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RESEARCH

Shifting the Conservation Conversation? A Critical Reflection on DH Project Design for a Counter-Mapping of Protected Areas in the Brazilian Amazon

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This article is a reflection on Digital Humanities project design, and a commentary on the way practice often falls short of theoretical ideals. Its critiques are rooted in personal experience of a particular context: mapping conservation areas in the Northeastern Brazilian Amazon. The author explores the theoretical ideals of engaged participative project design in digital counter-mapping initiatives and measures the ability of her own project to live up to such ideals. Through a process of critical reflection, and an exploration of the theoretical literature in critical cartography studies, science, technology and society studies and political ecology, she describes the ways in which counter-mapping can unseat hegemonic discourse for conservation and development schemes in the Amazon, while highlighting the pragmatic limitations that researchers may face in designing participative counter-mapping projects. Engaging with the tensions between theory and practice in politically engaged research, the author offers a critical analysis of her own work as an example of imperfect project design, with the hope that such a reflection may be useful and generalizable for researchers wary of the pitfalls in planning engaged participatory research projects in the field of digital mapping.

Keywords: counter-mapping; Brazil; Amazon; Google Earth; critical cartography; political ecology

Cet article représente une réflexion sur la conception de projet des humanités numériques, ainsi qu'un commentaire sur la façon dont la pratique n'atteint pas les idéaux théoriques. Ces critiques découlent de l'expérience personnelle dans un contexte particulier : celui de la cartographie de zones de conservation de l'Amazonie du nord-est du Brésil. L'auteure explore les idéaux théoriques de la conception de projet participative engagée dans des initiatives de contre-cartographie numériques et évalue la capacité

de son propre projet à atteindre de tels idéaux. À travers un processus de réflexion critique et une exploration de la littérature théorique dans les domaines des études de cartographie critique, des études sur les sciences, la technologie et la société, et l'écologie politique, l'auteure décrit les manières dont la contre-cartographie peut invalider le discours hégémonique pour des programmes de conservation et de développement en l'Amazonie, en soulignant les limitations pragmatiques que les chercheurs peuvent rencontrer durant le processus de conception de projets de contre-cartographie. Engagée dans les tensions entre la théorie et la pratique ayant trait à la recherche politiquement engagée, l'auteure offre une analyse critique de son propre travail comme un exemple de conception de projet imparfaite, en espérant qu'une telle réflexion puisse être utile et généralisable pour des chercheurs sur leurs gardes quant aux embûches dans la planification de projets de recherche participative engagée dans le domaine de la cartographie numérique.

Mots-clés: contre-cartographie; Brésil; Amazone; Google Earth; cartographie critique; écologie politique

1. Introduction

This article is a reflection on Digital Humanities project design, and a commentary on the way practice often falls short of theoretical ideals. Its critiques are rooted in personal experience of a particular context: mapping conservation areas in the Northeastern Brazilian Amazon. In 2016, I started working on the Calha Norte Portal, a digital tool with an interdisciplinary focus that catalogues conservation areas and relevant municipalities in the Guiana Plateau/Calha Norte region of the Northern Brazilian Amazon. At the time I was working as a research intern for the Amazonian Institute for Man and the Environment (Imazon[1]). The Social Policy department of this

[1] Imazon established a reputation as a leading civil society organization in conservation debates thanks, in part, to its maps. In the 1990s the organization came to fame for developing a "logging feasibility map" (Souza, Brandão and Lentini 2010). Using GIS mapping software, the feasibility project charts data on transportation networks (including existing roads and navigable rivers), topography, biodiversity figures, deforestation areas, conservation zones and timber processing facilities. This data is combined in raster layers and applied to a least-cost-surface analysis technique to predict the cost of transporting logs to regional processing facilities. This makes it easier to detect areas most susceptible to illegal deforestation, as well as those areas where timber can be most efficiently extracted by authorized parties, using sustainable methods. As the tool has become more sophisticated, it has also been used with great success in developing recommended zoning of different areas for tourism, community use and conservation.

non-governmental organization (NGO), was a significant stakeholder and mediator in the negotiations to implement the Calha Norte mosaic. This mosaic would be one of the largest jointly-managed patchworks of protected areas in the world. The existing conservation zones cover over 14 million hectares of land in an inter-locking network of national parks, biodiversity reserves, sustainable development areas, indigenous territories and communally-held maroon territories, locally referred to as *quilombolas*. During my internship with Imazon, I was commissioned to build a database of all the protected areas and municipal capitals in the Calha Norte region. After I left, the website and database that Imazon had envisioned took different directions, but I was granted permission to use the data I had personally collected for a class project. In early 2017, I elaborated the Calha Norte Portal, a website and mapped database which seeks to raise awareness on conservation efforts in this vast biologically and culturally diverse region, using Google Earth to facilitate an interactive user experience. This article will focus on my personal project, the Calha Norte Portal, and not on the work I did for Imazon.

The Google Earth map uses an overlay of shapefiles and informational dialogue boxes to plot social, economic, historical and cultural information on each of the protected areas and the municipal districts in the region. Data such as Human Development Index and Social Progress Index scores by municipality, deforestation statistics, protected area implementation scores, and population density are included in the dialogue boxes which pop-up as the user selects a particular area or pin. The pop-ups also show photos and include textual information – historical facts related to the implementation of the conservation zone or municipality, and information about cultural traditions in a particular area. The website, Calha Norte Portal (2020), hosts the download of the Google Earth map, and features a blog on conservation politics in the Amazon region, a user's guide for the tool and an abbreviated online version of the mapped database.

The Calha Norte map focuses especially on human presence in the region; it does not include data on biodiversity. During the design stages of the project, this was a conscious omission, as the map's main purpose is to highlight the rich cultural diversity and history of human occupation in this remote and commonly

neglected region of the Amazon. Despite my best intentions to represent this reality through institutional data, the Calha Norte Portal fails to live up to the ideals of participative project design, as articulated in post-colonial critical cartography theory. Throughout this paper, I discuss the process of elaboration for this project in relation to theoretical debates in the field of science, technology and society studies (STS), political ecology and critical cartography/GISci theory. Harris and Hazen, have used the term "conservation cartographies" to describe the complex system of spatio-territoriality that determines what types of geographic areas can be conserved, the types of activities that can be carried out in these areas and the cartographic representations that reflect these spaces (Harris and Hazen 2005). Without a doubt, the Calha Norte map is an iteration of "conservation cartography," although in its design I strive to embody a kind of "counter-mapping" by defying what Diegues calls "the modern myth of untouched wilderness", a myth which has been intrinsic to hegemonic conservation discourse in the Amazon (Diegues 2001). ("Conservation cartography" refers to the practice of mapping protected areas for conservation. Critical approaches have identified various power asymmetries in conservation and mapping practice. This has lead to an emergent movement of "counter-mapping" which seeks to encourage the reappropriation of cartographic technologies to redress the ways in which conservation maps normalize entrenched ideas about the nature of conservation – how it should be carried out, by whom, and in which fixed and bounded spaces [Harris and Hazen 2005]).

The article is divided into three sections. The first presents theoretical perspectives from current critical cartography/GISci, STS, and political ecology debates surrounding conservation. The ideas that circulate in these debates have served me in critically rethinking the design process which produced my Digital Humanities (DH) project. The second section of the paper contextualizes of the emergence of 'conservation' and 'development' as discursive concepts in the political history of the Amazon, and in the Calha Norte region more specifically. This discussion will serve to highlight the particular dynamics which motivated me to create the Calha Norte Portal in the first place, and discuss its potential utility, even if it does not live up to its theoretical ideals as a participative project. The third section is far more analytical.

