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SNEAK PEEK

GLOBAL INFORMATION SOCIETY WATCH 2020

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

Association for Progressive Communications (APC)
and Swedish International Development Cooperation Agency (Sida)

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Sida

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Introduction: Returning to the river

Alan Finlay

The terrain of environmental sustainability involves contestation – for resources, for rights, for territory, for survival and for profit. This contestation is ideological, and embroils, among others, notions of public good, the value of memory and cultural practice, ownership and land rights, and decisions around what among our biodiversity is important, and what can be discarded.

Language and what discourse analysts call "socio-cultural meaning structures" orientate us in this contestation and have over the years provided much material for scholars to try to understand how environmental policy and practice are structured and evolve. How environmental discourses are constructed shapes the "shared imagination of feasible and unfeasible policies, the demarcation of appropriate and inappropriate practices, or the shaping of social identities and relations through language, non-linguistic communication and practice."[1] In a practical sense, language makes visible what is governable, or can be governed.

In recent background research into environmental activism conducted by the Association for Progressive Communications (APC), it was clear that the use of language was important in how different environmental groups self-identified and delimited their activities. It was also evident how these language frames had implications for how the groups positioned themselves in relation to natural resources, people and human rights, and had become an overt site of political and policy struggle.

One of the most obvious examples is the important refusal of Indigenous peoples' organisations to be considered "stakeholders", in the language of multistakeholderism. Instead they insist on being referred to as "rights holders". They argue that they do not have the same power as governments or the agribusiness, fossil fuel and extractive industries, and that to refer to them as "stakeholders" would make this power imbalance opaque.

In line with this demand, the UN refers to "major groups and other stakeholders" in its deliberations, a separation of language that is reflected in the actual separation of business groups and Indigenous peoples' groups in pre-events at UN forums (unlike, for example, at the UN's Internet Governance Forum, where there is a desire for a shared platform for deliberation among business, government and civil society, even if it might not always meet this multistakeholder ideal).

Indigenous communities also insist on being referred to as "peoples" rather than "people", suggesting the diversity and distinctness of different Indigenous cultures and lifeworlds. Similarly, in one report in this GISWatch edition, the author pointed out that in their region they refer to Indigenous "knowledges".

In contrast, many conservationists, who are often dependent on the collaboration of governments and business for their expensive and expansive conservation projects, are more comfortable with the term "multistakeholder engagement". While organisations like the World Wildlife Fund have human rights policies and agendas that are important to their work, conservationists might also talk about the "human-animal" conflict and "fence building" when constructing reserves, terms and concepts anathema to environmental justice actors, who centre communities and people as a part of – both sustained by and sustaining – the environment.[2]

Even the term "environment" has produced its own linguistic battleground, to the extent that the multiplicity of definitions in popular usage led

1 Leipold, S., Feindt, P. H., Winkel, G., & Keller, R. (2019). Discourse analysis of environmental policy revisited: traditions, trends, perspectives. *Journal of Environmental Policy & Planning, 21*(5), 445-463. https://doi.org/10.1080/1523908X.2019.1660462

2 It is important to note that the different groupings and their approaches can be fluid. There have been many systemic changes in conservation over the years, and, for example, "landscaping" is now promoted as a more inclusive, horizontal decision-making method of engagement. At the same time, conservationists are also members of Friends of the Earth International, which has an environmental justice agenda.

academic David Schlosberg to argue in 1999 that "there is no such thing as environmentalism."[3]

The focus of this year's edition of GISWatch, "Technology, the environment and a sustainable world: Responses from the global South", is, in this sense, somewhat unstable when it comes to considering what it exactly means.

This is partly deliberate. GISWatch is, for APC, essentially a research process, rather than an end-in-itself. Country reports suggest possible policy actions and priorities, offer examples of the use of technology in different contexts, and explore the potential implications of these for enabling human rights. But, beyond insisting on a human rights and social justice framework for analysis, we typically offer few restrictions on the approach the authors take to the topic under discussion. By doing this we allow for multiple perspectives, approaches and politics to become visible. Authors who may be new to the issue under discussion are also able to talk through the issue in a way that is relevant to their work.

GISWatch provides a common forum where these different perspectives can be contrasted and compared, and new perspectives understood. In this way it often provides the "raw material" for advocacy and engagement, for learning and analysis, and for catalysing new directions for advocacy among many of those who write the reports.

This year was no different. While we offered a starting definition of "sustainability", in line with the 1987 Brundtland Report, we invited authors to critique or disagree with this definition if they wanted to. We also did not define what we meant by the "environment" and allowed authors to decide on the most meaningful topic for discussion. Even our use of the term "global South" is relatively fluid. It refers to issues of social justice and the marginalisation of people and communities in countries typically identified as in the global South, but includes developed countries in the "global North" where similar and relevant issues might emerge – whether relevant by example (such as the Right to Repair movement, discussed in a thematic report by Ugo Vallauri), or through allied experiences, such as the marginalisation of Indigenous peoples in Canada, or the social exclusions faced by Black people in New York, or working class people in London.

While "technology" has a more-or-less shared understanding among digital rights activists, its usage was also left open – geoengineering, for example, is also an important if controversial technological frontier in the field of environmental sustainability.

What we did want to do, however, was to problematise the normative relationship that exists between environmental sustainability and technology: the idea that technology, and the use of technology, is necessarily and automatically a panacea to the various environmental crises facing the planet. Instead we wanted to start to outline how technology could most productively be a part of the complex and nuanced power relations that exist when we talk about environmental sustainability and human rights in a holistic way, identifying both its potentials and its limitations.

The result is a diverse set of authors for this year's country reports that include digital rights activists, Indigenous peoples' activists, techies, academics, environmental researchers, conservationists, journalists and feminists. The topics covered are equally diverse and range, for example, from a discussion on solar-powered lamps in the Democratic Republic of Congo and the use of ozone-washing machines in jeans manufacturing to reduce water consumption in Tunisia, to marine conservation and entrepreneurship in the Seychelles and anti-poaching efforts in Uganda. An overview of the efficacy of digital justice platforms for environmental lawyers in Bulgaria is offered, alongside an introduction to open data "green" agriculture projects in Taiwan, and the benefits and challenges of a virtual sustainable development poster competition in Lebanon.

The use of technology by Indigenous communities is the focus of several reports, including in Mexico and several other countries in Latin America, in Indonesia and India, and in the context of the exploited oil fields of the Niger Delta.

For example, in the Amazon rainforest, which stretches across several countries including Brazil, Bolivia, Peru and Ecuador, Indigenous communities use drones to monitor ancestral territories for invaders, including illegal loggers. In Brazil, high frequency radio – a technology already familiar to Indigenous communities – is used to share encrypted digital data. This allows communities in the country's extractive reserves to monitor and protect their territories with some measure of safety when communicating, in a context where they "are left alone to deal with the consequences of a political and environmental crisis." (In Asia, the regional author argues that digital security training is undervalued in the environmental space, including by donors, even though "[d]igital threats targeting NGOs or individuals working on the environment in the global South are likely to be more severe.")

In India, the potential of a community network is used to create an online repository of traditional Indigenous cultural practices and knowledge

3 Schlosberg, D. (1999). *Environmental Justice and the New Pluralism*. Oxford University Press.

on biodiversity and farming – it includes categories on "rice", "millets", "Jawar", "native trees", "livestock", "use of biodiversity in festivals" and "folk music". The information is collected using an "offline-based" mobile app by young people in the community, and is also used to market Indigenous products online – a project which not only creates the potential of different livelihoods for the community through their community knowledge and practices, but, through the interaction of digital technologies and traditional knowledge, enables what the authors describe as a "new and eternally evolving knowledge form". While an app developed for the project allows customers to see what they would look like in traditional Bohada festival paper maché masks that are sold online, the authors provocatively suggest that virtual or augmented reality could allow a deeper interaction with community practices by outsiders.

In Indonesia, the author describes how a community network has been set up in the Indigenous rice community in the village of Ciptagelar. Village projects have included a knowledge repository, the participatory mapping of data on Indigenous lands and farming cultures and traditions in the region, and the mapping of forests using satellite data and field surveys.

While locally led projects are critical to meaningful sustainability, the author also shows how "top-down" projects – at least in so far as they leverage already-existing "ecosystems" of technology use – can be successful, by describing a disaster response initiative using Twitter as a crowdsourcing reporting tool, which began as a response to perennial flooding in the capital Jakarta. Practical challenges to the project nevertheless remain, including being able to process the data quickly enough to shape government action in a time of crisis.

Drones are also used in Benin's protected parks, to detect illegal logging, monitor forests and estimate forest carbon. They find similar application in agriculture in that country:

> With drones, it takes less than half an hour to use the startup app called AgriLeap to map a field, allowing you to monitor production from the study of the soil to harvesting and yield forecasts.

In Uganda, open-source technology is used to collect data from the daily ranger patrols in the country's Queen Elizabeth National Park, including sightings of animals, the location of snares, and arrests made for illegal activities. This allows a better understanding of poaching trends in the park – and the system has been so successful it has been implemented in countries in Central and South America, in Bhutan in the Eastern Himalayas, and in Thailand, Gabon and Madagascar.

In another innovative project in national parks in Uganda, game theory and artificial intelligence are helping rangers to optimise and randomise their patrols with significant success. As the author writes, "Humans find it hard to generate credible schedules that are also unpredictable. We are instinctively drawn to pre-existing patterns." These experimental technological interventions that support conservation efforts are critical. The illegal trade in wildlife is one of the four most lucrative global criminal trades after drugs, arms dealing and human trafficking – not only placing endangered species under duress (or close to extinction) but forcing rangers to often engage in military-level clashes with armed poachers.

Access to data is explored in several reports – such as in the positive role of open data platforms and civic tech communities in sustaining alternative farming practices in Taiwan, including in restoring chemically contaminated rivers in a tea-farming region of the country's Feicui Dam, and creating new markets for eco-friendly agritourism.

Yet a number of reports show how in Asia, accessing reliable datasets on air pollution to inform government policy proves difficult. Reliable technology for monitoring air pollution is costly, and is often only set up in urban areas. The data that exists can be contradictory and fragmented, offering an unstable base for analysis and action. In India, a country where the "air pollution monitoring system is a complex maze" with "confusing and inaccurate" data, low-cost sensors offer a viable way to expand the monitoring capacity in the country. However, standards and regulations have yet to be developed to authorise their use.

The problem of fragmented, inconsistent and unreliable datasets is also encountered in Sudan, resulting in a "fragility in predicting, planning for and responding to natural environmental problems." A key problem that country also faces is economic sanctions, which limit technology transfer and its ability to respond to the imperatives set in international agreements, such as those on climate change.

In Nigeria, the lack of reliable data on oil production, spillages and gas flares in the Niger Delta – a region where the "level of under-development, injustices and environmental neglect are unfathomable" – facilitates corruption in the sector and hampers the work of environmental justice actors in the country. In Bolsonaro's Brazil, research and climate data is censored in line with the right-wing

government's pro-agribusiness agenda. In India, air pollution data is also politicised, in a country ranked as one of the top polluters in the world. As the author writes, government air quality data cannot be trusted and is frequently "fudged". Meanwhile, the country's environment minister recently denied any link between air pollution and the poor health of citizens.

A different kind of censorship is felt in Saudi Arabia, where environmentally aware Saudis have turned to social media to create communities of interest, even while what they can say about the limitations of government policy remains restricted and censored (leaving, the author points out, a lack of a nuanced understanding of environmental sustainability in the country, including in the reporting by the media). Instead, social media groups in that country focus on individual agency, on "actions individuals can take to live a more sustainable and climate-friendly life", rather than criticism or discussion of government policy.

Fewer reports deal with the preservation of marine resources (see the Seychelles) or water scarcity (see Tunisia). Yet these are critical socio-environmental challenges. In Tunisia, access to water has become an increasingly visible component of socio-economic demands in the last decade. Throughout June 2020 alone, around 150 protests took place around the country to demand access to water and 50 protests for other environmental issues. Technology solutions include the introduction of ozone-washing machines and e-flow nano-bubbles technology machines, which have reduced the consumption of water by 98% at a jeans manufacturer – as the author states, usually 10,000 litres of water are needed to make a single pair of jeans. In the agricultural sector, technology startups are using internet of things (IoT) technology for the real-time monitoring of soil, water and environmental data to help manage and optimise water consumption.

At the same time, as the number of beaches there that are blacklisted grows annually after negative water sample tests, it is anticipated that in 10 years' time all the beaches in the country will be polluted by plastic. Environmental activists have turned to social media to confront the country's multiple environmental crises – including for awareness raising, citizen mobilisation against the phosphate industry, which is responsible for water shortages in parts of the country, and a call for a "digital strike" against the government's inaction on climate change. Activists have also called for climate change education to be integrated into school curricula (adapting the curricula is also a key concern for the island report from Saint Lucia).

Reports are critical of the smart city agenda – the centrepiece of many policy documents. Smart city policies often lack effective mechanisms and the political will to foster inclusion. In countries such as Malaysia, the author finds it unclear whether smart cities can "achieve their intended outcomes without leaving anyone behind." Instead of an inclusive economy, society and politics built on – as the authors of the Australia country report put it – "information sharing, civic engagement and community development," the potential of smart cities is "co-opted and used by state-corporate power to destabilise, divide, confuse, depersonalise and atomise."

Besides perpetuating and creating new forms of economic and social exclusion and alienation, smart cities have another shadow: the mounting and largely ineffectively dealt with problem of e-waste. As Arun Madhavan and Sreekrishna Sankar point out in their thematic report, the problem of e-waste has been in the public eye for over 10 years, at least since the first media reports of dumping in countries such as Nigeria emerged. Yet as country report authors show, policy responses that have emerged since then are often ineffective.

In Nigeria – a country with a vibrant second-hand market for technology, and insinuations of corruption being rife at the country's shipping docks when hazardous waste is illegally slipped past the borders – most unusable electronics are still discarded in landfills. Despite a growing appreciation of the importance of recycling and the entrepreneurial opportunities presented by e-waste, general public awareness of why e-waste should be properly disposed is low, and government enforcement of disposal regulations poor.

India's e-waste management rules, meanwhile, fail to recognise the critical role in recycling played by the informal sector, which handles most of the e-waste discarded in that country. In Bangladesh, there is a lack of proper data on e-waste to create effective management plans, or for effective civil society advocacy.

