DIGITAL MAGIC AIR

BRIDGING THE GLOBAL DIGITAL DIVIDE VIA 5G AND SATELLITES

Spotlight

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DIGITAL MAGIC AIR

HOW 5G CONNECTIVITY CAN BRING US TOGETHER

With 5G connectivity the air around us becomes magic – and our individual digital sphere will surround us continuously. And 5G even has the potential to be more than a data playground for the global elites. With a little help from space technology it can bridge the digital divide and create a level online playing field for humanity.

THE ISSUE AT STAKE

"The air will become magic." That's what the Austrian tech philosopher Peter Glaser promised us some years ago for the time when Internet around us would be ubiquitous. "The digital sphere will be reminiscent of a Disney cartoon: You wave your magic wand, stars are sparkling around it, and your wish becomes reality."[1]

Glaser even predicted at which point in time magic would happen: as soon as self-driving cars would force the cities to provide ultra high-speed data networks with huge bandwith. That's what today we refer to with a very unmagic acronym: 5G. The fifth-generation technology standard for mobile data communication is about to radically change our lives. And this time, there's a real chance that the new standard will not only serve the needs of urban elites, but also the needs of humanity.

THE INTERNET FOR EVERYTHING
The preceding generations were mostly used for our own mobile communication. In the 2000s, 3G enabled the rise of the smartphones, in the 2010s, 4G offered the speed for mobile gaming, streaming and video applications.[2] 5G, however, is not mainly designed for our smartphones – it is expected to support the Internet of Everything (IoE), in which not only separate users are connected, but also Internet-connected objects.[3]

The usual suspect for these autonomous, connected objects are self-driving cars. But they also are a demanding challenge for network technology, because of their high speed and complex environment. So experts expect that 5G applications in a range of different sectors will see an earlier implementation within the coming years (see below).

APPLICATIONS FOR 5G NETWORKING TECHNOLOGY

E-HEALTH DIAGNOSTICS AND THERAPIES
Digital and remote AI-assisted diagnostics, AI-guided therapies and remote surgery, even for patients at secluded locations

AUGMENTED AND EXTENDED REALITY
Immersive environments, such as educational content for students to virtually inspect objects in their environments

DRONES AND OTHER FLYING VEHICLES
Unmanned flight to increase productivity of rural businesses, improve access to goods, and reduce production and delivery costs

AUTONOMOUS VEHICLES
Safer traveling, improved traffic management, support for infotainment applications

