The codification of local knowledges through digital cartographic artefacts: A Case study of the Humanitarian OpenStreetMap Team in Dar es Salaam, Tanzania.

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The codification of local knowledges through digital cartographic artefacts: A Case study of the Humanitarian OpenStreetMap Team in Dar es Salaam, Tanzania.

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Abstract

The Humanitarian OpenStreetMap Team, affectionately known as HOT, worked on mapping the city of Dar es Salaam between 2014 and 2020. The efforts of HOT were designed to not only build a map of the city that would 'put people on the map', but to also use these maps to aid in development and humanitarian interventions through one of Africa's fastest growing cities, all while using participatory mapping practices. This thesis examines the extent to which HOT has been able to achieve the creation of a new map of Dar es Salaam, the influence this map had on development projects, and the degree to which the map was built using participatory methods. The research undertook a deep analysis of map completion and accuracy and used interviews to explore the interplay between technology and micro/macro politics around the mapping of Dar es Salaam. Findings suggest that HOT is still underdeveloped as an organization and lacks the maturity to create true participatory models of working. That many of their practices were exclusionary to the local population and that weak management structures and procedures allowed colonial and 'outsider' saviour complexes to grow within the organisation. The work concludes by noting that HOT has begun to change many of its practices since 2020 where this research ends.

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Authors declaration

I declare that all the material contained in this thesis is my own work.

Signed

Doug Specht on 10/09/2022

Authors publications related to this thesis

Kent, A. J., and Specht, D. (eds.) (2023, forthcoming). The Routledge Handbook of Geospatial Technologies and Society. Routledge.

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A full list of the authors publications and conference papers can be found at https://doug.specht.co.uk

List of abbreviations

AGI – Association for Geographic Information
AWS – Amazon Web Services
DCC – Dar es Salaam City Council
DCLI – Data Collaboratives for Local Impact
DFID – Department for International Development (UK)
DGI – Defence Geographic Intelligence
EU – European Union
FOSS4G – Free Open-Source Software for Geospatial
GDP – Gross Domestic Product
GI – Geographic Information
GIS – Geographic Information Systems
GPS – Global Positioning System
GWPL – Green WastePro Limited
HDI – Human Development Index
HDX – Humanitarian Data Exchange
HOT – Humanitarian OpenStreetMap Team
HR – Human Resources
ICT – Information and Communication technology
ICT4D - Information and Communication technology for Development
IDS – Institute of Development Studies
IHO – International Hydrographic Organization
ILAS – Institute of Latin American Studies
IMF – International Monetary Fund
IPS – Instructions per second
IREX – The International Research & Exchanges Board
ISO – International Standards Organisation
IST/36 – British Standards Institute Committee for Geographic Information
ITU – International Telecommunications Union
LEDC – Lower Economically Developed Country
MAUP – Modifiable Area Unit Problem
MCC – Millennium Challenge Corporation
MEDC – More Economically Developed Country
NGO – Non-Governmental Organisation
NSDI – National Spatial Data Infrastructure
OCHA – The United Nations Office for the Coordination of Humanitarian Affairs
ODA – Overseas Development Administration (UK)
ODI – Overseas Development Institute (UK)
ODK – Open Data Kit
OGC – Open Geospatial Consortium
OMDTZ – OpenMap Development Tanzania
OMK – Open Map Kit
ONS – Office for National Statistics (UK)
OSM – OpenStreetMap
OSM-PH – OpenStreetMap Philippines chapter
OSS – Open-Source Software
PEPFAR – The United States President's Emergency Plan for AIDS Relief
PGIS – Participatory Geographic Information Systems
PMO – Prime Minsters Office (Tanzania)

POI – Point of Interest
PPGIS – Public Participatory Geographic Information Systems
PRA – Participatory Rural Appraisal
RALG – Regional Administration and Local Government (Tanzania)
REDD – Reducing emissions from deforestation and forest degradation
SDI – Spatial Data Infrastructure
SMS – Short Message Service
SSK – Sociologies of scientific knowledge
UN – United Nations
UN-GGIM – United Nations Initiative on Global Geospatial Information Management
UNDP – The United Nations Development Programme
UNEP – The United Nations Environment Programme
UNHCR – The United Nations High Commissioner for Refugees
UNICEF – United Nations Children's Fund
UNRISD – United Nations Research Institute for Social Development
USAID – The United States Agency for International Development
VGI – Volunteered Geographic Information
WASH – Water sanitation and hygiene
WEO – Ward Executive Officer (Tanzania)
WSIS – World Summits on the Information Society
WTO – World Trade Organisation

1. Introduction

It is, wrote Karl Popper, 'imperative that we give up the idea of ultimate sources of knowledge'; instead, he argued we must admit that all knowledge is essentially mixed up with errors, prejudices, dreams and hopes (*Cited in* Lehrer, 2011, p.197). This notion that there are no ultimate knowledges forms the basis of this thesis, which aims to explore the relationship and codification of different knowledges in relation to international development projects. Taking as its starting point the idea that these knowledges are essentially representations, and that 'representations are unstable, moving and open to re-negotiation' (Kidd, 2016, p.38), this thesis will examine, using communication and geographic theories, how representations, especially through digital and cartographic artifacts, do not merely present a mirror of reality, but actually consciously, or unconsciously, perpetuate dependency and colonial modes of development through the employment of mapping techniques. Taking the city of Dar es Salaam as a case study, this thesis will critically examine the way in which the Humanitarian OpenStreetMap Team (HOT) have used digital mapping tools to represent the development needs and desires of the population of Africa's fastest growing city. Drawing upon development, communication, and geographic theories this thesis will examine the way in which HOT may have become entrapped in unconscious colonial mapping practices that rather than empower the local population, as is their aim, create a sense of dependency in which the city will always require HOT's presence.

To bring together communication and geographic theories in order to understand spaces of representation is not in itself a new idea. While the disciplines are certainly not 'neighbours' in the sense of having a similar subject matter or shared

methodological foundations, there are a number of texts which aim to share ideas, most notably *Geographies of Communication* by Jansson and Falkheimer (2006) which explores communication theory's *Spatial turn*. There are also numerous texts that examine geography's cultural or *Communicational turn* (*See* Adams and Jansson, 2012). Geography of old has long been connected with theories of communication and social structures that are now more fully seen as communication theory, and this is just as true in reverse. While geography has often been concerned with the larger scales of state and capital, and communications more so with localized power and representation, many theorists have found their work crossing this divide between scales and disciplines; Michel Foucault, Michel de Certeau, and Pierre Bourdieu being prominent examples, and of course there is Henri Lefebvre.

There is much to be gained from the combining of communications theories and those from the geographic disciplines. Bringing the two together allows for alternate, nuanced, and spatially grounded ways of envisioning the way in which the digital age mediates social, economic, and political experiences and in particular in the increasingly technologically informed development sector. Since the digital revolution in the 1980s, there has been increasing talk about a *digital post-development era,* yet for all this focus, study and optimism, the route out of underdevelopment has remained a series of hoop jumping exercises prescribed by the West and performed by the rest (Escobar, 1992; Ferguson, 2012; Specht, 2017a).

This requirement for continued hoop jumping in the digital age was seen by Deleuze as a new cycle of oppression of the *Third World* in which Western capitalism is no longer involved in production. The development model undertook to create new modes as the North no longer buys raw materials and no longer sells the finished products; it buys the finished products or assembles parts. What it wants to sell is

services and what it wants to buy is stocks (Deleuze, 1992). Uneven development then is always defined as 'the relations between groups in which a group benefits by extracting something from another group that is thereby impoverished' (Jordan, 2015, p.5). In this thesis it will be argued that the mapping of Dar es Salaam has become an act of extraction, drawing data from the population towards HOT and their donors, and feeding back less than is taken.

It is suggested that this mismatch between the aims of HOT, and the results of their mapping projects is in part borne out of a conflation between growth and development. The general choice, suggests Lefebvre (2009), of all States and political apparatuses is for quantitative growth without the qualitative development of civil society. This very much reflects the modes of imminent development, that place the role of capital and measurable growth ahead of the immanent growth of society. This mode of working was perhaps most famously lamented by Easterly and Pfutze (2008) in their text, *Where does the money go*?, and even more so in Easterly's hugely influential solo work, *White Man's Burden* (Easterly, 2006)[1]. These ideas manifest in initially vague, but increasingly precise interventions, motivated by a political need for the growth of global surplus production, fiscal resources, and population. The modern State, and to an increasing extent the Development sector, goes so far as to seek complete responsibility for growth. Implementing plans and programs through centrally made decisions, information, and scheduling by struggling for full employment and against inflation, and more often than not at the expense of the poorest (Lefebvre, 2009).

[1] The title of this book is borrowed from the 1899 poem "The White Man's Burden: The United States and the Philippine Islands", by Rudyard Kipling. The poem is about the Philippine–American War, in which he invites the United States to assume colonial control of that country.

HOT is just one of the many organizations that have entered the field of development, a field that has increasing sought digital-technocratic solutions for everything from monitoring health (Mesmar *et al*., 2016), distributing aid (Crooks and Wise, 2013), providing water sanitation (Gopal *et al*., 2009) or protecting forests (Lee, 2003). The technological turn is perhaps best optimized by the establishment of UN Global Pulse in 2008, pushing a global agenda for digital Development. This push has been sped up by a number of high profile 'success' cases, such as after the Haiti earthquake where UNDP successfully used mobile money to send cash transfers to families for reconstructing their homes (Oxfam, 2007); when *Rapid SMS* was used to facilitate the monitoring of child malnutrition in Malawi (Blaschke *et al*., 2009); and in acute emergencies, systems such as RapidFTR have helped with family tracing (Mattila 2011). There are ongoing discussions about ways in which ICTs can be used to help improve education for children with disabilities (Grönlund *et al*., 2010). And there are also projects that look at using ICTs in promoting indigenous languages through bespoke educational software for children (Azi, 2006). While these projects have demonstrated that the internet, digital tools, and data can indeed be harnessed to challenge entrenched economic, cultural, and political interests, it remains that it is not a utopian space that allows us to automatically transcend most of the real and place-based constraints that we face (Graham, 2013).

It is also clear that this is a trend that will continue, and that development assistance work will be increasingly supported by technological innovation (Kleine *et al*., 2014). Despite this, there are few media and communications scholars who would argue that uneven development would disappear as a result of new technologies (Adams and Jansson, 2012), just as new technology alone has not evened out access to other knowledges (van Dijk and Hacker, 2003). Indeed, the diffusion of ICTs within the

development sector has itself been highly uneven, just as development itself, and there are real dangers that digital divides will not only trace, but also 'further deepen existing social divides, between income-rich and income-poor, between urban and rural dwellers, between women and men, and girls' and boys' (Kleine *et al*., 2014: 4; *See also* Warschauer, 2003). This exclusion means we are often not truly able to measure the value of development.

The digital development work undertaken in Dar es Salaam by HOT manifests in drawing together data and knowledge through mapping the city in ever more detail using the OpenStreetMap platform, with the aim to ensure that everyone on the planet is mapped (Radford, interview, 2019). HOT purportedly wants to provide everyone in Dar es Salaam, and the wider world, with representation through appearing on a map. This idea is borne from the notion that mapping is a process by which you can 'take the measure of a world' and to communicate that measure (Cosgrove, 1999: 1). It is producing a rational and scientific space that can administered by the State for its development.

Yet, maps are subjective. Mapping is an act of power that actually creates space (Sen, 2008). Maps are an interpretation of space that bears the imprint of the world in which it is made. In the words of historian Brain Harley, cartography 'belongs to the terrain of the social world in which it is produced'. In short, 'cartographers manufacture power' (*Cited in* Potts, 2015, p.19). Furthermore, a map represents territory according to the knowledge and worldview of its culture and its period. This means that a map may be a mathematical rendering of space – but it can't help also being a viewpoint of the world (*ibid*.).

While sociocultural map scholars have worked hard to expose the inadequate and distorted conception of maps (Edney, 2019), their role in international

development persists, and has even grown with the number of privately-owned sensors, not only harnessing Global Positioning Systems (GPS), but also sound-level, light, and accelerometer sensors. Aggregating data from these diverse and plentiful sensors enables new forms of monitoring societal and development phenomena at an unprecedented scale and is seen by many as key to unlocking the development puzzle (Shum *et al*., 2012). The kind of data collected in this way may seem universal, but in the real world, it is always integrated with supplementary assumptions that render it culture-bound and parochial. This growth in geographic information, while lauded by many as being the answer to development issues and projects such as the Sustainable Development Goals, also works to force many peoples into an imperial logic under the no-win situation often referred to as *Map or Be Mapped* (Paglen, 2008). Data and mapping are becoming increasingly relied upon and valued (Kennedy *et al*., 2016), but cartography is not only poor at describing the qualities of the relationships of everyday life, it also forms power and has traditionally been used as an instrument of both colonialism as well as the contemporary geopolitical ordering of the world (Specht and Feigenbaum, 2018; Paglen, 2008).

In order to explore these issues more fully this thesis is laid out as follows. Firstly, an introduction to the geospatial landscape of Tanzania and Dar es Salaam is provided, followed by an introduction to HOT and the projects that were studied for this research. Following this an extensive review of the literature on development, mapping and technology is undertaken. A methodology for examining the work of HOT is given in chapter 4. The analysis follows the approach to data collection and map making undertaken by The Humanitarian OpenStreetMap Team in Dar es Salaam. A discussion of these findings following the format of the research questions is provided,

before a final conclusion on the role of HOT in recreating or deconstructing the colonial power of maps in Dar es Salaam.

2. Background

2.1 Tanzania

The United Republic of Tanzania was formed in 1964 through the unification of Tanganyika, which forms the mainland of the country, and Zanzibar Island. The country is situated in East Africa covering a total area of 945,000 sq. km, divided into 26 regions, and 130 districts. The country has a population of about 56 million, of which approximately 34% live in urban areas. The rest of the population is distributed across some 12,500 villages.

Tanzania is representative of many of the fast-growing countries in the world, especially those in Sub-Saharan Africa. There has been rapid population increase, and rapid urbanization is taking place with uncontrolled expansion of cities (Lubida *et al*., 2015). This presents many issues in relation to adequate housing, urban facilities, and basic infrastructures. Despite a 45.3 percent rise in the Human Development Index (HDI)[2] since 1990, Tanzania still sits at 154 out of 189 countries and territories. The country also remains vulnerable to climate variability, and severe weather events. Infrastructure remains poorly implemented and maintained, and public services are for a large part non-existent.