I unpack the political motivations which inspired the Calha Norte map, and their relationship to the theoretical debates presented in section one. Adopting a reflexive stance, I engage with the practical challenges that researchers face in designing DH projects, and the stark gap that continues to exist between practice and theory in many contexts.

In using my own project as the central example, I offer a self-critical exploration of the difficulties in developing participative Digital Humanities projects. Although my original goal was to develop a tool which challenges outdated visions of an unoccupied Amazonian wilderness. I now recognize that my efforts in some ways reinforce power structures wherein Western expertise constructs dominant narratives about the Amazon. As we will see throughout, a vast and thoughtful body of critical literature warns us, as researchers, to avoid the pitfalls of reinscribing colonial practices in our research methods. However, translating this theoretical sensibility into the practical design of a project can be made difficult by the researcher's distance from the area of study; distances which may be geographic, institutional and cultural. The question we must face, is whether it is worth elaborating such projects anyway. This discussion is bound to raise more questions than provide answers, but it is my hope that this self-critical reflection may be useful and generalizable to other researchers in the field.

2. Developing a theoretical sensibility

Critiquing cartography

Crampton and Krygier define "critical cartography" as a kind of "undisciplined cartography", describing in a positive light the ability of projects in this vein to transcend disciplinary boundaries and challenge the traditional power structures which have controlled cartographic technologies (Crampton and Krygier 2005, 16). As a growing field of critical theory and experimental work which democratizes mapping practices, critical cartography strives to generate explicit or implicit critiques of the imperial history of cartography as a 'scientific' discipline. The contribution of theorists in this field has been to expose the ways in which maps, typically presented as objective artifacts of science, are in fact of the products of culturally-embedded practices and points of view. In the words Farman, "maps, instead of being an objective visualization of a territory, are instead unstable signifiers, heavily imbued

with the cultural perspectives of the society that created them" (Farman 2010, 874). The power relations associated with the production of maps, the hierarchization of types of knowledge, and the impetus for imperial expansion have been a major focus for many scholars in the field (see Harley 1988, 1992, 2001; Lefebvre 1991; Monmonier 1996; Johnson et al. 2005, among others).

GIS mapping technologies have not escaped critique as they become the norm in the modern digital age. Mei-Po Kwan has criticized GIS for "inadequate representation of space and subjectivity, its positivist epistemology, its instrumental rationality, its technique-driven and data-led methods, and its role as surveillance or military technology deployed by the state" (Kwan 2002, 647). Indeed, Farman highlights one of the unnerving aspects of GIS technologies such as Google Earth:

> As Google Earth zooms in to the Earth from a distance, the 'disembodied master subject' as Donna Haraway theorized is 'seeing everything from nowhere'. These representations are believed to be objective; they are simply images of reality and outside the realm of cultural interpretation (Farman 2010, 876).

Critical GIS theorists, such as Farman, draw on many of the ideas developed in the critical cartography literature, challenging the concept of objectivity in cartographic science. But, critical GIS theory also looks at specifically digital challenges, including questions of access to these technologies and the power dynamics inherent in literacy of the software and hardware that generates interactive spatial data visualizations in the digital realm (Crampton and Krygier 2005, 16).

In their article, "Power of Maps: (Counter)Mapping for Conservation", Harris and Hazen take a sharp critical stance against dominant mapping techniques for conservation (Harris and Hazen 2005). They advocate for alternative conservation strategies, less dependent on 'territoriality', and counter-mapping techniques which reflect fluid boundaries for adaptive models of conservation. The authors point to three types of "power geometries" reflected in conservation mapping. The first concerns the exclusion of local populations from conservation planning and management (often reinforced by divides in GIS literacy between 'expert' and 'lay' parties) by means of the appropriation of management power by large

conservation organizations and the marginalization of local forms of knowledge and human-environment relationships. The second considers the danger of favouring the conservation of certain landscapes over others, such as tropical forests and mangroves over grasslands, based on the greater simplicity of mapping such areas and easily identifiable "conservation targets" (Harris and Hazen 2005, 106). The third problematizes a conservation approach which correlates environmental protection with a percentage of national land mass to be set aside. According to the authors, this approach obscures the necessity to prioritize diverse areas for conservation based on a number of factors, including richness of biodiversity, the value of ecosystem interconnectivity, and degree of local involvement in management. In each of the power asymmetries identified, conservation maps developed in a Western-scientific framework risk reinforcing hegemonic ideas over what constitutes 'conservation' and who has the right to dictate how it should be put into practice.

Some argue, however, that alternative mapping practices may offer a strategy for overturning problematic ideas and hierarchies of knowledge in conservation practice. Counter-mapping is defined as "any effort that fundamentally questions the assumptions or biases of cartographic conventions, that challenges predominant power effects of mapping, or that engages in mapping in ways that upset power relations" (Harris and Hazen 2005, 115). Johnson et al. have similarly argued for forms of counter-mapping which respect indigenous and non-Western mapping techniques (Johnson et al. 2005). A pervasive difficulty in translating these cartographies into Western cartographic tools and technologies dovetails with Harris and Hazen's critique of fixed boundaries in Western 'scientific' mapping. As Rundstrom states, "counter-mapping and GIS can provide, at best, no more than a simulacrum of indigenous or non-Western geographies" (Rundstrom 1998, 9). These critiques reflect a post-colonial stance, which questions the dominance of Western power and knowledge-construction.

Nevertheless, there may be a role for counter-mapping techniques in the deconstruction of power relations in cartography. Some researchers have emphasized the importance of pedagogy for developing a critical literacy of modern cartography and GIS so that indigenous and non-Western groups can engage with these technologies from a position of power, appropriating dominant technologies

of representation in order to re-present themselves on their own terms (Johnson et al 2005). The authors insist that researchers and cartographers working with indigenous communities must commit to advocating for a Freirian style of "critical consciousness" in the communities that they work for (Freire 1985; 2000). This should entail a pedagogical element with regards to the history of colonial cartography for dispossessing indigenous communities of their traditional lands and resources. Such transparency would also encourage what Linda Tuhiwai-Smith describes as "partnership research", research driven by the needs of the community as opposed to the aims of the researcher (Tuhiwai-Smith 1999, 178). Elsewhere, Farman has argued that spaces of counter-hegemonic discourse, and recontextualizations of master representations are possible within existing frameworks of established GIS tools and technologies, as long as creativity, agency, and interactivity are stimulated within the structures of these technologies (Farman 2010, 880). In other words, it may not be necessary to reinvent the wheel, as long as a critical consciousness of the wheel for what it is, is encouraged. The fundamental goal being that consciousness of the history of cartographic technologies will allow for innovative recontextualizations which upset its original imperialistic utility.

GIS beyond western science and discourse

On this note, we return to the discussion of cartography and alternative forms of conservation to incorporate contributions from the fields of science, technology and society studies (STS) and political ecology. As we have seen, critical cartography/GISci theory presents important challenges to the hierarchization of Western-scientific knowledge in mapping practices. STS offers a broader challenge to the dominance of scientific knowledge, by demonstrating how "conflicts between local residents and state officials and/or scientists are [often] based in part on their different types of knowledge about a place, with state-centered scientific knowledge usually considered to override local knowledge" (Cidell 2008, 4).

