the Personnel Committee to be mindful of employee pay and conditions across the broader employee population. The Committee has the power, in its sole discretion, to retain compensation consultants to assist the Personnel Committee in evaluating director and executive compensation.

The Personnel Committee Chair regularly engages with shareholders on pay and broader matters to hear their views on our compensation policies, programs and associated disclosures and reflect on their feedback. For example, we had increased the performance period to three years in response to shareholders' feedback

The Remuneration Policy of the President and CEO and the Board will be presented to the shareholders' at the 2020 AGM and is expected to remain in force for four years.

Work of the Personnel Committee

The Personnel Committee convened four times during 2019 with a general theme for each meeting. In addition to meetings in person, the Committee held one meeting in writing.



- 1 Approvals & reporting
- 2 Philosophy & structure
- 3 Long-term direction & market review
- 4 Planning

January

- Review of the President and CEO compensation
- 2018 achievement review and short-term incentive plan payment approvals including review of the performance of the President and CEO
- Budget approval for the 2019 Nokia equity program and performance review for the 2017 performance share plan
- Review of the Group Leadership Team succession planning

July:

- Review of:
 - Compensation of the Group Leadership Team
 - The EU Shareholder Rights Directive II
 - Talent overview
 - Workforce demographics
- Update on market and legal environment and market practices

September:

- Risk review
- Review of Alcatel Lucent 2015 performance share plan
- Investor outreach update
- Study on metrics used in long-term incentive programs in the technology sector and wider corporate environment

December:

- Review of:
 - Culture;
 - Framework for the short-term incentive program for 2020;
 - Framework for the long-term incentive program for 2020; and
 - The Remuneration Statement and Report for 2019

The President and CEO

The President and CEO has an active role in the compensation governance and performance management processes for the Group Leadership Team and the wider employee population at Nokia.

The President and CEO is not a member of the Personnel Committee and does not vote at Personnel Committee meetings, nor does he participate in any conversations regarding his own compensation.

Advisors

The Personnel Committee engaged Willis Towers Watson, an independent external consultant, to assist in the review and determination of executive compensation and program design and provide insight into market trends and regulatory developments.

Nokia Group Leadership Team remuneration

At the end of 2019, the Group Leadership Team consisted of 18 persons split between Finland, other European countries and the United States.

Name	Position in 2019	Appointment date
Rajeev Suri ⁽¹⁾	President and CEO	May 1, 2014
Nassib Abou-Khalil	Chief Legal Officer	August 1, 2019
Basil Alwan	Co-president of IP/Optical Networks	January 8, 2016
Hans-Jürgen Bill	Chief Human Resources Officer	January 8, 2016
Kathrin Buvac ⁽²⁾	President of Nokia Enterprise	January 8, 2016
Rick Corker	President of Customer Operations, Americas	January 1, 2019
Joerg Erlemeier	Chief Operating Officer	December 11, 2017
Barry French	Chief Marketing Officer	January 8, 2016
Sanjay Goel ⁽³⁾	President of Global Services	April 1, 2018
Bhaskar Gorti ⁽⁴⁾	President of Nokia Software	January 8, 2016
Federico Guillén	President of Customer Operations Officer, EMEA & APAC	January 8, 2016
Jenni Lukander	President of Nokia Technologies	August 1, 2019
Sandra Motley	President of Fixed Networks	January 31, 2019
Kristian Pullola	Chief Financial Officer	January 1, 2017
Sri Reddy	Co-president of IP/Optical Networks	May 15, 2018
Gabriela Styf Sjöman	Chief Strategy Officer	December 1, 2019
Tommi Uitto	President of Mobile Networks	January 31, 2019
Marcus Weldon	Chief Technology Officer and President of Bell Labs	April 1, 2017

⁽¹⁾ Rajeev Suri will leave his current position on August 31, 2020. Nokia's Board of Directors has appointed Pekka Lundmark as President and Chief Executive Officer of Nokia and he is expected to start in his new role on September 1, 2020.

⁽²⁾ Kathrin Buvac was appointed President of Nokia Enterprise as of January 1, 2019 and continued in her other role as Chief Strategy Officer until November 30, 2019.

⁽³⁾ Sanjay Goel, President of Global Services and member of the Group Leadership Team was in addition to this role appointed President of Operations as of January 1, 2020.

⁽⁴⁾ Bhaskar Gorti, President of Nokia Software and member of the Group Leadership Team was in addition to this appointed Chief Digital Officer as of January 1, 2020.

The following persons stepped down from the Group Leadership Team during 2019.

Name	Position in 2019	Appointment date	Leaving date
Maria Varsellona	Chief Legal Officer and President of Nokia Technologies	January 8, 2016	July 31, 2019
Joerg Erlemeier	Chief Operating Officer	December 11, 2017	December 31, 2019
Hans-Jürgen Bill ⁽¹⁾	Chief Human Resources Officer	January 8, 2016	December 31, 2019

⁽¹⁾ Hans-Jürgen Bill was a member of the Group Leadership Team until December 31, 2019. Stephanie Werner was appointed Chief Human Resources Officer and a member of the Group Leadership Team as of January 1, 2020.

The remuneration of the members of the Group Leadership Team (excluding the President and CEO) consists of base salary, fringe benefits and short- and long-term incentives and follows the same policy framework as the President and CEO and other eligible employees, except that the quantum differs by role. Short-term incentive plans are based on rewarding the delivery of business performance utilizing certain, or all, of the following metrics as appropriate to the member's role: revenue, operating profit, free cash flow and defined strategic objectives.

Remuneration on recruitment

Our policy on recruitment is to offer a compensation package which is sufficient to attract, retain and motivate individuals with the right skills for the required role. On occasion, we may offer compensation to buy out awards or other lost compensation which the candidate held prior to joining Nokia, but which lapsed upon the candidate leaving their previous employer. Due consideration is given to the potential value and timing of such awards and will take into account any conditions attached to the awards and the likely performance against such conditions.

Clawback

Our executives are subject to a clawback policy where any restatement of financial results may result in the reclaiming of amounts previously paid which had been based on numbers which have since been materially restated. Any such reclaimed amount, and the period over which payments can be reclaimed, will take into account the circumstances and duration of any misstatement.

Share ownership policy

Members of the Group Leadership Team are required to own two times their base salary in Nokia Shares. They are given five years from joining the Group Leadership Team to meet the requirements of the policy.

Pension arrangements of the Group Leadership Team

The members of the Group Leadership Team participate in the local retirement plans applicable to employees in the country of residence. Executives based in Finland participate in the statutory Finnish pension system, as regulated by the Finnish TyEL.

Executives based outside Finland participate in arrangements relevant to their location. Retirement plans vary by country and include defined benefit, defined contribution and cash balance plans. The retirement age for the members of Group Leadership Team varies between 60 and 65.

Termination provisions

In all cases, if an executive is dismissed for cause, no compensation will be payable and no outstanding equity will vest.

In the event of termination by Nokia for any other reason than cause, where Nokia pays compensation in lieu of notice period salary, the benefits and target short-term incentive amounts are taken into account.

The Board has discretion to implement change of control agreements if there is a period of significant instability in the business to facilitate stable and effective leadership during such a time, for example during a merger. At the end of 2019 there were no change of control agreements in place for the Group Leadership Team members.

Remuneration of the Group Leadership Team in 2019

Remuneration of the Group Leadership Team (excluding the President and CEO) in 2019 and 2018, in the aggregate, was as follows:

	2019 EURm ⁽¹⁾	2018 EURm ⁽¹⁾
Salary, short-term incentives and other compensation ⁽²⁾	21.7	20.5
Long-term incentives ⁽³⁾	4.4	3.6
Total	26.1	24.1

(1) The values represent each member's time on the Group Leadership Team.

(2) Short-term incentives represent amounts earned in respect of 2019 performance. Other compensation includes mobility related payments, local benefits and pension costs.

(3) The amounts represent the value of equity awards that vested in 2019.

The members of the Group Leadership Team (excluding the President and CEO) were awarded the following equity awards under the Nokia equity program in 2019:

Award	Units awarded ⁽¹⁾	Grant date fair value (EUR)	Grant date	Vesting date
Performance shares ⁽²⁾	1 993 548	7 931 654	July 3, 2019, October 2, 2019 and December 11, 2019	January 1, 2022
Restricted shares ⁽³⁾	93 300	438 930	April 24, 2019	July 1, 2020, 2021 and 2022

(1) Includes units awarded to persons who were Group Leadership Team members during 2019.

(2) The 2019 performance share plan has a three-year performance period based on financial targets. There is no minimum payout at below threshold performance for executive employees. The maximum payout would be 200% subject to maximum performance against all the performance criteria. Vesting is subject to continued employment.

(3) Nokia and some senior executives of the Company entered into agreements based on which the vesting of Restricted Shares granted to them is subject to fulfilment of predetermined performance conditions related to 5G development.

Unvested equity awards held by the Nokia Group Leadership Team, including the President and CEO

The following table sets forth the potential aggregate ownership interest through the holding of equity-based incentives of the Group Leadership Team in office, including the President and CEO, as of December 31, 2019:

	Shares receivable through performance shares at grant	Shares receivable through performance shares at maximum ⁽¹⁾	Shares receivable through restricted shares
Number of equity awards held by the Group Leadership Team ⁽¹⁾	7 877 129	15 754 258	761 462
% of the outstanding shares ⁽²⁾	0.14 %	0.28 %	0.01 %
% of the total outstanding equity incentives (per instrument) ⁽³⁾	8.63 %	8.63 %	23.25 %

(1) Includes the 18 members of the Group Leadership Team in office as of December 31, 2019.

(2) The percentages are calculated in relation to the outstanding number of shares and total voting rights of Nokia as of December 31, 2019, excluding shares held by Nokia Group. No member of the Group Leadership Team owns more than 1% of the outstanding Nokia shares.

(3) The percentages are calculated in relation to the total outstanding equity incentives per instrument.

(4) At maximum performance, under the performance share plans outstanding as of December 31, 2019, the payout would be 200% and the table reflects this potential maximum payout. The restriction period for the performance share plan 2017 and the performance period for the performance share plan 2018 ended on December 31, 2019 and Nokia's performance against the performance criteria set out in the plan rules, was above the threshold performance level for both plans. The settlement to the participants under the performance share 2017 plan took place in February 2020 and the settlement for the performance share 2018 plan is expected to take place in the beginning of 2021 after the restriction period ends.

Review of our incentive plans

Each year we monitor the performance of our incentive plans against the targets for the plan, total shareholder return and the impact that the plans have on total compensation compared to market peers.

Target setting

Targets for the short-term incentives are set annually at or before the start of the year, balancing the need to deliver value with the need to motivate and drive performance of the Group Leadership Team. Targets are selected from a set of strategic metrics that align with driving sustainable value for shareholders and are set in the context market expectations and analyst consensus forecasts. Targets for our long-term incentive plans are set in a similar context. The long-term incentive targets are set at the start of the performance period and locked in for the life of the plan.

Short-term incentives

Short-term incentive targets and achievements were based on a mix of revenue, operating profit and cash flow as well as personal targets. Targets are measured either at a Nokia Group level or, alternatively, a mix of Nokia Group and business group level for business group presidents. Payout levels for 2019 represent the challenging business environment in which Nokia has been operating with median payout at 37.49% of target.

Long-term incentives

We annually review of compensation against key metrics such as total shareholder return and share price to validate the effectiveness of our equity plans.

The 2016 performance share plan vested on January 1, 2019 with 46.25% of the target award vesting based on the achievement against the revenue and earnings per share targets during the performance period (financial years 2016 and 2017).

The 2017 performance share plan vested on January 1, 2020 with 28.9% of the target award vesting based on the achievement against the revenue and earnings per share targets during the performance period (financial years 2017 and 2018).

The 2018 performance share plan will vest on January 1, 2021 with 56.82% of the target award vesting based on the achievement against the market share, earnings per share and free cash flow targets during the performance period (financial years 2018 and 2019).

Pay for performance

Core to our compensation philosophy is a desire to pay for performance.

Each year we review overall total shareholder return compared to long-term incentive payouts mapping the performance of the plans against the total shareholder return curve.

Share price and total shareholder return vs long-term incentive performance



* Performance period not yet completed.

Looking at the performance of our long-term incentive plans against total shareholder return there is a reasonable alignment with the performance of the plans declining as total shareholder return declines and the trend lines are reasonably aligned.

Following the change in the performance metrics in the 2019 long-term incentive plan to better fit with the needs of the business, the Board continues to actively monitor the performance of our long-term incentive plans to ensure that they deliver value for shareholders.

Our peers

In looking for suitable comparators, we have considered ourselves a European technology company and looked at businesses of similar size, global scale and complexity, such as:

ABB	Deutsche Telekom
ASML	Ericsson
Airbus	Infineon
Atos	Kone
BAe Systems	Phillips
BT	SAP
Cap Gemini	Vodafone

This remains an appropriate comparator group and is expected to remain the same in 2020



Nokia Equity Program

The outstanding Nokia equity programs include the following equity instruments

	Performance shares	Restricted shares	Employee share purchase plan ("Share in Success")
Eligible employees	Grade-based eligibility	Grade-based eligibility	Employees in participating countries
Purpose	Annual long-term incentive awards, to reward delivery of sustainable long-term performance, align with the interests of shareholders and aid retention of key employees	Limited use for recruitment and retention	Encourage share ownership within the Nokia employee population, increasing engagement and sense of ownership in the company
Vesting schedule	Three-year plan period based on financial target(s). Prior to 2019 two-year performance period based on financial targets and one-year restriction period.	Vesting equally in three tranches on the 1st, 2nd and 3rd anniversary of grant. From 2020 in very exceptional cases all tranches may vest in a total of 18 months.	Matching shares vest at the end of the 12-month savings period
Performance period	Three years	Conditions may be applied before grant of the award	n/a
Shareholder rights	Until the Nokia shares are delivered, the participants will not have any shareholder rights, such as voting or dividend rights associated with the performance shares.	Until the Nokia shares are delivered, the participants will not have any shareholder rights, such as voting or dividend rights associated with the restricted shares	Participants have immediate shareholder rights over all purchased shares. Until the matching Nokia shares are delivered, the participants will not have any shareholder rights, such as voting or dividend rights associated with the matching shares.

General facts on Nokia

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General facts on Nokia

Our history

Few companies have Nokia's storied capacity for transforming, developing new technologies and adapting to shifts in market conditions. From its beginning in 1865 as a single paper mill operation, Nokia has found and nurtured success in several sectors over the years, including cable, paper products, rubber boots and tires, mobile devices and telecommunications infrastructure equipment.

Nokia's sector-by-sector success over the years has mirrored its geographical rise: from a Finnish-focused company until the 1980s with a growing Nordic and European presence; to a genuine European company in the early 1990s; and on to a truly global company from the mid-1990s onward. With our acquisitions of Alcatel Lucent, Gainspeed, Deepfield, and Comptel, we can deliver today an end-to-end portfolio of networks products and services on a global scale.

Nokia has been producing telecommunications equipment since the 1880s - almost since telephony began.

A storied past

When Finnish engineer Fredrik Idestam set up his initial wood pulp mill in Southern Finland in 1865, he took the first step in laying the foundation of Nokia's capacity for innovating and finding opportunity. Sensing growing pulp product demand, Idestam opened a second mill a short time later on the Nokianvirta River, inspiring him to name his company Nokia AB.

Idestam's sense of endeavor would continue to prevail in the different phases Nokia would take.

In the 1960s, Nokia became a conglomerate, comprised of rubber, cable, forestry, electronics and power generation businesses, resulting from the merger of Idestam's Nokia AB, and Finnish Cable Works Ltd, a phone and power cable producer founded in 1912, and other businesses.

Transformation anew

It was not long before transformation would occur again.

Deregulation of the European telecommunications industries in the 1980s triggered new thinking and fresh business models.

In 1982, Nokia introduced both the first fully-digital local telephone exchange in Europe and the world's first car phone for the Nordic Mobile Telephone analog standard. The breakthrough of GSM (global system for mobile communications) in the 1980s introduced more efficient use of radio frequencies and higher-quality sound. The first GSM call was made with a Nokia phone over the Nokia-built network of a Finnish operator called Radiolinja in 1991.

It was around this time that Nokia made the strategic decision to make telecommunications and mobile phones our core business. Our other businesses, including aluminum, cable, chemicals, paper, rubber, power plant, and television businesses were subsequently divested.

By 1998, Nokia was the world leader in mobile phones, a position it enjoyed for more than a decade.

And still, the business and technology worlds would continue to evolve, as would Nokia.

A shifting industry

In 2007, Nokia combined its telecoms infrastructure operations with those of Siemens to create the NSN joint venture. We later bought Siemens' stake in NSN in 2013 as the business was emerging from a successful strategy shift and the reality of what Nokia calls a Programmable World of connected devices, sensors and people was starting to take shape.

In 2011, we joined with Microsoft to strengthen our position in the highly competitive smartphone market, which in 2014 resulted in the closing of the sale of the Devices & Services business. Nokia emerged from the transaction with a firm financial footing and three strong businesses - Nokia Networks, HERE and Nokia Technologies - focused on connecting the things and people of the Programmable World.

Nokia's transformation was not complete. Our former HERE digital mapping and location services business, an arena we entered in 2006, had been a key pillar of Nokia's operational performance. However, following a strategic review of the business by the Board in light of plans to acquire Alcatel Lucent, Nokia decided to sell its HERE business in 2015.

Acquisition of Alcatel Lucent and beyond

The acquisition of Alcatel Lucent, completed in 2016, positions Nokia as an innovation leader in next-generation technology and services.

Our reputation as an innovation powerhouse has been bolstered by the addition of Bell Labs, now known as Nokia Bell Labs. It joins a future-focused business backed by tens of thousands of engineers and thousands of patent families, a reflection of Nokia's innovation pedigree which has produced a huge array of benefits for consumers, business, and society as a whole.

The acquisition helps us shape the connectivity and digitalization revolution before us - the Programmable World - in which billions of people, devices, and sensors are connected in a way that opens up a world of possibilities. These can make our planet safer, cleaner, healthier, more sustainable, more efficient and more productive.

Nokia's long history is marked by change and reinvention. We have always been excited by where technology will lead us as we seek to enable the human possibilities of a connected world. We will continue to innovate, reimagining how technology works for us discreetly while blending into, and enriching, our daily lives.

Memorandum and Articles of Association

Registration

Nokia is organized under the laws of the Republic of Finland and registered under the business identity code 0112038-9. Under its current Articles of Association, Nokia's corporate purpose is to research, develop, manufacture, market, sell and deliver products, software and services in a wide range of consumer and business-to-business markets. These products, software and services relate to, among others, network infrastructure for telecommunication operators and other enterprises, the IoT, human health and well-being, multimedia, big data and analytics, mobile devices and consumer wearables and other electronics. The company may also create, acquire and license intellectual property and software as well as engage in other industrial and commercial operations, including securities trading and other investment activities. The company may carry on its business operations directly, through subsidiary companies, affiliate companies and joint ventures.

Director's voting powers

Under Finnish law, resolutions of the Board shall be made by a majority vote. A director shall refrain from taking any part in the consideration of an agreement between the director and the company or third party, or any other issue that may provide any material benefit to him or her, which may be contradictory to the interests of the company. Under Finnish law, there is no age limit requirement for directors, and there are no requirements under Finnish law that a director must own a minimum number of shares in order to qualify to act as a director. However, in accordance with the current company policy, approximately 40% of the annual fee payable to the Board members is paid in Nokia shares purchased from the market or alternatively by using treasury shares held by Nokia, and the directors shall retain until the end of their directorship such number of shares that corresponds to the number of shares they have received as Board remuneration during their first three years of service (the net amount received after deducting those shares used for offsetting any costs relating to the acquisition of the shares, including taxes).

Share rights, preferences and restrictions

Each share confers the right to one vote at general meetings. According to Finnish law, a company generally must hold an Annual General Meeting called by the Board within six months from the end of the financial year. Additionally, the Board is obliged to call an Extraordinary General Meeting, whenever such meeting is deemed necessary, or at the request of the auditor or shareholders representing a minimum of one-tenth of all outstanding shares. Under our Articles of Association, the Board is elected at least annually at the Annual General Meeting of the shareholders for a term ending at the end of the next Annual General Meeting.

Under Finnish law, shareholders may attend and vote at general meetings in person or by proxy. It is not customary in Finland for a company to issue forms of proxy to its shareholders. Accordingly, Nokia does not do so. However, registered holders and beneficial owners of ADSs are issued forms of proxy by the Depository.

To attend and vote at a general meeting, a shareholder must be registered in the register of shareholders in the Finnish book-entry system on or prior to the record date set forth in the notice of the general meeting. A registered holder or a beneficial owner of the ADSs, like other beneficial owners whose shares are registered in the company's register of shareholders in the name of a nominee, may vote with their shares provided that they arrange to have their name entered in the temporary register of shareholders for the general meeting.

The record date is the eighth business day preceding the meeting. To be entered in the temporary register of shareholders for the general meeting, a holder of ADSs must provide the Depository, or have his broker or other custodian provide the Depository, on or before the voting deadline, as defined in the proxy material issued by the Depository, a proxy with the following information: the name, address, and social security number or another corresponding personal identification number of the holder of the ADSs, the number of shares to be voted by the holder of the ADSs and the voting instructions. The register of shareholders as of the record date of each general meeting is public until the end of the respective meeting. Other nominee registered shareholders can attend and vote at the general meetings by instructing their broker or other custodian to register the shareholder in Nokia's temporary register of shareholders and give the voting instructions in accordance with the broker's or custodian's instructions.

By completing and returning the form of proxy provided by the Depository, a holder of ADSs also authorizes the Depository to give notice to us, required by our Articles of Association, of the holder's intention to attend the general meeting.

Each of our shares confers equal rights to share in the distribution of the company's funds. Dividend entitlement lapses after three years if a dividend remains unclaimed for that period, in which case the unclaimed dividend will be retained by Nokia.

Under Finnish law, the rights of shareholders are related to the shares as set forth in law and our Articles of Association. Neither Finnish law nor our Articles of Association sets limitations on the rights to own Nokia securities, including the rights of foreign shareholders to hold or exercise voting rights in the said securities. Amendment of the Articles of Association requires a decision of the general meeting, supported by two-thirds of the votes cast and two-thirds of the shares represented at the meeting.

Disclosure of shareholder ownership or voting power

According to the Finnish Securities Market Act, a shareholder shall disclose their ownership or voting power to the company and the Finnish Financial Supervisory Authority when the ownership or voting power reaches, exceeds or falls below 5, 10, 15, 20, 25, 30, 50 or 90% of all the shares or the voting rights outstanding. The term "ownership" includes ownership by the shareholder, as well as selected related parties, and calculating the ownership or voting power covers agreements or other arrangements, which when concluded would cause the proportion of voting rights or number of shares to reach, exceed or fall below the aforementioned limits. Upon receiving such notice, the company shall disclose it by a stock exchange release without undue delay.

Purchase obligation

Our Articles of Association require a shareholder that holds one-third or one-half of all of our shares to purchase the shares of all other shareholders that so request. A shareholder who becomes subject to the purchase obligation is also obligated to purchase any subscription rights, stock options or convertible bonds issued by the company if so requested by the holder. The purchase price of the shares under our Articles of Association is the higher of: (a) the weighted average trading price of the shares on Nasdaq Helsinki during the ten business days prior to the day on which we have been notified by the purchaser that its holding has reached or exceeded the threshold referred to above or, in the absence of such notification or its failure to arrive within the specified period, the day on which our Board otherwise becomes aware of this; or (b) the average price, weighted by the number of shares, which the purchaser has paid for the shares it has acquired during the last 12 months preceding the date referred to in (a).

Under the Finnish Securities Market Act, a shareholder whose voting power exceeds 30% or 50% of the total voting rights in a company shall, within one month, offer to purchase the remaining shares of the company, as well as any other rights entitling to the shares issued by the company, such as subscription rights, convertible bonds or stock options issued by the company. The purchase price shall be the market price of the securities in question. Subject to certain exceptions, the market price is determined on the basis of the highest price paid for the security during the preceding six months by the shareholder or any party in close connection to the shareholder. Subject to certain exceptions, if the shareholder or any related party has not during the six months preceding the offer acquired any securities that are the target for the offer, the market price is determined based on the average of the prices paid for the security in public trading during the preceding three months weighted by the volume of trade.

Under the Finnish Companies Act, a shareholder whose holding exceeds nine-tenths of the total number of shares or voting rights in Nokia has both the right and, upon a request from the minority shareholders, the obligation to purchase all the shares of the minority shareholders for the then current market price. The market price is determined, among other things, on the basis of the recent market price of the shares. The purchase procedure under the Finnish Companies Act differs, and the purchase price may differ, from the purchase procedure and price under the Finnish Securities Market Act, as discussed above. However, if the threshold of nine-tenths has been exceeded through either a mandatory or a voluntary public offer pursuant to the Finnish Securities Market Act, the market price under the Finnish Companies Act is deemed to be the price offered in the public offer, unless there are specific reasons to deviate from it.

Pre-emptive rights

In connection with any offering of shares, the existing shareholders have a pre-emptive right to subscribe for shares offered in proportion to the amount of shares in their possession. However, a general meeting of shareholders may vote, by a majority of two-thirds of the votes cast and two-thirds of the shares represented at the meeting, to waive this pre-emptive right provided that, from the company's perspective, weighty financial grounds exist.

Monitoring of Foreign Corporate Acquisitions

Under the Finnish Act on the Monitoring of Foreign Corporate Acquisitions (2012/172 as amended), a notification to the Ministry of Economic Affairs and Employment is required for a non-resident of Finland, directly or indirectly, when acquiring one-tenth or more of the voting power or corresponding factual influence in a company. The Ministry of Economic Affairs and Employment has to confirm the acquisition unless the acquisition would jeopardize important national interests, in which case the matter is referred to the Council of State. If the company in question is operating in the defense sector, an approval by the Ministry of Economic Affairs and Employment is required before the acquisition is made. These requirements are not applicable if, for instance, the voting power is acquired in a share issue that is proportional to the holder's ownership of the shares. Moreover, the requirements do not apply to residents of countries in the European Economic Area or EFTA countries, except where at least one tenth of shares or other controlling right in such resident are held by a party not resident in the European Economic Area or EFTA.

Selected financial data

Five-year consolidated financial information

The selected financial data set forth below as of and for each of the years in the five-year period ended December 31, 2019 has been derived from, and should be read in conjunction with, our consolidated financial statements prepared in accordance with IFRS. The consolidated financial statements as of December 31, 2019 and 2018 and for the years ended December 31, 2019, 2018 and 2017 are included in this annual report on Form 20-F.

In 2019 the Group applied IFRS 16, Leases, for the first time. As the standard was adopted using the cumulative catch-up method, the financial information for the comparative periods has not been restated. Refer to Note 3, New and amended standards and interpretations, in the consolidated financial statements included in this annual report on Form 20-F. In January 2016, the Group acquired Alcatel Lucent, and consequently the acquisition is reflected in the selected financial data presented as of and for the year ended December 31, 2016, and all years thereafter.

For the nine months ended December 31	2019	2019	2018	2017	2016	2015
	USDm ⁽¹⁾	EURm				
From the consolidated income statement						
Net sales	26 103	23 315	22 563	23 147	23 641	12 560
Operating profit/(loss)	543	485	(59)	16	(1 100)	1 697
Profit/(loss) before tax	175	156	(360)	(510)	(1 369)	1 540
Profit/(loss) for the year from Continuing operations	20	18	(549)	(1 437)	(912)	1 194
(Loss)/profit for the year from Discontinued operations	(8)	(7)	214	(21)	(15)	1 274
Profit/(loss) for the year	12	11	(335)	(1 458)	(927)	2 468
Profit/(loss) from Continuing operations attributable to equity holders of the parent	16	14	(554)	(1 473)	(751)	1 192
Profit/(loss) attributable to equity holders of the parent	8	7	(340)	(1 494)	(766)	2 466
Earnings per share attributable to equity holders of the parent						
Basic earnings per share, EUR						
Continuing operations	0.00	0.00	(0.10)	(0.26)	(0.13)	0.32
Profit/(loss) for the year	0.00	0.00	(0.06)	(0.26)	(0.13)	0.67
Diluted earnings per share, EUR						
Continuing operations	0.00	0.00	(0.10)	(0.26)	(0.13)	0.31
Profit/(loss) for the year	0.00	0.00	(0.06)	(0.26)	(0.13)	0.63
Cash dividends per share, EUR ⁽²⁾	0.00	0.00	0.10	0.19	0.17	0.26
Average number of shares (millions of shares)						
Basic	5 600	5 600	5 588	5 652	5 732	3 671
Diluted						
Continuing operations	5 626	5 626	5 588	5 652	5 741	3 949
Profit/(loss) for the year	5 626	5 626	5 588	5 652	5 741	3 949

(1) In 2019, average rate of USD per EUR 1.1196 has been used to translate the consolidated income statement items.

(2) No dividend is proposed by the Board of Directors related to the financial year 2019.

As of December 31	2019	2019	2018	2017	2016	2015
	USDm ⁽¹⁾	EURm				
From the consolidated statement of financial position						
Non-current assets ⁽²⁾	25 074	22 320	21 246	21 160	24 182	5 102
Total cash and current financial investments ⁽³⁾	6 748	6 007	6 873	8 280	9 326	9 849
Other current assets	12 134	10 801	11 393	11 561	11 349	5 975
Assets held for sale	–	–	5	23	44	–
Total assets	43 956	39 128	39 517	41 024	44 901	20 926
Capital and reserves attributable to equity holders of the parent	17 216	15 325	15 289	16 138	20 094	10 503
Non-controlling interests	85	76	82	80	881	21
Long-term interest-bearing liabilities ⁽⁴⁾	4 477	3 985	2 826	3 454	3 647	2 023
Other non-current liabilities ⁽²⁾⁽⁴⁾	8 636	7 687	7 216	8 608	7 674	1 988
Short-term interest-bearing liabilities	328	292	994	309	370	51
Other current liabilities ⁽²⁾	13 215	11 763	13 110	12 435	12 235	6 340
Total shareholders' equity and liabilities	43 956	39 128	39 517	41 024	44 901	20 926
Net cash and current financial investments ⁽⁴⁾⁽⁵⁾	1 943	1 730	3 053	4 517	5 309	7 775
Share capital	276	246	246	246	246	246

(1) In 2019, end of period rate of USD per EUR 1.1234 has been used to translate the consolidated statement of financial position items.

(2) In 2019, non-current assets, other non-current liabilities and other current liabilities reflect the impact of adoption of IFRS 16, Leases. Refer to Note 3, New and amended standards and interpretations, and Note 16, Leases, in the consolidated financial statements included in this annual report on Form 20-F.

(3) Total cash and current financial investments consist of the following line items from our consolidated statement of financial position: cash and cash equivalents and current financial investments.

(4) Lease liabilities recognized in accordance with IAS 17, Leases, for the years ended December 31, 2018, 2017, 2016 and 2015 have been reclassified from long-term interest-bearing liabilities to other non-current liabilities to ensure comparability with the presentation of interest-bearing liabilities and lease liabilities following the adoption of IFRS 16, Leases, on January 1, 2019. Consequently, net cash and current financial investments for the years ended December 31, 2018, 2017, 2016 and 2015 has been revised to exclude lease liabilities. Despite the changes in the presentation of comparatives, IFRS 16 has not been adopted retrospectively.

(5) Net cash and current financial investments equal total cash and current financial investments less long-term and short-term interest-bearing liabilities

Shares

Shares and share capital

Nokia has one class of shares. Each Nokia share entitles the holder to one vote at General Meetings of Nokia.

As of December 31, 2019, the share capital of Nokia Corporation equaled EUR 245 896 461.96 and the total number of shares issued was 5 640 536 159. As of December 31, 2019, the total number of shares included 34 954 869 shares owned by Group companies representing approximately 0.6% of the total number of shares and the total voting rights.

Nokia does not have minimum or maximum share capital or a par value of a share.

As of December 31	2019	2018	2017	2016	2015
Share capital, EURm	246	246	246	246	246
Shares, (000s)	5 640 536	5 635 945	5 839 404	5 836 055	3 992 864
Shares owned by the Group, (000s)	34 955	42 783	259 887	115 552	53 669
Number of shares excluding shares owned by the Group, (000s)	5 605 581	5 593 162	5 579 517	5 720 503	3 939 195
Average number of shares excluding shares owned by the Group during the year					
Basic, (000s) ⁽¹⁾	5 599 912	5 588 020	5 651 814	5 732 371	3 670 934
Diluted, (000s) ⁽¹⁾	5 626 375	5 588 020	5 651 814	5 741 117	3 949 312
Number of registered shareholders ⁽²⁾	248 526	243 409	247 717	237 700	209 509

(1) Used in calculation of earnings per share for profit or loss for the year attributable to equity holders of the parent.

(2) Each account operator is included in the figure as only one registered shareholder.

Key ratios

For the year ended December 31, Continuing operations	2019	2018	2017	2016	2015
Earnings per share, basic, EUR	0.00	(0.10)	(0.26)	(0.13)	0.32
Earnings per share, diluted, EUR	0.00	(0.10)	(0.26)	(0.13)	0.31
P/E ratio, basic ⁽¹⁾	–	neg.	neg.	neg.	20.63
Dividend per share, EUR ⁽²⁾	0.00	0.10	0.19	0.17	0.26
Total dividends paid, EURm ⁽²⁾	–	560	1 063	963	1 501
Payout ratio, basic	–	neg.	neg.	neg.	0.81
Dividend yield, % ⁽¹⁾	–	1.99	4.88	3.70	3.94
As of December 31	2019	2018	2017	2016	2015
Shareholders' equity per share, EUR ⁽³⁾	2.73	2.73	2.89	3.51	2.67
Market capitalization, EURm ⁽¹⁾⁽³⁾	18 476	28 134	21 704	26 257	25 999

(1) Based on Nokia closing share price at year-end on Nasdaq Helsinki

(2) No dividend is proposed by the Board of Directors related to the financial year 2019. Amounts presented related to the financial years 2018, 2017, 2016 and 2015 represent the actual amounts paid.

(3) Excludes shares owned by Group companies.

Share turnover

For the year ended December 31	2019	2018	2017	2016	2015
Number of shares traded during the year (000s) ⁽¹⁾	11 003	8 960	8 839	9 604	8 490
	630	687	680	722	823
Average number of shares (000s)	5 599	5 588	5 651	5 732	3 670
Share turnover %	912	020	814	371	934
	196	160	156	168	231

(1) Source: Nasdaq Helsinki, the NYSE composite tape and Euronext Paris (since November 2015).

The principal trading markets for the shares are Nasdaq Helsinki and Euronext Paris, in the form of shares, and the NYSE, in the form of ADSs.

Share price development

Annual data	Nasdaq Helsinki			New York Stock Exchange			Euronext Paris		
	High	Low	Value	High	Low	Value	High	Low	Value
	EUR			USD			EUR		
2019 Full year High/Low	5.74	3.02		6.65	3.33		5.76	3.02	
2019 Full year Average (Volume-weighted)			4.45			5.08			4.31
Year-end value December 31, 2019			3.30			3.71			3.31
Year-end value December 31, 2018			5.03			5.82			5.06
Change from December 31, 2018 to December 31, 2019			-34.5%			-36.3%			-34.7%

Stock option exercises 2017-2019

Year	Stock option category	Subscription price	Number of new	Date of	Net proceeds	New share capital	
		EUR	shares 000s	payment	EURm	EURm	
2017	Nokia Stock Option Plan 2011 2Q	5.66	0	2017	0.00	–	
	Nokia Stock Option Plan 2011 3Q	3.40	0	2017	0.00	–	
	Nokia Stock Option Plan 2011 4Q	4.48	5	2017	0.02	–	
	Nokia Stock Option Plan 2012 1Q	3.48	0	2017	0.00	–	
	Nokia Stock Option Plan 2012 2Q	2.08	61	2017	0.13	–	
	Nokia Stock Option Plan 2012 3Q	1.82	148	2017	0.27	–	
	Nokia Stock Option Plan 2012 4Q	1.76	9	2017	0.02	–	
	Nokia Stock Option Plan 2013 1Q	2.58	0	2017	0.00	–	
	Nokia Stock Option Plan 2013 2Q	2.35	193	2017	0.45	–	
	Nokia Stock Option Plan 2013 3Q	2.72	0	2017	0.00	–	
	Nokia Stock Option Plan 2013 4Q	5.41	0	2017	0.00	–	
	Total			416		0.89	
	2018	Nokia Stock Option Plan 2012 1Q	3.48	0	2018	0.00	–
Nokia Stock Option Plan 2012 2Q		2.08	128	2018	0.27	–	
Nokia Stock Option Plan 2012 3Q		1.82	170	2018	0.31	–	
Nokia Stock Option Plan 2012 4Q		1.76	0	2018	0.00	–	
Nokia Stock Option Plan 2013 1Q		2.58	0	2018	0.00	–	
Nokia Stock Option Plan 2013 2Q		2.35	127	2018	0.30	–	
Nokia Stock Option Plan 2013 3Q		2.72	0	2018	0.00	–	
Nokia Stock Option Plan 2013 4Q		5.41	0	2018	0.00	–	
Total			425		0.87		
2019	Nokia Stock Option Plan 2013 1Q	2.58	0	2019	0.00	–	
	Nokia Stock Option Plan 2013 2Q	2.35	23	2019	0.05	–	
	Nokia Stock Option Plan 2013 3Q	2.72	0	2019	0.00	–	
	Nokia Stock Option Plan 2013 4Q	5.41	0	2019	0.00	–	
Total			23		0.05		

Shareholders

As of December 31, 2019, shareholders registered in Finland represented approximately 22% and shareholders registered in the name of a nominee represented approximately 78% of the total number of shares of Nokia Corporation. The number of directly registered shareholders was 248 526 as of December 31, 2019. Each account operator (12) is included in this figure as only one registered shareholder.

Largest shareholders registered in Finland as of December 31, 2019⁽¹⁾

Shareholder	Total number		
	of shares 000s	% of all shares	% of all voting rights
Solidium Oy	217 000	3.85	3.85
Keskinäinen Eläkevakuutusyhtiö Ilmarinen	76 030	1.35	1.35
Keskinäinen Työeläkevakuutusyhtiö Varma	49 502	0.88	0.88
Valtion Eläkerahasto	34 000	0.60	0.60
Keskinäinen Työeläkevakuutusyhtiö Elo	32 165	0.57	0.57
Schweizerische Nationalbank	29 891	0.53	0.53
KEVA	18 397	0.33	0.33
Oy Lival Ab	16 903	0.30	0.30
Svenska Litteratursällskapet i Finland r.f.	15 678	0.28	0.28
OP-Suomi-Sijoitusrahasto	14 088	0.25	0.25

(1) Excluding nominee registered shares and shares owned by Nokia Corporation. Nokia Corporation owned 23 496 208 shares as of December 31, 2019.

Breakdown of share ownership as of December 31, 2019⁽¹⁾

By number of shares owned	Number of shareholders	% of shareholders	Total number of shares	% of all shares
1–100	53 487	21.52	2 943 371	0.05
101–1 000	118 872	47.83	53 620 740	0.95
1 001–10 000	67 080	26.99	209 391 855	3.71
10 001–100 000	8 534	3.43	209 645 058	3.72
100 001–500 000	440	0.18	87 560 587	1.55
500 001–1 000 000	38	0.02	27 031 992	0.48
1 000 001–5 000 000	45	0.02	103 422 948	1.83
Over 5 000 000	30	0.01	4 946 919 608	87.70
Total	248 526	100.00	5 640 536 159	100.00

(1) The breakdown covers only shareholders registered in Finland, and each account operator (12) is included in the number of shareholders as only one registered shareholder. As a result, the breakdown is not illustrative of the entire shareholder base of Nokia.

By nationality	% of shares
Non-Finnish shareholders	77.92
Finnish shareholders	22.08
Total	100.00

By shareholder category (Finnish shareholders)	% of shares
Corporations	2.30
Households	8.25
Financial and insurance institutions	2.41
Non-profit organizations	1.29
Governmental bodies (incl. pension insurance companies)	7.83
Total	22.08

As of December 31, 2019, a total of 728 458 602 ADSs (equivalent to the same number of shares or approximately 12.91% of the total shares) were outstanding and held of record by 119 424 registered holders in the United States. We are aware that many ADSs are held of record by brokers and other nominees, and accordingly the above number of holders is not necessarily representative of the actual number of persons who are beneficial holders of ADSs or the number of ADSs beneficially held by such persons. Based on information available from Automatic Data Processing Inc., the number of beneficial owners of ADSs as of December 31, 2019 was 398 227.

Based on information known to us as of February 5, 2020, as of December 31, 2019 Blackrock, Inc. beneficially owned 311 907 753 Nokia shares, which at that time corresponded to approximately 5.5% of the total number of shares and voting rights of Nokia.

To the best of our knowledge, Nokia is not directly or indirectly owned or controlled by any other corporation or any government, and there are no arrangements that may result in a change of control of Nokia.

Shares and stock options owned by the members of the Board and the Nokia Group Leadership Team

As of December 31, 2019, the members of our Board and the Group Leadership team held a total of 8 017 085 shares and ADSs in Nokia, which represented approximately 0.14% of our shares and total voting rights excluding shares held by the Nokia Group.