While many of the problems we face with e-waste have not changed over the last decade or more, what does seem to be more prominent is the politicisation of a culture of reuse, which is now approached from strong, people-centred ideological perspectives, driven by ideas of a "circular economy", shared ownership, collectivism, and even radical hacker ethics. In Argentina, Nodo TAU calls for a paradigm shift in our understanding of consumption and disposal, a change in culture where the reuse of technology is aligned with "values such as shared technical knowledge, open codes,

collective action, collaborative mapping and the democratisation of information."

Meanwhile, Gato.Earth shows how the technology industry is implicated in the catastrophic impact on the environment and the rights and cultures of communities through the mining of lithium – used in rechargeable batteries for mobile phones, laptops and electric vehicles – in the salt flats of Argentina, Bolivia and Chile. What the authors call the "ecocide" in the lithium triangle in the region also holds unavoidable advocacy imperatives for digital rights activists concerned with environmental sustainability and the rights of marginalised communities.

A number of reports point to the importance of language and frameworks of meaning in the application of technology for environmental sustainability – and these offer some clues on how digital rights activists can sensitively navigate the interrelation between cultures and rights, technology, and the need to sustain our shared natural resources.

In their thematic report on community networks, the "Connecting the Unconnected" project team discuss how important communication is in the revitalisation of the Nahuatl and Tutunaku languages:

> A living, Indigenous language such as Nahuatl constitutes a thought-feeling system where nature and the environment are at the centre and the human being is only one part of the ecosystem.

In this context, the authors write:

> Language is vital for the care and defence of the territory, so in that sense a network that creates community through communication finds, through dialogue, knowledge, experiences, stories, needs and dreams that anchor it to the territory.

A similar perspective on "communication" – with its obvious implications of the use of technology in communities – is expressed in other reports. In the Amazon rainforest, for example, Intervozes - Coletivo Brasil de Comunicação Social writes that there is a need to connect people from different communities through multiple – new and traditional – forms of communication:

> This includes radio, meetings and assemblies, exchanges of traditional knowledge, and even dating strategies through radio transmitters, added by internet connections. These are multiple layers of communication that complement each other.

"The river," the authors write, is "a means of communication in itself."

These conceptions locate "communications technologies" more meaningfully at the local or grassroots level, embedded in and supportive of cultural practices and vulnerable communities, rather than alien to these.

Yet this is as true on the forest floor of the Amazon as it is in the highly urbanised and interconnected smart city, where technology can "destabilise, divide, confuse, depersonalise and atomise," or where, as the Connecting the Connected team point out:

> The ownership of [...] devices is both a symptom and a perpetuator of for-profit strategies based on the manufacturing of needs, and their temporary satisfaction, through excessive consumption of electronics rooted in planned obsolescence and a throw-away culture, reinforcing values of individualism, a false sense of human connection, and that one's worth is based on what one owns.

At the same time, Global Voices argues in their report on Indonesia that traditional knowledge systems are both practical and dynamic. Meanings and practices are not fixed in space or time but evolve; they have "strict parameters for community interaction" but are "fluid in nature, enabling a constant renegotiation with the environment in which these communities are located."

The meaningful and voluntary interaction with technology by communities can be "dynamic" and result in new forms of knowledge and being. Smart cities can "depersonalise" and "confuse" or promote "civic engagement and community development."

Whether in the most developed cities or remote regions, it therefore remains critical for digital rights activists to have a nuanced and contextual understanding of how technology can also be "extractive"; how it can destroy livelihoods, cultures and knowledge – alongside the environment – as much as it can produce new and exciting frameworks of democratised communication and meaning, and fresh possibilities for a sustainable future.

The Sustainable Development Goals and the environment

David Souter

Introduction

The Sustainable Development Goals – the SDGs – matter. They have flaws, like any international agreement, and they need to be interpreted in light of changing circumstances, but global agreement on development goals is immensely difficult to achieve, and reaching agreement on them was a big success for the UN.

Reaching agreement, though, is only half the task. It is equally difficult, if not more so, to implement agreement as to reach it. Many of the Goals are ambitious and much needs to work well for them to be achieved. They require political commitment, consensus around their key objectives, finance, a positive environment for economic growth. In practice, since they were agreed in 2015, they have run into headwinds: polarising geopolitics, underperforming economies in many countries, disrupted global trade relations, and now the COVID-19 crisis and recession. 2020 is going to saw slippage on many of the Goals and targets: slippage that will be tough to make up and that requires rethinking.

This report considers the SDGs from the dual perspectives of the environment and of technology. Its first part reviews the origins of sustainable development and the 2030 Agenda for Sustainable Development[1] – the UN agreement that contains the Goals. The second looks at how the environment and technology are reflected in the Goals and targets. The third is concerned with where we stand today and how we might move forward.

The meaning of sustainable development

It's a mistake to think that sustainable development is just another way of talking about the environment. The 2030 Agenda is fundamentally a strategy aimed at development, not the environment.

The word "sustainable" adds an important nuance to development. It was intended to be shorthand for something like "environmentally sustainable economic development" – and so inject long-term protection of the planet's viability into the ways that economic growth and social welfare are pursued.

The idea of sustainable development, as understood within the UN system, emerged from the Brundtland Commission (the World Commission on Environment and Development) in 1987[2] and the Earth Summit that followed it in 1992.[3] They proposed a tripartite approach to development built around economic prosperity, social welfare and environmental protection – all three of which, they claimed, could, should and must be pursued conjointly. They also proposed goals of intergenerational equity and sustainable consumption – principles intended to ensure that environmental outcomes affecting future generations should not be damaged irrevocably (or "unsustainably") by short-term policies and practices.

Achieving this tripartite core to sustainable development is challenging. It requires development strategies that don't juxtapose economic, social and environmental goals against each other, or address them separately, in silos, but consider them instead as interdependent, even inextricable. To illustrate: strategies are needed that recognise that economic and social welfare are unsustainable if climate change turns land to ocean, or critical natural resources become too scarce to be affordable.

There are obvious issues here of intergenerational *and* geographical equality. The overarching aim, as defined by the Brundtland Commission, has been "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[4] But conjoining economic, social and environmental goals at the Earth Summit, and more recently in the Sustainable Development Agenda, are also political. The outcomes of both processes

1 https://sustainabledevelopment.un.org/post2015/transformingourworld

2 Its report, *Our Common Future*, is at https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

3 Its *Rio Declaration* is at https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf

4 *Our Common Future*, p. 41.

– and of the Earth Summit's 20-year review in 2012, which strongly influenced the SDGs[5] – were negotiated through highly charged political processes in which different governments had different objectives, different expectations and sometimes sought relief in constructive ambiguity. The compromise they reached might also be described as "development that meets the needs of the developing world without compromising the ability of developed countries to continue their own growth."

There's a tension arising from this in the SDGs. The opening text of the Agenda is holistic. It emphasises the importance of integrating economic, social and environmental goals. The SDGs themselves, however, focus on specific aspects of development – food, health, education, water, gender and so on. Some are more detailed than others, with more specific targets, reflecting where politics enabled more or less consensus. The problem is that the distinctness of individual SDGs has encouraged siloed rather than holistic thinking about ways of implementing them, and undervalued the opening text's assertion of cross-cutting themes (like the environment) or means for addressing them (like technology).

The environment and technology within the SDGs

From an environmental perspective, the world today faces three great challenges, which are concerned with climate change, pollution and resource depletion (this last including land and water). All three of these pose fundamental challenges for sustaining economic growth (and therefore social welfare). Sustainable development, as understood in the Agenda, includes (some would say mainstreams) these environmental concerns within a range of SDGs rather than establishing a distinct platform for environmental protection within sustainability.

Only one of these three themes – the most existentially critical, the climate – is given its own SDG (Goal 13), and that cedes leadership to the United Nations Framework Convention on the subject. Other SDGs – concerned with water, energy, cities, the marine environment and land – have environmental aspects, but there's no cross-cutting strategy for pollution or resource depletion. That on sustainable production and consumption (Goal 12), refers to an earlier strategy on this[6] but is otherwise a checklist of desirable objectives. There's no plan, aside from the Framework Convention's view of climate change, to remain within what are called the "planetary boundaries" that represent tipping points beyond which environmental change could become irreversible. These can be thought of as the "safe operating space for humanity"[7] and are central to environmentalist perspectives on sustainability. Four of the nine planetary boundaries are now thought to be exceeded.[8]

Technology is, likewise, not treated holistically within the SDGs. It is mentioned here and there in the Agenda as holding potential for advancing development objectives – in medicine, in energy, in agriculture, in empowering women – but there's no overarching philosophy for technology beyond the assertion that progress should be "in harmony with nature: climate sensitive, respecting biodiversity, resilient."

Nor is it more than marginally mentioned in most SDGs themselves. Only two of the Goals have significant sections on technology. That on energy sees it as offering solutions, urging international cooperation on clean energy, renewables, "energy efficiency and cleaner fossil-fuel technology" (note the careful wording that reflects negotiating compromise), while reminding policy makers of the need to ensure energy infrastructure and availability in developing countries in order to achieve their economic goals (a central issue in geographic equality).

The final SDG, on global partnership, has a short section on governing technology, focused in particular on transfer – the contested goal of (mostly) developed countries sharing technology with developing countries in ways that enable the latter to have more autonomy regarding their development. The underlying issue of power over technological development which is represented by this is, in practice, unresolved, while rapid advances in new technologies (digitalisation, genetics, nanotechnology, etc.) are increasing rather than diminishing its geographic concentration.

From today's perspective, two things are missing from this treatment of technology within the SDGs. One is that, in spite of lobbying by the UN's International Telecommunication Union (ITU) and the multistakeholder Broadband Commission, there is no Goal specific to information and communications technologies (ICTs), just a reference to their likely

5 Its declaration, *The Future We Want*, is at https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf

6 10YFP Secretariat. (n/d). *The 10 Year Framework of Programmes on Sustainable Consumption and Production Patterns*. https://sustainabledevelopment.un.org/content/documents/1444HLPF_10YFP2.pdf

7 Rockström, J., Steffen, W., Noone, K. et al. (2009). A safe operating space for humanity. *Nature, 461*, 472-475. https://doi.org/10.1038/461472a

8 See https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html and https://ec.europa.eu/environment/integration/research/newsalert/pdf/four_out_of_nine_planetary_boundaries_exceeded_410na1_en.pdf

value and a single target in Goal 9 (on infrastructure, "inclusive and sustainable industrialisation" and innovation) aimed at increasing access, particularly in least developed countries (LDCs). This seemed inadequate at the time of the third Earth Summit in 2012 (whose outcome document also said next to nothing about ICTs), let alone 2015. It seems entirely inadequate today when the opportunities and risks of present and future digital technologies are so widely regarded as transformative (and seeing accelerated impact as a result of the coronavirus).

The second omission is concerned with ethics. Where technology is referred to in the SDGs, the assumption is that it is beneficial: that it brings progress but not problems. This is obviously inadequate. The industrial revolutions of the last two centuries and more have done wonders for economic prosperity, but have also left us with the existential threat of climate change and apparently uncheckable plastic pollution. TNT and nuclear fission were always going to have peaceful and warlike applications. The internet has proved as effective at spreading mis- and disinformation as it is has knowledge, while digitalisation enables surveillance at least as readily as it empowers. The ethical challenges of gene editing and artificial intelligence have come sharply to the fore in recent years.

To summarise: the 2030 Agenda and its SDGs provide the crucial framework for international action on sustainable development. Achieving agreement on consensus goals was an important step forward in entrenching both development objectives and international cooperation. (This would be much harder to achieve in today's more polarised geopolitical environment.) But the concept of a comprehensive and holistic approach to development in the Agenda's opening text is insufficiently translated in the list of Goals and targets. Its framework needs to be developed, in particular to take advantage of the opportunities and protect against the risks presented by the very rapid rise of new technologies.

Technology, the environment and SDGs today

Much of the development literature around technology and innovation discusses it in abstract terms, assuming consequent improvements in efficiency and welfare, yet their cumulative impacts are often underestimated. Five aspects of this are important in understanding how technology/technologies can contribute more effectively towards sustainable development (including the SDGs).

First, the impacts of technological developments are highly complex. Innovations in technology will affect many, most or all of the SDGs during the course of the Agenda (up to 2030) – gene editing in health and agriculture, for instance, robotics in industry, nanotechnology, digitalisation and artificial intelligence across a wider range – and these will interact with one another. They need to be understood collectively as well as individually.

Second, the pace of change since adoption of the SDGs has been intense and is accelerating. Fast broadband, new applications and big data have dramatically changed many of our societies, economies and cultures. Artificial intelligence, the "internet of things" and, soon, autonomous devices will do so again. Irreversible impacts arise from these before our institutions enable us to shape them. "Code is law," wrote Lawrence Lessig 20 years ago;[9] code (and other new technologies) could also be displacing policy (and good intentions like the SDGs).

Third, there's nothing that's inherently good or bad about technology. There's a balance, in every generation of technological development, between opportunity and risk. The pace and capabilities of today's techno-innovations make those opportunities and risks much larger and more critical than those in previous generations: they can bring greater benefits, but the threats they pose are greater too, and both are happening more quickly. Innovation has been somewhat fetishised by some in technical and development communities: the new valued over the tried and tested, "moving fast and breaking things" preferred to building on experience. That's insufficiently sophisticated.

Fourth, this balance between opportunity and risk requires both proactive and protective measures. New technologies, for instance, offer opportunities to monitor the impact of climate change (such as environmental sensors), reduce carbon emissions (by improving efficiency in the use of energy or by decarbonising fossil fuels) and mitigate their impacts (for instance by increasing productivity in food production). These should be maximised, though also monitored to identify potential (or real) risks arising, particularly unintended consequences (for instance from gene editing). But the broader impacts of technologies on the economy, society and the environment – caused by the way they are used, rather than the purposes for which they are intended – also need constant monitoring and, where harmful, to be minimised. That requires strategic intervention concerned with directing technology in ways that shape society rather than allowing the converse.

Fifth, technology can't be divorced from the political and economic power structures that surround it. Powerful governments and businesses are best

9 https://harvardmagazine.com/2000/01/code-is-law-html

placed to dominate emerging technologies, which require high levels of capital investment, and to leverage their benefits. Sustainable development requires that opportunities are made available and risks are shared more equitably. That requires much more than part-implemented agreements on technology transfer; it requires a change of mindsets about interdependence (of which the COVID-19 vaccines are proving an important test).