In Cidell's study on public hearings for noise mitigation around the construction of the Minneapolis-St. Paul International Airport, she demonstrates how local community-members challenged the methodology behind maps which illustrated

noise contours for residents in certain areas. During the hearings, the public argued that if the official maps and documents presented were not reflective of their own lived experience, there must be something wrong with the scientific process which produced them. Cidell's work is relevant for this discussion since it illustrates the important intersection between critical cartography and STS critiques of the scientific method *in itself*. To illustrate this critique in relation to conservation mapping in the Amazon, let us take a hypothetical example. Imagine an official map of a National Park that depicts a delimited and fixed space. Community members who live in close proximity to the park may have particular knowledge of seasonal migration patterns of certain species, and the role that their own actions play, which conservationists may not have taken into account. In this hypothetical case, community members may feel frustrated with an apparent arbitrariness of park boundaries, and their exclusion from this space of 'conservation', stimulating a lack of confidence not only in the map which assumes that conservation spaces can be fixed and bounded, but also in the scientific method which has contributed both to the conservation model and the map which depicts it.

While STS theory provides a pointed critique of the power structures inherent in scientific forms of knowledge, political ecology allows us to focus on the deconstruction of complex relationships in the *history* of political, economic, cultural, and technological factors which have contributed to our Western conceptions of the natural environment. Arturo Escobar, a Colombian-American anthropologist, has become a champion of this field through his deconstruction of the "discursive invention of biodiversity" (Escobar 1998, 53). Although the term biodiversity points to a measurable scientific reality (the variety of species within a delimited area or identified ecosystem), Escobar describes how it is reused and reinforced through a complex network of NGOs, international organizations, local communities, social movements and other political actors (Escobar 1998, 53). The widespread currency of the term 'biodiversity' also has significant economic impact through a major international industry based on the internalization of the costs and benefits of environmental services, or disservices (what economists would call "externalities")

(Carneiro da Cunha and Almeida 2000, 334). By tracing the historical roots of terms such as "biodiversity" and "development", Escobar highlights how discourse brings social reality into being (Escobar 1995, 39). In other words, narratives about the inevitability of modernity, or about protecting the richness of biological life from human activity, are developed over time and construct a certain vision of reality which becomes dominant and is inscribed in institutional practices. In this way discourse "sets the rules of the game", determining who has the power to speak, command expertise and create policies and plans for action (Escobar 1995, 41). Thus, a political ecology theory of the origins of 'conservation' and 'development' as artifacts of discourse can clarify the ways in which alternative forms of knowledge have become subordinate to the institutional legitimacy of Western scientific methods.

In a widespread attempt to expand conservation and development narratives to include alternative visions and approaches, a rich and diverse body of literature advocates for conservation models which place local communities in control of natural resources and management strategies (Leff 2010; Escobar 1998; Carneiro da Cunha and Almeida 2000; Lima 2006; Hecht and Cockburn 2010; Fearnside and De Lima Ferreira 1985; Zimmerer 2000; Barreto Filho 2009). Zimmerer argues for a particularly purist view of "social justice conservation", stating that protected areas should be established with the sole purpose of supporting populations dependent on park resources (Zimmerer 2000). However, Carneiro da Cunha and Almeida point to a challenge in this framework:

> The major bottleneck in involving local communities in conservation plans and putting them in control stems from the effort to give these plans local meaning. Agendas have to merge, benefits have to reach the communities, training and techniques have to be provided (2000, 326).

As Da Cunha and Almeida (2000) describe, a pedagogical approach is necessary to translate conservation objectives for improved communication between local communities and government representatives or environmental NGOs. Furthermore, local or traditional forms of environmental stewardship need to be incorporated into a more flexible international conservation agenda. These demands echo the

critiques presented in the post-colonial critical cartography literature, reaffirming the synergetic relationship between conservation discourse and the cartographic representations through which this discourse is crystallized into social reality.

Fortunately, 'alternative' models for conservation which emphasize local participation are gaining traction. Contemporary conservation policy has identified local involvement as a fundamental element for the success of protected areas (see Cisneros and Orellana 2017; Orellana 2017; Chape et al. 2008; Hall 1997). However, as Carneiro da Cunha and Almeida describe, and as STS theory and the political ecology literature reflect, the process of translation between local frameworks of knowledge and official forms of bureaucratic practice is rarely seamless. In order to deconstruct hierarchies of expertise, GIS counter-mapping strives to offer valuable tools for the communication and translation of knowledge and diverse understandings between different stakeholders. Still, critical theory warns that advocates for these tools must take great care to maintain a situated stance, reflecting on whether the widespread adoption of such technologies truly serves to undermine power imbalances in the construction of discourse, or whether their ubiquity is a sign of the entrenchment of inequities.

3. A political ecology of conservation and development discourse in the Amazon

I will now turn to a more specific focus on the historical, political and cultural origins of 'conservation' and 'development' as discursive concepts with important ramifications for environmental challenges in the Amazon. This section will serve to nuance the previous theoretical debates by illustrating the historical dynamics which have shaped conservation and development as powerful narratives in the contemporary politics of the Amazon, and the Calha Norte region more specifically. In this section I will explain why I developed the Calha Norte Portal in the first place, and how it may still be useful in questioning some of the assumptions common to mainstream Western ideas about the Amazon.

Conservation as discourse

In 1948, the World Conservation Union (IUCN) was formed in Fontainebleau, France. The first of its kind, the Union brought together governments and civil society

organizations with the common goal of conserving nature. Supported by UNESCO, the IUCN dedicated its early years to raising awareness about the endangerment of various species of flora and fauna and the need for conservation efforts throughout the world. Today, the IUCN is an international reference for conservation policy, with close links to the United Nations Environment Programme. The IUCN protected area management categories have become a standard worldwide for environmental conservation (IUCN 1994).

Although parks and protected areas have been around, arguably, since the dawn of humanity itself (Ramakrishnan 2003), the discursive concept of conservation as we know it today, is relatively new, having grown in tandem with a Western scientific focus on biodiversity (Escobar 1998). The term *protected area* typically refers to a geographical space set aside with particular limitations on its use in order to safeguard the biological integrity of a landscape. This idea of conserving nature through parceled territories is a particularly Western post-industrial revolution point of view, as it depends on a sharp dichotomization between areas for human use, and areas which must be protected from human activity. As Harris and Hazen state, "by designating particular areas for conservation, we are also concurrently – albeit often unwittingly – accepting that other areas are less worthy of protection" (Harris and Hazen 2005, 111). Zimmerer adds further emphasis, the "boundaries of conservation areas seem to cleave apart the privileged spaces of nature protection and preservation from those places of heavier human use and inhabitation" (Zimmerer 2000, 362).

This sharp dichotomization has been studied extensively by many scholars in the field of anthropology. The work of Gisli Palsson and Philippe Descola has allowed for a radical deconstruction of these ideas. In part, they suggest that this divide has biblical roots. When God created man he made him superior to all natural beings, the guardian of all of His creation. Descola and Palsson relate this "paternalistic" view of the human relationship to nature to the 'rationality' of the natural sciences in the enlightenment era (Descola and Palsson 1996). We can see proof of this in the work of early natural scientists and explorers such as Charles Marie de la Condamine,

Alexander von Humboldt,[2] and Charles Darwin. The work of these men of science, and countless other explorers in the 18th and 19th centuries, has been fundamental for the development of our modern Western understanding of biological systems and the natural environment. Without natural science, much of what we know today about ecosystems, climate change and other threats to the environment would not be possible (Wulf 2016).

