

# Improving people's lives with technology

We believe we can achieve our greatest impact on the world's sustainability challenges by developing and enhancing solutions and technology that improve lives and provide greater opportunities for people. The continued development and rollout of 5G and IoT has the potential to socially and economically empower any individual, community, industry or country.

# Highlights in 2018

# 6.1

billion subscriptions  
on our customers' networks

# 36

commercial 5G contracts  
as of end April 2019

More than  

# 1 000

mission critical  
network references

More than  

# 23 million

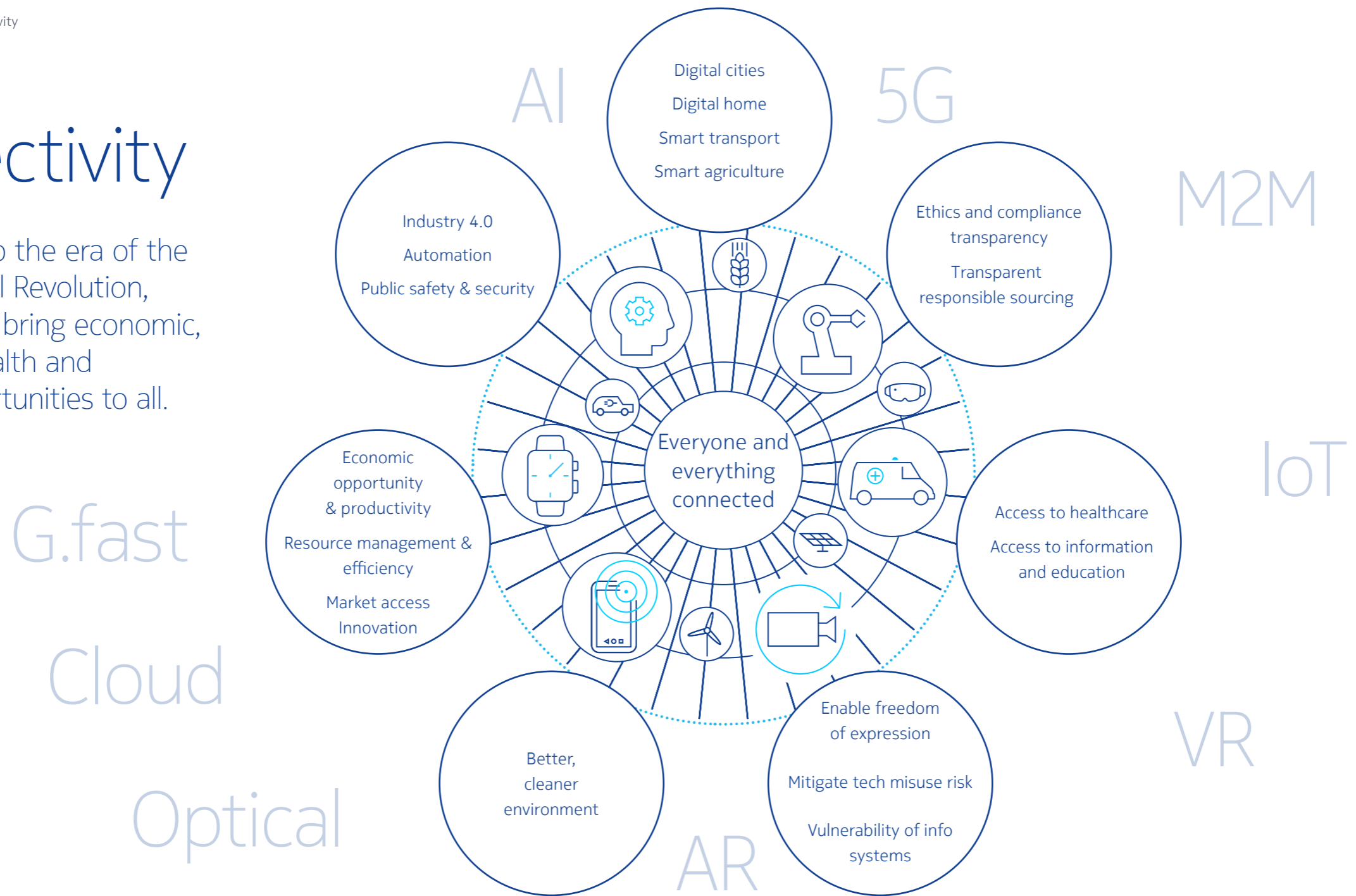
indirect beneficiaries with  
UNICEF mHealth program in Indonesia