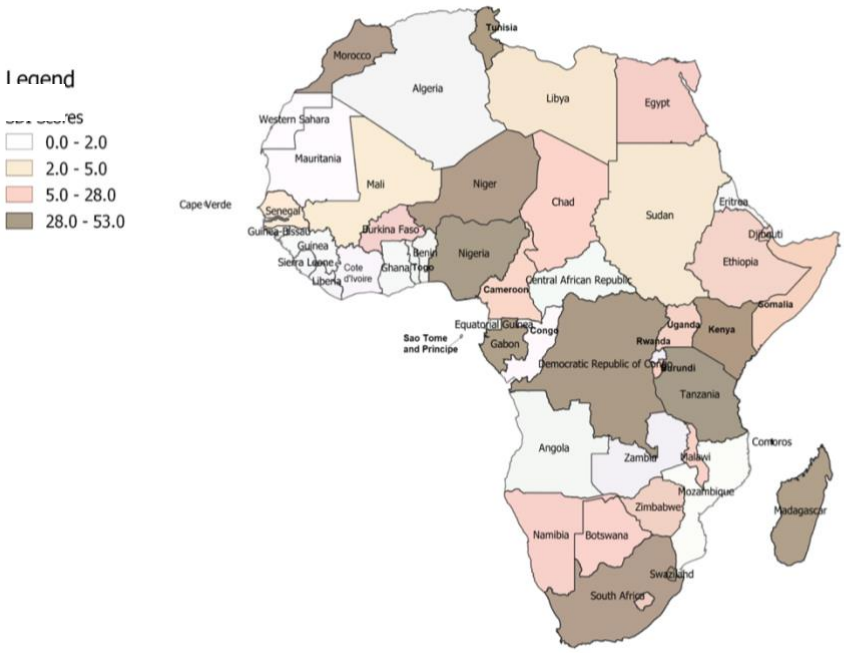
Poor planning and implementation of civic projects in Tanzania can be traced to a number of factors, including a lack of political will. However, a lack of data is also cited as a major factor in poor planning. One particular type of data that is missing is geospatial data. UNGGIM (2015) have noted that the use of geospatial information is rising rapidly globally, and that while there is a great recognition by governments and the private sector that this could have transformative effects, those who lack such

[2] The HDI is a multivariate index amalgamating life expectancy, education levels, gross national income, and other factors.

data are being left behind. In Tanzania there has long been an acute lack of spatial data (Kebede and Nicholls, 2012), and, where data does exist, the skills to use it effectively have been lacking. While a number of GIS units were set up in Tanzania through the 2000s, these often-lacked coordination and did not feed into a national framework. With studies showing that 80% of all local government decisions are of a spatial nature (Lubida *et al*., 2013), there is an urgent need to increase the geospatial information capacities of Tanzania in order to promote development and civic infrastructures.

Tanzania though is involved in the development of a National Spatial Data Infrastructure (NSDI). Spatial Data Infrastructures (SDIs) are now a key component of a nation's development (Smit and Makanga, 2010), and, while their creation and implementation is a difficult and challenging task, they are being increasingly used to help set an international standard for geospatial data, encapsulating development, production, management, discovery, access, sharing, visualization, and analysis of Geographic Information (Arshad and Hanifah, 2010; UNGGIM, 2015). NSDIs are being implemented across Africa, and while this process is still somewhat fragmented, with many countries working independently, there are indications that the value of geographic data is being recognised as a key component in the next stages of development (Smit and Makanga, 2010; Scott and Rajabifard, 2015). SDIs are more than just geospatial technology, they also encompass institutions, legislative and regulatory frameworks, and the building of new skill bases (Arshad and Hanifah, 2010). Analysis by Smit and Makanga (2010) at the beginning of this century suggested that Tanzania was scoring highly in terms of the SDI infrastructure compared with other parts of the African continent (see Figure 1).

Figure 1: SDI Scores of countries. Created by author in QGIS, using data from Smit and Makanga (2010a).



While the sharing of geospatial data, along with other information is enshrined in the Constitution of the United Republic of Tanzania, their NSDI remains in its early stages (Lubida *et al*., 2015). The project has been beset with funding issues, and despite an initial push in 2002, by 2006 the programme had become fragmented as finances dried up (Kalande and Ondulo, 2006; Larsen, 2014). At that time The Tanzania National Mapping Agency only possessed 1:50,000 and 1:250,000 topographic sheets at a national level and road network maps at 1:250,000. Most of them were produced before 1980 and are thus outdated, with the exception of the 1:2,500 topographical maps covering Arusha, Manyara and Kilimanjaro, which were updated using aerial photography in 2002 (Kalande and Ondulo, 2006). NSDI policy proposals though have been in place since 2007, and the National Bureau of Statistics set out to complete the NDSI infrastructure as part of the Tanzania Statistical Master Plans between 2009 and 2014 (Lubida *et al*., 2015). Yet this remains incomplete.

The need for NSDIs is becoming ever more important, but they must also be more than just a mechanism for mapping and delivering content, they must also include data integration, modelling, aggregation, fusion, communication and delivery, a very tall order for some parts of the world, including Tanzania (Arshad and Hanifah, 2010; Scott and Rajabifard, 2015).

Lubida *et al*. (2015) have demonstrated that there is a high potential for geospatial data sharing in Tanzania, and that there remains an urgent need for continued NSDI development. Their research suggested that there were positive attitudes in Tanzania around geospatial data sharing, however, a number of inhibiting factors were unearthed. These included lack of training, lack of equipment, lack of awareness, lack of policy, and lack of an institutional framework responsible for implementing sharing of spatial data countrywide. These factors are leaving Tanzania increasingly 'behind' in terms of geospatial development. This is becoming an ever more urgent issue, especially in the country's cities, such as Dar es Salaam, which face numerous specific risk factors.

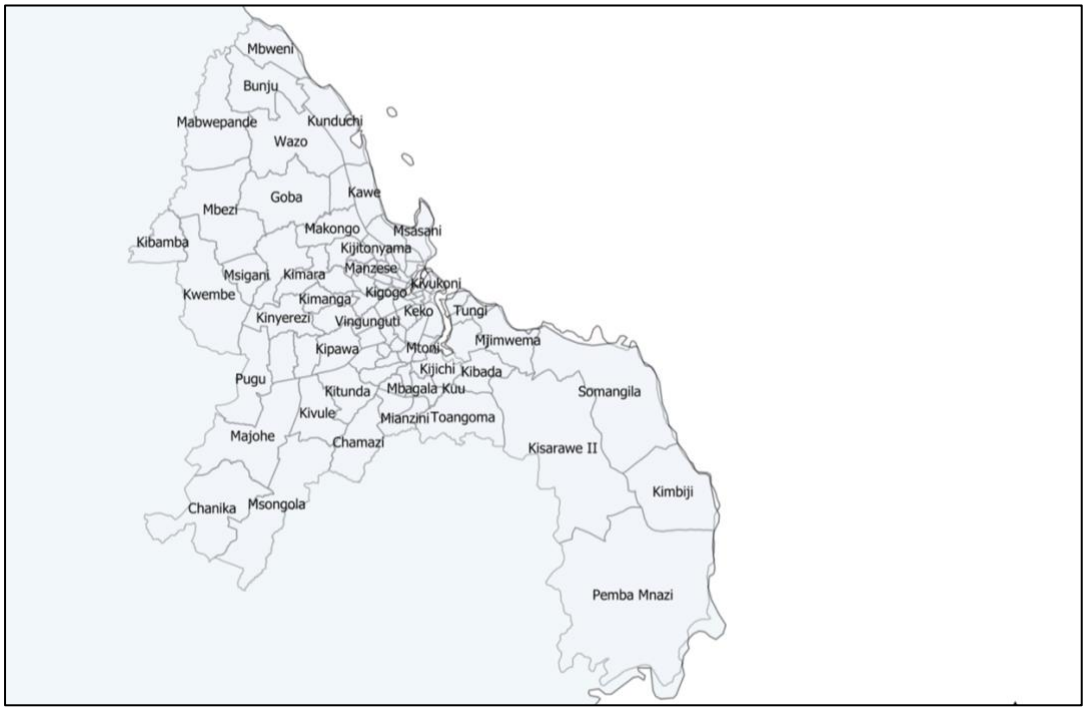
2.2 Dar es Salaam

Dar es Salaam, the focus for this research, is one of the fastest growing cities in Africa, with an annual population growth of 5.7%. In 2002, there were approximately 2.5 million inhabitants, increasing to over 5.5 million in 2017. The population is expected to exceed 10 million by 2030, making Dar es Salaam a megacity. Urbanization is largely unplanned, and 70% of city residents live in informal settlements. The pace of this growth has already stretched the limited capacities of the city to accommodate the needs of its population, or to keep statistics and data that would allow for better development thinking.

The information that is available is scattered across many agencies, some of whom are reluctant to share data. Geospatial data for the city is presently managed by a) PMO-RALG, the Prime Minsters Office – Regional Administration and Local Government, b) Ministry of Lands – Mapping and Survey Division, c) National Bureau of Statistics, and d). other government departments, such as the PMO – Disaster Management, which manages flooding data. This though is only part of the picture, as administratively, the Dar es Salaam City Council (DCC) is the city authority that covers the metropolitan area of Dar es Salaam, which is itself composed of three municipalities: Kinondoni, Ilala and Temeke. These three municipalities are then subdivided into 89 wards or *Kata* (See Figure 2); these wards are then further subdivided into sub-wards or *Mtaa*, and later the results show an additional layer of division into *Shina*. Each sub-ward has a representative who deals with local community issues, reporting to a Ward Executive Officer (WEO) who then reports to the respective municipality. This complicates data sharing significantly. On top of this private companies such as *Taxify* and *Uber*, as well as food delivery companies are

growing rapidly in Dar es Salaam, something that has brought the needs for improved maps to the attention of the urban elite (Pilling, 2018).[3]

Figure 2: Wards of Dar es Salaam. Map by author, made in QGIS with data from the Humanitarian Data Exchange (HDX) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA).



Into this complex mix come NGOs and private companies looking to improve mapping infrastructure, either for development purposes, or for the benefit of companies such as Uber. One of the most significant of these at present is the Humanitarian OpenStreetMap Team (HOT). With a permanent office in Dar es Salaam, they have carried out a number of projects mapping the city. Two of these projects will be studied in detail through this thesis. What follows is an introduction to the Humanitarian OpenStreetMap Team, and the two projects, Rumani Huria and Data Zetu.

[3] And this researcher, who took two hours to find his hotel in a Taxify cab.

2.3 Humanitarian OpenStreetMap Team (HOT)

The Humanitarian OpenStreetMap Team, affectionately known as HOT, was formed around the time of the 2010 earthquake in Haiti and was one of the organizations that emerged during the rise of digital humanitarianism which followed that disaster. The earthquake saw an unprecedented number of social and digital technologies employed in relief efforts, including Ushahidi, CrisisCamp Haiti, GeoCommonswere (Zook *et al*., 2010). OpenStreetMap (OSM) also played a pivotal role, but the crisis made it clear that there was room for a more dedicated branch of the OpenStreetMap platform which could respond to such events (Meier, 2015).

The HOT project is built upon the work of OSM, an open-source mapping platform that was started by Steve Coast in 2004 in response to his frustrations with the closed nature of Ordnance Survey data. The map has been gradually built by volunteers, growing rapidly to 140,000 contributors in its first five years, and now encompassing much of the globe (Chilton, 2009). The OSM project seeks to map the whole world in unprecedented detail, building a sort of geographical wiki atlas that can be easily updated and edited. Following the Haiti earthquake an additional 170,000 people signed up to contribute to the work of mapping infrastructure and roads in Port-au-Prince in order to aid the relief efforts (Radford, 2019). Using nothing more than their own browser, users were able to map and direct aid efforts from their own home.

HOT seized upon these opportunities and began to develop a platform that allowed for the quick mobilization of volunteers to map areas of the world that were facing crisis. They saw deployment in numerous natural disasters, including following Typhoon Haiyan in 2013 and the Nepal earthquake in 2015. The organization continued to grow, and so too did its mission. No longer was HOT just interested in

moments of crisis but began to move towards more long-term development and crisis prevention tasks – work that they see as being fulfilled though ensuring places and people are well mapped. As Executive Director Tyler Radford (2019, n.p.) puts it, "there are hundreds of thousands of people living in locations that literally appear as a dot on the map. We feel it's an injustice". With now a predicted 168 million people worldwide in need of humanitarian assistance on a wide range of scales (OCHA, 2020), the continued growth of HOT seems salient. The organization now has country offices in Uganda, Tanzania, and Indonesia, as well as its headquarters in the US and is engaged in 1,033 mapping projects around the world, and tens of thousands of remote mappers (Radford, 2019; HOT, 2018b).

HOT then has moved very firmly into the community mapping sphere. While the majority of mapping still happens remotely, they have begun employing and using on the ground staff and volunteers for more specific community projects. This is following a model that is designed to reduce the persistent and emergent access barriers to GIS, with a view to opening up cartography to the amateurs, allowing them to share their personal experiences, leading towards the often elusive ideal of empowerment of communities (Robinson *et al*., 2017; Parker, 2006; Corbett *et al*., 2016).

In Africa, and specifically Tanzania, the role of open-source software (OSS) and open data, such as facilitated by OSM, is becoming increasingly important in the development of Spatial Data Infrastructures (Smit and Makanga, 2010). However, The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) noted in 2014 that uptake in the use of geospatial information was still slow, and more was needed at government and policy level in order to guide development (See Scott and Rajabifard, 2015). Data too is now

increasingly relied upon for decision making around the world, and so lagging behind has potentially huge negative effects (Kennedy *et al*., 2016). In this respect, the way in which HOT has moved into the arena, contributing vast amounts of open – freely usable – data, to both the Tanzanian government and the wider Humanitarian Data Exchange (HDX)[4] means they are already fulfilling the role of bringing justice and self-determination to the population of Tanzania as well as the wider world (OCHA, 2020; Digital Globe, 2019; Sletto, 2009a). Indeed, HOT plans further alignment with HDX, designing their data collection to be even more widely used.

There are of course some contentions here. While the geospatial community has a unique opportunity to contribute to development and humanitarian issues (Rekha, 2016) there are also concerns about the limits of such projects. While community mapping and the work of HOT implies a collective endeavour that is representative, there are questions around the social and cultural implications of technology transfers, for example potential uneven gender relations, or unequal power structures (Parker, 2006; Sletto, 2009a). These new modes of data production and digital labour also play a role in the increasing capitalistisation of the humanitarian sector, with questions around profits, exploitation and philanthropy all coming to the fore (Burns, 2019). The quality of data produced by masses of volunteers might also be challenged, and although work by Haklay and Weber (2008) has noted that OSM is very accurate, there are still questions as to whose knowledge is being mapped. There are also concerns that literature on participatory mapping redraws the binaries that define the *raison d'être* of development – local and global, developed, and underdeveloped (Sletto, 2009a). HOT, like many other digital humanitarian

[4] Humanitarian Data Exchange is an open humanitarian data sharing platform managed by the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA).

organizations claim to be revolutionizing humanitarianism and emergency management (Burns, 2015), and while this should be applauded, continuous questions must be asked about how the maps they draw, or the maps that are drawn for them, might obscure the practices, relations, performances, and biases invested in the map itself (Janz, 2002).

To this end two HOT projects will be examined as part of this thesis, they are Ramani Huria and Data Zetu, each of which will be introduced more fully below.

2.3.1 Ramani Huria

Ramani Huria is a community-based mapping project in Dar Es Salaam, Tanzania, training university students and local community members to create maps of numerous issues around the city, specifically the most flood-prone areas of the city using OpenStreetMap. The project is supported by the U.K. Department for International Development (DfID) and World Bank as part of their programme of ensuring countries are resilient to climate change. While the project is still principally concerned with flooding prevention, one of the leading causes of flood risk was blocked drains, and thus the project has also expanded to include more general waste management across the city.

The project began by creating a new map of Dar es Salaam on the OSM platform, rebuilding the inaccurate and partial maps of the city (the quality of this approach is assessed later in this thesis). Frustrated that the majority of maps of Dar es Salaam were being developed remotely by cartographers, who may well be very experienced in their field, but no physical experience within the field that they are mapping. The project noted that there was inaccurate and insufficient data for designing flood prevention resilience and risk strategies. Ramani Huria set out to ‘do it

differently'. Training local university students and community members how to effectively create sophisticated maps of the city within which they live – maps with more than enough detail to serve as guides for all realms of development, but with a particular focus on improving flood resilience.