One standard way of understanding the impacts of technology is to look at them in four categories. I described these thus, eight years ago in a comprehensive review of digitalisation and the environment that I co-authored for the International Institute for Sustainable Development:[10]

- First order (or direct) effects are those that result from the physical existence of ICTs and the processes involved in making them available – for example, the jobs created in ICT manufacturing and services, or the carbon emissions generated by manufacturing, data centres and the use of terminal devices.
- Second order (or indirect) effects are those that result from the ways in which those ICTs are used, in particular those resulting from applications and access to content – for example, the loss of jobs in sectors undermined by internet-enabled businesses (such as music retail) or the reductions in carbon emissions achieved through automated ("smart") management of electricity generation and distribution.
- Rebound effects are the counterbalancing impacts that occur as a result of behavioural changes that themselves result from these first and second order effects – for example, the likelihood that the reduction in vehicle usage resulting from telecommuting will be accompanied by increased use of vehicles for leisure activities.
- Third order (or societal) effects are the aggregated outcomes of large numbers of people using ICTs over the medium-to-long term in ways that alter how economies and societies work – for example, changes in the nature of work and working relationships, in the relationships between diasporas and home communities, in patterns of consumption and human settlement.

That complex and reflexive framework is a good one for building better understanding of the impacts of all technologies, as they apply to SDGs in general as much as they apply to ICTs or the environment. It suggests three things.

First, that technology and its impacts are central to development, sustainable development and humanity's approach to its environment. They need to be better understood and better located within efforts to implement the SDGs and sustainable development more generally.

Second, that those impacts change rapidly in time. They need to be monitored and goals and targets need to be adjusted to take advantage of them and adapt to the different circumstances that technology is engineering as these changes occur. The SDGs cannot effectively be implemented in a state of stasis.

Third, that governance is critical. Most new technologies are developed within a framework that respects the precautionary principle – in terms of health or the environment, for instance – and accommodates regulatory oversight such as environmental audit. The digital sector has resisted this, preferring to enable innovation first and sort out problems later should they arise. A sustainable development framework, aimed at public goods, requires responsibility and accountability in technology and innovation. Mechanisms for this are an essential part of implementing the SDGs.

Technology's role in sustainable development can be expressed quite simply: to maximise potential gains for sustainability (that tripartite win) as well as individual SDGs, and to mitigate and minimise potential harms (those that arise from its own development as well as other sources such as fossil fuels). Implementation, though, is far more complicated.

One final point. The SDGs, like other international frameworks such as that for human rights, rely on immutability for their authority. If they could easily be changed, they would be, and governments would then focus on change rather than implementation. However, such frameworks need to be interpreted in light of changing circumstances – such as greater certainty about the trajectory of climate change, geopolitical conflict, the emergence of artificial intelligence, or a pandemic like COVID-19. The role of technology in facilitating (and threatening) sustainable development is in constant, complex flux. As this report has sought to suggest, this requires more and more sophisticated attention to the relationships between technology, sustainability and the environment.

10 Souter, D., & MacLean, D. (Eds.) (2012). *Changing our Understanding of Sustainability: The impact of ICTs and the Internet*. International Institute for Sustainable Development. https://www.iisd.org/system/files/publications/changing_our_understanding_of_sustainability.pdf

Community networks: A people – and environment – centred approach to connectivity

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Introduction

During the middle of the last decade, mobile phone penetration growth began to slow.[1] This, more than perhaps any other indicator, is a clear sign that the dominant model of connectivity around the world – i.e. commercial mobile services – has begun to reach its limits, saying nothing of the quality of the connectivity provided, who it is provided for, its social value, or the fact that only around half of the world's population can get online. It is clear that other approaches to connectivity must be embraced if all are to enjoy its benefits.

As a sector, agriculture shares many of the challenges of the telecommunications sector, both in terms of market concentration and big business interests, creating less than optimal outcomes. But it is also a sector in which small actors play a crucial role.

In 2014, the Food and Agriculture Organization published a report titled *The State of Food and Agriculture* that revealed that there are over 570 million farms in the world, more than 90% of which are run by an individual or a family and rely primarily on family labour.[2] These family farms produce about 80% of the world's food; yet while farms of less than one hectare account for 72% of all farms, they control only 8% of all agricultural land. In contrast, only 1% of all farms in the world are larger than 50 hectares, yet control 65% of the world's agricultural land.

As numerous recent reports have warned, the Earth and its inhabitants are being damaged by a global system that values profits over life.[3] In the world of agriculture, smallholder farms as well as cooperatives are a major way that land is responsibly stewarded and biodiversity is maintained around the world.

The analogue of this in connectivity are community, local and cooperative networks: self-organised, self-managed or locally developed solutions for communication and internet access.[4] Similar to the consolidation we see in the agricultural space, there are major monopolies controlling much of the spectrum and investment while only connecting half of the world's population, making it extremely challenging for local, more grassroots models to emerge. Despite these barriers, a significant number of community networks have managed to thrive where other networks did not exist or are not affordable or adequately meeting the needs of local people.

Digital technologies: Saviour or danger?

What is the connection between digital communication technology and the creation of a more just and sustainable world? Initially heralded as a saviour, digital communication technologies have also contributed to and facilitated much of the activity around the world that is destroying life. Additionally, they hold a special place as both signifier and contributor to the hegemonic ideas around development and progress.

An example of how the material and symbolic nature of connectivity runs counter to sustainable development and a more just world can be found in the explosion of mineral resource extraction to create the over eight billion mobile handsets in circulation.[5] The ownership of these devices is both a symptom and a perpetuator of for-profit strategies based on the manufacturing of needs, and their temporary satisfaction, through excessive consumption of electronics rooted in planned obsolescence and a throw-away culture, reinforcing values of individualism, a false sense of

1 International Telecommunication Union. (2018). *World Telecommunication/ICT Indicators Database*. Geneva: ITU.

2 Food and Agriculture Organization. (2014). *The State of Food and Agriculture: Innovation in family farming*. FAO. https://www.fao.org/3/a-i4040e.pdf

3 Brondizio, E. S., Settele, J., Díaz, S., & Ngo, H. T. (Eds.) (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES. https://ipbes.net/global-assessment

4 Finlay, A. (Ed.) (2018). *Global Information Society Watch 2018: Community Networks*. APC & IDRC. https://www.giswatch.org/community-networks

5 Murphy, M. (2019, 29 April). Cellphones now outnumber the world's population. *Quartz*. https://qz.com/1608103/there-are-now-more-cellphones-than-people-in-the-world

human connection, and that one's worth is based on what one owns.

The modus operandi of the telecom and internet industry that promotes most of the digital communication technology we all use is based upon and thrives on the most elemental and destructive aspects of "novelty" capitalism. Within the current world order there is a relentless focus on doing things as quickly and as massively as possible based on the imperative to put capital to productive means and guaranteeing a speedy return on investment and value to shareholders. The technological tools developed under these imperatives must extract as much value as possible from users by commodifying and manipulating their attention and "data bodies" through proprietary algorithms. Perhaps paradoxically, the telecommunications industry is only able to profitably serve half of the world's population, creating a massive and widening digital divide.

While this digital divide must be addressed, information and communications technologies (ICTs) can and must be employed and deployed differently. Community networks offer an example of how. One way to understand this is through the lens of "appropriate technology", defined as being small-scale, affordable by locals, decentralised, labour-intensive, energy-efficient, environmentally sound, and locally autonomous.[6] In this definition we find similar dynamics in land stewardship and small-scale agriculture insofar as the appropriate technology movement grew out of the energy crisis of the 1970s, similar to land-based approaches that promote environmental conservation by seeking to "close the cycle", such as permaculture.

The concept of connectivity and communication, as part of what the community is, rather than just another service it consumes, is at the heart of how and why community networks are an important way forward if we wish to have ICTs contribute positively to a more sustainable and environmentally stable planet. Community networks inherently embody the principles of sustainability and local involvement, and do not put the onus of connectivity on someone else. Instead they leverage the limited resources – yet unlimited ingenuity – of local people to address the inherent human need and desire to communicate and be informed. Due to these attributes, community networks are seen as key enablers of sustainable access.[7]

Within community networks, diversity is valued, and there is an emerging recognition that there can be linkages between digital expertise and, for example, women's alternative, grassroots technologies and skills already in use, such as weaving.[8] As fundamental as women are in small-scale agriculture, so too is their role in implementing and managing local networks.

Furthermore, mobile broadband is used by less than 20% of the population in least developed countries (LDCs), and a mobile broadband subscription with a 1.5 GB data package costs less than 2% of gross national income (GNI) per capita – the International Telecommunication Union affordability target – in only four LDCs. Community networks offer one of the few real prospects for allowing the barely connected and the unconnected to participate more meaningfully in the defence of the planet.[9]

Community networks: Sustainable, local solutions

Through the work of the "Connecting the Unconnected" project, we have had the privilege to work with and support community networks around the world and have seen first-hand how these networks embody and reproduce values of sustainable and participatory development.[10] Community networks sustain the use of local knowledge that directly relates to land stewardship and traditional knowledge about the natural world. They engage in local economic activities based on degrowth, circular economies, and upcycling. They are more conscious about energy usage than traditional networks – and they share knowledge freely so all can contribute. Not surprisingly, many community networks are located in regions affected by climate change, and being largely subsistence farming and agriculturally based, they are directly affected by deteriorating environmental conditions.

In 2019, through an APC-funded Community Networks Learning Grant programme,[11] projects were undertaken in South and Southeast Asia, Latin America and Africa, many of which had biodiversity

6 Hazeltine, B., & Bull, C. (1999). *Appropriate Technology: Tools, Choices, and Implications*. Academic Press.

7 Oghia, M. (2018). Community networks as a key enabler of sustainable access: A review. In A. Finlay (Ed.), *Global Information Society Watch 2018: Community Networks*. APC and IDRC. https://www.giswatch.org/en/infrastructure/community-networks-key-enabler-sustainable-access-review

8 Zanolli, B. et al. (2018). Feminist infrastructure and community networks: An opportunity to rethink our connections from the bottom up, seeking diversity and autonomy. In A. Finlay (Ed.), *Global Information Society Watch 2018: Community Networks*. APC and IDRC. https://www.giswatch.org/en/infrastructure/feminist-infrastructures-and-community-networks

9 https://itu.foleon.com/itu/measuring-digital-development/affordability; https://broadbandcommission.org/Documents/SOBB-REPORT%20HIGHTLIGHTS-v3.pdf

10 https://www.apc.org/en/project/connecting-unconnected-supporting-community-networks-and-other-community-based-connectivity

11 https://www.apc.org/en/node/35438

preservation as a key goal. Through the Gram Marg Broadband project, BAIF Development Research Foundation and IIT Bombay seeded the growth of community networks in a remote rural village in Maharashtra, India. The project focused on digitising local knowledge relating to rural livelihoods in Indigenous communities. The project looked to build connectivity infrastructure that is meaningful to the community through the use of a digital knowledge-sharing platform for economic empowerment and the promotion of local livelihoods.

Some of the critical concerns in the region are loss of traditional knowledge on agro-biodiversity and indigenous crop cultivation, and the impact of climatic change and weather patterns on crop yields and biodiversity. The open source platform allows farmers to share information and co-create knowledge on indigenous crop varieties, cultural art forms like paintings, craft, music, etc. This is collected by the community and stored as a repository on a locally accessible server.

Sustainable livelihoods are facilitated by this system using an e-commerce platform, ensuring direct connection between the farmer and the clientele for selling and purchasing of goods. In the Pathardi community network in Maharashtra, women played a lead role in collecting information of the various biodiversity available in the village. This information was collected in the form of audio recordings played on a community radio, and photographs and videos of different plant and crop varieties. Women also collected information on the various methods adopted by the community to preserve seeds. Other methods of biodiversity conservation that women contributed to were through tribal wild food festivals where women followed traditional recipes.

In Latin America, when a community network is planned, the communities centre on their traditional communication processes before even thinking about connectivity. For example, in the joint work carried out in Cuetzalan del Progreso, Puebla, Mexico with the Unión de Cooperativas Tosepan, the primary importance of communication has been the revitalisation of the Nahuatl and Tutunaku languages. A living Indigenous language such as Nahuatl constitutes a thought-feeling system where nature and the environment are at the centre and the human being is only one part of the ecosystem.

In this context, language is vital for the care and defence of the territory, so in that sense a network that creates community through communication finds dialogue, knowledge, experiences, stories, needs and dreams that anchor it to the territory.

Communication networks that create community are a space where people meet to decide on the technologies they need and want. In this way, educational spaces are generated where people can reflect on the dilemmas of the internet, social networks and privacy in territories where life of all types is protected and defended.

In Africa, BOSCO in northern Uganda uses solar energy to power its community network, which spans over 400 kilometres in 13 districts. The network connects a total of 54 centres, which include schools, health clinics, community ICT hubs, and local NGO and government offices. BOSCO has also established large energy systems (6 KW and 30 KW) powering three secondary schools. Youth from the communities are trained on how to operate and maintain the solar equipment.

BOSCO emerged as a way to connect the community around messages of peace and hope as local populations were unable to connect to the national radio or any form of communication with the outside throughout the war that left many displaced in refugee camps. BOSCO was established to connect the community and transition them out of isolation. The development and use of solar energy emerge in BOSCO and several other community networks on the continent as an extension of the ways to sustain life.

Conclusion

While big tech and traditional telecoms operators are pushing populations around the globe to go faster and carry on consuming, the coronavirus pandemic and the deteriorating state of the planet require us to scale back and slow down – to find ways to live more harmoniously with our environment and make digital communications an integral part of this change. In order to do so responsibly, we must support efforts from the global South to rethink connectivity. In the words of renowned economist and inequality expert Tony Atkinson:

> The direction of technological change should be an explicit concern of policy-makers, encouraging innovation in a form that increases the employability of workers and emphasises the human dimension of service provision.[12]

Community networks around the world are doing this and much more, and as such are an integral part of any strategy to create a greener and more just world.

12 https://economysg.wordpress.com/the-15-proposals-from-tony-atkinsons-inequality-what-can-be-done

COMMUNITY NETWORK CHECKLIST

- Build the capacity of communities, and especially women and ethnic minorities, to connect themselves in a timeframe and process that are comfortable to them and allow them to attend to their local and practical needs.
- Create space for women to make communication governance decisions and take on leadership roles in their communities.
- Create mechanisms for those communities and the organisations that support them to share experiences and learn from each other.
- Invest in free/libre and open source technology that is:
  - Easy to use, does not require prior technical knowledge, and is well documented
  - Affordable to build or purchase and operate
  - Robust enough to work in adverse environments
  - Easy to understand in terms of how it works and easy to repair locally
  - Adaptable to local needs and use cases
  - Energy efficient (consumes low amounts of energy) and can work with renewable energy
  - Optimised to the low bandwidth conditions of community networks.
- Create a more enabling policy and regulatory environment, for example, by:
  - Providing public funding to community network initiatives
  - Creating a more level playing field for interconnection with larger/dominant infrastructures
  - Facilitating access to spectrum, especially for mobile broadband
  - Creating appropriate options for community networks within regulatory licensing frameworks that do not place undue economic and bureaucratic burdens on community networks.