# 1.4 million









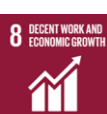











people have directly benefited  
from our corporate community investments since 2016

# Connectivity





















As we move into the era of the Fourth Industrial Revolution, connectivity will bring economic, educational, health and efficiency opportunities to all.



# Our commitments, targets, and performance

Priority area	Material topic	Targets	Achievements 2018	Status
<p><b>Improving people's lives with technology</b></p>                 	Connecting People and Things	<p><b>2022</b> Helping our customers to connect the next billion measured by the number of subscriptions in Nokia radio customers' networks and by the number of fixed network lines shipped to our customers.</p>	At the end of 2018 the radio networks we delivered to our customers served around 6.1 billion subscriptions worldwide, compared to around 5.5 billion at the end of 2016. ✓ <b>Assured</b>	 Ongoing - on track
	Sustainability-related products and services	<p><b>2018</b> 2-3 Nokia Saving Lives solution kits provided and supported by Nokia and used by selected partner organizations in the humanitarian field, proving that Nokia technology saves lives.</p>	Since the target was set in 2016, we have established three kits out of which one was partially funded by GSMA. In 2018 one in the Philippines for the exclusive use of the Red Cross, an earlier one in Germany for Rapid response cases, and one as a spare kit in case of replacements, new developments and for remote support.	 Achieved
		<p><b>NEW target 2019:</b> Establishment of a global rapid response team that can quickly respond in case of disasters.</p>		
		<p><b>NEW target 2019:</b> Establishment of further international relationships with rescue forces and potential funds, so that Nokia Saving Lives can be deployed in a similar mode to other teams as done for the Philippine Red Cross.</p>		
		<p><b>2025</b> Improve the life of 2 000 000 persons through our corporate and key regional community investment programs (baseline 2016), focusing our action on gender balance, education and health and on how Nokia products and services improve people's lives.</p>	In 2018, our corporate and key regional community investment programs had around 304 200 direct beneficiaries. Since the baseline, already around 1 426 600 people have benefitted from our programs. ✓ <b>Assured</b>	 Ongoing - on track

# Our commitments, targets, and performance

Priority area	Material topic	Targets	Achievements 2018	Status
<p><b>Improving people's lives with technology</b></p>                 	<p>Sustainability-related products and services</p>	<p><b>2018</b> Ensure participation of all Nokia employees in corporate health programs to reduce the incidence of cardiovascular disease.</p> <p><b>2020</b> Support the extension of remote patient monitoring of chronic diseases by rolling out patient care solutions using Nokia devices to over 100 000 patients.</p> <p><b>2020</b> Reduce the rate of uncontrolled hypertension from an average 50% of hypertensive adults to less than 10% among the Nokia wireless blood pressure user community.</p> <p><b>2020</b> Ensure integration of data from smart health devices into all major electronic health records accessible to doctors.</p>	<p>In the first half of 2018, as a continuation of our three employee wellness challenges in 2017, we organized a “Relay for Health” step challenge globally, with over 1200 employees participating. In 2018 Nokia divested its dedicated health device business and therefore discontinued the follow-up of this measurement, though we continue to roll out a successful employee wellbeing program.</p> <p>As Nokia sold its dedicated health devices business in 2018, this target was discontinued. We continue to supply network solutions to the healthcare industry.</p> <p>As Nokia sold its dedicated health devices business in 2018, this target was discontinued. We continue to supply network solutions to the healthcare industry.</p> <p>As Nokia sold its dedicated health devices business in 2018, this target was discontinued. We continue to supply network solutions to the healthcare industry.</p>	<p> Not achieved</p> <p> Not achieved</p> <p> Not achieved</p> <p> Not achieved</p>

## Connecting people and things

We are building extraordinary networks, software and ecosystems. We are continually reimagining technology to meet society's many challenges and opportunities, making communities smarter and more sustainable, transportation safer, and enterprises more agile.