The project has developed in three phases, firstly aiming to equip community members with the skills required to conduct mapping. This involved educating project participants about open-source data collection tools such as OpenMapKit and OpenDataKit. These tools are intuitive phone applications that are equipped with imagery and forms for direct data collection while in the field. This means that community members with a smartphone app and an internet connection are able to collect data at a hyperlocal level using digital surveys. This is work that is supported by the Ramani Huria team and *Wajumbe* (community leaders). The data they have collected, and the tagging of infrastructural features has reportedly created the most detailed map of Dar es Salaam ever.

Secondly, the project has gone beyond just mapping and is also working to improve aerial imagery of the city. Much of this aerial imagery is used as part of the mapping process where mappers trace the shapes of buildings (often from another country) to help build up the map of the rapidly expanding city. Prior to the project, the aerial photography being used for mapping in Dar es Salaam was dependant on minimal to no cloud cover, or alternatively was of low satellite quality. To combat this, Ramani Huria now employs drones in collaboration with Drone Adventures and the Commission for Science and Technology (COSTECH). This allows for much higher resolution photography to be used in tracing maps, and in theory these maps can now be updated more often.

Finally, the project which initially aimed to map roads and buildings in order to help plan for flooding events, has now moved to prevention by carrying out drainage mapping. The drainage system in Dar es Salaam is enormous and complex, with hundreds of thousands of drains, often alongside roads, ranging from enormous 3-metre-deep concrete channels along highways to 5-cm-deep hand-dug ditches draining individual homes. To help reduce flooding, drainage measurements and observations are taken to help identify problem spots where drains need repair, redesign, or cleaning. As of January 2018, the project had completed the field mapping, quality checks, and data cleaning for the drainage systems in twelve wards of Dar es Salaam.

In this work HOT and the Ramani Huria team draw upon ideas of inclusivity, diversity, and participation. The literature and rhetoric around this project follows much of the literature on the advantages of participatory development models (Martin, 2014). This thesis, through the research questions presented in the methodology will try to unpick to what extent HOT has been able to achieve these aims, which are by all accounts easy to discuss, but hard to implement (Cooke and Kothari, 2001).

2.3.2 Data Zetu

The second of the projects that will be examined in this research is Data Zetu. Data Zetu, which translates to “Our Data” in Swahili, was a country wide project that run from 2017-2018. While not a HOT project in and of itself, it is closely aligned with the work of HOT who have helped to provide much of the data building and mapping infrastructure that supports the project. Data Zetu is funded by IREX, the International Research & Exchanges Board. Based in Washington DC, IREX is an international, non-

profit organization that specializes in global education and development. IREX works with partners in more than 100 countries. The project is also supported by the Tanzanian Data Lab (dLab), The Data for Local Impact Innovation Challenge (DLI) and the Global Partnership for Sustainable Development.

Data Zetu in its own words 'aims to empower communities to make better, more evidence-based decisions to improve their lives'. The program works with communities across Tanzania with the aim of discovering issues that matter most to them, what the project terms "pain points". There is also a particular focus on those issues that pertain to public health – an area that has long been highlighted as one that can be aided through the use of geospatial technology and better infrastructure data (Johnson and Johnson, 2001; Pilling, 2018). The project began with a series of community meetups across 14 wards from the Temeke, Mbeya and Kyela districts, also known as the DREAMS districts – priority areas that have the highest rates of HIV in the country. Working with stakeholders, Data Zetu aims to arm the population with the skills and tools needed to make sense of data related to those challenges. The project hoped to use open data that is relevant, hyperlocal, and actionable; in order to increase the way in which subnational data was being used in decision making.

Data Zetu was not principally a mapping project, rather it aimed at improving data literacy, including map reading and interpretation. This work was undertaken via a number of activities including listening campaigns as noted above, as well as workshops and trainings in which community organizations and local government leaders were taught to find, clean, and share datasets that address pieces of the challenges identified by communities.

Many of the outputs from the project were used to build maps or to add to the OSM maps of Dar es Salaam, and these will be examined more closely in the map

analysis section of this thesis. It is also worth noting the other outputs from the project, which include (by their own metrics) 81% of over 100 organization representatives reporting that they have become more confident in engaging with data, with a prediction that the average training participant in turn trains more than four colleagues on these data skills. More than 600 Tanzanians have produced thousands of community-identified challenges, which have been published online as open data. Half of all visitors who access this information are Tanzanian. The projects Media Fellows have been trained in data sharing and journalism and have worked with Tanzanian national media outlets to publish more than 60 data-driven stories, which reached 40,000 online readers (IREX, 2020).

Data Zetu appears to have been a very successful project with a far-reaching gain. Its role in upskilling the residents of Dar es Salaam is an important part of the process of allowing people access to their own data and narratives. Assessing how much this helped HOT to be inclusive and participatory is a key part of this research and will be explored through interviews and document analysis – as well as exploration of the maps and data produced.

2.4 Summary

Dar es Salaam is growing at an enormous rate. The local, and national government are presently falling behind in terms of keeping up with data and information related to this growth, and despite being early adopters of the National Spatial Data Infrastructure (NSDI), which organizations such as the United Nations Committee of Experts on Global Geospatial Information management (UN-GGIM) point to as being key for development, have not been able to fully implement spatial data in their planning. This is coupled with increasing risks from climate change and extreme weather events which threaten Dar es Salaam with extensive and extreme flooding. And with increased health risks from unplanned urban sprawl and the spread of HIV, which is exacerbated by a lack of hospitals or building addressing system for use by ambulances and emergency services. Into this mix come outsiders, NGOs, and organizations such as HOT, bringing expertise, money and promises of participatory actions that will better the lives of the residents of Dar es Salaam. These actions would seem to have had a positive impact judging from the introductions to the projects above. They do not however exist in a vacuum. These projects are tied to the Development agenda, the social implications of technology, including issues of privacy and the digital divide. The very notion of participation too is contested, and the role of the outsider in African development is still entangled in colonial discourses.

The following literature review will take a theoretical examination of the many issues facing HOT and the Ramani Huria and Data Zetu projects placing them in the wider context of international development, interventionism, and participation. This will be followed by an in-depth empirical exploration of the projects as they stood at the time of the research.

3. Literature Review

3.1 Background: The history and role of the development sector

January 20th, 1949. That is the moment that is most often taken as heralding the start of the development age. Before this, before President Harry S Truman stood up and announced a plan to share the benefits of the West with *underdeveloped* areas, there was no imminent *development* (Fair and Shah, 1997). Or so the mantra goes. The idea that Truman singlehandedly placed half the world in poverty, and in need of development has a simplicity to it, and it certainly was the moment when the development apparatus began to churn into action. Yet, this oversimplification does little to help us to explore the notion of what development actually is. Moreover, Truman's words didn't really hold all that much meaning until the 1961 *Utilization of Democratic Institutions in Development Act*, which later became the *US Foreign Assistance Act* in 1966 (Cornwall, 2006).

Development is more than one President's speech, more than one US foreign policy, it is a 'complex process involving the working and reworking of knowledge in a changing and contested discourse' (Phillips and Edwards, 2000, p.49). That is to say, a discourse of modernity; to bring about modernization, to instil the values, institutions and economic and social systems born of the seventeenth century upon the world (Escobar, 2004; Fair and Shah, 1997).

Social science has constructed elaborate theories of development, just as politicians have constructed elaborate development projects, all of which form part of a long chain of imperialism and political relations between countries (Luke, 1990). This idea that the development project should be traced back further than the end of WWII echoes the complaints of Cowen and Shenton (1995; 1996) about *The Development*

Dictionary (Sachs, 1997). The dictionary, which is a mainstay of the development studies field, does, they say, ignores this longer interventionist trajectory, along with occluding the historical meaning of development in its intentional, imminent, sense.

There are two discrete meanings of development, immanent development, an unintentional process, and imminent, a *willed* process of development policy. Imminent development is the stuff of aid packages, NGOs, and projects. Immanent is then the process of structural change that comes about through the expansion of capitalism and globalization, affecting politics and economics (Hickey and Mohan, 2005; Bebbington, 2004). The matter becomes further complicated in a number of ways, first by a recognition that globalization is a contested notion (Yeates, 2002); then that development, while often seen as the West against the rest, also seems to provide a model for progress that is applied to this same 'rest' (Walsh, 2010). The reality is that development is not a one-way imposition of knowledge (Phillips and Edwards, 2000). There is also a complex relationship between development and democracy (Stiglitz, 2002). Even the language of development, and the discourses through which it is examined are compromised: words such as *Global South*, *Third World*, and *Periphery* are laden with colonial undertones, and imperialist world-making, and even with a consensus on terminology, meaning still differs greatly (McFarlane, 2006a; White, 1996) Furthermore, western concepts of development, and development studies, failed wholly to embrace concepts such as *buen vivir*, a notion born from Latin America and which bases knowledge development within a framework of a spatial-temporal-harmonious totality of existence (Walsh, 2010).

This leaves somewhat of an issue, the roots of development are contested, the language is contested, the nature of immanent and imminent development is contested, and the whole discourse is deeply imperialist, even in de-colonial writings

(Slater, 2010). Where is the way out? How might the discussion move forwards? There is certainly no easy answer to this, and the one chosen here is also contested. The work of Arturo Escobar, which has spanned many decades and which has pervaded development and post-development studies since the 1990s, offers some level of retreat. The post-development ideals put forward by Escobar holds that the whole concept and practice of development is a reflection of Western- Northern hegemony over the rest of the world, and that this needs to be deconstructed to remove the colonial under (and over) tones of development practice. A lofty aim, but his work is not without its critics. Some have suggested that his portrayal of development as a monolithic enterprise, controlled from the top, is over simplified and implies a passive Global South dominated by an all-powerful West – a critique also aimed at much post-development writing (Grillo, 1997; Kiely, 1999).

Yet, there is one important notion that Escobar puts forwards in his evocatively titled 2004 paper, *Development, violence, and the new imperial order*; the idea that modernity, and by implication, development, is about displacement. That it is about restructuring spaces, conquering territories, and up-rooting peoples from place (*ibid*., p.16). Here then the geographical is placed at the centre of concerns over what development is, and how it might be discussed. The regulation of space creates uneven development, through spatial planning initiatives, the spread of industry, nationalization of territories and the entrenched world-scale pattern of uneven development (Brenner and Theodore, 2002). The space is regulated by capital; Capitalism could not survive without geographic expansion, it is constantly seeking the spatial fix (Harvey, 2001a), returning us once more to the work of Lefebvre (2009), who stated that the long-term survival of capitalism is premised upon the *Production of Space*. With the relaxation of state regulation, the neoliberal phase of development

has taken on a life of its own, necessitating ever more space (Harvey, 2001a). Development then unfolds through the production of specific patterns of socio-spatial organization, in which territories and places are mobilized as productive forces (Brenner and Theodore, 2002). Uneven development is endemic to capitalism as an historical-geographical system. As Gill (1995) explains, 'the neoliberal shift in government policies has tended to subject the majority of the population to the power of market forces whilst preserving social protection for the strong' (p.407). So, while the definition of a *developing country* might be hard to pin down (McFarlane, 2006a), what is clear is that development, be it immanent or imminent, is a spatial issue.

Development is often discussed as a spatial issue in relation to the development apparatus (Nustad, 2001). Framed by the image of the International Monetary Fund (IMF) and the World Trade Organization (WTO) operating as neoliberal police, forcing through reterritorialization of the world through free trade, free markets and complex legal frameworks that support the rich. (Peck and Tickell, 2002). This view is not without its merits, it is after all the World Bank who defines poverty – the Bank quantifies those that earn less than a dollar a day as poor with little additional context (Unwin, 2007). The aid business now also spends $100 billion a year seeking to address the world's problems (Easterly and Pfutze, 2008). It is certain that it is these organizations that take responsibility for measuring development, and it is the United Nations or World Bank that we turn to for data around development (Ranganathan *et al*., 2015). It is also these organizations at which we thrust our anger about the continuation of poverty and perpetual neoliberalism. Mass demonstrations follow the WTO, IMF, World Bank, and World Economic Forum wherever they go, especially since the 1990s (Brenner and Theodore, 2002). This notion is further

solidified by the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs); goals to save the world, imposed from the top (Holder and Hodal, 2016).

However, to place all eggs in this basket is dangerous and short-sighted universalism, and offers little way out (Jenson, 1995). The tendency of seeking to apply theories wholesale is unhelpful. Rather theory should not be reduced to binary constructions. Instead, it must be acknowledged that in global governance and global politics, and thus by extension development, there are multiple actors operating on many levels (Yeates, 2002). Thus, it is important to see the spatial dimensions of development as not only capitalist spaces of reterritorialization, but also as spaces of knowledge and participation – else we fall into the trap of thinking of the South as passive (Grillo, 1997; Kiely, 1999). Too often development is interpreted as being economic development (Stiglitz, 2002). Instead, it is of the upmost importance to embrace the geographical view than has illuminated the forms of social movements, NGOs, and community development in particular locations (Bebbington, 2004), especially given than only 12 countries are on track to meet Sustainable Development Goal number 4 (SDG 4),[5] none of which is a low-income country (Holder and Hodal, 2016). So here we see the need for alternative thinking, beyond post-development.

As will be explored further in this chapter, the modern conceptualization of post-post-development places at its heart the notion of participation, the idea that people should be taking part in the formulation of their lives at every opportunity and directly challenging the monolithic status quo. This is a lofty aim, and one that will be deconstructed further in Chapter 4, but it is important to also state that if participation here means giving a voice to the voiceless, as it so often does, then this will not be

[5] SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

without conflict (White, 1996). Furthermore, participation is not a silver bullet, people often participate for negative reasons, and can grow tired of being an active citizen (*ibid*.).

It is though possible to see beyond this idea of participation, and to look again to a geographical understanding of participation, one which does not require perpetually active citizens, but one which creates space for the focus on the local as the site of empowerment and knowledge consciousness and action. Participation is a conduit for transference of our politico-cultural ideals and frustrations, and thus the *Third World* becomes a disposal site, in the way that it already acts as a dumping ground for toxic waste or hazardous multinational corporate products. The *Third World* is made into both resource and laboratory (Kapoor, 2005). Yet, despite all of this, participation has gained a status of development orthodoxy, something to which nobody can be opposed (Cornwall, 2006).

This leaves a sense that development is too complex to unpick, and that there is no real way out, that at every turn we are thwarted in our attempts to move things forwards. As the following pages will show, development narratives are complex, but also that they can be held together by the notion that Development represents a transformation of society, away from tradition and towards modernity (Stiglitz, 2002), a process that many see as capital driven, and spatially orientated (Soja, 1989). The way in which participation and the grassroots have been taken as being able to challenge this status quo by bringing more *relevant* information and data to the table (Stiglitz, 2002), will also be explored within the context of postmodern/post-development discourses (Shah, 2007). In reading these following passages, it must be remembered that the general problem is that academic formulations of development and alternative development are often as universalizing as are the formulations of

modernizing development that they critique so profoundly (Bebbington, and Bebbington, 2001). This universalization is dangerous, it is a tool of normalization and normalization removes the ability to push for constant questioning and improving of situations (Margonis, 1998; Lefebvre 2009). This chapter attempts to move beyond the notion that development is solely conceived within the context of the state (Walsh, 2010) and strives to escape the multidimensional phenomenon of the development trap (Ranganathan *et al*., 2015), allowing space for the emergence of new discourses of nationalism and bringing new claims to citizenship and with this, new practices of naming, mapping, and remembering (Jenson, 1995).