Country and regional reports

AUSTRALIA

A CAPITALOCENTRIC REVIEW OF TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT: THE CASE FOR MORE-THAN-HUMAN DESIGN

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Introduction

We study sustainability in the context of technology design for smart cities, their legal and policy implications, and are now leading a new programme of investigation into more-than-human futures and post-anthropocentric approaches to sustainability.[1] Sustainable development is often defined in a way that presents technological progress geared for incremental improvements and small efficiency gains as humanity's response to the imminent planetary ecocide. Critics claim that this is too simplistic, because it does not account for the complex entanglements of Earth's ecosystems. It also relegates responsibility away from systemic economic frameworks and onto ordinary people making everyday consumption choices.[2] We use the notion of the Capitalocene[3] to critique these conventional views, and present an alternative, more-than-human perspective.

We highlight the widespread co-option of the original conceptualisation of "sustainable development", and the erosion of its emphasis on social justice, grassroots participation, equality and low-impact development by market forces. This co-option, we argue, has taken place under the banner of "green growth" and the current conceptualisation of "smart cities". In response, we provide three examples of alternative approaches to "green growth"-based smart cities: planning, design and regulation. Cutting across all three practices, we posit the case for more-than-human principles to be more broadly embraced. (1) We focus on the potential role of more-than-human principles in planning for smart cities. Here, we discuss technological issues and examples of implementing Indigenous data sovereignty[4] and implications for smart cities and the people, plants and animals that live in them. (2) We grapple with the socio-cultural dimensions of a more-than-human approach, such as new participatory methods of decentring humans in the design of smart city technology.[5] (3) We then discuss regulatory and governance issues such as active resistance to planned obsolescence of digital devices and people's right to repair. More broadly, we discuss how more-than-human perspectives may centre ecosystems in the approach to the planning, design, regulation and governance of urban space.

Why a more-than-human approach is required: The myth of "green growth"

We suggest that a primary shift is required in smart city thinking away from the concept of humans as consumers of the smart city (and its services and supply chains), to producers of spaces and services that provide ecosystemic benefits within and beyond city boundaries. In the absence of this objective, cities risk becoming:

> [A] digital marketplace where citizen-consumers' participation is increasingly involuntary and the hegemony of global technology firms is inflated. What follows is that the city's "intelligent systems" are defined through a digital consumer experience that has inherent biases and leaves parts of the city and its population unaccounted for. This renders the city less resilient in the face of future social and climatic risks.[6]

Instead, we argue, as producers of the more-than-human smart city, humans who live, breathe and eat

1 https://research.qut.edu.au/morethanhuman

2 Lukacs, M. (2017, 17 July). Neoliberalism has conned us into fighting climate change as individuals. *The Guardian*. https://www.theguardian.com/environment/true-north/2017/jul/17/neoliberalism-has-conned-us-into-fighting-climate-change-as-individuals

3 Moore, J. W. (2017). The Capitalocene, Part I: on the nature and origins of our ecological crisis. *Journal of Peasant Studies*, *44*(3), 594-630. https://doi.org/10.1080/03066150.2016.1235036

4 Kukutai, T., & Taylor, J. (Eds.). (2016). *Indigenous Data Sovereignty: Toward an Agenda*. Australian National University Press. https://doi.org/10.22459/CAEPR38.11.2016

5 Clarke, R., Heitlinger, S., Light, A., Forlano, L., Foth, M., & DiSalvo, C. (2019). More-than-human participation: design for sustainable smart city futures. *Interactions*, *26*(3), 60-63. https://doi.org/10.1145/3319075

6 Viitanen, J., & Kingston, R. (2014). Smart Cities and Green Growth: Outsourcing Democratic and Environmental Resilience to the Global Technology Sector. *Environment and Planning A: Economy and Space*, *46*(4), 803-819. https://doi.org/10.1068/a46242

within a city will seek to break down the false binary between technology and nature – and between city and non-city spaces. We argue that wresting control of conceptualisation of the design and development of the smart city away from its people (and into the hands of the market, digital development companies and technocrats) erodes an already fragile and atomised public sphere, increases inequality and environmental injustice. Rather than information sharing, civic engagement and community development being fostered by smart city development, technological advances are co-opted and used by state-corporate power to destabilise, divide, confuse, depersonalise and atomise. They decrease freedom by increasing the efficiency of government bureaucratic control and exclude considerations of human and non-human inhabitants in the design of their spaces, processes and relationships. Here, humans and nature are commodified: humans are reduced to workers and consumers, nature to a series of assets, resources or ecosystem services, "mobilized to defend productivity gains, minimize costs of capital expansion, and stave off crises of reproduction."[7] In the alienated "smart city", nature is – at best – a "specific type of capital, which needs to be measured, conserved, produced, and even accumulated,"[8] as long as it meets the threshold of market value.

We agree that cities are fundamental to mitigating widening social inequality, ecological collapse, and climate change. We suggest, however, that they will only play this role in steering back from a planetary ecocide if they rapidly decouple from globalised market-led growth and move away from human exceptionalism towards ecologically just solutions.[9]

More-than-human futures

Having set the background, we explore three interrelated practices – planning, design and regulation – relevant to technology for sustainable development. Together, they afford a discussion of how a more-than-human perspective offers a different way of thinking about smart cities in the Capitalocene, which decouples human well-being from market-led growth and reconnects humans to their ecosystems.

Planning

Planning the more-than-human city transcends the "citizen-consumer" participatory modes touted by smart city technocrats and requires deeper engagement and recognition of the entanglement with multiple species which cohabit urban space.[10] We have an opportunity to decentre humans in city design and place-making processes and consider multiple perspectives, including those of non-humans, such as the migratory patterns of wildlife, the lives of ecosystem services, and Indigenous knowledge systems and cultures of managing land.[11] A more-than-human conceptualisation of the processes and technologies implicated by urban planning regimes opens up to diversity and cosmopolis,[12] allows us to measure urban sustainability beyond efficiency gains,[13] and eventually realise the "right to the city".[14] A more-than-human approach to planning for sustainability also entails learning from Indigenous cultures of land stewardship and caring for country, and implementing Indigenous data sovereignty.[15]

Realising Indigenous data sovereignty is an emerging agenda aimed at nation building and protecting the data rights of Indigenous people. An example from New Zealand – but with relevance to Australia – relating to urban planning processes is found in the Māori Plan of the Independent Māori Statutory Board (IMSB), a statutory advisory board to the Auckland Council, drafted in 2011. This Plan has a 30-year vision with key directions and actions required of multiple agencies. In New Zealand, organs of state have a duty to consult Indigenous people under two primary pieces of legislation (Local Government Act 2002; Resource Management Act 1991). Within the IMBS, a Data Strategy Expert Panel was responsible for drafting indicators for which data did not yet exist in an attempt to measure progress, considering that "existing regional development frameworks and measures had failed

7 Lohmann, L. (2016). What is the "green" in "green growth." In G. Dale, M. V. Mathai, & J. A. Puppim de Oliveira (Eds.), *Green Growth: Ideology, Political Economy and the Alternatives*. Zed Books.

8 Kenis, A., & Lievens, M. (2015). *The Limits of the Green Economy: From re-inventing capitalism to re-politicising the present*. Routledge. https://doi.org/10.4324/9781315769707

9 Yigitcanlar, T., Foth, M., & Kamruzzaman, M. (2019). Towards post-anthropocentric cities: Reconceptualizing smart cities to evade urban ecocide. *Journal of Urban Technology*, *26*(2), 147-152. https://doi.org/10.1080/10630732.2018.1524249

10 Franklin, A. (2017). The more-than-human city. *The Sociological Review*, *65*(2), 202-217. https://doi.org/10.1111/1467-954X.12396

11 Robertson, S. A. (2018). Rethinking relational ideas of place in more-than-human cities. *Geography Compass*, *12*(4). https://doi.org/10.1111/gec3.12367

12 Metzger, J. (2016). Cultivating torment: The cosmopolitics of more-than-human urban planning. *Cityscape*, *20*(4), 581-601. https://doi.org/10.1080/13604813.2016.1193997

13 Loh, S., Foth, M., Amayo Caldwell, G., Garcia-Hansen, V., & Thomson, M. (2020). A more-than-human perspective on understanding the performance of the built environment. *Architectural Science Review*, *63*(3-4), 372-383. https://doi.org/10.1080/00038628.2019.1708258

14 Shingne, M. C. (2020). The more-than-human right to the city: A multispecies reevaluation. *Journal of Urban Affairs*, 1-19. https://doi.org/10.1080/07352166.2020.1734014

15 Kukutai, T., & Taylor, J. (Eds.). (2016). Op. cit.

to adequately provide for Māori identity and well-being."[16] The Māori Plan in Auckland is an example of how Indigenous data sovereignty is conceptualised, captured and translated into planning processes.

Such lessons have the potential to also unlearn the colonial histories, trajectories and cultures of colonialism, and transform planning praxis.[17] In Australia, Aboriginal and Torres Strait Islander populations have intimate connections with country, and their land management practices have inspired intercultural planning practices around (1) health and well-being benefits, (2) cultural and socio-political benefits, (3) economic benefits, and (4) environmental benefits.[18] The Planning Institute of Australia[19] has over the past decade grappled with the ways in which planning reforms could centrally embed the concept of "caring for country" and introduce new planning methodologies, theories, communication ethics and needs assessments.[20] Civil society organisations such as the Australian Earth Laws Alliance[21] and New Economy Network Australia[22] are actively seeking ways to match the emerging Earth jurisprudence movement to Indigenous cultures of land stewardship.[23]

Design

Design practice plays a crucial role in creating technology for sustainable development and the smart cities that employ them. While concerns for sustainability have been long established in the field of design, the artefacts and outputs have largely remained in the pursuit of consumerism and commercial growth expectations. More recently, the complicity of design in accelerating the planetary ecocide has been pointed out, which ignited a healthy debate in the community.[24] In response, commentators suggest to re-think design practice in three ways:

- The conventional focus on usability in design practice is too narrow. Implementing an aspirational shift from "users" to "citizens" broadens the scope in order to encompass societal rights and responsibilities.[25]
- The so-far limited focus on designing technology solutions geared towards individuals making "sustainable" consumption choices, which are often informed by persuasive technology, behavioural economics and nudge theory, has also been criticised, because it largely ignores the responsibility of the Capitalocene's economic framework. This has prompted a call for designers to overcome the limited focus on individual consumerism and in turn create technology solutions that support community advocacy, activism, and the scale making required to build effective political movements.[26] As part of this process, "institutioning" has been proposed as a new design avenue on the basis of the recognition that "a re-engagement with institutions is necessary if we are to repoliticise"[27] design. Considering the political and institutional context that technology for sustainability is embedded in, institutioning has received increasing attention in the smart cities space.[28]

16 Hudson, J. (2016). The World's Most Liveable City—for Māori: Data Advocacy and Māori Wellbeing in Tāmaki Makaurau (Auckland). In T. Kukutai & J. Taylor (Eds.), *Indigenous Data Sovereignty: Toward an Agenda*. Australian National University Press. https://press-files.anu.edu.au/downloads/press/n2140/pdf/ch10.pdf

17 Porter, L. (2010). *Unlearning the Colonial Cultures of Planning*. Ashgate.

18 Weir, J., Stacey, C., & Youngetob, K. (2011). *The Benefits Associated with Caring for Country.* Australian Institute of Aboriginal and Torres Strait Islander Studies. https://aiatsis.gov.au/publications/products/benefits-associated-caring-country

19 https://www.planning.org.au

20 Wensing, E. (2011). Improving Planners' Understanding of Aboriginal and Torres Strait Islander Australians and Reforming Planning Education in Australia. Paper presented at the 3rd World Planning Schools Congress, Perth, Australia, 4-8 July. https://www.planning.org.au/documents/item/3320

21 https://www.earthlaws.org.au

22 https://www.neweconomy.org.au

23 Graham, M., & Maloney, M. (2019). Caring for Country and Rights of Nature in Australia: A Conversation between Earth Jurisprudence and Aboriginal Law and Ethics. In C. La Follette & C. Maser (Eds.), *Sustainability and the Rights of Nature in Practice.* CRC Press.

24 Monteiro, M. (2019). *Ruined by Design: How Designers Destroyed the World, and What We Can Do to Fix It.* Independently published. https://www.ruinedby.design

25 Foth, M., Tomitsch, M., Satchell, C., & Haeusler, M. H. (2015). From Users to Citizens: Some Thoughts on Designing for Polity and Civics. *OzCHI '15: Proceedings of the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction*, 623-633. https://doi.org/10.1145/2838739.2838769; Foth, M. (2018). Participatory urban informatics: Towards citizen-*ability*. *Smart and Sustainable Built Environment*, *7*(1), 4-19. https://doi.org/10.1108/SASBE-10-2017-0051

26 Dourish, P. (2010). HCI and environmental sustainability: the politics of design and the design of politics. *Proceedings of the 8th ACM Conference on Designing Interactive Systems (DIS)*, 1-10. https://doi.org/10.1145/1858171.1858173; Frauenberger, C., Foth, M., & Fitzpatrick, G. (2018). On scale, dialectics, and affect: pathways for proliferating participatory design. *Proceedings of the 15th Participatory Design Conference*. https://doi.org/10.1145/3210586.3210591; Boyd, A., & Mitchell, D. O. (2013). *Beautiful Trouble: A Toolbox For Revolution.* OR Books. https://beautifultrouble.org

27 Huybrechts, L., Benesch, H., & Geib, J. (2017). Institutioning: Participatory Design, Co-Design and the public realm. *CoDesign*, *13*(3), 148-159. https://doi.org/10.1080/15710882.2017.1355006

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- The recent push away from techno-centric and towards human-centred smart cities was aimed at increasing the participation of diverse, often marginalised citizens in the design and use of urban technology. Nonetheless, this shift – while admirable – continues the traditional view of urban space as separate from nature, and ready to be optimised for human comfort and convenience. In recognition of a more-than-human perspective, designers have started to contemplate how to decentre the human in the design of smart cities and what new participatory design methods are required to account for humans and more-than-humans alike.[29]

Regulation

We illustrate regulatory and governance practices with a discussion of planned obsolescence of digital technologies limiting the right to repair. Planned obsolescence is a tactic in industrial manufacturing to shorten the lifespan of a product so that it becomes obsolete or non-functional after a defined expiration date, so that consumers purchase new products. It may also involve designing for limited repair where products must be replaced entirely.[30] Intentionally shortening the lifespan of products by design, especially electronic devices, has significant environmental impacts as more waste is created and disposed. This applies to personal consumer products, but it entails an exponential scale factor in the context of technology for sustainability deployments in smart cities such as internet of things (IoT) devices and sensors.

