Committee: ITU1
Issue: Guaranteeing safe, secure, ethical and sustainable implementation of 5G at a global scale
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ICTs for SDGs:

The International Telecommunication Union is a UN organisation that aims to standardise, harmonise and regulate the development of information and communication technologies (ICTs) at a global level. One of its objectives is to promote inclusiveness and universal access to these technologies. ITU also collaborates with other UN organizations to effectively harness the potential of ICTs to meet the Sustainable Development Goals (SDGs).

# Guaranteeing safe, secure, ethical and sustainable implementation of 5G at a global scale

1. Introduction

Downloading a two-hour film took 26 hours via 3G, which corresponds to the duration of a flight between Switzerland and Mexico. Downloading this same movie will now take 3.6 seconds using 5G, which is the amount of time it takes for a person to ask themselves the question: "Is this movie downloaded?". Since 1G that appeared in the 1970s, these technologies have only evolved very strongly, allowing us to live in an increasingly connected world. The development of mobile networks has led to crucial improvements in fast connectivity, allowing users not only to carry out the same tasks more efficiently, but also to develop new forms of digital activity and new applications for these technologies.

Mobile services - those affected by the implementation of the 5G network - are in many cases the most readily accessible form of digital communication tool. In 2018, while almost 60 per cent of households had Internet access at home, fewer than half of households had a computer at home, highlighting that a substantial number of households accessed the Internet through other means, most importantly through mobile devices. There are now over 5.13 billion people - that is, 66.53% of the world's population - with mobile devices worldwide.

What's more, according to ITU, almost the whole world population now lives within range of a mobile-cellular network signal, and most people can access the Internet through a 3G or higher-quality network. Mobile-cellular telephone subscriptions continue to grow, and Sub-Saharan Africa - one of the regions most heavily challenged by lack of connectivity - is the fastest-growing region for mobile device ownership in the world. It can be expected that developing countries, and especially LDCs, will slowly catch up with the rest of the world. This means that mobile communication - including 5G - is an extremely promising path for global development.

Chart 1.14: Mobile coverage by type of network, 2007–2018*
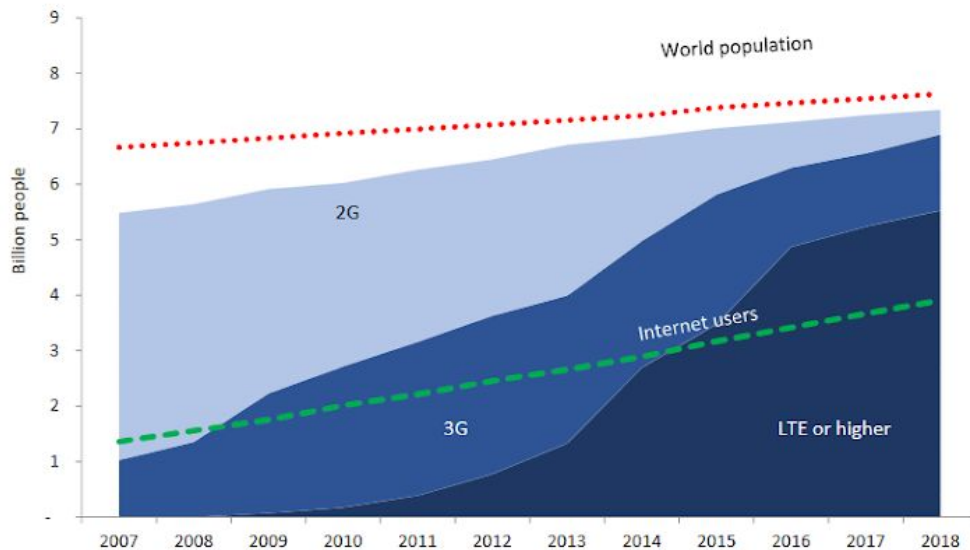
Source: ITU, "Measuring the Information Society Report", 2018

The advent of this new mobile network, which according to ITU will be operational in 2020, offers both new opportunities and new challenges. Indeed, how can we guarantee a stable and secure 5G without further aggravating the digital divide? How can we orient the 5G network towards the objectives of the SDGs? What standards and treaties are needed to ensure the effective functioning of 5G at a global scale? Many questions arise about a network from which so many innovations are expected, as ITU Secretary-General Houlin Zhao testifies: "5G is coming fast, and it will have great power to transform our lives for the better."

ITU states that Artificial Intelligence (AI) and the 5G mobile network are the two factors that will make it possible to turn an average society into an intelligent society. Indeed, 5G is the next telephone network that will be used to meet the needs of humanity. As for the AI, it should make 5G networks more efficient in terms of data interpretation, and thus make systems intelligent, autonomous and connected.