We look at how our technology impacts people – enabling them to control and manage their wellness, experiences, choices, lives, and how they explore and experience the world around them. We are focused on the human benefits of technologies that make a real difference in the lives of people and society.

More people and more things will be connected to each other and the world around them. It is happening now. Nokia Bell Labs have looked at the key technological elements that came together and caused previous unprecedented positive change in social, economic and industrial arenas. These areas of technology change were related to energy, transportation, health and sanitation, and

communications. And today we see the digitalization of these key technology areas:



**Digital energy:** combining smart power grids and smart meters into platforms that dynamically match energy generation and demand from both new and traditional sources



**Digital transport:** moving people and goods across oceans, skies, and land autonomously



**Digital health:** remotely enabling connected health care from anywhere



**Digital communication:** connecting billions of people and things, allowing them to interact in new ways



**Digital production:** driving a major shift from mass production to distributed, localized production, enabling the creation of goods in near real time

Furthermore, the digitalization of production and manufacturing will result in a shift from centralized mass production to distributed and localized production facilities.

### Technology and sustainable development

With the advent of such technologies as 5G, IoT, and AI, individuals and communities will be more economically and socially empowered. Through technology we are already seeing the initial efficiency promised by the fourth industrial revolution: smart cities that are more efficient, safer, cleaner and more secure; increased access to digital health; and better management of natural resources through digitalized utilities, building towards a purpose-driven economic model. As we move into a new era of technology, we also recognize and aim to mitigate potential risks, many already hotly debated in society as a whole. The social issues related to technology include automation and the changing landscape of jobs and talent acquisition, the role of AI and big data in privacy, the enhanced security of smart cities, the misuse of technology, and the impact of smart devices on society.

### This activity supports SDG Targets:



9.c: Significantly increase access to information and communications technology and strive to provide universal and affordable access to the internet in least developed countries by 2020; and

9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human wellbeing, with a focus on affordable and equitable access for all.

## Connecting the unconnected

In 2018 we had sales in approximately 130 countries, delivering technology that improved network capacity and coverage in many emerging markets and announced new cooperation in countries such as Sudan, Egypt, Ivory Coast, Cameroon, Senegal, Mali, Guinea-Bissau, Niger, Lebanon, the Philippines, Nepal and India. We participate in the Telecom Infra Project (TIP) [telecominfraproject.com](http://telecominfraproject.com) and also created the Nokia Community Hosted Network solution to help connected rural and remote locations. Examples of customer projects can be found at [www.nokia.com/sustainability](http://www.nokia.com/sustainability).

### 5G – the great enabler

5G is one of the most important technologies to be introduced in decades, as it will drive fundamental and expansive changes to the communications network infrastructure. Delivering extreme broadband and highly reliable low latency connectivity at massive scale, it will provide new experiences for consumers and address the different needs of businesses, transforming every aspect of our lives.

5G is critical for use cases such as virtual and augmented reality, e-education and e-health, industrial applications, machine-to-machine (M2M) communications as well as mission-critical communications. Smart cities will be fully enabled by 5G. 5G will drive gains in healthcare and education, enable safer roads with connected cars, and even eliminate hazardous situations for workers as risky tasks could be performed by robots. We are continuing our work with the European Commission to advance the 2020 5G trial plan activity across

member states, and currently have approaching 100 engagements globally for 5G.

In 2018 we announced, among others, agreements and collaboration on 5G with China Mobile, and rain in South Africa, inked a 3.5 billion dollar multi-year 5G deal with T-Mobile in the US, collaborated with NTT DoCoMo in Japan on 5G applications, and launched Nokia Reefshark chipsets that will enable massive performance gains in 5G networks. Learn more about how 5G will deliver the extraordinary at [networks.nokia.com/5g](http://networks.nokia.com/5g).