HOLOGRAPHIC TELEPRESENCE
Real holograms, such as holographic maps, to be used in crisis situations to plan rescue missions
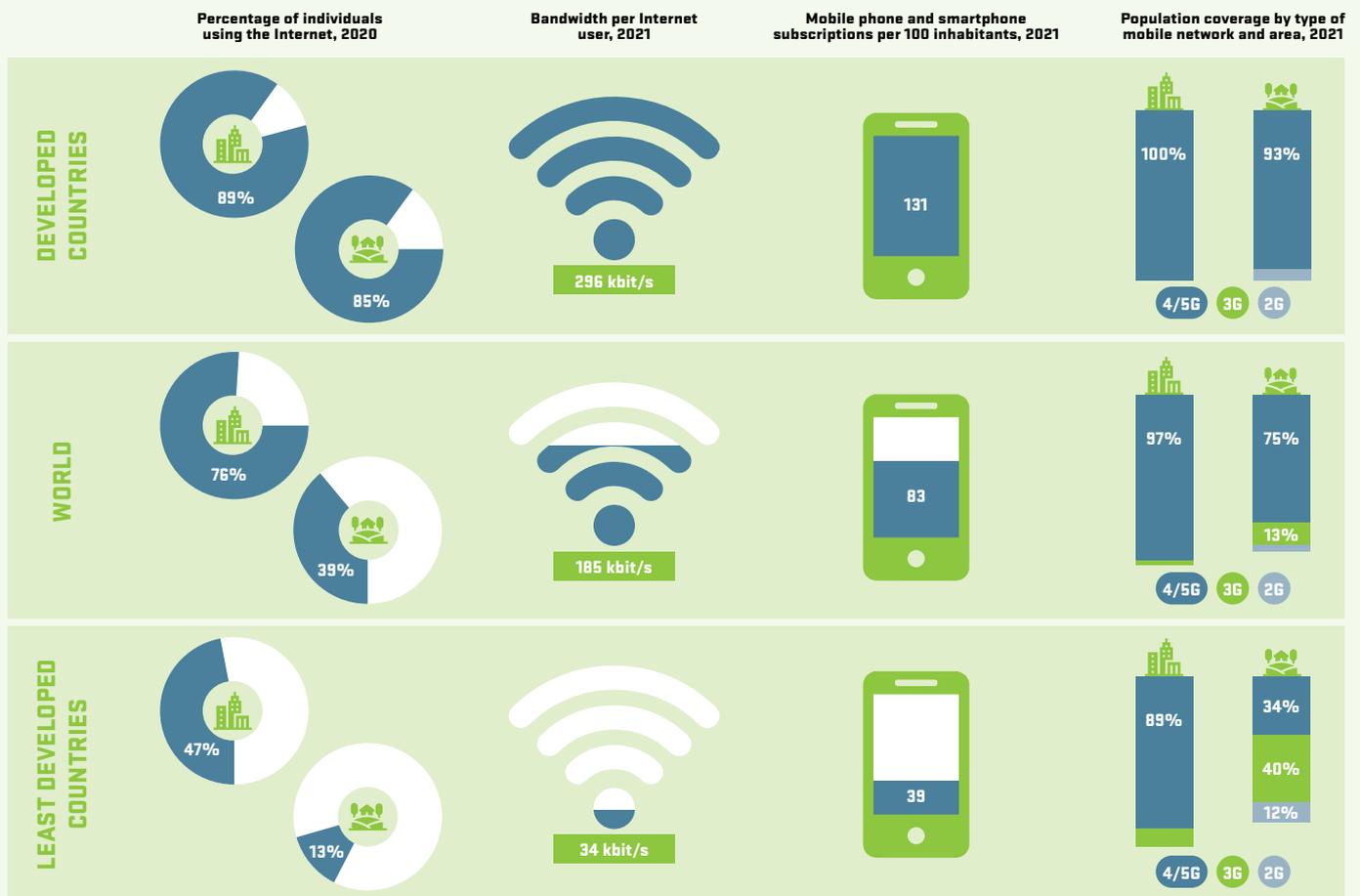
PERVASIVE SYSTEMS
Smart and complex systems, such as sustainable smart cities

INDUSTRIAL WORK
Improvement of robotics and automation to enhance productivity

Source: Kukkonen et al[3]

THE STATE OF THE GLOBAL DIGITAL DIVIDE

Percentage of individuals using the Internet, 2020	Bandwidth per Internet user, 2021	Mobile phone and smartphone subscriptions per 100 inhabitants, 2021	Population coverage by type of mobile network and area, 2021
DEVELOPED COUNTRIES 89% / 85%	296 kbit/s	131	100% / 93% — 4/5G 3G 2G
WORLD 76% / 39%	185 kbit/s	83	97% / 75% / 13% — 4/5G 3G 2G
LEAST DEVELOPED COUNTRIES 47% / 13%	34 kbit/s	39	89% / 34% / 40% / 12% — 4/5G 3G 2G

Source: International Telecommunication Union: Measuring digital development. Facts and Figures 2021[5]

GLOBAL COVERAGE – FROM SPACE

Within the last two decades, mobile phones and smartphones have dramatically increased the connectedness of rural regions everywhere in the world, and especially in low-income countries.[4] While investment in landline infrastructure networks (roads, electricity, conventional telephones) often didn't reach remote regions at all, mobile communication needed significantly fewer resources to connect those areas to the global village.

But the global digital divide, though reduced, still exists. Citizens of high-income countries have ten times more bandwith at their disposal than citizens of low-income countries.[5] This gap widens even more when urban and rural areas are compared. That's mainly not a technological, but an economic issue: The lack of purchasing power is a main reason for lower coverage, and lower coverage means lower chances of economic growth – a vicious circle.

Now 5G brings a completely new perspective to global connectivity: global coverage for technical reasons. Especially mobile objects that rely on Internet of Things applications need a broadband coverage wherever they move to – you don't want your car to break down somewhere in the countryside simply because it lacks connectivity. The same is true for flying objects like drones and agricultural machines like tractors.