3.1.1 Pre-Post-Development

Many have suggested that mass prosperity has failed, that regional inequalities persist too deeply, and have even widened. Indeed, taking some figures around wealth this would appear to be true. In the 1960s, the top 20 percent of the world were 30 times wealthier than the bottom 20 percent, by 1989 the top 20 percent had 60 times more. Yet the development paradigm, as stated previously, persists (Fair and Shah, 1997). It becomes salient at this stage to consider the historical narrative of the development industry and how it has led to its most recent incarnation, the Sustainable Development Goals (SDGs).

The introduction to this chapter suggested that the development agenda needed to be understood from earlier than Truman's 1949 speech and argued for looking back to the seventeenth century. It is though, in terms of understanding the geographical dimensions of development, crucial to look back to 1490. Two years before Native Americans discovered Columbus lost at sea, the first globe was produced by Martin Behaim (1459-1507). It was also around this time that the first

Mercator projections were being produced, transferring the world from a spherical object to a flattened plane, with all the inherent issues this involves (Jameson, 1991). The maps and globes produced at that time were perhaps the beginning of the mediation of the world. They began the process of seeing the world through a dominant discourse and a lens of Western dominance. The maps demarked territory, named places, named people, imposed stories, and created nations where nations never were (Jenson, 1995). These names, nations and the notion of empty land were alien to indigenous peoples, who rightly point out that the land did not need discovering, they knew it well (*ibid*.) The world building of the European *explorers* has shaped the economic, political, and social relations across the globe for the last 500 years; a direct consequence of Columbus' assertion that the world was a globe (*ibid*.).

While many development scholars skip from this moment right through to Truman's speech – a process which continues to disenfranchise the global south – there are other important moments to note in the creation of the western development discourse, namely the industrial revolution. It was during this age that the distinctions between *Immanent* and *Imminent* development became of great importance, and which would also leave its mark on the whole future of the development industry. The world was clearly already divided into two by this time, at least from the British perspective, and the politics that governed these two worlds could not have been more starkly different. In the UK, *laissez faire* gripped the political discourse, and development was not something that the government should have a hand in, rather the nation and the people who progress naturally through industrial capitalism (Banks *et al*. 2013). This of course has disastrous effects on the poorest peoples, with slums, workhouses and early death stalking the nation (Mitchell, 1996). Abroad though, in the Empire, *laissez faire* was not the preferred mode of governance.

Here instead the colonial powers sought 'the creation of order in a society undergoing radical transformation' (Cowen and Shenton, 1996, p.19). Rather than leaving industrial capitalism to run its course, international development became a tool to rein in, and reign over, the local populations, protecting interests and an assertion of pervasive control (Banks *et al*. 2013). As we fast forward to the modern development era, that which developed after the second world war, it is worth keeping in mind the longevity of this duality in the world and the role that cartographic mediation has played.

There were of course some challenges and alterations to this discourse through the first decades of the 1900s. The increasing issues of indirect rule, which critics noted was creating greater inequalities in the late 1930s, was starting to put great strain on the colonial powers. In 1929, the British government formally recognized *development* as a necessity in the colonial territories with the introduction of the *Colonial Development Act*. In support of this act Mr. H. Sneed MP argued in parliament that

> '*peoples of the British Empire are becoming increasingly aware of their position in the human family, and they are not satisfied with it. They are asking with increasing emphasis for the protection of this House against ruthless exploitation, for the protection of their tribal land, for some education, and for some participation in the shaping of their own destinies. These things represent moral responsibility which this Parliament can neither delegate nor ignore'* (2 July 1929, House of Commons Vol. 229, Cols 52–53, *Cited in* Cornwall, 2006, p.66).

By the 1940s, the push back against indirect rule continued to grow, and the 1929 act was replaced with the *Colonial Development and Welfare Act*, marking a shift away from indirect rule, perhaps heralding the birth of the modern aid industry

(Cornwall, 2006). Truman's speech in 1949 should not then come as such a surprise, as the red carpet for his plans had been laid out.

Truman's speech did not so much divide the world into those who were developed and those who were underdeveloped, he rather voiced a narrative that was already deeply ingrained in the global psyche. He solidified the battle lines between the *West and the rest*. His speech, and the subsequent global development agenda were designed to forestall the spread of communism. He was explicit about this too, calling it a *false philosophy*, and that development was an alternative to a system that added to peoples 'sorrows and their difficulties' (Nustad, 2001, p.480). This new kind of Western global Development, as an opposition to communism, was to be built on the Fordist model. Development would come about through the increase of productivity and the division of labour (Jenson, 1995). Economic growth became the focus, with GDP being the main measure of development (Srinivasan, 1994). The world economy was divided into parcels, overseen by US hegemony, accumulation matured and developed into dependency. Competition for economic space gathered pace, increasing international competition, trade deals were struck, and the US dollar become the world's currency (Brenner and Theodore, 2002). The old imperial powers, such as the United Kingdom, followed suit and also pursued this new 'American' model of development.

The imposition of this neoliberal agenda though, was, of course, highly uneven, both socially and geographically (*ibid*.), but was defended by the fallacy of *trickle down* – the economic proposition that taxes on businesses and the wealthy in society should be reduced as a means to stimulate business investment in the short term and benefit society at large in the long term (Srinivasan, 1994). For those who had been held under the imperial control of the British, the unevenness of the development agenda was

further fuelled by the UK government's preparations for self-rule. The British began to impose specific cultural styles and practices upon its colonies to help stimulate development (Cornwall, 2006). A major part of this was to push for more popular participation, a participation in which 'London could assist them in their work of extending popular participation in public affairs, of furthering education, and building up for the people better standards of social life' (A. Creech, 1959, 'The Labour Party and Colonial Policy' *Cited in* Cornwall, 2006, p.67). What this really meant though was the use of the state apparatus to contain and domesticate dissidents. The illusion of participation was used to illegitimatise popular movements and uprisings, and instead served the vested interests of politicians, civil servants, and political parties (Mamdani, 1996; Simmons and Birchall, 2008).

The 1960s and 70s started to see some pushback against these policies, especially from places such as Latin America where scholars such as Beltrán and Díaz Bordenave challenged the modernization-based approaches to development, that had pushed for the notion that the whole world needed to pass through the same stages of industrialization and progress as the West (Shah, 2007). A new form of participation was ripe for application, with a host of UN reports now heralding the possibilities of participation and voluntary democratic involvement in the development effort (Cornwall, 2006). The World Bank too commissioned a study which suggested development projects stood a better chance of success if people were involved (Lele, 1975). Furthermore, questions about how knowledge is used in development first began to emerge. The now infamous question, 'Whose Knowledge Counts?' was first asked by the Institute of Development Studies (IDS) in 1979, and indigenous technical knowledge was also beginning to enter common discourse (Chambers, 1998).

Following the 1970s significant shifts in the global political-economic discourse emerged. No longer were these entities confined to the nation-state, but now took place in new territories of what Lipietz (1994) has termed *new space*, or a new *mode of development*. This shift Lipietz suggests was a merging of the old geographical elements – stretching back to Columbus – and newly defined projected spaces created by neoliberalism (Brenner and Theodore, 2002). These new neoliberal spaces are built on the ideology that open, competitive, and unregulated markets represent the best mechanism for economic development (*ibid*.). This was a policy, that never acknowledged the economic or social effects on the poor, and that was aggressively pushed in the 1980s by Reagan and Thatcher, and which would be most dramatically manifest in the Washington Consensus[6] (Peck and Tickell, 2002; Stiglitz, 2002). The *Third World* took a knocking like never before under these conditions: crushing foreign debt, budget deficits, capital flight, falling commodity prices, declines in foreign assistance, and structural adjustment led to what is now refereed to the *lost decade* (Fair and Shah, 1997).

Alongside this though, the notion of participation was continuing to gather pace, and another World Bank report in 1987 again called for the inclusion of local people in development (Cornwall, 2006). This *associational revolution* (Salamon, 1993) suggested that small local organizations were best places to lead on development and the work of Robert Chambers (1974) became prominent. The Participatory Rural Appraisal method (PRA) pioneered by Chambers became a mainstay in development circles (Chambers, 1998). The explosion of NGOs seeking to fill the voids left by the

[6] The Washington Consensus refers to the 10 economic policy prescriptions considered to constitute the "standard" reform package promoted for crisis-wracked developing countries by Washington, D.C.–based institutions such as the International Monetary Fund (IMF), World Bank, and the US Treasury Department.

new neoliberal agendas, less bureaucratic modes of development, and fuelled by the *UN Declaration on the Right to Development* (Cornwall and Nyamu-Musembi, 2004). An exponential number of NGOs began working with grassroots organizations on micro level projects, with PRA being rolled out in over 100 countries by the mid 1990s (Drabek, 1987; Cornwall, 2006; Chambers, 1998).

Entering the 1990s though, the notion of free markets and liberal democracy would dominate the development discourse (Unwin, 2007). The collapse of the Soviet Union and the end of the Cold War also brought about a new impetus and focus for development, the eradication of poverty. Economic growth was though still the tool through which this should be achieved (*ibid*.), with of course a healthy dose of participation. This new generation of development, which was now being driven by the NGOs born of the 1980s, pushed for a rights-based approach for development, which while not altogether new, was solidified in development thinking in 1995 at the *World Social Development Summit* in Copenhagen (Cornwall and Nyamu-Musembi, 2004). Just as the rights-based approach – which set out to achieve a transformation of power relations among development actors, blurring the distinction between human rights and economic development, and strengthening the capacity of the institutions obligated to fulfil the holders' rights and empower those who do not experience full rights – saw itself as new and innovative, so too did the promulgation of participation. Actually, little was innovative, the new world order was built on the old-world order, the duality of immanent and imminent development still existed, and the models of development share much in common with those of the 1960s and 70s (Srinivasan, 1994; Cornwall, 2006).

This rights-based approach, which drew upon new tools such as the Human Development Index (HDI), which pertained to move the notion of development away

from economics (Srinivasan, 1994), actually worked to do little more than identify those who had a right to health care, unemployment insurance, family benefits, civil protection and political participation (Jenson, 1995), things to which all people should naturally have a right. Transparency also suffered in this age, as INGOs were not accountable to anyone but their donors, decision-making could happen away from public view, and thus agendas, biases, and vested interests were not revealed (Stiglitz, 2002). Furthermore, this NGO, rather than state organized, development model again redrew the maps. People's territories now revolved around their donors. The poor were no longer tied to states, but were instead tied to a new super state, the International Non-Governmental Organization (INGO).

A further shift occurred as the development sector moved into the 2000s. Four areas especially fuelled this evolution; Firstly, the World Bank too had shifted its position under its then President, Wolfensohn, emphasizing a holistic development process, one in which the Bank would foster not just relations with countries, but also with donor agencies (Stiglitz, 2002). The second strand of change came from the World Social Forum, who now also pushed for the inclusion of social movements in determining development models (Sinwell, 2012), although it should be noted, that the events of September 11^{th,} 2001, shifted global attention away from globalization and towards increased parochialism, as the war on terror fuelled fears around cross border movements (Deane, 2004). The fourth and final cause for change, or perhaps representation of change, was the launch of the Millennium Development Goals (MDGs), a plan, signed by the UN's 191 member states, to galvanize the international

community around a fixed set of goals and indicators for development (Cassidy, 2014).[7]

Despite these changes much of the aid at that time was still in the form of supporting specific and bounded projects with set amounts of money and clear delineation of where funds must be spent. While attempts were made to broaden this work, these changes were also happening against a backdrop of precarious funding for many NGOs, who then were seeking to maximize influence at minimum costs (Deane, 2004). So, while there was a shift towards inclusion and providing specific needs to specific peoples, many development projects remained naïve in the way in which they often lumped non-homogenous groups together into communities (Mohan and Stokke, 2000). The development world in the 2000s was stuck in silos, and the people they sought to aid were similarly divided up and siloed by these organisations (*ibid*.).

So, what now? The last twenty years have seen a shift towards a desire for a borderless world for economics and people (Belcher *et al*., 2015), albeit one now under threat. This has been coupled with an increasingly big push towards participation in development over the last thirty years – a move that is discussed in detail in the following two sections. Notions of empowerment and transformation have become pervasive in development discourse, with sustainability now also part of the mantra (Hickey and Mohan, 2005). There is also an increased realization by NGOs and aid agencies, whose importance continues to grow, that development work is more likely to be effective and not harmful when it is politically informed (Atack, 1999; Booth and Unsworth, 2014). The development world is now at a delicate precipice; the influence of Bretton Woods institutions is stronger than ever, and yet the modes of

[7] The Millennium Development Goals (MDGs), ratified by the United Nations General Assembly in 2000, aim to halve global poverty by 2015 (Alejandro Lead, 2007).

development employed by NGOs and aid agencies sees them cast as the Trojan horse of these institutions, even when undertaking the *noble* goal of bottom-up, grassroots led participatory development (Kapoor, 2005). This participation no longer holds radical connotations (Mosse, 2001). The economy has shifted to a knowledge economy, and participation is the new norm (Balit, 2012). Money for development has also dried up, making NGOs and local movements fight for the same resources (*ibid*.). Columbus's voyage of faith in the global continues to generate consequences. The economic, social, and political turbulence at the end of this century is a continuation of the politics of naming, mapping, and remembering, which his voyage to *find* lands and peoples in the name of European states set in motion. As many have done before, we will struggle with and confront these consequences, even into the twenty-first century (Jenson, 1995), with the Sustainable Development Goals being no less fortified with the colonial notions of the nineteenth century than the Millennium Development Goals before them.

3.1.2 Post-Development Theory

Despite calls for an end to grand theories of Development, and a move towards a development studies that would encompass competing theories, there is one theory that remains dominant in the contemporary discourse, and that is post-Development theory. Post-Development, whose main champion is Arturo Escobar, and which seeks to see development as a discourse, is very much inspired by the work of Foucault (Mohan and Stokke, 2000; Brigg, 2002). The theory attempts to demonstrate why development interventions do not work, and why the sector has seen 50 years of failure (Mohan and Stokke, 2000; Nustad, 2001). The main concepts could be seen as coming out of the *rights-based approach* to development discussed above, but the

ideas have been further developed and ultimately packaged into a very marketable form of Development, particularly in relation to women (in the 1980s), sustainable development (in the early 1990s) and human rights and governance (late 1990s-2000s) (Kapoor, 2005). Post-Development really aims to come to the defence of cultural difference and livelihoods, supporting collective struggles (Mohan and Stokke, 2000; Escobar, 1992). Proponent of post-Development see little in the way of redeeming qualities in relation to the development industry, and rather see Development as a way in which the *Third World* has been ravished by the global north through the building of new empires through the violent imposition of norms such as free-market economics, and through 'cruel little wars' (Escobar, 2004, p.18).

Post-Development theorists see the only way forwards as a total deconstruction of the development apparatus (Fair and Shah, 1997). Yet developmentalism persists, and the development apparatus has not yet disappeared. Therefore, the key work of post-Development becomes understanding the role of language and power in the perpetuation of colonial development models (*ibid*.). The post-modern analysis of power states that communities will also be able to generate power (Taylor, 2007). It also suggests that it is then not the role of NGOs to make political changes in countries (Alford, 2015). Instead, it draws upon people orientated development, in which the knowledge of rural peoples is included in development through equal exchange (Balit, 2012; Shah, 2007; Mohan and Stokke, 2000).