Our fiber access solutions support bandwidth-hungry consumer and enterprise services to homes and businesses. In January 2019, for example, we announced the collaboration with Open Fiber to bridge the digital divide in Italy by building high-speed fiber optic communication networks that will bring ultra-broadband services to the small towns and rural areas of Italy.

In 2018 we also worked, for example, with Telecom Egypt to offer higher-speed services to both broadband and mobile customers marking the first 200G long distance, single carrier transmission service in Africa.

### IoT

Everything and everyone will be connected and the Internet of Things will continue to play a key role. IoT will be an integral enabler of smart cities, the smart home, utilities, agriculture, automotive, public safety and healthcare. As 5G takes off we will see a proliferation of IoT devices and this will

require increased security capabilities to defend against malware and bots with solutions such as our NetGuard Security Suite. Read more in our latest [Threat Intelligence Report](#).

For example, we are working with the world leader in package delivery services, with more than 500 hubs in the USA and another 400 around the world. We are creating a next-generation, fully automated wireless network that encompasses voice, data, mobile, and IoT for tracking packages and vehicles in one seamless system.

### Artificial Intelligence

AI and Machine Learning are already playing a key role in making communications networks more efficient and will optimize future networks and enable a broad range of new services over 5G and cloud. In June 2018 we announced a memorandum of understanding with China Mobile to investigate the potential of AI and machine learning to enable these services. The companies will jointly establish a laboratory in Hangzhou, China, to develop the demo system to verify technology use cases using Nokia 5G Future X architecture. We also contribute to the responsible development of AI technology with participation in the EU High-Level Expert Group on AI which issued their ethics guidelines for trustworthy artificial intelligence. Read more at [Ethics guidelines for trustworthy AI](#).

## Smart City Infrastructure

Shared + Secure + Scalable



### Digital lives

As the world becomes more densely populated, as more and more people live in large cities, there are serious questions being raised about the livability of those cities.

Congestion, pollution, infrastructure, access to services, and many more issues are creating challenges on an unprecedented scale.

### Smart cities

Cities can be smarter, safer and more sustainable by using smart technologies to connect, engage and empower citizens, to develop innovative city services, manage public safety more proactively, streamline

operations, reduce traffic congestion and ease stress on city infrastructure, and attract visitors, businesses and talented workers.

IoT for Smart Cities is a fully integrated, modular and scalable framework to efficiently deliver and manage smart city services like video surveillance, lighting, parking, waste management, and environmental sensing.

For example, Chattanooga, USA, is one of the only places on Earth with internet speeds as fast as one gigabit per second, and its unparalleled smart grid system has led to a string of entrepreneurs and start-ups taking advantage of Chattanooga's

advanced technology infrastructure. Learn more about [The Surprising City of the Future](#).

The city of Bristol, UK, has numerous awards. Driving this success is the unique digital infrastructure in place, offering state-of-the-art fiber broadband networking capability to its citizens. A new home of entrepreneurial tech industries is growing. In fact, their commitment to ensuring connectivity in the city is so great that they're investing millions of pounds to explore the possibilities of technology. Learn more at [www.bristolisopen.com](http://www.bristolisopen.com).

In 2018, we worked with Singapore-based telecom operator StarHub to look into new mobility analytics



use cases to help operators create value from the data in their networks to address the needs of digital cities. We also introduced services to solve challenges of urbanization. IoT for Smart Cities and Sensing as a Service show the benefits of IoT in building economically and environmentally sustainable cities.

In October 2018, we successfully demonstrated our Integrated Operations Center (IOC), a smart city management solution, to Viettel in Hanoi, Vietnam. Once deployed, the IOC will allow Viettel's customers to efficiently manage several smart and safe city use cases such as traffic monitoring, pollution detection and water quality monitoring.