So high reliability for 5G applications needs high connectivity everywhere. Our economic and political systems were not able to close the digital divide for the sake of humanity – but they can do so for the sake of technology. →

AFFORDABLE UBIQUITY VIA SATELLITE

It's not only the demand side for mobile broadband communication that is growing massively, the same is true for the supply side. And one of the main push factors is coming from space: There is a whole bunch of projects that promise global connectivity via Low Earth Orbit satellites. Thousands of satellites circling the earth 500 to 1,200 kilometers above ground add considerable bandwith to the also growing terrestrial supply.

The main advantage of satellite coverage is affordable ubiquity. They can serve the customers that traditional providers find most difficult to reach: today's victims of the digital divide. That's neither a small number nor a small market: Servicing the parts of the world's population to whom satellite Internet is or will be the most viable option can generate an annual revenue of $30 billion.[6]

The best-known (and most outspoken) of these satellite companies is Elon Musk's →

How Low Earth Orbit satellites work

Low Earth Orbit is a sphere of space more than 160 kilometers and less than 1,500 kilometers above earth. While weather, TV and navigation satellites are mostly positioned in the Geostationary Orbit 36,000 kilometers above earth, the Low Earth Orbit is populated by imaging satellites, space stations and communication satellite networks. In these so-called "satellite constellations," dozens, hundreds or thousands of satellites are working together as a system. Each of these satellites covers only a small and constantly changing area of the earth, but as a system, they are organized in a way that at any time every place on earth is covered by at least one satellite, thus allowing uninterrupted data transfer. The first of these constellations became operative in 1998: Iridium with 66 satellites 780 km above earth. Today, the biggest fleet is operated by Starlink: 2,000 satellites (and counting) 550 km above earth. The OneWeb constellation is scheduled to be completed in 2022, with 648 satellites at an altitude of 1,200 km.

Starlink – with already more than 2,000 satellites in space and operating in 29 countries.[7]

Starlink's current business model, though, is not designed to reduce the digital divide. It is targeting individual customers, households, institutions or companies, with subscription prices starting at $99 per month, plus at least $500 for the purchase of the satellite dish needed to connect. With that pricing, today's purchasing power leads to tomorrow's connectivity power, and the poor are once again excluded.

THE ONEWEB APPROACH

A more inclusive way to 5G is taken by OneWeb. The company had started as a Richard Branson project, as part of the billionaire's space race, but after a phase of bankruptcy and restructuring, it is now on a more solid ground: The main shareholders to date are the Indian conglomerate Bharti Global, the French satellite operator Eutelsat and the British government. OneWeb is targeting mainly business partners like incumbent telephone companies. They can use the satellite-based coverage as add-on to expand their geographical reach to 100% – in a much more sustainable and resource-friendly way than by building transmission towers in sparsely populated areas.

Some of the OneWeb projects already on the way include India and the Middle East, where NEOM has signed a partnership deal with OneWeb to bring Digital Magic Air to NEOM and 5G connectivity to a broad region of the Middle East and East Africa (see box).