However, there is also a range of difficulties associated with 5G and its application. While new technologies like 5G have a tendency to attract attention and investment, nearly half of the total population still has no access to the internet, and in 2017 only 56 percent of people living in LDCs owned a mobile phone. In responding to this issue, it is important to consider questions of accessibility and integration, and to take into account existing digital divides and global inequalities. Furthermore, as "intelligent companies" become dependent on AI and 5G, how can we manage the problems of cybersecurity, personal data, and data analysis this will entail? What rules should be established to keep control of 5G and to prevent it from passing into the wrong hands, which will affect the safety of others? It is therefore crucial to place an international legal framework on these new technologies, which are proving to be both promising and dangerous.

Key words

- **5G or IMT-2020**

IMT is the general term used by ITU to refer to 2G, 3G, 4G, 5G and the next mobile networks that will follow. ITU calls 5G "IMT-2020" because this network should be deployed from 2020 with tests and activities to evaluate the technologies that could be used by 5G. By carrying more data than previous networks, by reliably connecting a very large number of devices in a very short time, 5G expects to connect people, objects, applications, cities and transport more easily, in an intelligent environment. 5G should help us to achieve the objectives of the SDGs more quickly and therefore those of sustainable development. As a result, this new mobile network promises a high level of security, reliability and stability on a global scale.

- **International Telecommunication Union (ITU)**

The International Telecommunication Union (ITU) is a United Nations (UN) organization focused on the development of new information and communication technologies (ICTs), based in Geneva. Thus, the development of the 5G network is at the heart of this organization's thinking. ITU plays a major role in the development of globally applicable standards for IMT-2020, including ensuring stable regulations at the international level. On 22 May 2019, ITU organized the World Radiocommunication Conference (WRC), during which many countries and organizations reached consensus on the deployment of IMT-2020.

- **Sustainable Development Goals (SDGs)**

The Sustainable Development Goals (SDGs) are the 17 goals that the UN sets for us. They show us the way forward to a better and sustainable world by confronting current and global challenges and problems. The goal is to achieve these interconnected goals by 2030: no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, clean and affordable energy, decent work and economic growth, industry, innovation and infrastructure, climate change action, aquatic life, land life, peace, justice and effective institutions and partnership to achieve the goals. The 5G network must contribute to achieving these objectives because it must be a technology that can help humanity reduce inequalities and fight global warming. while ensuring the use of clean energy.

- **Artificial Intelligence (AI)**

Artificial intelligence is a robotic system or a computer program created by humans and capable of performing "intelligent" tasks while being autonomous. This includes the observation or analysis of a situation, the ability to make decisions and engage in conversation with a human being and to perform several hundred specific activities

requested by a human. With the deployment of 5G, many AIs will be able to be functional, making companies "smart" and connected.

- **Mobile network**

A mobile network is a telephone network system that operates on frequencies that form a wireless spectrum. It therefore allows millions of users to make calls at the same time without any immobility constraints and it generally allows any connected device to establish a communication. There are seven different mobile networks. 5G is therefore the future mobile network that will be deployed in the 2020s.

- **Latency time**

Latency time refers to the time between an action and the initiation of a reaction, i.e. a delay. In our case, latency time refers to the time it will take for 5G to take action, such as downloading an application to a smartphone. It is estimated that the latency time increases from 120 milliseconds with 3G to 1 millisecond with 5G.

- **Frequency band**

A frequency band defines a range of frequencies of radio waves that have similar properties in propagation and material penetration. Each range represents a frequency spectrum. 5G requires a significant amount of new harmonized mobile frequencies, including three key frequency bands representing a certain infrastructure investment that can exceed €6 billion.

- **Digital divide**

The digital divide most often refers to unequal access to digital technologies. This inequality is strongly marked by the North/South boundary that separates developed countries from developing or emerging countries, it is an imaginary line that illustrates the inequalities of development at a global scale.

- **Backbones**

Internet backbones refer to the physical infrastructure, typically fiber optic trunk lines and submarine cables, which connect various pieces of the global network, including computer networks and core routers. Without this infrastructure, 5G implementation is impossible.