In early 2019, MIRIS, a leading Norwegian real estate and technology firm, selected our AirFrame Open Edge data center technology to support delivery of smart city services in business parks and residential areas. MIRIS plans to build data centers in about 20 urban locations in Norway during 2019, followed by a wider roll out across the Nordic region. Read more in our [press release](#).

Learn more about our work with Smart Cities [networks.nokia.com/industries/smart-city](https://networks.nokia.com/industries/smart-city).

### Public safety

We help public safety agencies use broadband networks and digital technologies to improve the effectiveness of first responders, address threats predictively and make faster, more informed decisions.

For example, we offer a comprehensive public safety services portfolio to simplify the evolution



towards broadband while assuring mission critical reliability and performance. We have more than 1 000 references for mission critical networks and 346 references for commercial LTE networks. For example, in Qatar, we are implementing a nationwide LTE network for public safety providing agencies like fire brigades and medical emergency services clear benefits of high-speed data in their daily work.

Nokia Scene Analytics solution processes thousands of simultaneous streams from CCTV cameras, audio

and IoT sensor data, allowing for real-time incident alerts. Security teams are immediately notified when the solution flags emergencies and potential criminal activity such as vandalism, theft, or drug and human trafficking.

For more information on our approach to public safety visit [networks.nokia.com/industries/public-safety](https://networks.nokia.com/industries/public-safety).

Our Future X architecture harnesses technologies such as Industrial Internet of Things, edge computing, cloud, artificial intelligence, machine learning, augmented and virtual reality, and high-performance networking – including 5G – to drive dramatic productivity improvements across a wide range of industrial sectors.

For urban safety, we introduced S-MVNO for Public Safety service, which enhances commercial LTE networks to meet mission critical requirements of public safety agencies.

### Digital industry – Allwhere

Our Future X architecture is the foundation upon which industry will build its next great age. The Industrial Internet of Things will benefit all key industries – energy, utilities, manufacturing, automotive, health, and transportation among others.

For example, in 2018 we worked with Finnish operator Telia and Intel to conduct an industrial trial leveraging the ultra-low latency, high-bandwidth capabilities of 5G to support time-critical applications and enhance production and efficiency in a manufacturing environment. We announced our cooperation with Tencent in China, one of the world's biggest online service providers to develop new 5G applications while exploring 5G's potential in transportation, finance, energy, intelligent manufacturing and entertainment.

5G allows operators and businesses to connect assets and take advantage of new flexibilities and

capabilities such as machine learning, artificial intelligence and widespread automation to efficiently transform operations.

### Utilities

Power utilities can build an efficient smart grid that enables new opportunities for sustainable energy offerings. Our solutions help manage grids more efficiently to deliver better power quality, improved resource efficiency and reduce carbon emissions. Our solutions provide power utilities with a network that can reconfigure itself, using real-time monitoring to detect and address issues as they arise.

In 2018, we were selected by French power utility EDF's R&D unit to test the performance of LPWA wireless networking technologies - key emerging standards for Internet of Things (IoT) device connectivity - to support critical operations for industries. The two companies will engage in a comprehensive testing regime, among the first of its kind in the industry, exploring the capabilities of LPWA technologies to support real-world industrial applications.

We also began work with Brazilian power distributor Elektro to deploy a private LTE network to increase the reliability and efficiency of the electrical grid in the City of Atibaia and surrounding areas in the state of Sao Paulo. This highly reliable wireless 4G network, the first of its kind in Brazil, will serve more than 75 000 homes and businesses.

Water utility companies also benefit from our technology. For example, in 2018 in Noida, India,

we made a commitment and investment in a smart water management end-to-end solution portfolio, where one of the main business results is reduction of water leakages from double to single digit percentages. We have also worked with the Thames Water authority in the UK on waste water management, improving resource utilization, minimizing failure on the network, and reducing flooding, and pollution.

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For more information on how we are helping cities and communities go digital, visit [www.nokia.com/sustainability](http://www.nokia.com/sustainability).

## Technology that makes a difference

Our advanced technical solutions help to reduce the impact of natural disasters and enable the transformation and modernization of community health services.