→

The NEOM example

"We are one step closer to ensuring that no child is left on the wrong side of the digital divide," said Saudi Arabia's communication minister HE Abdullah Alswaha, when the joint venture between OneWeb and NEOM Tech & Digital Holding was signed in October 2021.[8] For NEOM, the city of the future in the Northwest of Saudi Arabia, 100% 5G coverage has been a priority right from the start - but with the new partnership with OneWeb, high-speed satellite connectivity will also be brought to the regions of Middle East and East Africa with a population of about one billion people. The distribution of these services via NEOM is scheduled to commence in 2023.[9]
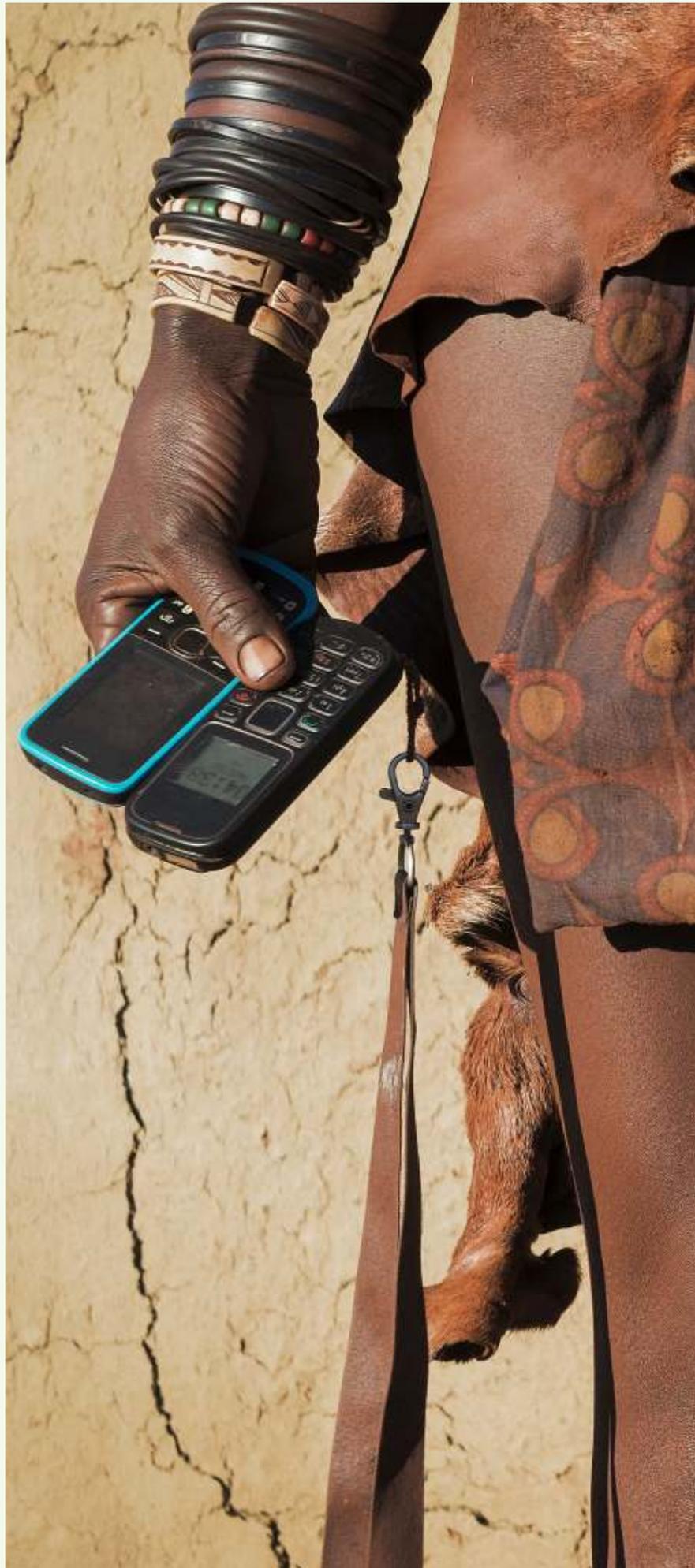
From 2G to 4G and beyond
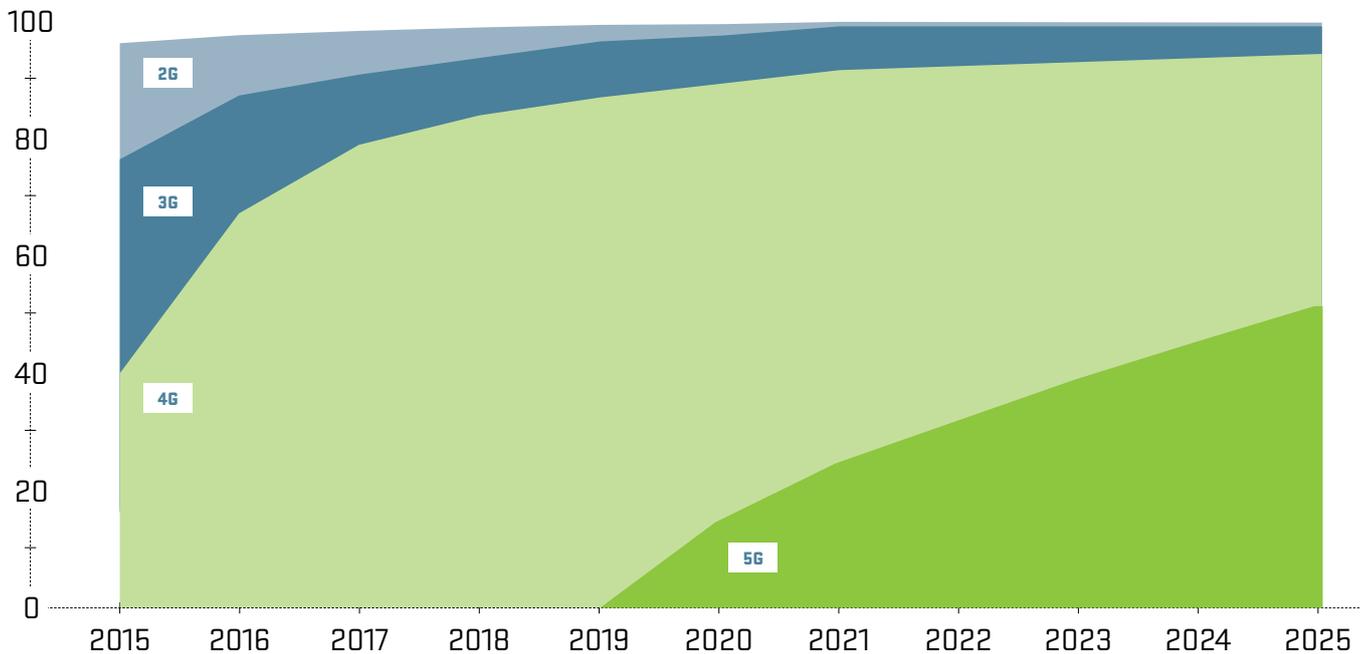
International Telecommunication Union: Measuring digital development. Facts and Figures 2021[5]