2. Overview of the issue

a. The evolution of mobile networks since the 1970s

For nearly fifty years, ITU has continued to develop standards and arrangements for the deployment of mobile networks. During the 1970s, 1G appeared. It was the first generation of mobile networks that led to two major advances: the invention of the microprocessor and the digitization of the control link between the mobile phone and the cell site. Ten years later, in the 1980s and 1990s, the second generation of mobile networks was born: 2G. This second wave made it possible to invent the voice signal in particular. At the 1992 World Telecommunication Administrative Conference, a major decision was taken to identify the global frequency bands for the operation of new telecommunications systems, now called international mobile telecommunications systems (international mobile telecommunication = IMT). Then, through ten long years of study and work, the radiocommunication sector established technical standards for the third generation LMI systems, 3G. These standards were approved at the Radiocommunication Assembly (ITU-R) in 2000, which made it possible to develop new services such as geolocation. The fourth generation was born in January 2012 and is called "IMT-advanced". These new IMT systems are significantly more advanced than those of 2000. Beyond facilitating telecommunications services, the long-awaited 5G will facilitate our ways of living and communicating via an intelligent and connected network in 2020.
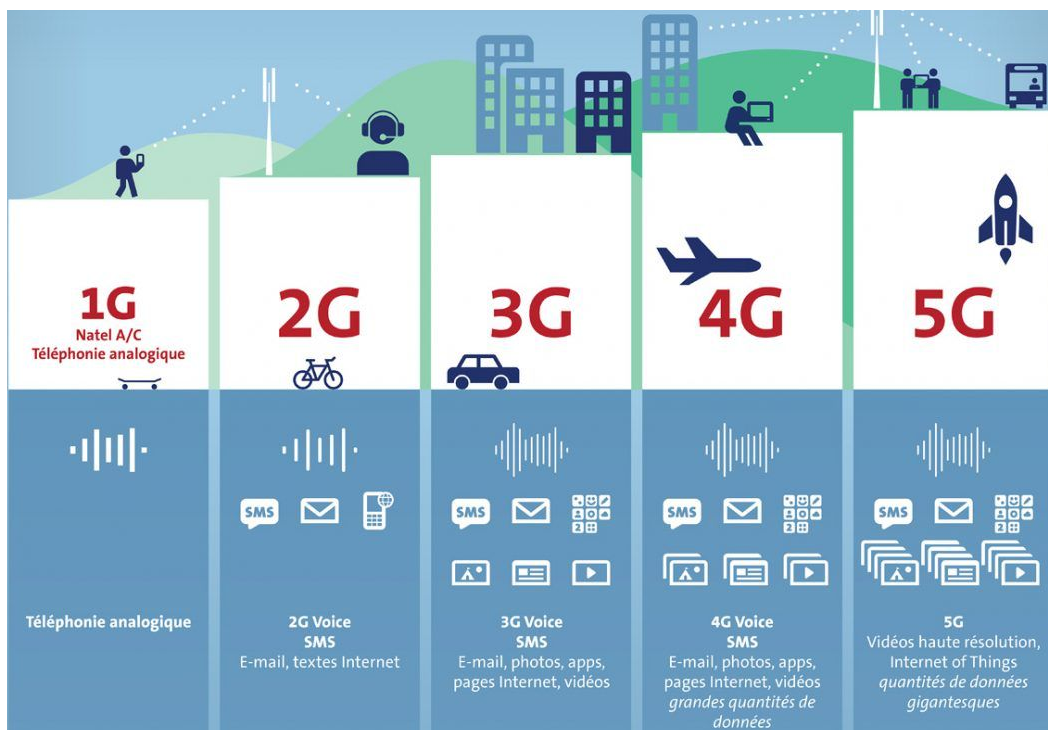

b. The advantages of 5G

[1] *Evolution of mobile networks since 1G with their characteristics, source :*
https://static.wixstatic.com/media/12550c_c3f0a5a2de1a4d2bbd09b53c158e1ebd~mv2.jpg

5G is the next generation of mobile networks that will emerge in a world facing climate change, a growing digital divide, national inequalities, poverty and many other challenges. Thus, humanity expects much more from 5G than a simple telephone network. 5G is a way to connect two people at the ends of the world in an unprecedented amount of latency. It iwill hopefully reduce inequalities between populations and countries. It can contribute to the objectives of sustainable development and be a symbol of peace and prosperity depending on how this network is used.

i. The promises and prospects of 5G

5G is multifunctional. Indeed, in addition to being an efficient mobile network, it makes it possible to connect people and to facilitate their daily lives, and to connect massive machines while reducing the digital divide and developing the market for ICT (Information and Communication Technologies).

