GLOBAL INFORMATION SOCIETY WATCH 2020

Technology, the environment and a sustainable world: Responses from the global South

Association for Progressive Communications (APC)
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ICT and the environment: Building a dialectical understanding

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When Marshall McLuhan coined the term "Global Village" in the 1960s, there was no internet. He did not even live long enough to see the beginning of the internet or to hear of the term information and communications technologies (ICTs). His prophecy about electronic media shrinking the world into a global village was nevertheless spot on. Today, 30% of the world population – 2.4 billion people – live in a village called Facebook. This is nearly 70% of all internet users. Remarkably, it took Facebook only 10 years to achieve this mass connection.

While the last decade showed how village-like we have become in liking and sharing everything from Gangnam Style to the latest TikTok videos, real villages have been battling an existential crisis. The stark reality of climate change was brought home to us by the Deepwater Horizon Oil Spill[1] and massive floods in Pakistan.[2] The Fukushima nuclear disaster exposed the hazardous and fragile nature of people-made systems. Between these catastrophic events and the ongoing COVID-19 pandemic, floods, forest fires and other disasters have ravaged parts of the world.

It is not just the larger ecology of the natural environment that has changed in the last decade. Social ecology has also shifted radically, its most defining feature being perhaps the ascendancy of right-wing populist leaders in many parts of the world. As the famous anthropologist Wade Davis recently wrote:

> [W]hen all the old certainties are shown to be lies, when the promise of a good life for a working family is shattered as factories close and corporate leaders, growing wealthier by the day, ship jobs abroad, the social contract is irrevocably broken.[3]

Though he was writing about the United States, the breaking of this social contract is visible across the world. There is widespread distrust of the establishment and people are no longer willing to settle for the status quo.

What can ICTs bring to this ever-shrinking world and its disrupted social ecology when it is facing one of the gravest challenges of its time? Will they enable us to overcome the crisis or will they fuel it?

We start with a review of key discussions captured by the GISWatch 2010 report on environmental sustainability and the internet.[4] The current report is in some senses a follow-up to this earlier GISWatch report – and it is useful to look back and consider what technology-focused civil society organisations were saying 10 years ago. We then discuss the direct impact of ICTs on the environment, highlighting the major trends in ICTs over the last decade. This takes us to the second part of the report where we look at the role of ICTs in climate crisis mitigation. We close with contesting visions of how to approach ICTs going forward.

What civil society was concerned about a decade ago

GISWatch 2010 points out the contradictory nature of ICTs in relation to the environment, where they represent both a solution and a problem. A full 70% of country reports raised the spectre of fast accumulating e-waste. One third of those reports, particularly from Africa, shared grave concerns surrounding the handling of e-waste. Recycling and refurbishing was a priority area for 46% of country reports, prominently those from Africa and Latin America. Another 46% saw ICTs as a tool for climate change mitigation. The carbon footprint of ICTs was a topic of discussion in 10 reports, seven of them from Europe.

This quick meta-analysis shows how, depending on the development stage of each country, the

1 https://en.wikipedia.org/wiki/Deepwater_Horizon_oil_spill

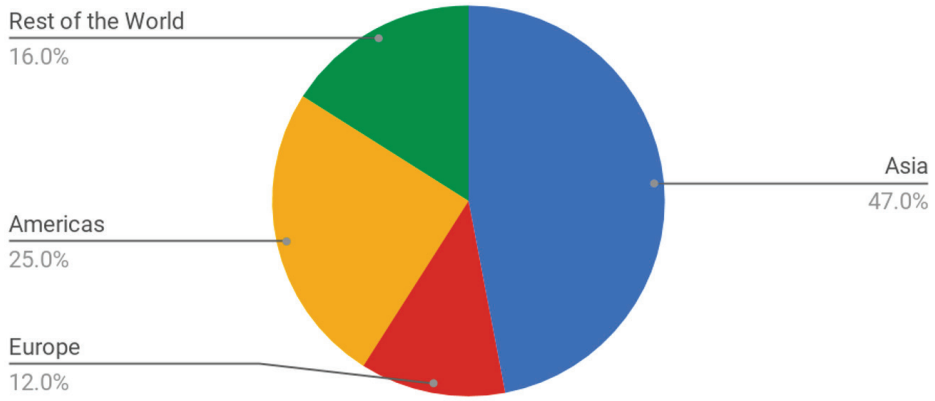
2 https://en.wikipedia.org/wiki/2010_Pakistan_floods