GIVE INCLUSION A CHANCE

Today's satellite race in the Low Earth Orbit range opens a window of opportunity for broadband connectivity even in remotest areas. The supply-side competition has led and will further lead to diverse approaches for distribution and marketing strategies. One of those approaches is "doing good": Satellite broadband is helping people and/ or the environment and makes the world a better place.

One current example is the rapid deployment of Starlink satellite terminals to Tonga. The Pacific island country was hit hard in January by a devastating volcanic eruption and a tsunami. In February Elon Musk's satellite venture launched a free high-speed Internet service to connect remote villages. 50 terminals were provided free of charge to be distributed to the outlying islands worst hit by the tsunami.[10]

Public and private institutions should take the opportunity to build upon the doing-good approaches. Inclusive connectivity doesn't happen automatically, but there are levers to be used. In the Tonga case, the letter of a New Zealand politician to Elon Musk had started the process that led to the donation of the satellite terminals.[10] In other places, in other circumstances, other levers may be needed – but can be used.

On a global level, the commitment is there: Resilient infrastructure and an inclusive and sustainable industrialization are part of the UN Sustainable Delevopment Goals for the year 2030 (SDG 9). Universal access to information and communication technology is one of the targets to reach that goal (Target 9c).[11] And the obstacles to reach that target on the local level shrink with every new generation of communication technology.