These ideals of post-Development have to some extent been taken up by mainstream development institutions, at least in name. The UK Overseas Development Administration (ODA), which later became The Department for International Development (DfID), started using phrases such as *stake holder participation* as early as 1995. The World Bank a year earlier introduced the language of stakeholders; in its

1994 paper on participation, in which it suggested giving people more control over their lives and to include their knowledge (Cornwall, 2003). This begins to reveal some of the contradictions of post-Development theory, a theory which seeks to avoid ideology, and to create a development model that is a 'multiplicity in one world' is in itself contradictory (Fair and Shah, 1997). Its aims of allowing people to set their own normative goals, which may not coincide with the post-industrial West, remain a vital step. It is important too to see individuals as more than mere actors being used as pawns in someone else's game (Phillips and Edwards, 2000), which post-development does well.

For all this forward thinking, post-Development has significant issues, as well as being a little light in theory, it does not really offer a future, a way out or a pragmatic solution (Brigg, 2002; Nustad, 2001). Many of the social movements that Escobar champions, do not see themselves as anti or post-Development, and to only see them as post-industrial and postmodern is to somewhat misunderstand the history of imperialism against which post-Development is pushing (Mohan and Stokke, 200). Furthermore, there has been little in the way of examining how learning might happen between the North and South (McFarlane, 2006a). This though is not reason enough to fully dismiss post-Development theory, but it certainly shows that there is a long way still to go before a day-to-day practice of dismantling neo-liberal polices becomes the norm (Brigg, 2002; Walsh, 2010).

Post-Development is often called upon to suggest that contemporary society is postcolonial in its development models, but this is overly optimistic and simplistic. While it is perhaps impossible to say what a postcolonial development (or post-post-development) would look like, we are certainly not there (Robinson, 2003). We should though not prematurely dismiss, or limit, post-Development theory (Brigg, 2002), but

instead we need to seek ways to examine how localized practices adopt and change the ideologies imposed upon them by projects of modernity, which does not in itself salvage post-Development, but may help to derive new ways of practicing development, and the development of a more grounded approach (Nustad, 2001; Bebbington and Bebbington, 2001). One such way this has manifest and continues to do so is through the model of using actions such as participatory rural appraisals, and its offshoots, to seek a more inclusive post-development mode of working.

3.2 Participation and Development

One of the major elements and practical ideas put forward in post-development thinking is that of Participatory Rural Appraisal (PRA). The method, which is designed to elicit knowledge from local communities about their true needs, was developed, and championed by Robert Chambers in the 1980s. The idea was to find ways for *outsiders* from aid organizations to effectively understand the needs of local peoples (Sinwell, 2012). In Chambers' (1998) own words, the method grew from a confluence of sharing traditions and methodologies. It is also built upon the work of many other scholars, notably Freire (1970; 1974) and Gaventa (1980), bringing to the fore the notion that poor and marginalized peoples can conduct their own needs analyses. In doing so, it pertains to reduce dependence and to increase empowerment among the world's poorest, something that is crucial given the very real need for peasant-led development (Mosse, 2001; Desmarais, 2008). These methods have been adopted widely by aid and development organizations (Balit, 2012), and many governments and donors still look to PRA as a mainstay of their projects and assessments (Chambers, 1998).

What really underpins the ideas of PRA are the notions of politically smart and locally led approaches to development (Booth and Unsworth, 2014). The term politically smart is normally taken to mean a mode of operation that considers history and an in-depth understanding of the country itself. And locally led is normally taken to mean working on issues that have local salience and benefits for the local, rather than national, community (*ibid*.). These ideas clearly reflect that of post-Development thinking (*See* Escobar, 1995; 2004), and in Chambers' (1983) text where PRA was born, he too laments the top-down approach to development, calling for a move from 'authoritarian to participatory communication' within development projects (190). His

main aim was to develop spaces for participation from a bottom-up approach (Sinwell, 2012). Many of the early adopters of these methods were field staff themselves, most notably in India and Kenya, but the method evolved and spread with fantastic speed and has continued to evolve (Chambers, 1998). This has supposedly brought about a new paradigm in which positivist, reductionist and standardized development models are rejected, and in which individuals are recognized for their contributions (Mosse, 2001). Ironically these ideals have been adopted by UNDP, who in 1993 called for NGOs to *urge* people to participate (Cornwall, 2006). Thus, begins some of the critique of PRA.

The massive and widespread adoption of PRA has seen manifestations of tensions and contradictions between the top-down necessity to standardize the method, and the bottom-up individualism it is meant to promote and has led to what Chambers (1998) has described as damaging modes of dominating interaction. Thus, despite its laudable aims, the knowledge and experience of the poor is often still, or even increasingly, marginalized (McFarlane, 2006b). PRA is still implemented by a facilitator, and this facilitator takes on an almost God-like status in the process, dictating who speaks, who is included and what the final report looks like (Kapoor, 2005). This facilitator is often an outsider from an NGO which has often developed its own operational interpretation of what a community needs, and who also fails to shake their Western hierarchical discourse (Mosse, 2001; Kapoor, 2005). Furthermore, the public nature of PRA also creates challenges in full participation, and may reinforce dominant local power structures, with the local elite leading the conversations with other people feeling they have no choice but to comply (Mosse, 2001; Platteau and Abraham, 2002). The final critique of PRA is the way in which it is often rigidly tied to the agendas of the donors who are funding it, meaning it can become tokenistic, and

lead to participants who suggest outcomes that they know will be supported and funded by the donor, as opposed to reporting actual needs (Mohan, 2002; Mosse, 2001). Furthermore, practitioners are often unable to remove their own biases, or disconnect themselves from the demands of their donors – many simply lack the ability to listen (Balit, 2012; Chambers, 1998). There is also often a genuine inability to see the community as partners, or leaders, in the project (Platteau and Abraham, 2002).

The most important though, and this returns us to the piecemeal use of Foucault by post-Development writers, is the lack of acknowledgment of power within the process. Local knowledge reflects local power, and thus PRA has become co-opted by communities and individuals to produce a rather peculiar type of knowledge that is shaped by pre-existing relationships (Mosse, 2001). While PRA may have been useful in pushing for a different approach, and perhaps even in developing grassroots movements, it falls into the trap of assuming that all alternative development is a liberating and socially balanced pushback against the dominance of the state (Bebbington and Bebbington, 2001). Furthermore, it fails to recognize *power* in participation.

One of the key principles of PRA and the modern development agenda is that of participation. This is not simply the involvement of people in politics – voting – but a process of open dialogue and broadly active civil engagement, where individuals express their voice (Stiglitz, 2002). This idea is built upon the notion that everyone should be included in the decision-making process, and those on the outside should *be brought into the development* process (White, 1996). This method of working is designed to challenge the *top-down* models of development, allowing people from the grassroots to advocate for themselves (Cornwall, 2006). As discussed above, Chambers

(1883; 1994) was one of the pioneers of these methods, bringing them to the fore in the 1980s, to promote immanent development over the more specific interventions of imminent development, which are more interested in telling people what to do rather than listening and giving voice (Sinwell, 2012; Balit, 2012). Also, as discussed earlier, there was the notion that participation in development is not new, and certainly Chambers was not the first to put this forward. In the early part of the twentieth century, participation (albeit a bastardised version) was very much the agenda of the powers of the day (Cornwall, 2006). It has been suggested that the UN could not reach the Millennium Development Goals, and in turn the Sustainable Development Goalss without massive amounts of participatory practice, and especially without the inclusion of women (Simmons and Birchall, 2008; Balit, 2012). Thus, decentralized and participatory development models have gained increasingly large amounts of funding from organizations such as the UN, the World Bank, and the European Community (Platteau and Abraham, 2002).

Yet these projects are not what Chambers envisaged, they are instead often participation by coercion, as aid and money are tied to the requirement to participate (Kapoor, 2005). This has led scholars such as Ribot (1996) and Cornwall (2006) to suggest that the modern instrumental versions of participation are little more than an extension of indirect rule, in that they pertain to seek the thoughts of the people, but that these are used to further empower the agencies that undertake the work. Undeterred by these criticisms, participation continues to be written to development projects at all levels (Hickey and Mohan, 2005). While repeating the mantra that everyone should be involved and empowered (Mohan and Stokke, 2000) the process is actually forcing people to accept changes by making them feel involved in the process, a process which itself is unlikely to be transformative in anything but the short term

(Stiglitz, 2002). These contradictions will be more carefully unpicked in Chapter 4, as issues of power are discussed more closely. Before this can be undertaken though, it is important to understand how these 'failures' of inclusion are being measured.

3.2.1 Measuring Development

It has been noted that development itself if hard to define, that post-development is not as post as it might wish to be, that PRA has made some steps towards a participatory development model, and therefore participation in itself is flawed. How though might any success be actually measured? What are the tools of measurement available and are they viable for recording something which is now recognized as a discourse rather than a project? And can measurement ensure more inclusion of localized knowledges or help NGOs to 'see' it better?

The way in which development is measured is becoming increasingly important to address as nations, NGOs, and the world gears up towards the post-2015 agenda, the implementation of the SDGs (Cassidy, 2014). While failing in their aims, the MDGs (which preceded the SDGs) did start the development sector down a road of building bigger data sets and what might be seen as the datafication of development, overseeing a significant improvement in data available (*ibid*.). The rise of technologies, digital networks, and the reduction in costs of monitoring equipment has also brought about new opportunities to capture and measure (Balit, 2012). This is a vast improvement from the issues of the Human Development Index which notoriously suffered from large data gaps and weaknesses (Srinivasan, 1994).

The majority of data that is collected is done so to measure the impact of a development project, rather than for an assessment of need. These assessments examine the outcome and effectiveness of a development project often for the benefit

of the organization carrying out the project, or the donors who are supporting it (Phillips and Edwards, 2000). Furthermore, they have been historically based on economic outcomes, although the MDGs saw a shift to an increased number of indicators, something which has grown even further with the introduction of the SDGs (Sachs, 2005; Griggs *et al*., 2013). Some statistical analysis is useful and can help galvanize action – for example knowing that universal secondary education in sub-Saharan Africa by 2030 would prevent 3.5 million child deaths in the following 30 years (Holder and Hodal, 2016). The task of actually measuring and recording is enormous and intimidating (Chambers, 1998). Like many of the discussions above, this process suffers from underlying biases, an over-reliance on the notion of homogeneity and lack of understanding of neo-colonial power (Bebbington, 2004; Srinivasan, 1994).

Understanding these measures is important as impact assessments do not just affect the decisions that are made around individual projects, they also affect the whole development discourse (Phillips and Edwards, 2000). Furthermore, while there is a massive increase in the amount of data produced and collected, there remain numerous gaps, especially in relation to those that are needed to measure the SDGs (Cassidy, 2014). Of course, in some places the data are deep. The USA and Sweden, for example, both have extensive data which is freely available (Vaughan and Geddes, 2009), and tools such as Landsat imagery which enable large scale monitoring of the whole planet from the sky (Paull *et al*., 2006).

The problem arises though from the increasing demand for data, which sees data scientists pushing the boundaries of what is possible with present data sets, implementing machine learning and modelling causality (Ranganathan *et al*., 2015), amalgamating disparate groups into massive data sets to enable easy measuring, and for the creation of abstract representations of people (Jenson, 1995). This might not

be an issue if it were not for the massive drive for use of these data to dictate the lives of the world's most vulnerable people. The data collected are often very uneven, and when it is good data, the geographic spread often reflects the agenda of the MDGs, which does somewhat suggest a sort of self-fulfilling prophecy (Cassidy, 2014).

Moreover, there is a colonial aspect here too, as the datafication of the global south is much greater in terms of development than that of North America or Europe. Indeed, many Western countries do not have sufficient data to measure their own Millennium Development Goal targets but invest greatly in the measurement of the South (*ibid*.). Even where statistics are drawn from well researched and well-defined local communities, these statistics are still susceptible to issues such as the Modifiable Area Unit Problem[8] (MAUP) (Vaughan Geddes, 2009). The length of assessment is also problematic, rarely looking beyond short-term effects, thus missing assessments of aid-related issues and sustainability (Booth and Unsworth, 2014). Easterly and Pfutze (2008) conclude in their paper that data are terrible, but worse because these data are circulated through western(ised) elites and intellectuals it becomes codified through that lens and begins to reflect western interests and desires, regardless of what the data might say (Kapoor, 2005).

This is further exacerbated by the stigma of failure and its associated financial implications (Moore *et al*., 2016). Data are most frequently collected as part of an assessment, but when those collecting the data have a vested interest in success, then the data collected are bound to reflect a positive agenda and is hardly impartial (Phillips and Edwards, 2000).

[8] The modifiable areal unit problem (MAUP) is a source of statistical bias that can impact the results of statistical hypothesis tests. MAUP affects results when point-based measures of spatial phenomena are aggregated into districts, for example, population density or illness rates.

The links between data, knowledge and development action are clearly complex (Mohan and Stokke, 2000), but the present way in which data is collected can never achieve objectivity, even if the development organizations and NGOs claim this to be so (Phillips and Edwards, 2000). However, only data that conforms to the world view of these NGOs, or their data analysis, is ever taken seriously or given legitimacy (McFarlane, 2006b). This evokes the work of Spivak (1988) when she cautions on speaking for the *Other*. To fully understand the way in which we understand the Other – or in this case collect and analyse data about the other – we must turn the anthropological gaze on ourselves. To view our representations about, or on behalf of, the third world as a function of our geopolitical and institutional positioning (*Cited in* Kapoor, 2005). The World Bank has been pushing for the datafication of development since its 1999 report *Knowledge for Development* (MCFarlane, 2006b) and the Bretton Wood institutions continue to push for a development agenda built upon these principles. In this way, the development process becomes depersonalized, numbers become the most powerful technique and mechanism of power, and lead to accusations of digital imperialism (Belcher *et al*., 2015; Brigg, 2002). This is an argument threaded through all aspects of this thesis and will continue to be explored.

3.2.2 The role of NGOs

Increasingly the development agenda is being carried out by NGOs and INGOs, both with and without state support. Thus, it is important to examine their role and position within the development context (Atack, 1999). A great deal of emphasis has also been placed on the role that NGOs can play in terms of interactions between government and communities and their effect of public policy (Drabek, 1987). There is also pressure on NGOs to offer an alternative narrative to the Bretton Wood

institutions, and the likes of the G8 (Yeates, 2002) and to work as a check and balance on abuses of power, strengthening civil society through participatory processes and bringing about democratic reform (Stiglitz, 2002; Atack, 1999). However, there persist concerns around the relationships between NGOs and donors, around the tools of implementation, and the potential for NGOs to become self-serving (Drabek, 1987). Some of these concerns have already been noted above in terms of general development projects but are worth examining in a little more detail through the lens of NGOs.