*Diagram showing the different uses of 5G*
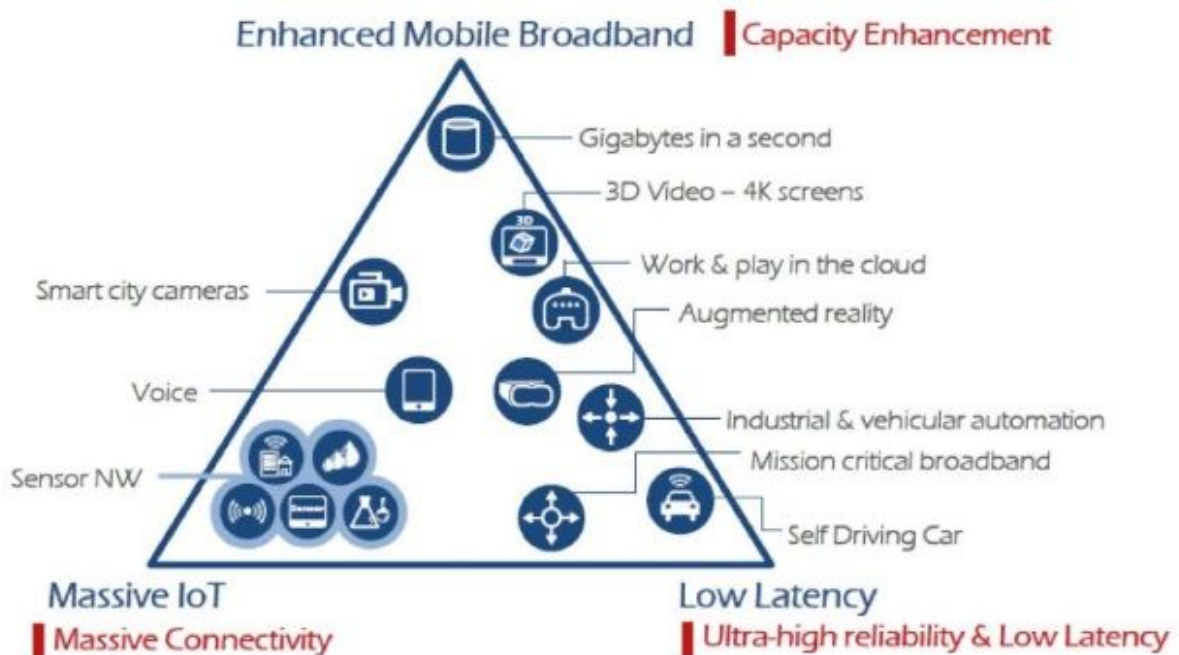
(Source: ETRI graphic, from ITU-R IMT 2020 requirements)

In addition, 5G has certain economic, social and cultural impacts:

❖ First of all, it is an asset for education. Indeed, this mobile network can change learning methods by providing access to digital textbooks and thus, students will have at their disposal more knowledge in the field of computers and the dangers of the Internet. On the other hand, this system could increase inequalities and the digital divide between rich and connected schools in developed countries where students benefit from a quality education and schools in developing countries where it is still difficult, today, to find teachers, and where the installation of 5G coverage is very expensive. It is therefore crucial to find a consensus that 5G should be useful and beneficial for countries and schools whose quality of education is not yet optimal for students.

❖ Secondly, 5G brings about social change. Indeed, because its latency time is minimal (equal to 1 millisecond), individuals can exchange information faster and communicate via social networks. As people will be able to connect more quickly with each other, this will reduce social inequalities for countries that benefit from 5G.

❖ Economically, 5G is very beneficial in terms of profits and job creation. Indeed, one of ITU's estimates predicts a generation of 12,300 USD by 2035. The European Commission (EC) estimates that if the 28 Member States deploy 5G in their countries, it will cost 56 billion euros. This investment would generate economic benefits of €113.1 billion and create 2.3 million jobs. However, since this 5G network has not really been tried and therefore secured, it is preferable for decision-makers and economic agents to make 4G more efficient by making it more available.

❖ Finally, on the cultural level, in cooperation with AI, 5G will be able to help individuals create works and participate in collective performances. 5G will allow people to create a virtual world and thus forge their own culture.

