Axon Advisory

Sustainability in the Digital Sphere: How green is ICT?

ICT's share of global GHG emissions is believed to have stood at between 1.8-2.8% in 2020. However, despite huge projected sector growth, the sector still can maintain or reduce its carbon footprint. In this article we delve into the climate action being taken by key stakeholders such as data centres, telco operators and the digital device market, as well as highlight key actions for regulators to ensure green digitalisation in their markets.

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www.axonpartnersgroup.com

Authors:
Samuel Tew,
Senior Manager

Victor Martínez,
Senior Associate

1. Climate change and ICT

Global warming has multiple dangerous impacts on the environment and on human life. If business leaders were worried about COVID-19, climate change should give them goosebumps. Effects of climate change include increased droughts, communities being displaced as their regions become too hot for habitation, rising sea levels, and a growing number of natural, as well as socio-economic, disasters. As such, leaders and executives are now increasing their focus on sustainability and reviewing their mission and purpose to reduce harmful emissions that are tied to their business operations.

To stabilise CO2 concentrations in the atmosphere, the world needs to reach net-zero emissions by revamping current climate policies and adopting long-term mitigation strategies to meet the Paris Agreement's temperature goals

However, global emissions have not yet peaked. Carbon emissions are in the international spotlight as they are responsible for 81% of overall greenhouse gas (GHG) emissions that contribute to global warming, with businesses being responsible for much of it. Total global GHG emissions rose by 1.4% per year between 2010 and 2019, according to the UN Emissions Gap Report 2020,[1] reaching a record high of 59.1 GtCO2e in 2019. To stabilise (or even reduce) CO2 concentrations in the atmosphere, the world needs to reach net-zero emissions by revamping current climate policies and adopting long-term mitigation strategies to meet the Paris Agreement's temperature goals. Such goals aim to keep the global temperature-rise below 2ºC this century, however, the real target should revolve around developing the means to limit the increase to 1.5ºC.[2] This requires fast and sustained reductions in emissions, and all industrial sectors must commit to the cause.

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[1] Emissions Gap Report 2020, UNEP. Available at: https://www.unep.org/emissions-gap-report-2020

[2] The Paris Agreement, crafted over two weeks in Paris during the 21st Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC) and adopted on 12 December 2015, marked a historic turning point for global climate action, as world leaders reached consensus upon an agreement comprised of pledges by 195 nations to combat climate change and adapt to its impacts.

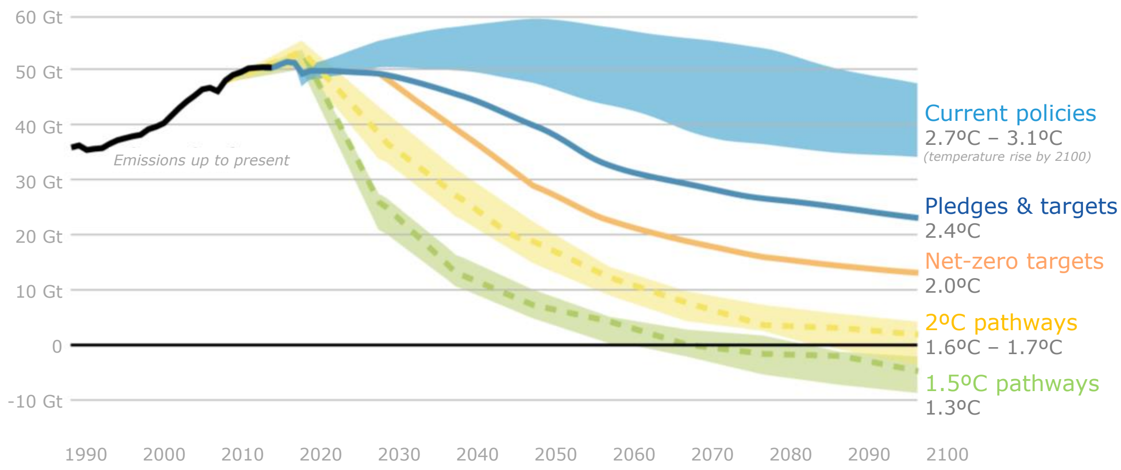

Exhibit 1.1. Global greenhouse gas emission and warming scenarios [Source: Climate Action Tracker as of June 2021[3]]