The European Union (EU) has made some initial moves towards limiting e-waste through the EU Directive on Waste Electrical and Electronic Equipment (WEEE). The WEEE Directive aims to:

> [C]ontribute to sustainable production and consumption by, as a first priority, the prevention of WEEE and, in addition, by the re-use, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste and to contribute to the efficient use of resources and the retrieval of valuable secondary raw materials.[31]

In addition, the EU has recently ratified a "Right to Repair" Directive that will enter into force in 2021. It will apply to lighting, washing machines, dishwashers, refrigerators and televisions, but not smartphones and laptops. It will require manufacturers to design products with longer life cycles, and supply spare parts for up to a decade.[32] However, it will only apply to professional repairs, not repairs conducted by consumers themselves.[33]

In Australia there are protections under the Australian Consumer Law that require businesses to repair faulty products.[34] In 2019, the Australian consumer affairs minister agreed to consider introducing right to repair laws, yet it is unclear if and when these will be introduced.[35] Despite the lack of formal right to repair laws, there are numerous examples of social enterprises concerned with electronic waste recycling,[36] reuse and repair centres,[37] and local repair cafés[38] that provide avenues for individuals to repair or re/upcycle electronic products rather than dispose of them. These initiatives are more aligned with moving away from a consumption model and towards a circular economy where resources are re/used and re/upcycled.

Significantly, planned obsolescence relates not only to individual consumers but also the infrastructures that underpin smart cities at a larger scale. This systemic technological foundation of smart cities means the magnitude of the impacts of planned obsolescence at city level are significant. While initiatives such as the right to repair are beginning to emerge at the individual consumer level, there is also a need to incorporate these considerations into procurement arrangements between cities and vendors, especially in relation to lifetime optimisation, maintenance and repair rights.

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31 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0019

32 Industry Europe. (2019, 2 October). "Right to Repair" rules to be adopted in EU from 2021. https://industryeurope.com/right-to-repair-rules-to-be-adopted-in-eu-from-2021

33 Harrabin, R. (2019, 1 October). EU brings in 'right to repair' rules for appliances. *BBC*. https://www.bbc.com/news/business-49884827

34 https://www.accc.gov.au/consumers/consumer-rights-guarantees/repair-replace-refund

35 Lowrey, T. (2019, 29 August). 'Right to repair' laws for fixable electronics pushed forward after agreement at consumer affairs meeting. *ABC*. https://www.abc.net.au/news/2019-08-30/smartphone-electronics-right-to-repair-request-ministers/11462572

36 https://substation33.com.au

37 https://bower.org.au

38 The Rogue Ginger. (2020, 16 February). Repairing Australia: The rise of repair cafes. https://www.theroguegineger.com/2020/02/repairing-australia-rise-of-repair-cafes.html

Conclusion

Our capitalocentric review of technology for sustainable development has raised a number of issues. While climate and environmental emergencies have gained mainstream attention, the associated responses and technology solutions are largely framed by a conventional neoliberal growth paradigm. Not only does this risk everyday citizens wanting to do the right thing yet inadvertently buying into greenwashing, it also allows overall consumption and resource depletion to continue, accelerating the planetary ecocide. Smart cities are a specific case in point due to the stark contrast between "green growth" and sustainability marketing rhetoric on the one side and their actual detrimental impact on the environment on the other side, including energy use, rare earth metal depletion, land clearing, and e-waste.[39] Additionally, the global smart city market is driven by global corporations and geopolitical agendas that can jeopardise not just environmental outcomes but also human rights and social justice aspirations of the global South.[40] Yet, environmental rights are human rights,[41] and it is imperative to consider them interlinked.

The more-than-human perspective explored in this report offers an alternative approach to the design of technology for sustainable development. It requires us to ponder our complex entanglements with ecological systems. It reminds us to recognise the merits of relationalist worldviews pioneered by Indigenous and First Nations peoples and learn from them. It also prompts a reflection on how technology, data, regulation and governance can be reimagined to bring about a future that is ecologically healthy and just for both humans and more-than-humans. Perhaps the current COVID-19 pandemic is the crisis humanity needed to radically rethink the purpose of our existence and create more-than-human futures.[42]

Action steps

We suggest the following action steps:

- Realise that using technology to drive efficiency gains while trapped inside a capitalist growth-oriented system will not save the planet.[43] Design technology for sustainability grounded in the recognition that the sustenance and prosperity of humans and more-than-humans are profoundly interdependent within the nature-technology continuum.[44]
- Demand legislators to implement a formal right to repair in law for individual consumers and at city level through procurement arrangements between cities and vendors, especially in relation to lifetime optimisation, maintenance, and repair rights.[45]
- Learn from and be guided by Indigenous and First Nations peoples to foster a more-than-human worldview and engage in a deeper understanding of relationalist cosmologies, ontologies and epistemologies.[46]
- Build effective partnerships[47] between government, industry, academia and civil society to advocate for an urgent transition to a new economic framework that creates an ecologically healthy and socially just society.[48]
- Design and use technology to strengthen community advocacy, activism, and building the scale of the progressive political movement.[49]

39 https://interactive.aljazeera.com/aje/2015/ewaste

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41 https://www.foei.org/resources/publications/publications-by-subject/human-rights-defenders-publications/our-environment-our-rights

42 Allam, Z., & Jones, D. S. (2020). Pandemic stricken cities on lockdown. Where are our planning and design professionals [now, then and into the future]? *Land Use Policy*, *97*. https://doi.org/10.1016/j.landusepol.2020.104805; Loker, A., & Francis, C. (2020). Urban food sovereignty: urgent need for agroecology and systems thinking in a post-COVID-19 future. *Agroecology and Sustainable Food Systems*, *44*(9), 1118-1123. https://doi.org/10.1080/21683565.2020.1775752; Batty, M. (2020). The Coronavirus crisis: What will the post-pandemic city look like? *Environment and Planning B: Urban Analytics and City Science*, *47*(4), 547-552. https://doi.org/10.1177/2399808320926912

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46 https://www.futuredreaming.org.au

47 Foth, M., & Adkins, B. (2006). A Research Design to Build Effective Partnerships between City Planners, Developers, Government and Urban Neighbourhood Communities. *Journal of Community Informatics*, *2*(2), 116-133. http://ci-journal.net/index.php/ciej/article/view/292

48 https://www.neweconomy.org.au

49 https://progressive.international

BRAZIL

TOWARDS A COHERENT AND GENDER-INCLUSIVE APPROACH FOR HIGH FREQUENCY RADIO CONNECTIVITY PROJECTS

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Introduction

In this report we analyse projects that work together with rural and forest communities[1] on the development of digital high frequency[2] (HF) radio (bi-directional telephony) connectivity solutions for enabling digital communication in remote and isolated regions in Latin America.

Access to communication has become a vital necessity for forest communities. It not only contributes to the autonomy of traditional and Indigenous communities, but also to the conservation and protection of their environment. Forest communities are an integral part of conservation of rainforests and their biological diversity. However, in the Brazilian Amazon, traditional and Indigenous communities with precarious public infrastructure – and more often without it – are left alone to deal with the consequences of a political and environmental crisis. Because of this, developing communication infrastructure becomes vital for the survival of both forest communities and the rainforest where they live.

We aim to analyse the sustainability of these projects with regard to gender inclusion and gender openness. We look at sustainable development from a gender perspective, meaning participation in community networks should be open and gender inclusive to provide for lasting engagement and inclusive participation of all its members. This, in turn, directly affects the process of environmental protection and conservation, with HF communication systems central to many vital activities of these communities.

1 Here we refer to traditional and Indigenous communities living inside the Amazon region. In most cases these are riverine (in Portuguese "riberinhos") communities living on the banks of Amazon rivers or inside the Amazon forest. They are also referred to as forest, local or rural communities.

2 High frequency is a synonym for the term "short wave" in the context of radio bands.

An Amazon that gave birth to high frequency telecommunication technology

In terms of information and communications technology (ICT) development, the Amazon region is one of the least developed, which is partly what inspired the testing of the digital HF radio systems. Around a decade ago, illegal extraction and deforestation had not yet escalated into the environmental crisis as we know it today. The socioeconomic situation being far from perfect only got worse and more insecure for the rural population of the Amazon region. Over the past year, the country's extractive reserves – a type of sustainable use protected area in Brazil[3] – have faced increased pressure due to changes in environmental policies in Brazil led by the new government, as well as aggravated levels of deforestation, record-breaking fires and illegal extraction.

Extractive reserves, where many riverine and forest communities live under conditions of non-extractive conservation, might cease their existence if people move out to the urban areas. At the same time, if there are no basic public services, from education, access to health and medical assistance, to communication and protection, there is little incentive and safety for people to stay. Therefore, communication is an important element that encourages people to stay in the forest, contributing to conservation and protection efforts in extractive reserves.

What has changed for communities taking action from inside the Amazon forest is the speed of events. Their response now has to be fast, which means there is a need for fast communication that functions within the local context.

Today, forest communities in rural and isolated areas are extremely vulnerable to external threats and heavily depend on communication. However, given the geographic, social and economic context of the Brazilian Amazon, the options for an affordable communication infrastructure are very limited. A digital HF communication system is an optimal solution, due to its affordability,[4] the fact that it is relatively easy to install and use, and that it is autonomous and does not depend on external factors

3 https://en.wikipedia.org/wiki/Extractive_reserve

4 The upgrade of an HF radio station costs around USD 150-200.

(such as regular monthly fees, telecom providers and big tech companies). Moreover, it is based on a bi-directional *rádio fonia* (telephony radio)[5] that has been in use in the Amazon region for decades. Once upgraded with the HERMES digital interface,[6] it is seen as something familiar and acceptable within rural and forest communities.[7]

Since 2013, members of the Brazilian Association of Digital Radio (ABRADIG) have participated in various trials and attempts to develop HF digital data transmission for long distance communication in the Amazon of Brazil using the Digital Radio Mondiale broadcast standard. As a result, in 2017, a prototype for digital data transmission over HF was first successfully tested in the state of Acre and developed further into a High-Frequency Emergency and Rural Multimedia Exchange System (HERMES)[8] prototype, enabling the system to provide small-scale data services to the communities. In 2018, it was successfully tested in Oaxaca, Mexico. The development of the HERMES prototype continued, and in 2019 Terra do Meio community networks in the Altamira region of Para state in Brazil were upgraded with HERMES.[9]

With regard to spectrum regulation, the Brazilian federal policy establishes a bureaucratic procedure to request a licence for *serviço limitado privado* (limited private service) for restricted private operation and use of radio networks. This procedure is not only time consuming but also resource demanding, which poses a challenge for community networks that want to use this technology.

Findings and opportunities for HF community networks

After working on a number of projects to do with HF connectivity in the Brazilian Amazon, we observed that women could have participated more in the *development* of the social technology. This raised questions about how we could make these projects and their solutions – digital HF radio community networks – more open and gender inclusive, by considering the process of how they are developed and implemented.

We conducted semi-structured expert interviews to better understand gender dynamics and relations within the field of sustainable development. Based on the exploratory phase of our research, we developed a questionnaire to evaluate the sustainability of HF radio connectivity projects with regard to openness and gender inclusiveness. Our objectives were to outline persistent issues that HF projects have to deal with, to show what has been done in the past years in terms of the development of HF connectivity in the Brazilian Amazon and Mexico, and to evaluate the openness and gender inclusiveness of HF projects.

We contacted members of four HF projects[10] from five different organisations – Rhizomatica,[11] ABRADIG itself, Instituto Socioambiental (ISA),[12] APC's local access and community networks project,[13] and Operação Amazônia Nativa (OPAN)[14] – and asked them to respond to our questionnaire. In the end, we analysed two projects that worked on the development of HERMES technology, in Terra do Meio[15] and in Oaxaca,[16] because, firstly, we received complete responses to our questionnaire from these projects, and secondly, an in-depth analysis of these projects was possible due to the close cooperation of the project teams.[17]

There were a number of issues that were raised with regard to the sustainable development of two integral parts of these project: the communities themselves, and the HF community networks. Firstly, as pointed out by one of the project team members, "It is essential that the local communities have their

5 This refers to two-way telephony radios, a point-to-multi-point broadcasting platform allowing every station in the network to receive the transmission and to communicate with each other.

6 The HF radio system was upgraded with a digital component (what later became the HERMES system) that allows digital data transmission over long distances, meaning that small data packets could now be transmitted over the radio frequency in the Amazon region across distances over 600 kilometres between two points where there are radio stations with HF receivers.

7 HERMES allied development and evolution of digital services running on top of the existing HF radio technology. This solution complements local technologies and networks instead of making them obsolete, with the applications running on top of the digital infrastructure.

8 https://www.rhizomatica.org/hermes

9 Within the scope of this project there are eight communities located within three Extractive Reserves with around 80 forest and riverine communities scattered throughout a vast isolated region where it takes some communities from two to four days to reach the next populated locality/city by boat.

10 We have contacted all known HF projects in the Brazilian Amazon that have already been implemented. Other Brazilian organisations, like OPAN and Nupef, are currently working on analogue HF projects in the Mato Grosso and Maranhão states respectively, and they have not been contacted for this reason. In total we identified four HF radio projects, with the projects operating differently and at various phases of development, e.g. being sponsored by different donors and implemented in stages.

11 https://www.rhizomatica.org

12 https://www.socioambiental.org/en

13 https://www.apc.org/en/project/connecting-unconnected-supporting-community-networks-and-other-community-based-connectivity

14 https://amazonianativa.org.br

15 The "Connecting Amazon Forest Indigenous and local communities through High Frequency (HF) radio technology" project that took place in the Terra do Meio territory of Altamira region, Brazil (2019-2020).

16 A pilot project that uses the HERMES prototype system and which entered the Mozilla Wireless Innovation for a Networked Society (WINS) competition, and was tested in Oaxaca, Mexico in 2018.