However, this 'paternalistic' view of human-environment relations has been problematic in two important senses. First, throughout Western history it has fostered an Orientalist viewpoint that sees human beings as vastly superior to nature and tasked with subduing it and exploiting its potential (Descola and Palsson 1996, 16). We can see this vision in various iterations in Amazonian history, from capitalist development projects, to colonial settlements.[3] The second issue with 'paternalistic' or 'orientalist' visions is that they obscure the reality of a third type of human-nature relationship, which Descola and Palsson call "communalism". Unlike the other two types, communalism rejects "any radical distinction between nature and society and between science and practical knowledge" (Descola and Palsson 1996, 16). Recognition of a communalist perspective, a term which characterizes the belief system of the vast majority of Amazonian indigenous communities, has bred an entirely new field of anthropological study which seeks to go "beyond the human"

[2] See Andrea Wulf's *The Invention of Nature* (2016) for a fascinating biography of Humboldt and his influence on modern environmentalism. Humboldt took inspiration from his natural surroundings to produce his theory of a 'gaia', a network of interconnected natural systems which could be observed throughout the world. This discovery was made possible by his observation that forms of vegetation on mountain slopes which were similar across various regions across the globe. His ideas have been formative for our modern understandings of ecosystems, and the interconnectedness of the global climate systems. Interestingly, Humboldt's work reflects a view of human relationships to the environment being either exploitative, what Palsson would refer to as "orientalism" or protective, in line with Palsson's description of "paternalism".

[3] See Matthew Parker's *Willoughbyland* (2015) for a history of early British settlements along the Guyanese coast and into its interior. The account illustrates the enormous difficulties faced by colonial settlers to survive harsh and unfamiliar conditions in order to establish imperial outposts in this frontier region. The history of these endeavors is reflective of the prevailing colonial attitudes in the 17th century, of a prerogative for human dominance over wild and unfamiliar tropical landscapes, as foreign powers scrambled to establish a foothold in the Amazon region.

to study the environments we construct and are constructed by, animal, natural, and otherwordly (Kohn 2013).

A growing body of work in Latin American environmental thought emphasizes traditional "communalist" relationships to the environment in opposition to the modernist principles of conservation policy. Enrique Leff, an environmental sociologist, traces a counter-cultural movement in environmental thought to the 1980s, when research and epistemological inquiry in Latin American environmental studies turned its focus on "complex systems, and a critical analysis of the coordination of sciences and interdisciplinarity, incipient fields and innovative theories, [...] fertilized in the fields of economy, ecology, anthropology, architecture, rural sociology and law, and applied problems such as urbanism, integrated resource management, development planning and environmental law" (Leff 2010, 9). According to Leff, one of the most valuable elements of this shift in thinking is its deconstructivist thrust, a decomposition of the separation between "economy" and "environment", and the integration of a multi-disciplinary approach to environmentalism, focusing on cultural factors in conservation policy (Leff 2010, 7). As these ideas gain institutional traction, organizations such as the IUCN have begun to incorporate references to "indigenous and traditional knowledge" into their guidelines for effective protected area management (Beltran 2000).

In the Amazon, this process has been underway at least since the 1980s. Leff (2010), Escobar (1998) and Carneiro da Cunha and Almeida (2000) each address the role of social movements in producing alternatives forms of environmental stewardship which are changing dominant conservation discourse to include a social development component. In other words, a new form of "eco-development" is emerging in the region which challenges received Western ideas of antagonism between environmental and development goals (Leff 2010). In this sense, the success of grassroots movements in Latin America is beginning to trouble the traditional Western narratives around *what* environmental conservation should entail and *who* has the power and authority to protect nature. Furthermore, these same movements are also unseating received ideas about how communities in the Amazon should become economically prosperous. This will be the focus of the next few pages.

Development as discourse

Development is a slippery term. In Western scholarship, it typically refers to projects which seek to improve human economic well-being. In most cases it refers specifically to economic progress, although recent scholarship focuses increasingly on human aspects of well-being, including education, nutrition, and environmental factors (Sen 1999). The mainstream vision of holistic development is illustrated in the United Nations Development Program's (UNDP), Sustainable Development Goals (SDGs), evolved from the Millennium Development Goals. To address the vast body of literature which criticizes 'development' as a Western neoliberal concept of progress is beyond the scope of this article (for some examples of critical development theory, see: Kothari and Minogue 2002; Munck and O'Hearn 1999; Stiglitz 2003; Karim 2011). However, STS and political ecology critiques of Western scientific knowledge can generally be applied to the discursive roots of 'development' as well. Under this lens of critique, development is a concept born from ideas of linear progress. These ideas of linear progress are rooted in the culturally-derived hegemonic assumptions of Western science. Many now see development as an imperial project to Westernize "underdeveloped" nations (Tucker 1999).

Recalling Escobar's (1995) arguments about the discursive construction of social realities, a critical stance on development projects in Amazonian history reveals the ways in which narratives of progress, civilization, and modernity have shaped the contemporary political and economic landscape of the region. If we take an expanded definition of the term "development" to refer to Eurocentric projects which impose Western ideas of progress on foreign cultures, a history of development in the Amazon would begin long before the invention of the term itself. Since the arrival of Europeans in the region, extractive activities and civilizing missions in the name of progress have shaped the region's history (Guzman 2009). In what follows, I will examine different projects undertaken at various periods of Amazonian history which have attempted to impose a particular vision of progress on the region's inhabitants. From this critical perspective I will attempt to reconcile contemporary eco-development projects as participative alternatives to traditional development frameworks, and argue that these alternative visions offer a channel

through which we can undermine traditionally Western hegemonic discourse about what constitutes development and prosperity. In the final section of this article, I will explore the role of counter-mapping for acting against hegemonic discourse, and how DH project design may aspire to such ideals.

Development throughout Amazonian history

For over a century, between 1820 and 1920, the Amazon's main export was rubber. The trade in this precious commodity has shaped the history of the region perhaps more than any other. At the peak of the rubber boom, the wealth generated by exports turned the capital cities of the Brazilian Amazon, Manaus and Belem, into centres of cultural and material consumption that rivalled the extravagance of European cities like Paris and Milan. The rubber industry prompted foreign investment in major development projects, such as the disastrous Mamore-Madeira railroad,[4] and imperial ambitions which nearly sparked an all-out war between Brazil and Bolivia. The Acrean revolution was partly the product of U.S. imperialist ambitions to seize control of the richest rubber-producing region in the Amazon, the Upper Purús, a frontier region disputed between Brazil, Peru and Bolivia (Hecht and Cockburn 2010; Schaan 2016; Barnham and Coomes 1997). After an armed revolt which resulted in the founding of the State of Acre in 1899, cunning diplomatic methods were required for Brazil to establish definitive control over the 15 million hectares of rubber-rich territory. Using maps produced by the notable Brazilian journalist, Euclides da Cunha,[5] Brazil's

[4] Between 1872 and 1912 there were two attempts by American business tycoons to build a railroad joining the rubber rich regions of Acre with calmer headwaters around the Jurua to facilitate exports. The first attempt at construction was headed by international entrepreneur George Church, but harsh conditions and high mortality rates for workers doomed the project to an early failure in 1881. In 1908 a Pennsylvania Quaker, Percival Farquar bought the concessions to the railroad and between the date of purchase and the completion of the project in 1912, succeeded in plunging $70 million in European capital into the scheme without ever obtaining third party expert opinions on economic prospects in the Amazon. At the time of completion, the rubber boom had already collapsed, by the 1920s, production was a trickle of what it once was. In all the railroad cost over $145,000 a mile and claimed over 6,000 lives (Hecht and Cockburn 2010, 76–78; 90–94).