Diagram illustrating the impacts of 5G

https://images.frandroid.com/wp-content/uploads/2014/10/5G-PPP.jpg
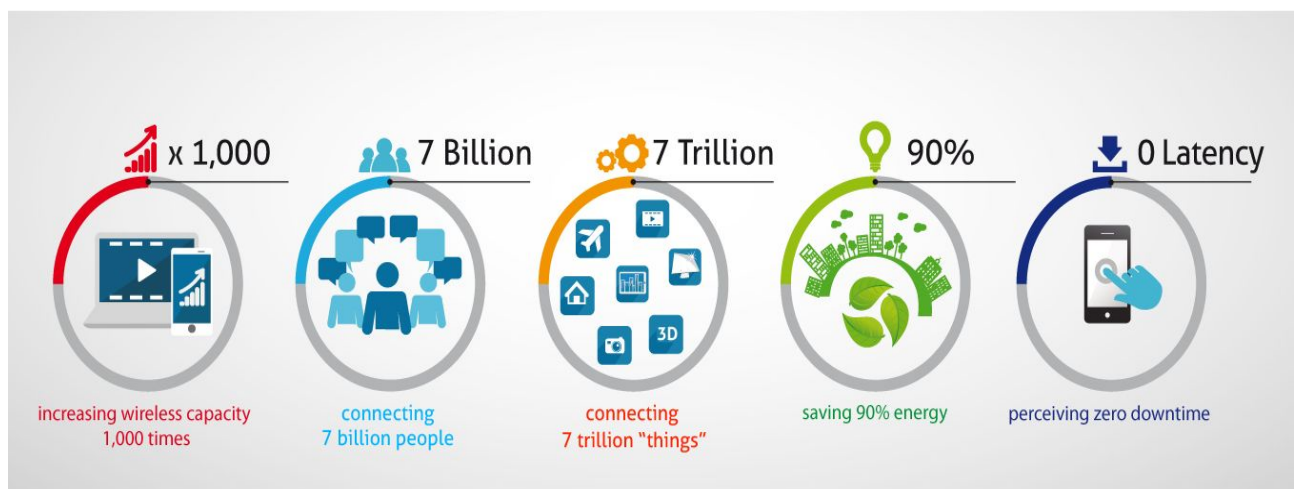
ii. 5G in an ideal world

1. 5G and transport

Thanks to 5G, transport data flows more freely and quickly, thus allowing data sharing and access, which is a fundamental right, to be respected. In addition, the development of 5G can allow new collaborations between applications, thus promising prosperity between the different agents that own these applications. In addition, 5G allows each object to be connected to the road, providing a real experience for drivers and users. As a result, these connected objects can facilitate the driver's driving over time, for example. However, the same questions remain: are these objects reliable? Will the owner of these connected objects be found guilty in the event of an accident?

2. The effect of 5G on autonomous cars

When 5G is established, it will have a certain impact, particularly on cars that will become autonomous. That is to say, the driver will no longer have to "drive" the car will "drive by itself" to the destination the driver has chosen. In this way, the automotive industry will be open to change. Indeed, the goal is for this industry and 5G to facilitate the driver's driving. As a result, new business models will emerge between different motoring companies that will gradually gain the trust of users and other sectors. Once again, new questions are emerging: if an accident occurs, who is responsible between the driver and the autonomous car? If car companies turn to 5G, which is still inaccessible in developing countries, it would not only increase the digital divide.

3. 5G's strengths in health

Nowadays, healthcare teams are increasingly turning to technology to facilitate the work of doctors, so 5G would be accepted all over the world to successfully treat all patients. The goal of 5G and health care is the same: to improve the well-being and quality of life of every patient. 5G and health care are therefore complementary. In addition, 5G would be requested by each health professional to reduce their workload. 5G would be more than beneficial in developing countries where again too few hospitals are present to meet the needs of all patients. In addition, in cooperation with artificial intelligence, 5G could be responsible for night shifts in hospitals and health facilities, thus giving doctors a longer rest period. However, a new problem is emerging: would a patient accept to be treated by an artificial intelligence using 5G? This problem of telemedicine and e-health is very topical because people will have to put their health and sometimes their lives back into the hands of machines. As a result, patients are concerned about the quality of these new technologies and do not have confidence because if the machine makes a mistake and causes even more serious injuries or even death of the patient, who is responsible for this error? Are the populations also ready to use 5G and to assume its consequences?

Thus, when 5G is developed, new business models will certainly emerge, but it is essential that they be based on a strong and clear legal framework and regulations and that each

person can express himself and give his point of view on the advent of 5G in the medical sphere.

4. 5G paves the way towards the objectives of the SDGs

Because of its scale and scope, 5G should accelerate the achievement of the 17 sustainable development goals (SDGs), affordable energy and zero hunger. Indeed, it is the network that will be able to reduce inequalities between countries and reduce the digital divide. The UN has set 17 goals on sustainable development: The SDGs. The artificial intelligence that is already exercised today in many countries must respect these objectives. 5G, on the other hand, will enter into force and will only consolidate AI and thus accelerate the achievement of these objectives.