The information and communications technology (ICT) industry is no exception. ICT's share of global GHG emissions is believed to have stood at between 1.8-2.8% in 2020, according to different studies,[4,5,6] which corresponds to the minimum threshold required for policy action in Europe, which is set at 2%. The most likely range for absolute emissions is 1.1-1.7 GtCO2e[7] for ICT, TVs and other consumer electronics, with roughly 30% coming from embodied[8] emissions and 70% from emissions derived from their daily use.[9]

ICT's share of global GHG emissions is believed to have stood at between 1.8-2.8% in 2020

However, despite huge sector growth in recent years, the carbon footprint of the industry has not grown at the same rate. As such, the increased total energy use by ICT as compared to 10 years ago does not translate into a higher carbon footprint. This is because the increased usage is partially offset by a higher share of renewable energy, improved systems' efficiency and a slight decrease in network overheads, whilst embodied carbon has stayed largely the same.

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Taking a holistic view beyond the ICT sector, the actions of individual industries and companies to combat climate change will take place within frameworks that are set by governments and international organisations

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[3] See: https://climateactiontracker.org/global/temperatures/
[4] "On global electricity usage of communication technology: trends to 2030" Andrae, A.S. and Edler, T., 2015.
[5] "Assessing ICT global emissions footprint: Trends to 2040 & recommendations", Belkhir, L. and Elmeligi, A., 2018.
[6] "Energy consumption and carbon emissions of the ICT sector", Malmodin, J., 2019.
[7] Giga tonnes of CO2 equivalent emissions.
[8] Emissions due to manufacturing, transportation, and installation of products or assets.
[9] Portion of TVs & other consumer electronics was roughly 400 MtCO2 in 2020.

such as the UN, the G20 and the European Union (EU). Among other pro-environment initiatives, the European Commission (EC) settled a 2030 climate and energy framework including EU-wide targets and policy objectives for the period 2021-2030, with the following key climate targets for 2030, relative to 1990 levels:

- At least 55% cuts in GHG emissions,
- At least 32% share for renewable energy,
- At least 32.5% improvement in energy efficiency.

Countries without national climate targets can neutralise the effect of good policy elsewhere and slow down an otherwise much faster global rate of progress

However, the opposite situation also exists in countries without national climate targets, normally in developing or emerging countries (or, in some cases, developed countries that choose to ignore the issue), which can neutralise the effect of good policy elsewhere and slow down an otherwise much faster global rate of progress.

When it comes to the practical implementation of national climate target frameworks, most actions involve controlling the emissions that businesses generate in their daily operations. As is commonly accepted in company emissions reporting, there are three classes of GHG emissions that a business can be directly or indirectly responsible for, which is determined by the location of such generation within the company's value chain:

There are three classes of GHG emissions that a business can be directly or indirectly responsible for depending on their occurrence in the value chain

- **Scope 1** emissions are those directly generated from company-owned and controlled resources, released into the atmosphere as a direct result of activities at an immediate level (e.g. burning of fossil fuels, use of carbon-generating vehicles, industrial generation, generation of fumes, etc.).
- **Scope 2** emissions are those indirect due to the generation of purchased energy, released into the atmosphere as a result of the consumption of electricity, steam, heat or cooling.
- **Scope 3** emissions are all other indirect emissions (not included in scope 2) in a company's value chain, including upstream emissions (e.g. from purchased goods and services, transportation of these goods to the company, use of leased assets such as offices or data centres, business travel and employee commuting) and downstream emissions (including transportation, distribution, use and end-of-life treatment of sold goods, investments, franchises and leased assets).

In regulatory terms, and according to the GHG Corporate Protocol,[10] most advanced economies (EU-27, Australia, the United States and other G20 members) oblige larger companies to report on their environmental and social impacts, including the monitoring and disclosure of their more direct GHG emissions (scopes 1 and 2), while scope 3 tend to be generally voluntary and the hardest to monitor.