NGOs do not just work to meet the needs of the poor, they also help the poor to articulate their own needs, something which attempts to undo the past failures of development work (Drabek, 1987). NGOs are often understood as being beneficial to social and economic change as well as playing a hugely important part in civil society (Atack, 1999). They claim to promote the public or common good, just as States do, but unlike states they are seen as autonomous, and free (*ibid*.). They are also closely aligned with the work of co-operatives and village organizations which are well suited to organizing around particular needs and which can lead to sustainable projects that last long after an NGO finishes its specific intervention (Simmons and Birchall, 2008). NGOs are in a position to challenge state-dominated development policy and have the power to voice criticism on behalf of those who may be persecuted for speaking out for reform or interests counter to the state (Yeates, 2002). And while it has already been noted in detail that participation does not automatically create a better environment, NGOs are still making an important step (Gilbert and Ward, 1984). This is particularly true in terms of aid efforts and in building networks of solidarity around causes and events (Atack, 1999). And to take it to its logical measurable end, these kinds of efforts have been shown to be a contributor to growth (Stiglitz, 2002).

This is all rather rose tinted though as there are significant issues with NGOs and the way in which they (do not) work. It is near impossible to define what development is, and thus impossible to define what an NGO should be doing (Drabek, 1987). Furthermore, a great deal of literature argues that the effectiveness of NGOs has been greatly exaggerated or assumed rather than demonstrated. This is in no small part due to the issues of measuring development outlined above (Edwards and Hulme, 1995; Atack, 1999). Temptations to enlarge claims about what an NGO has achieved are born from all sorts of institutional concerns, but they largely revolve around fear of blame, being out of touch with reality, or worries around future funding (Moore *et al*. 2016; Drabek, 1987). This last fear is born from the close relationship that NGOs have with their donors, this need to complete projects to secure further funding can then damage the legitimacy of the NGO (Atack, 1999). This also leads to NGOs working in geographically reduced areas, and sometimes taking over the role of local governance. Again, these two occurrences become delegitimizing in terms of the unevenness of provision and the changing status and power dynamic between the NGO and the people with whom they should be working (Bebbington, 2004; Atack, 1999). These dilemmas can then in turn lead to NGOs offering less, not more. A diluted approach, that seeks to neither upset the donor, nor the local power dynamics, and to minimize costs (Platteau and Abraham, 2002). Thus, rather than being accountable to the local population, NGOs become accountable to their networks, and to the multi-national institutions to which they wish to belong or lobby, such as the IMF or World Bank (Cornwall and Nyamu-Musembi, 2004; Bebbington, 2004; Atack, 1999). Of course, much international development work is only possible due to these networks, but the reliance on pleasing networks and donors becomes harmful to the independence and autonomy of the NGO that seeks to challenge these powers and networks

(Bebbington, 2004). Ultimately the NGO becomes defeated by its own desire to retain power (White, 1996).

This leaves us with many questions about the role of NGOs. They are not as autonomous as we might hope, but still it is required that they push their own vision of development as an alternative narrative (Drabek, 1987). It should though not be assumed that NGOs are always best placed to understand the needs of local communities, nor are they always 'closest' to those in need Instead they remain entrapped in structures of power and resource allocation that often predetermines who they are close to (Mohan and Stokke, 2000). The role of understanding communities should not be turned over to NGOs entirely, as their work is often co-opted, and thus needs to be questioned deeply (Atack, 1999; Bratton, 1989). An NGO should seek to work between people and governments, to share knowledge, to provide a forum for participation and avoid repetition of other mistakes (Drabek, 1987), but given the issues above, and issues around the lack of feedback and measurement (*See* Easterly and Pfutze, 2008), issues of participation (*See* Cooke and Kothari, 2001), and the issues of not being able to define development (*See* Sachs, 2005), the role of NGOs is one that is almost impossible, while at the same time, one that is dramatically increasing.

3.2.3 Model of development in this research

This chapter has been at best sceptical, and at worst scathing about the development industry, and in particular its ability to create a true development from the grassroots. It has suggested multiple points of failure, including the inability of development programmes to communicate with their beneficiaries (Balit, 2012); the biases and inherent colonialism in impact assessment (Phillips and Edwards, 2000); a

deeply engrained nostalgia for old forms of political organization, which serves to perpetuate the power models of the past (Gibson-Graham, 2006); and the way in which participation is far from bottom up, but is controlled by actors, both consciously through facilitation, or through the power wielded by elites (Mohan and Stokke, 2000). This though is not to suggest throwing the baby out with the bathwater as a full dismantling of the development industry would do much harm to many people, it would, rather than kicking away the ladder of development, pull the rug right out from under people's feet (Chang, 2002). Instead, while we might lament the way in which hardly a project is proposed without the word 'participation' in its title, and while we know that does not translate into automatic power sharing (White, 1996). It is necessary to take a strategically optimistic view to move forwards. Events around the world have demonstrated that strong campaigns can mount a challenge to governments, the state and other forms of oppression (Yeates, 2002). Furthermore, this should be recognized as not the only valid outcome. Yes, empowerment in the form of poor people being able to take direct control over their own lives is seen as paramount (Atack, 1999), but the ability to effect power does not need to be transformative, nor does it necessarily have to engage in the broader process of development. These ideals should not be romanticized, they should be critiqued because forms of power beyond the state can be used to sustain, or even enhance, the power of the state (Taylor, 2007; Sinwell, 2012). It is easy for a romanticized image of participatory development to become systematically institutionalized and to become co-opted as a tool of control by dominant groups (Gilbert and Ward, 1984). There is always a great deal of hypocrisy in advocating for the participation of the Other in a climate in which institutions themselves are rarely participatory or open to self-reflection (Kapoor, 2005). For Spivak (2003), we need to go beyond just learning about

others, but also need to imagine ourselves, through a process of learning and unlearning in order to move towards a truer post-colonial narrative.

It is important to recognize, incorporate, and value, indigenous and local knowledges and practices into the design of development projects (Balit, 2012; Mosse, 2001; Taylor, 2007); to not provincialize knowledge and pass it off as universal (Robinson, 2003); and to allow the entry of subjugated knowledges into the discourse (Foucault, 1980). It is important too, to understand the unevenness of development and to aspire to an alternative (Harvey, 2001b). However, at the core is understanding and interrogating terms such as development, globalization, politics, modernity, and participation. To really understand what these terms mean and what they do through their use, to examine how they perpetuate, translate and transfer power (McFarlane, 2006b). This examination is required to avoid the transference of unresolved conflicts onto a substitute, to not place our own failings unwittingly on the third world (Kapoor, 2005). To avoid wielding power over those who are most vulnerable as we attempt to *empower* them. Power can be deconstructed through an understanding of the language and discourse with creates the power itself (Taylor, 2007), else the agency of change merely becomes a catalyst to feelings of impotence (Stiglitz, 2002). This will involve a process of divesting in what we are in ourselves, to work against mastery to support the creation of *other economies* to make ourselves the condition of their emergence (Gibson-Graham, 2006).

This is not to argue for a retreat into a simple localism (Ellerman, 2002), instead it calls for a change in operations of international development agencies like the World Bank, from a paternalistic model of *teaching*, towards a two-way *learning* process (*ibid*.). Ellerman is echoing Freire (1970) by using learning as a mode of social transformation, rather than an attempt to create linear knowledge additions. Such an

engagement, however, must counter the unequal power relations and move beyond a liberalist conception of "integrating subaltern knowledge" towards a more radical conception. The appropriation of subaltern knowledge must be avoided. Spivak (1988), writing about the desires of European leftist intellectuals to *speak for* the *Third World* subaltern, has famously argued that the subaltern cannot speak. This is to say that the subjugated cannot be heard. For Spivak, learning from one another is an ethical imperative (cited in McFarlane, 2006a).

Here then we return to the spatial. Understanding the spatiality of development helps us two-fold, firstly aiding us in seeing the move from global to local, or imminent to immanent (Simmons and Birchall, 2008), and secondly, because the unevenness of development is brought about through capital's seeking of new spaces of accumulation (Harvey, 1989). Thus, it is of the upmost importance to return to geography, to examine the literature of development geography and to seek alternatives to present models (Bebbington and Bebbington, 2001). Firstly, in addressing language to remove the familiar cartographic positioning of global north and global south (McFarlane, 2006a). To embrace neogeography, a conceptualization in which lay persons create their own geography after their own image, as a tool of assembling, organizing, and sharing information without advancing the specific concept of democracy (Haklay, 2013). To understand that borders are struggles, spatial struggles, struggles of people trying to live (Belcher *et al*. 2015), and that these borders are drawn between not just territories on a map, but territories in the ethological, natural sense, and that these borders are porous (Günzel, 1998; Bebbington, 2004). The spaces then in which development occurs, in which participation may take place, are not a mere geographical space, they are 'a dynamic, humanely constructed means of control and hence of domination, of power' (Lefebvre, 1991, p.24). These spaces are

often seen as being more transformative if it is the grassroots that create the space, but as this chapter, and other authors (See Sinwell, 2012) have shown these spaces are just as political and just as dominated by power, and opportunities to participate outside of prescribed spaces are in fact extremely limited.

To paraphrase Foucault (1984), not everything is bad, but everything is dangerous, which is not exactly the same as bad. People's knowledge is used to advance and legitimize development projects and agendas, or even to negotiate a participatory approach with other stakeholders such as funders, technical consultants, and senior management (Mosse, 2001). The assertion that emancipatory forms of development can be wilfully managed through *the right mixture* of institutional responses has effectively *depoliticized* the notion and practice of development in poor countries (Ferguson, 1994), rather than seeing it as negotiated with and contested by its subjects (Hickey and Mohan, 2005).

3.2.4 Summary

This chapter has for the most part confirmed many of the long-standing complaints about foreign aid, the development industry as a whole and the failure of NGOs to meet the requirements of the world's poorest people without becoming co-opted by state actors or hegemonic power. The development sector, for all its lofty claims, is remarkably splintered into many small efforts across all dimensions and in many ways, there is actually little to discuss in terms of a heterogeneous development sector (Easterly and Pfutze, 2008). There are numerous factors that play into this. Development agencies are often accused of lacking institutional memory. But there is more at work here than simply a failure to remember the past. The amnesia in this case appears almost cultured, rather than simply incidental; something akin to a tacit

agreement not to invoke past failures or allow reflections on the past to act as a brake on the urgent business at hand (Cornwall, 2006, p.64). There is also little accountability for failure, and thus the machine marches on in ever disparate directions; 'throwing good money after bad. Sometimes' writes a survey respondent of Moore *et al*.'s (2016) study into development failure 'I think the organization is better at admitting small failures [rather] than large ones, hence the continuation of large-scale IM projects that should be shelved' (*ibid*., p.13). There is clearly a great distance still to travel in the creation of a development sector that is able to truly serve the needs of local people, incorporating their ideas, knowledges and expertise in such a way as to ensure they are included and represented and involved in a true participatory mode of development. Much of this understanding will come through a deeper and more nuanced understanding of the power dynamics at all levels and in all spaces of development and aid, and this will be discussed in detail in the following chapter.

3.3 Knowledge and power

This chapter will discuss the general notions of how knowledge and power are inter-related within the context of space and the development agenda. This issue has become increasingly important as development institutions have been highlighting the importance of knowledge and information in helping the poor. The World Bank in their 1999 report suggested that it is indeed knowledge and not resources than are needed for development (World Bank, 1999). There is though a dearth of information on the subject and mainstream development organizations have often avoided any rigorous interrogation of the relationships between knowledge and development. Even projects such as Chambers' (1983; 1994) PRA have previously failed to fully conceptualize the idea of knowledge in its programs (McFarlane, 2006b). Yet this is a hugely important part of the process, as knowledge is inevitably intertwined with power (Gaventa and Cornwall, 2008) and as seen previously this power is of crucial importance in the design of technologies and development agendas. The issue is further complicated by the lack of nuance between terms such as knowledge and information, words which are often used interchangeably (McFarlane, 2006b), and there has been little attempt to really define knowledge (*ibid*.).

One significant issue arises because there is no single definition of knowledge. Nevertheless, an important distinction can be made between information and knowledge. While the former consists of hard numbers, data and facts, the latter involves personal experience (Ackoff, 1989). There is also a large variety of knowledge existing among different actors (Somers, 2012, p.14). According to Hordijk and Baud (2006), to build knowledge from information, context must be added. Since context is influenced by individual perspectives, it affects the meaning and value of knowledge. Further to this, ideas can never be seen as innocent but `either reinforce or challenge

existing social and economic arrangements' (Bryant, 1998, p.87). Indeed, from a critical theoretical stance, it is possible to suggest than knowledge is always there '*for someone and for some purpose*'. There is always a connection between the knower and the known and thus it would be impossible to consider knowledge as 'neutral'. Rather it is value-laden and constructed from interests (Hordijk & Baud, 2006, p.672).

There are essentially two basic analytical models of knowledge-building. The first one is the classical linear model of knowledge, which relies on expert and scientific knowledge systems. The underlying assumption for this model is that codified knowledge is universally applicable, independent of the context in which it is produced (Baud *et al.*, 2011*a;* Baud *et al.*, 2011*b*). This perspective has been widely criticized for being ignorant towards social circumstances and existing hegemonic knowledge discourses. The second model recognizes the existence of several types and sources of knowledge and understands knowledge building as a social process, '*produced by interactions between researchers, citizens and organizations*' (Somers, 2012, p.14).

Van Ewijk and Baud (2009) make a distinction between three different forms of knowledge. The first type is *tacit knowledge,* which is built up through individual practice and experience. *Contextually embedded knowledge* consists of technical, economic, and political, as well as community-based and social knowledge and is embedded in technical, social, and political networks. This form of knowledge is also created through practice, but is more widely spread than *tacit knowledge*. The third knowledge type identified by Van Ewijk and Baud is called *codified knowledge* and is expressed systematically. Circulating mainly in the academic sphere, a great part of it is laid down in written documentation.

Although this distinction is quite useful for the categorization of knowledge, it should be noted than none of these forms of knowledge can claim to be universal or 'true', nor independent of the influence of dominant discourses. What is important to note however, is which knowledges are and are not included in each of these forms. It is by 'excluding certain forms of knowledge—such as practical experience and traditional knowledge— that more powerful actors can also exclude the interests of the less powerful: invalidating an argument by contesting the source of knowledge and the legitimacy of the claim' (Hordijk & Baud, 2006, p.673).

In much of the mainstream development literature, knowledge is conceived as travelling between bounded territories. This is premised on the idea that information and knowledge travel in a linear way and claims that the transfer of knowledge may be accomplished without distortion. It also suggests that information and knowledge circulate globally, and can be *applied to* local places, or can work alongside *local* knowledge. Knowledge here is conceived as a technical entity that can be delivered unchanged as a development *solution*.

This move requires an ontological separation between space and place and perpetuates a North-South divide. *Poor* countries are required to draw upon the knowledge of *rich* countries in order to develop. This kind of conception of knowledge underpins the World Bank's approach to information and knowledge, which is itself deeply rationalist. With communication costs plummeting the World Bank (1999) suggested that transferring knowledge was cheaper than ever and set the stage for a rapid narrowing of knowledge gaps and a surge in economic growth and well-being. The Bank, and the development discourse that follows this mode, are then not able to translate information to knowledge in such a way as to enable people to make use of it at different levels (Hovland, 2003). This misses the important notion that knowledge is

marked by its origins and projects a form of universality which destroys subjugated knowledges and their producers (Rose, 1997). This still forms a great deal of the mainstream of development thinking despite an acceptance by development agencies that it is indisputable that local people are well qualified to define their problems, and have expert knowledge (Sillitoe, 2000). In order to counter this rationalist approach to knowledge it is important to produce knowledge in a way that affects popular awareness and consciousness (Gaventa and Cornwall, 2008), something which post-Rationalist ideas, following post-Development, attempt to do.

