ITU CWG-Internet: Online Open Consultation (October-December 2021)
"The Environmental Impacts and Benefits of the Internet"
ESOA Secretary General's Considerations

This document represents the views of the ESOA Secretary General and not necessarily of its members.

SUMMARY

The Pandemic provides a good backdrop to the topic of this consultation. With lockdowns across multiple countries, the need for universal connectivity has become very clear and real in a way that policymakers perhaps did not realise. Similarly, the positive effect lockdowns had on the environment also did not go unnoticed. Hence, connectivity and climate are both important considerations; they are not unrelated and as noted in this submission, should be given greater consideration together.

What effects does the Internet have on the environment and vice-versa?

The need to connect users regardless of location coupled with the push for faster and faster Internet connectivity in the form of 5G is resulting in policies that favour (through funding and spectrum decisions) specific technologies such as fibre and terrestrial mobile which are perceived as ideal solutions that all governments should strive to deploy as far and wide as possible. Both are indeed very important and without them, millions would not have been able to telework and communicate with others as they did during the recent lockdowns – connectivity literally became a lifeline. This does not mean however that important questions should not be asked such as the energy consumption of 5G base stations.

This question is important as we seek to connect as many people to high-speed Internet (or to 5G) as possible. The reason is that in order to ensure wide area coverage, mobile operators need to build many more base stations, and each one uses more power. The problem gets worse if the base station uses the higher mm-Wave frequency bands which can enable greater throughput/bandwidth. Signals travelling at these higher frequencies do not travel very far; hence ensuring wide coverage requires even more base stations than when lower frequencies are used.

According to Huawei[1], 5G base stations use up to three-and-a-half times more energy than 4G infrastructure, which is a huge problem given that, as explained, 5G requires more densely placed base stations. The Ericsson CTO also said last year[2] that "energy consumption is set to increase dramatically if 5G is deployed in the same way as 3G and 4G were,". In China mobile operators have started putting base stations to sleep at night to save energy[3]. If they did not do this, the operators would not be able to afford to run them.

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[1] https://carrier.huawei.com/~/media/CNBG/Downloads/Spotlight/5g/5G-Power-White-Paper-en.pdf
[2] https://kr-asia.com/5g-towers-are-consuming-a-lot-of-energy-so-china-unicom-is-putting-some-of-them-to-sleep-overnight
[3] https://techblog.comsoc.org/2020/08/07/5g-base-station-deployments-open-ran-competition-huge-5g-bs-power-problem/

The Chinese example highlights well the need to incorporate the full picture of capex, opex, and unforeseen externalities into policymaking and the need to optimise network deployments by not over-focussing on specific technological solutions. The case for a mix of technologies is further made below.

How can we improve the impact the Internet has on the environment and take advantage of its potential to help address climate-related issues?

There are many ways in which satellite technology helps climate-related issues. The global reach and resilience of satellite communications technologies means that they can support climate change related activities in ways that other communications technologies are unable to do. Specifically, they extend the reach of communications technologies globally, not only into rural areas, but also into the oceans and skies.

Firstly, satellite technology has the power to bring connectivity into unconnected areas without the need to deploy large quantities of base stations. In fact, satellite can "backhaul" (connect to the Internet backbone) a base station in a greenfield area that has no communications infrastructure available at all. This means that with a single satellite dish installed by a base station, citizens can have access to 4G or even 5G services within a matter of weeks. This is not just a matter for emerging economies facing huge digital divides, but also for the unconnected living in hard-to-reach or sparsely populated areas in developed countries. Equally, satellite can bring connectivity to such areas by powering community Internet solutions. This too provides near 'instant' connectivity without the deployment of base stations.

Figure 1: Aerial view of a base station backhauled by satellite powered by solar energy in Congo. *Credit: Rascomstar*

The second way in which satellite can help address climate-related issues is by helping to actively monitor and mitigate emissions by enabling real-time access for numerous IoT applications for the purposes of reducing pollution, increasing operational efficiency, and minimizing consumption. Companies and space agencies around the world are currently investing in new operational systems to enable the global tracking from space of CO2 and CH4 emissions, and in applications to manage emissions from the ground.

The specific relevance of satellite communications to climate change comes largely from the ability to collect and share data from millions of sensors used for numerous applications, which can then be analysed and processed to ensure real-time action is taken to prevent harmful occurrences such as leaks and accidents that could negatively impact the environment.

The energy sector has long been criticised for its use of fossil fuels. Satellite-enabled industrial IoT applications are helping the industry meet increasing demands to reduce such non-renewable energy consumption. Energy providers operate huge networks of pipelines often carrying gas or other fuel. These pipelines can and do suffer accidents but by using a network of sensors along their networks, energy providers can gather data to monitor their integrity and activate/deploy a rapid response in case a leak is detected which could result in increased carbon emissions or otherwise harm the environment. The data collected from sensors can be efficiently collected and shared using satellite communications, while deploying manpower to locate, assess and then respond would be time and resource-intensive, resulting in greater damage and loss.

The farming sector increasingly relies on connectivity to react, adapt and survive in an increasingly complex and competitive world. In the field of agriculture, IoT sensors can provide carbon dioxide monitoring, which is directly relevant to some agricultural activities such as burning. Sensors placed in areas where burning has traditionally occurred supports authorities who seek to enforce compliance as they can indicate those farming organisations playing by the rules, and those who are not.

The global transportation sector is foreseen to grow enormously in years to come, despite the Pandemic, and with that growth, will come increased carbon emissions. The International Transport Forum estimates that heightening travel demands could see global CO_2 emissions from transport increase by 60 percent by 2050. Vehicles can go everywhere, even places without terrestrial communications infrastructure in place, such as the skies and the seas, which only satellite technology can reach. Both travel and transport sectors are under huge pressure to reduce emissions and satellite-enabled IoT solutions are helping. Using diagnostic sensors, smart telematics and other technologies to gather engine status data and automatically notify fleet managers of anomalies can help limit CO_2 emissions due to faulty equipment, engine damage and even poor route planning. This data can also help extend the lifespan of vehicles, reducing emissions and minimising wastage.

The ecological improvements through the use of satellite communications can be dramatic. Inmarsat estimates a reduction of more than 20 million tonnes of CO2 per year for the aviation industry alone[4].

[4] https://www.inmarsat.com/content/dam/inmarsat/corporate/documents/aviation/insights/2018/Inmarsat%20Aviation%20-%20LSE%20Sky%20High%20Economics%20Chapter%202.PDF

What role should stakeholders play in shaping the environmental impacts and benefits of the Internet?

The benefits of technologies such as satellite may be far less known compared with technologies such as mobile which are literally in peoples' hands. Yet the contribution of this sector is unique and important and as such satellite stakeholders should be play a key role in shaping ICT policy for a connected world.