Since scope 3 emissions are believed to represent the majority of an organisation's carbon footprint,[11] carbon neutral pledges are not currently enough for the world to limit global warming to 1.5°C as they do not require companies to account for these emissions. Companies are currently able to lower their scope 1 and 2 emissions by outsourcing carbon-heavy activities to suppliers, whilst not in fact decreasing the overall count, giving a misleading effect. By signing up to scope 3 targets, companies take responsibility for their full supply chain, thereby having an incentive to encourage their suppliers to cut emissions too and creating a snowball effect in the market.

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Altogether, it is clear that this cannot be achieved without unwavering support from regulators, who have in their hands the power to enable sustainability-friendly regulation for the ICT sector, and therefore a responsibility not to look away from greening the digital era.

[10] See: https://ghgprotocol.org/
[11] See: https://www.epa.gov/climateleadership/scope-3-inventory-guidance

2. Carbon-intense ICT stakeholders

Alongside academic work and intergovernmental initiatives, sustainability has pushed its way to the top of the agenda of a myriad of ICT companies. As the ICT industry is itself a key enabler of other business models and has direct impact upon entire markets (e.g. energy, healthcare, manufacturing, transportation), there are significant factors to be considered to ensure the carbon footprint left by ICTs does not outweigh the positive economic impacts.

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To understand that the impact of the ICT sector does not offset its positive action, it is necessary to obtain a clear view on its emissions by taking the ICT sector apart and examining each of its key segments that contribute to its environmental impact. The proportional breakdown of the ICT carbon footprint (excluding the entertainment and media sub-sector) can be approximated as a fairly equal distribution between the following three categories: data centres, telecommunications networks, and digital devices. The following chart illustrates the upper and lower emissions estimates for each category in 2020:

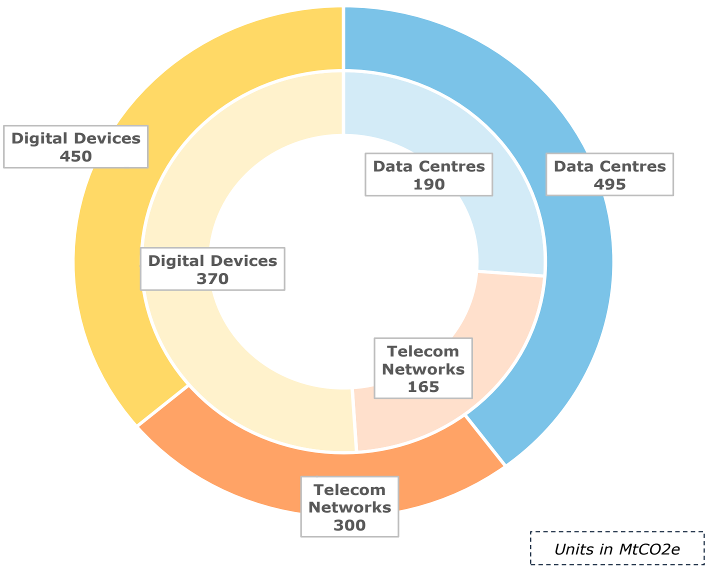

Exhibit 2.1. Upper (outer) and lower (inner) limits of GHG emissions from ICT in 2020 [Source: Axon based on different studies]

The ICT carbon footprint can be approximated as a fairly equal distri-bution between the following three categories: data centres, telecom-munications networks, and digital devices

It makes perfect sense that these three categories are the most relevant in the ICT sector, having at the same time the highest sustainability potential:

- First, power-hungry **data centres** are being built on commitments to innovative green and renewable strategies due to massive energy consumptions, discarding obsolete systems and taking advantage of newer, energy-efficient technologies to decrease CO2 emissions.

- Next, network operators need to rethink their energy consumption, not least of all from a cost perspective, however also with respect to the impact their **telecommunication networks** have on the environment. This will have a profound effect on the way they plan and deploy their next-generation networks to minimise their carbon footprint.
- And finally, with the ever-increasing demand for **digital devices**, circular economy-oriented programmes and tools become essential to optimise resources and reduce the huge tons of e-waste generated in every corner of the world that translate into GHG emissions.

Each of these categories, along with considerations for regulators, are further explored in following subsections.

2.1. Data Centres and energy efficiency

Data centres are of extreme importance in satisfying the need to store and process data, which is becoming increasingly prevalent across all industries. Relative to 2015, emissions from data centres have decreased by 10%, the most out of the three categories (despite large increases in data traffic due to 4G and 5G build out and an increasing number of hyperscale data centres). As a result, it is inevitable that the data centre industry's own requirements will become more complex over time.