Even though it is obvious that 5G implementation in rural areas has to take different paths than in global megacities, these paths exist. Just one example already discussed: So-called "digital oases" could be built in rural areas to provide sufficient data rate and availability at least close to home and with affordable cost.[12] And if the global players are reluctant to build these oases or hotspots, local "microoperators" could step in. In Peru, they have already done so.[13]
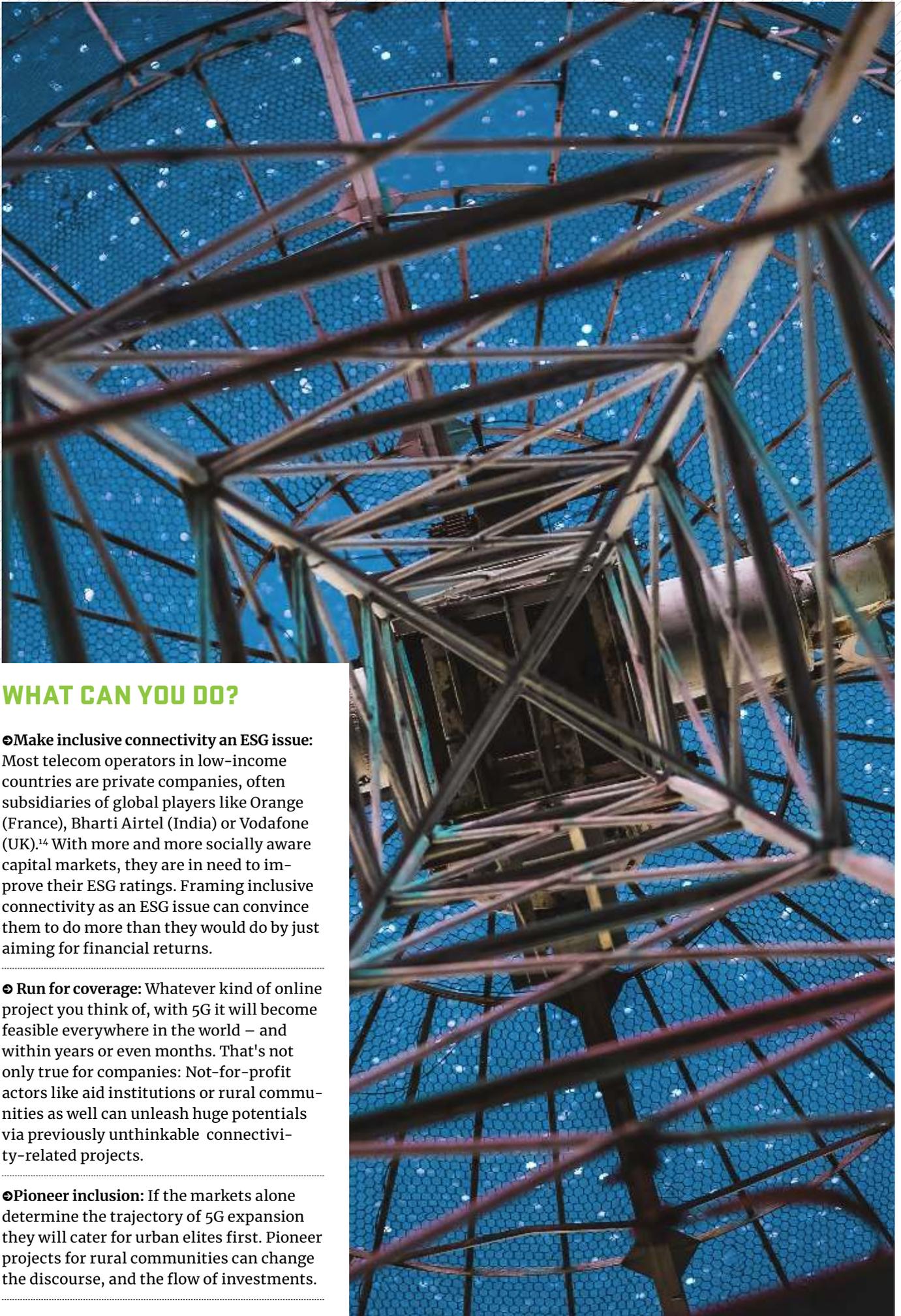
WHAT CAN YOU DO?

⤷**Make inclusive connectivity an ESG issue:** Most telecom operators in low-income countries are private companies, often subsidiaries of global players like Orange (France), Bharti Airtel (India) or Vodafone (UK).[14] With more and more socially aware capital markets, they are in need to improve their ESG ratings. Framing inclusive connectivity as an ESG issue can convince them to do more than they would do by just aiming for financial returns.

⤷ **Run for coverage:** Whatever kind of online project you think of, with 5G it will become feasible everywhere in the world – and within years or even months. That's not only true for companies: Not-for-profit actors like aid institutions or rural communities as well can unleash huge potentials via previously unthinkable connectivity-related projects.

⤷**Pioneer inclusion:** If the markets alone determine the trajectory of 5G expansion they will cater for urban elites first. Pioneer projects for rural communities can change the discourse, and the flow of investments.