The ways in which AI and therefore 5G will be able to achieve the objectives of the ODDs

c. The difficulties involved with 5G

2   *source :*
http://44qewv8ie16ohghf2s78zn7f-wpengine.netdna-ssl.com/wp-content/uploads/2017/05/ai-for-good-1.jpg

5G is certainly a very advantageous technology for everyone, but it remains an expensive mobile network.

i. 5G, an expensive technology

Like any technology, 5G is a new mobile network that requires some investment, regardless of the country. According to ITU, the investments that are made by each operator vary according to the number of inhabitants, population density, current 4G coverage and the proposed coverage area.

Several estimates have been made for each country:

-In England, the estimated investment could amount to GBT 71 billion for a 5G network operation over 10 years, from 2020 to 2030

-The deployment of 5G in the United States would cost USD 300 billion

-In Europe, the cost of deploying 5G would vary between 300 and 600 billion euros

-In China, 5G spending represents 57% of global technology spending

Given the scale of this investment, decision-makers will have to consider various investment models: public-private partnerships, loans, promotion funds. The State can intervene and finance part of the investment in partnership with the market of 5G as is the case in Germany. This investment, regardless of its size, has many advantages, as shown in the graph below:
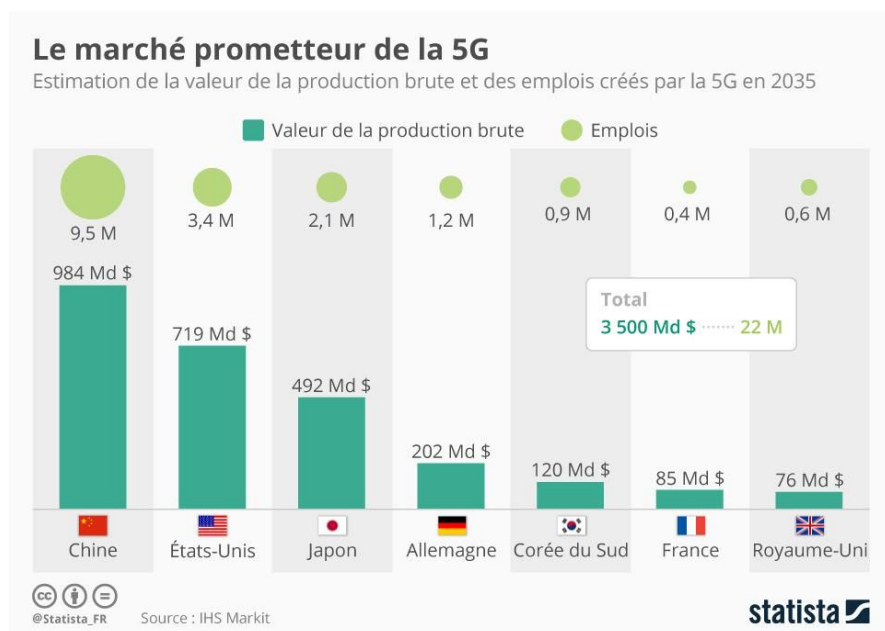
ii. The impact of 5G on the digital divide

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[3]   *source : http://infographic.statista.com/normal/chartoftheday_9691_le_marche_prometteur_de_la_5g_n.jpg*

Our world is marked by the digital divide. In other words, it is divided in two and differs first of all between the developed countries of the "North" and the developing countries of the "South". This separation is characterized in particular by wage, health, technological and other inequalities and by the GDP of the countries. As 5G is a very expensive technology, only the "northern" countries could afford it, which would further increase this digital divide even if developing countries need it more to meet their needs.

5G would initially be deployed in densely populated urban areas where demand is very high. Then it would be deployed in a second phase in rural areas where demand is generally lower. However, there are frequency bands below 1 GHz that could counter this phenomenon. Indeed, these frequency bands allow mobile operators to provide for people in large areas at a lower cost than higher frequency bands.

iii. Difficulties related to the deployment of 5G

The difficulties associated with the deployment of 5G are multiple:

❖ According to ITU, deployment affects the regulations and standards that are to come into force when 5G is deployed: the length of the authorization and planning process, which can last from 18 to 24 months, the length of the agreement process between the different markets, the fees and the costs involved.
❖ The deployment of 5G has a human factor. Indeed, beyond a certain limit, humans are likely to be exposed to radiofrequency electromagnetic fields that are harmful to health. This limit differs from country to country. However, ITU recommends that the regulations and therefore the limits set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a non-governmental organization affiliated to WHO, be applied.
❖ According to ITU, access rights and rights conferred by the code can also be a problem for 5G deployment. Indeed, decision-makers may not have the right to install radio communication tools on urban devices, such as a bench or a street lamp. In the United Kingdom, the code has therefore been reviewed and rescheduled to make it more flexible regarding the deployment of 5G.