The strong growth in demand and, consequently, energy consumption in data centres continues to be offset by ongoing efficiency improvements for servers, storage devices, network switches and data centre infrastructure

For the period 2020-2025, the global data centre power market is expected to grow at a CAGR of over 6.4%, and by 2025, it is expected that data centres will be using 20% of the world's power, becoming the largest global energy user.[12] Nevertheless, the International Telecommunications Union (ITU) published in 2020 a study with a more optimistic view on global GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement, expecting a CAGR of 2.1% for the same period (1.5% for the full period 2015-2030).[13] The strong growth in demand and, consequently, energy consumption in data centres continues to be offset by ongoing efficiency improvements for servers,

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[12] "Decreasing ICT energy consumption – the power of data centres and people's will", ICTFOOTPRINT.eu, 2018. Available at: https://ictfootprint.eu/en/webinar/decreasing-ict-energy-consumption-–-power-data-centres-and-people's-will

[13] "Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement", ITU, 2019. Available at: https://www.itu.int/rec/T-REC-L.1470-202001-I/en

storage devices, network switches and data centre infrastructure. The efficiency of power usage to run data centres is therefore fundamental to decreasing the industry's carbon footprint.

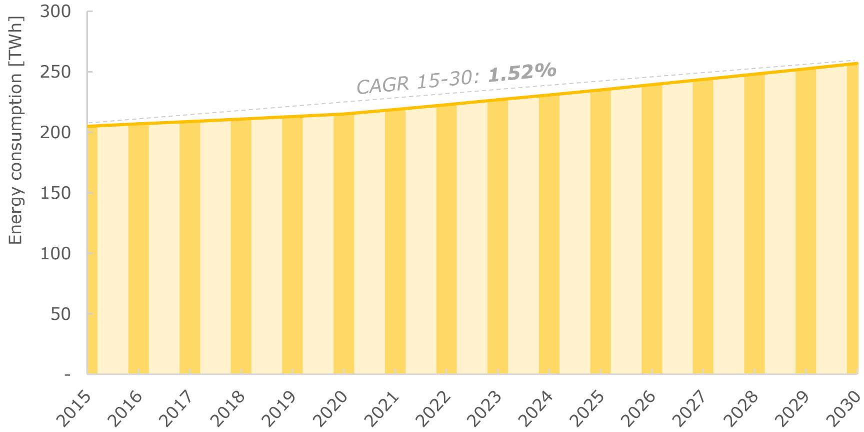

Exhibit 2.2. Electricity consumption in data centres[14], 2015-2030 period [Source: Axon based on ITU data]

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Energy efficiency is a common sustainability metric directly linked to the reduction of GHG emissions, since greater energy efficiency reduces overall energy demand, and therefore the associated energy production. If current trends in the efficiency of hardware and data centre infrastructure can be maintained, global data centre energy demand can remain nearly flat through 2022, despite a 60% increase in service demand.

Power Usage Effectiveness (PUE) is the most common indicator of energy efficiency in data centres. It is a measure of the ratio between the total facility power supply to a data centre against its IT equipment power consumption.[15] Trying to keep a value as close to 1.0 as possible remains one of the challenges of data centre companies worldwide, however, and above all, the activity of cooling a data centre remains the most critical, energy-consuming activity of its daily operation. Without cooling systems, the excess heat generated would quickly cause equipment to become too hot to function. Cooling equipment, especially with low energy intensity, is therefore a major focus of this industry, with increasingly efficient

[14] Grid and overheads consumption are excluded in this representation.

[15] In a perfect scenario, a PUE value of 1.0 would indicate that 100% of the power used to run the data centre is consumed by the IT equipment, and 0% is wasted. Although this is a highly unlikely figure to obtain, with efficient data centres currently running in the 1.2-1.5 PUE range. See: https://searchdatacenter.techtarget.com/tip/Power-and-cooling-checklist-for-a-better-data-center-PUE

solutions such as liquid cooling (which can decrease energy consumption associated to cooling by up to 60%) finding their way into the market.

