ICT Solutions for Brilliant Minds

CSC

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EU climate target for 2040
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CSC wholeheartedly agrees with the need to set ambitious targets and take decisive action to fight climate change. As pointed out in the call for evidence, a new 2040 climate target will require policy responses in many fields beyond climate policy. We regret to note that the call for evidence does not list digital and technology policies as key fields, although the climate impact of digitalisation is significant and increasing[1]. In the following sections we will outline some aspects of this impact and how it should be taken into account when setting the climate target for 2040 and designing the measures for achieving the target.

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The urgent need to fight climate change as well as the rapid technological development and digitalisation are fundamentally shaping societies worldwide. We are not talking about isolated phenomena or impacts in individual policy fields. We are talking about global megatrends that all policy fields must take into account, not as an afterthought or something to be added on top of existing policies but as underlying systemic disruptions, steering the very design of any current or future policy actions.

The green and digital transitions impact all sectors of society, including also each other. In fact, the two transitions are so deeply intertwined that they are often referred to as a twin transition. Not only do they take place at the same time, they also impact and leverage one another in many ways. Therefore, climate and environmental policies must have digital considerations at their heart and vice versa.

One way to illustrate the interdependence of the green and digital policies is the idea of the footprint and handprint of digitalisation, i.e. the negative and the positive impact digitalisation has on climate and environment. On the footprint side, there are issues such as the use of raw materials for building the digital infrastructure and devices as well as electricity consumption of using the digital solutions. On the handprint side, digital solutions can create new knowledge to help reduce the footprint of other sectors by e.g. supporting circular economy as well as optimising various processes and policies.

Reducing the footprint

A key aspect of a successful twin transition is reducing the climate and environmental footprint of digitalisation. According to Finland's climate and environmental strategy for the ICT sector[2], published in March 2021, the ICT sector consumes an estimated 4-10 per cent of global electric

[1] see e.g. https://wedocs.unep.org/bitstream/handle/20.500.11822/37439/FB027.pdf
[2] https://lvm.fi/en/-/finland-announces-climate-strategy-for-ict-sector-harnessing-data-bits-to-combat-climate-change-1260885

power and gives rise to some 3-5 per cent of greenhouse gas emissions. In addition to this, the extraction and processing of the raw materials used in ICT infrastructure and devices burdens the environment considerably.

Some measures to reduce the footprint of digitalisation have already been taken, with particular emphasis on data centres, e.g. the Climate Neutral Data Centres Pact[3], the sustainability indicators to be set based on the new Energy Efficiency Directive[4] and the environmental labelling scheme to be introduced based on the EU Action Plan on Digitalising the Energy Sector[5]. At national level, Finland is applying a reduced electricity tax rate to data centres fulfilling certain energy efficiency criteria[6]. These kinds of measures must be further developed and extended to other burdensome digital infrastructures, taking into account the entire lifecycle from construction through the operational phase to decommissioning.

A good way to reduce the footprint of the construction phase is to use brownfield sites, i.e. existing facilities redesigned to new purposes. CSC's own experience of building a data centre[7] in the premises of an old paper mill has shown that using a brownfield site can reduce the need for new construction materials to the extent that the carbon footprint of the construction project is reduced by 80 %.

When it comes to the operational phase, particular attention must be paid to the electricity consumption: how much and what kind of energy is used and how energy efficient and cost efficient the whole process is? Weather variables and local sources of power generation have a significant impact on the carbon footprint of a data centre or any energy-intensive digital infrastructure[8]. Therefore, these infrastructures should be placed in locations where temperatures are low and humidity levels moderate, thereby reducing the need to use energy for cooling of the machines, and supply of renewable energy is abundant.

As to the decommissioning phase, due attention must be paid to reusing or recycling the materials to the extent possible. This also applies to the facilities hosting the digital infrastructures: they must not be abandoned after the old infrastructures are decommissioned but "re-used" as hosting sites of new infrastructures allowing them to start this cycle from brownfield construction as well.

Increasing the handprint

While it is important to continue working towards reducing the negative climate and environmental impact of digitalisation, there is particularly lot of potential to keep increasing its positive impact. The opportunities to create digital solutions that help creating new knowledge to reduce the footprint in all sectors of society are practically endless. The key is to find the right incentives to maximise the development of these solutions.