There are many scholars who have criticized the rationalist approach to knowledge in development, most notably in post-development (*See* Escobar, 1995; Ferguson, 1994; Hobart, 1993). However, this literature often fails to present alternative ways of conceiving knowledge and learning (McFarlane, 2006b). A post-rationalist approach to knowledge is predicated on three fundamental ideas. Firstly, that knowledge is formed through interaction, that it is socially produced through various forms of interaction amongst individuals and organizations. This could be formal meetings, conversations over coffee or through emails. In this way knowledge is seen as embedded in the lives and experiences of the people (Patel and Mitlin, 2002). Secondly, that knowledge is situated, meaning knowledge is context-specific (Nonaka *et al*., 2000). It is always dependent on particular times and spaces (McFarlane, 2006b). The spatial relationality of knowledge, and the importance of practices is emphasized. And thirdly, that knowledge has two broad forms, tacit and codified. Here we borrow from Latour's notions of translation, where he refers not to 'a shift from one vocabulary to another', but 'to mean displacement, drift, invention, mediation, the creation of a link that did not exist before and that to some degree modifies the original two' (1999, p.179). A *chain of translation* refers to the many steps

through which knowledge is produced (Latour, 1999). Rather than focusing simply on the question of whether knowledge remains the same or not, it focuses attention on the multiple forms and effects of knowledge (McFarlane, 2006b). All the processes discussed under the particular umbrella of post-rationalism outlined in this section are driven by translation. Information is converted to knowledge though translation, as is knowledge to learning, and the discursive framing of development problems and solutions is a continual process of translation (*ibid*.).

Here there is clearly a difficulty in seeing development knowledge as an objective and universal solution that can be conceived unproblematically as separate from context and politics (McFarlane, 2006a). It is only by bringing together multiple competing knowledges that we can challenge Otherness and subjugation. This requires a deconstruction of otherness through the pluralization of places of knowledge which must challenge the separation between theory and practice, and the speculative fragmentation that has allowed the identification of the Western European subject as the thinking subject informing and conquering the objectified other (de Certeau, 1986).

One of the fundamental types of knowledge discussed by Hordijk & Baud (2006) is Tacit knowledge. This kind of knowledge is deeply rooted in actions, procedures, routines, ideals, values, and emotions. Most knowledge is primarily tacit, and rarely does it travel well (McFarlane, 2006b). This is particularly noticeable in indigenous knowledges, which are often seen as tacit only, but which also tend to be extensive and systematic in comparison to the narrow focus of reductionist scientific disciplines (Sillitoe, 1998). These kinds of tacit knowledges though are always born from a lived space, a space where subaltern identities can emerge. These spaces Lefebvre (2009) described as being a representational world of complex symbols and

one that allows for identity to be formed through narratives and representations (Allen, 1999). Because they are derived from the lived space, these tacit knowledges – or minor knowledges, as Deleuze might call them – activate local knowledge; are rooted in context and interaction; are continually produced and reproduced, and sit in opposition to scientific knowledge, and challenge its power (McFarlane, 2006b; Foucault, 1980).

For Foucault then, and perhaps for the humanities as a whole, the promotion of this self/local knowledge has ultimate value in examining life and challenging the status quo – we are after all informed that the unexamined life is not worth living (Tuan, 1979). This status, while almost fetishized by some, does give us cause to reflect on the situatedness of Western knowledge, and also forces a challenge to the assumption that this knowledge is universally applicable (McFarlane, 2006b). This becomes increasingly important in the development industry, as it is the lack of respect for other knowledges, and the notion that western science and technology holds all the answers, which creates a considerable barrier to development (Sillitoe, 1998).

It is though vital to not swing back the other way and focus so deeply on tacit/indigenous knowledges that this in and of itself becomes detrimental. Tacit/Indigenous knowledges are not homogenous, and nor should they be treated as such. These knowledges are carried and transferred through generations, through idioms alien to science, symbols, rites, and myths, and never remain stationary even within Space (Sillitoe, 1998). This returns us to the importance of space in the production of tacit knowledge. Not only is tacit knowledge born of its spatial embeddedness, a knowledge of the broad topography, as well as comprehensive knowledge gained through long-term residency (Goodchild, 2009), but it is also

territorialized through the inclusion and exclusion of certain elements, with and from outside a community, forming knowledge that is seen as in or out of 'proper' space (McFarlane, 2006b).

One of the ways in which development organisations attempt to read tacit knowledge is through the afore mentioned PRA (Participatory Rural Appraisals). These contradictions make participation worthy of a little further discussion. Participation in its modern guise was of course built upon the supposedly innovative 1980s – the lost decade for development – that provided a new impetus for redesigning aid and development (Cornwall, 2006). Its lofty objectives of moving from authoritarian to participatory governance should indeed be noted and applauded (Sinwell, 2012), and placing participation at the centre of development is akin to a basic human right the Council of Europe have suggested. It is difficult to argue with the idea that including people's knowledge within a project would do anything but challenge the status quo and the top-down bureaucratic structures of the development industry and government (Mosse, 2001). This kind of participation would foster self-reliance, a more democratic, egalitarian, and equitable society which in turn would bring about truly successful long-term development (Chambers, 1974; Stiglitz, 2002). These ideas of participation also evoke the notion of democracy, an equilibrium of access to resources and information (Haklay, 2013; Platteau and Abraham, 2002), and the idea of creating space for new, previously excluded actors, to become involved in the development process and to exercise real influence over their own and their community's future (Taylor, 2007; Drabek; 1987). Furthermore, the process itself is meant to be seen as transformative in and of itself, a paradigm shift (White, 1996; Mohan and Stokke, 2000). The idea of moving beyond managers, reaching the excluded, including everyone's voice, might resonate with the concept of multiple

realities, something that Chambers (1998) was keen to see in Participatory Rural Appraisals.

The real objective of participation though is to reach a consensus. This consensus should not be prescriptive, but rather should reflect the needs of the community as a whole (Kapoor, 2005). Herein lies the issue of participation as conceptualized by Chambers, and much of the development apparatus. The notion of participation and empowerment is based upon a harmony of power, implying that the empowerment of the powerless in a community could be transformative without a significant effect on the powerful (Mohan and Stokke, 2000). When spelled out like this the fallacy appears starkly obvious. Indeed Kapoor (2005) goes as far as to suggest that to believe that this is possible is 'the product of self-delusion' (1209).

The very notion of consensus is a problem that overlooks community tensions and power struggles (Kapoor, 2005). Local power hierarchies, personal project interests and other dynamics make the transformative nature of participation far from achievable (Mosse, 2001). The notion that communities are homogenous lies at the heart of these issues (Sinwell, 2012). For example, elite members of the community will often play a significant role in the facilitation of a participatory project, be this by design or influence, and furthermore those with power often do not feel tied to the decisions made, even though consensus, a factor often ignored by practitioners (Platteau and Abraham, 2002; Nustad, 2001). Even when power is challenged, it is clear that there is a very real danger of new patterns of domination forming (White, 1996).

These power issues also extend to the institutional level. To start, many institutions that may be sought to implement participatory development models are vertical in nature, and not conducive to horizontal frameworks (Balit, 2012).

Furthermore, although they would rarely admit it, they too do not wish to relinquish power to communities (*ibid*.). Even on the ground, the facilitator of the participatory process is compromised by their own power and bias. Power is of course tilted in favour of the convener, they after all select the time, location, purpose, and agenda for the meeting (Kapoor, 2005). This can lead to participation which is nominal, particularly for those already on the periphery – often women – or which is instrumental, serving the needs of the outside donors (White, 1996).

The public nature of these participatory exercises, placing great emphasis on transparency, further compounds these problems. Foucault's panopticon becomes useful here. In the full light of the community, donors, facilitator, and local elites, it is all but impossible to speak up for your own needs, or those needs that appear to contradict the power exerted by these forces. The community becomes self-policing (Kapoor, 2012). If a challenge is placed, the process of bringing about consensus can lead to deep divisions, fracturing communities into warring factions over the terms of the project (Platteau and Abraham, 2002). These complex relations take time to untangle, and thus the process is slow, taking much longer than the typical 3-5-year project plans of many development agencies (Platteau and Abraham, 2002; Balit, 2012).

Furthermore, some have suggested that participation was fostered specifically by the Bretton Wood institutions in order to give the illusion of self-rule, while using this to suppress the population (*See* Leal and Opp, 1998; Rahman, 1995). While this was seen in the British Empire, this is perhaps a conspiracy too far, there are already enough underlying, subconscious, structurally and institutional colonial aspects to many participatory projects for them to fail without the need of a conspiracy. The image presented is one in which the grassroots flourishes through careful facilitation,

allowing for a full involvement of the people (Nustad, 2001), but without a shift in power, towards something more palatable (Nelson and Wright, 1995), little can change.

Participation is not just a trend, it has become an institutional brand (Kapoor, 2005), and thus is it not possible to dismiss it entirely because of the fallacies noted above. Instead, some truths must be understood. Firstly, that the notion of participation is fraught with dangers and can be easily co-opted by different stakeholders and actors for personal gain, and that the whole process is inherently political (Mohan and Stokke, 2000; Cornwall, 2006). Furthermore, while participation and empowerment are seen as developing agency from below, it needs to be acknowledged that this is still facilitated by power from above, and that levels of participation decline without this top-down intervention (White, 1996). Building from this, it is important to realize that not only do the facilitators of participation hold the power, but this power is also born of a previous age. Talk of actor and agency, empowerment, and political agency, hark back to the 1960s and 70s and the continuing discourse of mobilization still embodies 1990s thinking (Cornwall and Nyamu-Musembi, 2004). Amidst concerns of indirect rule by another name, the term Participation has become what Chambers (1998) feared, a catch-all category, that produces a *feel-good* experience, but which fails to see its own behind the scenes stage management (Kapoor, 2005). Participation should, say Hickey and Mohan (2005) be part of a project to 'directly challenge existing power relations, rather than simply to work around them' (p.168), yet this ideal still feels very distant.

This failure is often seen at the stage of codification of knowledge. Codified knowledge is often seen as a polar opposite to tacit knowledge, being expressed as it is, through formal systematic language and shared through data, scientific formulae,

specifications, manuals and the like. In development terms this often takes the form of statistics, reports, and recommendations (Tomlinson, 2002). This opposition is not as polarized as often portrayed, and knowledge is rather created through a process of tacit knowledge being codified. What then is codification? For Latour (1999) it is a process of translation, not from one vocabulary to another, but rather a displacement, drift, invention, mediation, or creation of a link that did not exist before, that together produce new knowledge.

This kind of translation is seen most explicitly when working with indigenous/tacit knowledges, typically born from a close connection to the land and environment, and a shared experience of colonialism. While this knowledge might well be being translated in order to seek a sympathetic and in-depth appreciation of the indigenous knowledge, the reading of indigenous knowledge is often a construct of the planning context behind a project and is confused within a 'micro-politics of knowledge' (Mosse, 2001, p.387). It undergoes a process of being linked to scientific knowledge ensuring can be enumerated and demonstrated to be 'useful' (Renes, 2014; Sillitoe, 1998; Patel *et al*. 2012).

Furthermore, through the translation (codification), these knowledges undergo a further level of mobilization bias, with some knowledges being declared as more valid than others (Gaventa and Cornwall, 2008). This has been particularly so with indigenous knowledges, which until recently have been considered inefficient or outmoded (Sillitoe, 2000). Yet even with a shift towards the recognition of indigenous knowledge as legitimate it still requires brokering and remains distorted through stereotyping and prejudices (Hall, 1981; Sillitoe, 1998). The question becomes, how can particular moments of struggle or locally understood demands be institutionally articulated? (Bratsis, 2003). How might a meaningful facilitation of communication

between scientific and local knowledge be established, particularly in the development discourse? (Sillitoe, 1998; Sillitoe, 2000)

Perhaps a couple of concrete examples are required to solidify the issues of codification, beginning with one based in a geographic understanding of knowledge. Many indigenous peoples are well aware of the environmental conditions of their location, understanding the growing seasons and the types of soils and crops that might be cultivated (Nygren, 1999). Yet despite the growing ability of people to map and create maps of places themselves, it is likely that asking most people to map soils would be near impossible (Goodchild, 2009). The specifics of the soil types, the classes and subgroups are beyond the knowledge (and interest) of most people. So, despite an extensive tacit knowledge, the local community are not able to codify this knowledge into something scientific and enumerated. As development work becomes increasingly data driven information about those soils is needed in a quantifiable format. At this point scientists are brought in to map the territory and its soils, to produce a map of what the locals already know. This codified knowledge of the area is then used to delineate the development aid provided. And this occurs despite Goodchild's (2009) assertion that two soil scientists are unlikely to produce them same map as each other due to the complexities, and of course no geographic data can be perfect (*ibid*.). Yet because of the emphasis placed upon the scientific, the maps are taken as gospel, and the local knowledge is further marginalized and seen as rooted in superstition (Nygren, 1999). A starker example comes from Zambia, where the World Bank praised the privatization of the public health system, citing the reduction of queues at hospitals as a sign of success. This reduction of queues though, according to the Zambian Post, are because 'now people die at home' (Alejandro Lead, 2007, p.541).

The problem then is that codified expertise is really about using inaccessible tools and data to speak *for* others, rather than being based upon a lived experience (Gaventa and Cornwall, 2008). But this still doesn't help with the question so often put forward. Who is indigenous? Whose knowledge counts? (Renes, 2014; Chambers *et al.,* 1979). The contradictions are deep and complex. There is a notion that scientific knowledge has something to contribute to development, else we may be accused of kicking away the ladder (Chang, 2002). At the same time, local knowledge needs to be conveyed in a way that is understandable, but which also respects its tacit nature. This is a gap that is hard to bridge, particularly in relation to environmental indigenous knowledge (Sillitoe, 1998; Compton, 1989; Coletta and Raftopoulos, 2016). The way to move forwards is perhaps to see knowledge relationally, as a product of social relations, and not as something fixed (Mosse, 2001); to include a wide range of knowledges and to see them as equally legitimate and necessary for their own tacit nature, and also to understand that this tacitness may be a weakness. Yet, as noted earlier, the disincentives for, and barriers to, adopting participatory approaches are numerous (Mosse, 2001).

3.3.1 Legitimization

A quick examination of the projects funded by the UK's Department for International Development over the last 2 decades shows how important the role of local knowledge is in the design of imminent development projects (Sillitoe, 1998). Yet as seen, the transformation of this knowledge from local to institutional is problematic, and the way in which the State, and non-state actors, manage the mix of indigenous knowledge and development ideologies is complex, but ultimately revolves around the State's stranglehold on knowledge through choosing which knowledges are

legitimate (Lefebvre, 2009). These legitimations are codified through the representations of knowledge drawn from identities, nationalism, and power, arching back across 2000 years (Said, 2000), and those who do not easily fit within the State's conception of legitimate are marginalized by development, regardless of any participatory aims (Williams, 2004). Again, we return to Foucault (1980) who questioned what types of knowledge are disqualified in the name of science, and how this diminished not just the knowledge, but also the creators of that knowledge. There is still the overarching assumption that it is experts, and most notably economists who are best placed to advise on policy and development plans which are then imposed upon the other (Sillitoe, 2000).