As energy efficiency is a cost-saving activity, it is inherently aligned with company strategic objectives

As energy efficiency is a cost-saving activity, it is inherently aligned with company strategic objectives in most cases and is therefore no surprise that Europe's biggest and arguably most successful data centres pay great attention to efficiency metrics (such as PUE), with great results. In fact, the average annual PUE for Google's global fleet of data centres in 2019 hit a new record low of 1.10, compared with the industry average of 1.67.[16] However, it is also true that smaller data centres, who do not have large budgets for equipment upgrades are being left behind in this regard. In addition, the increasing trend of hyperscale and large data centres pushing towards 100% use of renewable energy to run operations is not new. For instance, Amazon Web Services (AWS) is moving steadily towards achieving Amazon's company-wide goal of using 100% renewable energy by 2025.[17]

Fact check: Will energy efficiency reduce ICT's carbon footprint?

History has seen ICT emissions consistently rising in spite of significant efficiencies improvements. It is true that **efficiency upgrades lead to increase in demand**, and many times translate into increased emissions that often undermine the efficiency achieved. For instance, on a per-bit basis, 5G standards are more power efficient than their predecessors, but by 2030 5G networks will be supporting up to 1,000 times more data than 4G did in 2018. This means that, at the "unitary" level, energy-efficient solutions do reduce emissions. However, **the problem is likely to be offset by the sheer scale of the industry** before the peak in demand is achieved.

2.2. Telecommunication Networks and energy consumption

Telecom networks are constantly changing, with the most noticeable trends being the deployment of 5G and the advancement of fibre networks and IoT ecosystems. While a 5G site currently can consume around 3 times more electricity than a 4G site, power-saving features such as 'sleep

[16] See: https://blog.google/outreach-initiatives/sustainability/data-centers-energy-efficient/
[17] See: https://aws.amazon.com/es/power-and-utilities/sustainability/?nc=sn&loc=4

mode' could narrow the gap to 1.25 times more by 2022.[18] Additionally, network infrastructure providers and operators are projecting that 5G could be up to 10-20 times more energy-efficient in unitary terms (i.e. measured by Gigabyte) than 4G by 2030.[19] On top of it, fibre networks are 85% more energy efficient than copper alternatives.

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Telecom networks currently consume less than 1% of global energy, with mobile networks having considerably higher electricity intensity (kWh/GB) compared with fixed-line networks at current traffic rates. Just in 2020, 100 TWh of electricity was consumed by fixed networks and 115 TWh were consumed by mobile networks.

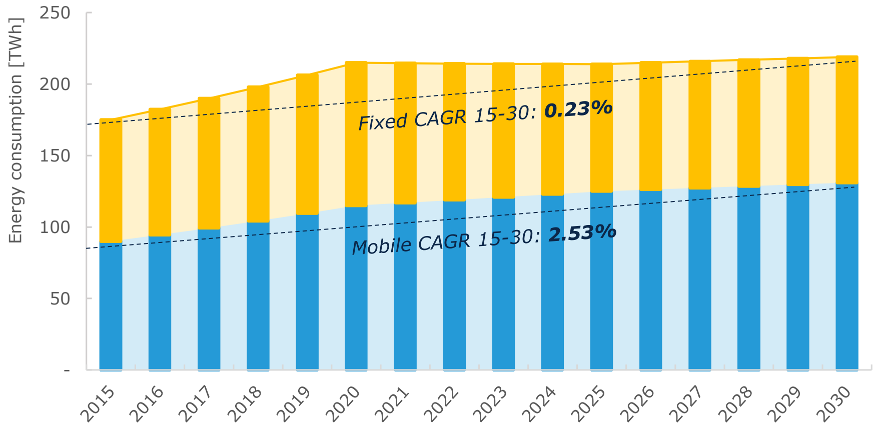

Exhibit 2.3. Electricity consumption by mobile and fixed telecommunications networks[20], 2015-2030 period [Source: Axon based on ITU data]

Furthermore, the full deployment of 5G networks will further increase the industry's energy requirements, making it essential for operators to rely on renewable energy sources and smart grids (i.e. efficient base station and networks) to decarbonise the energy supply and decrease the industry's GHG footprint. In fact, the share of renewable energy over total electricity consumption is a common metric tracked within the industry and MNOs are already meeting their ambitious targets to reach 100% renewables in their main markets before 2030. Most of the large players in the telecommunications industry are already giving strong priority to the removal of legacy equipment and to the exchange of copper landlines

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[18] "5G Energy Efficiency by Design", Orange. Available at: https://hellofuture.orange.com/en/5g-energy-efficiency-by-design/

[19] "Data Centres and Data Transmission Networks", IEA, June 2020; Link: https://www.iea.org/reports/data-centres-and-data-transmission-networks

[20] Operator overheads and own electricity generation are excluded in this representation.

for the more efficient optical fibre alternative as a way to enhance their environmental scores and create competitive advantage.