Other difficulties arise related to the 5G spectrum. Indeed, 5G is a new technology that must be established worldwide, so its harmonized spectrum portions must be accepted and recognized by the global community and any organization or authority. The deployment of 5G will be the factor for peace between countries and will optimize existing resources.

iv. 5G and cybersecurity issues

In many countries, laws are beginning to be reviewed to encourage the deployment of 5G while minimizing as much as possible the associated cybersecurity problems. In France, the

National Defence has reviewed a law on the security of mobile telecommunications networks, which aims to secure networks for 5G. This new technology is both expected and feared in terms of security given that, when it comes into force, billions of objects will be connected without being secured. In truth, only 2% of the connected objects are secure.

Cybersecurity in the age of 5G and the Internet of Things, based on USA survey data.
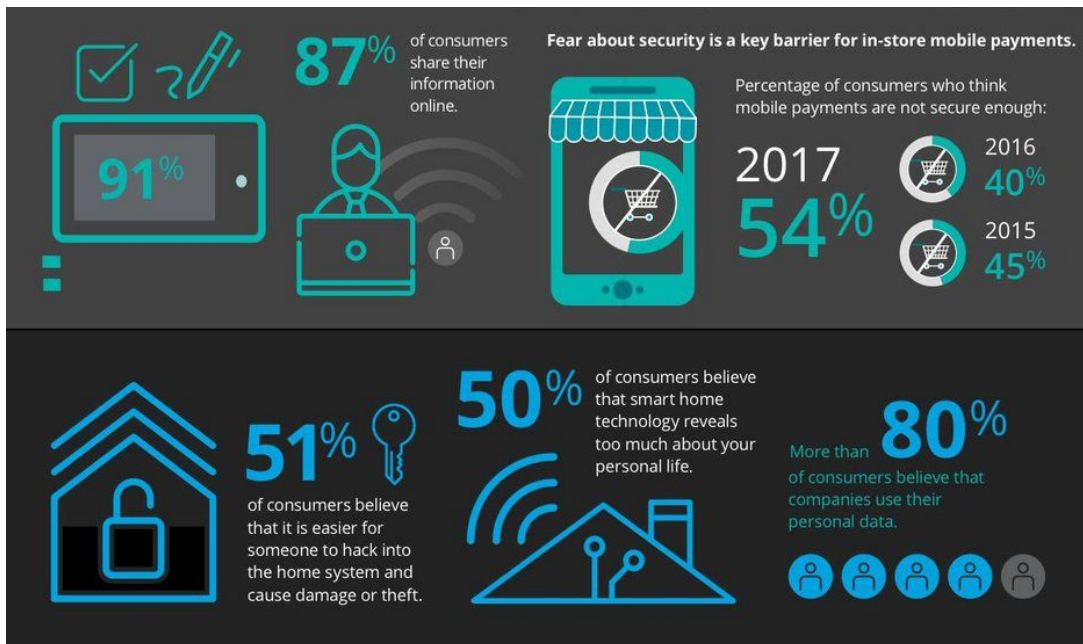
Source: Deloitte Global Mobile Consumer Survey: US edition, 2018

Nowadays, 5G is at the heart of tensions between several countries and companies. Some countries believe that it is far too risky to entrust private companies, especially companies based in foreign countries, with the deployment of 5G because too many sectors with a direct affect on people and their safety come into play, such as health, banking and energy.

AI could be a solution to all these problems. Indeed, artificial intelligence could detect the cybersecurity risks associated with new technologies. But again, are agents ready to deliver a responsible AI, ensuring a flawless network? Are people ready to trust a brand new technology and put their own security in their hands?

3. Case study: the Italian and Chinese collaboration

The Italian operators Wind Tre and Open Fibre and the Chinese seller ZTE are partners and have planned to set up the first pre-commercial 5G network in Europe. To carry out their project, they are collaborating with universities, research centres and companies at local level to test and verify the performance of 5G, in particular, but also to study the architecture of

the network and future cases of use of 5G: virtual reality, smart cities, public safety and healthcare. This project will be ongoing until December 2021.

4. Major organisations involved

→ **South Korea**: South Korea is the first country to deploy 5G for a world event: the 2018 Olympic Winter Games. It has set up 5G networks to offer athletes a taste of this new technology. South Korea wants to be a leader in 5G deployment and has already begun to invest in 5G infrastructure. In addition, since 2018, the Republic of Korea has been auctioning various 5G frequency bands to attract as many operators as possible.