[5] Political ecologist, Susanna Hecht, offers a brilliant analysis of the instrumentalization of Euclides da Cunha's maps and reports on the upper Purus region for Brazil's imperialist ambitions in Acre. Commissioned by the Baron Rio Branco, da Cunha travelled up the Purus river and produced maps and eloquent reports documenting identity politics which associated the residents of the area with a Brazilian national identity rooted in racial blending (Hecht 2013).

foreign secretary, the Baron Rio Branco was able to establish control over large swaths of territory in western regions of the Amazon. (Political ecologist, Susanna Hecht, offers a brilliant analysis of the instrumentalization of Euclides da Cunha's maps and reports on the upper Purus region for Brazil's imperialist ambitions in Acre. Commissioned by the Baron Rio Branco, da Cunha travelled up the Purus river and produced maps and eloquent reports documenting identity politics which associated the residents of the area with a Brazilian national identity rooted in racial blending [Hecht 2013].) Wresting control of Acre from Bolivia in 1903, Rio Branco also succeeded in establishing Brazilian dominance over Peru's territorial claims to the Upper Purus region.

Between 1910 and 1920, the Amazonian rubber industry faced a major crisis. Competition from Asian rubber plantations, where the plant grew free of its natural predators, was proving untenable for the costly Amazonian production scheme. In its natural habitat, the rubber tree grows in dispersed pockets throughout the forest to avoid contagion of leaf blight, a common pest of the *hevea brasiliensis*. Plantation-style production in Southeast Asia was much cheaper, although transportation costs to ship the product to Europe and the United States exceeded those of rubber shipments from Brazil. Bolstered by this calculation, prospectors of Amazonian rubber encouraged the implementation of rubber plantations in Brazil to attempt the revive the dying rubber industry. Unfortunately, they failed to account for the trials of tropical agriculture, neglecting local knowledge of the rubber tree's common pests (Hecht and Cockburn 2010, 96).

In 1927, Henry Ford purchased two and a half million acres of land on the Tapajos river to start up a rubber plantation that might supply the growing U.S. automobile industry. Devoid of local consultation, the project lasted 18 years and never produced sufficient quantities of rubber for export. Furthermore, Ford's austere management style clashed with local patterns of seasonal labour combined with subsistence agriculture. Despite pay scales that exceeded regional norms, and social benefits for plantation workers, such as healthcare and institutionalized education, labour was scarce, as local rubber tappers rejected the Puritanical Midwestern management structure (Grandin 2010; Hecht and Cockburn 2010: 97–99).

The case of 'Fordlandia', as Ford's doomed plantation would come to be called, illustrates what James Scott has called "high modernism", an ideology founded on blind faith in the legitimacy of science, technology, and industry (Scott 1998, 4). High-modernist states govern through simplifications which attempt to render complex phenomena more "legible" for the purpose of bureaucratic administration, and facilitate the expansion of large-scale modernization projects. Although Scott's analysis focuses on major state-led development schemes such as collectivization in Soviet Russia and forced villageization projects in Tanzania, the dangers of high-modernist planning can also serve as a warning to private-sector development initiatives. In fact, one of the most valuable elements of Scott's analysis is his exposition of the simplifications and assumptions inherent in all forms of planned development, *especially* in foreign schemes replicated in diverse contexts. In the case of Fordlandia these assumptions proved fatal, and it can be argued that in any planned project, the dangers of attempting to render complex reality bureaucratically legible can result in simplifications which produce unforeseen consequences.

In the period between 1960 and 1980, under the rule of Brazil's modernist military dictatorship, major development schemes were launched in the Amazon under the purported aim to bring "people with no land to a land with no people" (Cardoso 2002, 53). In a more general sense, the plan sought to further increase State penetration into the region and stimulate foreign investment. Large-scale resource extraction projects were encouraged and subsidized, and the Amazon saw a boom in mega-projects including hydroelectric dams, mines, and an extensive network of roads and highways which pushed deforestation rates to levels previously unimaginable (Fearnside and De Lima Ferreira 1985). Given growing international attention to environmental issues and conservation, this period also saw a boom in the number of national parks and conservation areas throughout the Amazon region. Despite the pretenses, many scholars saw through these empty conservation schemes, warning of the implementation of "paper parks": "parks that have not been implemented in any serious way and that enjoy a virtual existence as lines drawn on official maps" (Terborgh and Van Schaik 2002, 4).

Throughout the 1980s a social movement of rubber tappers was stirring around issues of dispossession from their traditional lands. In 1985, a number of activists,

supporters and civil society organizations rallied around the Rubber Tapper's National Council, a nation-wide meeting of land defenders, hosted in Brasilia to discuss the demands of the consolidated social movement. The participants called for development policy with a regional focus that would recognize traditional people as "the true defenders of the forest" (Hecht and Cockburn 2010, 208). Their demands also included a particularly concrete recommendation: the implementation of extractive reserves. These reserves represented a highly innovative model for conservation, placing the management and control of a territory in the hands of local communities. Similar to indigenous land grants, these reserves endowed local people with control over conservation strategies, recognizing the need for a compatibility between their traditional knowledge and livelihoods, and the aims of conservation policy (Carneiro da Cunha and Almeida 2000).

Extractive reserves quickly gained popularity and the model was replicated throughout the Amazon region, and internationally (Lima 2009). As a conservation model grown out of grassroots organization, and imbued with meaning by local populations, the reserves have been heralded as the quintessential example of counter-hegemonic eco-development. As we have seen, for scholars, such as Leff (2010) and Escobar (1998), the 'extractive reserve' model may exemplify the revolutionary potential of Latin American environmental thought and the power of social movements. Indeed, the success of the extractive reserve model relies on its ability to invert traditional power dynamics in conservation policy, placing the expertise with local communities who inhabit a particular area. Furthermore, the model upends the traditional paternalistic conservation paradigm (i.e., that nature must be divided into parcels by knowledgeable experts to be protected from humans) by legitimizing a communalist form of human-nature interaction.

Still, we should take care not to over-simplify a complex reality. Since its emergence in the late 1980s, the extractive reserve model has been assimilated into dominant conservation and development discourse as a "community-based sustainable program" (Carneiro da Cunha and Almeida 2000, 326). In order to avoid the dangers of simplifying a complex reality and transposing it in the form of planned (eco)development schemes sponsored by bureaucratic foreign bodies, proponents of this model should recall that conservation must always be couched in local idioms

or local structures of meaning, for it to be successful. The process of translation between international or national conservation/development agencies and local communities must always seek to deconstruct power hierarchies, by fostering two-way communication and striving to incorporate "partnership research" that responds to the needs of local communities (Tuhiwai-Smith 1999).

As this brief historical overview illustrates, narratives of the Amazon as a space in need of 'civilizing', have constituted the political patterns of economic development in the region. Although conservation is a more recent discursive invention, one can see how it emerged as a necessary counterpoint to the long history of commercial exploitation which has shaped the social and political dynamics of human life in the Amazon. What is of interest to us here is how contemporary grassroots movements are beginning to trouble the frameworks which define conservation and development through hegemonic Western discourse. Extractive reserves propose a model in which these two ideas: human prosperity and sustainability, are not mutually independent, but rather merge and produce an alternative ontology of human-environment relationships. This alternative ontology is a non-Western one, and its increased traction in contemporary conservation discourse may well reflect an increased recognition of the rights and legitimacy of indigenous and other traditional frameworks of knowledge and being. Nevertheless, there remains work to be done if indigenous and traditional knowledge is to be understood in its own terms, and not coopted by Western structures of authority.