Offer and listing details

Our capital consists of shares traded on Nasdaq Helsinki under the symbol "NOKIA" and Euronext Paris under the symbol "NOKIA". Our ADSs, each representing one of our shares, are traded on the NYSE under the symbol "NOK". The ADSs are evidenced by American Depositary Receipts (ADRs) issued by Citibank, N.A.

American Depositary Shares

Fees and charges

ADS holders may have to pay the following service fees to the Depositary:

Service	Fees, USD
Issuance of ADSs	Up to 5 cents per ADS ⁽¹⁾
Cancellation of ADSs	Up to 5 cents per ADS ⁽¹⁾
Distribution of cash dividends or other cash distributions	Up to 2 cents per ADS ⁽²⁾
Distribution of ADSs pursuant to (i) stock dividends, free stock distributions or (ii) exercises of rights to purchase additional ADSs	Up to 5 cents per ADS ⁽²⁾
Distribution of securities other than ADSs or rights to purchase additional ADSs	Up to 5 cents per ADS ⁽¹⁾
ADS transfer fee	1.50 per transfer ⁽¹⁾

(1) These fees are typically paid to the Depositary by the brokers on behalf of their clients receiving the newly issued ADSs from the Depositary and by the brokers on behalf of their clients delivering the ADSs to the Depositary for cancellation. The brokers in turn charge these transaction fees to their clients.

(2) In 2019 a fee of USD 0.25 cents per ADS was deducted from each of the two dividend payments.

Additionally, ADS holders are responsible for certain fees and expenses incurred by the Depositary on their behalf and certain governmental charges such as taxes and registration fees, transmission and delivery expenses, conversion of foreign currency and fees relating to compliance with exchange control regulations. The fees and charges may vary over time.

In the event of refusal to pay the depositary fees, the Depositary may, under the terms of the deposit agreement, refuse the requested service until payment is received or may set-off the amount of the depositary fees from any distribution to be made to the ADS holder.

Payments

In 2019, our Depositary made the following payments on our behalf in relation to our ADS program.

Category	Payment, USD
Settlement infrastructure fees (including the Depositary Trust Company fees)	1 069 493.20
Proxy process expenses (including printing, postage and distribution)	940 913.64
ADS holder identification expenses	98 172.33
Legal fees	—
NYSE listing fees	500 000.00
Total	2 608 579.17

Additionally for 2019, our Depositary reimbursed us USD 7 036 032.10 mainly related to contributions towards our investor relations activities, including investor meetings and conferences and fees of investor relations service vendors, and other miscellaneous expenses related to the United States listing of our ADSs.

Production of infrastructure equipment and products

Our operations team handles the supply chain management of all Nokia's hardware, software and original equipment manufacturer products. This includes supply planning, manufacturing, distribution, procurement, logistics and supply.

Most of our production and assembly is outsourced, while the remaining portion is carried out in our production sites. This system provides us with considerable flexibility in our manufacturing and enables us to meet demands related to cost, availability and customer requirements more easily.

On December 31, 2019, we had ten manufacturing facilities globally: one in Australia, one in Brazil, one in China, one in Finland, two in France, one in Germany, one in India, one in the United Kingdom and one in the United States.

The table below shows the productive capacity per location of significant manufacturing facilities for our infrastructure equipment on December 31, 2019.

Country	Location and products ⁽¹⁾	Productive capacity, Net (m ²) ⁽²⁾
Australia	Kilsyth: radio frequency systems	5 400
Brazil	Embu: radio frequency systems	8 100
China	Suzhou: radio frequency systems	16 600
Finland	Oulu: base stations	13 800
France	Calais: submarine cables	63 000
France	Trignac: radio frequency systems	7 300
Germany	Hannover: radio frequency systems	23 500
India	Chennai: base stations, radio controllers and transmission systems	12 000
UK	Greenwich: submarine cables	19 500
USA	Meriden: radio frequency systems	31 000

(1) We consider the production capacity of our manufacturing network to be sufficient to meet the requirements of our network infrastructure business. The extent of utilization of our manufacturing facilities varies from plant to plant and from time to time during the year. None of these facilities is subject to a material encumbrance.

(2) Productive capacity equals the total area allotted to manufacturing and to the storage of manufacturing-related materials.

Controls and procedures

Our management, with the participation of our President and CEO and our Chief Financial Officer, conducted an evaluation pursuant to Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the Exchange Act), of the effectiveness of our disclosure controls and procedures as of December 31, 2019. Based on such evaluation, our President and CEO and our Chief Financial Officer have concluded that our disclosure controls and procedures were effective.

Disclosure controls and procedures mean controls and other procedures that are designed to ensure that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the Commission's rules and forms, and that such information required to be disclosed by us in the reports that we file or submit under the Exchange Act is accumulated and communicated to our management, including our President and CEO and our Chief Financial Officer, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosures.

Management's annual report on internal control over financial reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting for Nokia. Our internal control over financial reporting is designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation and fair presentation of published financial statements. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Our management evaluated the effectiveness of our internal control over financial reporting using the criteria described in Internal Control – Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on this evaluation, our management has assessed the effectiveness of Nokia's internal control over financial reporting at December 31, 2019 and concluded that such internal control over financial reporting is effective.

The effectiveness of our internal control over financial reporting as of December 31, 2019 has been audited by PricewaterhouseCoopers Oy, an independent registered public accounting firm. Refer to "Report of independent registered public accounting firm" of this Annual Report on Form 20-F.

Changes in internal control over financial reporting

There have been no changes in our internal control over financial reporting during 2019 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Attestation report of the registered public accounting firm

Refer to "Report of independent registered public accounting firm" of this Annual Report on Form 20-F.

Exchange controls

There are currently no Finnish laws which may affect the import or export of capital, or the remittance of dividends, interest or other payments.

Government regulation

Nokia and its businesses are subject to direct and indirect regulation in each of the countries in which we and our customers do business. As a result, changes in or uncertainties related to various types of regulations applicable to current or new technologies, intellectual property, products and services could affect our business adversely. Moreover, the implementation of technological or legal requirements could impact our products and services, technology and patent licensing activities, manufacturing and distribution processes, and could affect the timing of product and services introductions and the cost of our production, products and services, as well as their commercial success. Also, our business is subject to the impacts of changes in economic and trade policies or regulation favoring the local industry participants, as well as other measures with potentially protectionist objectives that the host governments in different countries may take. Export control, tariffs or other fees or levies imposed on our products and services, environmental, product safety and security and other regulations that adversely affect the export, import, pricing or costs of our products and services as well as export prohibitions (sanctions) enacted by the EU, the United States or other countries or regions could adversely affect our net sales and results of operations.

For example, in the United States, our products and services are subject to a wide range of government regulations that might have a direct impact on our business, including, but not limited to, regulation related to product certification, standards, spectrum management, provision of telecommunications services, privacy and data protection, competition and sustainability. The EU-level or local member state regulation has a direct impact on many areas of our business, markets and customers within the EU. The European regulation influences, for example, conditions for innovation for telecommunications infrastructure and internet and related services, as well as technology and patent licensing; investment in fixed and wireless broadband communication infrastructure and operation of global data flows. Additionally, with respect to certain developing market countries, the business environment we operate in can be affected by protectionist regulation.

We are in continuous dialog with relevant state agencies, regulators and other decision makers through our government relations representatives in various geographies through our experts, industry associations and representatives in order to proactively exchange views and address the impact of any planned changes to the regulatory environment on our business activities.

Sales in United States-sanctioned countries

General

We are a global company and have sales in most countries of the world. Nokia is committed to the highest standards of ethical conduct, and adheres to all applicable national and international trade-related laws. As a leading international telecommunications company with global operations, Nokia has a presence also in countries subject to international sanctions. All operations of Nokia, and in particular any operations undertaken in countries targeted by sanctions, are conducted in accordance with our comprehensive and robust Internal Compliance Program to ensure that they are in full compliance with all applicable laws and regulations. In addition, we continuously monitor international developments and assess the appropriateness of our presence and business in these, and all, markets. Nevertheless, business in these markets is marked by complexity and uncertainty.

We cannot exclude the possibility that third parties may unlawfully divert our products to these countries from other countries in which we sell them, or that, for services distributed through the internet, third parties could have accessed them in markets or countries for which they are not intended by circumventing the industry standard protective mechanisms, such as IP address blocks, despite our efforts in implementing measures to prevent such actions.

Disclosure pursuant to Section 219 of the Iran Threat Reduction and Syria Human Rights Act of 2012

We operate in Iran in compliance with applicable economic sanctions and other trade-related laws. We provide telecommunications equipment with ancillary services to various network operator customers and internet service providers. We do not deliver equipment and services to Iran for military purposes, or for the purpose of limiting political discourse, blocking legitimate forms of free speech or conducting surveillance of individuals.

In connection with the business activities relating to Iran, we have two local offices in Iran that employed approximately 55 employees at the end of 2019 through a branch of a Finnish subsidiary. Nokia is the controlling shareholder in Pishahang Communications Network Development Company (Pishahang). The other minority shareholder in Pishahang is Information Technology Application Development TACFAM Company (Tacfam).

We continue to maintain routine contacts with governmental agencies in Iran as required, for example, to maintain a legal presence and office facilities in Iran, pay taxes and employ Iranian nationals.

To our knowledge, none of our sales in Iran in 2019 are required to be disclosed pursuant to ITRA Section 219, with the possible exception of the following:

In 2019, we continued only with our existing contractual obligations in compliance with applicable economic sanctions and other trade-related laws including limited local delivery of radio, core and transmission equipment, including associated services, to MTN Irancell and some software and features to Mobile Communications Company of Iran (MCCI). We also provided some services to local fixed networks operators, Telecommunication Company of Iran (TCI) and, additionally, in 2019, we purchased certain fixed line telephony services from TCI and mobile phone subscriptions from MCCI.

Although it is difficult to evaluate with any reasonable degree of certainty, we have concluded that we cannot exclude the possibility that MCCI, MTN Irancell, TCI or Tacfam is owned or controlled, directly or indirectly, by the government of Iran. None of these activities involve U.S. affiliates of Nokia, or any persons from the United States.

Nokia does not normally allocate net profit on a country-by-country or activity-by-activity basis, other than as set forth in Nokia's consolidated financial statements prepared in accordance with IFRS. Therefore, for this exercise Nokia will reflect its sales margin in lieu of the net profit / loss. In 2019, we recognized net sales of EUR 0.47 million and a negative sales margin of EUR 0.2 million from business with MCCI, net sales of EUR 7.76 million and a sales margin of EUR 0.79 million from business with MTN Irancell and net sales of EUR 0.06 million and a negative sales margin of EUR 0.39 million from business with TCI.

Although we evaluate our business activities on an ongoing basis, we intend to continue not accepting any new business in Iran in 2020 and intend to only complete existing contractual obligations in Iran in compliance with applicable economic sanctions and other trade-related laws.

Taxation

General

The statements of the United States and Finnish tax laws set out below are based on the laws in force as of the date of this annual report on Form 20-F and may be subject to any changes in US or Finnish law, and in any double taxation convention or treaty between the United States and Finland, occurring after that date, possibly with retroactive effect.

For purposes of this discussion, "US Holders" are beneficial owners of ADSs that: (i) hold the ADSs as capital assets; (ii) are citizens or residents of the United States, corporations created in or organized under US law, estates whose income is subject to US federal income tax, or trusts that elect to be treated as a US person or are both subject to the primary supervision of a US court and controlled by a US person; and (iii) in each case, are considered residents of the United States for purposes of the current income tax convention between the United States and Finland, referred to as the "Treaty," and the limitation on benefits provisions therein. Special rules apply to US Holders that are also residents of Finland and to citizens or residents of the United States that do not maintain a substantial presence, permanent home or habitual abode in the United States. For purposes of this discussion, it is assumed that the Depositary and its custodian will perform all actions as required by the deposit agreement with the Depositary and other related agreements between the Depositary and Nokia.

If a partnership holds ADSs (including for this purpose any entity or arrangement treated as a partnership for US federal income tax purposes), the tax treatment of a partner will depend upon the status of the partner and activities of the partnership. If a US Holder is a partnership or a partner in a partnership that holds ADSs, the holder is urged to consult its own tax advisor regarding the specific tax consequences of owning and disposing of its ADSs.

Because this summary is not exhaustive of all possible tax considerations - such as situations involving financial institutions, banks, tax-exempt entities, pension funds, US expatriates, real estate investment trusts, persons that are dealers in securities, persons who own (directly, indirectly or by attribution) 10% or more of the share capital or voting stock of Nokia, persons who acquired their ADSs pursuant to the exercise of employee stock options or otherwise as compensation, or US Holders whose functional currency is not the US dollar, who may be subject to special rules that are not discussed herein - holders of shares or ADSs that are US Holders are advised to satisfy themselves as to the overall US federal, state and local tax consequences, as well as to the overall Finnish and other applicable non-US tax consequences, of their ownership of ADSs and the underlying shares by consulting their own tax advisors. This summary does not discuss the treatment of ADSs that are held in connection with a permanent establishment or fixed base in Finland, and it does not address the US Medicare tax on certain investment income.

For the purposes of both the Treaty and the US Internal Revenue Code of 1986, as amended, referred to as the "Code," US Holders of ADSs will be treated as the owners of the underlying shares that are represented by those ADSs. Accordingly, the following discussion, except where otherwise expressly noted, applies equally to US Holders of ADSs, on the one hand, and of shares on the other.

The holders of ADSs will, for Finnish tax purposes, be treated as the owners of the shares that are represented by the ADSs. The Finnish tax consequences to the holders of shares, as discussed below, also apply to the holders of ADSs.

US and Finnish taxation of cash dividends

For US federal income tax purposes, the gross amount of dividends paid to US Holders of shares or ADSs out of our current or accumulated earnings and profits, including any related Finnish withholding tax, generally will be included in gross income as foreign source dividend income. We do not expect to maintain calculations of our earnings and profits under US federal income tax principles; therefore, US Holders should expect that the entire amount of any distribution generally will be reported as dividend income. Dividends will not be eligible for the dividends received deduction allowed to corporations under the Code. The amount includible in income (including any Finnish withholding tax) will equal the US dollar value of the payment, determined at the time such payment is received by the Depository (in the case of ADSs) or by the US Holder (in the case of shares), regardless of whether the payment is in fact converted into US dollars. Generally, any gain or loss resulting from currency exchange rate fluctuations during the period between the time such payment is received and the date the dividend payment is converted into US dollars will be treated as US source ordinary income or loss to a US Holder.

Special rules govern and specific elections are available to accrual method taxpayers to determine the US dollar amount includible in income in the case of a dividend paid (and taxes withheld) in foreign currency. Accrual basis taxpayers are urged to consult their own tax advisers regarding the requirements and elections applicable in this regard.

Under the Finnish Income Tax Act and Act on Taxation of Non-residents' Income, non-residents of Finland are generally subject to a withholding tax at a rate of 30% on dividends paid by a Finnish resident company. Under the Finnish Repayment Act, starting January 1, 2020, 50% preliminary tax must be withheld on dividends paid in certain situations. However, pursuant to the Treaty, dividends paid to US Holders are generally subject to Finnish withholding tax at reduced rates.

Under the Finnish Income Tax Act, the distribution of funds from reserves for invested unrestricted equity (an "SVOP-reserve") by a listed company such as Nokia is taxed as a distribution of a dividend. The Central Tax Board in Finland has provided Nokia a ruling, which Nokia has appealed, that a distribution of funds from Nokia's SVOP-reserve would be treated as a distribution of a dividend under Article 10 of the Treaty, rather than as a return of capital, and thus would be subject to the same tax withholding provisions that apply to dividend distributions. If Nokia makes a distribution from its SVOP-reserve when it does not have current or accumulated earnings and profits, a US Holder may not be able to claim a foreign tax credit for any Finnish tax withheld on the distribution.

Subject to certain limitations and the above discussion of SVOP-reserves, Finnish taxes withheld will be treated as foreign taxes eligible for credit against a US Holder's US federal income tax liability. Dividends received generally will constitute foreign source "passive category income" for foreign tax credit purposes. In lieu of a credit, a US Holder may elect to claim a deduction in respect of its Finnish income taxes provided the deduction is claimed for all of the foreign taxes paid by the US Holder in that particular taxable year. A deduction does not reduce US tax on a dollar-for-dollar basis like a tax credit. The deduction, however, is not subject to the limitations applicable to foreign tax credits.

Provided that certain holding period and other requirements are met, individuals and certain other non-corporate US Holders are eligible for reduced rates of US federal income tax at a maximum rate of 20% in respect of "qualified dividend income." Dividends that Nokia pays with respect to its shares and ADSs generally will be qualified dividend income if certain holding periods are met and Nokia was neither a passive foreign investment company (PFIC) in the taxable year prior to the year in which the dividend was paid nor in the taxable year in which the dividend is paid. Nokia currently believes that dividends it pays with respect to its shares and ADSs will constitute qualified dividend income for US federal income tax purposes; however, this is a factual matter and is subject to change. Nokia anticipates that its dividends will be reported as qualified dividends on Forms 1099-DIV delivered to US Holders. US Holders of shares or ADSs are urged to consult their own tax advisors regarding the availability to them of the reduced dividend tax rate in light of their own particular situation and the computations of their foreign tax credit limitation with respect to any qualified dividends paid to them, as applicable.

We believe we should not be classified as a PFIC for US federal income tax purposes for the taxable year ended December 31, 2019 and we do not expect to become a PFIC in the foreseeable future. US Holders are advised, however, that this conclusion is a factual determination that must be made annually and thus may be subject to change. If we were to be classified as a PFIC, the tax on distributions on our shares or ADSs and on any gains realized upon the disposition of our shares or ADSs generally would be less favorable than as described herein. Dividends paid by a PFIC are not "qualified dividend income" and are not eligible for reduced rates of taxation. Additionally, US persons that are shareholders in a PFIC generally will be required to file an annual report disclosing the ownership of such shares and certain other information. US Holders should consult their own tax advisors regarding the application of the PFIC rules, including the related reporting requirements, to their ownership of our shares or ADSs.

Finnish withholding taxes on nominee registered shares

US Holders are required to provide certain information in order to benefit from the reduced 15% dividend withholding tax rate set out in the Treaty. If such information is not received, the normal 30% withholding tax rate will apply. The Finnish tax authorities have in their recent guidance taken a strict position on the required information, and a new tax regime will enter into force on January 1, 2021 that will tighten the conditions for the reduced withholding rate under the Treaty. Consequently, there is currently uncertainty on what information US Holders are required to provide to benefit from the reduced dividend withholding tax rates under the Treaty. Nokia may be required to apply a strict interpretation of the information required for a US Holder to obtain the reduced withholding rate, and withhold at a 50% rate on dividends paid to a US Holder.

Additionally, if a US Holder receives the reduced 15% withholding rate without meeting the criteria for receiving such rate, it is possible that the Finnish Tax Administration would assess the tax directly to the US Holder.

As mentioned above, new rules will enter into force as of January 1, 2021 and be applicable to dividend distributions made on or after January 1, 2021. In addition to tightening the conditions for the application of the withholding tax rates set forth in the Treaty, the new rules will increase the withholding tax rate applied to unidentified beneficial owners from 30% to 35%.

U.S. and Finnish tax on sale or other disposition

A US Holder generally will recognize taxable capital gain or loss on the sale or other disposition of ADSs in an amount equal to the difference between the US dollar value of the amount realized and the adjusted tax basis (determined in US dollars) in the ADSs. If the ADSs are held as a capital asset, this gain or loss generally will be long-term capital gain or loss if, at the time of the sale, the ADSs have been held for more than one year. Any capital gain or loss, for foreign tax credit purposes, generally will constitute US source gain or loss. In the case of a US Holder that is an individual, long-term capital gain generally is subject to US federal income tax at preferential rates. The deductibility of capital losses is subject to significant limitations.

The deposit or withdrawal by a US Holder of shares in exchange for ADSs or of ADSs for shares under the deposit agreement generally will not be subject to US federal income tax or Finnish income tax.

The sale by a US Holder of the ADSs or the underlying shares, other than an individual who, by reason of his residence in Finland for a period exceeding six months, is or becomes liable for Finnish income tax according to the relevant provisions of Finnish tax law, generally will not be subject to income tax in Finland, in accordance with Finnish tax law and the Treaty.

Finnish transfer tax

The transfer of our shares and ADSs for cash through a broker or other appropriate intermediary is generally not subject to Finnish transfer tax. Non-brokered transfers will generally be exempted from the transfer tax if the transferee has been approved as a trading party in the market where the transfer is executed, or other conditions are met. Transfers of ADSs on the New York Stock Exchange are exempt. Where the transfer does not fulfil the above requirements, and either the buyer or the seller is a Finnish resident or a Finnish branch office of a specified foreign financial service provider, the buyer is liable to pay transfer tax of 1.6% of the transaction price where the resulting tax is at least EUR 10. Selling shareholders should consult their tax advisors regarding the specific tax considerations of a sale of our shares or ADSs.

Finnish inheritance and gift taxes

A transfer of an underlying share by gift or by reason of the death of a US Holder and the transfer of an ADS are not subject to Finnish gift or inheritance tax provided that none of the deceased person, the donor, the beneficiary of the deceased person or the recipient of the gift is resident in Finland.

Non-residents of the United States

Beneficial owners of ADSs that are not US Holders will not be subject to US federal income tax on dividends received with respect to ADSs unless such dividend income is effectively connected with the conduct of a trade or business within the United States. Similarly, non-US Holders generally will not be subject to US federal income tax on any gain realized on the sale or other disposition of ADSs, unless (a) the gain is effectively connected with the conduct of a trade or business in the United States or (b) in the case of an individual, that individual is present in the United States for 183 days or more in the taxable year of the disposition and other conditions are met.

The United States information reporting and backup withholding

Dividend payments with respect to shares or ADSs and proceeds from the sale or other disposition of shares or ADSs may be subject to information reporting to the Internal Revenue Service and possible US backup withholding. Backup withholding will not apply to a holder if the holder furnishes a correct taxpayer identification number or certificate of foreign status and makes any other required certification in connection therewith, or if it is a recipient otherwise exempt from backup withholding (such as a corporation). Any US person required to establish their exempt status generally must furnish a duly completed IRS Form W-9 (Request for Taxpayer Identification Number and Certification). Non-US holders generally are not subject to US information reporting or backup withholding. However, such holders may be required to provide certification of non-US status (generally on IRS Form W-8BEN for individuals and Form W-8BEN-E for corporations) in connection with payments received in the United States or through certain US-related financial intermediaries. Backup withholding is not an additional tax. Amounts withheld as backup withholding may be credited against a holder's US federal income tax liability, and the holder may obtain a refund of any excess amounts withheld under the backup withholding rules by timely filing the appropriate claim for refund with the Internal Revenue Service and furnishing the proper required information.

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Consolidated income statement

For the year ended December 31	Notes	2019 EURm	2018 EURm	2017 EURm
Net sales	5, 7	23 315	22 563	23 147
Cost of sales	8	(14 989)	(14 117)	(14 008)
Gross profit		8 326	8 446	9 139
Research and development expenses	8	(4 411)	(4 620)	(4 916)
Selling, general and administrative expenses	8	(3 101)	(3 463)	(3 615)
Other operating income	10	424	290	363
Other operating expenses	8, 10	(753)	(712)	(955)
Operating profit/(loss)		485	(59)	16
Share of results of associated companies and joint ventures	34	12	12	11
Financial income and expenses	11	(341)	(313)	(537)
Profit/(loss) before tax		156	(360)	(510)
Income tax expense	12	(138)	(189)	(927)
Profit/(loss) for the year from Continuing operations		18	(549)	(1 437)
Profit/(loss) for the year from Continuing operations attributable to:				
Equity holders of the parent		14	(554)	(1 473)
Non-controlling interests		4	5	36
Profit/(loss) for the year from Continuing operations		18	(549)	(1 437)
Profit/(loss) for the year from Discontinued operations attributable to:				
Equity holders of the parent		(7)	214	(21)
Non-controlling interests		–	–	–
(Loss)/profit for the year from Discontinued operations	6	(7)	214	(21)
Profit/(loss) for the year attributable to:				
Equity holders of the parent		7	(340)	(1 494)
Non-controlling interests		4	5	36
Profit/(loss) for the year		11	(335)	(1 458)
Earnings per share attributable to equity holders of the parent				
	13	EUR	EUR	EUR
Basic earnings per share				
Continuing operations		0.00	(0.10)	(0.26)
Discontinued operations		0.00	0.04	0.00
Profit/loss for the year		0.00	(0.06)	(0.26)
Diluted earnings per share				
Continuing operations		0.00	(0.10)	(0.26)
Discontinued operations		0.00	0.04	0.00
Profit/loss for the year		0.00	(0.06)	(0.26)
Average number of shares				
	13	000s shares	000s shares	000s shares
Basic				
Continuing operations		5 599 912	5 588 020	5 651 814
Discontinued operations		5 599 912	5 588 020	5 651 814
Profit/loss for the year		5 599 912	5 588 020	5 651 814
Diluted				
Continuing operations		5 626 375	5 588 020	5 651 814
Discontinued operations		5 599 912	5 612 477	5 651 814
Profit/loss for the year		5 626 375	5 588 020	5 651 814

The notes are an integral part of these consolidated financial statements.

Consolidated statement of comprehensive income

For the year ended December 31	Notes	2019 EURm	2018 EURm	2017 EURm
Profit/(loss) for the year		11	(335)	(1 458)
Other comprehensive income				
Items that will not be reclassified to profit or loss:				
Remeasurements of defined benefit plans		414	388	723
Income tax related to items that will not be reclassified to profit or loss		(95)	(90)	(58)
Items that may be reclassified subsequently to profit or loss:				
Translation differences		260	401	(1 819)
Net investment hedges		(58)	(73)	440
Cash flow and other hedges		(2)	(53)	35
Financial assets at fair value through other comprehensive income		8	(45)	–
Available-for-sale investments		–	–	(88)
Other increase/(decrease), net		–	1	(1)
Income tax related to items that may be reclassified subsequently to profit or loss		11	33	(92)
Other comprehensive income/(loss), net of tax	22	538	562	(860)
Total comprehensive income/(loss) for the year		549	227	(2 318)
Attributable to:				
Equity holders of the parent		545	221	(2 304)
Non-controlling interests		4	6	(14)
Total comprehensive income/(loss) for the year		549	227	(2 318)
Attributable to equity holders of the parent:				
Continuing operations		552	7	(2 283)
Discontinued operations		(7)	214	(21)
Total attributable to equity holders of the parent		545	221	(2 304)
Attributable to non-controlling interests:				
Continuing operations		4	6	(14)
Discontinued operations		–	–	–
Total attributable to non-controlling interests		4	6	(14)

The notes are an integral part of these consolidated financial statements.

Consolidated statement of financial position

As of December 31	Notes	2019 EURm	2018 EURm
ASSETS			
Non-current assets			
Intangible assets	14, 17	7 956	8 805
Property, plant and equipment	15, 17	1 856	1 790
Right-of-use assets	16, 17	912	–
Investments in associated companies and joint ventures	17, 34	165	145
Non-current financial investments	24	740	690
Deferred tax assets	12	5 124	4 911
	17, 24,		
Other non-current financial assets	36	445	373
Defined benefit pension assets	27	4 830	4 224
Other non-current assets	19	292	308
Total non-current assets		22 320	21 246
Current assets			
Inventories	18	2 936	3 168
Trade receivables	24, 36	5 025	4 856
Contract assets	7, 36	1 489	1 875
Prepaid expenses and accrued income	19	908	1 024
Current income tax assets	12	279	227
	24, 25,		
Other current financial assets	36	164	243
Current financial investments	24, 36	97	612
Cash and cash equivalents	24, 36	5 910	6 261
Total current assets		16 808	18 266
Assets held for sale		–	5
Total assets		39 128	39 517
SHAREHOLDERS' EQUITY AND LIABILITIES			
Capital and reserves attributable to equity holders of the parent			
Share capital	20	246	246
Share issue premium		427	436
Treasury shares		(352)	(408)
Translation differences	21	(372)	(592)
Fair value and other reserves	21	1 382	1 063
Reserve for invested unrestricted equity		15 607	15 606
Accumulated deficit		(1 613)	(1 062)
Total capital and reserves attributable to equity holders of the parent		15 325	15 289
Non-controlling interests		76	82
Total equity		15 401	15 371
Non-current liabilities			
	23, 24,		
Long-term interest-bearing liabilities	36	3 985	2 826
Long-term lease liabilities	16	771	2
Deferred tax liabilities	12	390	350
Defined benefit pension and post-employment liabilities	27	4 343	4 327
Contract liabilities	7	915	1 113
Deferred revenue and other long-term liabilities	24, 28	712	852
Provisions	29	556	572
Total non-current liabilities		11 672	10 042
Current liabilities			
	23, 24,		
Short-term interest-bearing liabilities	36	292	994
Short-term lease liabilities	16	259	–
	24, 25,		
Other financial liabilities	36	803	891
Current income tax liabilities	12	187	268
Trade payables	24, 36	3 786	4 773
Contract liabilities	7	2 752	2 383
Accrued expenses, deferred revenue and other liabilities	28	3 323	3 940
Provisions	29	653	855
Total current liabilities		12 055	14 104
Total liabilities		23 727	24 146
Total shareholders' equity and liabilities		39 128	39 517

The notes are an integral part of these consolidated financial statements.

Consolidated statement of cash flows

For the year ended December 31	Notes	2019 EURm	2018 EURm	2017 EURm
Cash flow from operating activities				
Profit/(loss) for the year		11	(335)	(1 458)
Adjustments, total	31	2 627	2 093	3 676
Change in net working capital ⁽¹⁾				
Decrease/(increase) in receivables		159	246	(421)
Decrease/(increase) in inventories		285	(544)	(296)
(Decrease)/increase in non-interest bearing liabilities		(2 232)	(645)	1 221
Cash from operations		850	815	2 722
Interest received		57	68	53
Interest paid	16, 23	(1)	(159)	(409)
Income taxes paid, net		(516)	(364)	(555)
Net cash from operating activities		390	360	1 811
Cash flow from investing activities				
Purchase of property, plant and equipment and intangible assets		(690)	(672)	(601)
Proceeds from sale of property, plant and equipment and intangible assets		39	88	67
Acquisition of businesses, net of acquired cash		–	(31)	(394)
Proceeds from disposal of businesses, net of disposed cash		19	(18)	(16)
Purchase of current financial investments		(473)	(2 104)	(2 729)
Proceeds from maturities and sale of current financial investments		991	2 397	3 589
Purchase of non-current financial investments		(180)	(145)	(104)
Proceeds from sale of non-current financial investments		144	170	207
Payment of other long-term loans receivable		(21)	(1)	(2)
Other		4	1	(7)
Net cash (used in)/from investing activities		(167)	(315)	10
Cash flow from financing activities				
Proceeds from stock option exercises		–	1	1
Purchase of treasury shares		–	–	(785)
Purchase of equity instruments of subsidiaries		(1)	1	(38)
Proceeds from long-term borrowings	23	1 039	139	2 129
Repayment of long-term borrowings	23	(766)	(29)	(2 041)
Proceeds from/(repayment of) short-term borrowings	23	40	2	(38)
Payment of principal portion of lease liabilities	16	(221)	(2)	(7)
Dividends paid		(570)	(1 081)	(970)
Net cash used in financing activities		(479)	(969)	(1 749)
Translation differences		(95)	(184)	(200)
Net decrease in cash and cash equivalents		(351)	(1 108)	(128)
Cash and cash equivalents as of January 1		6 261	7 369	7 497
Cash and cash equivalents as of December 31		5 910	6 261	7 369

(1) Net working capital includes both short-term and long-term items.

The consolidated statement of cash flows combines cash flows from both the Continuing and the Discontinued operations.

The amounts in the consolidated statement of cash flows cannot be directly traced from the consolidated statement of financial position without additional information on the acquisitions and disposals of subsidiaries and the net foreign exchange differences arising on consolidation.

The notes are an integral part of these consolidated financial statements.

1. Corporate information

Nokia Corporation, a public limited liability company incorporated and domiciled in Helsinki, Finland, is the parent company (Parent Company or Parent) for all its subsidiaries (Nokia or the Group). The Group's operational headquarters are located in Espoo, Finland. The Group is listed on the Nasdaq Helsinki Stock Exchange, the New York Stock Exchange and the Euronext Paris Stock Exchange. The Group is a leading global provider of mobile and fixed network infrastructure combining hardware, software and services, as well as advanced technologies and licensing that connect people and things.

On March 5, 2020 the Board of Directors authorized the financial statements for 2019 for issuance and filing.

2. Significant accounting policies

Basis of presentation and statement of compliance

The consolidated financial statements are prepared in accordance with International Financial Reporting Standards as issued by the International Accounting Standards Board (IASB) and as adopted by the European Union (IFRS). The consolidated financial statements are presented in millions of euros (EURm), except as otherwise noted, and are prepared under the historical cost convention, except as disclosed in the accounting policies below. The notes to the consolidated financial statements also conform to the Finnish accounting legislation.

Other information

This paragraph is included in connection with statutory reporting requirements in Germany. The fully consolidated German subsidiary, Nokia Solutions and Networks GmbH & Co. KG, registered in the commercial register of Munich under HRA 88537, has made use of the exemption available under § 264b and § 291 of the German Commercial Code (HGB).

Principles of consolidation

The consolidated financial statements comprise the financial statements of the Parent Company, and each of those companies over which it exercises control. Control over an entity exists when the Group is exposed, or has rights, to variable returns from its involvement with the entity and has the ability to affect those returns through its power over the entity. When the Group has less than a majority of voting or similar rights in an entity, the Group considers all relevant facts and circumstances in assessing whether it has power over an entity, including the contractual arrangements, and voting rights and potential voting rights. The Group reassesses whether or not it controls an entity if facts and circumstances indicate that there are changes to the elements of control.

Consolidation of a subsidiary begins when the Group obtains control over the subsidiary and ceases when the Group loses control over the subsidiary. Assets, liabilities, income and expenses of a subsidiary acquired or disposed of during the year are included in the consolidated financial statements from the date the Group gains control until the date the Group ceases to control the subsidiary. A change in the ownership interest of a subsidiary, without a loss of control, is accounted for as an equity transaction. If the Group loses control in a subsidiary, the related assets, liabilities, non-controlling interest and other components of equity are derecognized with any gain or loss recognized in the consolidated income statement. Any investment retained in the former subsidiary is measured at fair value.

All intercompany transactions are eliminated as part of the consolidation process. Non-controlling interests are presented separately as a component of net profit or loss and are shown as a component of shareholders' equity in the consolidated statement of financial position.

Business combinations

Business combinations are accounted for using the acquisition method. The consideration transferred in a business combination is measured as the aggregate of the fair values of the assets transferred, liabilities incurred towards the former owners of the acquired entity or business and equity instruments issued. Acquisition-related costs are recognized as expenses in the consolidated income statement in the period in which the costs are incurred and the related services are received with the exception of costs directly attributable to the issuance of equity instruments that are accounted for as a deduction from equity.

Identifiable assets acquired and liabilities assumed are measured at the acquisition date fair values. The Group elects whether to measure the non-controlling interests in the acquiree at fair value or at the proportionate share of the acquiree's identifiable net assets on a business combination by business combination basis. The excess of the aggregate of the consideration transferred and the amount recognized for non-controlling interests over the acquisition date fair values of the identifiable net assets acquired is recorded as goodwill.

Investment in associates and joint ventures

An associate is an entity over which the Group exercises significant influence. Significant influence is the power to participate in the financial and operating policy decisions of the entity, but is not control or joint control over those policies.

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the arrangement. Joint control is the contractually agreed sharing of control of an arrangement, which exists only when decisions about relevant activities require the unanimous consent of the parties sharing control.

The Group's investments in associates and joint ventures are accounted for using the equity method. Under the equity method, the investment in an associate or joint venture is initially recognized at cost. The carrying amount of the investment is adjusted to recognize changes in the Group's share of net assets of the associate or joint venture since the acquisition date. The Group's share of profits and losses of associates and joint ventures is included in the consolidated income statement outside operating profit or loss. Any change in other comprehensive income of associates and joint ventures is presented as part of the Group's other comprehensive income.

After application of the equity method, as of each reporting date, the Group determines whether there is objective evidence that the investment in an associate or joint venture is impaired. If there is such evidence, the Group recognizes an impairment loss that is calculated as the difference between the recoverable amount of the associate or joint venture and its carrying value. The impairment loss is presented within 'share of results of associated companies and joint ventures' in the consolidated income statement.

Non-current assets (or disposal groups) held for sale and discontinued operations

Non-current assets or disposal groups are classified as assets held for sale if their carrying amounts will be recovered principally through a sale transaction rather than through continuing use. For this to be the case, the asset, or the disposal group, must be available for immediate sale in its present condition subject only to terms that are usual and customary for sales of such assets or disposal groups, and the sale must be highly probable. These assets, or in the case of disposal groups, assets and liabilities, are presented separately in the consolidated statement of financial position and measured at the lower of the carrying amount and fair value less costs to sell. Non-current assets classified as held for sale, or included in a disposal group classified as held for sale, are not depreciated or amortized.

Discontinued operations are reported when a component of the Group, comprising operations and cash flows that can be clearly distinguished both operationally and for financial reporting purposes from the rest of the Group, is classified as held for sale or has been disposed of, or the component represents a major line of business or geographical area of operations, or is a part of a single coordinated plan to dispose of a separate major line of business or geographical area of operations. Profit or loss from Discontinued operations is reported separately from income and expenses from Continuing operations in the consolidated income statement, with prior periods presented on a comparative basis. Cash flows for Discontinued operations are presented separately in the notes to the consolidated financial statements. Intra-group revenues and expenses between Continuing and Discontinued operations are eliminated.

Revenue recognition

The Group accounts for a contract with a customer when the contract has been approved in writing which is generally when both parties are committed to perform their respective obligations, the rights, including payment terms, regarding the goods and services to be transferred can be identified, the contract has commercial substance, and collection of the consideration to which the Group expects to be entitled is probable. Management considers only legally enforceable rights in evaluating the accounting for contracts with customers. As such, frame agreements that do not create legally enforceable rights and obligations are accounted for based on the issuance of subsequent legally binding purchase orders under the frame agreements.

A contract modification or a purchase order is accounted for as a separate contract if the scope of the contract increases by additional distinct goods or services, and the price of the contract increases by an amount that reflects the standalone selling price of those additional goods or services. In case the additional goods or services are distinct but not sold at a standalone selling price, the contract modification is accounted for prospectively. In cases where the additional goods or services are not distinct, the modification is accounted for through a cumulative catch-up adjustment.

The Group recognizes revenue from contracts with customers to reflect the transfer of promised goods and services to customers for amounts that reflect the consideration to which the Group expects to be entitled in exchange for those goods and services. The consideration may include a variable amount which the Group estimates based on the most likely amount. Items causing variability include volume discounts and sales-based or usage-based royalties. The Group includes variable consideration into the transaction price only to the extent that it is highly probable that a significant revenue reversal will not occur. The transaction price also excludes amounts collected on behalf of third parties.

The Group's payment terms are on average 90 to 180 days. Invoices are generally issued as control transfers and/or as services are rendered. When this is not the case the Group recognizes a contract asset or liability depending on the timing of payment versus transfer of control. In case the timing of payments provides either the customer or the Group with a significant benefit of financing, the transaction price is adjusted for the effect of financing and the related interest revenue or interest expense is presented separately from revenue. As a practical expedient, the Group does not account for financing components if the consideration is received in one year or less before or after the goods or services have been transferred to the customer.

The Group enters into contracts with customers consisting of any combination of hardware, services and intellectual property. The associated revenue recognized for such contracts depends on the nature of the underlying goods and services provided. The promised goods or services in the contract might include sale of goods, license of intellectual property and grant of options to purchase additional goods or services that may provide the customer with a material right. The Group conducts an assessment at contract inception to determine which promised goods and services in a customer contract are distinct and accordingly identified as performance obligations. The Group considers that goods and services are distinct if the customer can benefit from the good or service either on its own or together with other resources readily available, and if the Group's promise to transfer the good or service is separately identifiable from other promises in the contract.

The Group allocates the transaction price to each distinct performance obligation on the basis of their stand-alone selling prices, relative to the overall transaction price. If a stand-alone selling price is not observable, it is estimated. The transaction price may include a discount or a variable amount of consideration that is generally allocated proportionately to all performance obligations in the contract unless the Group has observable evidence that the entire discount relates to only one or more, but not all, performance obligations in a contract.

Revenue is recognized when, or as, the Group satisfies a performance obligation by transferring a promised good or service to a customer which is when the customer obtains control of that good or service. The amount of revenue recognized is the amount allocated to the satisfied performance obligation based on the relative standalone selling prices. A performance obligation may be satisfied at a point in time or over time.