3 Davis, W. (2020, 6 August). The Unraveling of America. *Rolling Stone*. https://www.rollingstone.com/politics/political-commentary/covid-19-end-of-american-era-wade-davis-1038206

4 Finlay, A. (Ed.) (2010). *Global Information Society Watch 2010: Focus on ICTs and environmental sustainability*. APC & Hivos. https://www.giswatch.org/en/2010

FIGURE 1.

Global e-waste production in 2019, by region



concerns around ICTs and the environment can change drastically. On the one side are developing countries grappling with mounting e-waste – not just their own but also what more affluent countries have dumped on them. Because these countries do not have the regulations, know-how or infrastructure to safely dispose of this waste, the sorting and recycling of this enormous junk remains a serious health and environmental concern. The general technological capabilities of some developing countries like India and Egypt have advanced enough that they are able to view ICTs as a potential solution. On the other side are developed countries (and some developing countries) that have started assessing the long-term impact of ICTs such as their carbon footprint.

The growing ecological footprint of ICTs

Managing e-waste: Is there progress?[5]

In 2019, the world generated 54 million tonnes of e-waste, including electrical waste (refrigerators, washing machines and such) and ICT waste (smartphones, computers, etc.). About 25% to 30% of the total e-waste was ICT waste. The yearly growth of e-waste is almost 5% or 2.5 million tonnes per year.

Only 17.4% of the e-waste is formally collected and recycled because of the lack of formal collection and recycling processes in developing countries. This means that the outcome for 82.6% of electronic waste is uncertain.

While e-waste generation grew rapidly in the last decade, recycling and refurbishing did not keep pace (growth of 9.2 megatons vs 1.8 megatons between 2014 and 2019). Even Europe, which has the highest collection and recycling rate, collected only 42.5% of all electronic waste in 2019. Asia is low at 11.7% and the Americas at 9.4%, while Africa has an abysmal 0.9% rate. These statistics do not capture the contribution of the informal sector to e-waste handling. Reports also point towards continuing weakness in e-waste legislation and its implementation in key regions such as Africa and Asia.

While data on the weight of e-waste is indicative of the challenge before us, it does not reveal the full extent of the toxicity we may be dealing with. Miniaturisation of electronic goods may have reduced their total weight. It does not mean that there has been a proportional reduction in the hazardous components and rare metals they carry. Because of this, the challenge of e-waste handling is as significant now as it was in 2010.

ICTs and GHG emissions

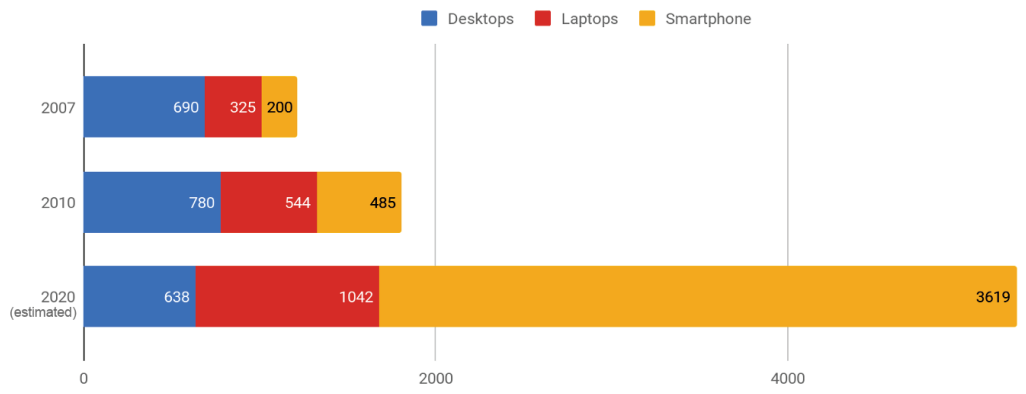
ICTs are emerging as a major contributor to global greenhouse gas (GHG) emissions. The total GHG contribution of ICTs covers production, usage and disposal of ICT goods. In 2007, the GHG emissions from ICTs accounted for 1% of the total emissions, but current projections suggest that this will rise to 14% of global GHG emissions by 2040.[6] This might appear a bit counter-intuitive to many, given the efficiencies and optimisations that ICT devices have brought in. Two major changes in the way we use ICTs need to be looked into: one, increasing use of