17 Please also read the report by Rhizomatica in this edition of GISWatch.

territory legally protected in the face of the increasing pressure of loggers, squatters and prospectors." In this context, as another interviewee put it, "Communication technologies are essential to guarantee the permanence and the quality of life of these communities in remote areas, where usually there are no phone services or any other means of communication." As Peter Bloom pointed out, one of the "important effects of HF technology on environmental protection" is that "it supports land defenders with communication tools that are secure, helping them better protect nature."

On top of this, HF technology is an efficient way of communication, with "the possibility of sending digital data in HF increasing the relevance of this system, because it allows anonymous data transmission" said an Altamira project team member.

Reflecting on the telecommunication projects and work that have been done in the region, Nils Brock, from the Gesac project (a Brazilian e-government and digital inclusion programme), pointed to the fact that it is dangerous to leave telecommunications to commercial or state actors, because their interest in the region might vary a lot from the interests of the Amazon communities. Therefore it is important that tech is co-designed, co-created and co-controlled locally.

With regard to technology, there are issues that HF radio projects encounter in their work and in a broader context of rural and isolated communities, ranging from security of communication to the nature of network technology.

Today, HERMES is the only civilian digital HF solution operating in the Amazon region, although it is in the early stage of software development and use. This introduces the problem of regulatory aspects that are not addressed by legislation, and consequently many HF networks use frequencies without licences or authorisation.

With that in mind, for HERMES to become a widely used technology in the region, some components have to be upgraded (e.g. stable and fast modems, automatic frequency selection) and some developed. For example, today there is no affordable commercial off-the-shelf hardware for doing digital HF telecommunications, and there is a lack of mature free software solutions for HF radio networking. There are also other issues, such as a problem of interference for the radio stations located close to the city; power generation and storage;[18] power batteries wearing out after few years of use; and equipment disposal.

Apart from purely technical aspects, one concern is the end-users' expectations. Digital HF connectivity is slower compared to Wi-Fi or satellite, so if users are familiar with the internet, their expectations will not be met; both the speed and file size of what can be uploaded and downloaded are lower, since it has a different purpose and was not designed for internet and social media use. The idea behind civilian HF connectivity – a non-internet electronic communication technology[19] – was always about developing alternative information and communications solutions in Brazil outside the totalitarian contexts of internet and big data. This also reflects in the nature of this network technology, meaning it is designed to be less abusive in terms of digital/online consumption, and therefore less invasive in terms of local acculturation and dynamics.

The security and anonymity of communication is another valid concern. For monitoring illegal activities it is extremely important that voice messages/communication are not overheard (or intercepted) and also that the person reporting or speaking is not putting herself in danger. The HERMES system supports symmetric encryption using GnuPG for digital data transmission, meaning that the files (audio, text, image) sent over the air are private. However, the analogue voice communication that standard HF radios provide (e.g. bi-directional telephony) is not encrypted.

Gender relations in the Amazon forest

Forest and rural communities in the Amazon forest are very diverse and cannot be generalised. Yet, all of our respondents made it very clear that gender relations in the Amazon forest are well defined.

Different Indigenous peoples have very different societal structures, and there are different roles for men and for women. Yet Indigenous women and men act together, and there is a perception among the different genders that they act together and that anyone can take on a (new) role. As one expert working with Indigenous peoples said, "You can still be part of this thing together [and in the role that you chose] from a different perspective now and it's fine."

In traditional communities these days women have a more active role. Along with housework and caring for children and elders, they now share the work that traditionally was done by men, like farming and fishing. More recently, women have started to engage in social movements, participate in public debates, and assume leadership roles. However, despite the shift in gender roles, this protagonism

18 There is still a need to improve energy consumption and energy storage.

19 However, there is a possibility of data exchange with the internet, like email or routing.

provokes some domestic[20] and marital conflicts, according to one of the experts.

Various examples of direct observation in communities indicate that if women do not understand that they can participate, and more importantly, how they can participate – when the process, intentionally or unintentionally, is left obscure to them – then they will attend to their regular roles and withhold from taking part, despite being nominally present.

Apart from making the process of participation intuitive and comprehensible to women, in order to make it inclusive, other persistent structural issues need to be addressed. How do we free women from their daily responsibilities[21] so they actually have time to use the HF radios? There is an issue of younger women dropping out of development projects when they get married and have to attend to marital responsibilities, as well as an issue of women's lasting engagement – married women tend to spend less time on a project if their husbands are not part of it too. How do we tackle the lack of funding to address structured gender action in these projects with a limited budget that often can barely accommodate the most essential parts of the project? How do we get to prioritise one over the other, and make a gender-inclusive approach a priority? Will using gender-inclusive practices and guidelines be sufficient in these cases? And how do we normalise these practices?

Most of the decisions about the technology design[22] of the HERMES system were taken by the project's technical team, and women or gender-diverse people have not contributed much. Here we refer to the initial software development phases, when the needs and wishes for the product were identified and, based on these, the design requirements and coding of the HERMES software were done. If women do not know anything about the system in advance and their needs and daily habits are not reflected and supported by the HERMES system as much as they could have been, is that an issue for women's engagement and interests?[23] To what extent is the HERMES system user friendly to women, and how does it take into account usability principles?

To make such processes and practices sustainable, there is a need for a coherent and often lengthy and ongoing approach. "Gender issues have many levels and there are openings and cultural answers in each one of those levels," was the evaluation that one of the project team members gave us. "To address some questions there is the need to build a trusting relationship that lasts longer and is broadened to allow the discussion of some taboo questions."

Conclusion

In this report we attempted to analyse the extent to which the projects working on community connectivity solutions for the Brazilian Amazon region are gender open and inclusive. The sustainability of community networks can imply many different elements, and we believe that one of them is gender openness and equity that, in turn, is an essential element of digital inclusion.

What implication do gender-biased projects have for the sustainability of communities and their networks? We reached a conclusion that HF technology *per se* does not pose a barrier for participation of female users from forest communities; on the contrary, the new role of radio operator is exciting and often is taken up with enthusiasm by many young people and women.

The problem is more structural than it seems in the beginning. To provide for an open and gender-inclusive approach, projects should take care in making the process of participation explicit and comprehensible to all members of communities. Moreover, it is vital that women become part of this process themselves and that the process applies or embraces an "inward and outward" focus to participation. This means that we should not only try to engage communities to understand how they can participate, but we ourselves should understand that participation and co-creation start at the design phase of the project, and that engagement at earlier phases can embrace and reflect local scenarios and uses of social technology better. How do we do that? Human-centred design might be one of the answers.

More than that, there are some structural issues that pose problems to the structured gender action that we have identified: the supremacy of marital and family obligations, a lack of time, no established value of new roles, and last but not least, a lack of funding to provide a coherent framework to embrace all these points.

20 Since the COVID-19 pandemic, the rates of domestic violence in the region of Altamira got higher. Domestic violence continues to be treated as a domestic issue, allowing little external intervention.

21 In the forest, women do everything around the house by hand, e.g. cooking, cleaning, washing, planting the garden, etc.

22 The software development and design were carried out by just one system engineer, Rafael Diniz, who is a pioneer in the area of study of community digital HF telecommunication and has been working for many years to develop the HERMES solution for the Amazon region.

23 According to Costanza-Chock, "Research shows that unless the gender identity, sexual orientation, race/ethnicity, age, nationality, language, immigration status, and other aspects of user identity are explicitly specified, even diverse design teams tend to default to imagined users who belong to the dominant social group." Costanza-Chock, S. (2020). *Design Justice: Community-Led Practices to Build the Worlds We Need*. MIT Press.

Another structural issue that directly affects the sustainability of the HF community networks using the HERMES system is the lack of regulation for community networks of any kind in Brazil. Without affordable, easy-to-get, new types of telecommunication licences for community use of HERMES and other HF community networks, they cannot operate in a secure and sustainable way.

In the words of Indigenous leader Célia Xakriabá, "The Amazon's like the vagina of the world [...]. It's like the entry door of the world. When this opening is sick, the future generations, they will be sick also."[24] The Amazon is where the traditional and Indigenous peoples with the knowledge of how to preserve and save the lungs of this planet live.

HF technology has tremendous potential to directly contribute to the sustainability of forest communities and their environment. It is an affordable tool that can play an important role in providing faster and safer communication in the Amazon forest, especially when the speed of response is vital in the face of threats from illegal loggers, squatters and miners – and when this is a struggle that has to be brought to everyone's attention.

Action steps

The following action steps are suggested for the use of HF technology in the Amazon in Brazil:

- Advocate for a regulatory framework on community connectivity and bring the notion of community network licences (licences to operate and licences to use the radio spectrum) to the level of policy making and legislation in Brazil.
- Focus on and help international civil society organisations to understand the Brazilian Amazon context. International civil society actors working in the Brazilian Amazon with traditional and Indigenous communities, in the capacity of a non-governmental organisation or development project, need to become aware of the processes and mechanisms that Indigenous and traditional communities are using to express their needs and establish their requests to the government. Knowing these processes will help to engage in a timely way (at the right phase of this process) and contribute accordingly.
- Develop a methodology for gender-inclusive and open projects working on community connectivity.
- Make a gender-focused agenda and vocabulary comprehensive for project work on community connectivity.
- Apply guidelines and practices for open and inclusive participation starting from the design phase of a project working on community networks. Introduce and discuss gender-inclusive and open frameworks at all stages of the project. Engage every member of the community in the participation by explaining the purpose and implications of inclusive participation for the project and for the community itself.
- Put the concept of a rights-based approach to conservation at the centre of social development work. Along with a gender-inclusive and open framework, international civil society organisations need to educate themselves on the concept of a rights-based approach to conservation and the role that Indigenous and traditional communities play in this.
- Develop and extend approaches for diversity, social inclusion and gender equity in the work of community connectivity projects. To test gender-inclusive methodologies in the work with Indigenous and traditional communities, we first need to study and understand gender and gender relations in this context better. We need to do more studies, have more conversations and focus groups with Indigenous women, and we need to run more pilot projects where Indigenous women will have a leading role and engage from the beginning.

24 V (formerly Eve Ensler). (2020, 10 August). 'The Amazon is the entry door of the world': why Brazil's biodiversity crisis affects us all. *The Guardian*. https://www.theguardian.com/environment/2020/aug/10/the-amazon-is-the-vagina-of-the-world-why-women-are-key-to-saving-brazils-forests-aoe

LATIN AMERICA

WHITE GOLD, DIGITAL DESTRUCTION: RESEARCH AND AWARENESS ON THE HUMAN RIGHTS IMPLICATIONS OF THE EXTRACTION OF LITHIUM PERPETRATED BY THE TECH INDUSTRY IN LATIN AMERICAN ECOSYSTEMS

Gato.Earth
Danae Tapia and Paz Peña
https://gato.earth

Introduction

The exploitation of lithium in the so-called "lithium triangle" represented by the salt flats of Argentina, Bolivia and Chile shows how neoliberal logics have co-opted the concept of sustainable development.[1] Lithium is used to manufacture cutting-edge electronic devices that are central to a "green" idea of reducing the carbon footprint of industries. However, this extractivist arrangement is just a new phase of the capitalist and colonialist logic that has led us to the current climate emergency.

The ecological crisis – caused by the exploitation of natural resources – cannot be solved with more extractivism. In such a scheme, the environment continues to be seen as a commodity, the role of states is relegated to legally protect the private sector through cost-benefit analyses, and the developing world is reduced to a mine of resources for green technologies developed in the global North.

Focusing on the case of the exploitation of lithium in Chile and its ecological, economic and cultural impact, this report proposes that actors dedicated to the human rights agenda in the digital context have a duty to include in their concerns the material and ideological aspects related to the ways in which technological devices are produced, and their damaging effects on the environment and the local communities of the global South.

Context

The ecological collapse of fossil fuels has made it urgent to transition to a new energy paradigm that incorporates solar and wind energy. Lithium is crucial for this purpose. Since sunlight and wind are not continuous, storing the vast amounts of energy they produce is vital. As lithium is highly reactive and relatively light, it is an ideal material to conserve energy in batteries.

Electric cars, laptops, smartphones, and the many internet-of-things devices that are launched daily onto the market, rely on lithium batteries. Lithium is central to an industry whose business model counts on obsolescence; therefore, the supply of this key mineral has to be secured for the many manufacturers based in the global North.

There are around 107 projects that mine lithium worldwide: more than 45% of them are in South America, specifically in the lithium triangle formed by Argentina, Bolivia and Chile. These projects are concentrated in four companies that cover around 91% of world production.[2] However, the mining of lithium has its limits. As the Chilean researcher Bárbara Jerez says:

> The global lithium market boom has a limited horizon of about 15 more years, as other elements such as hydroxide, cobalt, graphene and other salts such as potassium – and even the salts that exist in cannabis – constitute potential replacements and competitors for the manufacture of rechargeable batteries for electric cars, the current main use of lithium.[3]

These gigantic extractivist operations in the Latin American region contradict the "green" image that tech companies want to promote, especially the electric cars business that has positioned its products as a central component to what ecological living should be. For example, Tesla, one of the leading manufacturers of electric cars, does not acknowledge the environmental impact of the massive extraction of lithium that its production chain requires. In fact, on the sustainability section of its website, it only addresses policies related to the recycling of used lithium batteries, which should be sent to a Tesla store by the customer.[4]

The lithium business has severe repercussions: irreversible damage to the ecosystem, dishonesty, and the sustained harassment of local communities. While few electric vehicle companies seem to

1 Castro, C. J. (2004). Sustainable Development: Mainstream and Critical Perspectives. *Organization & Environment, 17*(2), 195-225.

2 Dorador, C., & Román, J. (2018, 20 December). El espejismo del litio: el verdadero costo de la energía verde (parte 2). *Etilmercurio*. https://www.etilmercurio.com/em/especial-etilmercurio-el-espejismo-del-litio-parte-2

3 Bustamante Pizarro, R. (n/d). Bárbara Jerez y explotación del litio: "Los salares también son Zonas de Sacrificio". *Causas y Beats*. https://www.causasybeats.cl/movimiento-social/barbara-jerez-y-explotacion-del-litio-los-salares-tambien-son-zonas-de-sacrificio

4 https://www.tesla.com/en_GB/support/sustainability-recycling

understand Chile's ecological disaster,[5] the digital tech industry seems to be still ignoring this ecocide.[6] Moreover, hardly any actors dedicated to technology and human rights have taken up this crisis as a reason for concern.