Hardware and software sold by the Group includes warranty, which can either be assurance-type for repair of defects and recognized as a centralized warranty provision (refer to Note 29, Provisions), or service-type for scope beyond the repair of defects or for a time period beyond the standard assurance-type warranty period and considered a separate performance obligation within the context of the contract. Revenue is allocated to each performance obligation based on its standalone selling price in relation to the overall transaction price. The standalone selling price of each performance obligation is determined by considering factors such as the price of the performance obligation if sold on a standalone basis and the expected cost of the performance obligation plus a reasonable margin when price references are not available. The portion of the transaction price allocated to each performance obligation is then recognized when the revenue recognition criteria for that performance obligation have been met.

The Group presents its customer contracts in the consolidated statement of financial position as either a contract asset or a contract liability, depending on the relationship between the Group's performance and the customer's payment for each individual contract. On a net basis, a contract asset position represents where the Group has performed by transferring goods or services to a customer before the customer has provided the associated consideration or before payment is due. Conversely, a contract liability position represents where a customer has paid

consideration or payment is due, but the Group has not yet transferred goods or services to the customer. Contract assets presented in the consolidated statement of financial position are current in nature while contract liabilities can be either current or non-current. Invoiced receivables represent unconditional rights to payment and are presented separately as trade receivables in the consolidated statement of financial position.

Sale of products

The Group manufactures and sells a range of networking equipment, covering the end-to-end requirements of network operators. Revenue for these products is recognized when control of the products has transferred, the determination of which may require judgment. Typically, for standard equipment sales, control transfers upon delivery. For more complex solutions, control generally transfers upon acceptance.

In some arrangements, mainly within the submarine cable business, performance does not create an asset with an alternative use and the Group recognizes revenue over time using the output method, which faithfully depicts the manner in which the asset is transferred to the customer as well as the Group's enforceable rights to payment for the work completed to date. The output measure selected by the Group may vary from each contract depending on the nature of contract.

Sale of services

The Group provides services related to the provision of networking equipment, ranging from managing a customer's network and product maintenance services to network installation, integration and optimization. Revenue for each separate service performance obligation is recognized as or when the customer obtains the benefits of the Group's performance. Service revenue is recognized over time for managed and maintenance services, as in these cases the Group performs throughout a fixed contract term and the customer simultaneously receives and consumes the benefits as the Group performs. In some cases, the Group performs services that are subject to customer acceptance where revenue is recognized when the customer acceptance is received.

Sale of intellectual property licenses

The Group provides its customers with licenses to intellectual property (IP) owned by the Group by granting software licenses and rights to benefit from the Group's IP in their products. When a software license is sold, revenue is recognized upon delivery or acceptance of the software, as the Group has determined that each software release is distinct and the license is granted for software as it exists at the point of transfer of control to the customer.

When the Group grants customers a license to use IP owned by the Group, the associated license fee revenue is recognized in accordance with the substance of the relevant agreements. In the majority of cases, the Group retains obligations to continue to develop and make available to the customer the latest IP in the licensed assets during the contract term, and therefore revenue is recognized pro rata over the period during which the Group is expected to perform. Recognition of the revenue as pro rata over the term of the license is considered the most faithful depiction of the Group's satisfaction of the performance obligation as the IP being licensed towards the customer includes new inventions patented by the Group that are highly interdependent and interrelated and created through the course of continuous research and development (R&D) efforts that are relatively stable throughout the year. In some contracts, the Group has no remaining obligations to perform after granting a license to the initial IP, and licensing fees are non-refundable. In these cases, revenue is recognized at the beginning of the license term.

Government grants

Government grants are recognized when there is reasonable assurance that the Group will comply with the conditions attached to them and the grants will be received. Government grants received as compensation for expenses or losses incurred are recognized in the consolidated income statement as a deduction against the related expenses. Government grants related to assets are presented in the consolidated statement of financial position as deferred income and recognized as income over the same period the asset is depreciated or amortized.

Government grants received in the form of R&D tax credits are recognized as a deduction against R&D expenses if the amount of the tax credit is linked to the amount of R&D expenditures incurred by the Group and the tax credit is a fully collectible asset which will be paid in cash by the government in case the Group is not able to offset it against its income tax payable. R&D tax credits that do not meet both conditions are recognized as income tax benefit.

Employee benefits

Pensions and other post-employment benefits

The Group companies have various post-employment plans in accordance with the local conditions and practices in the countries in which they operate. The plans are generally funded through payments to insurance companies or contributions to trustee-administered funds as determined by periodic actuarial calculations.

In a defined contribution plan, the Group's legal or constructive obligation is limited to the amount that it agrees to contribute to the fund. The Group's contributions to defined contribution plans, multi-employer and insured plans are recognized in the consolidated income statement in the period to which the contributions relate. If a pension plan is funded through an insurance contract where the Group does not retain any legal or constructive obligations, the plan is treated as a defined contribution plan. All arrangements that do not fulfill these conditions are considered defined benefit plans.

For defined benefit plans, including pension and post-employment healthcare and life insurance, costs are assessed using the projected unit credit method: the cost is recognized in the consolidated income statement so as to spread the benefit over the service lives of employees. The defined benefit obligation is measured as the present value of the estimated future cash outflows using interest rates on high-quality corporate bonds or government bonds with maturities that most closely match expected payouts of benefits. The liability or asset recognized in the consolidated statement of financial position is the present value of the defined benefit obligation as of the reporting date less the fair value of plan assets including effects of any asset ceiling.

Service cost related to employees' service in the current period is presented within cost of sales, research and development expenses or selling, general and administrative expenses and net interest is presented within financial income and expenses in the consolidated income statement. Past service costs or gains arising from plan amendments and curtailments, as well as gains and losses on settlements, are recognized immediately in the consolidated income statement as part of other operating income or expense when the plan amendment, curtailment or settlement occurs. Remeasurements in the defined benefit liability and asset comprise actuarial gains and losses arising from experience

adjustments, changes in actuarial assumptions, changes in the effect of the asset ceiling and the return on plan assets, excluding amounts recognized in net interest. Remeasurements are recognized immediately in the consolidated statement of financial position with a corresponding debit or credit to fair value and other reserves in shareholders' equity through other comprehensive income in the period in which they occur and are not reclassified to the consolidated income statement in subsequent periods.

Actuarial valuations for the Group's defined benefit post-employment plans are performed annually or when a material plan amendment, curtailment or settlement occurs.

Termination benefits

Termination benefits are payable when employment is terminated before the normal retirement date, or whenever an employee accepts voluntary redundancy in exchange for these benefits. The Group recognizes termination benefits when it is demonstrably committed to either terminating the employment of current employees according to a detailed formal plan without possibility of withdrawal, or providing termination benefits as a result of an offer made to encourage voluntary redundancy. These benefits are recorded as termination benefits as a component of the restructuring provision. Local laws may provide employees with the right to benefits from the employer upon termination whether the termination is voluntary or involuntary. For these specific benefits, the difference between the value of the higher benefit for involuntary termination and the lower benefit for voluntary termination is treated as a termination benefit and the portion of the benefit that the Group would be required to pay to the employee in the case of voluntary termination is treated as a contractual or legal obligation determined by local law and accounted for as a defined benefit arrangement as described in the pensions section above.

Share-based payments

The Group offers three types of global equity-settled share-based compensation plans for employees: performance shares, restricted shares and the employee share purchase plan.

Employee services received and the corresponding increase in equity are measured by reference to the fair value of the equity instruments as of the grant date, excluding the impact of any non-market vesting conditions. Non-market vesting conditions attached to the performance shares are included in assumptions about the number of shares that the employee will ultimately receive. The Group reviews the assumptions made on a regular basis and, where necessary, revises its estimates of the number of performance shares that are expected to be settled. Plans that apply tranching vesting are accounted for under the graded vesting model. Share-based compensation is recognized as an expense in the consolidated income statement over the relevant service periods.

Income taxes

The income tax expense comprises current tax and deferred tax. Tax is recognized in the consolidated income statement except to the extent that it relates to items recognized in other comprehensive income, or directly in equity; then the related tax is recognized in other comprehensive income or equity, respectively.

Current taxes are based on the results of Group companies and are calculated using the local tax laws and tax rates that are enacted or substantively enacted as of each reporting date. Corporate taxes withheld at the source of the income on behalf of Group companies are accounted for in income taxes where determined to represent a tax on net income.

Deferred tax assets and liabilities are determined using the balance sheet liability method for all temporary differences arising between the tax bases of assets and liabilities and their carrying amounts in the consolidated financial statements. Deferred tax assets are recognized to the extent it is probable that future taxable profit will be available against which the unused tax losses, unused tax credits and deductible temporary differences can be utilized in the relevant jurisdictions. Deferred tax assets are assessed for realizability as of each reporting date. When circumstances indicate it is no longer probable that deferred tax assets will be utilized, adjustments are made as necessary. Deferred tax liabilities are recognized for taxable temporary differences, and for temporary differences that arise between the fair value and the tax base of identifiable net assets acquired in business combinations.

Deferred tax assets and deferred tax liabilities are offset for presentation purposes when there is a legally enforceable right to set off current tax assets against current tax liabilities, and the deferred tax assets and deferred tax liabilities relate to income taxes levied by the same taxation authority on either the same taxable entity or different taxable entities which intend either to settle current tax liabilities and assets on a net basis, or to realize the assets and settle the liabilities simultaneously in each future period in which significant amounts of deferred tax liabilities or deferred tax assets are expected to be settled or recovered.

Deferred tax liabilities are not recognized if they arise from the initial recognition of goodwill. Deferred tax liabilities are provided on taxable temporary differences arising from investments in subsidiaries, associates and joint arrangements, except for deferred tax liability where the timing of the reversal of the temporary difference is controlled by the Group, and it is probable that the temporary difference will not reverse in the foreseeable future.

The enacted or substantively enacted tax rates as of each reporting date that are expected to apply in the period when the asset is realized or the liability is settled are used in the measurement of deferred tax assets and deferred tax liabilities. Deferred tax assets and liabilities are not discounted.

The Group periodically evaluates positions taken in tax returns with respect to situations in which applicable tax regulation is subject to interpretation. It adjusts the amounts of current and deferred tax assets and liabilities recorded, where it is considered probable, i.e. more likely than not, that certain tax positions may not be fully sustained upon review by tax authorities. The amounts recorded are based on the most likely amount or the expected value, depending on which method the Group expects to better predict the resolution of the uncertainty, as of each reporting date.

Foreign currency translation

Functional and presentation currency

The financial statements of all Group companies are measured using functional currency, which is the currency of the primary economic environment in which the entity operates. The consolidated financial statements are presented in euro, the functional and presentation currency of the Parent Company.

Transactions in foreign currencies

Transactions in foreign currencies are recorded at exchange rates prevailing as of the dates of the individual transactions. For practical reasons, a rate that approximates the actual rate as of the date of the transaction is often used. Monetary assets and liabilities denominated in foreign currency are valued at the exchange rates prevailing at the end of the reporting period. Foreign exchange gains and losses arising from monetary assets and liabilities as well as fair value changes of related hedging instruments are recognized in financial income and expenses in the consolidated income statement. Unrealized foreign exchange gains and losses related to non-monetary non-current financial investments are included in the fair value measurement of these investments and recognized in other operating income and expenses in the consolidated income statement.

Foreign Group companies

On consolidation, the assets and liabilities of foreign operations whose functional currency is other than euro are translated into euro at the exchange rates prevailing at the end of the reporting period. The income and expenses of these foreign operations are translated into euro at the average exchange rates for the reporting period. The exchange differences arising from translation for consolidation are recognized as translation differences in the consolidated statement of comprehensive income. On disposal of a foreign operation the cumulative amount of translation differences relating to that disposal is reclassified to profit or loss.

Intangible assets

Intangible assets acquired separately are measured on initial recognition at cost. The cost of intangible assets acquired in a business combination is their fair value as of the date of acquisition. Internally generated intangibles, except for development costs that may be capitalized, are expensed as incurred. Development costs are capitalized only if the Group has the technical feasibility to complete the asset; has an ability and intention to use or sell the asset; can demonstrate that the asset will generate future economic benefits; has resources available to complete the asset; and has the ability to measure reliably the expenditure during development.

The useful life of the Group's intangible assets, other than goodwill, is finite. Following initial recognition, finite intangible assets are carried at cost less accumulated amortization and accumulated impairment losses. Intangible assets are amortized over their useful lives, generally three to ten years, using the straight-line method which is considered to best reflect the pattern in which the asset's future economic benefits are expected to be consumed. Depending on the nature of the intangible asset, the amortization charges are presented within cost of sales, research and development expenses or selling, general and administrative expenses in the consolidated income statement.

Property, plant and equipment

Property, plant and equipment are stated at cost less accumulated depreciation and accumulated impairment losses. Depreciation is recorded on a straight-line basis over the expected useful lives of the assets as follows:

Buildings and constructions	
Buildings and constructions	20–33 years
Light buildings and constructions	3–20 years
Machinery and equipment	
Production machinery, measuring and test equipment	1–5 years
Other machinery and equipment	3–10 years

Land and water areas are not depreciated.

Maintenance, repairs and renewals are generally expensed in the period in which they are incurred. However, major renovations are capitalized and included in the carrying amount of the asset when it is probable that future economic benefits in excess of the originally assessed standard of performance of the existing asset will flow to the Group. Major renovations are depreciated over the remaining useful life of the related asset. Leasehold improvements are depreciated over the shorter of the lease term and the useful life. Gains and losses on the disposal of property, plant and equipment are included in other operating income or expenses.

Leases

On January 1, 2019, the Group adopted IFRS 16, Leases (IFRS 16). IFRS 16 provides a single lessee accounting model, requiring lessees to recognize right-of-use assets and lease liabilities for all leases with a lease term exceeding 12 months in the consolidated statement of financial position. The right-of-use asset represents the lessee's right to use the underlying leased asset while the lease liability represents the lessee's obligation to make lease payments.

The Group assesses at contract inception whether a contract is, or contains, a lease. That is, the Group assesses whether the contract conveys the right to control the use of an identified asset for a period of time in exchange for consideration. At the commencement date of the lease, the Group recognizes a right-of-use asset and a lease liability for all leases with a lease term exceeding 12 months. The commencement date is the date when the lessor makes the underlying leased asset available for use by the Group.

The Group applies a practical expedient available under IFRS 16 whereby the Group does not recognize any leases, where the lease term is 12 months or less at the lease commencement date (short-term leases), in its consolidated statement of financial position. Instead, the Group recognizes the lease payments associated with short-term leases as an operating expense on a straight-line basis over the lease term. In addition, as a practical expedient, the Group does not separate certain non-lease components from lease components but instead accounts for each lease component and associated specified non-lease component as a single lease component. Non-lease components such as payments for maintenance and services made in conjunction with the leased asset are included in the lease liability whenever these payments are fixed and defined in the lease contract. Other payments for non-lease components which are variable based on consumption, as an example property taxes, insurance payments and variable property service costs, are recognized as an expense when incurred.

The majority of the Group's leased assets relate to commercial and industrial properties such as R&D facilities, production facilities and office buildings. The Group also leases vehicles provided as employee benefits and service vehicles.

Right-of-use assets are measured at cost less accumulated depreciation and impairment losses, and adjusted for any remeasurements of the lease liabilities. The cost of right-of-use assets includes the amount of lease liabilities recognized, initial direct costs incurred, and lease payments made at or before the commencement date less any lease incentives received. Right-of-use assets are depreciated on a straight-line basis over the lease term as follows:

Buildings	3–10 years
Other	3–5 years

The Group applies the requirements of IAS 36, Impairment of Assets, to assess its right-of-use assets for impairment. Refer to "Impairment of goodwill, other intangible assets, property, plant and equipment and right-of-use assets" section below.

Lease liabilities are measured at the present value of lease payments to be made over the lease term. The Group determines the lease term as the non-cancellable term of the lease, together with any periods covered by an option to extend the lease if it is reasonably certain to be exercised, as well as any periods covered by an option to terminate the lease if it is reasonably certain not to be exercised. The lease payments include fixed lease payments and certain fixed non-lease components less any lease incentives receivable, variable lease payments that depend on an index or a rate, and appropriate termination fees whenever the lease term has been determined based on the expectation that the Group will exercise its option to terminate. The Group does not generally enter into lease contracts with variable lease payments linked to future performance or use of an underlying asset.

After the commencement date, the amount of lease liabilities is measured on an amortized cost basis using the effective interest method where the lease liabilities increase related to the accretion of interest and decrease for lease payments made. In addition, the carrying amounts for the right-of-use asset and lease liability are remeasured if there is a modification, a change in the lease term or a change in the future lease payments resulting from a change in an index or rate used to determine such lease payments. The interest component of the lease payments is recognized as interest expense within financial income and expenses.

The Group uses its incremental borrowing rate to calculate the present value of lease payments as the interest rate implicit in the lease is not readily determinable. The Group estimates its incremental borrowing rate quarterly based on the rate of interest that the Group would pay to borrow over the lease term with a similar security to obtain an asset of a similar value to the leased asset in a similar economic environment. The Group measures all leases at amortized cost based on the appropriate discount rate available in the quarter when lease commencement occurred. Where a lease contract modification or reassessment of the lease liability resulting from a change in the lease term occurs, the Group remeasures the present value of the lease liability based on the appropriate discount rate available in the quarter when the reassessment or modification occurs.

The Group acts primarily as a lessee in its leasing transactions. However, the Group will enter into contracts to sublease vacant leasehold or freehold properties for sublease terms up to 10 years to offset or mitigate the unavoidable costs associated with those properties. In these cases, the Group classifies each sublease as a finance lease whenever the sublease contract transfers substantially all the risks and rewards incidental to ownership to the subtenant. All other subleases are classified as operating leases.

Included within other financial assets in its consolidated statement of financial position, the Group recognizes a net investment asset for all finance subleases based on the present value of future sublease payments at the sublease commencement date. After the commencement date, the net investment asset is measured on an amortized cost basis using the effective interest method where the net investment asset increases related to the accretion of interest income and decreases for sublease payments received. Sublease payments received from operating subleases is recognized as other operating income on a straight-line basis over the lease term.

Impairment of goodwill, other intangible assets, property, plant and equipment and right-of-use assets

The Group assesses the recoverability of the carrying value of goodwill, other intangible assets, property, plant and equipment and right-of-use assets if events or changes in circumstances indicate that the carrying value may be impaired. In addition, the Group tests the carrying value of goodwill for impairment annually even if there is no indication of impairment.

Factors that the Group considers when it reviews indications of impairment include, but are not limited to, underperformance of the asset relative to its historical or projected future results, significant changes in the manner of using the asset or the strategy for the overall business, and significant negative industry or economic trends.

Goodwill is allocated to the cash-generating units or groups of cash-generating units that are expected to benefit from the synergies of the related business combination and that reflect the lowest level at which goodwill is monitored for internal management purposes. A cash-generating unit, as determined for the purposes of the Group's goodwill impairment testing, is the smallest group of assets, including goodwill, generating cash inflows that are largely independent of the cash inflows from other assets or groups of assets. The carrying value of a cash-generating unit includes its share of relevant corporate assets allocated to it on a reasonable and consistent basis. When the composition of one or more groups of cash generating units to which goodwill has been allocated is changed, the goodwill is reallocated based on the relative fair value of the affected groups of cash generating units.

The Group conducts its impairment testing by determining the recoverable amount for an asset or a cash-generating unit. The recoverable amount of an asset or a cash-generating unit is the higher of its fair value less costs of disposal and its value-in-use. The recoverable amount is compared to the asset's or cash-generating unit's carrying value. If the recoverable amount for the asset or cash-generating unit is less than its carrying value, the asset is considered impaired and is written down to its recoverable amount. Impairment losses are presented in other operating expenses, or as a separate line item if significant, in the consolidated income statement.

Inventories

Inventories are stated at the lower of cost and net realizable value. Cost is determined using standard cost, which approximates actual cost on a first-in first-out (FIFO) basis. Net realizable value is the amount that can be realized from the sale of the inventory in the normal course of business after allowing for the costs of realization. In addition to the cost of materials and direct labor, an appropriate proportion of production overhead is included in the cost of inventory. An allowance is recorded for excess inventory and obsolescence based on the lower of cost and net realizable value.

Fair value measurement

A number of financial instruments are measured at fair value as of each reporting date after initial recognition. Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The fair value of an asset or a liability is measured using the assumptions that market participants would use when pricing the asset or liability, assuming that market participants act in their economic best interest, by using quoted market rates, discounted cash flow analyses and other appropriate valuation models. The Group uses valuation techniques that are appropriate in the circumstances and for which sufficient data is available to measure fair value, maximizing the use of relevant observable inputs and minimizing the use of unobservable inputs. All financial assets and liabilities for which fair values are being measured or disclosed in the consolidated financial statements are categorized within the fair value hierarchy, described as follows, based on the lowest level input that is significant to the fair value measurement as a whole:

Level 1—Quoted (unadjusted) market prices for exchange-traded products in active markets for identical assets or liabilities;

Level 2—Valuation techniques for which significant inputs other than quoted prices are directly or indirectly observable; and

Level 3—Valuation techniques for which significant inputs are unobservable.

The Group categorizes assets and liabilities that are measured at fair value on a recurring basis into an appropriate level of the fair value hierarchy at the end of each reporting period.

Classification and measurement of financial assets

The Group has classified its financial assets that are debt instruments in the following three categories: financial assets measured at amortized cost, financial assets measured at fair value through other comprehensive income and financial assets measured at fair value through profit and loss. The Group has classified its financial assets that are equity instruments to financial assets measured at fair value through profit and loss. The selection of the appropriate category is made based on both the Group's business model for managing the financial asset and on the contractual cash flow characteristics of the asset.

The Group's business model for managing financial assets is defined on a portfolio level. The business model must be observable on practical level by the way business is managed. The cash flows of financial assets measured at amortized cost are solely payments of principal and interest. These assets are held within a business model which has an objective to hold assets to collect contractual cash flows. Financial assets measured at fair value through other comprehensive income have cash flows that are solely payments of principal and interest and these assets are held within a business model which has an objective that is achieved both by holding financial assets to collect contractual cash flows and selling financial assets. Financial assets measured at fair value through profit and loss are assets that do not fall in either of these two categories. In addition to the classification as described above, the accounting for financial assets is impacted if the financial asset is part of a hedging relationship (see below the section on Hedge accounting).

All purchases and sales of financial assets are recorded on the trade date, that is, when the Group commits to purchase or sell the asset. A financial asset is de-recognized when substantially all the risks and rewards related to the financial asset have been transferred to a third party that assumes control of the financial asset.

Non-current financial investments

Non-current financial investments include investments in unlisted private equity shares and unlisted venture funds. These equity and debt investments are classified as fair value through profit and loss and are initially recognized and subsequently remeasured at fair value.

Fair value is estimated using a number of methods, including, but not limited to: quoted market rates; the current market value of similar instruments; prices established from a recent arm's-length financing transaction of target companies; and analysis of market prospects and operating performance of target companies, taking into consideration public market comparable companies in similar industry sectors. The Group uses judgment in selecting the appropriate valuation methodology as well as underlying assumptions based on existing market practice and conditions.

Fair value adjustments, foreign exchange gains and losses as well as realized gains and losses from the disposal of these investments are recognized within other operating income and expenses in the consolidated income statement. Weighted average method is used to determine the cost basis of the investments disposed.

Other non-current financial assets

Other non-current financial assets include restricted assets and other receivables, customer and vendor financing related loan receivables and certain other investments of a long-term nature.

Restricted assets and other receivables include restricted bank deposits primarily related to employee benefits as well as other loan receivables. These assets are initially measured at fair value and in subsequent periods at amortized cost using the effective interest method. Interest calculated using the effective interest method as well as foreign exchange gains and losses are recognized in financial income and expenses in the consolidated income statement. For these assets, a loss allowance is calculated on a quarterly basis based on a review of collectability and available collateral, recorded as an adjustment to the carrying amount of the investment and recognized in other financial expenses in the consolidated income statement.

Customer and vendor related loan receivables are managed in a portfolio with a business model of holding investments to collect principal and interest as well as selling investments. They are initially recognized and subsequently remeasured at fair value determined using discounted cash

flow method. The changes in fair value are recognized in fair value reserve in other comprehensive income. Interest calculated using the effective interest method as well as foreign exchange gains and losses are recognized in financial income and expenses in the consolidated income statement. Estimated credit loss is typically based on 12 month expected credit loss for existing loans and estimated additional draw-downs during that period, refer to Impairments section for further detail. Loss allowance is calculated on a quarterly basis based on a review of collectability and available collateral, and recorded in other financial expenses in the consolidated income statement reducing fair value loss recorded in other comprehensive income. In case a receivable is sold, the impact of expected credit loss is reversed, and the full gain or loss incurred for the sale is recorded in financial income and expenses in the consolidated income statement.

The cash flows of other investments of a long-term nature do not fulfil the criteria of being solely payments of principal and interest. These investments are initially recognized and subsequently remeasured at fair value using quoted market rates, discounted cash flow models or other appropriate valuation methods as of the reporting date. Fair value adjustments, foreign exchange gains and losses as well as realized gains and losses from the disposal of these investments are mainly recognized within financial income and expenses in the consolidated income statement.

Other current financial assets

Other current financial assets include current part of other non-current financial assets and short-term loan receivables as well as derivative assets that are discussed separately in Derivative financial instruments section below.

Short-term loan receivables are initially measured at fair value and in subsequent periods measured at amortized cost using the effective interest method. Interest calculated using the effective interest method as well as foreign exchange gains and losses are recognized in financial income and expenses in the consolidated income statement. For these loans, a loss allowance is calculated on a quarterly basis based on a review of collectability and available collateral, recorded as an adjustment to the carrying amount of the investment and recognized in other financial expenses in the consolidated income statement.

Trade receivables

Trade receivables arise from contracts with customers and represent an unconditional right to receive the consideration and only the passage of time is required before the consideration is received. The Group sells trade receivables to various financial institutions without recourse in the normal course of business, in order to manage credit risk and working capital cycle, and the business model for managing trade receivables is holding receivables to collect contractual cash flows and selling receivables. Trade receivables are initially recognized and subsequently remeasured at fair value, determined using discounted cash flow method. The changes in fair value are recognized in fair value reserve in other comprehensive income. The Group applies a simplified approach to recognizing a loss allowance on trade receivables and contract assets based on measurement of lifetime expected credit losses arising from trade receivables and contract assets without significant financing components. Refer to Note 4, Use of estimates and critical accounting judgments, for disclosure of the use of estimates and critical accounting judgments necessary in the estimation of such loss allowances. Loss allowances on trade receivables and contract assets are recognized in other operating expenses in the consolidated income statement. If trade receivables are sold, the difference between the carrying amount derecognized and the consideration received is recognized in financial expenses in the consolidated income statement.

Current financial investments

The Group invests a portion of the corporate cash needed to cover the projected cash outflows of its ongoing business operations in highly liquid, interest-bearing investments. Current financial investments may include investments measured at amortized cost, investments measured at fair value through other comprehensive income and investments measured at fair value through profit and loss.

Corporate cash investments in bank deposits used as collaterals for derivative transactions are initially measured at fair value and in subsequent periods measured at amortized cost using the effective interest method. Interest calculated using the effective interest method as well as foreign exchange gains and losses are recognized in financial income and expenses in the consolidated income statement.

Corporate cash investments in bank deposits as well as fixed income and money market securities with initial maturity or put feature longer than three months that have characteristics of solely payments of principal and interest and are not part of a structured investments, are managed in a portfolio with a business model of holding investments to collect principal and interest as well as selling investments, and are classified as fair value through other comprehensive income. In this portfolio investments are executed with the main purpose of collecting contractual cash flows and principal repayments. However, investments are sold from time to time for bucket rebalancing needs as well as liquidity management and market risk mitigation purposes.

The fair value of these investments is determined using quoted market rates, discounted cash flow models or other appropriate valuation methods as of the reporting date. The changes in fair value are recognized in fair value reserve in other comprehensive income. Interest calculated using the effective interest method as well as foreign exchange gains and losses are recognized in financial income and expenses in the consolidated income statement. When an investment is disposed of, the related accumulated fair value changes are derecognized from other comprehensive income and recognized in financial income and expenses in the consolidated income statement. The FIFO method is used to determine the cost basis of fixed income securities being disposed of.

Due to the high credit quality of the Group's investment portfolio, the estimated credit loss is normally based on 12 month expected credit loss. Loss allowance is calculated on a quarterly basis, recorded in other financial expenses in the consolidated income statement reducing fair value gains and losses recorded in other comprehensive income.

Corporate cash investments may also include money market funds that do not qualify as cash equivalents, investments acquired for trading purposes, investment structures consisting of securities traded in combination with derivatives with complementing and typically offsetting risk factors and other investments that have cash flows not being solely payments of principal and interest. In this portfolio investments are executed with the purpose of collecting contractual cash flows and principal repayments as well as for capital appreciation and can be sold at any time.

These investments are initially recognized and subsequently remeasured at fair value determined using quoted market rates, discounted cash flow models or other appropriate valuation methods as of the reporting date. Fair value adjustments, foreign exchange gains and losses and realized gains and losses are recognized in financial income and expenses in the consolidated income statement.

Cash and cash equivalents

Cash and cash equivalents include cash at bank and in hand as well as highly liquid, fixed income and money market investments that are readily convertible to known amounts of cash with maturities at acquisition of three months or less, as well as bank deposits with maturities or contractual call periods at acquisition of three months or less. Due to the high credit quality and short-term nature of these investments, there is an insignificant risk of change in value. Investments in money market funds that have a risk profile consistent with the afore-mentioned criteria are also classified as cash equivalents. Investments that have cash flows that are solely payments of principal and interest are measured at amortized cost. All other investments are measured at fair value through profit and loss.

Classification and measurement of financial liabilities

The Group has classified its financial liabilities in the following categories: financial liabilities measured at amortized cost and financial liabilities measured at fair value through profit and loss. The Group classifies derivative liabilities as well as the conditional obligation related to Nokia Shanghai Bell at fair value through profit and loss and all other financial liabilities at amortized cost.

All financial liabilities are initially recognized at fair value and, in case of borrowings and payables, net of transaction costs. Financial liabilities are derecognized when the related obligation is discharged or cancelled or expired. Additionally, a substantial modification of the terms of an existing financial liability is accounted for as a derecognition of the original financial liability and the recognition of a new financial liability. On derecognition of a financial liability, the difference between the carrying amount extinguished and the consideration paid is recognized in interest expenses in the consolidated income statement.

Interest-bearing liabilities

Long-term interest-bearing liabilities are measured at amortized cost using the effective interest method. Short-term interest-bearing liabilities, including current part of long-term interest-bearing liabilities and collaterals for derivative transactions, are measured at amortized cost using the effective interest method.

Transaction costs, interest calculated using the effective interest method as well as foreign exchange gains and losses are recognized in financial income and expenses in the consolidated income statement.

Other financial liabilities

Other financial liabilities mainly include a conditional obligation to China Huaxin as part of the Nokia Shanghai Bell definitive agreements where China Huaxin obtained the right to fully transfer its ownership interest in Nokia Shanghai Bell to the Group in exchange for a future cash settlement. The financial liability related to the conditional obligation is measured based on the expected future cash settlement with any changes recorded in financial income and expenses in the consolidated income statement.

Other financial liabilities also include derivative liabilities that are discussed separately in Derivative financial instruments section below.

Trade payables

Trade payables are carried at invoiced amount which is considered to be equal to the fair value due to the short-term nature of the Group's trade payables.

Impairments of financial assets excluding trade receivables and contract assets

Impairment requirements apply to the recognition of a loss allowance for expected credit losses (ECL) on financial assets measured at amortized cost, financial assets measured at fair value through other comprehensive income, financial guarantee contracts and loan commitments. The Group continuously assesses its financial instruments on a forward-looking basis and accounts for the changes in ECL on a quarterly basis using the following method:

§ $ECL = PD \times LGD \times EAD$

§ Probability of Default (PD) is estimated separately for the centralized investment portfolio and non-centralized investments. The estimate is based on the credit rating profile of these investments as well as specific local circumstances as applicable, unless there are specific events that would indicate that the credit rating would not be an appropriate basis for estimating credit risk at the reporting date.

§ For Loss Given Default (LGD) the recovery rate is also estimated separately for centralized investment portfolios and non-centralized investments and is based on the type of investment, specific local circumstances as applicable as well as related collateral arrangements, if any.

§ Exposure at Default (EAD) is normally the nominal value of the investment or financial guarantee. For loan commitments EAD is based on estimated draw-down amounts for the next 12 months.

All the Group's current investments at amortized cost and fair value through other comprehensive income are considered to have low credit risk, and the loss allowance recognized during the period is therefore limited to 12 months expected losses. Financial instruments that are rated as investment grade are considered to have low credit risk for the purposes of this assessment.

For other non-current financial assets, loans, loan commitments and financial guarantees extended to third parties, the ECL is calculated separately for each significant counterparty using the method described above, including the impact of any collateral arrangements or other credit enhancements to LGD. The estimate is based on 12-month ECL unless there has been a significant increase in credit risk for the specific counterparty since the initial recognition, in which case lifetime ECL is estimated. Breaches of contract, credit rating downgrades and other credit measures are typical indicators that the Group takes into consideration when assessing, whether the credit risk on a financial instrument has increased significantly since initial recognition.

The change in the amount of loss allowance for ECL is recognized as an impairment gain or loss in financial income and expenses in the consolidated income statement. For assets carried at amortized cost the loss allowance is recorded as an adjustment to the carrying amount. For assets carried at fair value through other comprehensive income the loss allowance is recorded as an adjustment in other comprehensive income instead of adjusting the carrying amount that has already been recorded at fair value. For financial guarantee contracts the loss allowance is recognized as an other liability in the statement of financial position.

Derivative financial instruments

All derivatives are recognized initially at fair value on the date a derivative contract is entered into and subsequently remeasured at fair value. The method of recognizing the resulting gain or loss varies according to whether the derivatives are designated and qualify under hedge accounting.

The cash flows of a hedge are classified as cash flows from operating activities in the consolidated statement of cash flows in case the underlying hedged items relate to the Group's operating activities. When a derivative contract is accounted for as a hedge of an identifiable position relating to financing or investing activities, the cash flows of the contract are classified in the same way as the cash flows of the position being hedged. Certain derivatives are hedging the foreign exchange risk of the Group's cash position and their cash flows are included in foreign exchange adjustment in the consolidated statement of cash flows.

Derivatives not designated in hedge accounting relationships carried at fair value through profit and loss

Foreign exchange forward contracts are valued at market-forward exchange rates. Changes in fair value are measured by comparing these rates with the original contract-forward rate. Currency options are valued as of each reporting date by using the Garman & Kohlhagen option valuation model. Changes in fair value are recognized in the consolidated income statement.

Fair values of forward rate agreements, interest rate options, futures contracts and exchange-traded options are calculated based on quoted market rates as of each reporting date. Discounted cash flow method is used to value interest rate and cross currency swaps. Changes in fair value are recognized in the consolidated income statement.

For derivatives not designated under hedge accounting but hedging identifiable forecast exposures such as anticipated foreign currency denominated sales and purchases, the gains and losses are recognized in other operating income or expenses in the consolidated income statement. The gains and losses on all other derivatives not designated under hedge accounting are recognized in financial income and expenses in the consolidated income statement.

Embedded derivatives included in contracts are identified and monitored by the Group. For host contracts that are not financial assets containing embedded derivatives that are not closely related, the embedded derivatives are separated and measured at fair value as of each reporting date with changes in fair value recognized in financial income and expenses in the consolidated income statement. For host contracts that are financial assets containing embedded derivatives the whole contract is measured at fair value as of each reporting date with changes in fair value recognized in financial income and expenses in the consolidated income statement.

Hedge accounting

The Group applies hedge accounting on certain foreign exchange forward contracts, options or option strategies, and interest rate derivatives. Qualifying options and option strategies have zero net premium, or a net premium paid. For option structures, the critical terms of the purchased and written options are the same and the notional amount of the written option component is not greater than that of the purchased option.

In the fair valuation of foreign exchange forward contracts, the Group separates the spot element and the forward element including the impact of foreign currency basis spread and forward points, that is considered as the cost of hedging for foreign exchange forward contracts. In the fair valuation of foreign exchange option contracts, the Group separates the intrinsic value and time value, that is considered as the cost of hedging for foreign exchange option contracts. In the fair valuation of cross currency swaps, the Group separates the foreign currency basis spread that is considered as the cost of hedging for cross currency swaps.

Cash flow hedges: hedging of forecast foreign currency denominated sales and purchases

The Group applies cash flow hedge accounting primarily to forecast business foreign exchange exposure that arises from highly probable forecast operative business transactions. The risk management strategy is to hedge material net exposures (identified standard sales exposure minus identified standard costs exposure) by using foreign exchange forwards and foreign exchange options in a layered hedging style that follows defined hedge ratio ranges and hedge maturities in quarterly time buckets. The hedged item must be highly probable and present an exposure to variations in cash flows that could ultimately affect profit or loss.

The Group only designates the spot element of the foreign exchange forward contract as the hedging instrument. Currency options, or option strategies, may also be used for cash flow hedging, in which case the intrinsic value of the option is designated as the hedging instrument. Hedge effectiveness is assessed at inception and quarterly during the hedge relationship to ensure that an economic relationship exists. As the Group only enters in hedge relationships where the critical terms match, the assessment of effectiveness is done on a qualitative basis.

For qualifying foreign exchange forwards and foreign exchange options, the change in fair value that reflects the change in spot exchange rates on a discounted basis is recognized in hedging reserve in other comprehensive income. The changes in the forward element of the foreign exchange forwards and the time value of the options that relate to hedged items are deferred in the cost of hedging reserve in other comprehensive income and are subsequently accounted for in the same way as the spot element or intrinsic value.

In each quarter the Group evaluates whether the forecast sales and purchases are still expected to occur. If a portion of the hedged cash flow is no longer expected to occur, all related deferred gains or losses are derecognized from other comprehensive income and recognized in other operating income and expenses in the consolidated income statement as hedge accounting criteria is no longer met. If the hedged cash flow ceases to be highly probable, but is still expected to occur, accumulated gains and losses remain in other comprehensive income until the hedged cash flow affects profit or loss.

The Group's risk management objective is to hedge forecast cash flows until the related revenue has been recognized. Each hedge relationship is discontinued during the quarter when the hedge matures, which is also the quarter that it has been designated to hedge. At this point the accumulated profit or loss of cash flow hedges is recycled to other operating income and expenses in the consolidated income statement. In case the forecast amount of revenue is not recognized during a quarter, the full accumulated profit or loss of cash flow hedges designated for said quarter is still recycled and the portion related to forecast revenue that was not recognized is disclosed as hedge ineffectiveness.

As cash flow hedges primarily mature in the same quarter as the hedged item, there is no significant ineffectiveness resulting from time value of money. The group will validate the magnitude of the impact of discounting related to the amount of profit or loss recognized in other comprehensive income on a quarterly basis.

The Group has also entered into foreign exchange forwards in relation to forecast sales and purchases that do not qualify as highly probable forecast transactions and hence do not satisfy the requirements for hedge accounting. For these foreign exchange forwards the gains and losses are recognized in other operating income and expenses in the consolidated income statement.

Cash flow hedges: hedging of future interest cash flows

The Group also applies cash flow hedging to future interest cash flows in foreign currency related to issued bonds. These future interest cash flows are hedged with cross currency swaps that have been designated partly as fair value hedges and partly as cash flow hedges with the risk related to the risk free portion of interest cash flows being hedged under fair value hedge accounting and the company specific credit spread portion being hedged under cash flow hedge accounting. The accumulated profit or loss for the part of these cross currency swaps designated as cash flow hedges is initially recorded in hedging reserve and recycled to profit or loss at the time when the related interest cash flows are settled. The Group separates the foreign currency basis spread from cross currency swaps and excludes it from the hedge relationship as cost of hedging that is initially recognized and subsequently measured at fair value and recorded in cost of hedging reserve in other comprehensive income.

Fair value hedges: hedging of foreign exchange exposure

In certain cases, mainly related to long-term construction projects, the Group applies fair value hedge accounting for foreign exchange risk with the objective to reduce the exposure to fluctuations in the fair value of firm commitments due to changes in foreign exchange rates. Changes in the fair value of both spot and forward elements of the derivatives designated and qualifying as fair value hedges, together with any changes in the fair value of the hedged firm commitments attributable to the hedged risk, are recorded in financial income and expenses in the consolidated income statement.

Fair value hedges: hedging of interest rate exposure

The Group applies fair value hedge accounting to reduce exposure to fair value fluctuations of interest-bearing liabilities due to changes in interest rates and foreign exchange rates. The Group uses interest rate swaps and cross currency swaps aligned with the hedged items to hedge interest rate risk and associated foreign exchange risk.

The Group has entered into long-term borrowings mainly at fixed rate and swapped a portion of them into floating rates in line with a defined target interest profile. The Group aims to mitigate the adverse impacts from interest rate fluctuations by continuously managing net interest exposure resulting from financial assets and liabilities by setting appropriate risk management benchmarks and risk limits. The hedged item is identified as a proportion of the outstanding loans up to the notional amount of the swaps as appropriate to achieve the risk management objective. The Group enters into interest rate swaps that have similar critical terms as the hedged item, such as reference rate, reset dates, payment dates, maturities and notional amount and hence the Group expects that there will be no significant ineffectiveness. The Group has not entered into interest rate swaps where it would be paying fixed rate.

