GLOBAL INFORMATION SOCIETY WATCH 2020

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

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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.

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

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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.

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 project was possible due to the close cooperation of the projects teams.[17]

There were a number of issues that were raised with regard to the sustainable development of two integral parts of these projects: 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

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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.

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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

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.

APC

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