5 This section is based on the Global E-waste Monitor 2020. https://www.itu.int/en/ITU-D/Environment/Pages/Spotlight/Global-Ewaste-Monitor-2020.aspx

6 Belkhir, L., & Elmeligi, A. (2018). Assessing ICT global emissions footprint: Trends to 2040 & recommendations. *Journal of Cleaner Production, 177*, 448-463. https://doi.org/10.1016/j.jclepro.2017.12.239

FIGURE 2.

Installed ICT devices (in million units)



mobile devices, particularly, smartphones; and two, increasing adoption of data centre-based services integral for mobility.

Disposable smartphone adoption

The energy efficiency of smartphones has improved dramatically over the last few years. It is during their production that 85% to 95% of the emissions occur. Moreover, the business model of this industry does not maximise the usable life of the phone. Regular upgrades and newer models are the key growth drivers for smartphone sales. This necessitates reduced lifespan (estimated to be around two years) and no repairability. Studies suggest that smartphone emissions have increased from 17 megatons (4% of total ICT emissions) to 125 megatons (11% of total ICT emissions) of carbon dioxide equivalent between 2010 and 2020.[7]

Low-cost smartphones have improved access to the internet and ICTs for a substantial section of the population, but have also increased the environmental footprint. Moving towards personal devices like smartphones has also reduced the use of shared resources like telecentres. Even in settings like schools, where shared devices such as desktops are desirable, the trend is towards replacing them with mobile devices.

Data centres: Increasing efficiency and demand

From around 500,000 data centres in 2012, the number had grown to eight million in 2019.[8] There has been a marked improvement in data centre energy efficiency over the years.[9] Still, the average data centre energy efficiency is 50% less than that of the top-of-the-line data centres.[10] Data centres along with telecom networks contribute around 69% of the GHG emissions of the ICT sector.[11] Optimists would like to point out that electricity use per computation of a typical volume server has dropped by a factor of four since 2010 and the watts per terabyte of installed storage has dropped by an estimated factor of nine.[12] Energy efficiency in data centres is expected to absorb the next doubling of data centre energy usage.[13] However, given the nearly 25% growth rate for global data centre IP traffic, researchers have estimated data centres accounting for 3% to 13% of global electricity by 2030.[14]

Major developments in the ICT sector such as deep learning and cryptocurrency are energy intensive as they require massive storage and computing resources.[15] Every bit of reduction in energy consumption achieved through efficiency is thus offset by new demands around these new technologies.

7 Ibid.

8 Trueman, C. (2019, 9 August). Why data centres are the new frontier in the fight against climate change. *Computerworld*. https://www.computerworld.com/article/3431148/why-data-centres-are-the-new-frontier-in-the-fight-against-climate-change.html

9 Masanet, E., et al. (2020). Recalibrating global data center energy-use estimates. *Science, 367*(6481), 984-986. https://science.sciencemag.org/content/367/6481/984

10 Trueman, C. (2019, 9 August). Op. cit.

11 Belkhir, L., & Elmeligi, A. (2018). Op. cit.

12 Masanet, E., et al. (2020). Op. cit.

13 Ibid.

14 Andrae, A. S. G., & Edler, T. (2015). On Global Electricity Usage of Communication Technology: Trends to 2030. *Challenges, 6*(1), 117-157. https://doi.org/10.3390/challe6010117