The Group's borrowings are carried at amortized cost. Changes in the fair value of derivatives designated and qualifying as fair value hedges, together with any changes in the fair value of hedged liabilities attributable to the hedged risk, are recorded in financial income and expenses in the consolidated income statement. The Group separates the foreign currency basis spread from cross currency swaps and excludes it from the hedged risk as cost of hedging that is initially recognized and subsequently measured at fair value and recorded in cost of hedging reserve in other comprehensive income. If a hedge relationship no longer meets the criteria for hedge accounting, hedge accounting ceases, cost of hedging recorded in cost of hedging reserve is immediately expensed and any fair value adjustments made to the carrying amount of the hedged item while the hedge was effective are recognized in financial income and expenses in the consolidated income statement based on the effective interest method.

Hedges of net investments in foreign operations

The Group applies hedge accounting for its foreign currency hedging of selected net investments. Hedged item can be an amount of net assets equal to or less than the carrying amount of the net assets of the foreign operation in the Group consolidated financial statements. The risk management strategy is to protect the euro counter value of the portion of this exposure expected to materialize as non-euro cash repatriation in the foreseeable future.

The Group only designates the spot element of the foreign exchange forward contract as the hedging instrument. Currency options, or option strategies, may also be used for net investment hedging, in which case the intrinsic value of the option is designated as the hedging instrument. Hedge effectiveness is assessed at inception and quarterly during the hedge relationship to ensure that an economic relationship exists. As the Group only enters in hedge relationships where the critical terms match, the assessment of effectiveness is done on a qualitative basis with no significant ineffectiveness expected.

For qualifying foreign exchange forwards, foreign exchange options and option strategies, the change in fair value that reflects the change in spot exchange rates is recognized in translation differences within consolidated shareholders' equity. The changes in the forward element of foreign exchange forwards as well as the changes in the time value of options (collectively known as the "cost of hedging") is recognized in cost of hedging reserve in other comprehensive income. The cost of hedging at the date of designation of the foreign exchange forward or option contract as a hedging instrument is amortized to financial income and expenses in the consolidated income statement over the duration of the contract. Hence, in each reporting period, the change in fair value of forward element of the foreign exchange forward contract or time value of the option contract is recorded in cost of hedging reserve, whilst the amortization amount is reclassified from cost of hedging reserve to profit or loss.

Accumulated changes in fair value from qualifying hedges are derecognized from translation differences within consolidated shareholders' equity on the disposal of all or part of a foreign subsidiary by sale, liquidation, repayment of share capital or abandonment. The cumulative amount or proportionate share of changes in the fair value of qualifying hedges deferred in translation differences is recognized as income or expense on disposal.

Provisions

Provisions are recognized when the Group has a present legal or constructive obligation as a result of past events, it is probable that an outflow of resources will be required to settle the obligation and a reliable estimate of the amount can be made. When the Group expects a provision to be reimbursed, the reimbursement is recognized as an asset only when the reimbursement is virtually certain. The Group assesses the adequacy of

its existing provisions and adjusts the amounts as necessary based on actual experience and changes in facts and circumstances as of each reporting date.

Restructuring provisions

The Group provides for the estimated cost to restructure when a detailed formal plan of restructuring has been completed, approved by management, and announced. Restructuring costs consist primarily of personnel restructuring charges. The other main components are costs associated with exiting real estate locations, and costs of terminating certain other contracts directly linked to the restructuring.

Warranty provisions

The Group provides for the estimated liability to repair or replace products under standard warranty at the time revenue is recognized. The provision is an estimate based on historical experience of the level of repairs and replacements.

Litigation provisions

The Group provides for the estimated future settlements related to litigation based on the probable outcome of potential claims.

Environmental provisions

The Group provides for estimated costs of environmental remediation relating to soil, groundwater, surface water and sediment contamination when the Group becomes obliged, legally or constructively, to rectify the environmental damage, or to perform restorative work.

Project loss provisions

Project loss provisions relate to contracts with customers and are evaluated at a contract level. The Group provides for onerous contracts based on the lower of the expected cost of fulfilling the contract and the expected cost of terminating the contract. An onerous contract is a contract in which the unavoidable costs of meeting the obligations under the contract exceed the economic benefits expected to be received under it.

Divestment-related provisions

The Group provides for indemnifications it is required to make to the buyers of its disposed businesses.

Material liability provisions

The Group recognizes the estimated liability for non-cancellable purchase commitments for inventory in excess of forecasted requirements at each reporting date.

Other provisions

The Group provides for uncertain taxes, other legal and constructive obligations based on the expected cost of executing any such commitments.

Treasury shares

The Group recognizes its own equity instruments that are acquired (treasury shares) as a reduction of equity at cost of acquisition. When cancelled, the acquisition cost of treasury shares is recognized in retained earnings or other distributable reserves of the equity.

Dividends

Until 2018, dividends proposed by the Board of Directors were recognized in the consolidated financial statements when they were approved by the shareholders at the Annual General Meeting. From 2019 onwards, and applicable for the first time for distribution of funds for 2018, dividends and capital repayments are recognized in the consolidated financial statements when the Board of Directors has approved the quarterly payment in accordance with the authorization granted by Annual General Meeting.

3. New and amended standards and interpretations

On January 1, 2019, the Group adopted IFRS 16, Leases (IFRS 16). The nature of the new standard, impact of adoption on the Group's consolidated financial statements and changes to the Group's accounting policies resulting from the adoption are described in detail below.

Other amendments and interpretations that became effective on January 1, 2019, did not have a material impact on the Group's consolidated financial statements. The new and revised standards, amendments and interpretations to existing standards issued by the IASB that are not yet effective are not expected to have a material impact on the consolidated financial statements of the Group when adopted.

IFRS 16 Leases

IFRS 16, Leases, was issued in January 2016 and sets out the requirements for the recognition, measurement, presentation and disclosure of leases. IFRS 16 provides a single lessee accounting model, requiring lessees to recognize right-of-use assets and lease liabilities for all leases with a lease term exceeding 12 months in the consolidated statement of financial position.

The Group adopted IFRS 16 on the effective date of January 1, 2019 using the cumulative catch-up transition method. In accordance with the IFRS 16 transition guidance, comparative information was not restated. Key judgments and estimates used under IFRS 16 primarily relate to the evaluation of lease terms and the use of discount rates, refer to Note 4, Use of estimates and critical accounting judgments.

IFRS 16 permits entities to elect a number of practical expedients to simplify the initial adoption of IFRS 16. Upon the adoption of IFRS 16 on January 1, 2019:

- § The Group applied IFRS 16 to contracts that were previously identified as leases applying IAS 17, Leases (IAS 17), and IFRIC 4, Determining whether an Arrangement contains a Lease;
- § The Group adjusted its right-of-use assets by the amount of onerous lease contract provisions recognized in the consolidated statement of financial position as of December 31, 2018 in accordance with IAS 37, Provisions, Contingent Liabilities and Contingent Assets;
- § The Group excluded initial direct costs related to the execution of lease contracts from the measurement of the right-of-use assets; and
- § The Group applied hindsight to estimate the lease term for all lease contracts existing on the effective date of January 1, 2019.

IFRS 16 opening balance sheet impact

Upon adoption, all lease liabilities were recorded with an equal amount recorded for the related right-of-use assets. The right-of-use assets were then adjusted for onerous lease contract provisions and accrued lease payments recognized in the statement of financial position immediately before adoption and for sublease net investment assets recognized upon adoption.

Lease liabilities recognized upon the adoption of IFRS 16 were previously classified as operating leases in accordance with the previous accounting standard IAS 17. Under the requirements of IAS 17, the Group did not have any significant finance lease arrangements in the statement of financial position prior to adoption of IFRS 16.

Upon the adoption of IFRS 16, the Group identified temporary differences between right-of-use assets, lease liabilities and their tax bases. The deferred tax assets and liabilities are recorded, subject to IAS 12, Income taxes, recognition and offsetting criteria.

The following table shows the adjustments recognized for each applicable line item in the consolidated statement of financial position. Financial statement line items unaffected by the adoption of IFRS 16 are excluded such that the subtotals and totals cannot be calculated from the numbers provided.

Consolidated statement of financial position (extract):

EURm	December 31, 2018	Adjustment upon adoption of IFRS 16	January 1, 2019
ASSETS			
Right-of-use assets	–	975	975
Other non-current financial assets	373	15	388
Non-current assets	21 246	990	22 236
Other current financial assets	243	16	259
Current assets	18 266	16	18 282
Total assets	39 517	1 006	40 523
SHAREHOLDERS' EQUITY AND LIABILITIES			
Accumulated deficit	(1 062)	4	(1 058)
Total equity	15 371	4	15 375
Long-term lease liabilities	–	800	800
Deferred tax liabilities	350	1	351
Provisions	572	(17)	555
Non-current liabilities	10 042	784	10 826
Short-term lease liabilities	–	266	266
Accrued expenses, deferred revenue and other liabilities	3 940	(28)	3 912
Provisions	855	(20)	835
Current liabilities	14 104	218	14 322
Total shareholders' equity and liabilities	39 517	1 006	40 523

In 2019, operating profit was higher primarily due to the recognition of the interest component on lease payments of EUR 28 million as interest expense within financial income and expenses and cash flow from operating activities was higher as the principal portion of lease payments, EUR 221 million, was recorded within cash flow from financing activities.

Reconciliation of IAS 17 non-cancellable operating lease commitments to IFRS 16 lease liability

In accordance with the requirements of the previous accounting standard, IAS 17, the Group disclosed non-cancellable operating lease commitments within Note 30, Commitments and contingencies, of the consolidated financial statements for the year ended December 2018. As of January 1, 2019, the Group recognized lease liabilities in accordance with IFRS 16 for leases which had previously been classified as operating leases under the requirements of IAS 17. The lease liabilities recorded upon adoption of IFRS 16 were measured at the present value of lease payments, using a discount rate based on the Group's estimated incremental borrowing rate. As of January 1, 2019, the weighted average discount rate was 2.6%.

	EURm
IAS 17 operating lease commitment disclosed as of December 31, 2018	1 099
Effect of discounting	(83)
Discounted IAS 17 operating lease commitment as at January 1, 2019	1 016
Add	
Lease extension options reasonably certain to be exercised	266
Non-lease components included in the lease liability	41
Less	
Leases where commencement date is after January 1, 2019	(238)
Lease commitments related to short-term leases	(21)
Other	2
IFRS 16 lease liability recognized as of January 1, 2019	1 066

4. Use of estimates and critical accounting judgments

The preparation of consolidated financial statements requires use of management judgment in electing and applying accounting policies as well as in making estimates that involve assumptions about the future. These judgments, estimates and assumptions may have a significant effect on the consolidated financial statements.

The estimates used in determining the carrying amounts of assets and liabilities subject to estimation uncertainty are based on historical experience, expected outcomes and various other assumptions that were available when these consolidated financial statements were prepared, and they are believed to be reasonable under the circumstances. The estimates are revised if changes in circumstances occur, or as a result of new information or more experience. As estimates inherently contain a varying degree of uncertainty, actual outcomes may differ, resulting in additional charges or credits to the consolidated income statement.

Management considers that the estimates, assumptions and judgments about the following accounting policies represent the most significant areas of estimation uncertainty and critical judgment that may have an impact on the consolidated financial statements.

Revenue recognition

Accounting for contract modifications

A significant part of the Group's business is conducted under framework agreements with no fixed commitment on the overall project scope. The accounting treatment of subsequent purchase commitments received from the customer in the form of new purchase orders is a critical judgment. Subsequent purchase orders may be deemed either to represent separate contracts or to represent a modification of the existing contract, which requires combination with the original contract for accounting purposes.

The decision whether to segregate or combine subsequent purchase orders can have a direct impact on the amount of revenue recognized in a given period for arrangements with multiple performance obligations including material rights as the transaction price is allocated to the performance obligations identified within the contract.

Determining and allocating the transaction price

The Group enters into complex customer arrangements, some of which are non-committed framework agreements that contain complex discounting structures as well as customer pricing that varies depending on the different needs of each customer. The appropriate identification and allocation of discounts and other forms of variable consideration as well as determination of the standalone selling price of each performance obligation are critical judgments that have a direct impact on the timing and amount of revenue recognized. The determination of standalone selling prices of existing performance obligations and of unexercised customer options to purchase additional goods or services will also impact the Group's determination whether a non-committed part of the contract contains material rights that must be accounted for within the context of the contract. Identified material rights are accounted for as a performance obligation within the contract and the Group will allocate part of the transaction price to it with the relative standalone selling price method.

Identifying distinct performance obligations and determining when the performance obligation is satisfied

The Group regularly enters into agreements with customers comprising multiple performance obligations, that include a variety of products, services and software that the Group offers. The identification of distinct performance obligations within these types of arrangements is considered a critical judgment as inappropriate identification of performance obligations could lead to the recognition of revenue in an incorrect period or for an inaccurate amount.

Pension and other post-employment benefit obligations and expenses

The determination of pension and other post-employment benefit obligations and expenses for defined benefit plans is dependent on a number of estimates and assumptions, including the discount rate, future mortality rate, annual rate of increase in future compensation levels, and healthcare costs trend rates and usage of services in the United States where the majority of our post-employment healthcare plans are maintained. A portion of plan assets is invested in debt and equity securities, which are subject to market volatility. Changes in assumptions and actuarial estimates may materially affect the benefit obligation, future expense and future cash flow. Based on these estimates and assumptions, as of December 31, 2019 defined benefit obligations amount to EUR 24 663 million (EUR 23 955 million in 2018) and the fair value of plan assets amounts to EUR 26 180 million (EUR 24 479 million in 2018). Refer to Note 27, Pensions and other post-employment benefits.

Income taxes

The Group is subject to income taxes in the jurisdictions in which it operates. Judgment is required in determining current tax expense, uncertain tax positions, deferred tax assets and deferred tax liabilities; and the extent to which deferred tax assets can be recognized.

Estimates related to the recoverability of deferred tax assets are based on forecasted future taxable income and tax planning strategies. Based on these estimates and assumptions, the Group has EUR 20 426 million as of December 31, 2019 (EUR 20 465 million in 2018) of temporary differences, tax losses carry forward and tax credits for which no deferred tax assets are recognized due to uncertainty of utilization. The majority of the unrecognized deferred tax assets relate to France. Refer to Note 12, Income taxes.

The utilization of deferred tax assets is dependent on future taxable profit in excess of the profit arising from the reversal of existing taxable temporary differences. The recognition of deferred tax assets is based on the assessment of whether it is probable that sufficient taxable profit will be available in the future to utilize the reversal of deductible temporary differences, unused tax losses and unused tax credits before the unused tax losses and unused tax credits expire. Recognition of deferred tax assets involves judgment regarding the future financial performance of the particular legal entity or tax group that has recognized the deferred tax asset.

Liabilities for uncertain tax positions are recorded based on estimates and assumptions of the amount and likelihood of outflow of economic resources when it is probable, i.e. more likely than not, that certain positions may not be fully sustained upon review by local tax authorities. Currently, the Group has ongoing tax investigations in multiple jurisdictions, including the United States, Canada, India, Saudi Arabia and South Korea. Due to the inherently uncertain nature of tax investigations, the ultimate outcome or actual cost of settlement may vary materially from estimates. Refer to Note 12, Income taxes.

Leases

Key judgments and estimates used in the application of IFRS 16 primarily relate to the evaluation of lease terms and the use of discount rates.

Many of the Group's more significant leasehold properties include options to extend the lease term or to terminate the lease prior to the expiration of the lease. These options provide the Group with the financial flexibility needed to align its global portfolio of commercial and industrial real estate properties to meet the changing occupancy needs of its various businesses. This financial flexibility is reflected in the measurement of the right-of-use assets and lease liabilities that the Group records for its leasehold properties to the extent that management concludes that any lease extension options are not reasonably certain to be exercised.

In its assessment whether lease extension and termination options are reasonably certain to be exercised, management applies judgment considering all relevant factors that create an economic incentive for the Group to exercise either the option. The Group determines that extension of the lease term beyond the non-cancellable lease term is reasonably certain when the leased property is significantly customized or specialized for the Group's specific use, the Group has made significant leasehold improvements that it seeks to recover over the lease term, or lease payments in the optional renewal or break period are significantly lower than the expected future market rent levels. After the commencement date of the lease, the Group reassesses the lease term only if there is a significant event or change in circumstances that is within its control and affects its ability to exercise or not to exercise the option. As of December 31, 2019, the Group has potential (undiscounted) future lease payments of EUR 560 million relating to extension options not expected to be exercised and EUR 79 million relating to termination options expected to be exercised which are not included in the lease liability. Total lease liabilities recognized in the statement of financial position is EUR 1 030 million (discounted) as of December 31, 2019.

The Group estimates its incremental borrowing rate to measure lease liabilities at the present value of lease payments as the interest rate implicit in the lease is not readily determinable. The estimation of the Group's incremental borrowing rate requires judgment to ensure that it adequately reflects the rates that the Group would pay to finance the acquisition of an asset similar to the leased asset, considering the nature, value and geographical location of the underlying asset, length of the lease term and frequency of lease payments. The estimation of the incremental borrowing rate impacts the amount of lease liabilities and right-of-use asset recognized in the statement of financial position as well as portion of interest expense and depreciation recognized in the income statement over the lease term.

Refer to Note 16, Leases, for further details on leases.

Goodwill recoverability

The recoverable amounts of the groups of CGUs were based on fair value less costs of disposal that was determined using a level 3 fair value measurement based on a discounted cash flow calculation. The cash flow projections used in calculating the recoverable amounts were based on financial plans approved by management covering an explicit forecast period of three years. Seven additional years of cash flow projections subsequent to the explicit forecast period reflect a gradual progression towards the steady state cash flow projections modeled in the terminal year. Estimation and judgment are required in determining the components of the recoverable amount calculation, including the discount rates, the terminal growth rates, estimated revenue growth rates, gross margins and operating margins. The discount rates reflect current assessments of the time value of money and relevant market risk premiums reflecting risks and uncertainties for which the future cash flow estimates have not been adjusted. The terminal growth rate assumptions reflect long-term average growth rates for the industry and economies in which the groups of CGUs operate.

The results of the impairment testing indicate adequate headroom for each group of CGUs. Total goodwill amounts to EUR 5 527 million as of December 31, 2019 (EUR 5 452 million in 2018). Refer to Note 14, Intangible assets and Note 17, Impairment.

Loss allowances on trade receivables and contract assets

Loss allowances are recognized for estimated losses resulting from customers' inability to meet payment obligations. The Group applies a simplified approach to recognizing a loss allowance on trade receivables based on measurement of lifetime expected credit losses arising from trade receivables without significant financing components. Estimation and judgment are required in determining the value of loss allowances at each reporting date. Management specifically analyzes trade receivables and historical losses; customer concentrations; customer creditworthiness; past due balances; current economic trends; and changes in customer payment terms when determining loss allowances. In addition to past events and current conditions, reasonable and supportable forecasts affecting collectability are considered when determining the amount of loss allowances. Based on these estimates and assumptions, loss allowances on trade receivables and contract assets are EUR 147 million as of December 31, 2019 (EUR 195 million in 2018), representing 2% of trade receivables and contract assets combined (3% in 2018). Refer to Note 36, Financial risk management.

Allowances for excess and obsolete inventory

Allowances for excess and obsolete inventory are recognized for excess amounts, obsolescence and declines in net realizable value below cost. Estimation and judgment are required in determining the value of the allowance for excess and obsolete inventory at each reporting date. Management specifically analyzes estimates of future demand for products when determining allowances for excess and obsolete inventory. Changes in these estimates could result in revisions to the valuation of inventory in future periods. Based on these estimates and assumptions, allowances for excess and obsolete inventory are EUR 505 million as of December 31, 2019 (EUR 521 million in 2018), representing 15% of inventory (14% in 2018). Refer to Note 18, Inventories.

Fair value of financial instruments

Fair values for level 3 financial instruments are determined with valuation techniques using material inputs that are not observable from transactions on active market requiring estimation and judgment both in selecting an appropriate valuation technique as well as in defining appropriate underlying assumptions.

For unlisted shares, the fair value is based on a number of factors including, but not limited to, the current market value of similar instruments; prices established from recent arm's-length transactions; and/or analysis of market prospects and operating performance of target companies with reference to public market comparable companies in similar industry sectors. Changes in these estimates could result in losses in future periods. Based on these estimates and assumptions, the fair value of level 3 financial assets is EUR 746 million (EUR 688 million in 2018), representing 9% of total financial assets measured at fair value on a recurring basis (8% in 2018).

Level 3 financial liabilities include conditional obligation to China Huaxin as part of the Nokia Shanghai Bell definitive agreements where China Huaxin obtained the right to fully transfer its ownership interest in Nokia Shanghai Bell to the Group in exchange for a future cash settlement. The financial liability related to the conditional obligation is measured based on the expected future cash settlement mainly dependent on certain financial performance metrics of Nokia Shanghai Bell. The total level 3 financial liabilities amount to EUR 659 million as of December 31, 2019 (EUR 707 million in 2018), representing 79% of total financial liabilities (78% in 2018) measured at fair value on a recurring basis. Refer to Note 24, Fair value of financial instruments.

Provisions

The Group recognizes a provision when it has a present legal or constructive obligation as a result of past event, it is probable that an outflow of resources will be required to settle the obligation and a reliable estimate of the amount can be made. At times, management judgment is required in determining whether it is probable that an outflow of economic benefits will be required to settle the obligation.

Estimation is required in determining the value of the obligation. The amount recognized as a provision is based on the best estimate of unavoidable costs required to settle the obligation at the end of the reporting period. When estimating the value, management may be required to consider a range of possible outcomes and their associated probabilities, risks and uncertainties surrounding the events and circumstances as well as making assumptions of the timing of payment. Changes in estimates of timing or amounts of costs required to settle the obligation may become necessary as time passes and/or more accurate information becomes available. Based on these estimates and assumptions, provisions amount to EUR 1 209 million as of December 31, 2019 (EUR 1 427 million in 2018). Refer to Note 29, Provisions.

Legal contingencies

The Group is regularly subject to various legal proceedings and investigations covering a wide range of matters. Management judgment is required in assessing the probability of different outcomes and a provision is recognized when an unfavorable outcome is deemed probable and the related obligation can be reasonably estimated. Refer to Note 29, Provisions.

5. Segment information

The Group has three reportable segments for financial reporting purposes: (1) Networks, (2) Nokia Software and (3) Nokia Technologies. Segment-level information for Group Common and Other is also presented.

Networks reportable segment consists of four aggregated operating segments: (1) Mobile Networks, (2) Global Services, (3) Fixed Networks and (4) IP/Optical Networks. The aggregated operating segments have similar economic characteristics, such as long-term margins; have similar products, production processes, distribution methods and customers; and operate in a similar regulatory environment.

In addition, the Group provides net sales disclosure for the following businesses within Networks reportable segment: (i) Mobile Access (comprises Mobile Networks and Global Services operating segments), (ii) Fixed Access (comprises Fixed Networks operating segment), (iii) IP Routing (comprises part of IP/Optical Networks operating segment) and (iv) Optical Networks (comprises part of IP/Optical Networks operating segment).

The Group adopted its current operational and reporting structure on January 1, 2019. The reporting structure was revised to better reflect the Group's strategy, organizational structure and the way the management evaluates operational performance and allocates resources. Previously the Group had two businesses: Nokia's Networks business and Nokia Technologies, and four reportable segments for financial reporting purposes: (1) Ultra Broadband Networks, (2) Global Services and (3) IP Networks and Applications within Nokia's Networks business; and (4) Nokia Technologies. Furthermore, Ultra Broadband Networks was comprised of two aggregated operating segments: Mobile Networks and Fixed Networks, and IP Networks and Applications was comprised of two aggregated operating segments: IP/Optical Networks and Nokia Software. The most significant changes to the operational and reporting structure are the following: Nokia Software operating segment was moved from within IP Networks and Applications reportable segment into a separate reportable segment and activities related to the Cloud Core software portfolio were reclassified from the Mobile Networks and Global Services operating segments to the Nokia Software reportable segment. Additionally, the Mobile Networks, Global Services, Fixed Networks and IP/Optical Networks operating segments were aggregated into one reportable segment called Networks. Segment information for 2018 and 2017 has been recasted for comparability purposes according to the new operating and reporting structure.

The President and CEO is the chief operating decision maker and monitors the operating results of operating and reportable segments for the purpose of assessing performance and making decisions about resource allocation. Key financial performance measures of the segments include primarily net sales and operating profit. The evaluation of segment performance and allocation of resources is based on segment operating profit⁽¹⁾.

Accounting policies of the segments are the same as those described in Note 2, Significant accounting policies. Inter-segment revenues and transfers are accounted for as if the revenues were to third parties, that is, at current market prices. Certain costs and revenue adjustments are not allocated to the segments⁽¹⁾.

Segment descriptions

Networks

Networks comprises Mobile Networks, Global Services, Fixed Networks and IP/Optical Networks operating segments.

The Mobile Networks operating segment focuses on mobile radio including macro radio, small cells and cloud native radio solutions for communications service providers and enterprises.

Global Services operating segment provides a wide range of professional services with multi-vendor capabilities, covering network planning and optimization, network implementation, systems integration as well as company-wide managed services.

The Fixed Networks operating segment provides copper and fiber access products, solutions and services. The portfolio allows for a customized combination of technologies that brings fiber to the most economical point for the customer.

The IP/Optical Networks operating segment provides IP routing and optical transport systems, each with their own software and services to build high capacity network infrastructure for the internet and global connectivity.

Nokia Software

The Nokia Software operating segment offers the cloud core software portfolio in addition to software applications spanning customer experience management, network operations and management, communications and collaboration, policy and charging, as well as cloud, IoT, security, and analytics platforms that enable digital services providers and enterprises to accelerate innovation, monetize services, and optimize their customer experience.

Nokia Technologies

The Nokia Technologies operating segment, building on decades of innovation and R&D leadership in technologies used in virtually all mobile devices used today, is expanding Nokia patent licensing business, reintroducing the Nokia brand to smartphones through brand licensing, and establishing a technology licensing business. The majority of net sales and related costs and expenses attributable to licensing and patenting the separate patent portfolios of Nokia Technologies, Networks, Nokia Software and Nokia Bell Labs are recorded in Nokia Technologies. Each reportable segment continues to separately record its own research and development expenses.

Group Common and Other

Group Common and Other includes Alcatel-Lucent Submarine Networks and Radio Frequency Systems, both of which are managed as separate entities. In addition, Group Common and Other includes Nokia Bell Labs' operating expenses, as well as certain corporate-level and centrally managed operating expenses.

(1) Segment results exclude costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

Segment information

EURm	Networks ⁽¹⁾	Nokia Software	Nokia Technologies	Group Common and Other	Eliminations	Segment total	Unallocated items ⁽²⁾	Total
Continuing operations								
2019								23
Net sales to external customers	18 207	2 767	1 473	897	–	23 344	(29)	315
Net sales to other segments	2	–	14	55	(71)	–	–	–
Depreciation and amortization	(566)	(85)	(31)	(54)	–	(736)	(924)	(1 660)
Operating profit/(loss)	665	589	1 239	(490)	–	2 003	(1 518)	485
Share of results of associated companies and joint ventures	12	–	–	–	–	12	–	12
2018								22
Net sales to external customers	17 403	2 713	1 486	978	–	22 580	(17)	563
Net sales to other segments	1	–	15	47	(63)	–	–	–
Depreciation and amortization	(383)	(65)	(21)	(46)	–	(515)	(940)	(1 455)
Operating profit/(loss)	773	450	1 203	(246)	–	2 180	(2 239)	(59)
Share of results of associated companies and joint ventures	12	–	–	–	–	12	–	12
2017								23
Net sales to external customers	17 725	2 798	1 639	1 060	–	23 222	(75)	147
Net sales to other segments	–	–	15	54	(69)	–	–	–
Depreciation and amortization	(446)	(52)	(12)	(48)	–	(558)	(1 033)	(1 591)
Operating profit/(loss)	1 297	414	1 124	(248)	–	2 587	(2 571)	16
Share of results of associated companies and joint ventures	21	–	(10)	–	–	11	–	11

(1) Includes Mobile Access net sales of EUR 11 655 million (EUR 11 273 million in 2018 and EUR 11 457 million in 2017), Fixed Access net sales of EUR 1 881 million (EUR 1 980 million in 2018 and EUR 2 075 million in 2017), IP Routing net sales of EUR 2 921 million (EUR 2 545 million in 2018 and EUR 2 694 million in 2017) and Optical Networks net sales of EUR 1 752 million (EUR 1 606 million in 2018 and EUR 1 499 million in 2017).

(2) Excludes costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

Reconciliation of total segment operating profit to total operating profit/(loss)

EURm	2019	2018	2017
Total segment operating profit	2 003	2 180	2 587
Amortization and depreciation of acquired intangible assets and property, plant and equipment	(924)	(940)	(1 033)
Restructuring and associated charges	(502)	(321)	(579)
Gain on defined benefit plan amendment	168	–	–
Product portfolio strategy costs	(163)	(583)	(536)
Transaction and related costs, including integration costs relating to the acquisition of Alcatel Lucent	(48)	(220)	(206)
Impairment of assets, net of impairment reversals	(29)	(48)	(173)
Operating model integration	(12)	–	–
Release of acquisition-related fair value adjustments to deferred revenue and inventory	(6)	(16)	(55)
Divestment of businesses	(2)	(39)	–
Fair value changes of legacy IPR fund	–	(57)	–
Other	–	(15)	11
Total operating profit/(loss)	485	(59)	16

Information by geographies
Net sales to external customers and non-current assets by country

EURm	Net sales ⁽¹⁾			Non-current assets ⁽²⁾	
	2019	2018	2017	2019	2018
Finland ⁽³⁾	1 552	1 556	1 698	1 477	1 462
United States	6 609	6 204	5 991	5 505	5 818
China	1 506	1 754	2 082	400	350
India	1 348	1 629	1 455	178	122
France	1 229	1 179	1 295	1 997	1 938
Other	11 071	10 241	10 626	1 167	905
Total	23 315	22 563	23 147	10 724	10 595

(1) Net sales to external customers by country are based on the location of customer.

(2) In 2019, consists of goodwill and other intangible assets, property, plant and equipment and right-of-use assets. In 2018, consisted of goodwill and other intangible assets and property, plant and equipment.

(3) All Nokia Technologies IPR and licensing net sales are allocated to Finland.

No single customer represents 10% or more of revenues.

6. Discontinued operations

Discontinued operations include the continuing financial effects of the HERE business and the D&S business. The Group sold its HERE digital mapping and location services business to a German automotive industry consortium comprised of AUDI AG, BMW Group and Daimler AG in a transaction that was completed on December 4, 2015. The Group sold substantially all of its Devices & Services business to Microsoft in a transaction that was completed on April 25, 2014. The timing and amount of financial effects are largely dependent upon external factors such as final outcomes of uncertain tax positions.

Results of Discontinued operations

EURm	2019	2018	2017
Net sales	–	–	–
Cost of sales	–	–	–
Gross profit	–	–	–
Research and development expenses	–	–	–
Selling, general and administrative expenses	(6)	(9)	(7)
Other operating income and expenses	(1)	17	(15)
Operating (loss)/profit	(7)	8	(22)
Financial income and expenses	(5)	81	6
(Loss)/profit before tax	(12)	89	(16)
Income tax (expense)/benefit	(1)	125	(10)
(Loss)/profit for the year, ordinary activities⁽¹⁾	(13)	214	(26)
Gain on the sale, net of tax ⁽²⁾	6	–	5
(Loss)/profit for the year	(7)	214	(21)

(1) In 2018, the results of discontinued operations mostly relate to a resolution reached in the tax dispute concerning the applicability of withholding tax in respect of payments by Nokia India Private Limited to Nokia Corporation for the supply of operating software in D&S business as well as a release of uncertain tax positions related to HERE business.

(2) In 2019, an addition of EUR 7 million to and a deduction of EUR 1 million from gain on the sale were recognized related to D&S business and HERE business, respectively, due to tax indemnification. In 2017, an additional gain on the sale of EUR 5 million was recognized related to HERE business due to tax indemnification.

Cash flows from Discontinued operations

EURm	2019	2018	2017
Net cash used in operating activities	(7)	(33)	(14)
Net cash from/(used in) investing activities	9	10	(16)
Net cash flow for the period	2	(23)	(30)

7. Revenue recognition

Management has determined that the Group's reported geographic areas depict how the nature, amount, timing and uncertainty of revenue and cash flows are affected by economic factors. The Group's primary customer base consists of companies that operate on a country specific or a regional basis. Although the Group's technology cycle is similar around the world, different countries and regions are inherently in a different stage of that cycle, often influenced by macroeconomic conditions specific to those countries and regions.

Each reportable segment, as described in Note 5, Segment Information, consists of customers that operate in all geographic areas. No reportable segment has a specific revenue concentration in any geographic area other than Nokia Technologies, which is included within Europe.

Net sales to external customers by region⁽¹⁾

EURm	2019	2018	2017
Asia-Pacific	4 556	4 081	4 228
Europe	6 620	6 489	6 833
Greater China	1 843	2 165	2 516
Latin America	1 472	1 380	1 279
Middle East & Africa	1 876	1 874	1 907
North America	6 948	6 574	6 384
Total	23 315	22 563	23 147

(1) Net sales to external customers by region are based on the location of customer.

Contract assets and contract liabilities

Contract asset balances decrease upon reclassification to trade receivables when the Group's right to payment becomes unconditional. Contract liability balances decrease when the Group satisfies the related performance obligations and revenue is recognized. There were no material cumulative adjustments to revenue recognized arising from changes in transaction prices, changes in measures of progress or changes in estimated variable consideration.

During the year, the Group recognized EUR 1.9 billion (EUR 1.7 billion in 2018) of revenue that was included in the current contract liability balance at the beginning of the period.

Order backlog

As of December 31, 2019, the aggregate amount of the transaction price allocated to partially or wholly unsatisfied performance obligations arising from fixed contractual commitments amounted to EUR 18.8 billion (EUR 21.1 billion in 2018). Management has estimated that these unsatisfied performance obligations will be recognized as revenue as follows:

	2019	2018
Within 1 year	69%	59%
2-3 years	27%	34%
More than 3 years	4%	7%
Total	100%	100%

The estimated timing of the satisfaction of these performance obligations is subject to change owing to factors beyond the Group's control such as customer and network demand, market conditions and, in some cases, restrictions imposed by the weather or other factors impacting project logistics. Revenue recognized in the reporting period from performance obligations satisfied (or partially satisfied) in previous periods (for example, due to changes in transaction price) was not material.

Completed Contracts

In April 2014, the Group entered into an agreement to license certain technology patents and patent applications owned by the Group on the effective date of that agreement, on a non-exclusive basis, to a licensee, for a period of 10 years (the "License Agreement"). Contemporaneously and under the terms of the License Agreement, the Group issued to the licensee an option to extend the technology patent license for the remaining life of the licensed patents. The Group received all cash consideration due for the sale of the 10-year license and option upon closing of the License Agreement. Management has determined that, upon transition to IFRS 15, Revenue from Contracts with Customers, the License Agreement is a completed contract. As such, in accordance with the transition requirements of the standard, the Group continues to apply its prior revenue accounting policies, based on IAS 18, Revenue, and related interpretations, to the License Agreement. Under those policies, the Group is recognizing revenue over the term of the License Agreement.

As of December 31, 2019, the balance of deferred revenue related to the License Agreement of EUR 670 million (EUR 825 million in 2018), recognized in deferred revenue in the consolidated statement of financial position, is expected to be recognized as revenue through 2024.

8. Expenses by nature

EURm	2019	2018	2017
Continuing operations			
Cost of material	8 148	7 544	7 776
Personnel expenses	7 191	7 835	7 845
Depreciation and amortization	1 660	1 455	1 591
IT Services	362	491	526
Research and development subcontracting	207	240	226
Rental expenses ⁽¹⁾	90	338	339
Impairment charges	38	55	210
Other	5 558	4 954	4 981
Total operating expenses	23 254	22 912	23 494

(1) Upon adoption of IFRS 16, Leases, on January 1, 2019, for all leases with a lease term exceeding 12 months, the Group records depreciation expense and interest expense on all right-of-use assets and lease liabilities, respectively. The Group records lease payments for leases with a lease term of 12 months or less and other payments for certain non-lease components as an operating expense. Refer to Note 3, New and amended standards and interpretations and Note 16, Leases.

Operating expenses include government grant income and R&D tax credits of EUR 83 million (EUR 124 million in 2018 and EUR 140 million in 2017) that have been recognized in the consolidated income statement as a deduction against research and development expenses.

9. Personnel expenses

EURm	2019	2018	2017
Continuing operations			
Salaries and wages ⁽¹⁾	5 953	6 356	6 456
Share-based payment expense ⁽²⁾	77	62	99
Pension and other post-employment benefit expense, net ⁽³⁾	242	465	445
Social security costs	919	952	845
Total	7 191	7 835	7 845

(1) Includes termination benefits.

(2) Presented net of related social costs, refer to Note 26, Share Based Payment. Includes EUR 77 million for equity-settled awards (EUR 62 million in 2018 and EUR 97 million in 2017).

(3) Includes net gain on pension plan amendments, curtailments and settlements of EUR 131 million, refer to Note 27, Pensions and Other Post-Employment Benefits.

The average number of employees is 98 322 (103 083 in 2018 and 101 731 in 2017).

10. Other operating income and expenses

EURm	2019	2018	2017
Continuing operations			
Other operating income			
Pension curtailment and plan amendment income	187	23	38
Gains from unlisted venture funds ⁽¹⁾	87	162	51
Change in the loss allowance and impairment losses on trade receivables, net	28	–	–
Profit on sale of property, plant and equipment	18	21	19
Subsidies and government grants	8	8	2
Foreign exchange gain on hedging forecasted sales and purchases, net	–	–	93
Interest income from customer receivables and overdue payments ⁽²⁾	–	–	25
Expiration of stock option liability	–	–	18
Other	96	76	117
Total	424	290	363
Other operating expenses			
Restructuring, cost reduction and associated charges	(391)	(266)	(568)
Foreign exchange loss on hedging forecasted sales and purchases, net	(88)	(27)	–
Pension curtailment and plan amendment expenses	(56)	(79)	(41)
Changes in provisions	(47)	(13)	–
Impairment charges	(38)	(55)	(210)
Losses and expenses related to unlisted venture funds ⁽¹⁾	(36)	(118)	(6)
Retirements and loss on sale of property, plant and equipment	(27)	(52)	(23)
Change in the loss allowance and impairment losses on trade receivables, net	–	(45)	(24)
Expenses related to sale of receivables transactions ⁽²⁾	–	–	(37)
Other	(70)	(57)	(46)
Total	(753)	(712)	(955)

(1) All venture fund related gains and losses are presented in other operating income and expenses as a result of the adoption of IFRS 9, Financial Instruments, in 2018. In 2017, gains and losses for certain venture funds were presented in financial income and expenses.

(2) Interest income and expenses related to the financing components of contracts with customers are recognized within financial income and expenses from 2018 onwards.

11. Financial income and expenses

EURm	2019	2018	2017
Continuing operations			
Interest income on financial investments not measured at fair value through profit and loss	31	39	35
Interest income on financing components of other contracts	42	37	–
Interest expense on interest-bearing liabilities ⁽¹⁾	(99)	(105)	(391)
Interest expense on financing components of other contracts ⁽²⁾	(172)	(162)	(81)
Interest expense on lease liabilities ⁽³⁾	(28)	–	–
Net interest expense on defined benefit plans	(9)	(15)	(37)
Net realized losses on investments at fair value through other comprehensive income ⁽⁴⁾	–	–	(33)
Net fair value losses on investments at fair value through profit and loss	(2)	(1)	–
Net fair value (losses)/gains on hedged items under fair value hedge accounting for interest risk	(133)	(7)	42
Net fair value gains/(losses) on hedging instruments under fair value hedge accounting for interest risk	141	9	(23)
Net foreign exchange losses	(106)	(100)	(157)
Other financial income ⁽⁵⁾	92	9	172
Other financial expenses ⁽⁶⁾	(98)	(17)	(64)
Total	(341)	(313)	(537)

(1) In 2017, includes one-time charges of EUR 220 million related to the Group's tender offer to purchase USD 300 million 6.50% notes due January 2028, USD 1 360 million 6.45% notes due March 2029, EUR 500 million 6.75% notes due February 2019 and USD 1 000 million 5.375% notes due May 2019.

(2) In 2019, includes an interest expense of EUR 94 million (EUR 66 million in 2018) related to the sale of receivables. In 2017, includes an interest expense of EUR 69 million related to a change in uncertain tax positions.

(3) Interest expense on lease liabilities is presented in financial income and expenses as a result of the adoption of IFRS 16, Leases, in the beginning of 2019.

(4) In 2017, includes a one-time charge of EUR 32 million related to the sale of certain financial assets.

(5) In 2019, includes income of EUR 64 million due to a change in the fair value of the financial liability related to Nokia Shanghai Bell, refer to Note 33, Significant partly-owned subsidiaries. Venture fund related gains and losses are presented in other operating income and expenses as a result of the adoption of IFRS 9, Financial Instruments, in 2018. In 2017, includes distributions of EUR 80 million from venture funds held as non-current available-for-sale investments and income of EUR 64 million due to a change in the fair value of the financial liability related to Nokia Shanghai Bell, refer to Note 33, Significant partly-owned subsidiaries.