For instance, as part of the GSMA-The Carbon Trust initiative,[21] more than 50 MNOs are now disclosing their carbon footprint, energy and GHG emissions via the globally recognised Carbon Disclosure Project (CDP) system.[22] Indeed, the mobile industry was the world's first, in 2016, to commit to achieving the UN Sustainable Development Goals (SDGs), setting an industry goal of net-zero emissions by 2050.

Fact check: Will renewables be the solution to greening the ICT industry?

The ICT sector is in the forefront of shifting towards greater use of green energy from renewable sources, which has seen the industry limit its emission, although having a constant and efficient energy supply from renewable sources is not always easy. Firstly, use of renewables depends upon physical accessibility, which is not always there, and in terms of efficiency one should also account for the generated embodied emissions during the manufacture, transport and installation of renewable energy equipment. Nonetheless, it has been very much proven that **higher shares of renewable energy ARE the path to achieving carbon-neutrality**, with large players in the ICT industry having already seen enormous GHG and cost reductions.

2.3. Digital Devices and circular economy

The concept of circular economy for electronics has been gaining strength in recent years as the significance of properly disposing of and collecting electronic waste (e-waste) is better understood. Recycling processes separate precious metals found in electronics, lowering the demand for metal mining and extraction, which is a GHG intensive process. Additionally, recycling e-waste from landfills directly reduces methane emissions, a gas with a high heat trapping capacity.

In 2019, 53.6 Mt (mega ton) of e-waste were generated globally, which represents an annual growth of 5.45% since 2014.[23] Northern Europe is the largest producer of e-waste, creating 22.4kg per person yearly, which is well above the global average of 7.3kg per capita. On a global scale, only 17.4% of all e-waste generated is formally collected and properly

[21] See: https://www.gsma.com/betterfuture/enablement-effect

[22] See: https://www.cdp.net/en

[23] Global E-waste Monitor 2020, ITU. Available at: https://www.itu.int/en/ITU-D/Environment/Documents/Toolbox/GEM_2020_def.pdf

recycled, with this figure increasing to 42.5% when considering only Europe. However, if large electrical equipment is left out of the equation, only between 12-15% of mobile phones are properly recycled. According to a study published in the Journal of Carbon Research,[24] between 2.5-3.0 Mt of CO_2 equivalent emissions are saved for every Mt of e-waste documented and recycled.

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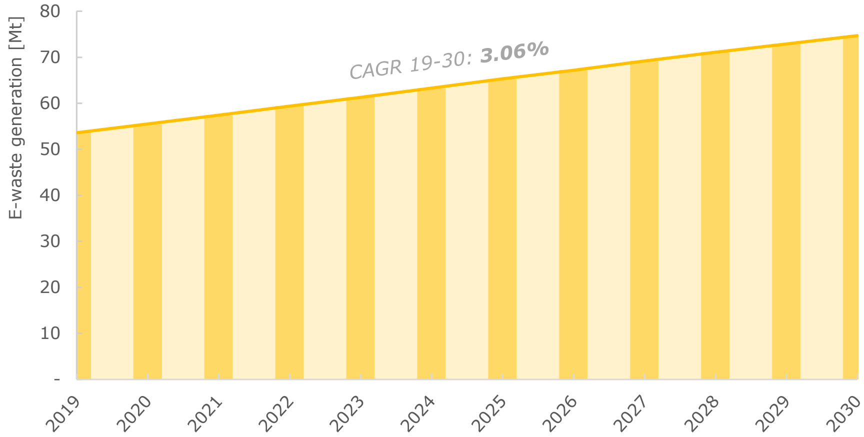