ABOUT FII INSTITUTE

THE FUTURE INVESTMENT INITIATIVE (FII) INSTITUTE is a new global nonprofit foundation with an investment arm and one agenda: Impact on Humanity.

Global, inclusive and committed to Environmental, Social and Governance (ESG) principles, we foster great minds from around the world and turn ideas into real-world solutions in five critical areas: Artificial Intelligence (AI) and Robotics, Education, Healthcare and Sustainability. We are in the right place at the right time: when decision-makers, investors and an engaged generation of youth come together in aspiration, energized and ready for change.

We harness that energy into three pillars: THINK, XCHANGE, ACT. Our THINK pillar empowers the world's brightest minds to identify technological solutions to the most pressing issues facing humanity. Our XCHANGE pillar builds inclusive platforms for international dialogue, knowledge sharing and partnership. Our ACT pillar curates and invests directly in the technologies of the future to secure sustainable real-world solutions. Join us to own, co-create and actualize a brighter, more sustainable future for humanity. ←

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References

1 Peter Glaser: Das nächste Testament. GDI Impuls 04/2016 (in German) https://www.gdi.ch/sites/default/files/documents/2019-10/gdi_impuls_4_16_zusammenfassung.pdf

2 Science Museum London: A Computer in your Pocket. The Rise of Smartphones, November 2018 https://www.sciencemuseum.org.uk/objects-and-stories/computer-your-pocket-rise-smartphones

3 Harri Oinas-Kukkonen, Pasi Karppinen and Markku Kekkonen: 5G and 6G Broadband Cellular NetworkTechnologies as Enablers of New Avenues for Behavioral Influence with Examples from Reduced Rural-Urban Digital Divide. Urban Sci. 2021, 5, 60 https://doi.org/10.3390/urbansci5030060

4 International Telecommunication Union: Connectivity in the Least Developed Countries, 2021, p. 7ff https://www.itu.int/hub/publication/d-ldc-ictldc-2021-2021/

5 International Telecommunication Union: Measuring Digital Development, Facts and Figures, 2021, p. 14 https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx

6 Christian Goetz: Starlink - How Musk's Satellites may force telecoms into 5G-overdrive, BDO Global, April 2021 https://www.bdo.global/en-gb/blogs/tech-media-watch-blog/april-en/starlink%e2%80%93-how-musk%e2%80%99s-satellites-may-force-telecoms-into-5g-overdrive

7 Jonathan's Space Pages: Starlink Statistics, March 2022 https://planet4589.org/space/stats/star/starstats.html

8 Press release: NEOM Tech & Digital Holding Company and OneWeb sign $200m JV for satellite network, October 2021 https://oneweb.net/media-center/neom-tech-digital-holding-company-and-oneweb-sign-200m-jv-for-satellite-network

9 Jason Rainbow: OneWeb and Saudi Arabia create $200 million connectivity joint venture, Space News, October 2021 https://spacenews.com/oneweb-and-saudi-arabia-create-200-million-connectivity-joint-venture/

10 Kirsty Needham, Reuters: Musk's Starlink connects remote Tonga villages still cut off after Tsunami, February 2022 https://www.reuters.com/world/asia-pacific/musks-starlink-connects-remote-tonga-villages-still-cut-off-after-tsunami-2022-02-23/

11 UN Department of Economic and Social Affairs: SDG 9 https://sdgs.un.org/goals/goal9

12 Harri Oinas-Kukkonen, Pasi Karppinen and Markku Kekkonen: 5G and 6G Broadband Cellular NetworkTechnologies as Enablers of New Avenues for Behavioral Influence with Examples from Reduced Rural-Urban Digital Divide. Urban Sci. 2021, 5, 60, p. 6 https://doi.org/10.3390/urbansci5030060

13 Luciano Leonel Mendes et al: Enhanced Remote Areas Communications: The Missing Scenario for 5G and Beyond 5G Networks, in IEEE Access, vol. 8, pp. 219859-219880, 2020 https://ieeexplore.ieee.org/document/9279219

14 International Telecommunication Union: Connectivity in the Least Developed Countries, 2021, p. 37ff https://www.itu.int/hub/publication/d-ldc-ictldc-2021-2021/