This is the tension that I will return to in the reflexive analysis in part three of this paper. First, however, I present a brief but pertinent history of the Calha Norte region itself. Although this area of the Amazon reflects the larger historical patterns I have discussed above, it is worth highlighting certain particularities of the region, and the history of the conservation mosaic, which is the focus of the Calha Norte Portal. In this section, I will argue in more detail the value that the tool has for unseating dominant narratives about the Amazon region, and for raising awareness of the practical challenges for traditional conservation frameworks.

Calha Norte

The name 'Calha Norte' literally means 'the Northern Trench', although its origins are a little more sinister than its name would suggest. In the 1980s the Brazilian

government began facing threats of drug trafficking, regular incursions from Colombian guerrilla groups, and a growing industry of illegal mining along the Venezuelan border. For national security reasons, it began exploring ways to secure its porous northern border. The Calha Norte project, later renamed *Nossa Natureza* (Our Nature), represented the first Amazonian development program of the *Nova Republica* of emerging civilian rule (Hecht and Cockburn 2010, 136). The plan focused on a vast area, from the triple-border between Peru, Colombia and Brazil in the west, to the Oiapoque river between Amapá state and French Guiana, and north to the isolated frontier regions between Brazil, Venezuela, Guyana and Suriname. In its first iterations, the plan was developed in the utmost secrecy, focusing on an expansion of road networks and military presence to secure the nation's northern frontier. Under the facelift provided by the *Nossa Natureza* program, in 1989 the plan changed emphasis, focusing instead on the promulgation of extractive reserves for rubber tappers, the creation of national parks and forests, and the reinforcement of indigenous reserves across the Guiana Plateau. Despite these positive steps, the plan included some glaring omissions. It neglected to address the issues of dam projects and the building of roads, major development projects which were generating significant political and environmental protest for their impacts on deforestation and their irrevocable damage to local ecosystems.

Gregory and Vaccaro, have discussed the emergence of conservation zones and indigenous territories as "islands of governmentality[6]" which allow the modern Guyanese state to expand its reach and legitimacy according to territorial reconfigurations of sovereignty (Gregory and Vaccaro 2015). They argue that the creation of these conservation spaces and indigenous territories represents a modernization of the Guyanese state, through a decentralization of power into local, regional, national and international actors. This process of decentralization, paradoxically, does not represent an erosion of state power, but rather a strengthening and legitimization of state penetration into frontier regions (Gregory and Vaccaro

[6] Michel Foucault developed the concept of governmentality to refer to "the ensemble formed by institutions, procedures, analyses and reflections, calculations, and tactics that allow the exercise of this very specific, albeit very complex, power that has the population as its target, political economy as its major form of knowledge, and apparatuses of security as its essential technical instrument" (Foucault 2009, 108).

2015, 345). The promulgation of the *Nossa Natureza* program in the northern frontier regions of the Brazilian Amazon may also be understood in these terms. By decentralizing state power into local forms of organization, and legitimizing itself in the eyes of international conservation NGOs, the Brazilian government was able to achieve its goal of extending state power over its frontier.

Keeping this historical trajectory of the region in mind, we now turn to the state of conservation policy in the Calha Norte mosaic. The mapped database that I created does not cover as vast a region as the original military agenda once targeted. The Google Earth map focuses on a reduced area from the border between states of Pará and Amazonas, to the coastline of Amapá state in the east, and is limited by the international borders between Guyana, Suriname and French Guiana in the north. The map focuses on the Calha Norte conservation mosaic, a patchwork of protected areas, indigenous territories and quilombola communities, which are governed individually but managed collectively, according to certain guidelines. It is from this mosaic initiative that the Portal and the map draw their name.

The protected areas, and indigenous and quilombola territories which will make up the mosaic are pre-existing conservation zones. The innovation of the Calha Norte mosaic will be to consensually manage them as a whole. At the time of writing, community consultations and institutional planning are halted, due in large part to political reticence to implement conservation areas, under the government of far-right president, Jair Bolsonaro. Although the initiative had been slated for implementation at the end of 2017, some criticism had been levelled at government and NGO representatives for failing to encourage sufficient participation from quilombola and rural riparian communities, known locally as *ribeirinhos* (Instituto Iepe 2017; Radio EBC 2016). Overall, support from government stakeholders and indigenous representatives remains strong, although, under the present political conditions, the officialization of the mosaic has been postponed (Ideflor-Bio 2016; HuffpostBrasil 2017; Instituto Iepe 2017). As the case of the Calha Norte mosaic demonstrates, there are many complex challenges for conservation in this vast region. One major issue is precisely that of ensuring local participation in the planning, creation and management of the mosaic.

In meetings, government representatives involved in the creation of the Calha Norte mosaic have emphasized the importance of dialogue between institutional bodies and local people, and pedagogical approaches to articulate what the mosaic would entail and its impact on the lives of local communities and their residents. One member of the conservation management board of The Institute for Tropical Forest Development and Biodiversity for the State of Pará (IDEFLORBio) was clear in articulating that "before we can declare that the mosaic is ready on paper, we have to make it a reality in practice" (Instituto Iepe 2017). Despite this enthusiasm, challenges within existing conservation zones abound (RAISG 2002). Enforcement of park boundaries is poor given the lack of government support for monitoring and prosecuting illegal encroachments (TCU 2013). Furthermore, a disconnect between local understandings of human-environment relationships and institutional discourse has contributed to sporadic support for conservation policies among affected communities (Semeia Institute 2014).

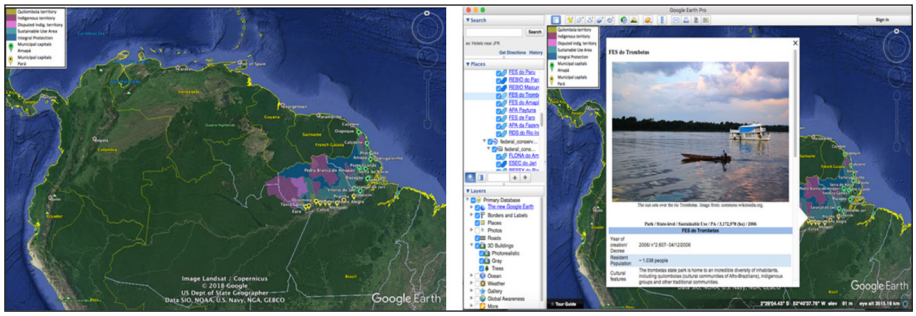
Part of the reason for these misunderstandings is the complexity of conservation categories themselves. The Calha Norte mosaic is composed of 34 different protected areas, 10 legislated indigenous territories, and more than 50 quilombola land concessions in various phases of legal titling. Focusing solely on the protected areas, all government-mandated protected areas in Brazil are divided into two broad types of usage, and within each type, various categories designate the specific classification of land use. Integral Protection indicates that the reserves are allocated for strict biodiversity conservation. No extractive activities are permitted there, by law, and any individual or family inhabiting these territories is subject to eviction. Sustainable use areas, designate those territories that may be used for extractive activities, although the type of activity depends on the specific category. For example, as we have seen, in the case of RESEX (Extractive Reserve) territories, communities may sustain their traditional livelihoods through activities such as logging and agriculture for commercial purposes. In most cases, these activities must be undertaken following certain guidelines elaborated according to scientific prescriptions of sustainable practice. In some National Parks, inhabitants are permitted to use ground-level resources for sustenance purposes, but they may not hunt or commercialize the

resources that are extracted within the boundaries of the protected area. Each protected area is supposed to be governed according to a management plan which takes into account the specificities of a particular area, although limitations may prevent the timely elaboration of this important document, posing further challenges for the effective management of conservation areas in the region (SEMA and Imazon 2012). The protected areas to be included Calha Norte mosaic span the full range of categories, contributing to confusion among local residents about activities permitted in the landscapes which have sustained their livelihoods for generations, and thus, sometimes compromising their support for institutionally-mandated conservation programs.