→ **Australia**: Today, the Australian Government is preparing a document that defines Australia's policy towards 5G and provides for the creation of a 5G working group to facilitate the process of dialogue with the private sector. Australia relies heavily on 5G, and is already starting to invest. The Government has set 2012 as the deadline by which all facilities must have made the transition from copper to fibre optic. Australia was one of the first countries to deploy 5G in its major cities, and it was also one of those that excluded Huawei from the market.

→ **Huawei:** Huawei is a world leader in 5G with around 50 contracts, the latest of which are Monaco, and Spain is expected to follow shortly. The Chinese giant has another great ambition: to participate in the digital transformation of the United Kingdom. Huawei now sells more smartphones than Apple, it is becoming the world leader in 5G. However, some states such as the United States or Australia have blocked the giant company which is becoming more and more powerful every day.

→ **The United Kingdom**: In the United Kingdom, London and other major cities are switching to 5G with two operators whose deployment is likely to be stopped by Huawei. The United Kingdom is being pushed by the United States to block the Chinese giant, except that reducing Huawei would probably condemn the deployment of 5G around the world. In 2016, the Government announced the creation of a Promotion Fund of 740 million BPGs for investment in local networks to support the deployment of 5G.

5. Possible solutions:

1. Establishing global regulation between all countries that wish to deploy 5G in their country, by setting rules, and laws regarding the deployment of 5G in cybersecurity, human health and other sectors.

PROS: find a consensus among the signatory countries before the deployment of 5G to avoid any confusion.

CONS: exclusion of non-signatory countries (i.e. mainly non-developed countries that are not rich enough to obtain 5G).

2. All countries that already have 5G must find an effective way to implement 5G in developing countries.

PROS: this contributes to the equal distribution of 5G worldwide.

CONS: countries may oppose this resolution and this may create tensions between developed countries.

3. Develop artificial intelligence and combine it with 5G in all countries to make 5G even more beneficial and effective.

PROS: faster progress towards the 17 UN SDG targets

CONS: more dangers regarding cybersecurity and access to personal data + widening the digital divide; frequency allocation is also a big issue, since increasing demand for ever higher mobile data rates puts pressure on globally shared frequency spectrum resources.

Congratulations, you have completed this report! To help you prepare for the debate, here are some links and guidelines that may help you in your research. An interesting and lively debate is the result of a good preparation! Good luck!

6. Guidelines for your research
- Am I a developed or developing country?
- Do I have fiber optics? Are all cities, towns and local communities connected to a network?
- Have I already deployed 3G and 4G networks?
- Does my country have any regulations or laws regarding frequency networks?
- Is my country turning to the objectives of the SDGs? Does it intend to use 5G to do so?
- Does my country allow the sale of Huawei smartphones? Is it dependent on this company to deploy 5G?
- How does my country want to deploy 5G in an inclusive way, ensuring that all countries can have 5G?
- Is my country aware of cybersecurity issues? How does it intend to deal with these technological problems?

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J. Tyson, How Internet Infrastructure Works
https://computer.howstuffworks.com/internet/basics/internet-infrastructure4.htm

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https://www.itu.int/itu-d/tnd-map-public/

Submarine cables: *Le Dessous des cartes - Câbles sous-marins, la guerre invisible*
(https://www.youtube.com/watch?v=Cb7ibgRivwU)

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ITU's magazine on 5g (english)
https://www.itu.int/en/itunews/Documents/2017/2017-02/2017_ITUNews02-en.pdf

"ITU's approach to 5G" (english)
https://news.itu.int/5g-fifth-generation-mobile-technologies/

Infrastructure and connectivity of 5G in the world (english)
https://www.itu.int/en/ITU-D/Regulatory-Market/Pages/InfrastructurePortal.aspx

GSMA Public Policy Position on 5G spectrum (french)
https://www.gsma.com/spectrum/wp-content/uploads/2018/11/5G-Spectrum-Positions-FRA.pdf

Article on the asian investments regarding 5G (french)
https://www.zdnet.fr/actualites/la-5g-represente-57-des-investissements-chinois-dans-la-technologie-39882313.htm

Articles discussing the impact of 5G and cybersecurity (french)
- https://www.journaldunet.com/ebusiness/expert/71338/cybersecurite---quand-la-5g-s-eveillera.shtml
- https://www.images-et-reseaux.com/ia5gcybersecurite-cocktail-bouscule-leconomie/

Interesting videos regarding 5G (english)

- https://www.youtube.com/watch?v=kwqkbWFNIhU
- https://www.youtube.com/watch?v=m2B67aMTkds
- https://www.youtube.com/watch?v=04W1YI0ZxCs