(6) In 2019, includes an impairment of EUR 64 million related to a loan extended to certain emerging market customer recognized upon contract exit. Venture fund related gains and losses are presented in other operating income and expenses as a result of the adoption of IFRS 9, Financial Instruments, in 2018. In 2017, includes impairments of EUR 34 million related to venture funds held as non-current available-for-sale investments. Refer to Note 17, Impairment.

12. Income taxes

Components of the income tax expense

EURm	2019	2018	2017
Continuing operations			
Current tax	(367)	(530)	(261)
Deferred tax	229	341	(666)
Total	(138)	(189)	(927)

Income tax reconciliation

Reconciliation of the difference between income tax computed at the statutory rate in Finland of 20% and income tax recognized in the consolidated income statement:

EURm	2019	2018	2017
Income tax (expense)/benefit at statutory rate	(31)	72	102
Permanent differences	53	(22)	85
Tax impact on operating model changes ⁽¹⁾	30	13	(245)
Non-creditable withholding taxes	(31)	(24)	(29)
Income taxes for prior years ⁽²⁾	(13)	26	(132)
Effect of different tax rates of subsidiaries operating in other jurisdictions	(38)	(31)	178
Effect of deferred tax assets not recognized ⁽³⁾	(99)	(205)	(164)
Benefit arising from previously unrecognized deferred tax assets	29	46	56
Net increase in uncertain tax positions	(6)	(43)	–
Change in income tax rates ⁽⁴⁾	(30)	(45)	(738)
Income taxes on undistributed earnings	(2)	26	(42)
Other	–	(2)	2
Total	(138)	(189)	(927)

(1) In 2017, the Group continued to integrate former Nokia and Alcatel Lucent operating models, the Group transferred certain intellectual property between its operations in Finland and in the United States, recording a tax expense of EUR 245 million. These transactions reduced the deferred tax assets in the United States and increased the deferred tax assets in Finland.

(2) In 2017, the Group recorded a EUR 139 million tax expense related to an uncertain tax position in Germany. The matter relates to the disposal of the former Alcatel Lucent railway signaling business in 2006 to Thalès.

(3) In 2018, relates primarily to foreign withholding tax credits in Finland.

(4) In 2017, primarily resulting from the tax rate change in the United States. The United States federal income tax rate reduction caused a revaluation of the United States deferred tax assets and liabilities, resulting in the recognition of an additional tax provision of EUR 777 million.

Income tax liabilities and assets include a net EUR 154 million liability (EUR 177 million in 2018) relating to uncertain tax positions with inherently uncertain timing of cash outflows.

Prior period income tax returns for certain Group companies are under examination by local tax authorities. The Group has on-going tax investigations in various jurisdictions, including the United States, Canada, India, Saudi Arabia and South Korea. The Group's business and investments, especially in emerging market countries, may be subject to uncertainties, including unfavorable or unpredictable tax treatment. Management judgment and a degree of estimation are required in determining the tax expense or benefit. Even though management does not expect that any significant additional taxes in excess of those already provided for will arise as a result of these examinations, the outcome or actual cost of settlement may vary materially from estimates.

Deferred tax assets and liabilities

EURm	2019			2018		
	Deferred tax assets	Deferred tax liabilities	Net balance	Deferred tax assets	Deferred tax liabilities	Net balance
Tax losses carried forward and unused tax credits	1 301	–		1 300	–	
Undistributed earnings	–	(83)		–	(80)	
Intangible assets and property, plant and equipment	3 257	(279)		2 922	(299)	
Right-of-use assets ⁽¹⁾	2	(221)		–	–	
Defined benefit pension assets	55	(1 150)		51	(1 028)	
Other non-current assets	62	(53)		28	(21)	
Inventories	216	(24)		196	(16)	
Other current assets	164	(32)		178	(16)	
Lease liabilities ⁽¹⁾	220	–		–	–	
Defined benefit pension and other post-employment liabilities	1 006	(29)		962	–	
Other non-current liabilities	32	–		30	(10)	
Provisions	213	(51)		205	(47)	
Other current liabilities	182	(126)		220	(84)	
Other temporary differences	99	(27)		77	(7)	
Total before netting	6 809	(2 075)	4 734	6 169	(1 608)	4 561
Netting of deferred tax assets and liabilities	(1 685)	1 685	–	(1 258)	1 258	–
Total after netting	5 124	(390)	4 734	4 911	(350)	4 561

(1) The Group adopted IFRS 16, Leases, on January 1, 2019, refer to Note 3, New and amended standards and interpretations and Note 16, Leases.

Movements in the net deferred tax balance during the year:

EURm	2019	2018	2017
As of January 1	4 561	4 169	5 298
Adoption of new IFRS standards ⁽¹⁾	(1)	19	–
Recognized in income statement, Continuing Operations	229	341	(666)
Recognized in income statement, Discontinued Operations	–	29	2
Recognized in other comprehensive income	(84)	(57)	(150)
Recognized in equity	(7)	6	(7)
Acquisitions through business combinations and disposals	–	–	(29)
Translation differences	36	54	(279)
As of December 31	4 734	4 561	4 169

(1) In 2019, adoption of IFRS 16, Leases. In 2018, adoption of IFRS 9, Financial Instruments, and IFRS 15, Revenue from Contracts with Customers.

Amount of temporary differences, tax losses carried forward and tax credits for which no deferred tax asset was recognized due to uncertainty of utilization:

EURm	2019	2018
Temporary differences	1 716	1 600
Tax losses carried forward	18 609	18 757
Tax credits	101	108
Total	20 426	20 465

The majority of the unrecognized temporary differences and tax losses relate to France. Based on the pattern of losses in the past years and in the absence of convincing other evidence of sufficient taxable profit in the future years, it is uncertain whether these deferred tax assets can be utilized in the foreseeable future. A significant portion of the French unrecognized deferred tax assets are indefinite in nature and available against future French tax liabilities, subject to a limitation of 50% of annual taxable profits.

Deferred tax assets are recognized to the extent it is probable that future taxable profit will be available against which the unused tax losses, unused tax credits and deductible temporary differences can be utilized in the relevant jurisdictions. The majority of the Group's recognized deferred tax assets relate to unused tax losses, tax credits and deductible temporary differences in Finland of EUR 2.8 billion (EUR 2.5 billion in 2018) and the United States of EUR 1.1 billion (EUR 1.2 billion in 2018).

The Group continually evaluates the probability assessment in respect of the utilization of deferred tax assets. As it relates to Finland, the Group has considered the following favorable and unfavorable factors in this assessment:

§ The recent years' cumulative profitability in Finland, excluding certain integration costs in Finland related to the acquisition of Alcatel Lucent in 2016, which are considered as non-recurring in nature;

§ The historical and expected future positive impact on Finnish taxable income from Nokia Technologies;

§ The risks and investments related to 5G roll-out; and

§ The relevant attributes underlying the deferred tax assets are generally not subject to expire.

Based on its assessment, the Group has concluded that it is probable that it will be able to utilize the tax losses, tax credits and deductible temporary differences in Finland. The Group will continue to monitor the above factors, including in particular its actual profit record, in upcoming periods.

As it relates to the United States, the Group has an established pattern of sufficient tax profitability to conclude that it is probable that the Group will utilize the deferred tax assets.

Expiry of tax losses carried forward and unused tax credits:

EURm	2019			2018		
	Recognized	Unrecognized	Total	Recognized	Unrecognized	Total
Tax losses carried forward						
Within 10 years	2 181	1 609	3 790	2 195	1 698	3 893
Thereafter	–	6	6	353	58	411
No expiry	1 728	16 994	18 722	1 497	17 001	18 498
Total	3 909	18 609	22 518	4 045	18 757	22 802
Tax credits						
Within 10 years	251	88	339	249	92	341
Thereafter	237	2	239	204	5	209
No expiry	13	11	24	11	11	22
Total	501	101	602	464	108	572

The Group has undistributed earnings of EUR 1 104 million (EUR 709 million in 2018) for which a deferred tax liability has not been recognized as these earnings will not be distributed in the foreseeable future.

13. Earnings per share

	2019 EURm	2018 EURm	2017 EURm
Basic and diluted			
Profit or loss attributable to equity holders of the parent			
Continuing operations	14	(554)	(1 473)
Discontinued operations	(7)	214	(21)
Profit/(loss) for the year	7	(340)	(1 494)
	000s shares	000s shares	000s shares
Basic			
Weighted average number of shares in issue	5 599 912	5 588 020	5 651 814
Diluted			
Effect of dilutive shares			
Effect of dilutive equity-settled share-based incentive programs			
Restricted shares and other	2 390	3 656	–
Performance shares	24 072	20 577	–
Stock options	1	224	–
Total effect of dilutive equity-settled share-based incentive programs	26 463	24 457	–
Total effect of dilutive shares	26 463	24 457	–
Adjusted weighted average number of shares	5 626 375	5 612 477	5 651 814
Earnings per share attributable to equity holders of the parent	EUR	EUR	EUR
Basic earnings per share			
Continuing operations	0.00	(0.10)	(0.26)
Discontinued operations	0.00	0.04	0.00
Profit/(loss) for the year	0.00	(0.06)	(0.26)
Diluted earnings per share			
Continuing operations	0.00	(0.10)	(0.26)
Discontinued operations	0.00	0.04	0.00
Profit/(loss) for the year	0.00	(0.06)	(0.26)

Basic earnings per share is calculated by dividing the profit or loss attributable to equity holders of the parent by the weighted average number of shares outstanding during the year. Diluted earnings per share is calculated by adjusting the profit or loss attributable to equity holders of the parent, and the weighted average number of shares outstanding, for the effects of all dilutive potential ordinary shares. Potential ordinary shares are treated as dilutive only for the periods with reported profit.

In 2019, the dilutive impact of 2 million restricted shares (4 million in 2018 and 5 million in 2017) was included in the calculation of diluted earnings per share for the periods with reported profit but excluded from the calculation for the periods with reported loss as they are determined to be anti-dilutive.

In 2019, the dilutive impact of 24 million performance shares (21 million in 2018 and 14 million in 2017) was included in the calculation of diluted earnings per share for the periods with reported profit but excluded from the calculation for the periods with reported loss as they are determined to be anti-dilutive.

In 2019, the dilutive impact of stock options equivalent to fewer than 1 million (fewer than 1 million shares in 2018 and 2017) was included in the calculation of diluted earnings per share for the periods with reported profit but excluded from the calculation for the periods with reported loss as they are determined to be anti-dilutive.

14. Intangible assets

EURm	Goodwill	Other	Total
Acquisition cost as of January 1, 2018	6 297	8 997	15 294
Translation differences	172	175	347
Additions	–	277	277
Acquisitions through business combinations	32	–	32
Disposals and retirements ⁽¹⁾	(141)	(25)	(166)
Acquisition cost as of December 31, 2018	6 360	9 424	15 784
Accumulated amortization and impairment charges as of January 1, 2018	(1 049)	(5 026)	(6 075)
Translation differences	–	(80)	(80)
Impairment charges	–	(16)	(16)
Disposals and retirements ⁽¹⁾	141	15	156
Amortization	–	(964)	(964)
Accumulated amortization and impairment charges as of December 31, 2018	(908)	(6 071)	(6 979)
Net book value as of January 1, 2018	5 248	3 971	9 219
Net book value as of December 31, 2018	5 452	3 353	8 805
Acquisition cost as of January 1, 2019	6 360	9 424	15 784
Translation differences	75	82	157
Additions	–	52	52
Disposals and retirements	–	(92)	(92)
Acquisition cost as of December 31, 2019	6 435	9 466	15 901
Accumulated amortization and impairment charges as of January 1, 2019	(908)	(6 071)	(6 979)
Translation differences	–	(41)	(41)
Impairment charges	–	(12)	(12)
Disposals and retirements	–	71	71
Amortization	–	(984)	(984)
Accumulated amortization and impairment charges as of December 31, 2019	(908)	(7 037)	(7 945)
Net book value as of January 1, 2019	5 452	3 353	8 805
Net book value as of December 31, 2019	5 527	2 429	7 956

(1) Includes goodwill with acquisition cost and accumulated impairment of EUR 141 million related to the Digital Health business disposal in 2018.

Net book value of other intangible assets by type of asset:

EURm	2019	2018
Customer relationships	1 788	2 063
Technologies	41	582
Tradenames and trademarks	145	191
Other	455	517
Total	2 429	3 353

As of December 31 2019, the weighted average for the remaining amortization periods is approximately six years for customer relationships, two years for developed technology, three years for tradenames and trademarks and four years for other.

15. Property, plant and equipment

EURm	Buildings and constructions	Machinery and equipment	Other	Assets under construction	Total
Acquisition cost as of January 1, 2018	1 065	2 649	106	86	3 906
Translation differences	8	6	2	–	16
Additions	65	366	–	88	519
Reclassifications	31	49	–	(80)	–
Disposals and retirements	(25)	(237)	(3)	(3)	(268)
Acquisition cost as of December 31, 2018	1 144	2 833	105	91	4 173
Accumulated depreciation as of January 1, 2018	(271)	(1 768)	(14)	–	(2 053)
Translation differences	(5)	(5)	–	–	(10)
Impairment charges	(33)	(7)	–	–	(40)
Disposals and retirements	15	194	2	–	211
Depreciation	(92)	(397)	(2)	–	(491)
Accumulated depreciation as of December 31, 2018	(386)	(1 983)	(14)	–	(2 383)
Net book value as of January 1, 2018	794	881	92	86	1 853
Net book value as of December 31, 2018	758	850	91	91	1 790
Acquisition cost as of January 1, 2019	1 144	2 833	105	91	4 173
Translation differences	15	22	2	–	39
Additions	63	339	–	143	545
Reclassifications	27	62	1	(90)	–
Disposals and retirements	(55)	(267)	(6)	(1)	(329)
Acquisition cost as of December 31, 2019	1 194	2 989	102	143	4 428
Accumulated depreciation as of January 1, 2019	(386)	(1 983)	(14)	–	(2 383)
Translation differences	(8)	(16)	–	–	(24)
Impairment charges	–	(4)	–	–	(4)
Disposals and retirements	33	257	–	–	290
Depreciation	(90)	(359)	(2)	–	(451)
Accumulated depreciation as of December 31, 2019	(451)	(2 105)	(16)	–	(2 572)
Net book value as of January 1, 2019	758	850	91	91	1 790
Net book value as of December 31, 2019	743	884	86	143	1 856

In 2014, the tax authorities in India placed a lien which prohibited the Group from transferring the mobile devices-related facility in Chennai to Microsoft as part of the sale of D&S business. As of December 31, 2019, the lien prohibiting the Group from transferring the facility to third parties is still in place.

16. Leases

Right-of-use assets

Right-of-use assets represent the Group's right to use the underlying leased assets.

EURm	Buildings	Other	Total
Acquisition cost as of January 1, 2019	898	77	975
Net additions	150	44	194
Acquisition cost as of December 31, 2019	1 048	121	1 169
Accumulated depreciation as of January 1, 2019	–	–	–
Impairment charges	(32)	–	(32)
Depreciation	(177)	(48)	(225)
Accumulated depreciation as of December 31, 2019	(209)	(48)	(257)
Net book value as of January 1, 2019	898	77	975
Net book value as of December 31, 2019	839	73	912

Amounts recognized in the income statement

EURm	2019
Depreciation expense on right-of-use assets	(225)
Expenses relating to short-term leases	(26)
Interest expense on lease liabilities	(28)
Income from subleasing leasehold and freehold properties ⁽¹⁾	9
Gains arising from sale and leaseback transactions	9
Total recognized in the income statement	(261)

(1) Sublease income comprises rent income from operating subleases and financial income on the net investment in the lease related to finance subleases.

Amounts recognized in the statement of cash flows

EURm	2019
Payment of principal portion of lease liabilities	(221)
Interest portion of lease liabilities	(28)
Total cash outflow for leases	(249)

Changes in lease liabilities reported in financing activities

EURm	2019
As of January 1, 2019	1 066
Cash flows	(221)
Non-cash changes:	
Net additions	194
Other	(9)
As of December 31, 2019	1 030

The maturity analysis for lease liabilities is presented in Note 36, Financial risk management.

17. Impairment

Goodwill

The Group has allocated goodwill to the operating segments corresponding to groups of cash generating units (CGUs) that are expected to benefit from goodwill in line with the Group's operational and reporting structure. Refer to Note 5, Segment information.

Allocation of goodwill

The following table presents the allocation of goodwill to groups of CGUs as of the annual impairment testing date October 1:

EURm	2019	2018
Mobile Networks ⁽¹⁾	794	963
Fixed Networks	876	836
Global Services ⁽¹⁾	1 043	1 306
IP/Optical Networks	1 954	1 871
Nokia Software ⁽¹⁾	982	434

(1) On January 1, 2019, the Group reallocated goodwill of EUR 205 million from Mobile Networks and EUR 310 million from Global Services operating segments to Nokia Software operating segment following the reclassification of the activities related to the Cloud Core software portfolio. Refer to Note 5, Segment information.

Recoverable amounts

The recoverable amounts of the groups of CGUs were based on fair value less costs of disposal that was determined using a level 3 fair value measurement based on a discounted cash flow calculation. The cash flow projections used in calculating the recoverable amounts were based on financial plans approved by management covering an explicit forecast period of three years.

Seven additional years of cash flow projections subsequent to the explicit forecast period reflect a gradual progression towards the steady state cash flow projections modelled in the terminal year. The terminal growth rate assumptions reflect long-term average growth rates for the industries and economies in which the groups of CGUs operate. The discount rates reflect current assessments of the time value of money and relevant market risk premiums reflecting risks and uncertainties for which the future cash flow estimates have not been adjusted. Other key variables in future cash flow projections include assumptions on estimated sales growth, gross margin and operating margin. All cash flow projections are consistent with market participant assumptions.

The results of the impairment testing indicate adequate headroom for each group of CGUs. The key assumptions applied in the impairment testing analysis for the groups of CGUs as of the annual impairment testing date October 1:

Key assumption %	2019		2018 ⁽¹⁾	
	Terminal growth rate		Post-tax discount rate	
Mobile Networks	1.1	1.1	8.4	9.2
Fixed Networks	1.1	1.1	7.6	7.9
Global Services	0.9	1.0	8.0	8.6
IP/Optical Networks	1.4	1.3	8.2	9.1
Nokia Software	1.5	1.6	7.6	8.7

(1) Key assumptions for 2018 reflect the operational and reporting structure in place in 2018. For information on organizational changes in 2019, refer to Note 5, Segment Information.

Impairment charges by asset category

EURm	2019	2018	2017
Goodwill	–	–	141
Other intangible assets	12	16	33
Property, plant and equipment	4	39	25
Right-of-use assets ⁽¹⁾	20	–	–
Investments in associated companies and joint ventures	2	–	–
Financial assets	64	–	45
Total	102	55	244

(1) The Group adopted IFRS 16, Leases, on January 1, 2019. Refer to Note 3, New and amended standards and interpretations and Note 16, Leases. In 2019, EUR 20 million impairment charge is presented net of onerous lease contract provision releases.

In 2019, upon contract exit the Group recognized an impairment charge of EUR 64 million related to loans extended to a certain emerging market customer.

In 2017, as a result of challenging business conditions, the Group recorded an impairment charge of EUR 141 million on its Digital Health CGU. The impairment charge was allocated in its entirety to reduce the carrying amount of goodwill of the Digital Health CGU to zero. The Group disposed its Digital Health business in 2018.

In 2017, the Group recognized an impairment charge of EUR 45 million primarily related to the performance of certain private funds investing in IPR that were included in non-current available-for-sale equity investments at cost less impairment. These charges were recorded in other operating expenses and financial income and expenses. As a result of the adoption of IFRS 9, Financial Instruments, on January 1, 2018, venture fund investments are classified as fair value through profit and loss and the related gains and losses are presented in other operating income and expenses.

Other impairments recorded by the Group in 2019, 2018 and 2017 are immaterial.

18. Inventories

EURm	2019	2018
Raw materials, supplies and other	568	462
Work in progress	1 281	1 398
Finished goods	1 087	1 308
Total	2 936	3 168

The cost of inventories recognized as an expense during the year and included in the cost of sales is EUR 8 181 million (EUR 7 569 million in 2018 and EUR 7 803 million in 2017).

Movements in allowances for excess and obsolete inventory for the years ended December 31:

EURm	2019	2018	2017
As of January 1	521	432	456
Charged to income statement	83	153	100
Deductions ⁽¹⁾	(99)	(64)	(124)
As of December 31	505	521	432

(1) Deductions include utilization and releases of allowances.

19. Prepaid expenses and accrued income

Non-current

EURm	2019	2018
R&D tax credits and other indirect tax receivables	156	155
Deposits	58	56
Other	78	97
Total	292	308

Current

EURm	2019	2018
Social security, R&D tax credits, VAT and other indirect taxes	543	514
Divestment-related receivables	33	67
Deposits	20	35
Other	312	408
Total	908	1 024

20. Shares of the Parent Company

Shares and share capital

Nokia Corporation (Parent Company) has one class of shares. Each share entitles the holder to one vote at General Meetings. As of December 31, 2019, the share capital of Nokia Corporation is EUR 245 896 461.96 and the total number of shares issued is 5 640 536 159. As of December 31, 2019, the total number of shares includes 34 954 869 shares owned by Group companies representing 0.6% of share capital and total voting rights. Under the Nokia Articles of Association, Nokia Corporation does not have minimum or maximum share capital or share par value.

Authorizations

Authorization to issue shares and special rights entitling to shares

At the Extraordinary General Meeting held on December 2, 2015, the shareholders authorized the Board of Directors to issue, in deviation from the shareholders' pre-emptive right, a maximum of 2 100 million shares through one or more share issues. The authorization includes the right for the Board of Directors to resolve on all the terms and conditions of such share issuances. The authorization may be used to issue Parent Company shares to the holders of Alcatel Lucent shares, American Depositary Shares and convertible bonds as well as to beneficiaries of Alcatel Lucent employee equity compensation arrangements for the purpose of implementing the transaction with Alcatel Lucent, including the consummation of the public exchange offers made to Alcatel Lucent shareholders as well as other transactions contemplated by the memorandum of understanding between the Group and Alcatel Lucent, and/or otherwise to effect the combination. The authorization is effective until December 2, 2020.

At the Annual General Meeting held on May 30, 2018, the shareholders authorized the Board of Directors to issue a maximum of 550 million shares through one or more issues of shares or special rights entitling to shares. The Board of Directors is authorized to issue either new shares or shares held by the Parent Company. The authorization included the right for the Board of Directors to resolve on all the terms and conditions of such share and special rights issuances, including issuance in deviation from the shareholders' pre-emptive rights. The authorization may be used to develop the Parent Company's capital structure, diversify the shareholder base, finance or carry out acquisitions or other arrangements, settle the Parent Company's equity-based incentive plans, or for other purposes resolved by the Board of Directors. The authorization that would have been effective until November 30, 2019 was terminated by a resolution of Annual General Meeting on May 21, 2019.

At the Annual General Meeting held on May 21, 2019, the shareholders authorized the Board of Directors to issue a maximum of 550 million shares through one or more issues of shares or special rights entitling to shares. The Board of Directors is authorized to issue either new shares or shares held by the Parent Company. The authorization included the right for the Board of Directors to resolve on all the terms and conditions of such share and special rights issuances, including issuance in deviation from the shareholders' pre-emptive rights. The authorization may be used to develop the Parent Company's capital structure, diversify the shareholder base, finance or carry out acquisitions or other arrangements, settle the Parent Company's equity-based incentive plans, or for other purposes resolved by the Board of Directors. The authorization is effective until November 21, 2020.

In 2019, under the authorization held by the Board of Directors, the Parent Company issued 23 000 new shares following the holders of stock options issued in 2013 exercising their option rights.

In 2019, under the authorization held by the Board of Directors, the Parent Company issued 4 568 000 new shares without consideration to the Parent Company to fulfil the company's obligation under the Nokia Equity Programs.

In 2019, under the authorization held by the Board of Directors, the Parent Company issued 12 396 097 treasury shares to employees, including certain members of the Group Leadership Team, as settlement under Parent Company equity-based incentive plans and the employee share purchase plan as well as an Alcatel Lucent employee equity compensation arrangement. The shares were issued without consideration and in accordance with the rules of the plans and arrangement.

As of December 31, 2019, the Board of Directors had no other authorizations to issue shares, convertible bonds, warrants or stock options.

Other authorizations

At the Annual General Meeting held on May 30, 2018, the shareholders authorized the Board of Directors to repurchase a maximum of 550 million shares. The amount corresponds to less than 10% of the total number of Parent Company's shares. The shares may be repurchased in order to optimize the capital structure of the Company. In addition, shares may be repurchased in order to meet obligations arising from debt financial instruments that are exchangeable into equity instruments, to settle equity-based incentive plans for employees of the Group or of its associated companies, or to be transferred for other purposes such as financing or carrying out acquisitions. The authorization that would have been effective until November 30, 2019 was terminated by a resolution of the Annual General Meeting on May 21, 2019.

At the Annual General Meeting held on May 21, 2019, the shareholders authorized the Board of Directors to repurchase a maximum of 550 million shares. The amount corresponds to less than 10% of the total number of Parent Company's shares. Shares may be repurchased to be cancelled, held to be reissued, transferred further or for other purposes resolved by the Board. The Board shall resolve on all other matters related to the repurchase of Nokia shares. The authorization is effective until November 21, 2020.

21. Translation differences, fair value and other reserves

EURm	Translation differences	Fair value and other reserves			Fair value reserve ⁽¹⁾
		Pension remeasurements	Hedging reserve	Cost of hedging reserve	
As of January 1, 2017	483	173	10	-	305
Foreign exchange translation differences	(1 830)	-	-	-	-
Net investment hedging gains	352	-	-	-	-
Remeasurements of defined benefit plans	-	662	-	-	-
Net fair value gains	-	-	103	-	18
Transfer to income statement	12	-	(75)	-	(104)
Other increase/(decrease)	1	3	(1)	-	-
Movement attributable to non-controlling interests	50	-	-	-	-
As of December 31, 2017	(932)	838	37	-	219
Adoption of IFRS 9	-	-	-	(10)	(242)
As of January 1, 2018	(932)	838	37	(10)	(23)
Foreign exchange translation differences	444	-	-	-	-
Net investment hedging losses	(66)	-	-	3	-
Remeasurements of defined benefit plans	-	293	-	-	-
Net fair value losses	-	-	(28)	(8)	(116)
Transfer to income statement	(37)	-	(30)	23	78
Other (decrease)/increase	(1)	6	-	-	-
As of December 31, 2018	(592)	1 137	(21)	8	(61)
Foreign exchange translation differences	259	-	-	-	-
Net investment hedging losses	(40)	-	-	(6)	-
Remeasurements of defined benefit plans	-	319	-	-	-
Net fair value losses	-	-	(17)	(34)	(101)
Transfer to income statement	1	-	32	18	107
Other increase	-	1	-	-	-
As of December 31, 2019	(372)	1 457	(6)	(14)	(55)

(1) In 2017, fair value reserve includes changes in the fair value of available-for-sale investments.

Translation differences consist of foreign exchange differences arising from translation of foreign operations into euro, the presentation currency of the consolidated financial statements as well as gains and losses related to hedging of net investments in foreign operations.

Pension remeasurements reserve includes actuarial gains and losses as well as return on plan assets and changes in the effect of the asset ceiling, excluding amounts recognized in net interest, related to the Group's defined benefit plans.

Hedging reserve includes the change in fair value that reflects the change in spot exchange rates for certain foreign exchange forward contracts that are designated as cash flow hedges to the extent that the hedge is effective.

Cost of hedging reserve includes forward element of foreign exchange forward contracts and time value of foreign exchange options related to cash flow hedging of forecasted foreign currency sale and purchase transactions. Additionally, cost of hedging reserve includes the difference between the change in fair value of forward element of foreign exchange forward contracts and time value of option contracts and the amortization of forward element of foreign exchange forward contracts and time value of option contracts related to net investment hedging. Cost of hedging reserve also includes changes in fair value from foreign currency basis spread related to fair value hedging of foreign currency denominated bonds.

Fair value reserve includes the changes in fair value of financial instruments that are managed in a portfolio with a business model of holding financial instruments to collect contractual cash flows including principal and interest as well as selling financial instruments. The fair values of these instruments are reduced by amounts of loss allowances.

For more information on the accounting for items recognized in translation differences, fair value and other reserves, refer to Note 2, Significant accounting policies.

22. Other comprehensive income

EURm	2019			2018			2017		
	Gross	Tax	Net	Gross	Tax	Net	Gross	Tax	Net
Pension remeasurements									
Remeasurements of defined benefit plans	414	(95)	319	388	(90)	298	723	(58)	665
Net change during the year	414	(95)	319	388	(90)	298	723	(58)	665
Translation differences									
Exchange differences on translating foreign operations	259	–	259	443	1	444	(1 831)	1	(1 830)
Transfer to income statement	1	–	1	(42)	–	(42)	12	–	12
Net change during the year	260	–	260	401	1	402	(1 819)	1	(1 818)
Net investment hedges									
Net investment hedging (losses)/gains	(58)	12	(46)	(79)	16	(63)	440	(88)	352
Transfer to income statement	–	–	–	6	(1)	5	–	–	–
Net change during the year	(58)	12	(46)	(73)	15	(58)	440	(88)	352
Cash flow and other hedges									
Net fair value (losses)/gains	(64)	13	(51)	(44)	8	(36)	129	(26)	103
Transfer to income statement	62	(12)	50	(9)	2	(7)	(94)	19	(75)
Net change during the year	(2)	1	(1)	(53)	10	(43)	35	(7)	28
Financial assets at fair value through other comprehensive income⁽¹⁾									
Net fair value losses	(126)	25	(101)	(144)	28	(116)	–	–	–
Transfer to income statement on impairment	40	(8)	32	33	(8)	25	–	–	–
Transfer to income statement on disposal	94	(19)	75	66	(13)	53	–	–	–
Net change during the year	8	(2)	6	(45)	7	(38)	–	–	–
Available-for-sale investments⁽¹⁾									
Net fair value gains	–	–	–	–	–	–	19	(1)	18
Transfer to income statement on impairment	–	–	–	–	–	–	14	(1)	13
Transfer to income statement on disposal	–	–	–	–	–	–	(121)	4	(117)
Net change during the year	–	–	–	–	–	–	(88)	2	(86)
Other increase/(decrease), net	–	–	–	1	–	1	(1)	–	(1)
Total	622	(84)	538	619	(57)	562	(710)	(150)	(860)

(1) Related to the adoption of IFRS 9, Financial Instruments, in 2018, investments in unlisted private equity shares, technology-related publicly quoted shares and unlisted venture funds that were classified as available-for-sale investments are classified as fair value through profit and loss. Certain current financial investments, customer or vendor related loan receivables and trade receivables are classified as fair value through other comprehensive income under IFRS 9, Financial Instruments.

23. Interest-bearing liabilities

Issuer/borrower	Instrument	Currency	Nominal (million)	Final maturity	Carrying amount EURm ^(a)	
					2019	2018
Nokia Corporation	6.75% Senior Notes ⁽¹⁾	EUR	231	February 2019	–	232
Nokia Corporation	5.375% Senior Notes ⁽²⁾	USD	581	May 2019	–	507
Nokia Corporation	1.00% Senior Notes	EUR	500	March 2021	499	499
Nokia Corporation	3.375% Senior Notes	USD	500	June 2022	445	423
Nokia Corporation	2.00% Senior Notes	EUR	750	March 2024	766	750
Nokia Corporation	NIB R&D loan ⁽³⁾	EUR	250	May 2025	250	–
Nokia Corporation	2.00% Senior Notes ⁽⁴⁾	EUR	750	March 2026	765	–
Nokia Corporation	4.375% Senior Notes	USD	500	June 2027	452	415
Nokia of America Corporation	6.50% Senior Notes	USD	74	January 2028	66	65
Nokia of America Corporation	6.45% Senior Notes	USD	206	March 2029	185	182
Nokia Corporation	6.625% Senior Notes	USD	500	May 2039	517	455
Nokia Corporation and various subsidiaries	Other liabilities				332	292
Total					4 277	3 820

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- (1) In February 2019, the Group repaid its EUR 231 million 6.75% Senior Notes.
- (2) In May 2019, the Group repaid its USD 581 million 5.375% Senior Notes.
- (3) In May 2019, the Group drew an amortizing loan from Nordic Investment Bank (NIB). The loan is repayable in three equal installments in 2023, 2024 and 2025.
- (4) In March 2019, the Group issued EUR 750 million 2.00% Senior Notes due 2026 under its EUR 5 billion Euro Medium-Term Note Programme.
- (5) Carrying amount includes EUR 138 million (EUR 11 million in 2018) of fair value adjustments related to discontinued fair value hedge accounting relationships that are amortized over the life of the respective Senior Notes.

The Group's significant credit facilities and funding programs as of December 31:

Committed / Uncommitted	Financing arrangement	Currency	Nominal (million)	Utilized	
				2019	2018
Committed	Revolving Credit Facility ⁽¹⁾	EUR	1 500	–	–
Committed	EIB R&D Loan Facility ⁽²⁾	EUR	500	–	–
Uncommitted	Finnish Commercial Paper Programme	EUR	750	–	–
Uncommitted	Euro Medium-Term Note Programme ⁽³⁾	EUR	5 000	2 000	1 250
Total				2 000	1 250

- (1) In June 2019, the Group refinanced its EUR 1 579 million revolving credit facility maturing in 2020 with EUR 1 500 million five-year revolving credit facility with two one-year extension options.
- (2) The loan facility of EUR 500 million with the European Investment Bank (EIB) was signed in August 2018 and will have an average maturity of approximately five years after disbursement. The facility has not been disbursed as of December 31, 2019, and the availability period ends in February 2020.
- (3) All euro-denominated bonds are issued under Euro Medium-Term Note Programme.

All borrowings and credit facilities presented in the tables above are senior unsecured and have no financial covenants.

The Group uses the following interest rate swaps and cross currency swaps under fair value and cash flow hedge accounting to manage interest rate and foreign exchange risks related to the Group's interest-bearing liabilities as of December 31:

Entity	Instrument ⁽¹⁾	Currency	Notional (million)	Maturity	Fair values EURm	
					2019	2018
Nokia Corporation	Cross currency swaps	USD	581	May 2019	–	(29)
Nokia Corporation	Cross currency swaps ⁽²⁾	USD	500	June 2022	(11)	(16)
Nokia Corporation	Interest rate swaps ⁽³⁾	EUR	–	March 2024	–	7
Nokia Corporation	Cross currency swaps ⁽²⁾	USD	500	June 2027	(18)	(22)
Nokia Corporation	Cross currency swaps ⁽²⁾	USD	400	May 2039	(20)	20
Total					(49)	(40)

- (1) All cross currency swaps and interest rate swaps are fixed-to-floating swaps.
- (2) In 2019, the Group unwound EUR/USD cross currency swaps and re-entered into equivalent swaps with different pricing levels to retain both foreign exchange and interest rate risk positions otherwise unchanged. Hedge accounting was discontinued and new hedge relationships were defined for the new EUR/USD cross currency swaps.
- (3) In 2019, the Group fixed the interest rate of EUR 750 million 2.00% Senior Notes due March 2024 by unwinding fixed-to-floating interest rate swaps.

Changes in interest-bearing liabilities and associated derivatives related to financing activities (for changes in lease liabilities, refer to Note 16, Leases):

	Long-term interest- bearing liabilities	Short-term interest- bearing liabilities	Derivatives held to hedge long-term borrowings ⁽¹⁾	Total
As of January 1, 2018	3 457	309	135	3 901
Cash flows	28	2	92	122
Non-cash changes:				
Changes in foreign exchange rates	89	(1)	(138)	(50)
Changes in fair value	(4)	–	(32)	(36)
Reclassification between long-term and short-term	(739)	739	–	–
Other	(5)	(55)	–	(60)
As of December 31, 2018	2 826	994	57	3 877
Cash flows	253	40	20	313
Non-cash changes:				
Changes in foreign exchange rates	43	1	(25)	19
Changes in fair value	131	–	(142)	(11)
Reclassification between long-term and short-term	738	(738)	–	–
Other ⁽²⁾	(6)	(5)	140	129
As of December 31, 2019	3 985	292	50	4 327

- (1) Includes derivatives designated in fair value and cash flow hedge accounting relationships as well as derivatives not designated in hedge accounting relationship but hedging identifiable long-term borrowing exposure.
- (2) Includes EUR 138 million cash inflow from unwind settlements of certain interest rate derivatives held to hedge long-term borrowings that is included in interest paid in the consolidated statement of cash flows.

24. Fair value of financial instruments

Financial assets and liabilities recorded at fair value are categorized based on the amount of unobservable inputs used to measure their fair value. Three hierarchical levels are based on an increasing amount of judgment associated with the inputs used to derive fair valuation for these assets and liabilities, level 1 being market values for exchange traded products, level 2 being primarily based on quotes from third-party pricing services, and level 3 requiring most management judgment. At the end of each reporting period, the Group categorizes its financial assets and liabilities to appropriate level of fair value hierarchy. Items carried at fair value in the following table are measured at fair value on a recurring basis.

EURm	Carrying amounts							Fair value ⁽¹⁾	
	Amortized cost	Fair value through profit or loss			Fair value through other comprehensive income			Total	Total
		Level 1	Level 2	Level 3	Level 1	Level 2	Level 3		
2019									
Non-current financial investments	–	–	–	740	–	–	–	740	740
Other non-current financial assets	165	–	171	6	–	103	–	445	430
Other current financial assets including derivatives	46	–	81	–	–	37	–	164	164
Trade receivables	–	–	–	–	–	5 025	–	5 025	5 025
Current financial investments	42	–	51	–	–	4	–	97	97
Cash and cash equivalents	4 090	–	1 820	–	–	–	–	5 910	5 910
Total financial assets	4 343	–	2 123	746	–	5 169	–	12 381	12 366
Long-term interest-bearing liabilities	3 985	–	–	–	–	–	–	3 985	4 056
Other long-term financial liabilities	–	–	10	20	–	–	–	30	30
Short-term interest-bearing liabilities	292	–	–	–	–	–	–	292	292
Other financial liabilities including derivatives	–	–	164	639	–	–	–	803	803
Trade payables	3 786	–	–	–	–	–	–	3 786	3 786
Total financial liabilities	8 063	–	174	659	–	–	–	8 896	8 967

EURm	Carrying amounts							Fair value ⁽¹⁾	
	Amortized cost	Fair value through profit or loss			Fair value through other comprehensive income			Total	Total
		Level 1	Level 2	Level 3	Level 1	Level 2	Level 3		
2018									
Non-current financial investments	–	8	–	682	–	–	–	690	690
Other non-current financial assets	188	–	94	6	–	85	–	373	357
Other current financial assets including derivatives	20	–	131	–	–	92	–	243	243
Trade receivables	–	–	–	–	–	4 856	–	4 856	4 856
Current financial investments	106	–	52	–	–	454	–	612	612
Cash and cash equivalents	4 531	–	1 730	–	–	–	–	6 261	6 261
Total financial assets	4 845	8	2 007	688	–	5 487	–	13 035	13 019
Long-term interest-bearing liabilities	2 826	–	–	–	–	–	–	2 826	2 818
Other long-term financial liabilities	–	–	–	14	–	–	–	14	14
Short-term interest-bearing liabilities	994	–	–	–	–	–	–	994	997
Other financial liabilities including derivatives	–	–	198	693	–	–	–	891	891
Trade payables	4 773	–	–	–	–	–	–	4 773	4 773
Total financial liabilities	8 593	–	198	707	–	–	–	9 498	9 493

(1) The following fair value measurement methods are used for items not carried at fair value: The fair values of long-term interest-bearing liabilities, including current part, are primarily based on quotes from third-party pricing services (level 2). The fair values of other assets and liabilities, including loan receivables and loans payable are primarily based on discounted cash flow analysis (level 2). The fair value is estimated to equal the carrying amount for short-term financial assets and financial liabilities due to limited credit risk and short time to maturity. Refer to Note 2, Significant accounting policies.

Lease liabilities are not included in the fair value of financial instruments.

The level 1 category includes financial assets and liabilities that are measured in whole by reference to published quotes in an active market. A financial instrument is regarded as quoted in an active market if quoted prices are readily and regularly available from an exchange, and those prices represent actual and regularly occurring market transactions on an arm's-length basis. This category includes only exchange traded products.

The level 2 category includes financial assets and liabilities measured using a valuation technique based on assumptions that are supported by prices from observable current market transactions. These include assets and liabilities with fair values based on quotes from third-party pricing services, financial assets with fair values based on broker quotes and assets that are valued using the Group's own valuation models whereby the material assumptions are market observable. The majority of the Group's listed bonds and other securities, over-the-counter derivatives, trade receivables and certain other products are included within this category.