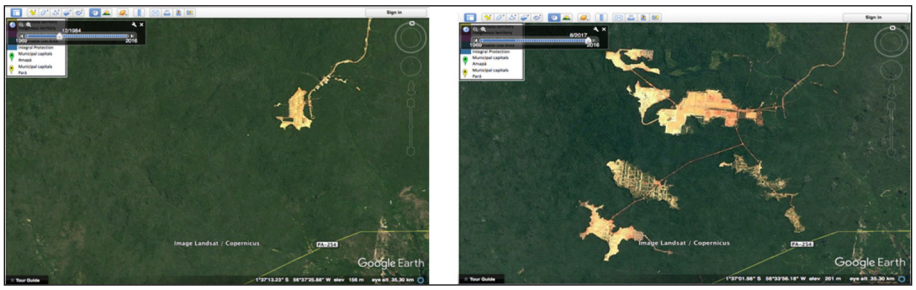
Overcoming this confusion and carving out a space for local communities to bring their own visions of conservation to the negotiating table is crucial if systems of management are to become more participative. There is a need for open dialogue between researchers, NGO-workers, government officials and the communities they interact with, in order to foster critical consciousness among inhabitants of protected areas as to what 'conservation' and 'development' mean in official discourse, and what programs under these rubrics would entail for their livelihoods. Participative GIS projects could help to communicate local visions of conservation to policymakers and legislators by overcoming physical separations between the residents of rural communities and the official consultative meetings, often held in urban centers. In order for these technologies to truly serve this purpose, however, the maps *must* be elaborated either by communities themselves, or with the wholehearted participation of engaged residents who care about their impact. If these digital platforms are not adopted by locals who feel that they are served by a sort of "partnership research", then the tools will not fulfill their potential to bridge power divides and democratize the production of discourse (Tuhiwai-Smith 1999).

Nevertheless, the Calha Norte Portal, that I have designed, can still occupy a limited role. Among researchers, NGO-workers and other Western institutional actors interested in conservation policy in the region, the mapped database can be a valuable resource. One of the great strengths of the project is the way it demonstrates the wealth of cultural diversity among communities residing in and around protected

areas. The map brings into focus the *people* who are affected by conservation policy, and those who work very hard to institute it. The database visually documents threats to reserves, national parks and other conservation zones, threats which should be brought forward and communicated in terms that institutional actors can clearly understand (See **Figures 1** and **2**). One aspect of the Google Earth map that does this particularly well is its timelapse feature. By cataloguing satellite images from the 1960s up until the present, Google Earth allows the user to scroll back in time and observe how landscapes and cities have changed (See **Figures 3** and **4**). In the Calha Norte mosaic, these observations are especially poignant. Seeing how urban centers sprawl, forests shrink and agricultural spaces grow is illustrative of the socioeconomic dynamics that the map represents. A particularly striking example of what the map



Figures 1 and **2:** (Left): The Calha Norte mosaic, mapped in Google Earth; (Right): Example of the pop-up information boxes in the tool. Screenshots are of the .kmz file downloaded from calhanorteportal.com, and opened in Google Earth. Citation: (Calha Norte Portal 2020).



Figures 3 and **4:** The MRN bauxite mine in the Saracá-Taquera National Forest, as seen from Google Earth. On the left, the mine in 1984, on the right, the same mine in 2017. Screenshots are of the .kmz file downloaded from calhanorteportal.com, and opened in Google Earth. Citation: (Calha Norte Portal 2020).

can portray is the Mineração Rio Norte (MRN) bauxite mining facilities, located within the Saracá-Taquera National forest. Despite ongoing land disputes with local quilombola and ribeirinho communities, this mine, the largest bauxite producer in Brazil, has been operating within the boundaries of a conservation area since 1989. The satellite images of this mine capture the tremendous contradictions inherent in Brazilian conservation policy, and the fraught relationship between development projects writ large, and environmental protection.

4. Critical reflections on DH project design

Reflecting on the potential of this tool, and the future directions for the Calha Norte Portal, I return to my earlier reflections on institutional planning, and the dangers of simplifying complex realities for the purpose of legibility (Scott 1998). My project is a simplification and a generalization of local realities and complex dynamics in the fields of conservation and human development. However, as Monmonier explains, this is what maps do:

> A good map tells a multitude of little white lies; it suppresses truth to help the user see what needs to be seen. Reality is three-dimensional, rich in detail, and far too factual to allow a complete yet uncluttered two-dimensional graphic scale model. Indeed, a map that did not generalize would be useless. But the value of a map depends on how well its generalized geometry and generalized content reflect a chosen aspect of reality (Monmonier 1996, 25).

If we are to accept that maps are useful ways of communicating spatial information and generalizing complex realities for specific purposes, then perhaps we can justify their use as tools for questioning the hegemonic structures that bound us on every side. The Calha Norte Portal can be a useful platform for researchers and others who are interested in obtaining a certain type of knowledge and vision of the Calha Norte mosaic. It is a rich, visual database with many potential applications in institutional settings. But, it only communicates one reality, a reality based on figures and reports, not based on the lived experiences of the people who inhabit this vast and complex region.

As researchers and project designers in DH we are faced with a major challenge. Which aspect of reality do we want to reflect in our projects? What is gained and what is lost in focusing on the particular aspect of reality that we choose to highlight? Being transparent about this tension can improve our research practice, especially when pragmatic limitations impede a participative approach. By explicitly stating that which is absent (participation), we bring it to the forefront and thus, enforce a critical consciousness of what is lacking in our work. This humility in practice and design could be a significant step in the direction of deconstructing hierarchies of knowledge and expertise.

There is another issue at play in this discussion – the question of whether Western cartographic technologies are suitable for representing non-Western ontologies (ways of seeing, experiencing reality and the world). Given that we live in a complex world where power operates within particular frameworks of knowledge and technology, as researchers steeped in these privileged forms of knowledge, we have a responsibility to *democratize their legibility and use.* Whether or not they are suited to communicating non-Western frameworks of knowledge, technologies such as GIS have currency as tools of communication in the institutions which wield power and authority. Therefore, engaged researchers have a duty to facilitate access to these technologies. In so doing, we are working to transfer agency to individuals and communities who can choose to appropriate GIS mapping tools for their own purposes, or not. Our role should be a pedagogical one, leaving the decision-making to the individuals and communities engaged in the negotiation of locally-relevant conservation policies.