15 Baraniuk, C. (2019, 3 July). Bitcoin's energy consumption 'equals that of Switzerland'. *BBC*. https://www.bbc.com/news/technology-48853230

The "right to repair" movement

How should one view the repair movement that has come up in the United States and other developed countries? Is it about being more environmentally aware or about protecting consumer rights and keeping expenses low? As iFixit, the global repair community points out, companies do not want you to repair. They want you to keep consuming new goods. And even if you repair, it should be only under their monopolistic control.[16] Taking away users' right to repair and keeping them at the mercy of the manufacturer clearly involves a rights issue.[17] But equally at stake is environmental safety. Many of these devices carry hazardous components harmful to the people handling them as well as the environment. So it makes sense to have restrictions on who all can do the repairs. In this case, the right of the user is secondary to our social responsibility to protect the environment. Advocacy around the right to repair should focus more on the collective good rather than an individual right. Today, businesses enjoy unbridled power without any responsibility. The right to repair movement is a strong antidote to that.

The right to repair movement does not seem to have gained much ground in the developing regions of the global South. There are many reasons for this: low consumer awareness, a thriving informal repair sector, and consumer preference for cost over durability.

ICT innovation and disruptions in social ecology

The anthropogenic nature of the climate crisis is well established. The social environment does affect the natural environment in which it is embedded. Poverty forces people to exploit the natural environment and exacerbate the damage already done.[18] Researchers have pointed out how pushing farmers to the margins of arable land may have led to the coronavirus pandemic.[19] Poverty affects a person's ability to make the right choice for oneself and for the community. In desperate circumstances, short-term interests prevail over long-term ones.

In the last decade, ICTs have caused a lot of disruption in our social ecology. Probably there are more to come. In this section, we look at two major disruptions and their consequences.

16 https://www.ifixit.com/Right-to-Repair/Intro

17 https://www.eff.org/issues/right-to-repair

18 OECD. (2002). *Poverty-Environment Gender Linkages*. https://www.oecd.org/dac/gender-development/1960506.pdf

19 Spinney, L. (2020, 25 March). It takes a whole world to create a new virus, not just China. *The Guardian*. https://www.theguardian.com/commentisfree/2020/mar/25/new-virus-china-covid-19-food-markets

Artificial intelligence, the gig economy and jobs

Globalisation shifted blue-collar jobs from the global North to the South, creating a new middle class in the global South. With advances in ICTs, white-collar jobs have also started taking the same direction. With automation facilitated by artificial intelligence (AI), many of these jobs are starting to disappear altogether. Change has begun to affect the middle class both in the North and South. According to the International Labour Organization, between 2005 and 2014, robots may have led to a 14% reduction in employment in the developing world.[20] New business models, such as Uber, facilitated by ICTs, bring in a lot of productivity gain but they also reduce the agency of workers, leading to informalisation of labour. While capital enjoys the gains of productivity improvements, labour is becoming more and more vulnerable. This has led to low faith in the ruling class. In the past, labour movements helped force a redistribution agenda, where the benefits of growth are shared more widely.

An argument often put forth is that, even in the past, while technology took away jobs, it created many more. This argument is valid – new technologies may create more jobs than what they take away.[21] While in the long run labour markets are likely to adjust with newly emerging job sectors, the transition will not be friction-free. It is easy to talk about re-skilling, but it is not so easy to achieve it, particularly as people grow older. Moving from a factory assembly job to coding is not something that is easily achievable.

Protection of the environment may not figure as an important objective for a person who lost their job or is forced to work extra hours to make a living. Labour movements that acted as a corrective force in the past have declined over the years in the onslaught of neoliberal globalisation. How labour as a class responds to the interrelated questions of automation and climate change needs to be studied.

Job losses are not the only outcome of new disruptive technologies and business models. An increasing appetite for data, leading to a violation of privacy, power consumption fuelled by AI, cryptocurrency applications, low-cost transportation services, etc. are important issues in themselves.

20 Carbonero, F., Ernst, E., & Weber, E. (2018). *Robots worldwide: The impact of automation on employment and trade*. International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_648063.pdf

21 Manyika, J., & Sneader, K. (2018, 1 June). AI, automation, and the future of work: Ten things to solve for. *McKinsey Global Institute*. https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for

However, this report emphasises labour challenges considering that workers as a political class can be a corrective force.