The level 3 financial assets category includes a large number of investments in unlisted equities and unlisted venture funds, including investments managed by NGP Capital specializing in growth-stage investing. The fair value of level 3 investments is determined using one or more valuation techniques where the use of the market approach generally consists of using comparable market transactions, while the use of the income approach generally consists of calculating the net present value of expected future cash flows. For unlisted funds, the selection of appropriate valuation techniques by the fund managing partner may be affected by the availability and reliability of relevant inputs. In some cases, one valuation technique may provide the best indication of fair value while in other circumstances multiple valuation techniques may be appropriate.

The inputs generally considered in determining the fair value of level 3 investments include the original transaction price, recent transactions in the same or similar instruments, completed or pending third-party transactions in the underlying investment or comparable issuers, subsequent rounds of financing, recapitalizations or other transactions undertaken by the issuer, offerings in the equity or debt capital markets, and changes in financial ratios or cash flows, adjusted as appropriate for liquidity, credit, market and/or other risk factors. The level 3 investments are valued on a quarterly basis taking into consideration any changes, projections and assumptions, as well as any changes in economic and other relevant conditions. The fair value may be adjusted to reflect illiquidity and/or non-transferability, with the amount of such discount estimated by the managing partner in the absence of market information. Assumptions used by the managing partner due to the lack of observable inputs may impact the resulting fair value of individual investments, but no individual input has a significant impact on the total fair value of the level 3 investments.

Level 3 financial liabilities include a conditional obligation to China Huaxin as part of the Nokia Shanghai Bell definitive agreements where China Huaxin obtained the right to fully transfer its ownership interest in Nokia Shanghai Bell to the Group in exchange for a future cash settlement. The fair value of the liability is calculated using the net present value of the expected future cash settlement. The most significant unobservable valuation inputs include certain financial performance metrics of Nokia Shanghai Bell. No individual input has a significant impact on the total fair value of the level 3 financial liability. Refer to Note 33, Significant partly-owned subsidiaries.

Reconciliation of the opening and closing balances on level 3 financial assets and liabilities:

EURm	Level 3 Financial Assets	Level 3 Financial Liabilities
As of December 31, 2017	552	(672)
Adoption of IFRS 9 ⁽¹⁾	122	–
As of January 1, 2018	674	(672)
Net gains/(losses) in income statement	49	(34)
Additions	119	–
Deductions	(150)	8
Other movements	(4)	(9)
As of December 31, 2018	688	(707)
Net gains in income statement	49	35
Additions	90	–
Deductions	(79)	1
Other movements	(2)	12
As of December 31, 2019	746	(659)

(1) Non-current available-for-sale investments for which the fair value was estimated to equal cost less impairment under IAS 39, as their fair value was not possible to estimate reliably, are classified as level 3 financial assets at fair value through profit or loss under IFRS 9, Financial Instruments.

The gains and losses from venture fund and similar investments categorized in level 3 are included in other operating income and expenses. The gains and losses from other level 3 financial assets and liabilities are recorded in financial income and expenses. A net gain of EUR 73 million (net loss of EUR 96 million in 2018) related to level 3 financial instruments held at December 31, 2019, was included in the profit and loss during 2019.

25. Derivative financial instruments

EURm	Assets		Liabilities	
	Fair value ⁽¹⁾	Notional ⁽²⁾	Fair value ⁽¹⁾	Notional ⁽²⁾
2019				
Hedges on net investment in foreign subsidiaries				
Foreign exchange forward contracts	36	3 807	(2)	517
Cash flow hedges				
Foreign exchange forward contracts	7	660	(18)	749
Currency options bought	1	343	–	–
Fair value hedges				
Foreign exchange forward contracts	7	697	(7)	549
Firm commitments	6	606	(2)	255
Cash flow and fair value hedges⁽³⁾				
Cross currency swaps	–	–	(49)	1 246
Derivatives not designated in hedge accounting relationships carried at fair value through profit and loss				
Foreign exchange forward contracts	17	3 491	(72)	8 070
Currency options bought	7	654	–	–
Other derivatives	–	–	(7)	84
Total	81	10 258	(157)	11 470
2018				
Hedges on net investment in foreign subsidiaries				
Foreign exchange forward contracts	11	2 559	(23)	4 075
Currency options bought	1	240	–	–
Cash flow hedges				
Foreign exchange forward contracts	5	621	(26)	818
Currency options bought	9	522	–	44
Currency options sold	–	–	–	15
Fair value hedges				
Interest rate swaps	7	600	–	–
Foreign exchange forward contracts	2	218	(6)	548
Firm commitments	14	466	(1)	234
Cash flow and fair value hedges⁽³⁾				
Cross currency swaps	22	260	(69)	1 512
Derivatives not designated in hedge accounting relationships carried at fair value through profit and loss				
Foreign exchange forward contracts	59	6 230	(43)	5 329
Currency options bought	1	103	–	–
Other derivatives	–	–	(10)	104
Total	131	11 819	(178)	12 679

(1) Included in other financial assets and other financial liabilities in the consolidated statement of financial position.

(2) Includes the gross amount of all notional values for contracts that have not yet been settled or cancelled. The amount of notional value outstanding is not necessarily a measure or indication of market risk as the exposure of certain contracts may be offset by that of other contracts.

(3) Cross currency swaps have been designated partly as fair value hedges and partly as cash flow hedges.

26. Share-based payments

The Group has several equity-based incentive programs for executives and other eligible employees. The programs consist of performance share plans, restricted share plans and employee share purchase plans. The equity-based incentive grants are generally conditional on continued employment as well as the fulfillment of the performance and other conditions determined in the relevant plan rules. In 2019, the share-based payment expense, including social security costs, for all equity-based incentive grants in the consolidated income statement amounts to EUR 77 million (EUR 62 million in 2018 and EUR 99 million in 2017).

Active share-based payment plans by instrument

	Performance shares		Restricted shares	
	Number of performance shares outstanding at target	Weighted average grant date fair value EUR ⁽¹⁾	Number of restricted shares outstanding	Weighted average grant date fair value EUR ⁽¹⁾
As of January 1, 2017	43 417 550		5 969 537	
Granted	29 983 190	5.08	2 366 008	4.90
Forfeited	(2 589 904)		(807 556)	
Vested ⁽²⁾	(10 294 593)		(1 959 287)	
As of December 31, 2017	60 516 243		5 568 702	
Granted	36 943 251	4.39	1 479 350	4.47
Forfeited	(4 146 246)		(1 431 215)	
Vested ⁽²⁾	(10 169 717)		(2 034 789)	
As of December 31, 2018	83 143 531		3 582 048	
Granted	31 979 747	4.02	2 060 342	4.18
Forfeited	(4 964 055)		(451 540)	
Vested ⁽²⁾	(18 933 700)		(1 915 675)	
As of December 31, 2019⁽³⁾	91 225 523		3 275 175	

(1) The fair values of performance and restricted shares are estimated based on the grant date market price of the Nokia share less the present value of dividends expected to be paid during the vesting period.

(2) Vested performance shares at target are multiplied by the confirmed payout (% of target) to calculate the total number of Nokia shares settlement.

(3) Includes 25 706 652 performance shares for the Performance Share Plan 2017 and 388 914 Restricted Shares that vested on January 1, 2020.

Performance shares

In 2019, the Group administered four global performance share plans, the Performance Share Plans of 2016, 2017, 2018 and 2019. The performance shares represent a commitment by the Group to deliver Nokia shares to eligible participants at a future point in time, subject to the fulfillment of predetermined performance criteria. The number of performance shares at target is the amount of performance shares granted to an individual that will be settled if the target performance, with respect to the performance criteria, is achieved. Any additional payout beyond the minimum amount will be determined based on the financial performance against the established performance criteria during the applicable performance periods. At maximum performance, the settlement amounts to two times the amount at target. Until the Nokia shares are delivered, the participants do not have any shareholder rights, such as voting or dividend rights, associated with the performance shares. The performance share grants are generally forfeited if the employment relationship with the Group terminates prior to vesting.

The Performance Share Plan 2019 includes a minimum payout guarantee for performance shares granted to non-executive participants, such that 25% of the performance shares granted will settle, regardless of the satisfaction of the applicable performance criteria. Performance shares granted to executive participants under the Performance Share Plan 2019 do not include a minimum payout guarantee.

Global performance share plans as of December 31, 2019:

Plan	Performance shares outstanding at target	Confirmed payout (% of target)	Performance period ⁽¹⁾	Restriction period ⁽²⁾	Settlement year
2016	–	46	2016-2017	2018	2019
2017	25 706 652	29	2017-2018	2019	2020
2018	33 932 724	57	2018-2019	2020	2021
2019	31 586 147	–	2019-2021	N/A	2022

(1) The 2019 Performance Share plan has a three-year performance period with no subsequent restriction period.

(2) The restriction period will be no less than one year from the end of the performance period.

The 2019 performance share plan has a three-year performance period (2019-2021). The number of performance shares to be settled would be determined with reference to the performance targets during the performance period. Under the 2019 performance share plan the performance criteria are: earnings per share (diluted), free cash flow and revenue relative to market (market share). The criteria exclude costs related to the acquisition of Alcatel Lucent and related integration, goodwill impairment charges, intangible asset amortization and other purchase price fair value adjustments, restructuring and associated charges and certain other items.

Restricted shares

In 2019, the Group administered four global restricted share plans: the Restricted Share Plans 2016, 2017, 2018 and 2019. Restricted shares are granted on a limited basis for purposes related to retention and recruitment of individuals deemed critical to the Group's future success. The vesting schedule for the plans follow a tranche vesting schedule whereby each plan vests in three equal tranches on the first, second and the third anniversary of the award subject to continued employment with the Group. Restricted Share Plan participants do not have any shareholder rights, such as voting or dividend rights, until the Nokia shares are delivered. The restricted share grants are generally forfeited if the employment relationship with the Group terminates prior to vesting of the applicable tranche or tranches.

Employee share purchase plan

The Group offers a voluntary Employee Share Purchase Plan to its employees. Participating employees make contributions from their net salary to purchase Nokia shares on a monthly basis during a 12-month savings period. The Group intends to deliver one matching share for every two purchased shares the employee holds as of the end of the Plan cycle. In 2019, 4 524 101 matching shares were issued as a settlement to the participants of the Employee Share Purchase Plan 2018 (3 980 286 matching shares issued under the 2017 Plan in 2018 and 2 920 204 matching shares issued under the 2016 Plan in 2017).

Legacy equity compensation programs

Stock options

In 2019, the Group administered one global stock option plan, the Stock Option Plan 2011. The last stock options under this Plan were granted in 2013. The final subscription period ended on December 27, 2019. Each stock option entitled the holder to subscribe for one new Nokia share. The stock options were non-transferable and could be exercised for shares only. Shares were eligible for dividends for the financial year in which the share subscription took place. Other shareholder rights commenced on the date on which the subscribed shares were entered in the Trade Register. The stock option grants were generally forfeited if the employment relationship with the Group was terminated.

Reconciliation of stock options outstanding and exercisable:

Shares under option	Number of shares	Weighted average exercise price EUR	Weighted average share price EUR	Number of options exercisable	Weighted average exercise price EUR
As of January 1, 2017	1 601 021	3.34		1 197 771	3.56
Exercised	(415 750)	2.13	4.93		
Forfeited	(215 000)	2.71			
Expired	(522 771)	5.65			
As of December 31, 2017	447 500	2.07		447 500	2.07
Exercised	(424 500)	2.06	5.07		
As of December 31, 2018	23 000	2.35		23 000	2.35
Exercised	(23 000)	2.35	5.34		
As of December 31, 2019	-	-		-	-

Alcatel Lucent liquidity agreement

In accordance with the Memorandum of Understanding dated April 15, 2015 between Nokia and Alcatel Lucent, as amended, Nokia has entered into liquidity agreement with beneficiaries of Alcatel Lucent 2015 performance share plan (Plan). In 2019 to fulfill Nokia's obligations under the aforementioned agreement, 1 314 468 Nokia shares were issued to the Plan participants.

27. Pensions and other post-employment benefits

The Group maintains a number of post-employment plans in various countries including both defined benefit and defined contribution plans. The Group's defined benefit plans comprise significant pension programs and schemes as well as material other post-employment benefit plans providing post-employment healthcare and life insurance coverage to certain employee groups. Defined benefit plans expose the Group to various risks such as investment risk, interest rate risk, life expectancy risk, and regulatory/compliance risk. The characteristics and extent of these risks vary depending on the legal, fiscal, and economic requirements in each country. The amount recognized in the consolidated income statement related to defined benefit plans was EUR 31 million (EUR 234 million in 2018 and EUR 214 million in 2017).

The Group also participates in defined contribution plans, multi-employer and insured plans for which the Group contributions are recognized as expense in the consolidated income statement in the period to which the contributions relate. In a defined contribution plan, the Group's legal or constructive obligation is limited to the amount that it agrees to contribute to the fund. The amount recognized in the consolidated income statement related to defined contribution plans was EUR 220 million (EUR 246 million in 2018 and EUR 231 million in 2017).

Defined benefit plans

The total net defined benefit asset is EUR 487 million (EUR 103 million net defined benefit liability in 2018) consisting of net pension and other post-employment benefit liabilities of EUR 4 343 million (EUR 4 327 million in 2018) and net pension and other post-employment benefit assets of EUR 4 830 million (EUR 4 224 million in 2018).

The Group's most significant defined benefit pension plans are in the United States, Germany, and the United Kingdom. Together they account for 92% (92% in 2018) of the Group's total defined benefit obligation and 91% (91% in 2018) of the Group's total plan assets.

The defined benefit obligations, the fair value of plan assets, the effects of the asset ceiling and the net defined benefit balance as of December 31:

EURm	2019				2018			
	Defined benefit obligation	Fair value of plan assets	Effects of asset ceiling	Net defined benefit balance	Defined benefit obligation	Fair value of plan assets	Effects of asset ceiling	Net defined benefit balance
United States	(18 657)	20 906	(975)	1 274	(18 346)	19 616	(573)	697
Germany	(2 808)	1 232	–	(1 576)	(2 650)	1 145	–	(1 505)
United Kingdom	(1 147)	1 612	–	465	(1 122)	1 459	–	337
Other	(2 051)	2 430	(55)	324	(1 837)	2 259	(54)	368
Total	(24 663)	26 180	(1 030)	487	(23 955)	24 479	(627)	(103)

United States

The Group has significant defined benefit pension plans and a significant post-employment welfare benefit plan (Opeb) providing post-employment healthcare benefits and life insurance coverage in the United States. The pension plans include both traditional service-based programs as well as cash-balance plans. Salaried, non-union-represented, employees are covered by a cash-balance program. All other legacy programs, including legacy service-based programs, were frozen by December 31, 2009. For active union-represented employees and for former employees who, when actively employed, were represented by a union, the Group maintains two defined benefit pension plans, both of which are traditional service-based programs. The larger of the two, which represents 96% of the obligation, is a closed plan. The post-employment plans provide welfare benefits for certain retired former employees. Pursuant to an agreement with the Communications Workers of America (CWA) and the International Brotherhood of Electrical Workers (IBEW) unions, the Group provides post-employment healthcare benefits and life-insurance coverage for employees formerly represented by these two unions. That agreement was renewed in 2019 and the contract expires on December 31, 2024.

The defined benefit obligations, the fair value of plan assets, the effects of the asset ceiling and the net defined benefit balance for United States defined benefit plans as of December 31:

EURm	2019				2018			
	Defined benefit obligation	Fair value of plan assets	Effects of asset ceiling	Net defined benefit balance	Defined benefit obligation	Fair value of plan assets	Effects of asset ceiling	Net defined benefit balance
Pension benefits								
Management (salaried and others)	(13 186)	15 686	–	2 500	(12 860)	14 617	–	1 757
Occupational (formerly union represented)	(2 795)	4 757	(975)	987	(2 766)	4 602	(573)	1 263
Supplemental	(351)	–	–	(351)	(336)	–	–	(336)
Total	(16 332)	20 443	(975)	3 136	(15 962)	19 219	(573)	2 684
Post-employment benefits								
Health (non-union represented)	(49)	–	–	(49)	(66)	–	–	(66)
Health (formerly union represented)	(731)	257	–	(474)	(972)	184	–	(788)
Group life (non-union represented)	(1 038)	139	–	(899)	(885)	149	–	(736)
Group life (formerly union represented)	(507)	68	–	(439)	(460)	64	–	(396)
Other	–	–	–	–	(1)	–	–	(1)
Total	(2 325)	464	–	(1 861)	(2 384)	397	–	(1 987)

Germany

The Group maintains two primary plans in Germany which cover the majority of active employees: the cash balance plan Beitragsorientierter Altersversorgungs Plan (BAP) for the Group's former Nokia employees and a similar cash balance program (AVK Basis-/Matchingkonto) for the Group's former Alcatel Lucent employees. Individual benefits are generally dependent on eligible compensation levels, ranking within the Group and years of service. These plans are partially funded defined benefit pension plans, the benefits being subject to a minimum return guaranteed by the Group. The funding vehicle for the BAP plan is the NSN Pension Trust e.V. The trust is legally separate from the Group and manages the plan assets in accordance with the respective trust agreements.

All other plans have been frozen or closed in prior years and replaced by the cash balance plans. Benefits are paid in annual installments, as monthly retirement pension, or as a lump sum on retirement in an amount equal to accrued pensions and guaranteed interest.

United Kingdom

In 2019, the legacy Nokia plan was merged and members' benefits were transferred to the legacy Alcatel Lucent plan. The new combined plan was renamed to "Nokia Retirement Plan for former NSN & ALU employees". It consists of both money purchase sections with Guaranteed Minimum Pension (GMP) underpin and final salary sections. All final salary sections are closed to future benefit accrual, the legacy Nokia plan closed on April 30, 2012 and the legacy Alcatel-Lucent plan on April 30, 2018. Individual benefits for final salary sections are dependent on eligible compensation levels and years of service. For the money purchase sections with GMP underpin, individual benefits are dependent on the greater of the value of GMP at retirement date or the pension value resulting from the individual's invested funds. The Trust manages all investments for the combined pension plan.

Impact on the consolidated financial statements

Movements in the defined benefit obligation, fair value of plan assets and the impact of the asset ceiling

The movements in the present value of the defined benefit obligation for the years ended December 31:

EURm	2019				2018			
	United States pension	United States Opeb	Other pension	Total	United States pension	United States Opeb	Other pension	Total
As of January 1	(15 962)	(2 384)	(5 609)	(23 955)	(17 096)	(2 518)	(5 883)	(25 497)
Current service cost	(66)	–	(87)	(153)	(70)	–	(93)	(163)
Interest expense	(553)	(79)	(121)	(753)	(540)	(79)	(106)	(725)
Past service cost	(46)	167	19	140	(44)	–	(8)	(52)
Settlements	–	–	149	149	–	–	(1)	(1)
Total	(665)	88	(40)	(617)	(654)	(79)	(208)	(941)
Remeasurements:								
Gain/(loss) from change in demographic assumptions	759	49	5	813	36	23	21	80
(Loss)/gain from change in financial assumptions	(1 677)	(231)	(483)	(2 391)	938	155	205	1 298
Experience gain/(loss)	37	39	(5)	71	56	(10)	33	79
Total	(881)	(143)	(483)	(1 507)	1 030	168	259	1 457
Translation differences	(335)	(53)	(92)	(480)	(717)	(105)	15	(807)
Contributions from plan participants	–	(105)	(25)	(130)	–	(115)	(23)	(138)
Benefits paid	1 511	284	242	2 037	1 475	278	235	1 988
Other	–	(12)	1	(11)	–	(13)	(4)	(16)
Total	1 176	114	126	1 416	758	45	223	1 026
As of December 31	(16 332)	(2 325)	(6 006)	(24 663)	(15 962)	(2 384)	(5 609)	(23 955)

Present value of obligations includes EUR 17 782 million (EUR 17 593 million in 2018) of wholly funded obligations, EUR 5 660 million (EUR 5 162 million in 2018) of partly funded obligations and EUR 1 221 million (EUR 1 200 million in 2018) of unfunded obligations.

The movements in the fair value of plan assets for the years ended December 31:

EURm	2019				2018			
	United States pension	United States Opeb	Other pension	Total	United States pension	United States Opeb	Other pension	Total
As of January 1	19 219	397	4 863	24 479	19 967	532	5 036	25 535
Interest income	674	11	108	793	635	15	95	745
Administrative expenses and interest on asset ceiling	(18)	–	(7)	(25)	(17)	–	(1)	(18)
Settlements	–	–	(158)	(158)	–	–	(3)	(3)
Total	656	11	(57)	610	618	15	91	724
Remeasurements:								
Return on plan assets, excluding amounts included in interest income	1 834	43	414	2 291	(775)	(25)	(187)	(987)
Total	1 834	43	414	2 291	(775)	(25)	(187)	(987)
Translation differences	386	9	111	506	868	19	(21)	866
Contributions:								
Employers	27	14	57	98	26	6	65	97
Plan participants	–	105	25	130	–	115	23	138
Benefits paid	(1 511)	(284)	(139)	(1 934)	(1 475)	(278)	(145)	(1 898)
Section 420 Transfer ⁽¹⁾	(169)	169	–	–	(13)	13	–	–
Other	1	–	(1)	–	3	–	1	4
Total	(1 266)	13	53	(1 200)	(591)	(125)	(77)	(793)
As of December 31	20 443	464	5 273	26 180	19 219	397	4 863	24 479

(1) Section 420 Transfer. Refer to 'Future Cash Flow' section below.

The movements in the funded status for the years ended December 31:

EURm	2019				2018			
	United States pension	United States Opeb	Other pension	Total	United States pension	United States Opeb	Other pension	Total
As of January 1	3 257	(1 987)	(746)	524	2 871	(1 986)	(847)	38
Current service cost	(66)	–	(87)	(153)	(70)	–	(93)	(163)
Interest income/(expense)	103	(68)	(20)	15	78	(64)	(12)	2
Past service cost	(46)	167	19	140	(44)	–	(8)	(52)
Settlements	–	–	(9)	(9)	–	–	(4)	(4)
Total	(9)	99	(97)	(7)	(36)	(64)	(117)	(217)
Remeasurements:								
Return on plan assets, excluding amounts included in interest income	1 834	43	414	2 291	(775)	(25)	(187)	(987)
Gain/(loss) from change in demographic assumptions	759	49	5	813	36	23	21	80
(Loss)/gain from change in financial assumptions	(1 677)	(231)	(483)	(2 391)	938	155	205	1 298
Experience gain/(loss)	37	39	(5)	71	56	(10)	33	79
Total	953	(100)	(69)	784	255	143	72	470
Translation differences	51	(44)	19	26	151	(86)	(6)	59
Employer contributions	27	14	57	98	26	6	65	97
Benefits paid	–	–	103	103	–	–	90	90
Section 420 Transfer ⁽¹⁾	(169)	169	–	–	(13)	13	–	–
Other	1	(12)	–	(11)	3	(13)	(3)	(13)
Total	(90)	127	179	216	167	(80)	146	233
As of December 31	4 111	(1 861)	(733)	1 517	3 257	(1 987)	(746)	524

(1) Section 420 Transfer. Refer to 'Future Cash Flow' section below.

The movements in the impact of the asset ceiling limitation for the years ended December 31:

EURm	2019				2018			
	United States pension	United States Opeb	Other pension	Total	United States pension	United States Opeb	Other pension	Total
As of January 1	(573)	–	(54)	(627)	(453)	–	(46)	(499)
Interest expense	(24)	–	–	(24)	(16)	–	(1)	(17)
Remeasurements:								
Change in asset ceiling, excluding amounts included in interest expense	(370)	–	–	(370)	(76)	–	(6)	(82)
Translation differences	(8)	–	(1)	(9)	(28)	–	(1)	(29)
As of December 31	(975)	–	(55)	(1 030)	(573)	–	(54)	(627)

Net balances as of December 31:

EURm	2019				2018			
	United States pension	United States Opeb	Other pension	Total	United States pension	United States Opeb	Other pension	Total
As of December 31	3 136	(1 861)	(788)	487	2 684	(1 987)	(800)	(103)

Asset ceiling limitation

IAS19, Employee benefits, limits the amount of pension fund surplus that an entity may recognize to the amount of economic benefit that the entity can realize, either through a refund or as a reduction in future contributions. The most significant limitation of asset recognition for the Group is from the overfunded US formerly union represented pension plan. All other countries where asset ceiling limits apply are not considered material. Movements in asset ceiling limitation are recognized directly in the consolidated statement of comprehensive income, excluding amounts included in interest expense. The Group recognized an asset ceiling limitation in the amount of EUR 1 030 million (EUR 627 million in 2018).

Recognized in the income statement

Recognized in the consolidated income statement for the years ended December 31:

EURm	2019	2018	2017
Current service cost ⁽¹⁾	153	163	180
Past service cost ⁽²⁾	(140)	52	(3)
Interest expense ⁽³⁾	9	15	37
Settlements ⁽²⁾	9	–	–
Other	–	4	–
Total	31	234	214
Of which relates to:			
United States pensions	33	52	55
United States Opeb	(99)	64	83
Other pensions	97	118	76

(1) Included in operating expenses within the consolidated income statement.

(2) Included in other operating income and expense within the consolidated income statement.

(3) Included in financial income and expense within the consolidated income statement.

Recognized in other comprehensive income

Recognized in other comprehensive income for the years ended December 31:

EURm	2019	2018	2017
Return on plan assets, excluding amounts included in interest income	2 291	(987)	1 589
Gain from change in demographic assumptions	813	80	136
(Loss)/gain from change in financial assumptions	(2 391)	1 298	(1 036)
Experience gain	71	79	267
Change in asset ceiling, excluding amounts included in interest expense	(370)	(82)	(233)
Total	414	388	723
Of which relates to:			
United States pensions	583	179	599
United States Opeb	(100)	143	133
Other pensions	(69)	66	(9)

Actuarial assumptions and sensitivity analysis

Actuarial assumptions

Assumptions regarding future mortality are set based on actuarial advice in accordance with published statistics and experience in each country.

The discount rates and mortality tables used for the significant plans:

	2019	2018	2019
	Discount rate %		Mortality table
United States	2.8	3.9	Pri-2012 w/MP-2019 mortality projection scale
Germany	0.8	1.6	Heubeck 2018G
United Kingdom ⁽¹⁾	1.9	2.7	S2PA Light
Total weighted average for all countries	2.5	3.5	

(1) Tables are adjusted with 1.5% long-term rate of improvement.

The principal actuarial weighted average assumptions used for determining the defined benefit obligation:

	2019	2018
%		
Discount rate for determining present values	2.5	3.5
Annual rate of increase in future compensation levels	1.9	1.9
Pension growth rate	0.3	0.4
Inflation rate	1.9	2.1
Weighted average duration of defined benefit obligations	10 yrs	11 yrs

Actuarial assumptions – United States

Actuarial assumptions used for determining the defined benefit obligation:

	2019	2018
%		
Benefit obligation, discount rate		
Pension	2.8	3.9
Post-employment healthcare and other	2.6	3.7
Post-employment group life	2.9	4.0
Annual rate of increase in future compensation levels	2.06	2.05
Assumed healthcare cost trend rates		
Healthcare costs trend rate assumed for next year	6.1	6.3
Healthcare cost trend rate assumed for next year (excluding post-employment dental benefits)	6.2	6.4
Terminal growth rate	4.4	4.9
Year that the rate reaches the terminal growth value	2028	2028

Sensitivity analysis

When calculating the sensitivity of the defined benefit obligation to significant actuarial assumptions, the present value of the defined benefit obligation is calculated using the projected unit credit method. The sensitivity analyses are based on a change in an assumption while holding all other assumptions constant and may not be representative of the actual impact of changes. If more than one assumption is changed simultaneously, the combined impact of changes would not necessarily be the same as the sum of the individual changes. If the assumptions change to a different level compared with that presented, the effect on the defined benefit obligation may not be linear. Increases and decreases in the principal assumptions which are used in determining the defined benefit obligation, do not have a symmetrical effect on the defined benefit obligation primarily due to the compound interest effect created when determining the net present value of the future benefit.

The sensitivity of the defined benefit obligation to changes in the principal assumptions:

	Change in assumption	Increase in assumption ⁽¹⁾	Decrease in assumption ⁽¹⁾
		EURm	EURm
Discount rate for determining present values	1.0 %	2 282	(2 776)
Annual rate of increase in future compensation levels	1.0 %	(134)	111
Pension growth rate	1.0 %	(542)	420
Inflation rate	1.0 %	(580)	475
Healthcare cost trend rate	1.0 %	(30)	28
Life expectancy	1 year	(811)	756

(1) Positive movement indicates a reduction in the defined benefit obligation; a negative movement indicates an increase in the defined benefit obligation.

Investment strategies

The overall pension investment objective of the Group is to preserve or enhance the pension plans' funded status through the implementation of an investment strategy that maximizes return within the context of minimizing funded status risk. In formulating the asset allocation for the Plans, multiple factors are considered, including, but not limited to the long-term risk and return expectations for a variety of asset classes as well as current and multi-year projections of the pension plans' demographics, benefit payments, contributions and funded status. Local trustee boards are responsible for conducting Asset-Liability studies, when appropriate; overseeing the investment of plan assets; and monitoring and managing associated risks under company oversight and in accordance with local law. The results of the Asset-Liability framework are implemented on a plan level.

The Group's pension investment managers may use derivative financial instruments including futures contracts, forward contracts, options and interest rate swaps to manage market risk. The performance and risk profile of investments is regularly monitored on a stand-alone basis as well as in the broader portfolio context. One risk is a decline in the plan's funded status as a result of the adverse performance of plan assets and/or defined benefit obligations. The application of the Asset-Liability Model study focuses on minimizing such risks.

Disaggregation of plan assets

EURm	2019				2018			
	Quoted	Unquoted	Total	%	Quoted	Unquoted	Total	%
Equity securities	963	–	963	4	1 735	23	1 758	7
Fixed income securities	19 294	113	19 407	74	17 195	203	17 398	71
Insurance contracts	–	841	841	3	–	901	901	4
Real estate	–	1 435	1 435	6	–	1 332	1 332	5
Short-term investments	758	75	833	3	515	40	555	2
Private equity and other	131	2 570	2 701	10	114	2 421	2 535	11
Total	21 146	5 034	26 180	100	19 559	4 920	24 479	100

Most short-term investments including cash, equities and fixed-income securities have quoted market prices in active markets. Equity securities represent investments in equity funds and direct investments, which have quoted market prices in an active market. Fixed income securities represent investments in government and corporate bonds, as well as investments in bond funds, which have quoted market prices in an active market. Fixed income securities may also comprise investments in funds and direct investments. Insurance contracts are customary pension insurance contracts structured under domestic law in the respective countries. Real estate investments are investments in commercial properties or real estate funds which invest in a diverse range of real estate properties. Short-term investments are liquid assets or cash which are being held for a short period of time, with the primary purpose of controlling the tactical asset allocation. Private equity and other, includes commodities as well as alternative investments, including derivative financial instruments.

United States plan assets

United States plan asset target and actual allocation range of the pension and Opeb trust by asset category as of December 31, 2019:

%	Pension target allocation range	Percentage of plan assets	Opeb target allocation	Percentage of post-employment plan assets
Equity securities	0 - 6	1	42	42
Fixed income securities	77 - 87	83	14	14
Real estate	4 - 8	5	–	–
Short-term investments	–	–	44	44
Private equity and other	6 - 13	11	–	–
Total	100	100	100	100

The majority of the Group's United States pension plan assets are held in a master pension trust. The Opeb plan assets are held in two separate trusts. The Pension & Benefits Investment Committee formally approves the target allocation ranges every few years on the completion of the asset-liability study by external advisors and internal investment management. The overall United States pension plan asset portfolio reflects a balance of investments split of approximately 17/83 between equity, including alternative investments for this purpose, and fixed income securities.

United States pension plan assets included EUR 0.1 million of Nokia ordinary shares and EUR 0.5 million of Nokia bonds as of December 31, 2019 (EUR 0.2 million of Nokia ordinary shares and EUR 0.5 million of Nokia bonds in 2018).

Significant events in 2019

Plan amendments

US post-employment medical and dental benefit agreement renewal

In the US, the Group has an existing agreement with two unions, the Communications Workers of America (CWA) and International Brotherhood of Electrical Workers (IBEW)—to provide post-employment medical and dental benefits and group life insurance coverage for formerly represented retirees. That agreement originally ran until December 31, 2019. On September 10, 2019, the Group entered into a new agreement with the CWA and IBEW that extends these benefits for another five years, until December 31, 2024. The new agreement continues a reduction, of EUR 36 million per year, in the amount of the Group's financial commitment with respect to these benefits. As the liability is calculated based upon the Group's original commitment before the reduction, this reduced subsidy under the new agreement resulted in an overall reduction of EUR 168 million in the existing obligation, which was recognized as a gain due to plan amendment offsetting past service costs in the consolidated income statement.

US Mortality Table update

On October 23, 2019, the US Society of Actuaries (SoA) published new base mortality tables applicable to private pension plans (the Pri-2012 mortality tables) in the US. On the same day, the SoA published a new mortality improvement scale (MP-2019). As a result of publication of the new base mortality tables and mortality improvement scale, the Group adopted Pri-2012 ("white collar" for management participants and "blue collar" for occupational participants) and MP-2019 for the valuation of obligations at December 31, 2019. This resulted in a decrease in the pension liability in the US and an actuarial gain of EUR 775 million, which was recognized as pension remeasurement in the consolidated statement of comprehensive income.

UK Trust Merger and related Pension Increase Exchange (PIE) exercise and pension buy-out

During 2019 a PIE was offered to Lucent pensioners to settle a portion of their future pension liabilities and benefits. The liability of 'new' Lucent pensioners whose benefit was not insured earlier was transferred out of the trust, together with the previously insured Lucent pensioners, through a pension buy-out arrangement, to an insurer. The net impact of these activities resulted in a EUR 140 million reduction in the defined benefit obligation as at December 31, 2019 and an accounting charge of EUR 4 million in the consolidated income statement, recognized as past service/settlement costs.

Future cash flows

Contributions

Group contributions to the pension and other post-employment benefit plans are made to facilitate future benefit payments to plan participants. The funding policy is to meet minimum funding requirements as set forth in the employee benefit and tax laws, as well as any such additional amounts as the Group may determine appropriate. Contributions are made to benefit plans for the sole benefit of plan participants. Employer contributions expected to be paid in 2020 total EUR 92 million.

United States pension plans

Funding methods

Funding requirements for the three United States qualified defined benefit pension plans are determined by the applicable statutes, namely the Employee Retirement Income Security Act of 1974 (ERISA), the Internal Revenue Code of 1986, and regulations issued by the Internal Revenue Service (IRS).

In determining funding requirements, ERISA allows assets to be either market value or an average value over a period of time; and liabilities to be based on spot interest rates or average interest rates over a period of time. For the non-represented, represented and formerly represented pension plans, the Group does not foresee any future funding requirement for regulatory funding purposes, given the plans' asset allocation and the level of assets compared to liabilities.

Post-employment healthcare benefits for both non-represented and formerly union represented retirees' are capped for those who retired on or before March 1, 1990. The benefit obligation associated with this group of retirees is approximately 73% of the total United States retiree healthcare obligation as of December 31, 2019. The US government's Medicare program is the primary payer for those aged 65 and older, comprising almost all of uncapped retirees.

Section 420 transfers

Section 420 of the U.S. Internal Revenue Code (Section 420) allows for the transfer of pension assets in excess of specified thresholds (excess pension assets) over the plan's funding obligation to be used to fund healthcare benefits and/or life insurance coverage (Opeb) of retired employees entitled to pension benefits under the plan. Section 420 requires employers making such transfers to continue to provide healthcare benefits or life insurance coverage, as the case may be, to those retirees for a certain period of time (cost maintenance period) at levels prescribed by regulations.

For retirees who were represented by the CWA and IBEW, the Group expects to fund the entire current retiree healthcare and group life insurance obligations with Section 420 transfers from the formerly represented pension plan's pension surplus. This is considered as a refund from the pension plan when setting the asset ceiling. For retirees participating in the non-represented pension plan, the Group expects, from time to time, to be able to fund some portion of the current retiree group life insurance obligation with Section 420 transfers from the non-represented pension plan's pension surplus, as funding levels permit.

Section 420 is currently set to expire on December 31, 2025.

Group Contributions

The following table summarizes expected contributions to the Group pension and Opeb plans for 2020 and for the US pension and post-employment plans until 2029. These figures include the reimbursements the Group expects to receive with respect to the US coverage provided to US plan participants eligible for the Medicare prescription drug benefit. The Group did not make contributions to the US qualified pension plans in 2019, nor does it expect to make any contributions in 2020. Actual contributions may differ from expected contributions due to various factors, including performance of plan assets, interest rates, and legislative changes.

EURm	US Pension		US Opeb		Medicare subsidy for formerly union represented ⁽¹⁾	Other Countries	Total for Group
	Supplemental plans	Non-represented	Other benefit plans				
2020	26	8	3		(13)	55	79
2021	26	8	3		(12)		
2022	25	7	3		(11)		
2023	25	7	53		(11)		
2024	24	6	56		(10)		
2025-2029	110	23	285		(41)		

(1) Medicare Subsidy is recorded within other movements in the reconciliation of the present value of the defined benefit obligation.

Benefit payments

The following table summarizes expected benefit payments from the pension plans and other post-employment benefit plans until 2029. Actual benefit payments may differ from expected benefit payments. The amounts for the United States plans are net of expected plan participant contributions, as well as the annual Medicare Part D subsidy of approximately EUR 13 million.

EURm	Direct benefit payments						Other countries	Total
	US Pension			US Opeb				
	Management	Occupational	Supplemental plans	Formerly union represented	Non-union represented			
2020	1 222	290	26	132	61	263	1 994	
2021	1 066	257	26	125	61	269	1 804	
2022	1 019	243	25	110	62	265	1 724	
2023	976	230	25	92	62	304	1 689	
2024	932	217	24	79	62	275	1 589	
2025-2029	4 040	891	110	442	308	1 444	7 235	

Benefits are paid from plan assets where there is sufficient funding available to the plan to cover the benefit obligation. Any payments in excess of the plan assets are paid directly by the Group. Direct benefit payments expected to be paid in 2020 total EUR 102 million.

28. Accrued expenses, deferred revenue and other liabilities

Non-current

EURm	2019	2018
Deferred revenue ⁽¹⁾	615	770
Salaries, wages and social charges	45	54
Other	52	28
Total	712	852

Current

EURm	2019	2018
Deferred revenue ⁽¹⁾	155	155
Salaries, wages and social charges	1 236	1 426
VAT and other indirect taxes	359	387
Discount accruals ⁽²⁾	385	604
Accrued expenses related to customer projects	496	617
Other	692	751
Total	3 323	3 940

(1) Non-current deferred revenue EUR 615 million (EUR 770 million in 2018) and current deferred revenue EUR 155 million (EUR 155 million in 2018) relates to an IP licensing contract which was determined to be a completed contract as defined in the transition guidance of IFRS 15, Revenue from Contracts with Customers.

(2) Discount accruals represent customer credits without any outstanding future performance obligations.

Other accruals include accrued royalties, research and development expenses, marketing expenses and interest expenses, as well as various amounts which are individually insignificant.

29. Provisions

EURm	Restructuring	Warranty	Litigation	Environmental	Project losses	Divestment-related	Material liability	Other	Total
As of January 1, 2018	722	210	130	107	76	76	66	501	1 888
Translation differences	2	–	(11)	4	1	(5)	2	3	(4)
Reclassification	(18)	–	9	(1)	–	–	(1)	11	–
Charged to income statement:									
Additional provisions	289	171	32	11	–	–	81	86	670
Changes in estimates ⁽¹⁾	(51)	(75)	(9)	(3)	(10)	(5)	(51)	(206)	(410)
Total charged to income statement	238	96	23	8	(10)	(5)	30	(120)	260
Utilized during year ⁽²⁾	(451)	(111)	(42)	(10)	(12)	–	(25)	(66)	(717)
As of December 31, 2018	493	195	109	108	55	66	72	329	1 427
Translation differences	1	–	(1)	2	–	1	1	–	4
Reclassification ⁽³⁾	(43)	–	(1)	–	–	–	–	(9)	(53)
Charged to income statement:									
Additional provisions	442	122	18	32	–	–	79	76	769
Changes in estimates	(57)	(46)	(11)	(8)	–	(16)	(38)	(58)	(234)
Total charged to income statement	385	76	7	24	–	(16)	41	18	535
Utilized during year ⁽²⁾	(459)	(104)	(39)	(7)	(5)	–	(33)	(57)	(704)
As of December 31, 2019	377	167	75	127	50	51	81	281	1 209

(1) The changes in estimates in other provisions include a release of EUR 110 million due to resolution of a tax dispute related to discontinued operations.

(2) The utilization of restructuring provision includes items transferred to accrued expenses, of which EUR 78 million remained in accrued expenses as of December 31, 2019 (EUR 55 million in 2018).

(3) The reclassification in restructuring provisions is based on adoption of IFRS 16, Leases. Refer to Note 3, New and amended standards and interpretations for further details.

As of December 31, 2019, the restructuring provision amounted to EUR 377 million including personnel and other restructuring related costs, such as real estate exit costs. The provision consists of EUR 343 million global provision related to the announcements on April 6, 2016 and October 25, 2018 and EUR 34 million relating to the restructuring provisions recognized due to previously announced restructuring programs. The majority of the restructuring-related cash outflows is expected to occur over the next two years.