### Saving Lives

Nokia Saving Lives (NSL) is an innovative non-profit initiative which aims to bring the advanced technical solutions to the crisis field for humanitarian purposes. Based on a portable LTE network, LTE connected drones, and a portable data center for analysis functionality, NSL is operated under the collaboration of humanitarian actors and Network Communications Service Providers.

NSL also supplies technical experts to operate the solution during disasters, following the rules and regulations of humanitarian actors. This helps to prevent a delay in the use of the solution in the emergency area due to a lack of understanding of operational processes and technology. During a disaster, network infrastructure can be severely damaged at a time when commercial network traffic dramatically increases as people try to reach their loved ones. The NSL's portable LTE network can be moved to wherever a network doesn't exist, to enable fast decisions and saves lives.

Furthermore, Network Communications Service Providers own the spectrum to implement NSL



©UNICEF/Rabenstein/2018. Children enrolled in Class One of Islamia Primary School in Nairobi are using the Digital Literacy Project tablets procured by the Kenyan Government.

effectively. Read more at [networks.nokia.com/innovation/nokia-saving-lives](https://networks.nokia.com/innovation/nokia-saving-lives). We progressed our Saving Lives Innovation initiative where we combine the capabilities of the ultra-compact LTE network with drones and drone video applications for search and rescue missions.

NSL was deployed for crisis management and rescue in the Philippines on 23 Nov 2018 in collaboration

with the Philippine Red Cross (PRC) and Smart Communications, who provided the spectrum to operate the solution. The NSL program in the Philippines is partially supported by GSMA.

The disaster management process was implemented to address two types of incidents (for example, landslides and pregnant women involved in car accidents) during search and rescue operations. After

LTE-connected drones mapped the disaster scenario, the information was safely and securely stored in the portable data center. The scenario was then analyzed using this data and the information was promptly forwarded to PRC for rescue and disaster management. Aside from mapping the impacted areas, the swarm of drones connected via this instant private LTE network also streamed live video to PRC, enabling the organization to save crucial minutes that spell the difference between life and death for those affected.

We will continue partnering with operators and NGOs on this initiative to help rescue operations in different countries, offering a limited number of our Nokia Saving Lives technical solutions on a non-profit basis.

### Corporate community investments

Our corporate community investment emphasizes the role of technology in improving lives by connecting the unconnected, empowering women and girls, and saving lives. In 2018, we rolled out five corporate programs at the global level. These programs included connecting schools in Kenya and the mHealth program in Indonesia both with Unicef. We also finalized our long-running program of support for education in Myanmar with Save the Children. Our greenlight for girls program also continued in 2018. We also ran our Season's Greetings voting campaign amongst employees benefitting three chosen charities.

### Making a real difference in 2018

With Nokia's support, Unicef Indonesia supports the Government of Indonesia to transform and

modernize community health services by introducing innovative mHealth applications, to improve health at the community level. Directly reached beneficiaries are those with whom we had direct contact in 2018, for example, 4 400 newborn-caregiver pairs who received immunization reminders to vaccinate their newborn children (pairs who had been registered in 2017 and continued to receive reminders due to continuous vaccination needs in 2018 and new pairs with newborns that were newly identified with vaccination needs, registered and received reminders in 2018), and also 51 000 vulnerable children who, with the support of RapidPro, were identified and connected to health facilities through UNICEF's program. Indirect beneficiaries are those vaccinated by the health facility staff (23 201 669 beneficiaries for year 2018) and those who received malaria bednets (3 133 556) as part of national Ministry of Health campaigns which were monitored and supported through the mHealth platform.

We also have regional and country-based NGO cooperation. Our strong presence in India is shown also in our ongoing local community investment programs which link closely to our three global corporate community investment themes. Our Kanchiloom project in India continued to enable weavers to learn IT and business skills in order to enhance their income by improving their market access. We also announced Smartpur project that aims to develop 500 digitally integrated and sustainable villages across India in line with the government's vision of Digital India. More details on our key programs can be found in the [Making change happen together](#) section of this report.