A green new sacrifice

The lithium triangle in South America is made up of the salt flats in the Andean desert, stretching across the three countries. In Chile, "the concentration of the brines and the extremely arid conditions of the Salar de Atacama are the main comparative advantages in relation to neighbouring countries; this, along with legal frameworks that authorise these aquifers to not be legally treated as groundwater, has permitted decades of low-cost extraction."[7] Beneath the salt flats in the Atacama, there is a vast natural underground saltwater reservoir containing dissolved lithium salts. Lithium is extracted by a massive exploitation of water resources through hydraulic mining. Drilling allows access to the saltwater deposits; then the brine is pumped to the surface and distributed to evaporation ponds to produce lithium carbonate that is collected and transformed into metallic lithium. Mining companies are also accessing scarce freshwater supplies in the desert because they need it to clean their machinery and produce a brine by-product, potash, which is used as a fertilizer.[8]

Although the brine's high salinity makes it unsuitable for human consumption, its exploitation affects human settlements and the ecological balance. One of the most controversial aspects of lithium exploitation is how the freshwater and brine deposits interact with the rest of the ecosystem, impacting negatively on water scarcity.[9] The area is now facing a drought, which Indigenous communities in the Atacama have drawn attention to for years. According to the Atacama People's Council (an entity representing 18 communities), during the last decade, rivers, wetlands and meadows have drained.[10] In Peine, for example, the water is cut off at night; some days people do not have access to water and they must depend on water tank trucks.[11] Algarrobo trees and flamingos in the area are disappearing[12] and there are also changes in the unique microbial life of the Atacama Desert impacting on native flora and fauna.[13]

The drought that the area is facing today, and in which lithium mining operations have played a significant role, has also produced an economic crisis for the Indigenous inhabitants who end up being displaced. As Jorge Cruz from the town of Camar says: "It is increasingly difficult to cultivate. If it gets worse, we will have to migrate."[14] Unfortunately, since "green" technologies are presented as the only option to halt the climate crisis, and the lithium-ion battery market will experience a boom due to recent advancements in consumer electronics technologies, local communities will not cease to be victims of this ignored environmental, economic and political crisis.

Under the neoliberal zodiac sign

According to Mining Global, the two largest lithium producers worldwide – Albemarle and SQM – also have operations in Chile.[15] This information is consistent with the historical extractivist approach that neoliberal governments in the global South have adopted, schemes in which economic benefit is only obtained through exploiting natural resources and

5 Sherwood, D. (2020, 11 February). Germany's Volkswagen and Daimler push for more 'sustainable' Chile lithium. *Nasdaq*. https://www.nasdaq.com/articles/exclusive-germanys-volkswagen-and-daimler-push-for-more-sustainable-chile-lithium-2020-0

6 Quitzau, A. (2020, 10 February). IBM Research is reshaping the scene of sustainable batteries. *IBM*. https://www.ibm.com/blogs/nordic-msp/ibm-research-reshaping-scene-of-sustainable-batteries

7 Morales Balcazar, R. (2020, 29 June). Lithium and socio-environmental conflicts in times of crisis: An opportunity to (re)think the transition. *Observatorio Plurinacional de Salares Andinos*. https://observatoriosalares.wordpress.com/2020/06/29/lithium-and-socio-environmental-conflicts-in-times-of-crisis-an-opportunity-to-rethink-the-transition

8 EnerNews. (2018, 14 August). Experto: Boom de litio no afecta al mercado de potasio / Interviewer GD. *EnerNews*. http://enernews.com/318490/experto-boom-de-litio-no-afecta-al-mercado-de-potasio

9 Wenjuan, L., Agusdinata, D. B., & Myint, S. W. (2019). Spatiotemporal patterns of lithium mining and environmental degradation in the Atacama Salt Flat, Chile. *International Journal of Applied Earth Observation and Geoinformation, 80*, 145-156.

10 Houmann Mortensen, N. (2019, 29 November). El lugar más árido del planeta está amenazado por culpa de la gran demanda de vehículos eléctricos y teléfonos inteligentes. *Climática*. https://www.climatica.lamarea.com/la-sed-de-litio-amenaza-atacama

11 Mössbauer, K. (2019, 4 November). Extracción del litio produce crisis hídrica en Peine-Atacama. *En La Línea*. https://enlalinea.cl/extraccion-de-litio-produce-crisis-hidrica-en-peine-atacama

12 López Muñoz, M. (2017, 19 September). La delicada situación de los flamencos por la extracción del litio. *Facultad de las Ciencias Forestales y de la Conservación de la Naturaleza*. http://www.forestal.uchile.cl/noticias/137019/la-delicada-situacion-de-los-flamencos-por-la-extraccion-del-litio

13 Venegas, C. (2019, 2 December). Salares y acuíferos del norte en peligro. *Nueva Minería y Energía*. https://www.nuevamineria.com/revista/salares-y-acuiferos-del-norte-en-peligro/

14 Livingstone, G. (2019, 19 August). Cómo la apuesta de Chile por el litio está desatando una disputa por el agua en Atacama. *BBC*. https://www.bbc.com/mundo/noticias-america-latina-49394020

15 Benton, D. (2020, 9 August). Top 10 lithium producers. *Mining Global*. https://www.miningglobal.com/top10/top-10-lithium-producers

never taking part in value-add production chains that occur mostly in the North.[16]

Although South American governments have expressed an interest in being involved in the manufacture of batteries, this is a task that requires highly specialised workers, and more importantly, a geographical and political closeness to the countries with big centres of production of electric cars, mobile phones, laptops, etc.[17] This resonates with the strategies promoted by the European Commission that focus on developing a local market that meets the huge upcoming demand for lithium-ion batteries;[18] therefore it is fair to assume that the business of lithium in developing countries will stay as a merely extractivist operation, with the only incentive of mining to the maximum capacity.

While in documents (local laws on mining, for instance), governments accept that lithium is a strategic and finite commodity that should only be exploited by the Chilean state, these notions are not really enforced. Through exceptional agreements, the Chilean government has accepted the intervention of private companies in these mining operations. Many of them are based in Canada, China or the United States, and the Chilean actors are former state companies that were privatised during US-backed authoritarian regimes and now are in the hands of a few oligarchs.[19]

The privatisation of state companies is an unequivocal mechanism of neoliberal regimes. It happened in the United Kingdom during Thatcherism, and it has happened in Latin America every time the US has intervened in local politics to overthrow governments that do not align with their neo-imperialist interests. This mechanism, in the Latin American region, is generally focused on the ownership of natural resources. It happened in Honduras to gain control of hydric resources,[20] it is happening in Bolivia with the coup against the Indigenous president Evo Morales to gain control of lithium (as was admitted by "tech entrepreneur" Elon Musk),[21] and it happens in Chile because of the legacy of the fascist dictatorship of Augusto Pinochet implanted by the US State Department.

After what Naomi Klein calls "shock doctrines"[22] occur, neoliberal regimes develop sophisticated discourses in which they disguise their structures of corporate looting as sustainable and participatory development practices. Researcher Bárbara Jerez provides an example explaining how lithium companies in Chile have created a concept of "shared value" with local communities, most of them in precarious economic conditions, in order to gain licences for the exploitation of territories. This is done through the creation of false benefits and disinformation.[23]

Profit-centred visions see natural resources as mere commodities, while Indigenous populations generally adopt a more animistic perspective in which every component of the ecosystem, the rivers, the mountains, etc. are living entities that should not be exploited. This is why many land defenders and environmentalist leaders belong to Indigenous communities. Their struggle is a clear example of the neocolonial tensions in the region. Theirs is a type of political dispute that cannot be solved through the Western logics of economics.[24] Moreover, to understand these conflicts, it is necessary to acknowledge the enormous power imbalance between both groups, an asymmetry that has led to the assassination and harassment of activists, as well as the irreversible destruction of local ecosystems.

Digital communications are built upon exploitation

For science, technology and society (STS) studies, technology is a system made of artefacts, social practices and knowledge systems. The STS theory is centred on the idea that technology and society co-constitute each other; they are inseparable.

16 Acosta, A. (2013). Extractivism and neoextractivism: Two sides of the same curse. In M. Lang & D. Mokrani (Eds.), *Beyond Development: Alternative Visions from Latin America*. Transnational Institute & Rosa Luxemburg Foundation. https://www.tni.org/en/publication/beyond-development

17 Barría, C. (2019, 21 June). El triángulo del litio: 3 obstáculos que enfrentan Argentina, Bolivia y Chile para escapar de la "maldición de los recursos naturales". *BBC*. https://www.bbc.com/mundo/noticias-48666235

18 https://ec.europa.eu/jrc/sites/jrcsh/files/jrc114616_li-ion_batteries_two-pager_final.pdf

19 Sanderson, H. (2018, 5 June). Chilean billionaire Ponce Lerou rejoins lithium producer SQM. *Financial Times*. https://www-ft-com.eur.idm.oclc.org/content/225ab6a4-68e4-11e8-b6eb-4acfcfb08c11

20 Lakhani, N. (2020). *Who Killed Berta Cáceres? Dams, Death Squads, and an Indigenous Defender's Battle for the Planet*. Verso.

21 Telesur. (2020, 25 July). Elon Musk Confesses to Lithium Coup in Bolivia. https://www.telesurenglish.net/news/elon-musk-confesses-to-lithium-coup-in-bolivia-20200725-0010.html

22 *The Shock Doctrine: The Rise of Disaster Capitalism*, a 2007 book by Naomi Klein, argues that neoliberal policies gain a foothold in developed countries through a strategy of "shock therapy" that exploits natural crises to implement questionable policies. https://tsd.naomiklein.org/shock-doctrine.html

23 Bustamante Pizarro, R. (n/d). Op. cit.

24 Wright, R. M., Kapfhammer, W., & Braune Wiik, F. (2012). The clash of cosmographies: indigenous societies and project collaboration – three ethnographic cases (Kaingang, Sateré-Mawé, Baniwa). *Vibrant: Virtual Brazilian Anthropology, 9*(1), 384-450. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1809-43412012000100014

Instead of analysing technology as an artefact, the study focuses on sociotechnical systems.[25]

Today, sociotechnical analyses of the ecological impact of digital technologies are almost non-existent in the hegemonic human rights community working in the digital context. Dominated by a liberal framework, the material conditions of production of technological devices that allow digital communications are still ignored in the analysis of the impact of technology on human rights. This omission only favours the old capitalist, extractivist and colonial interests that still dominate the digital revolution.

Even if some initiatives have emerged in this community in the last few years, most of them are attached to the UN agenda of Sustainable Development Goals.[26] Yet several aspects of this agenda are worrisome. For example, the tech industry has come up with the idea of a "sustainable internet"[27] or "sustainable web",[28] a global North framework to reduce carbon emissions, but one incapable of having a more critical perspective to incorporate a social justice agenda. As the Chilean case of lithium exploitation shows, "green" approaches that will help the tech industry to have zero carbon emissions are compatible with extractivist logics that are extremely damaging to the environment. And while we understand that technologies will be needed in the fight against global warming, the neoliberal ideology of "technosolutionism" (as a silver bullet that will solve all the problems thanks to the innovation of individuals) is still dominant within the community.[29]

At the 2020 edition of the RightsCon conference, an important event for the digital rights community that claims to be a meeting point for civil society, governments and the private sector, not one of their more than 270 sessions was dedicated to the neocolonial extractivism promoted by the tech industry. The topic of climate was barely addressed and the few sessions on the climate crisis were led by actors from the global North. These were related to topics such as the activism of Extinction Rebellion; some researchers from New York University were trying to solve the question "Is climate change an emergency?"; and a French private company that sells tools to measure emissions hosted a panel on markets, startups and their risks during the climate crisis.[30] This is an example that demonstrates the huge challenge in terms of climate justice that this community has ahead.

Conclusions

The tech industry is responsible for a massive ecocide that is taking place in the lithium triangle, and actors dedicated to human rights in digital environments are not paying any attention to this abuse. The case of lithium demonstrates that hegemonic digital technologies are part of an ideological complex in which technosolutionism is spurred, and one that never promotes a participatory, democratic and decolonial change in our development models.

Furthermore, a human rights agenda in the digital context must be cautious about the greenwashing operations that tech corporations do today.[31] These actions have to be critically analysed taking into consideration the constant geopolitical impact of tech development on communities of the global South. It is not acceptable to engage in these PR strategies without acknowledging that the extractivist and colonialist logics present in the exploitation of lithium in Argentina, Bolivia and Chile are made to satisfy "green" consumerism from the global North.

In our context of climate crisis and massive extinction of species, we believe that there are three urgent challenges with regards to technology. One is to analyse the ecological and ideological conditions behind the development of hegemonic digital technologies. Another is to join an urgent global agenda for a decolonised democratic and sustainable transition to clean energy, translating this challenge into the field of digital technologies.[32] And, finally, to be especially vigilant with the new "sacrifice zones", as is the case of the salt flats in Chile, areas which are currently invisible to liberal activism despite their function as the fuel of a new stage in colonial capitalism: the development of "green" technologies.

25 Johnson, D. (2010). Sorting Out the Question of Feminist Technology. In L. L. Layne, S. L. Vostral & K. Boyer (Eds.), *Feminist Technology*. University of Illinois Press.

26 Internet Society. (2015). *The Internet and Sustainable Development*. https://www.internetsociety.org/resources/doc/2015/the-internet-and-sustainable-development/

27 https://wiki.mozilla.org/Projects/Sustainability/Glossary

28 Greenwood, T. (2019, 10 May). Introducing the Sustainable Web Manifesto. *Wholegrain Digital*. https://www.wholegraindigital.com/blog/introducing-the-sustainable-web-manifesto

29 Sherriff, L. (2020, 8 April). Hackathons: An inclusive way to tackle the climate crisis? *DW*. https://www.dw.com/en/hackathons-an-inclusive-way-to-tackle-the-climate-crisis/a-52966234

30 https://www.rightscon.org/program

31 Zero Cool. (2019, 7 December). Oil is the New Data. *Logic*. https://logicmag.io/nature/oil-is-the-new-data/

32 Morales Balcazar, R. (2020, 29 June). Op. cit.

Action steps

The following steps are necessary for civil society activists:

- Activists and researchers at the intersection of human rights and technology must create strategies for accountability of the environmental impact of digital corporations, adopting a critical perspective towards devices and technologies that claim to be "green". This should take into consideration issues of neoliberal neocoloniality and promote respect for non-Western cosmologies.
- Civil society organisations dedicated to digital rights must address the harassment and surveillance of local communities, and the deceit practices by mining giants in these communities, and should develop digital security strategies for their protection.
- Of course, these proposed advocacy steps have to involve people from the affected geographies, who should be at the centre of strategising and in decision-making roles, in order to gain legitimacy and to not replicate the power imbalances of neocolonial realities.