The warranty provision relates to sold products. Cash outflows related to the warranty provision are generally expected to occur within the next 18 months.

The litigation provision includes estimated potential future settlements for litigation. Cash outflows related to the litigation provision are inherently uncertain and generally occur over several periods.

The environmental provision includes estimated costs to sufficiently clean and refurbish contaminated sites, to the extent necessary, and where necessary, continuing surveillance at sites where the environmental remediation exposure is less significant. Cash outflows related to the environmental liability are inherently uncertain and generally occur over several periods.

The project loss provision relates to onerous customer contracts. The timing of the project loss provision utilization is typically uncertain.

The divestment-related provision relates to the sale of businesses, and includes certain liabilities where the Group is required to indemnify the buyer. Cash outflows related to the divestment-related provision are inherently uncertain.

The material liability provision relates to non-cancellable purchase commitments with suppliers, in excess of forecasted requirements as of each reporting date. Cash outflows related to the material liability provision are expected to occur over the next 12 months.

Other provisions include provisions for various contractual obligations, other obligations and uncertain tax positions. Cash outflows related to other provisions are generally expected to occur over the next two years.

Legal matters

A number of Group companies are and will likely continue to be subject to various legal proceedings and investigations that arise from time to time, including proceedings regarding intellectual property, product liability, sales and marketing practices, commercial disputes, employment and wrongful discharge, antitrust, securities, health and safety, environmental, tax, international trade, privacy matters and compliance. As a result, the Group may incur substantial costs that may not be covered by insurance and could affect business and reputation. While management does not expect any of these legal proceedings to have a material adverse effect on the Group's financial position, litigation is inherently unpredictable and the Group may in the future incur judgments or enter into settlements that could have a material adverse effect on the results of operations and cash flows.

Litigation and proceedings

Mass labor litigation Brazil

The Group is defending against a substantial number of labor claims in various Brazilian labor courts. Plaintiffs are former employees whose contracts were terminated after the Group exited from certain managed services contracts. The claims mainly relate to payments made under, or in connection with, the terminated labor contracts. The Group has closed the majority of the court cases through settlement or judgment. Closure of most of the remaining open cases is expected to occur within the next couple of years.

Asbestos litigation in the United States

The Group is defending approximately 300 asbestos-related matters, at various stages of litigation. The claims are based on premises liability, products liability, and contractor liability. The claims also involve plaintiffs allegedly diagnosed with various diseases, including but not limited to asbestosis, lung cancer, and mesothelioma.

Securities Class Action

A litigation was filed on April 19, 2019 against the Group and certain executives in the United States relating to allegations of the Group making false and misleading statements and omissions concerning its progress of integration of Alcatel-Lucent S.A, including compliance practises identified during the integration process and disclosed in the company's annual report on Form 20-f on March 21, 2019. The complaint was subsequently amended to include allegations of the Group making false and misleading statements and omissions concerning the Group's readiness for the transition to fifth generation wireless technology.

Intellectual property rights litigation

Daimler litigations

In March 2019, the Group commenced patent infringement proceedings against Daimler in Germany. The Group has asserted 10 Nokia patents relevant to the 3G and 4G cellular standards in three German regional courts against Daimler's connected cars.

Continental US litigation

In May 2019, Continental Automotive Systems filed a lawsuit in the USA against the Group and three other defendants relating to an alleged breach of FRAND obligations and a refusal to license component suppliers.

Lenovo

In September and October 2019, the Group commenced patent infringement proceedings against Lenovo in Germany, India and the United States. Across these actions, there are 19 Nokia patents in suit, covering video coding technologies used in Lenovo's laptop, PC and tablet products.

30. Commitments and contingencies

Contractual obligations

Payments due for contractual obligations as of December 31, 2019 by due date:

EURm	Within 1 year	1 to 3 years	4 to 5 years	More than 5 years	Total
Purchase obligations ⁽¹⁾	2 681	176	46	11	2 914

(1) Includes inventory purchase obligations, service agreements and outsourcing arrangements.

Additionally, the Group has committed lease contracts that have not yet commenced as of December 31, 2019. The future lease payments for these non-cancellable lease contracts are EUR 34 million within five years and EUR 126 million thereafter.

Guarantees and other contingent commitments

EURm	2019	2018
Contingent liabilities on behalf of Group companies⁽¹⁾		
Guarantees issued by financial institutions	1 721	1 570
Other guarantees	54	505
Contingent liabilities on behalf of other companies		
Other guarantees	5	25
Financing commitments		
Customer finance commitments ⁽²⁾	303	313
Financing commitments to associated companies	10	20
Venture fund commitments ⁽³⁾	244	314

(1) In contingent liabilities on behalf of Group companies, the Group reports guarantees that have been given to third parties in the normal course of business. These are mainly guarantees given by financial institutions to the Group's customers for the performance of the Group's obligations under supply agreements, including tender bonds, performance bonds, and warranty bonds issued by financial institutions on behalf of the Group. Additionally, the Group has issued corporate guarantees with primary obligation given directly to customers with these guarantees amounting to EUR 969 million (EUR 1 041 million in 2018). In Other guarantees, the Group reports guarantees related to non-commercial contracts that support business activities. As a result of internal policies and active management of outstanding guarantee exposure, the Group has not been subject to any material guarantee claims during recent years.

(2) Customer finance commitments are available under loan facilities negotiated with customers. Availability of the facility is dependent upon the borrower's continuing compliance with the agreed financial and operational covenants, and compliance with other administrative terms of the facility. The loan facilities are primarily available to fund capital expenditure relating to purchases of network infrastructure equipment and services. Refer to Note 36, Financial risk management.

(3) As a limited partner in NGP Capital and certain other funds making technology-related investments, the Group is committed to capital contributions and entitled to cash distributions according to the respective partnership agreements and underlying fund activities.

The amounts represent the maximum principal amount for commitments and contingencies.

31. Notes to the consolidated statement of cash flows

EURm	2019	2018	2017
Adjustments for⁽¹⁾			
Depreciation and amortization	1 660	1 455	1 591
Share-based payments	81	68	92
Impairment charges	102	55	244
Restructuring charges ⁽²⁾	397	238	522
Profit on sale of property, plant and equipment and non-current financial investments	(65)	(60)	(121)
Share of results of associated companies and joint ventures (Note 34)	(12)	(12)	(11)
Financial income and expenses	283	232	402
Income tax expense	140	64	937
(Gain)/loss on the sale of businesses	(4)	24	(5)
Other operating income and expenses	45	29	25
Total	2 627	2 093	3 676

(1) Includes Continuing and Discontinued operations.

(2) Adjustments represent the non-cash portion of the restructuring charges recognized in the consolidated income statement.

The Group did not engage in any material non-cash investing or financing activities in 2019, 2018 and 2017.

32. Principal Group companies

The Group's significant subsidiaries as of December 31, 2019:

Company name	Country of incorporation	Parent holding %	Group ownership interest %
Nokia Solutions and Networks Oy	Finland	100.0	100.0
Nokia of America Corporation	United States	–	100.0
Nokia Shanghai Bell Co., Ltd ⁽¹⁾	China	–	50.0
Nokia Technologies Oy	Finland	100.0	100.0
Nokia Solutions and Networks India Private Limited	India	–	100.0
Nokia Solutions and Networks B.V.	Netherlands	–	100.0
Nokia Solutions and Networks Japan G.K.	Japan	–	100.0
Alcatel-Lucent International SA	France	–	100.0
Nokia Solutions and Networks Branch Operations Oy	Finland	–	100.0
Alcatel Submarine Networks SAS	France	–	100.0
Nokia Solutions and Networks do Brasil Telecomunicações Ltda.	Brazil	–	100.0
Alcatel-Lucent Participations SA	France	–	100.0
Nokia Solutions and Networks Korea Ltd.	South Korea	–	100.0
Nokia Spain, S.A.	Spain	–	100.0
Nokia UK Limited	United Kingdom	–	100.0
Nokia Canada Inc.	Canada	–	100.0
Nokia Solutions and Networks Italia S.p.A.	Italy	–	100.0
Nokia Solutions and Networks GmbH & Co. KG	Germany	–	100.0
Nokia Solutions and Networks Australia Pty Ltd	Australia	–	100.0
PT Nokia Solutions and Networks Indonesia	Indonesia	–	100.0
Alcatel Lucent SAS	France	–	100.0
Nokia Solutions and Networks Taiwan Co., Ltd.	Taiwan	–	100.0

(1) Nokia Shanghai Bell Co., Ltd is the parent company of the Nokia Shanghai Bell Group of which the Group owns 50% plus one share with China Huaxin, an entity controlled by the Chinese government, holding the remaining ownership interests. Refer to Note 33, Significant partly-owned subsidiaries.

33. Significant partly-owned subsidiaries

The Group holds an ownership interest of 50% plus one share in Nokia Shanghai Bell's parent company, Nokia Shanghai Bell Co., Ltd., with China Huaxin Post & Telecommunication Economy Development Center (China Huaxin) holding the remaining ownership interests. In 2017, the Group entered into a contractual arrangement providing China Huaxin with the right to fully transfer its ownership interest in Nokia Shanghai Bell to the Group and the Group with the right to purchase China Huaxin's ownership interest in Nokia Shanghai Bell in exchange for a future cash settlement. To reflect this, the Group derecognized the non-controlling interest balance related to Nokia Shanghai Bell and recognized a financial liability based on the estimated future cash settlement.

The financial liability is measured based on the expected future cash settlement to acquire the non-controlling interest in Nokia Shanghai Bell. The Group recognized an interest expense of EUR 19 million in 2019 (EUR 39 million in 2018) to reflect the recognition of the present value discount on the financial liability up to the commencement of the put option exercise period in July 2019. In addition, the Group decreased the value of the financial liability to reflect a change in estimate of the future cash settlement resulting in the recognition of a EUR 64 million gain (EUR 6 million in 2018) in financial income and expenses. As of December 31, 2019, the expected future cash settlement amounted to EUR 639 million (EUR 693 million in 2018).

Financial information for the Nokia Shanghai Bell Group⁽¹⁾:

EURm	2019	2018
Summarized income statement		
Net sales ⁽²⁾	2 013	2 518
Operating (loss)/profit	(26)	54
(Loss)/profit for the year	(47)	25
(Loss)/profit for the year attributable to:		
Equity holders of the parent	(47)	25
Non-controlling interests ⁽³⁾	–	–
Summarized statement of financial position		
Non-current assets	651	600
Non-current liabilities	(192)	(127)
Non-current net assets	459	473
Current assets ⁽⁴⁾	2 669	3 340
Current liabilities	(1 637)	(2 209)
Current net assets	1 032	1 131
Net assets⁽⁵⁾	1 491	1 604
Non-controlling interests ⁽³⁾	–	–
Summarized statement of cash flows		
Net cash from/(used in) operating activities	125	(103)
Net cash used in investing activities	(87)	(92)
Net cash from/(used in) financing activities	38	(63)
Net increase/(decrease) in cash and cash equivalents	76	(258)

(1) Financial information for the Nokia Shanghai Bell Group is presented before eliminations of intercompany transactions with the rest of the Group but after eliminations of intercompany transactions between entities within the Nokia Shanghai Bell Group.

(2) Includes EUR 100 million (EUR 268 million in 2018) net sales to other Group entities.

(3) Based on the contractual arrangement with China Huaxin, the Group does not recognize any non-controlling interest in Nokia Shanghai Bell.

(4) Includes a total of EUR 819 million (EUR 738 million in 2018) of cash and cash equivalents and current financial investments.

(5) The distribution of the profits of Nokia Shanghai Bell Co., Ltd requires the passing of a special resolution by more than two-thirds of its shareholders, subject to a requirement that at least 50% of the after-tax distributable profits are distributed as dividends each year.

34. Investments in associated companies and joint ventures

EURm	2019	2018
Net carrying amount as of January 1	145	128
Translation differences	3	4
Additions	13	2
Impairments	(2)	–
Share of results	12	12
Dividends	(6)	(1)
Net carrying amount as of December 31	165	145

Shareholdings in associated companies and joint ventures comprise investments in unlisted companies.

35. Related party transactions

The Group has related party transactions with pension funds, associated companies, joint ventures and other entities where the Group has significant influence, as well as the management and the Board of Directors. Transactions and balances with companies over which the Group exercises control are eliminated on consolidation. Refer to Note 2, Significant accounting policies, and Note 32, Principal Group companies.

Transactions with pension funds

The Group has borrowings of EUR 69 million (EUR 69 million in 2018) from Nokia Unterstützungsgesellschaft mbH, the Group's German pension fund, a separate legal entity. The loan bears interest at the rate of 6% per annum and its duration is pending until further notice by the loan counterparties even though they have the right to terminate the loan with a 90-day notice. The loan is included in short-term interest-bearing liabilities in the consolidated statement of financial position. For more information on the Group's pension plans refer to Note 27, Pensions and other post-employment benefits.

Other entities where the Group has significant influence

In addition to associated companies and joint ventures, the Group has determined that it exercises significant influence over HMD global Oy (HMD) despite holding no voting power in it. In 2016, the Group engaged in a strategic agreement covering branding rights and intellectual property licensing to grant HMD an exclusive global license to create Nokia-branded mobile phones and tablets for ten years. Under the agreement, Nokia Technologies receives royalty payments from HMD for sales of Nokia-branded mobile products, covering both brand and intellectual property rights. The Board of Directors of HMD includes a representative from Nokia.

In 2019, the Group granted a convertible loan of EUR 60 million to HMD. The loan is provided for a maximum three-year term and bears an interest at the rate of 6% per annum. The loan agreement contains both mandatory equity conversion clauses triggered by potential HMD executed transactions, as well as a call option, held by the Group, to convert the loan into shares under certain circumstances. If converted to shares, the equity investment will be accounted for as an investment in associated companies using the equity-method. The loan is included in the other non-current financial assets in the consolidated statement of financial position.

Transactions with associated companies, joint ventures and other entities where the Group has significant influence

EURm	2019	2018	2017
Share of results	12	12	11
Dividend income	6	1	1
Share of shareholders' equity	165	145	128
Sales	153	167	117
Purchases	(193)	(159)	(252)
Trade Receivables	22	58	41
Trade Payables	(38)	(32)	(19)

The Group has a financing commitment of EUR 10 million (EUR 20 million in 2018) to an associated company.

Management compensation

Compensation information for the President and CEO:

EUR	2019	2018	2017
Base salary/fee	1 300 000	1 050 000	1 050 000
Cash incentive payments	637 163	873 862	997 369
Share-based payment expenses ⁽¹⁾	2 265 547	1 978 268	2 606 613
Pension expenses	353 846	312 607	338 787
Total	4 556 556	4 214 737	4 992 769

(1) Represents the expense for all outstanding equity grants recorded during the year.

Total remuneration awarded to the Group Leadership Team for their time as members of the Group Leadership Team:

EURm	2019	2018	2017
Short-term benefits	24	23	22
Post-employment benefits ⁽¹⁾	1	1	1
Share-based payments	8	6	7
Termination benefits ⁽²⁾	–	5	4
Total	33	35	34

(1) The members of the Group Leadership Team participate in the local retirement programs applicable to employees in the country where they reside.

(2) Includes both termination payments and payments made under exceptional contractual arrangements for lapsed equity awards.

Board of Directors' compensation

The annual remuneration paid to the members of the Board of Directors, as decided by the Annual General Meetings in the respective years:

	2019		2018		2017	
	Gross annual	Shares	Gross annual	Shares	Gross annual	Shares
	fee ⁽¹⁾ EUR	received ⁽²⁾ number	fee ⁽¹⁾ EUR	received ⁽²⁾ number	fee ⁽¹⁾ EUR	received ⁽²⁾ number
Risto Siilasmaa, Chair	440 000	38 675	440 000	34 749	440 000	30 497
Sari Baldauf, Vice Chair ⁽³⁾	197 000	16 261	160 000	12 636	–	–
Bruce Brown ⁽⁴⁾	217 000	16 700	214 000	15 005	209 000	13 169
Jeanette Horan ⁽⁵⁾	197 000	15 382	195 000	13 820	175 000	12 129
Louis R. Hughes ⁽⁶⁾	22 000	–	199 000	13 820	194 000	12 129
Edward Koziel ⁽⁷⁾	215 000	17 140	217 000	15 400	175 000	12 129
Jean C. Monty	–	–	14 000	–	174 000	11 090
Elizabeth Nelson ⁽⁸⁾	200 000	15 382	192 000	13 820	207 000	13 169
Olivier Piou ⁽⁹⁾	189 000	15 382	196 000	14 610	199 000	12 823
Søren Skou ⁽¹⁰⁾	160 000	14 063	–	–	–	–
Carla Smits-Nusteling ⁽¹¹⁾	210 000	16 700	206 000	15 005	195 000	12 129
Kari Stadigh ⁽¹²⁾	172 000	14 063	170 000	12 636	170 000	11 090
Total	2 219 000		2 203 000		2 138 000	

(1) The meeting fees for the term that ended at the close of the Annual General meeting in 2019 were paid in cash in 2019 and are included in the table. The meeting fees for the current term as resolved by the Annual General Meeting in 2019 will be paid in cash in 2020 and are not included in the table.

(2) Approximately 40% of each Board member's annual compensation is paid in Nokia shares purchased from the market, and the remaining approximately 60% is paid in cash.

(3) Consists of EUR 185 000 for services as Vice Chair of the Board and meeting fees of EUR 12 000.

(4) Consists of EUR 160 000 for services as a member of the Board and EUR 30 000 for services as the Chair of the Personnel Committee and meeting fees of EUR 27 000.

(5) Consists of EUR 160 000 for services as a member of the Board and EUR 15 000 for services as member of the Audit Committee and meeting fees of EUR 22 000.

(6) Served as a member of the Board until the Annual General Meeting 2019. No annual fee was paid to him during financial year 2019, but he received the annual fee for the term until the Annual General Meeting 2019 in the financial year 2018 including meeting fees of EUR 22 000.

(7) Consists of EUR 160 000 for services as a member of the Board and EUR 20 000 for services as the Chair of the Technology Committee, EUR 15 000 for services as member of the Audit Committee and meeting fees of EUR 20 000.

(8) Consists of EUR 160 000 for services as a member of the Board and EUR 15 000 for services as member of the Audit Committee and meeting fees of EUR 25 000.

(9) Consists of EUR 160 000 for services as a member of the Board and EUR 15 000 for services as member of the Audit Committee and meeting fees of EUR 14 000.

(10) Consists of EUR 160 000 for services as a member of the Board.

(11) Consists of EUR 160 000 for services as a member of the Board and EUR 30 000 for services as a Chair of the Audit Committee and meeting fees of EUR 20 000.

(12) Consists of EUR 160 000 for services as a member of the Board and meeting fees of EUR 12 000.

Transactions with the Group Leadership Team and the Board of Directors

No loans were granted to the members of the Group Leadership Team and the Board of Directors in 2019, 2018 or 2017.

Terms of termination of employment of the President and CEO

The President and CEO, Rajeev Suri, may terminate his service contract at any time with six months' prior notice. The Group may terminate his service contract for reasons other than cause at any time with an 18 months' notice period. If there is a change of control event as defined in Mr. Suri's service contract and the service contract is terminated either by the Group or its successor without cause, or by him for "good reason", he would be entitled to a severance payment equaling up to 18 months of compensation and cash payment of the pro-rated value of his outstanding unvested equity awards, if he is dismissed within 18 months of the change in control event.

Rajeev Suri will leave his current position as President and CEO on August 31, 2020. Nokia's Board of Directors has appointed Pekka Lundmark as President and CEO of Nokia and he is expected to start in his new role on September 1, 2020.

36. Financial risk management

General risk management principles

We have a systematic and structured approach to risk management. Key risks and opportunities are primarily identified against business targets either in business operations or as an integral part of strategy and financial planning. Risk management covers strategic, operational, financial and hazard risks. Key risks and opportunities are analyzed, managed and monitored as part of business performance management with the support of risk management personnel and the centralized Enterprise Risk Management function. The principles documented in the Nokia Enterprise Risk Management Policy, which is approved by the Audit Committee of the Board, require risk management and its elements to be integrated into key processes. One of the core principles is that the business or function head is also the risk owner, although all employees are responsible for identifying, analyzing and managing risks, as appropriate, given their roles and duties. Our overall risk management concept is based on managing the key risks that would prevent us from meeting our objectives, rather than solely focusing on eliminating risks. In addition to the principles defined in the Nokia Enterprise Risk Management Policy, specific risk management implementation, including financial risk management, is reflected in other key policies and operating procedures.

Financial risks

The objective for treasury activities is to guarantee sufficient funding at all times and to identify, evaluate and manage financial risks. Treasury activities support this aim by mitigating the adverse effects on the profitability of the underlying business caused by fluctuations in the financial markets, and by managing the capital structure by balancing the levels of liquid assets and financial borrowings. Treasury activities are governed by the Nokia Treasury Policy approved by the Group President and CEO which provides principles for overall financial risk management and determines the allocation of responsibilities for financial risk management activities. Operating procedures approved by the Group CFO cover specific areas such as foreign exchange risk, interest rate risk, credit risk and liquidity risk as well as the use of derivative financial instruments in managing these risks. The Group is risk averse in its treasury activities.

Financial risks are divided into market risk covering foreign exchange risk and interest rate risk; credit risk covering business-related credit risk and financial credit risk; and liquidity risk.

Market risk

Foreign exchange risk

The Group operates globally and is exposed to transaction and translation foreign exchange risks. The objective of foreign exchange risk management is to mitigate adverse impacts from foreign exchange fluctuations on the Group profitability and cash flows. Treasury applies global portfolio approach to manage foreign exchange risks within approved guidelines and limits.

Transaction risk arises from foreign currency denominated assets and liabilities together with foreign currency denominated future cash flows. Transaction exposures are managed in the context of various functional currencies of Group companies. Material transactional foreign exchange exposures are hedged, unless hedging would be uneconomical due to market liquidity and/or hedging cost. Exposures are defined using transaction nominal values. Exposures are mainly hedged with derivative financial instruments, such as foreign exchange forward contracts and foreign exchange options with most of the hedging instruments having a duration of less than a year.

Layered hedging approach is typically used for hedging of highly probable forecast foreign currency denominated cash flows with quarterly hedged items defined based on set hedge ratio ranges for each successive quarter. Hedged items defined for successive quarters are hedged with foreign exchange forward contracts and foreign exchange options with a hedge ratio of 1:1. Hedging levels are adjusted on a monthly basis including hedging instrument designation and documentation as appropriate. In case hedges exceed the hedge ratio range for any specific quarter, the hedge portfolio for that specific quarter is adjusted accordingly.

In certain cases, mainly related to long-term construction projects, the Group applies fair value hedge accounting for foreign exchange risk with the objective to reduce the exposure to fluctuations in the fair value of the related firm commitments due to changes in foreign exchange rates. Exposures are mainly hedged with foreign exchange forward contracts with most of the hedging instruments having a duration of less than a year. The Group continuously manages the portfolio of hedging instruments to ensure appropriate alignment with the portfolio of hedged items at a hedging ratio of 1:1.

As the Group has entities where the functional currency is other than the euro, the shareholders' equity is exposed to fluctuations in foreign exchange rates. Changes in shareholders' equity caused by movements in foreign exchange rates are shown as currency translation differences in the consolidated financial statements. The risk management strategy is to protect the euro counter value of the portion of this exposure expected to materialize as foreign currency repatriation cash flows in the foreseeable future. Exposures are mainly hedged with derivative financial instruments, such as foreign exchange forward contracts and foreign exchange options with most of the hedging instruments having a duration of less than a year.

Hedged items are defined based on conservative expectations of repatriation cash flows based on a range of considerations. Net investment exposures are reviewed, hedged items designated, and hedging levels adjusted at minimum on a quarterly basis with a hedge ratio of 1:1. Additionally, hedging levels are adjusted whenever there are significant events impacting expected repatriation cash flows.

The foreign exchange risk arising from foreign currency denominated interest-bearing liabilities is primarily hedged using cross currency swaps that are also used to manage the Group's interest rate profile (refer to interest rate risk section below).

Notional amounts in currencies that represent a significant portion of the currency mix in outstanding financial instruments and other hedged items as of December 31:

EURm	USD	GBP	CNY	INR
2019				
Foreign exchange exposure designated as hedged item for cash flow hedging, net ⁽¹⁾	628	379	–	–
Foreign exchange exposure designated as hedged item for fair value hedging for FX risk, net ⁽²⁾	423	(70)	–	–
Foreign exchange exposure designated as hedged item for net investment hedging, net ⁽³⁾	2 547	93	981	346
Foreign exchange exposure from interest-bearing liabilities, net ⁽⁴⁾	(1 314)	–	–	–
Foreign exchange exposure from items on the statement of financial position, excluding interest-bearing liabilities, net	(2 855)	(81)	(868)	(294)
Other foreign exchange derivatives, carried at fair value through profit and loss, net ⁽⁵⁾	2 607	86	711	346
2018				
Foreign exchange exposure designated as hedged item for cash flow hedging, net ⁽¹⁾	952	374	–	–
Foreign exchange exposure designated as hedged item for fair value hedging for FX risk, net ⁽²⁾	314	(93)	–	–
Foreign exchange exposure designated as hedged item for net investment hedging, net ⁽³⁾	2 486	61	944	544
Foreign exchange exposure from interest-bearing liabilities, net ⁽⁴⁾	(1 800)	–	–	–
Foreign exchange exposure from items on the statement of financial position, excluding interest-bearing liabilities, net	(2 446)	(63)	(978)	(299)
Other foreign exchange derivatives, carried at fair value through profit and loss, net ⁽⁵⁾	1 690	102	886	596

(1) Includes foreign exchange exposure from forecasted cash flows related to sales and purchases. In some currencies, especially the U.S. dollar, the Group has substantial foreign exchange exposures in both estimated cash inflows and outflows. These underlying exposures have been hedged.

(2) Includes foreign exchange exposure from contractual firm commitments. These underlying exposures have been substantially hedged.

(3) Includes net investment exposures in foreign operations. These underlying exposures have been hedged.

(4) Includes interest-bearing liabilities that have been hedged with cross currency swaps and foreign exchange forwards. Refer to Note 23, Interest-bearing liabilities.

(5) Items on the statement of financial position are hedged by a portion of foreign exchange derivatives not designated in a hedge relationship and carried at fair value through profit and loss.

The methodology for assessing foreign exchange risk exposures: Value-at-Risk

The Group uses the Value-at-Risk (VaR) methodology to assess exposures to foreign exchange risks. The VaR-based methodology provides estimates of potential fair value losses in market risk-sensitive instruments as a result of adverse changes in specified market factors, at a specified confidence level over a defined holding period. The Group calculates the foreign exchange VaR using the Monte Carlo method which simulates random values for exchange rates in which the Group has exposures and takes the non-linear price function of certain derivative instruments into account. The VaR is determined using volatilities and correlations of rates and prices estimated from a sample of historical market data, at a 95% confidence level, using a one-month holding period. To put more weight on recent market conditions, an exponentially weighted moving average is performed on the data with an appropriate decay factor. This model implies that within a one-month period, the potential loss will not exceed the VaR estimate in 95% of possible outcomes. In the remaining 5% of possible outcomes the potential loss will be at minimum equal to the VaR figure and, on average, substantially higher. The VaR methodology relies on a number of assumptions which include the following: risks are measured under average market conditions, changes in market risk factors follow normal distributions, future movements in market risk factors are in line with estimated parameters and the assessed exposures do not change during the holding period. Thus, it is possible that, for any given month, the potential losses at a 95% confidence level are different and could be substantially higher than the estimated VaR.

The VaR calculation includes foreign currency denominated monetary financial instruments, such as current financial investments, loans and trade receivables, cash, loans and trade payables; foreign exchange derivatives carried at fair value through profit and loss which are not in a hedge relationship and are mostly used to hedge the statement of financial position foreign exchange exposure; and foreign exchange derivatives designated as forecasted cash flow hedges, fair value hedges and net investment hedges as well as the exposures designated as hedged items for these hedge relationships.

The VaR figures for the Group's financial instruments which are sensitive to foreign exchange risks are presented in the Total VaR column and the simulated impact to financial statements presented in profit, other comprehensive income (OCI) and cumulative translation adjustment (CTA) columns in the table below.

EURm	2019				2018			
	Total VaR	Simulated impact on financial statements			Total VaR	Simulated impact on financial statements		
		Profit	OCI	CTA		Profit	OCI	CTA
As of December 31	8	10	18	–	16	21	33	6
Average for the year	11	10	22	1	14	18	38	5
Range for the year	7-25	4-17	13-31	0-4	5-24	7-27	25-58	0-8

Interest rate risk

The Group is exposed to interest rate risk either through market value fluctuations of items on the consolidated statement of financial position (price risk) or through changes in interest income or expenses (refinancing or reinvestment risk). Interest rate risk mainly arises through interest-bearing liabilities and assets. Estimated future changes in cash flows and the structure of the consolidated statement of financial position also expose the Group to interest rate risk.

The objective of interest rate risk management is to mitigate adverse impacts arising from interest rate fluctuations on the consolidated income statement, cash flow, and financial assets and liabilities while taking into consideration the Group's target capital structure and the resulting net interest rate exposure. The Group has entered into long-term borrowings mainly at fixed rates and swapped a portion of them into floating rates, in line with a defined target interest profile. The Group has not entered into interest rate swaps where it would be paying fixed rates. The Group aims

to mitigate the adverse impacts from interest rate fluctuations by continuously managing net interest rate exposure arising from financial assets and liabilities, by setting appropriate risk management benchmarks and risk limits.

Interest rate profile of items under interest rate risk management including the Group's net cash and current financial investments as well as related derivatives as of December 31:

EURm	2019		2018	
	Fixed rate	Floating rate ⁽¹⁾	Fixed rate	Floating rate ⁽¹⁾
Current financial investments	4	93	145	466
Cash and cash equivalents	80	5 830	497	5 765
Interest-bearing liabilities	(3 872)	(405)	(3 612)	(208)
Financial assets and liabilities before derivatives	(3 788)	5 518	(2 970)	6 023
Interest rate derivatives	1 197	(1 197)	2 332	(2 332)
Financial assets and liabilities after derivatives	(2 591)	4 321	(638)	3 691

(1) All cash equivalents and derivative transaction related collaterals with initial maturity of three months or less are considered floating rate for the purposes of interest rate risk management.

Treasury monitors and manages interest rate exposure centrally. The Group uses selective sensitivity analyses to assess and measure interest rate exposure arising from interest-bearing assets, interest-bearing liabilities and related derivatives. Sensitivity analysis determines an estimate of potential fair value changes in market risk-sensitive instruments by varying interest rates in currencies in which the Group has material amounts of financial assets and liabilities while keeping all other variables constant. Sensitivities to credit spreads are not reflected in the numbers.

The Group's sensitivity to interest rate exposure in the investment and debt portfolios is presented in the fair value column in the table below with simulated impact to financial statements presented in profit and OCI columns.

EURm	2019			2018		
	Impact on fair value	Impact on profit	Impact on OCI	Impact on fair value	Impact on profit	Impact on OCI
Interest rates – increase by 100 basis points	112	1	2	34	3	4
Interest rates – decrease by 50 basis points	(58)	(1)	(1)	(17)	(1)	(2)

Effects of hedge accounting on the financial position and performance

The Group is using several types of hedge accounting programs to manage its foreign exchange and interest rate risk exposures, refer to Note 2, Significant accounting policies. The effect of these programs on the Group's financial position and performance as of December 31:

EURm	Cash flow hedges (FX forwards and options) ⁽¹⁾	Net investment hedges (FX forwards and options) ⁽¹⁾	Fair value hedges (FX forwards) ⁽²⁾	Fair value and cash flow hedges (IR swaps and cross currency swaps) ^{(1),(2)}
	2019			
Carrying amount of hedging instruments	(10)	34	1	(51)
Notional amount of hedging instruments	(1 029)	(4 106)	(348)	1 246
Notional amount of hedged items	1 043	4 106	351	(1 246)
Change in intrinsic value of hedging instruments since 1 January	(31)	(51)	(4)	132
Change in value of hedged items used to determine hedge effectiveness	32	51	3	(133)
2018				
Carrying amount of hedging instruments	(13)	(11)	(4)	(46)
Notional amount of hedging instruments	(1 451)	(4 129)	(226)	2 330
Notional amount of hedged items	1 451	4 129	231	(2 330)
Change in intrinsic value of hedging instruments since 1 January	(44)	(83)	(13)	9
Change in value of hedged items used to determine hedge effectiveness	45	83	17	(7)

(1) No significant ineffectiveness has been recorded during the periods presented and economic relationships have been fully effective

(2) In 2019 change in fair value of hedging instruments in the income statement includes an additional EUR 9 million positive impact from cost of hedging of discontinued hedge relationships, refer to Note 11, Financial income and expenses and Note 23, Interest-bearing liabilities.

The most significant foreign exchange hedging instruments under cash flow, net investment and fair value hedge accounting as of December 31:

	Currency	Instrument	Fair value (EURm)	Weighted average hedged rate	Maturity breakdown of net notional amounts (EURm)(1)			
					Total	Within 3 months	Between 3 and 12 months	Beyond 1 year
2019								
Cash flow hedge accounting								
	GBP	FX Forwards	(8)	0.8780	(207)	(53)	(126)	(28)
	GBP	FX Options	1	0.9058	(172)	(40)	(99)	(33)
	JPY	FX Forwards	(2)	122.1697	(167)	(44)	(123)	–
				1				
	KRW	FX Forwards	(1)	310.0412	(129)	(15)	(114)	–
				1				
	KRW	FX Options	0	336.2500	(46)	(31)	(15)	–
	PLN	FX Forwards	2	4.2926	139	45	94	–
	USD	FX Forwards	0	1.1171	(280)	(0)	(280)	–
	USD	FX Options	0	1.1489	(125)	(67)	(58)	–
Net investment hedge accounting								
	CNY	FX Forwards	0	7.8003	(981)	(981)	–	–
	INR	FX Forwards	6	78.4807	(346)	(346)	–	–
	USD	FX Forwards	28	1.1076	(2 547)	(2 547)	–	–
Fair value hedge accounting for FX risk								
	USD	FX Forwards	0	1.1082	(423)	(171)	(270)	18
2018								
Cash flow hedge accounting								
	GBP	FX Forwards	3	0.8866	(184)	(38)	(93)	(53)
	GBP	FX Options	7	0.9064	(191)	(48)	(90)	(53)
	JPY	FX Forwards	(4)	130.0618	(150)	(51)	(99)	–
	PLN	FX Forwards	1	4.2966	149	46	102	–
	USD	FX Forwards	(19)	1.1653	(655)	(140)	(515)	–
	USD	FX Options	2	1.2029	(297)	(87)	(210)	–
Net investment hedge accounting								
	CNY	FX Forwards	4	7.8333	(944)	(944)	–	–
	INR	FX Forwards	(15)	81.5362	(544)	(544)	–	–
	USD	FX Forwards	(2)	1.1414	(2 246)	(2 246)	–	–
	USD	FX Options	1	1.1703	(240)	(240)	–	–
Fair value hedge accounting for FX risk								
	USD	FX Forwards	(3)	1.1478	(314)	(378)	64	–

(1) Negative notional amounts indicate that hedges sell currency and positive notional amounts indicate that hedges buy currency.

For information on the impact of hedge accounting on equity, refer to Note 21, Fair value and other reserves. For information on hedging instruments used for fair value and cash flow hedge accounting related to the Group's interest-bearing liabilities, refer to Note 23, Interest-bearing liabilities. For information on derivative instruments, refer to Note 25, Derivative financial instruments.

Other market risk

In certain emerging market countries there are local exchange control regulations that provide for restrictions on making cross-border transfers of funds as well as other regulations that impact the Group's ability to control its net assets in those countries.

Credit risk

Credit risk refers to the risk that a counterparty will default on its contractual obligations resulting in financial loss to the Group. Credit risk arises from credit exposures to customers, including outstanding receivables, financial guarantees and committed transactions, as well as financial institutions, including bank and cash, fixed income and money market investments, and derivative financial instruments. Credit risk is managed separately for business-related and financial credit exposures.

Business-related credit risk

The Group aims to ensure the highest possible quality in trade receivables and contract assets as well as customer or third-party loan receivables. The Credit Risk Management Standard Operating Procedure, approved by the Group CFO, lays out the framework for the management of the business-related credit risks. The Credit Risk Management Standard Operating Procedure sets out that credit decisions are based on credit evaluation in each business, including credit rating and limits for larger exposures, according to defined principles. Group level limit approvals are required for material credit exposures. Credit risks are monitored in each business and, where appropriate, mitigated on case by case basis with the use of letters of credit, collaterals, sponsor guarantees, credit insurance, and sale of selected receivables.

The Group applies a simplified approach to recognizing a loss allowance on trade receivables and contract assets based on measurement of lifetime expected credit losses arising from trade receivables without significant financing components. Based on quantitative and qualitative analysis, the Group has determined that the credit risk exposure arising from its trade receivables is low risk. Quantitative analysis focuses on historical loss rates, historic and projected sales and the corresponding trade receivables, and overdue trade receivables including indicators of any deterioration in the recovery expectation. Qualitative analysis focuses on all relevant conditions, including customer credit rating, country credit rating and political situation, to improve the accuracy of estimating lifetime expected credit losses. In 2019 and 2018, the Group recognized impairment losses of less than 1% of net sales.

Credit exposure is measured as the total of trade receivables, contract assets and loans outstanding from customers and committed credits. Trade receivables do not include any major concentrations of credit risk by customer. The top three customers account for approximately 4.6%, 4.3% and 3.8% (4.2%, 3.7% and 3.5% in 2018) of trade receivables, contract assets and loans due from customers and other third parties as of December 31, 2019. The top three credit exposures by country account for approximately 12.4%, 11.4% and 9.7% (16.2%, 11.0% and 7.9% in 2018) of the Group's trade receivables, contract assets and loans due from customers and other third parties as of December 31, 2019. The 12.4% credit exposure relates to trade receivables in China (16.2% in 2018).

The Group has provided loss allowances on trade receivables, contract assets and loans due from customers and other third parties not past due based on an analysis of debtors' credit ratings and credit histories. The Group establishes loss allowances that represent an estimate of expected losses at the end of the reporting period. All trade receivables, contract assets and loans due from customers are considered on an individual basis to determine the loss allowances. The total of trade receivables, contract assets and loans due from customers is EUR 6 936 million (EUR 7 112 million in 2018) as of December 31, 2019.

The aging of trade receivables, contract assets and customer finance loans is as of December 31:

EURm	Current	Past due 1-30 days	Past due 31-180 days	Past due More than 180 days	Total
As of December 31, 2019					
Trade receivables	4 364	156	306	345	5 171
Contract assets	1 489	–	–	–	1 489
Customer financing related loan receivables	224	–	17	35	276
Total	6 077	156	323	380	6 936
As of December 31, 2018					
Trade receivables	4 224	243	300	284	5 051
Contract assets	1 875	–	–	–	1 875
Customer financing related loan receivables	186	–	–	–	186
Total	6 285	243	300	284	7 112

Movements in loss allowances, all of which relate to trade receivables, for the years ended December 31:

EURm	2019	2018	2017
As of January 1	195	192	168
Charged to income statement	41	86	61
Deductions ⁽¹⁾	(89)	(83)	(37)
As of December 31	147	195	192

(1) Deductions include utilization and releases of allowances

The Group's exposure to credit risk related to customer and vendor financing as of December 31:

EURm	2019	2018
Loan commitments given undrawn	303	313
Outstanding customer financing related loan receivables	276	186
Total	579	499

For customer and vendor financing related loan receivables, the credit loss estimate is typically based on a 12 month expected credit loss for outstanding loans and estimated additional draw-downs during this period. The loss allowance is calculated on a quarterly basis based on a review of collectability and available collateral, derecognized from other comprehensive income and recognized in other financial expenses in the consolidated income statement.

Loss allowance for customer and vendor financing related loan receivables was EUR 76 million in 2019 (EUR 7 million in 2018). The movement of EUR 69 million in loss allowance balance is mainly due to an impairment related to a certain emerging market customer, refer to Note 17, Impairment.

Financial credit risk

Financial instruments contain an element of risk resulting from changes in the market price due to counterparties becoming less creditworthy or risk of loss due to counterparties being unable to meet their obligations. Financial credit risk is measured and monitored centrally by Treasury. Financial credit risk is managed actively by limiting counterparties to a sufficient number of major banks and financial institutions, and by monitoring the creditworthiness and the size of exposures continuously. Additionally, the Group enters into netting arrangements with all major counterparties, which give the right to offset in the event that the counterparty would not be able to fulfill its obligations. The Group enters into collateral agreements with certain counterparties, which require counterparties to post collateral against derivative receivables.

Investment decisions are based on strict creditworthiness and maturity criteria as defined in the Treasury-related policies and procedures. As a result of this investment policy approach and active management of outstanding investment exposures, the Group has not been subject to any material credit losses in its financial investments in the years presented. The Group did not have any financial investments that were past due but not impaired at December 31. Due to the high credit quality of the Group's financial investments the expected credit loss for these investments is deemed insignificant.