In an edited volume on community-based natural resource management projects, environmental anthropologists Anna Lowenhaupt Tsing, Peter Brosius and Charles Zerner and their contributors reflect on the power of community-based countermapping to assert local control over conservation schemes (Tsing, Brosius and Zerner 2005). Several contributors to the volume suggest that avoiding mapping tools is a futile exercise (Colchester 2005; Poole 2005; Topatimasing 2005). These authors use a variety of case studies from Guyana, Canada, and Indonesia to demonstrate the power of participative mapping projects for community building,

for the assertion of historical territorial rights, and for facilitating communication between local representatives and conservation authorities. Nevertheless, they emphasize the importance of *process* in these community-based mapping projects. It is not enough for researchers to capture alternative visions of space and map them, the communities themselves must be involved in every step of the process, dictating the terms through which the map is created and the purposes for which it will be employed. Indeed, anything short of this would be a repetition of neo-colonial power dynamics and the hierarchization of knowledge. Furthermore, Rocheleau reminds us that even within a community, maps may prioritize certain points of view over others (Rocheleau 2005). For example, how women visualize spatial boundaries may be different from how men view them, and how hunters interact with space will differ from how farmers understand the landscape that surrounds them (Rocheleau 2005). Indeed, as Tsing, Brosius and Zerner articulate, "[w]henever we offer the one true map, we make it harder to access all the other possible maps" (Tsing, Brosius and Zerner 2005, 22). As a result, the authors demand that mapmakers commit themselves to "multimapping", "that is, the making of many maps that show alternative representations and thus make discussion of the community and its representation possible" (Tsing, Brosius and Zerner 2005, 22).

The kind of mapping practices advocated for in *Communities and Conservation: Histories and Politics of Natural Resource Management*, emphasize the creative political possibilities of counter-mapping (Tsing, Brosius and Zerner 2005). The possibilities that counter-mapping can create emerge from a commitment to dialogue, community-building and multi-perspectivism. If, as engaged researchers, we are to strive for project design which takes seriously an ethical engagement with the perspectives of the individuals it will touch, we must do everything possible to reach this ideal. But what does it take to design a Digital Humanities project that would live up to this theoretical ideal? What kind of practical hurdles might prevent us from attaining it? And, if we produce work which falls short of our ethical and political ideals, should we disseminate our results anyways?

These are not simple questions, and I realize that they are particular to a certain audience. Needless to say, I am writing from a privileged position as a Western

researcher with the political and economic freedom to reflect on such things. I am also writing for individuals like me, who believe in the power of research and the production of knowledge, but who often feel uncomfortable with the power dynamics inherent in the work that we do. In my work, I try to cultivate a critical position, drawing attention to unequal power divides, especially when they are inherent to my own actions. It is this feeling of discomfort which led me to write this very article, and yet I still feel a level of discomfort with the results of my own work. The Calha Norte map does not live up to a participative ideal. It did not benefit from the input of the residents of the protected areas and indigenous territories that it depicts. And yet, for practical reasons, I am resigned to the reality that living up to that ideal at the moment of its creation was impossible.

Projects are never perfect, they are never finished, they are always in progress. They are often the product of particular circumstances at a particular moment in time. This was the case with the work that led me to produce the Calha Norte map. Due to financial constraints, time restrictions, and a simple lack of experience, connections, and manpower it would have been impossible for me to produce the same map with input from all the communities it would touch. The effort to produce a participative project on such scale would be superhuman, and would require the participation of a vast and committed network actors. I feel certain that if that project could be undertaken under the right conditions, its effects could be incredibly powerful. But, what are the right conditions? They were certainly not conditions that I, alone, could create. As researchers we must be humble enough to accept our own limits, and often, we must do the best we can with the time and resources available to us. We must also accept that the most successful projects emerge organically out of personal connections. Participative projects cannot be imposed. They must grow out of the desires and needs of a group of people who come together to materialize an idea.

In 2017, Maynooth University, in Ireland, ran a Masterclass on Participatory Engagement in the Digital Humanities (a summary of the class is available online at pedh.hypotheses.org). The participants in the class identified a number of practical themes that DH project designers must take into consideration before launching

into a participatory engagement project. These considerations range from resource (human and financial) management, to ethical and legal questions, to audience engagement and questions surrounding scholarly credit (DARIAH-eu 2017). Reading through the practical considerations raised in this Masterclass made me reflect on the complexities involved in designing effective projects. Most importantly, it has made me realize how crucial it is that participative projects are planned with a particular goal and a realistic scope from the outset. Had I decided from the outset that the Calha Norte map was to include the input of individuals touched by the conservation areas it depicts, I quickly would have realized the massive scale of the project and resources needed to make it possible, and found myself confronted with other questions, including who's input should be included, how, and for what ends. These are the questions which must dictate the elaboration of engaged projects, especially DH projects with political leanings.

Certainly, going forward in my career I will strive to engage with these kinds of community-based projects. Designing my research program around such initiatives will allow me to work towards the ethical and political ideals of participatory engagement in digital mapping initiatives. In the meantime, however, I consider the Calha Norte map to embody one particular instance of "multi-mapping" (Tsing, Brosius and Zerner 2005). The map speaks to institutional audiences, to young researchers like myself, or Western audiences interested in learning more about the immense human diversity of the Amazon. It seeks to unseat taken-for-granted ideas about an untouched wilderness in need of external protection, and emphasize the immense potential community-based conservation frameworks. In this limited sense, I feel that the project is worthwhile and can serve a particular purpose, for a particular audience. Even though it does not live up to the ideals of the participative projects I feel that engaged researchers should strive for, it serves its purpose as one map among many, offering a unique gaze and a unique approach.

5. Conclusion

As we have seen, maps are not perfect tools. They have an imperialist history, they tend to reinforce fixed boundaries, even when this is not ideal or appropriate, and they have often cleaved power divides between forms of expert 'scientific' knowledge and

local/traditional knowledge and experience. Still, as practical forms of communication that are recognised and established, they may be re-appropriated for counter-hegemonic purposes. In relation to dominant discourses surround 'conservation' in the Amazon, I have argued that GIS counter-mapping can be a productive solution for translating between institutional conceptions of conservation, and local understandings. The Calha Norte Portal is a work in progress. But as a project which situates itself in relation to critical cartography theory and fosters a critical consciousness of its limitations, it may still have the potential to facilitate dialogue among institutional actors and researchers with an interest in locally-relevant conservation policy.

In its current version it can serve to educate foreign researchers, policymakers and legislators interested in the Calha Norte mosaic by demonstrating the human diversity in the region, and the complex political ecology which has produced contemporary challenges to conservation. In order for this project to live up to the theoretical ideals of participative engagement, it would have had to be designed as such an initiative from the outset by a diverse network of actors concerned with developing awareness of local conservation efforts. In this article I have reflected both on the potential value of the tool, and some of its more problematic aspects. This reflection has led me to argue that participative Digital Humanities projects must reflect and ethical and political engagement from the outset, and incorporate this approach into the very earliest stages of project design. Practical limitations may prevent DH projects from attaining the theoretical ideals which drive engaged research, but this is precisely why researchers must remain critical at all phases of their work, questioning and requestioning the shortcomings of their projects. Particularly in counter-mapping projects, we must remember that maps are tools with immense power – the power to show and the power to hide. Taking this into account, and working tirelessly to represent reality from a multitude of different perspectives is the only way to truly apply our theoretical ideals for an engaged research approach in practice.

Competing interest

The data for the Calha Norte Portal project was collected during a summer internship with the Amazonian Institute for Man and the Environment (Imazon), in Belém, Brasil, between May and August of 2016. Imazon helped create the shapefiles for the

map at calhanorteportal.com, and guided me in the collection of data from reliable sources. The internship was funded by a McBurney Latin America grant from the McGill Institute for Health and Social Policy.

Editorial contributions

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