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[3] https://www.climateneutraldatacentre.net/
[4] https://www.consilium.europa.eu/en/press/press-releases/2023/03/10/council-and-parliament-strike-deal-on-energy-efficiency-directive/
[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0552&qid=1666369684560
[6] https://www.vero.fi/syventavat-vero-ohjeet/ohje-hakusivu/107822/s%C3%A4hk%C3%B6n-veroluokat-ja-verotuksen-korjaaminen/#1.1-s%C3%A4hk%C3%B6n-verotus-ja-veroluokat-i-ja-ii (in Finnish)
[7] https://www.csc.fi/en/kajaani-datacenter
[8] see e.g. https://it-resource.schneider-electric.com/white-papers/wp-66-estimating-a-data-center-s-electrical-carbon-footprint

One example of a digital infrastructure having a lot of potential to increase its handprint in relation to its footprint is a supercomputer. Thanks to their high computing capacity, supercomputers can perform calculations on large masses of data and thus make it possible to simulate, accelerate and optimise various processes and policies, in order to make them less burdensome on climate and environment.

A particularly promising data-driven simulation model that supercomputers make possible are digital twins. For example, Europe's fastest supercomputer LUMI, located in CSC's data centre in Kajaani, will be the computing platform for a digital twin of the Earth's climate[9]. The digital twin will combine large masses of data from various fields to produce simulations at an unprecedented horizontal resolution. Information provided by the digital twin enables next-generation adaptation strategies, planning measures to adapt and curb climate change. They can also be used for assessing the risks that arise if mitigation measures are not taken.

Another example of the handprint is re-use of waste heat produced by large digital infrastructures. By transferring the waste heat into the local district heating network, it is possible to decrease the need to produce heat with other means and thereby reduce the footprint of the energy system. This also supports the target of the new Renewable Energy Directive[10] to increase the use of renewables in heating and cooling by 0.8% per year until 2026 and 1.1% from 2026 to 2030.

There are obviously numerous other examples too, related to e.g. reducing and optimising the use of energy, logistics and raw materials via digital means. These cases should be explored further and incentives for developing new ones strengthened. For example, EU funding must put more emphasis on projects that take both the green and the digital aspects into account. While it is important to invest in the development of new technologies that may be crucial for the final steps towards climate neutrality, it is important to also keep funding basic research that lays the foundation for long-term technological progress[11].

Way forward

When setting the climate target for 2040, a sub-target for the climate impact of digitalisation should be considered. This will require some work on methodology as the complex cross-border operations in the ICT sector have made it difficult to identify appropriate measurement or reporting practices for the sector's footprint[12]. Therefore, the first step should be to agree on a shared method for measuring the footprint of digitalisation. Once shared metrics are agreed, it will be possible to set a target for the overall climate impact, possibly also taking into account the handprint.

In addition to setting targets for the climate impact of digitalisation, the EU should develop a horizontal strategy for advancing the twin transition, building on the 2022 Strategic Foresight Report on twinning the green and digital transitions in the new geopolitical context[13] and taking

[9] https://www.lumi-supercomputer.eu/lumi-selected-as-a-platform-for-destination-earths-climate-change-adaptation-digital-twin/
[10] https://www.consilium.europa.eu/en/press/press-releases/2023/03/30/council-and-parliament-reach-provisional-deal-on-renewable-energy-directive/
[11] see e.g. https://digital-strategy.ec.europa.eu/en/news/long-term-benefits-basic-research-technology
[12] https://www.etla.fi/en/research/ict-and-its-energy-consumption/
[13] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0289

inspiration from Finland's climate and environmental strategy for the ICT sector. Here too, both the footprint and the handprint must be addressed.

While it is important to pay more attention to the handprint, positive climate impact cannot be used as a reason to exempt ICT sector from addressing its own emissions. Responsible digital transition will not happen automatically but requires deliberate decisions, involving broad political and industrial actions and different measures and incentives for both reducing the footprint and increasing the handprint[14].

On the footprint side, tax exemptions or reductions for energy efficient digital infrastructures could be further promoted. Another way to incentivise footprint reductions would be to create similar indicators and labeling schemes for all energy-intensive digital infrastructures to those now being created for data centres. This would make it possible to compare the footprints of different service providers and use the comparisons when making purchasing or funding decisions.

On the handprint side, good examples of innovative projects and solutions must be explored and brought forward to raise awareness of the opportunities of the twin transition. EU funding instruments must also be geared towards further incentivising green and digital research and innovation as well as supporting related technological development and basic research.

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[14] see e.g. https://www.sciencedirect.com/science/article/pii/S2666389921001884