Outstanding current financial investments, cash equivalents and cash classified by credit rating grades ranked in line with Standard & Poor's rating categories as of December 31:

EURm	Rating ⁽²⁾	Cash	Due within 3 months	Due between 3 and 12 months	Due between 1 and 3 years	Due between 3 and 5 years	Due beyond 5 years	Total ⁽³⁾
2019								
	AAA	–	800	–	–	–	–	800
	AA+ - AA-	663	143	–	–	–	–	806
	A+ - A-	2 007	1 377	20	20	25	–	3 449
	BBB+ - BBB-	445	360	13	–	–	–	818
	BB+ - BB-	8	–	–	–	–	–	8
	B+ - B-	22	–	–	–	–	–	22
	Non-rated	100	3	1	–	–	–	104
Total		3 245	2 683	34	20	25	–	6 007
2018								
	AAA	–	317	–	–	–	–	317
	AA+ - AA-	762	176	3	–	–	–	941
	A+ - A-	1 718	1 930	310	140	207	–	4 305
	BBB+ - BBB-	373	427	189	–	–	–	989
	BB+ - BB-	6	–	–	–	–	–	6
	B+ - B-	24	18	–	–	–	–	42
	Non-rated	260	10	3	–	–	–	273
Total		3 143	2 878	505	140	207	–	6 873

(1) Bank Parent Company ratings are used here for bank groups. Actual bank subsidiary ratings may differ from the Bank Parent Company rating.

(2) Credit rating grades for 2018 previously ranked in line with Moody's rating categories have been adjusted according to the Standard & Poor's rating categories.

(3) Current financial investments and cash equivalents include bank deposits, structured deposits, investments in money market funds and investments in fixed income instruments.

(4) Instruments that include a call feature have been presented at their final maturities. Instruments that are contractually due beyond 3 months include EUR 77 million (EUR 472 million in 2018) of instruments that have a call period of less than 3 months.

The Group has restricted bank deposits primarily related to employee benefits of EUR 126 million (EUR 158 million in 2018) that are presented in other non-current financial assets. The Group has assessed the counterparty credit risk for these financial assets and concluded that expected credit losses are not significant.

Financial assets and liabilities subject to offsetting under enforceable master netting agreements and similar arrangements as of December 31:

EURm	Gross amounts of financial assets/ (liabilities)	Gross amounts of financial liabilities/ (assets) set off in the statement of financial position	Net amounts of financial assets/ (liabilities) presented in the statement of financial position	Related amounts not set off in the statement of financial position		Net amount
				Financial instruments assets/(liabilities)	Cash collateral received/(pledged)	
2019						
Derivative assets	81	–	81	76	–	5
Derivative liabilities	(157)	–	(157)	(83)	(37)	(37)
Total	(76)	–	(76)	(7)	(37)	(32)
2018						
Derivative assets	131	–	131	104	15	12
Derivative liabilities	(178)	–	(178)	(103)	(72)	(3)
Total	(47)	–	(47)	1	(57)	9

The financial instruments subject to enforceable master netting agreements and similar arrangements are not offset in the consolidated statement of financial position where there is no intention to settle net or realize the asset and settle the liability simultaneously.

Liquidity risk

Liquidity risk is defined as financial distress or extraordinarily high financing costs arising from a shortage of liquid funds in a situation where outstanding debt needs to be refinanced or where business conditions unexpectedly deteriorate and require financing. Transactional liquidity risk is defined as the risk of executing a financial transaction below fair market value or not being able to execute the transaction at all within a specific period of time. The objective of liquidity risk management is to maintain sufficient liquidity, and to ensure that it is readily available without endangering its value in order to avoid uncertainty related to financial distress at all times.

The Group aims to secure sufficient liquidity at all times through efficient cash management and by investing primarily in highly liquid money market investments. Depending on its overall liquidity position, the Group may pre-finance or refinance upcoming debt maturities before contractual maturity dates. The transactional liquidity risk is minimized by entering into transactions where proper two-way quotes can be obtained from the market. The Group aims to ensure flexibility in funding by maintaining committed and uncommitted credit lines. Refer to Note 23, Interest-bearing liabilities.

The following table presents an undiscounted cash flow analysis for financial liabilities and financial assets that are presented on the consolidated statement of financial position as well as contingent financial assets and liabilities, such as loan commitments. The line-by-line analysis does not directly reconcile with the consolidated statement of financial position.

EURm	Total	Due between				
		Due within 3 months	3 and 12 months	Due between 1 and 3 years	Due between 3 and 5 years	Due beyond 5 years
2019						
Non-current financial assets						
Other non-current financial assets ⁽¹⁾	252	–	3	115	54	80
Current financial assets						
Other current financial assets excluding derivatives ⁽²⁾	53	21	32	–	–	–
Current financial investments	97	95	2	–	–	–
Cash and cash equivalents ⁽³⁾	5 913	5 835	33	20	25	–
Cash flows related to derivative financial assets gross settled:						
Derivative contracts – receipts	9 660	7 582	1 993	85	–	–
Derivative contracts – payments	(9 639)	(7 548)	(2 005)	(86)	–	–
Trade receivables	5 019	3 873	1 088	58	–	–
Non-current financial liabilities						
Long-term interest-bearing liabilities	(4 990)	(43)	(75)	(1 209)	(1 113)	(2 550)
Long-term lease liabilities ⁽⁴⁾	(841)	–	–	(375)	(251)	(215)
Current financial liabilities						
Short-term interest-bearing liabilities	(294)	(212)	(82)	–	–	–
Short-term lease liabilities ⁽⁴⁾	(276)	(81)	(195)	–	–	–
Other financial liabilities excluding derivatives ⁽⁵⁾	(646)	(638)	(8)	–	–	–
Cash flows related to derivative financial liabilities gross settled:						
Derivative contracts – receipts	11 725	9 003	828	616	86	1 192
Derivative contracts – payments	(11 517)	(9 078)	(808)	(569)	(43)	(1 019)
Trade payables	(3 786)	(3 653)	(111)	(21)	(1)	–
Contingent financial assets and liabilities						
Loan commitments given undrawn ⁽⁶⁾	(303)	(32)	(77)	(194)	–	–
Loan commitments obtained undrawn ⁽⁷⁾	1 971	499	(4)	(11)	(11)	1 498
Leases committed but not yet commenced ⁽⁴⁾	(160)	–	–	(11)	(23)	(126)

(1) Other non-current financial assets include long-term customer and vendor financing related loan receivables as well as certain other long-term loan receivables that have been presented in other non-current financial assets in the consolidated statement of financial position. Convertible instruments are presented at their final contractual maturities.

(2) Other current financial assets excluding derivatives include short-term customer and vendor financing related loan receivables that have been presented in other financial assets in the consolidated statement of financial position.

(3) Instruments that include a call feature have been presented at their final maturities. Instruments that are contractually due beyond 3 months include EUR 77 million of instruments that have a call period of less than 3 months.

(4) As a result of adoption of IFRS 16, Leases, in the beginning of 2019, lease liabilities and leases committed but not yet commenced are presented in the liquidity risk table in 2019.

(5) Other financial liabilities include a conditional obligation to China Huaxin presented in the earliest period as the exercise period is open.

(6) Loan commitments given undrawn have been included in the earliest period in which they could be drawn or called.

(7) Loan commitments obtained undrawn have been included based on the period in which they expire. These amounts include related commitment fees.

EURm	Total	Due within 3 months	Due between 3 and 12 months	Due between 1 and 3 years	Due between 3 and 5 years	Due beyond 5 years
2018						
Non-current financial assets						
Other non-current financial assets ⁽¹⁾	146	23	–	48	25	50
Current financial assets						
Other current financial assets excluding derivatives ⁽²⁾	97	35	62	–	–	–
Current financial investments	612	231	381	–	–	–
Cash and cash equivalents ⁽³⁾	6 271	5 796	125	142	208	–
Cash flows related to derivative financial assets net settled:						
Derivative contracts – receipts	22	3	(6)	8	8	9
Cash flows related to derivative financial assets gross settled:						
Derivative contracts – receipts	11 428	9 506	1 017	151	46	708
Derivative contracts – payments	(11 093)	(9 463)	(1 008)	(124)	(17)	(481)
Trade receivables	4 851	3 998	774	79	–	–
Non-current financial liabilities						
Long-term interest-bearing liabilities	(3 916)	(28)	(72)	(730)	(604)	(2 482)
Current financial liabilities						
Short-term interest-bearing liabilities	(1 024)	(470)	(554)	–	–	–
Other financial liabilities excluding derivatives ⁽⁴⁾	(731)	–	(731)	–	–	–
Cash flows related to derivative financial liabilities gross settled:						
Derivative contracts – receipts	12 251	9 863	1 335	68	482	503
Derivative contracts – payments	(12 236)	(9 944)	(1 347)	(20)	(459)	(466)
Trade payables	(4 773)	(4 645)	(104)	(23)	–	(1)
Contingent financial assets and liabilities						
Loan commitments given undrawn ⁽⁵⁾	(313)	(14)	(30)	(153)	(77)	(39)
Loan commitments obtained undrawn ⁽⁶⁾	2 323	249	(3)	2 077	–	–

(1) Other non-current financial assets include long-term customer and vendor financing related loan receivables as well as certain other long-term loan receivables that have been presented in other non-current financial assets in the consolidated statement of financial position.

(2) Other current financial assets excluding derivatives include short-term customer and vendor financing related loan receivables that have been presented in other financial assets in the consolidated statement of financial position.

(3) Instruments that include a call feature have been presented at their final maturities. Instruments that are contractually due beyond 3 months include EUR 472 million of instruments that have a call period of less than 3 months.

(4) Other financial liabilities include a conditional obligation to China Huaxin based on the beginning of the exercise period.

(5) Loan commitments given undrawn have been included in the earliest period in which they could be drawn or called.

(6) Loan commitments obtained undrawn have been included based on the period in which they expire. These amounts include related commitment fees.

37. Subsequent events

Non-adjusting events after the reporting period

Financing transactions

On February 24, 2020, the Group drew a loan of EUR 500 million from European Investment Bank (EIB). The loan facility agreement was signed in August 2018 and the loan will mature in February 2025.

Change of President and Chief Executive Officer

On March 2, 2020 Nokia's Board of Directors appointed Pekka Lundmark as President and Chief Executive Officer of Nokia and he is expected to start in his new role on September 1, 2020. Rajeev Suri will leave his current position as President and Chief Executive Officer on August 31, 2020 and continue to serve as an advisor to the Nokia Board until January 1, 2021.

Report of independent registered public accounting firm

To the Board of Directors and shareholders of Nokia Corporation

Opinions on the financial statements and internal control over financial reporting

We have audited the accompanying consolidated statement of financial position of Nokia Corporation and its subsidiaries (the "Company") as of December 31, 2019 and 2018, and the related consolidated income statement, consolidated statement of comprehensive income, consolidated statement of changes in shareholders' equity and consolidated statement of cash flows for each of the three years in the period ended December 31, 2019, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019 in conformity with International Financial Reporting Standards as issued by the International Accounting Standards Board and International Financial Reporting Standards as adopted by the European Union. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principles

As discussed in Note 3 and 2 to the consolidated financial statements, respectively, the Company changed the manner in which it accounts for leases in 2019 and the manner in which it accounts for revenue from contracts with customers and the manner in which it accounts for financial instruments in 2018.

Basis for opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Annual Report on Internal Control over Financial Reporting appearing under Item 15 of the Annual Report on Form 20-F for the fiscal year ended December 31, 2019. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and limitations of internal control over financial reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that (i) relate to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Identification of Performance Obligations related to Networks and Nokia Software

As described in Notes 2, 4 and 7 to the consolidated financial statements, €21 billion of the Company's total net sales for the year ended December 31, 2019 was generated from Networks and Nokia Software. Nokia Corporation and its subsidiaries ("The Group") regularly enter into agreements with customers comprising multiple performance obligations, that include a variety of products, services and software that the Group offers. The Group conducts an assessment at contract inception to determine which promised goods and services in a customer contract are distinct and accordingly identified as performance obligations. The Group considers there to be a distinct performance obligation if the customer can benefit

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from the good or service either on its own or together with other resources readily available, and if the Group's promise to transfer the good or service is separately identifiable from other promises in the contract.

The principal considerations for our determination that performing procedures relating to revenue recognition on complex contracts is a critical audit matter are there was significant judgment by management when identifying performance obligations. This in turn led to significant audit judgment and effort in performing procedures to evaluate the appropriate identification of performance obligations.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included understanding the design and testing the effectiveness of controls relating to the revenue recognition process, with particular focus on the controls related to the identification of performance obligations, within revenue contracts and determination of the timing of recognition for each revenue obligation. These procedures also included, among others, detailed testing procedures over revenue arrangements that we selected based on size and complexity to assess the appropriateness of judgements made by management regarding performance obligations. We assessed the Group's revenue recognition accounting policies for compliance with International Financial Reporting Standards ('IFRS') and tested a sample of revenue transactions recorded during the year by tracing them to supporting evidence of delivery and acceptance and assessed the revenue recorded in the period by comparing it to contractual terms.

Utilization of Deferred Tax Assets in Finland

As described in Notes 2, 4 and 12 to the consolidated financial statements, the Group had recognized net deferred tax assets of €4.7 billion, of which €2.8 billion relates to Finland. Deferred tax assets are recognized to the extent it is probable that future taxable profit will be available against which the unused tax losses, unused tax credits and deductible temporary difference can be utilized in the relevant jurisdictions. The Group continually evaluates the probability assessment in respect to the utilization of deferred tax assets. The recognition of deferred tax assets is based on the assessment of whether it is probable that sufficient taxable profit will be available in the future to utilize the reversal of deductible temporary differences, unused tax losses and unused tax credits before the unused tax losses and unused tax credits expire. Recognition of deferred tax assets involves judgment regarding the future financial performance of the particular legal entity or tax group that has recognized the deferred tax asset.

The principal considerations for our determination that performing procedures relating to utilization of deferred tax assets is a critical audit matter are there was significant judgement by management in determining the future financial performance of the Finnish entities. This in turn led to a high degree of auditor judgment and effort in evaluating audit evidence relating to evaluation of the reasonableness of forecasted future taxable profit. Also, the evaluation of audit evidence available to support the utilization of deferred tax assets was complex and required significant auditor judgment as the nature of the evidence is often highly subjective.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included understanding the design and testing the effectiveness of controls relating to deferred tax assets and forecasting financial results. These procedures also included, among others, validating the completeness and accuracy of tax attributes and confirming the appropriate application of tax rules for utilizing deferred tax assets, including expiry of those attributes, as well as evaluating the reasonableness of forecasts of Finland's future taxable profit to utilize deferred tax assets.

/s/ PricewaterhouseCoopers Oy
Helsinki, Finland
March 5, 2020

We have served as the Company's auditor since 1987.

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Other information

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Exhibits

1	Articles of Association of Nokia Corporation (incorporated by reference to Exhibit 1 of our annual report on Form 20-F filed with the Securities and Exchange Commission on March 23, 2017 (File No. 1-13202)).
6	Refer to Note 13, Earnings per share, of our consolidated financial statements included in this annual report on Form 20-F, for information on how earnings per share information was calculated.
8	Refer to Note 32, Principal Group companies, of our consolidated financial statements included in this annual report on Form 20-F, for more information on our significant subsidiaries.
11	Code of Ethics
12.1	Certification of Rajeev Suri, President and Chief Executive Officer of Nokia Corporation, Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
12.2	Certification of Kristian Pullola, Group Chief Financial Officer of Nokia Corporation, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
13	Certification, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
15.1	Consent of Independent Registered Public Accounting Firm.
15.2	Letter from PricewaterhouseCoopers Oy to the U.S. Securities and Exchange Commission, dated March 5, 2020.
101	Interactive Data Files (XBRL – Related Documents)

Key ratios

Earnings per share (basic)

Profit attributable to equity holders of the parent
Weighted average number of shares in issue

Earnings per share (diluted)

Profit attributable to equity holders of the parent adjusted for the effect of dilution
Adjusted weighted average number of shares

P/E ratio

Closing share price as of December 31
Earnings per share (basic) for Continuing operations

Payout ratio

Dividend per share
Earnings per share (basic) for Continuing operations

Dividend yield %

Dividend per share
Closing share price as of December 31

Shareholders' equity per share

Capital and reserves attributable to equity holders of the parent
Number of shares as of December 31 - number of treasury shares as of December 31

Market capitalization

(Number of shares as of December 31 - number of treasury shares as of December 31) x closing share price as of December 31

Share turnover %

Number of shares traded during the year
Average number of shares during the year

Total cash and current financial investments

Cash and cash equivalents and current financial investments

Net cash and current financial investments

Total cash and current financial investments - Long-term interest-bearing liabilities - Short-term interest-bearing liabilities

Free cashflow

Net cash from operating activities - purchases of property, plant and equipment and intangible assets (capital expenditures) + proceeds from sale of property, plant and equipment and intangible assets - purchase of non-current financial investments + proceeds from sale of non-current financial investments.

Glossary of terms

2G (Second Generation Mobile Communications): Also known as GSM (Global System for Mobile Communications): A digital system for mobile communications that is based on a widely-accepted standard and typically operates in the 900 MHz, 1800 MHz and 1900 MHz frequency bands.

3G (Third Generation Mobile Communications): The third generation of mobile communications standards designed for carrying both voice and data generally using WCDMA or close variants. See also WCDMA.

4G (Fourth Generation Mobile Communications): The fourth generation of mobile communications standards based on LTE, offering IP data connections only and providing true broadband internet access for mobile devices. See also LTE.

5G (Fifth Generation Mobile Communications): The next major phase of mobile telecommunications standards. 5G is a complete redesign of network architecture with the flexibility and agility to support upcoming service opportunities. It delivers higher speeds, higher capacity, extremely low latency and greater reliability.

Access network: A telecommunications network between a local exchange and the subscriber station.

Airframe: Our 5G-ready, end-to-end data center solution that combines the benefits of cloud computing technologies with the requirements of the core and radio telecommunications world. It is available in Rackmount and Open Compute Project (OCP) form factors. This enables the solution to be very scalable: from small distributed latency-optimized data centers, all the way to massive centralized hyperscale data center deployment.

AirScale Radio Access: A 5G-ready complete radio access generation that helps operators address the increasing demands of today and tomorrow. The solution comprises: Nokia AirScale Base Station with multiband radio frequency elements and system modules; Nokia AirScale Active Antennas; Cloud RAN with Nokia AirScale Cloud Base Station Server and the cloud-based AirScale RNC (Radio Network Controller) for 3G; Nokia AirScale Wi-Fi; common software; and services which use intelligent analytics and extreme automation to maximize the performance of hybrid networks.

Alcatel Lucent SA or Alcatel Lucent: Alcatel Lucent, a subsidiary of Nokia Corporation.

Anyhaul: Mobile transport solution for 5G networks covering microwave, IP, optical and broadband.

Artificial Intelligence (AI): Autonomous and adaptive intelligence of machines, where machines have the ability to perform tasks in complex environments without constant guidance by a user and have the ability to improve performance by learning from experience.

Bandwidth: The width of a communication channel, which affects transmission speeds over that channel.

Base station: A network element in a mobile network responsible for radio transmission and reception to or from the mobile station.

Broadband: The delivery of higher bandwidth by using transmission channels capable of supporting data rates greater than the primary rate of 9.6 Kbps.

Churn: Churn rate is a measure of the number of customers or subscribers who leave their service provider, e.g. a mobile operator, during a given time period.

Cloud: Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort.

CloudBand: Our Cloud management and orchestration solutions enabling a unified cloud engine and platform for NFV.

Common Software Foundation (CSF): As a coherent software suite, Nokia's cloud-native Common Software Foundation is designed to deliver applications that are hardware- and vendor-agnostic, and easy to deploy, integrate, use and upgrade.

Continuing operations: Refers to the Continuing operations following the acquisition of Alcatel Lucent, the sale of HERE business in 2015 and the sale of Devices & Services business in 2014.

Converged Core: Converged core refers to wireless and fixed access convergence within the core. As we move towards a 5G standalone core, service providers will be able to use a common set of control plane functions within the core to manage both wireless and fixed user plane functions. The ability of a unified control plane will simplify operations and provide independent location, scaling and lifecycle management capabilities.

Convergence: The coming together of two or more disparate disciplines or technologies. Convergence types are, for example, IP convergence, fixed-mobile convergence and device convergence.

Core network: A combination of exchanges and the basic transmission equipment that together form the basis for network services.

CSP: Communication service providers.

Customer Experience Management: Software suite used to manage and improve the customer experience, based on customer, device and network insights.

Devices & Services: Our former mobile device business, substantially all of which was sold to Microsoft.

Digital: A signaling technique in which a signal is encoded into digits for transmission.

Discontinued operations: Discontinued operations include the continuing financial effects of the HERE business and the Devices & Services business. HERE was divested to an automotive consortium and substantially all of Devices & Services business was sold to Microsoft.

Ecosystem: An industry term to describe the increasingly large communities of mutually beneficial partnerships that participants such as hardware manufacturers, software providers, developers, publishers, entertainment providers, advertisers and ecommerce specialists form in order to bring their offerings to market. At the heart of the major ecosystems in the mobile devices and related services industry is the operating system and the development platform upon which services are built.

ETSI (European Telecommunications Standards Institute): Standards produced by the ETSI contain technical specifications laying down the characteristics required for a telecommunications product.

Fixed Networks: Our Fixed Networks business group provides copper and fiber access products, solutions, and services.

Fixed Wireless Access (FWA): Uses wireless networks to connect fixed locations such as homes and businesses with broadband services.

Future X: A network architecture - a massively distributed, cognitive, continuously adaptive, learning and optimizing network connecting humans, senses, things, systems, infrastructure, processes.

G.fast: A fixed broadband technology able to deliver up to 1Gbps over very short distances (for example, for in-building use, also called "Fiber-to-the-Building"). Launched in 2014, G.fast uses more frequencies and G.fast Vectoring techniques to achieve higher speeds.

Global Services: Our Global Services business group provides a broad variety of services to communication service providers and enterprises ranging from network infrastructure services, professional services and managed operations to network cognitive services and analytics.

GPON (Gigabit Passive Optical Networking): A fiber access technology that delivers 2.5Gbps over a single optical fiber to multiple end points including residential and enterprise sites.

GSM (Global System for Mobile Communications): A digital system for mobile communications that is based on a widely-accepted standard and typically operates in the 900 MHz, 1800 MHz and 1900 MHz frequency bands. See also 2G.

GSM-R (GSM-Railway): An international wireless communications standard for railway communication and applications. A sub-system of European Rail Traffic Management System (ERTMS), it is used for communication between train and railway regulation control centers.

HERE: A former Nokia company focused on mapping and location intelligence services, which was divested to an automotive consortium in 2015.

IFRS (International Financial Reporting Standards): International Financial Reporting Standards as issued by the International Accounting Standards Board and in conformity with IFRS as adopted by the European Union.

Internet of Things (IoT): All things such as cars, the clothes we wear, household appliances and machines in factories connected to the Internet and able to automatically learn and organize themselves.

IP (Internet Protocol): A network layer protocol that offers a connectionless internet work service and forms part of the TCP/IP protocol.

IP (Intellectual Property): Intellectual property results from original creative thought, covering items such as patents, copyright material and trademarks, as well as business models and plans.

IPR (Intellectual Property Right): Legal right protecting the economic exploitation of intellectual property, a generic term used to describe products of human intellect, for example patents, that have an economic value.

IP/MPLS (IP multiprotocol label switching): IP/MPLS is a routing technique in telecommunications networks that directs data from one node to the next based on short path labels rather than long network addresses, thus avoiding complex lookups in a routing table and speeding traffic flows.

IPR licensing: Generally refers to an agreement or an arrangement where a company allows another company to use its intellectual property (such as patents, trademarks or copyrights) under certain terms.

IP/Optical Networks: Our IP/Optical Networks business group provides the key IP routing and optical transport systems, software and services to build high capacity network infrastructure for the internet and global connectivity.

LTE (Long-Term Evolution): 3GPP radio technology evolution architecture and a standard for wireless communication of high-speed data. Also referred to as 4G.

Mission-critical networks/communications: One of the key elements of 5G. Mission-critical communications meets the needs of emergency responders such as emergency operations centers, fire departments, emergency vehicles, police, and search and rescue services, replacing traditional radio with new communications capabilities available to smartphone users.

Mobile broadband: Refers to high-speed wireless internet connections and services designed to be used from arbitrary locations.

Mobile Networks: Our Mobile Networks business group offers an industry-leading portfolio of radio access networks solutions, including 2G, 3G, 4G, 5G and Single-RAN, microwave radio links and cloud computing hardware platforms.

MPLS: Multiprotocol Label Switching, a routing technique for networks.

MSO: Multiple system operators (MSO) are operators of multiple cable television systems. The majority of system operators run cable systems in more than one community and hence most of them are multiple system operators.

Networks segment: One of our three reportable segments that provides net sales disclosure for the following businesses i.e. reportable businesses: Mobile Access (a combination of Mobile Networks and Global Services business groups), Fixed Access, IP Routing, Optical Networks.

NFV (Network Functions Virtualization): Principle of separating network functions from the hardware they run on by using virtual hardware abstraction.

Nokia Bell Labs: Our research arm discovering and developing the technological shifts needed for the next phase of human existence as well as exploring and solving complex problems to radically redefine networks.

Nokia Enterprise: Recognizing the growth potential of our business within the enterprise customer segment, we created Nokia Enterprise business group, effective January 1, 2019. It addresses the mission- and business-critical networking requirements of asset-intensive industries such as transportation, energy, manufacturing and logistics – as well as governments and cities.

Nokia Networks: Our former business focused on mobile network infrastructure software, hardware and services.

Nokia Software: One of our three reportable segments and our business group offering carrier-grade software applications and platforms to provide operations and business support systems, build, deliver, and optimize services, enable their monetization, and to improve customer experience.

Nokia Technologies: One of our three reportable segments and our business group focused on advanced technology development and licensing.

NSN (Nokia Solutions and Networks): The former name of our Networks business. From 2007, NSN was known as Nokia Siemens Networks until we acquired Siemens' 50% stake in the joint venture in 2013.

Nuage Networks: A Nokia brand, focused on creating Software Defined Networking (SDN) solutions that simplify and automate Telco cloud networks and enterprise wide area networks (SD-WAN).

Operating system (OS): Software that controls the basic operation of a computer or a mobile device, such as managing the processor and memory. The term is also often used to refer more generally to the software within a device, including, for instance, the user interface.

Packet: Part of a message transmitted over a packet switched network.

Platform: Software platform is a term used to refer to an operating system or programming environment, or a combination of the two.

PON (Passive Optical Networking): A fiber access architecture in which unpowered fiber optic splitters are used to enable a single optical fiber to serve multiple end-points without having to provide individual fibers between the hub and customer.

Programmable World: A world where connectivity will expand massively, linking people as well as billions of physical objects - from cars, home appliances and smartphones, to wearables, industrial equipment and health monitors. What distinguishes the Programmable World from the Internet of Things is the intelligence that is added to data to allow people to interpret and use it, rather than just capture it.

PSE-3: The PSE-3 chipset is the first coherent digital signal processor to implement probabilistic constellation shaping (PCS), a modulation technique pioneered by Nokia Bell Labs.

RAN (Radio Access Network): A mobile telecommunications system consisting of radio base stations and transmission equipment.

SDAN: Software Defined Access Network.

SDN (Software Defined Networking): Decoupling of network control and data forwarding to simplify and automate connections in data centers, clouds and across the wide area.

SD-WAN: Software-defined networking in a wide area network (WAN) that simplifies and automates enterprise networks, seamlessly connecting users and applications, from branch office to cloud.

SEP (Standard-Essential Patent): Generally, patents needed to produce products which work on a standard, which companies declare as essential and agree to license on fair, reasonable and non-discriminatory (FRAND) terms. Can be referred to as essential patent also.

Single RAN: Single RAN (S-RAN) allows different radio technologies to be provided at the same time from a single base station, using a multi-purpose platform.

Small cells: Low-powered radio access nodes (micro cells or picocells) that are a vital element in handling very dense data traffic demands. 3G and LTE small cells use spectrum licensed by the operator; Wi-Fi uses unlicensed spectrum which is therefore not under the operator's exclusive control.

Technology licensing: Generally refers to an agreement or arrangement where under certain terms a company provides another company with its technology and possibly know-how, whether protected by intellectual property or not, for use in products or services offered by the other company.

Telco Cloud: Applying cloud computing, SDN and NFV principles in telecommunications environment, e.g. separating application software from underlying hardware with automated, programmable interfaces while still retaining telecommunications requirements such as high availability and low latency.

Transmission: The action of conveying signals from one point to one or more other points.

TXLE (Technical extra-large enterprise): Technically sophisticated companies, such as banks, that invest heavily in their own network infrastructures to gain a key competitive advantage.

VDSL2 (Very High Bit Rate Digital Subscriber Line 2): A fixed broadband technology, the successor of ADSL. Launched in 2007, it typically delivers a 30Mbps broadband service from a street cabinet (also called a "Fiber-to-the-Node" deployment) over existing telephone lines.

VDSL2 Vectoring: A fixed broadband technology launched in 2011, able to deliver up to 100Mbps over a VDSL2 line by applying noise cancellation techniques to remove cross-talk between neighboring VDSL2 lines.

Virtual Reality (VR): The simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.

VoLTE (Voice over LTE): Required to offer voice services on an all-IP LTE network and generally provided using IP Multimedia Subsystem, which is an architectural framework designed to deliver IP-based multimedia services on telecommunications networks; standardized by 3GPP.

WAN (Wide Area Networking): A geographically distributed private telecommunications network that interconnects multiple local area networks.

WCDMA (Wideband Code Division Multiple Access): A third-generation mobile wireless technology that offers high data speeds to mobile and portable wireless devices. Also referred to as 3G.

Webscale companies: Companies - such as Google, Microsoft, and Alibaba - which are investing in cloud technology and network infrastructure on an increasing scale to fulfill their needs for massive, mission-critical networks.

WING: Worldwide IoT Network Grid is a managed service that offers CSPs the ability to support their enterprise customers with global IoT connectivity across borders and technologies.

WLAN (Wireless Local Area Network): A local area network using wireless connections, such as radio, microwave or infrared links, in place of physical cables.

Investor information

Information on the internet

www.nokia.com

Available on the internet: financial reports, members of the Group Leadership Team, other investor-related materials and events, and press releases as well as environmental and social information, including our Sustainability Report, Code of Conduct, Corporate Governance Statement and Remuneration Statement.

SEC maintains an internet site that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC (<http://www.sec.gov>).

Investor Relations contacts

investor.relations@nokia.com

Annual General Meeting

Date: April 8, 2020

Place: Helsinki, Finland

Dividend

The Board proposes to the Annual General Meeting that no dividend be paid for the financial year 2019.

Financial reporting

Our interim reports in 2020 are planned to be published on April 30, 2020, July 31, 2020 and October 29, 2020. The full-year 2020 results are planned to be published in February 2021.

Information published in 2019

All our global press releases and statements published in 2019 are available on the internet at www.nokia.com/en_int/news/releases.

Stock exchanges

The Nokia Corporation share is quoted on the following stock exchanges:

	Symbol	Trading currency
Nasdaq Helsinki (since 1915)	NOKIA	EUR
New York Stock Exchange (since 1994)	NOK	USD
Euronext Paris (since 2015)	NOKIA	EUR

Documents on display

The documents referred to in this annual report on Form 20-F can be read at the Securities and Exchange Commission's internet site at <http://www.sec.gov>.

Contact information

Nokia Head Office

Karakaari 7

FI-02610 Espoo, Finland
FINLAND

Tel. +358 (0) 10 44 88 000
Fax +358 (0) 10 44 81 002

Signatures

The registrant hereby certifies that it meets all of the requirements for filing on Form 20-F and that it has duly caused and authorized the undersigned to sign this annual report on Form 20-F on its behalf.

Nokia Corporation

By: **/S/ KRIS LEMMENS**

Name: Kris Lemmens

Title: Deputy Chief Financial Officer

By: **/S/ ESA NIINIMÄKI**

Name: Esa Niinimäki

Title: Deputy Chief Legal Officer, Corporate

March 5, 2020



CODE OF ETHICS

FOR THE PRINCIPAL EXECUTIVE OFFICERS AND THE SENIOR FINANCIAL OFFICERS

1 Purpose

The purpose of this Code of Ethics (the “Code”) is to reinforce ethical behavior and promote high standards of corporate governance. This Code complements Nokia’s Code of Conduct, Nokia Insider Policy and other guidelines and policies applicable at Nokia.

2 Applicability

The Code applies to Nokia’s President and Chief Executive Officer, Chief Financial Officer, Deputy Chief Financial Officer and Corporate Controller (the “Officers”).

3 Good corporate practices

3.1 Honest and ethical conduct

The Officers shall act honestly and ethically in all their business activities in their respective roles. They shall comply with and promote compliance with the highest standards of ethical conduct, including the principles set out in Nokia’s Code of Conduct, in all their business activities at Nokia.

3.2 Conflicts of interest

Situations involving an actual or apparent conflict of interest between personal and professional relationships of the Officers with Nokia, or any doubt thereof, shall be handled in an ethical way. An Officer shall not participate in consideration of a matter in which he/she has a conflict of interest or even a perceived conflict of interest between his/her personal and professional relationships with respect to Nokia.

For the avoidance of doubt, the Officers shall comply with the provisions on conflicts of interest included in various Nokia guidelines and policies (e.g., Nokia Insider Policy, Conflict of Interest Policy and external board membership related standard operating procedures).

3.3 Fair and timely disclosure

The Officers shall take all measures generally required from a prudent principal executive officer or senior financial officer, including measures in accordance with Nokia's disclosure controls and procedures, to promote full, fair, accurate, timely and understandable disclosure in reports and documents filed with or submitted to financial and regulatory authorities or stock exchanges by Nokia.

3.4 Compliance with laws and regulations

The Officers shall comply in all their business activities in their respective roles with all applicable governmental laws, rules and regulations of Finland and other applicable jurisdictions, as well as the rules of stock exchanges on which Nokia shares are listed, including the New York Stock Exchange. These obligations include cooperating, appropriately, with governmental investigations of Nokia's business and operations.

4 Accountability

4.1 Clearances

Nokia regards adherence to this Code as well as accountability for such adherence as important.

The Chief Compliance Officer may, upon request, advise the Officers whether a particular situation or behavior is in compliance with this Code or not, and give a clearance for a situation or behavior that is obviously and evidently compliant. The determination whether a conflict of interest exists or not, shall be made by the Chief Compliance Officer or, upon the request of the Officer or the Chief Compliance Officer, by the Chair of the Audit Committee.

4.2 Reporting of illegal or unethical behavior

Any suspected failures to adhere to, and suspected violations of this Code by any of the Officers, shall be reported to the Chief Compliance Officer or to the Chair of the Audit Committee. Except for such matters that are beyond question frivolous, each such matter shall be reviewed and considered by the Audit Committee. The matter shall be prepared for such consideration by the Chief Compliance Officer or another officer as instructed by the Audit Committee.

4.3 Violations

The Audit Committee shall consider and determine if a violation of this Code has occurred, and possible consequences, if any, for such violation. The consequences may vary from a

written reprimand to a recommendation to the corporate body entitled to discharge the Officer in question to discharge him/her from his/her duties, and may include other measures that the Audit Committee deems appropriate, depending on the circumstances of the case.

4.4 Recording

The Chief Compliance Officer shall keep records of all clearances given by him/her or the Vice Chair of the Board, as well as of all reports made under this Code on suspected failures by the Officers to adhere to the Code or suspected violations thereof. In addition, records shall be kept on all decisions taken by the Audit Committee in respect of matters considered under this Code.

5 Assignments

The Audit Committee may authorize its Chair to resolve a specific matter, or a specific category of matters, under this Code.

Any reference to the Chief Compliance Officer in this Code is equally applicable to his/her deputy.

6 Waivers

Any waiver of this Code may be made only by the Audit Committee and must be disclosed as set forth below.

7 Disclosure

This Code will be published on the Nokia's website. Amendments to, and waivers of, this Code will be disclosed in a similar way.

8 Approval and amendments

This Code is approved, and may be amended, by the Board of Directors of Nokia.

CERTIFICATION

I, RAJEEV SURI, certify that:

1. I have reviewed this annual report on Form 20-F of Nokia Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the company as of, and for, the periods presented in this report;
4. The company's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the company and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the company, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the company's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the company's internal control over financial reporting that occurred during the period covered by the annual report that has materially affected, or is reasonably likely to materially affect, the company's internal control over financial reporting; and
5. The company's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the company's auditors and the audit committee of the company's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the company's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the company's internal control over financial reporting.

Date: March 5, 2020

/s/ RAJEEV SURI

RAJEEV SURI

President and Chief Executive Officer

CERTIFICATION

I, KRISTIAN PULLOLA, certify that:

1. I have reviewed this annual report on Form 20-F of Nokia Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the company as of, and for, the periods presented in this report;
4. The company's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the company and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the company, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the company's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the company's internal control over financial reporting that occurred during the period covered by the annual report that has materially affected, or is reasonably likely to materially affect, the company's internal control over financial reporting; and
5. The company's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the company's auditors and the audit committee of the company's board of directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the company's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the company's internal control over financial reporting.

Date: March 5, 2020

/s/ KRISTIAN PULLOLA

KRISTIAN PULLOLA

Chief Financial Officer

**CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002**

In connection with the annual report on Form 20-F of Nokia Corporation (the "Company") for the period ending December 31, 2019, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned hereby certify that to the best of our knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ RAJEEV SURI

Name: RAJEEV SURI

Title: President and Chief Executive Officer

Date: March 5, 2020

/s/ KRISTIAN PULLOLA

Name: KRISTIAN PULLOLA

Title: Chief Financial Officer

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form F-3 (No.333-218330) and Form S-8 (Nos. 333-223852, 333-223848, 333-216908, 333-216898, 333-212122, 333-210546, 333-210545, 333-202869, 333-194196, 333-187096, 333-179982, 333-173974, 333-157795 and 333-141674) of Nokia Corporation of our report dated March 5, 2020 relating to the consolidated financial statements and the effectiveness of internal control over financial reporting, which appears in this Form 20-F.

/s/ PricewaterhouseCoopers Oy

PricewaterhouseCoopers Oy
Helsinki, Finland
March 5, 2020

March 5, 2020

Securities and Exchange Commission

100 F Street, N.E.

Washington, DC 20549

Commissioners:

We have read the statements made by Nokia Corporation (copy attached), which we understand will be filed with the Securities and Exchange Commission, pursuant to Item 16F of Form 20-F of Nokia Corporation dated March 5, 2020. We agree with the statements concerning our Firm contained therein.

Very truly yours,

/s/PricewaterhouseCoopers Oy

Helsinki, Finland

Attachment: Nokia Corporation Item 16F disclosure

Auditor rotation

The Board of Directors is responsible for proposing the external auditor for election by the shareholders, upon recommendation from the Audit Committee of the Board of Directors. Under applicable auditor rotation rules, Nokia must change auditors from its current auditor PricewaterhouseCoopers Oy (PwC) no later than for the financial year 2020. Accordingly, PwC declined to stand for re-election for the financial year 2020. Therefore in 2018, Nokia initiated a tendering process, overseen by the Audit Committee, for appointment of Nokia Corporation's auditor for the financial year 2020. To give the elected auditor time to prepare for the new audit engagement, the Board of Directors decided to propose the appointment of auditor for the financial year 2020 already at the 2019 Annual General Meeting of shareholders. Based on the recommendation of the Audit Committee, the Board of Directors proposed to the AGM that Deloitte Oy be elected as the Company's auditor for the financial year 2020. On May 21, 2019, the AGM resolved to appoint PwC as auditors of Nokia Corporation for the financial year 2019 and Deloitte Oy for the financial year 2020.

In respect of financial years 2019 and 2018 and the subsequent interim period ended March 5, 2020:

- § PwC has not issued any report on the financial statements or on the effectiveness of internal control over financial reporting of Nokia or any of its subsidiaries that contained an adverse opinion or a disclaimer of opinion. The relevant PwC auditor's reports were not qualified or modified as to uncertainty, audit scope or accounting principles.
- § There has not been any disagreement with PwC on any matter of accounting principles or practices, financial statement disclosure, or auditing scope or procedure, which disagreement, if not resolved to PwC's satisfaction, would have caused PwC to make reference to the subject matter of the disagreement in connection with its auditor's reports.
- § There has not been any "reportable event" as described in Item 16F(a)(1)(v) of Form 20-F except for the material weakness in the design of controls related to the reporting of contract assets, contract liabilities and related balances in accordance with IFRS 15, Revenue from Contracts with Customers, which was identified by management during Q3 2018 and subsequently remediated as of December 31, 2018.

Nokia has provided PwC with a copy of the foregoing disclosure and has requested that they furnish it with a letter addressed to the U.S. Securities and Exchange Commission stating whether it agrees with such disclosure and, if not, stating the respects in which it does not agree. A copy of PwC's letter dated 5 March 2020, in which they stated that they agree with such disclosure, is filed as Exhibit 15.2.