Exhibit 2.4. E-waste generation, 2019-2030 period
[Source: Axon based on ITU data]

New and updated versions of electronic goods are released almost yearly for some product categories (e.g. smartphones, laptops) in order to meet an increasing demand for faster and more up-to-date products. As a result, one problem arises: there is a large number of electronics discarded after 1 or 2 years of use that are still in near-perfect condition. During a 10-year period, extending the lifetime of mobile phones and other electronics by one or two years can mitigate between 20 and 30 million tonnes of CO2e, particularly from displacing the production of new devices. For instance, corporates are undertaking internal programmes to create alternative business models, encouraging the reuse of electronic devices, such as the PC-as-a-Service provided by Dell Technologies to its business customers.

A further driver of e-waste reduction besides reuse and recycling is repair. By improving repair capabilities or by enhancing the repairability of devices through improved designs, generated e-waste can be reduced and demand for new devices can also be lowered. Instead of trying to find solutions on what to do with generated e-waste, the development of

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[24] "Calculating the Emissions Impacts of Waste Electronics Recycling in Ontario, Canada", Journal of Carbon Research, 2016. See: https://www.mdpi.com/2311-5629/2/2/11/pdf

sustainable devices can help to stop the waste from being generated in the first place. Modular designs allow different components to be exchanged without the need to acquire an entirely new device, whereas the potential of durable materials for designing new electronics has already started to be explored and directly contributes to extending the smartphone's lifespan.

Fact check: Will recycling be the answer to the e-waste problem?

While recycling is of course a partial solution to the problem, the greater potential of reuse and repair is often overlooked. Companies in the ICT sector have recently started to promote circular economy programmes aimed at extending the equipment lifecycle (generally through refurbishment) and thus saving tonnes of e-waste and avoiding GHG emissions for the entire industry. While with current trends in repairability, spare parts are often expensive and therefore not worth the cost, **repair and reuse DOES reduce churn rate of devices and prevents e-waste generation more than recycling**, eliminating the need to collect and postprocess millions of devices globally.

3. The future of sustainable ICT

Despite the presence of some deniers of climate change, there is broad agreement between analysts that the world's carbon footprint needs to decrease in order to avoid climate catastrophe. From an ICT perspective, it is also clear that the energy demand of the global ICT sector will only grow in coming years due to digitalisation.

According to current levels, an optimistic projection sees ICT's emissions staying stable in the next several years. However, in order to meeting temperature-rise goals of 1.5°C, the global economy needs to reduce its emissions by more than 42% by 2030, more than 72% by 2040, and more than 91% by 2050.[25]

It is therefore important that regulators play a role in ensuring that the digital journey of their country/jurisdiction is undertaken by a responsible and climate-conscious ICT sector. Current policies to reduce, or at least slow down growth in, CO2 and other greenhouse gas emissions will have some impact on reducing future warming, but most are still far from the rates of progress required to achieve international targets.

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Here we highlight five areas in which regulators can look to take action to help drive sustainability in ICT.

3.1. Opportunities for regulators

3.1.1. Stock-taking

To begin on a sustainability journey, a good starting point is to assess current levels of sustainability in the country's ICT sector. Understanding the market from the ground level in terms of: energy consumption, use of renewables, GHG emissions, e-waste, etc. is an important step for regulators to identify what the strengths and weaknesses of the sector are, as well as to define what the sectoral sustainability objectives can be.

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For example, regulated industry players may be mandated to report specific metrics using predefined reporting models. Such models can be designed by the regulator to serve different purposes depending on the stakeholder under analysis. Considering data centres for instance, the

[25] Climate Action Tracker. See: https://climateactiontracker.org/global/temperatures/

objective of the regulator may be to understand the energy efficiency and data traffic levels of the centre in order to ascertain the likely growth in energy demand in the mid- to long-term, whilst for a telecom operator it may be very important to understand levels of sustainability across operational and supply chains.

Another area that regulators may be interested to take stock of is the number of activities or initiatives being undertaken or planned by industry players. In some markets, corporate responsibility towards sustainability is very active and, in some cases, may in fact be aligned with business objectives. It can therefore be interesting for regulators to understand where companies such as telecoms operators are with respect to sustainable action such as commitment to clean energy, commitment to recycling of equipment, impact investing, etc. Using such information, regulators can benchmark these actions and use this to further define objectives or policies for the industry.