Social media: Unifier or divider?

The advent of social media is a significant development of the last decade. Like other mass media, social media has a role in shaping people's aspirations and attitudes. It influences how they organise and try to effect change. Social media is expected to build a sense of collective identity through discourse.

The last decade started with the Jasmine Revolution and Arab Spring, two movements that inspired progressives around the world. Social media, which had a catalytic role in both, acquired the image of a tool that can empower ordinary people. At the end of the decade, we are left with a very different picture. Whether it is Trump's USA or Modi's India, we see social media being used as an instrument to fuel hatred. Doubts remain as to how viable social media platforms are for constructive debates and conversations.[22] Given their pervasive influence, it is important that we understand their strengths and weaknesses. The situation is further complicated by the fact that social media platforms are largely controlled by profit-motivated businesses with very little democratic control.

The rise of right-wing politics and social media's amplifying effect should be read along with the loss of trust we discussed in the introduction to this report and the challenges for labour we discussed in the previous section. Environmental issues cannot be addressed in an environment of hate. They require democratic consensus. The sections of society that are going to be worst affected by the climate crisis are the ones that are swayed by the rhetoric of pseudo-anti-establishment forces that fuel hatred. When the progressives abandoned the poor and the working class, it created room for these forces to thrive. Social media has been a powerful tool in their hands. The need of the hour is a climate agenda that foregrounds poverty and inequality.

ICTs for climate response

There is no doubt that the adverse impact notwithstanding, ICTs have been good for humanity. If it were not for the internet, Greta Thunberg's small steps in one small corner of her country would not have inspired millions across the world. Apart from being a medium of communication, ICTs have an important role in helping us face the emerging reality.

Disaster response is one important area. Ushahidi,[23] an application which has its origin in political activism, became an important tool in responding to climate disasters across the world. Sahana, a free software project developed in the context of the 2004 Indian Ocean earthquake and tsunami for disaster response,[24] has been used in multiple climate disasters. Interestingly, both solutions came from the global South. This may also be an indication that the emergency response systems set up by the governments of developing regions are not yet ICT-enabled, or have significant gaps that civil society fills.

Monitoring the environment and forecasting events in the short or medium term and at local levels is an important requirement at a time when weather events have become less predictable. Remote sensing and geospatial technologies have improved substantially, and with new developments in ICTs and cheaper computing power available, we are in a position to be better prepared. Technological advancement in this area is largely driven by public research and therefore is part of the commons. Even private interests have not become as closed as in other sectors when it comes to climate-related technologies. The fact that private sector remote sensing firms are releasing their data in response to humanitarian emergencies shows their open attitude.[25]

Development in geospatial technology such as improvements in global navigation satellite systems (GNSS) and their mass availability via smartphones allow citizens to play an important part in crisis mitigation. Similarly, drone technologies make the generation of high-quality geospatial data cheap and relatively easy for individuals. Leveraging technology platforms such as OpenStreetMap[26] is expanding the geospatial data commons. This can enable better planning and efficient resource utilisation or reduce aggregate resource consumption.

Catch-up: The challenge for developing countries

Knowledge gaps pose a serious disadvantage for developing countries in leveraging ICT for climate crisis mitigation. Whether it is adopting geospatial technologies for planning or using remote sensing for weather predictions, it is important that

22 Jonasson, J. (2020, 6 March). Europeans: Top of the Class. *The Guardian*. https://www.theguardian.com/world/ng-interactive/2020/mar/02/europeans-top-of-the-class-by-jonas-jonasson-starring-viktor-akerblom

23 https://www.ushahidi.com

24 https://sahanafoundation.org

25 https://disasterscharter.org

26 https://www.openstreetmap.org

capability improvements happen in developing regions. This often requires learning the science and technology as well as the institutions and practices of the developed regions. For example, policies and laws that treat maps as highly classified secrets are disempowering when it comes to leveraging geospatial technology.