UGANDA

CATCHING THE POACHERS: AI IN WILDLIFE CONSERVATION

Space for Giants
Oliver Poole
www.spaceforgiants.org

Introduction

The COVID-19 pandemic has been a wakeup call for modern society. With most scientists believing it was caused by zoonotic transfer resulting from a mix of contemporary farming methods, the exploitation of species through the illegal wildlife trade (with transmission possible through a pangolin) and the conditions at overcrowded and unsanitary "wet" markets, it can appear a symptom of an imbalance between contemporary behaviour and a more organic way of living.[1] This has only been compounded by the way that social media has been used to spread misinformation about the virus, leading to the risk that technology becomes perceived as part of the problem rather than part of the solution to the issue of sustainability.[2]

This report, however, will highlight one way that a sophisticated technological advance, specifically artificial intelligence (AI), is being harnessed to defend nature. Using the east African state of Uganda as an example, it will show how – in order to protect wildlife from those who wish to exploit it for profit – cutting-edge contemporary solutions have been adopted to address the poaching crisis, and thereby also protect key landscapes and enable the development of sustainable economic models for local communities. Although there is still much work to be done to harness the full potential benefits, this is an important example of how the latest technological innovations can defend our relationship with nature, not undermine it.

The illegal wildlife trade

The highly sophisticated illegal trade in wildlife and wildlife products endangers species around the globe. It is the fourth most profitable transnational crime after the drug trade, arms dealing and human trafficking, being worth between USD 7 billion and USD 23 billion a year.[3] It is often run by well-organised criminal networks that seek to exploit the high rewards and low risks of the trade. It undermines environmental efforts, fuels corruption, threatens the rule of law, and hurts communities dependent on wildlife tourism.[4]

The demand for wildlife products is often fuelled by their perceived medicinal value or the social status associated with them. At other times it is driven by the desire to possess exotic pets or own rare plants and animals. At the local level, poaching is also the result of poverty, corruption and political instability. In all cases, the illegal poaching, trade and consumption of wildlife is one of the most destructive and destabilising conservation threats.[5]

Its impact on global populations of elephants and rhinos has received international attention, but other mammals are under equally severe pressure. This includes cats – such as lions, tigers and snow leopards – and primates, including the great apes. Many species of reptiles, birds, amphibians, fish and invertebrates also require urgent action to protect them.[6] The pangolin, the scaly-skinned mammal sought for its meat and scales and which was possibly a zoonotic conduit for COVID-19, is believed the world's most illegally trafficked mammal of all, with poachers killing an estimated one million African pangolins over the last decade for meat, a delicacy in parts of Asia, and keratin scales, an ingredient in traditional Chinese medicine.[7]

Uganda is one of the nations whose wildlife has been particularly impacted. In the 1960s the country had more mega-herbivores such as elephants and hippos per square kilometre than any other African country. By the 1980s its elephant population alone had been reduced to around 700 to 800, although conservation efforts since have seen

1 UK Research and Innovation. (2020, 14 April). Where did the new coronavirus come from? https://coronavirusexplained.ukri.org/en/article/cad0006

2 EBRD. (2020, 15 June). Is technology in the era of Covid-19 a threat to democracy? https://www.ebrd.com/news/2020/is-technology-in-the-era-of-covid19-a-threat-to-democracy.html

3 https://www.thegef.org/topics/illegal-wildlife-trade

4 https://www.worldwildlife.org/threats/illegal-wildlife-trade

5 USAID. (2017). *What Drives Demand For Wildlife?* https://www.usaidwildlifeasia.org/resources/reports/inbox/what-drives-demand-for-wildlife

6 Cookson, C. (2019, 3 October). Global wildlife trade a key factor in species decline. *Financial Times*. https://www.ft.com/content/f2f48da6-e513-11e9-b112-9624ec9edc59

7 https://www.traffic.org/what-we-do/species/pangolins

its number rise to around 5,000.[8] Uganda is also a major transit route for illegal wildlife and illegal wildlife products, much of it being smuggled from the Democratic Republic of Congo. This has resulted in the rise of crime syndicates focused on the trade, particularly in ivory and pangolins.[9]

This matters not only for conservation reasons but for social and economic ones too. Until the present impact on the tourism sector caused by COVID-19, the number of tourists to Africa was expected to increase from 62 million in 2016 to 134 million people in 2030.[10] Four out of every five tourists who come do so for a wildlife experience.[11] Even post-COVID, a large increase is still predicted, not least as people are expected to now be looking for a more nature-based holiday experience.[12] In response, Uganda has been working actively to develop its wildlife tourism product, and the local communities around its national parks can potentially benefit economically from having a thriving wildlife tourism sector, in the context of often traditionally poorly paid employment opportunities in these areas.[13] Therefore, the threat to the country's wildlife poses a threat to the development aims of the country and of these communities too.

Tackling the poachers

One of the greatest challenges facing conservationists is that the poachers often appear to be one step ahead of their efforts, a result of the natural dispersal of species populations and the limited number of wildlife rangers that existing budgetary constraints enable to be employed. Technology is one solution to fill this gap, and Uganda has pioneered two of the most innovative and important such solutions: SMART and PAWS. Both have proved successful in giving rangers an advantage over poachers, and the trials in Uganda resulted in both solutions being adopted in other countries facing similar challenges.

SMART

SMART stands for the Spatial Monitoring and Reporting Tool and is an open-source solution.[14] It is an accessible and powerful software to manage law enforcement data. It works through rangers in the field collecting data during their daily patrols so that it can then be computer analysed to provide understanding of poaching trends and hotspots. The data gathered is extensive, including elements such as the locations of animals, evidence of animal poaching such as the placement of snares, and any arrests for illegal activities. It is logged by the rangers using a hand-held device, or when not enough such devices are available, by recording the data via paper and pen for inclusion once back at base.

The data is then fed into a central computer that can then be asked specific questions such as: Where did my rangers go? How many foot patrols resulted in poacher arrests? Or where were carcasses recorded? The information is converted into visually informative maps, charts and reports – for example, to show locations of carcass sightings and trends in their detection rate. These are then corrected for any unintentional biases caused by the number of times a specific area is patrolled. An area visited the most will likely result in a greater concentration of data, for example, but that does not mean it is necessarily the most likely poached hotspot. Similarly, an area visited sparingly will likely produce little data, but nevertheless may be an area where poaching is actually on the rise. This correction therefore enables the identification of unusual trends and warnings of isolated but significant activity. The result is that conservation managers can more effectively record data and analyse the impact of patrols retrospectively.[15]

The system was developed by an international partnership of conservation organisations. This was comprised of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Monitoring the Illegal Killing of Elephants (MIKE) programme, the Frankfurt Zoological Society, Global Wildlife Conservation, North Carolina Zoo, Panthera, Peace Parks Foundation, the Wildlife Conservation Society, the World Wildlife Fund and the Zoological Society of London.[16]

8 Pandey, A. (2015, 18 August). Ugandan elephants' long march to recovery. *DW*. https://www.dw.com/en/ugandan-elephants-long-march-to-recovery/a-18655456

9 Rossi, A. (2018). *Uganda Wildlife Trafficking Assessment*. TRAFFIC. https://www.traffic.org/publications/reports/uganda-wildlife-trafficking-assessment

10 Signé, L. (2018). *Africa's tourism potential: Trends, drivers, opportunities, and strategies*. Brookings Institution. https://www.brookings.edu/wp-content/uploads/2018/12/Africas-tourism-potential_LandrySigne1.pdf

11 Space for Giants. (2019). *Building A Wildlife Economy*. https://spaceforgiantstest.squarespace.com/s/Building-Africas-Wildlife-Economy-Space-for-Giants-Working-Paper-1.pdf

12 Derrick, F. (2020, 10 July). Wellness travel: Why it could be the post-coronavirus stress-buster you need. *Skyscanner*. https://www.skyscanner.net/news/wellness-travel-coronavirus-stress-buster

13 Ledger, E. (2017, 5 October). How tourism can safeguard African wildlife. *The Independent*. https://www.independent.co.uk/voices/campaigns/GiantsClub/Uganda/how-tourism-can-safeguard-african-wildlife-a7985141.html

14 Huger, J. (20 June 2013). Open source spatial monitoring gets SMART for conservation. *Opensource.com*. https://opensource.com/life/13/6/SMART

15 https://smartconservationtools.org

16 https://www.zsl.org/conservation/how-we-work/conservation-technology/implementing-the-smart-approach

The original trial for the system was Queen Elizabeth National Park in Uganda, one of the country's most important protected areas for elephant conservation, but also an area that had particularly suffered from poaching.[17] It was the accumulation of data there that made its impact so meaningful. Once implemented, over a 12-year period the detection of illegal activity such as wildlife poaching and cattle encroachment increased by as much as 250% despite no increase in the number of rangers deployed.[18] Indeed, its success was so great that the Uganda Wildlife Authority extended its use across its protected area network.

The Uganda trial also resulted in it being implemented at a further 147 sites around the globe. The protected area and wildlife agencies of seven countries have now committed to following Uganda and implementing it across their protected area networks. These are Belize, Bhutan, Colombia, Gabon, Madagascar, Peru and Thailand.[19] In all these locations, they also found that it enabled conservation managers to more effectively coordinate their protection efforts.

PAWS

PAWS stands for Protection Assistant for Wildlife Security and is a game theory-based protection assistant.[20] The successful implementation of SMART in Uganda enabled it to be the first country in which – following research beginning in 2013 – PAWS was trialled in 2014 and then again in 2016.[21] The SMART programme meant there was already an accumulation of data for this new, AI-driven approach, which was developed by applied science academies at institutions including Harvard and the University of Southern California.

Game theory is the study of strategic decision making. It has proved particularly informative in the struggle against poaching as, in that game, there are two players with dramatically conflicting objectives and both act logically in their own interests. For example, if the rangers take the same patrol routes every day, then the poachers will succeed by simply moving elsewhere. Therefore, it is in the rangers' interest to behave randomly, but they do not want to behave totally randomly, as otherwise they might not go to where the poachers are likely to be. Ideally, in deciding routes, the rangers want to deter poachers from going to places with lots of animals by patrolling them regularly. Also, the poachers would ideally be deterred from poaching in areas where there are fewer animals, because not only do they know the chance of catching an animal there is low, but also that there is a chance of a surprise patrol. It is by factoring in all these variables (including factors such as terrain and the weather) that PAWS has helped determine the optimum daily routes that the available pool of rangers should patrol.

SMART enables the impact of patrols to be more effectively assessed, but it does not help create patrol routes or identify targets to protect. It is still a human – the patrol manager – who does this, and humans find it hard to generate credible schedules that are also unpredictable. We are instinctively drawn to pre-existing patterns. PAWS, however, builds on SMART and provides an automated approach that has resulted in much more efficient and randomised patrolling routes.

The trial at Queen Elizabeth National Park found that the PAWS-assisted patrols outperformed traditional patrols in both human activities and animals seen per kilometre surveyed.[22] As a result of PAWS, for example, the implementation team identified a poaching hotspot that rangers had not previously patrolled. On arriving in the area, they discovered an elephant that had its tusks cut off as well as a snare hidden nearby. During subsequent tests a further 10 antelope snares were discovered before any animals were injured or killed.[23] In fact, so successful was the pilot that its use was extended to a second Ugandan National Park – Murchison Falls – in 2017 before being extended to a park in Cambodia in 2019. Now, following support for the project from Microsoft AI, an improved version building on what was learned from the Ugandan and Cambodian trials is planned to be launched in a further 10 to 20 parks.[24] Increasingly, AI will be helping globally in ensuring that wildlife rangers can get the upper hand on the poachers preying on our planet's endangered wildlife.

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Conclusion

The SMART and PAWS approach taken in Uganda provides an example of a concrete response to the current environmental crisis and provides a solution that has impacted poaching in the country. It therefore is a clear and measurable example of technology delivering positive change.

However, this report is being published at a unique time as a result of the COVID-19 pandemic. With the eyes of the world focused elsewhere, those who prey on endangered wildlife have exploited the disruption caused by the virus. Endangered animals are under threat as the limitations imposed on movement hamper wildlife rangers and conservationists, and the sudden collapse in funding caused by the economic consequences of the pandemic puts at risk the future of protection programmes.[25] With tourism having also collapsed, revenues that funded wildlife protection have disappeared and poachers have been encouraged by the absence of visitors.[26] Local communities, facing poverty, are on occasion resorting to killing wild animals to survive.[27]

In July 2020, the head of the Uganda Wildlife Authority, Sam Mwandha, warned that criminal networks involved in the illegal trade of wildlife were exploiting the COVID-19 situation to increase poaching. The same time that he spoke, Uganda announced an elephant had been killed by a snare in Murchison Falls National Park by poachers wanting its ivory. During March to April, 822 snares laid by poachers to trap wildlife were found in Uganda's Bwindi Park, compared to just 21 in the same period the previous year – a rise of 3,814%. Mwandha told the media that in the era of COVID-19, "[f]unds are needed to address poaching, encroachment and illegal wildlife trade."[28]

The challenge that national parks like those in Uganda face is therefore now likely going to be greater. Part of the solution to that will be securing funding to assist the work of the country's wildlife authority and conservation NGOs operating there, so that rangers can continue to do their work. But part will also be utilising the innovative spirit that produced SMART and PAWS to develop new solutions. We urgently need to keep innovating to create new partnerships with industry, government and academia to develop further technological answers. Technology partnerships have the potential to be transformative in the area of wildlife conservation, enabling conservationists to target resources more efficiently and more effectively and to scale impact. In 2020 such an approach is needed more than ever before.

Action steps

The following steps are necessary in Uganda:

- NGOs in Uganda need to reach out to tech companies to secure further technological innovations in this space. One way would be to stage a one-day digital conference for conservationists and representatives of such firms to interact and discuss.
- Civil society organisations in Uganda need to urgently assess the humanitarian needs of local communities near protected areas and create an updated computer database of where food is absent to identify urgent need and limit the extent to which people turn to bushmeat hunting through necessity.
- NGOs need to lobby Western governments so that they are aware of the impact that the COVID-19 pandemic and its consequences for tourism are having on local communities, and to secure interventions for long-term solutions – including paying for representatives from local communities to be trained to become data gatherers for SMART, and therefore local "conservation custodians".
- The extension of PAWS due to the support for the project from Microsoft AI provides an important opportunity for greater engagement. Civil society organisations should work with the Uganda Wildlife Authority to ensure technical training for local nationals to undertake the technical work involved rather than foreign nationals being employed to do this.

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GLOBAL INFORMATION SOCIETY WATCH 2020

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

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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