3.1.2. Create a forum for discuss

If one does not exist already, regulators should consider the creation of a space where industry players, public agencies and other organisations such as NGOs can begin a discussion on green ICT. The existence of a forum enables dialogue whereby obstacles to sustainability measures, as well as concerns from all sides, can be shared and accounted for, allowing for progress to begin to take place from a collaborative perspective.

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Of course, any forum such as this must be used correctly for any meaningful dialogue to take place. As such, the responsible agency must be active in their approach to instigating dialogue through regular events, engaging stakeholders, creating working groups, etc., and through the use of received information to inform the wider net of stakeholders and push relevant agreements or policy changes within the sector.

3.1.3. Drive sustainable innovation for other sectors

While the carbon footprint of the ICT sector in general is mostly under scrutiny in this article, it is also widely considered that ICT is set to be highly impactful as a "green enabler" in other sectors. In theory this is absolutely true as novel ICT use-cases are creating opportunities for increased efficiencies and energy cost savings. However, the true application of such technologies is the decisive factor in whether they will substitute or add to the current carbon levels.

For instance, new innovations in Edge Computing technology can drive a reduction in data traffic to and from data centres and can therefore unburden the energy consumption of the latter as well as telecom networks carrying this data. However, this technology also gives birth to many new innovations and use cases, which will in fact likely be deployed in addition to existing ICT structures, generating new demand for digital devices (e.g. IoT devices), data generation, and energy consumption.

It is widely considered that ICT is set to be highly impactful as a "green enabler" in other sectors

A role the regulator can play here is to drive ICT innovation in the direction of energy-saving or low-energy intensive use cases. Of course, regulators are not advised to place obstacles to innovation in general, but incentives can be used to make investment in, and development of, sustainable solutions more attractive for the private sector. Regulators should focus on defining what these areas are, or will be, through studies and analyses of technology trends in their particular market. Incentives such as investment vehicles or tax breaks can then be used to encourage action in these directions.

3.1.4. Limiting industry emissions

An easy objective to set for the ICT industry is regarding levels of pollution. Placing a "carbon cap" on industry stakeholders can be an unpopular but effective way to reduce emissions in the industry. However, the definition of such an emissions cap is a serious task with many questions.

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As mentioned in Section 1, Type 3 emissions are often not accounted for in entities' reporting processes. In fact, such emissions can be difficult to estimate, and therefore their inclusion in such an emission cap would require the regulator to define a model for their calculation as part of the mandate. Currently, there are a number of standards that propose ways to calculate and take inventory of scope 3 emissions, but it is still no easy task. At the least, such an emission cap should be inclusive of the supply chains of industry players, requiring them to maintain that their suppliers are also making a reasonable commitment to sustainability in their operations.

3.1.5. Regulation of equipment

A further way to limit the emissions output of the sector can be to regulate the development of ICT equipment. Regulators can easily put certain constraints on the design and manufacturing of ICT equipment in their jurisdiction or on the procurement of equipment from abroad. Factors such as the choice of raw materials used, the product lifespan, energy efficiency levels, etc., can all be considered as regulated factors, guaranteeing a minimum level of sustainability in future ICT deployments within the sector.

Regulators can easily put certain constraints on the design and manufacturing of ICT equipment in their jurisdiction or on the procurement of equipment from abroad

Regulators could even adopt a certification scheme that allows for the simple trading of verified equipment in the industry. This kind of action, however, requires significant work from the side of the regulator to define such a scheme and its governance, as well as to attain buy-in from stakeholders across the sector and beyond.

4. About Axon Advisory

Axon is an international investment and advisory firm offering, through its Advisory arm, world class consulting services to a broad client base in the ICT industries and beyond.

In the last 10 years, Axon has executed +500 projects in +70 countries in the ICT domain, for major private companies, institutional bodies, and technology companies worldwide.

Axon is an expert in sustainability and emerging technology research and strategy, having implemented projects for multiple organisations from the public and private sector in this domain across multiple jurisdictions.

Analysts Team at Axon Partners Group[26]

[26] The views and opinions expressed in this article are those of the authors and do not necessarily reflect the view of Axon Partners Group.