Historically, public agencies as well as international development agencies have played a crucial role in facilitating knowledge flow between developed and developing countries. While international agencies will continue to have an important role in the context of the environmental and climate crisis, equally important is the role of NGOs who are rooted in communities. The issue at hand is political; it raises questions about which development path to follow. Given that available resources are finite, development paths will diverge depending how resources are allocated. There are bound to be winners and losers. Those who enjoy more resources now could be the losers in the new allocation. In a not-so-well functioning democracy (loss of faith by people in the ruling class indicates this), the state may fail in ensuring fair allocation. There is also the issue of general inertia – systems take time to change. Often, it is the NGOs that champion the cause of the disadvantaged. It is not just their advocacy capability that needs to be strengthened but also their technology skills. Armed with new technologies, they can explore new opportunities to engage with and exert pressure on state institutions.

Screen New Deal vs Green New Deal: Which side are we on?

ICT is the most important general-purpose technology that defines the current phase of humanity. It has brought in substantial productivity gains. Investments in ICTs are seen as a driver of growth by countries across the board.[27] In response to the 2008/2009 economic crisis, Organisation for Economic Co-operation and Development (OECD) countries created stimulus packages that emphasised broadband expansion, smart grids, smart transport, e-health, e-education, etc.[28] The developing world also followed suit. The Aadhaar national ID project of the government of India is an example. A linear relation between ICTs and development was assumed and the notion of development adopted was also very narrow.

Confronted by the pandemic, we have stark choices to make. On the one hand we have what the famous researcher and writer Naomi Klein calls the "Screen New Deal"[29] – an agenda of virtualisation, technology mediating almost all human experience. ICTs are a key enabler in this idea, which gained ground when the pandemic placed restrictions on direct human experience. It enabled ICT firms to profit even at the expense of others during the lockdown. This agenda is based on assumptions about inherent capabilities of new technologies (primarily ICTs) to address all human challenges. On the other hand, we have the Green New Deal, which focuses on the environmental challenge before humanity and calls for investments to mitigate the challenge. Here technology is not the driver but a facilitator. ICTs are definitely an important part in both versions of the future before us. The question before us is which side we should take.

The rebound effect in the ICT sector is so strong that there are hardly any gains for the environment from efficiency improvements in technology. ICT equipment is becoming more personal than shared, fuelling consumption. On the plus side, access has improved with major computing activities becoming services (think word processing, data storage, video conferencing, email, etc.) and equipment getting cheaper. Can access be improved without sacrificing the environment and civil liberties?

An entrepreneurial spirit can drive change by introducing new business models. To nurture it, the state must regulate the marketplace and set the direction for change. The state has done it in the past successfully. It can do it again in the interest of society as long as it is not led by narrow self-interest.

27 World Bank. (2009). *Information and Communications for Development 2009: Extending Reach and Increasing Impact*. https://openknowledge.worldbank.org/handle/10986/2636

28 OECD. (2009). *The Impact of the Crisis on ICTs and their Role in the Recovery*. https://www.oecd.org/dataoecd/33/20/43404360.pdf

29 Klein, N. (2020, 8 May). Screen New Deal. *The Intercept*. https://theintercept.com/2020/05/08/andrew-cuomo-eric-schmidt-coronavirus-tech-shock-doctrine

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The world is facing an unprecedented climate and environmental emergency. Scientists have identified human activity as primarily responsible for the climate crisis, which together with rampant environmental pollution, and the unbridled activities of the extractive and agricultural industries, pose a direct threat to the sustainability of life on this planet.

This edition of Global Information Society Watch (GISWatch) seeks to understand the constructive role that technology can play in confronting the crises. It disrupts the normative understanding of technology being an easy panacea to the planet's environmental challenges and suggests that a nuanced and contextual use of technology is necessary for real sustainability to be achieved. A series of thematic reports frame different aspects of the relationship between digital technology and environmental sustainability from a human rights and social justice perspective, while 46 country and regional reports explore the diverse frontiers where technology meets the needs of both the environment and communities, and where technology itself becomes a challenge to a sustainable future.

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