This is a particularly acute problem in relation to indigenous knowledges, for which the interpretation and assessment alongside scientific knowledge has repeatedly failed to find an interface, but instead has been marginalized purely by holding it against science as different (Sillitoe, 1998). Western science still struggles to deal with the communal form of indigenous and some local knowledges based on relational ontologies which do not externalize nature (Coletta and Raftopoulos, 2016).[9] One of the main struggles in the relationship between these knowledges is that indigenous knowledges are fragmentarily distributed and exist nowhere in totality, no one place or person encompasses it all as there is no grand repository (Sillitoe, 2000).

Here then we see the link to technologies. Is the role of technology in development not an attempt to collate the knowledge in one place, into a grand repository? This too presents a contradiction. The codification of indigenous and local

[9] For example, 'natural scientists find it difficult to comprehend how belief in demon fish lurking in lakes and the practices of Hindu puja rituals to the Druga and Gonga deities can have any relevance to their work, while these intimately inform the understanding and practices of Bangladeshi fishermen' (Sillitoe, 2000, p.4).

knowledge through digital artefacts means it becomes subjected to all the issues discussed above of colonial and neo-colonial subconscious twisting. Yet at the same time, because it is now presented in a form that makes 'scientific' sense, it has become legitimized and more likely to be included in the project. Does this mean greater participation, or even greater marginalization? Of course, the vision of using new technologies for the good of humankind has always existed (Tufte and Mefalopulos, 2009), but is it possible to record and document indigenous and local knowledges in this way, and does it legitimize them? McCall (1995) suggested that it was necessary to abandon the project of packaging up knowledges and passing them to other parties for consumption but was writing long before the pervasive use of digital tools in development for the purposes of collection and codification of knowledge.

Our new modes of development, and governance, are built upon 'algorithmic regulation' (Morozov, 2014), and technology is used to legitimize knowledge through all kinds of methods. Two which are striking are peer exchange and participatory models. Peer exchange is used to legitimize community knowledge by sharing it with other regions and countries, applying enumerated solutions to places, and when they work the previous knowledge becomes legitimized, and when they do not, that knowledge is discarded, regardless, or in spite of, regional differences (Patel *et al*. 2012). The second legitimization, which is connected, is the fallacy that collective knowledge, or crowdsourced information is likely to be more accurate than that created by individuals (Goodchild, 2009). This is often expressed as truth within VGI projects drawing together thousands of data points to create better maps, blurring the line between expert and amateur map makers, and allowing for the expression of other knowledges (Goodchild, 2009). But questions still remain about how

legitimatizing or inclusive these projects, based upon the power of sharing really are (Heimans and Timms, 2014).

It has been accepted that more consultation needs to take place with beneficiaries of development aid (Sillitoe, 2000), but what is still missing is a true understanding of indigenous knowledges. Thus, these knowledges are always seen as less legitimate than western science, even when they are being romanticized (*ibid*.; Sillitoe, 1998). The issue becomes the constant seeking of universalism of knowledge through the western discourse, which while understanding that universal applicability is a fallacy, still struggles to understand the non-liner nature of alternative knowledges. This leads to deep ethnocentrism (Rose, 1997; Sillitoe, 1998) and certainly fails to include a constant re-evaluation and change (Lefebvre, 2009). These issues are hard baked into the notion of legitimization (Forester, 1982). Local knowledge is still collected for the benefit of bureaucracies, and an in-depth knowledge of how to communicate these multifaceted knowledges is still sorely lacking (Mosse, 2001; Quarry, 2008).

These issues of legitimization are compounded by the small number of actors and gatekeepers through which knowledge passes. The knowledge which so greatly affects people's lives is held in the hands of a monopoly (Gaventa and Cornwall, 2008), a situation that often forgets or ignores the importance of knowledge in relation to who created it (Rose, 1997). So, while there has been a significant rise in the level of participation within development (Tufte and Mefalopulos, 2009), the power of the knowledge ultimately rests with the planners, the technicians, and western scientists (Forester, 1982). This situation leads to participation itself being damaged as a true participatory model would eliminate hierarchies of knowledge. This is not achieved though present models of codification as stakeholders are not engaged from the

outset and fail to be brought into projects (Tufte and Mefalopulos, 2009). Rather the project is still guided by the influence of international donors and domestic policies which act as gatekeepers in the legitimization of knowledge (Mosse, 2001). 'Teachers', Renes (2014, n.p.) reminds us, 'should not be the gatekeepers for student voices, and once we suppose we are, we miss half the conversation'. Is the same not true of development workers? Goodman (2010) put things more harshly in his essay on *Freedom and Autonomy* when he stated that 'men [sic.] in authority are especially likely to be stupid because they are out of touch with concrete finite experience and instead keep interfering with other people's initiative, making them stupid and anxious' (p.58).

However, to only look to the big players is a mistake as it must be also acknowledged that there is a multitude of 'minor' figures at all stages of codification and legitimization who all play a part in the skewing of knowledge (Lorimer, 2003). The attempts of Development to defer to indigenous knowledge to redress power balances still draw upon positivist, reductionist, mechanistic and standardized models that allows for this skewing (Mosse, 2001). To broadly blame development officials though would not be helpful (Williams, 2004). Rather it must be acknowledged that power exists in a form of micro politics at every stage of the production, codification, and legitimization of knowledge (Gaventa and Cornwall, 2008). Therefore, power must be discussed in detail in relation to knowledge.

3.3.2 Power and control

It has been established in the last paragraphs and through this chapter that power is not something that might be possessed or measured, but is rather a set of relationships (Miraftab, 2004). The word power though, even under this definition is

contentious, and can also be seen as rather threatening in the development context due to its multifaceted understanding (Eyben *et al*. 2006). Power though, is perhaps at its heart defined best by British Philosopher Bertrand Russell who termed it simply as 'the ability to produce intended effects' (*Cited in* Heimans and Timms, 2014, n.p.). In this respect we might consider power as a capacity – a Weberian conceptualization – something that changes the status quo, and which is formed through patterns of social relations (Eyben *et al*. 2006). Power though is not held in just some specific places or by some specific people, rather it permeates and characterizes the whole of society (Foucault, 1980). One of the ways in which this permeation happens is through the crediting or discrediting of different knowledges, as noted previously, which increases the hegemony of certain power structures at the expense of others (Sillitoe, 2000).

Here the dimensions of power, as discussed by Lukes (1974), and built upon by Gaventa become of use. Lukes (1974) challenged the traditional view in which power is understood as a relationship of one over another, stating that, knowledge is a resource, used and mobilized to inform decision-making on key public issues – issues of who produces knowledge, or its impact on the awareness and capacity of the powerless are less important. Lukes also asserted that power operates to prevent grievances from entering the political arenas, and that the exercise of power must involve conflict between the powerful and the powerless (Gaventa and Cornwall, 2008). The powerful use control over the production of knowledge as a way of setting the public agenda, and for including or excluding certain voices and participants in action upon it (*ibid*.).

Building on work by Foucault (1977) others have come to see power more as productive and relational. In this view power becomes a multiplicity of force relations that constitute social relationships. Power exists in all spheres, rather than being

exerted by one individual or group over another. Power and knowledge rely directly upon one another, there is no power relation without the correlative constitution of a field of knowledge nor any knowledge that does not presuppose and constitute at the same time power relations.

These notions of power are also intrinsically linked to the notion of space. Particularly in the field of critical geography, space is seen as the apparatus through which hegemony is created and through which notions of the 'other' or subjugation are formed (Allen, 1999). The fundamental way of controlling people, ideas, or knowledge is to possess control over the space which they occupy. This notion becomes fundamental in a world in which the hegemonic discourse is one of territories of people and knowledge, all of which are bounded by numerous laws, models, modes, and constructs (Sewell, 2001). Space is what gives us the ability to see the world, but when this space is bounded and controlled by elites such as scientists, planners, urbanists, technocrats and policymakers, these spaces become hegemonically orchestrated and institutionalized and do not allow for the legitimizing of alternative narratives, knowledges, or conceptions of space (Foucault, 1972).

There have been attempts to conceptualize these spaces, with the term space beginning a journey of redefinition in the 1990s, but as will be seen in the chapter on technology, these spaces are still bounded by old modes of power, and these spaces are still very much controlled, or territorialized (Allen, 1999). Information helps to challenge these power models (Jordan, 2015), and the use of technology has been useful in these challenges, potentially increasing human agency (Heimans and Timms, 2014). As information and technology come together to expose power, some see this as a direct challenge to hegemony in and of itself (Eyben *et al*., 2006). To take this to its logical conclusion, if technology and information increase to allow more people to

join the challenge to present power structures then things could be done very differently (*ibid*.).

Chambers (1998) always advocated for a position in which power could be used as a counter narrative to empower those who were seeking help and to increase their stakes in life. This notion is supported by Forester (1982) who called upon planners to understand relations of power in order to improve their analysis and to empower communities. Yet, the status quo remains 30 years on. The ultimate form of control and power remain the prohibition of space (Lefebvre, 1991). These conceived spaces, or representations of space, refers to the socially constructed discourses, signs, and meanings. Conceived space is 'tied to the relations of production [and reproduction] and to the *order* which those relationships impose, and hence to knowledge, to signs, to codes' (Lefebvre 1991, p.33) In a phrase, [the bourgeoisie] creates a world in its own image (Marx and Engels, 1848/1998).

3.3.3 Empowerment and representation

One of the ironies of these power structures is the way in which they are held up by notions of empowerment and representation. At first this seems like a harsh and perhaps unfair contradiction, surely the logical implication is that to overturn oppressive states, regimes, and programs the way forwards is empowerment (Alejandro Lead, 2007). First, it is important to address what empowerment is, or at least what it is meant to be. It is seen as the process of gaining self-control, over an ideology, and over the resources that determine power (Quarry, 2008). It is where primary stakeholders are given power and control and produce joint decisions, are seen as equal partners and take ownership of their own lives and political actions (Tufte and Mefalopulos, 2009). For Chambers this is about participation (Williams,

2004), while for the World Bank the use of the words empowerment, self-reliance, and participation have played into its now populist rhetoric (Alejandro Lead, 2007, p.542). In the development industry the notions of participation and development are very much seen as being outside structures of oppression and control, but instead are seen as something that strengthens individuals' sense of worth and esteem and their ability to negotiate and hold accountable the institutions that control their lives. But by seeing this as outside of the apparatus, it does little to challenge to status quo of power (Tufte and Mefalopulos, 2009; Miraftab, 2004).

Unable to accept those issues the development industry moved to create new interpretations of the concept. Principal among them is the idea of power as something which could be *given* by the powerful to the powerless. Of course, as noted through the works of Tandon (1996) this is highly problematic. Empowerment, disassociated from the broader societal issues that generate poverty and disenfranchisement, is reduced to sharing in the cycle of development projects; but, as White (1996) notes, 'sharing through participation does not necessarily mean sharing in power' (Alejandro Lead, 2007, p.545). If empowerment, as Guijt (1998) states, is about the transformative capacity of people or groups, and there is no collective analysis of the causes of oppression or marginalization and what actions can be taken to confront and affect those causes, then any efforts are unlikely to be empowering. Genuine empowerment is about people seizing and constructing popular power through their own praxis and then continuing to push further. Power is not handed down from the powerful to the powerless, as institutional development has conveniently chosen to interpret the concept (Alejandro Lead, 2007). 'Freedom is acquired by conquest, not by gift' (Freire, 1970).

There is a way out, a way of reimagining participation as open-ended in which the consequences of participation and empowerment are not predetermined and in which new spaces are created outside of the territorialized spaces of the dominant power structures (Miraftab, 2004). A mode of empowerment that does not produce conceptualizations of the Third World that are bound up in authority, and negative representations and in which the dangers of our own position within powerful institutions is understood (Rose, 1997). There are of course benefits to participation, but its failures are mixed up in a lack of understanding of the liquid nature of power and limited understandings of the local context (Tufte and Mefalopulos, 2009).

Empowerment then should be seen as relative, building on previous power structures, and allowing for development projects to have their own trajectory (Williams, 2004). These goals need to move away from producing bounded localized spaces of liberation, but towards a network of deterritorialization (*ibid*.; Nunes, 2015). In this process, direct involvement of outside researchers seems inappropriate (Sillitoe, 1998), else feelings of empowerment may well come at the price of reinforcing anti-democratic dimensions of liberalism and push people towards neo-liberal forms of representation and power, which ultimately work to marginalize the knowledge and power of the very communities it suggests it is empowering (Miraftab, 2004). Both representation and empowerment have very frustrated relationships with reality (Kidd, 2016). So, what then of those who make their own reality, who produce a counter power from below?

3.3.4 Counter power

Participation was long seen as the counter-power to hegemonic power and as a tool to radically transform society, but this is rather an oversimplification, which has

been put forward by agrarian populists (Mosse, 2001). Counter-power is a much more complex phenomenon (Alejandro Lead, 2007). Counter-power needs to break with the old modes and structures in order to create resistance and alternative narratives. This can be done in numerous ways, but a significant step is in the analysis of power at every level and in every situation, and through an understanding of the social production of the spaces of power (Abu-Lughod, 1990; Williams, 2004). This diagnostic approach to power can help us to detect shifts in power, and the lack of change (Abu-Lughod, 1990). This kind of inversion then can lead to an inversion of power by acting as a catalyst for bringing to light power relations, locating them, and drawing modes of change to the fore (Foucault, 1982).

This action can then bring around a process of creating holes in the fabric of the state and hegemony through democratic insurrection (Murray, 2010). This kind of insurrection is less about becoming what one is – that is to become human – but it is about becoming what one is not, a process of rejecting the internalized domination and actively seeking appropriation of potentiality (Deleuze and Guattari, Cited in Murray, 2010). This would follow the Foucauldian notion that subjugated knowledges, or the subaltern to utilize Spivak (1988), can move from spaces of disqualification, but not through an attempt to move into the spaces of dominant hegemony, but rather through the process of deterritoralisation and the creation of new spaces for power and knowledge (Foucault, 1980). The process of making the unseen visible is an important first step, and provides a historical basis of value (Spivak, 1988). Proponents of new power echo these thoughts, suggesting that the more we shine a light on people and their knowledges the better the world will be (Heimans and Timms, 2014).

Without yet entering the debate on privacy, we have seen this develop through increased gathering of community grassroots knowledge and information by

governments and development actors, an idea that is also put forward by those advocating the advances of digitals tools and the networked society (Nunes, 2015). But this is to little avail in terms of creating counter-power, and merely links these knowledges to pre-existing power structures (Patel *et al*. 2012). While it is necessary to open up conversations to include new voices and new perspectives, it must also be noted how these will be skewed by existing power models (Gaventa and Cornwall, 2008). For example, the Ch'orti'[10] are particularly conscious of what their development should look like. They have long resisted a mega dam as they see it as a dangerous start of a much larger project that seeks to connect the Atlantic and Pacific Oceans. This project would comprise a road, railway and oil and gas pipelines running through their communities in Chiquimula, Guatemala. The creation of additional sources of electricity would therefore only be the first step in development of the region, preceding the construction of massive infrastructure and the growth of the extractive industries. They can see little promise for their traditional way of life and their ancestral lands should these projects come to pass (Berger *et al*. 2015).

While this kind of insurrection opens new possibilities for action and organization, promotes the free transformation of individual and collective subjectivities through political action, and provides a means for global collective action, it faces a number of limitations. A lack of equitable participation is an issue. Local organizations and individuals, as well as those with the time and resources to travel, typically white activists from the Global North, are often disproportionately represented (Murray, 2010). It often becomes the case that the more participation

[10] The Ch'orti' people are one of the indigenous Maya peoples of south-eastern Guatemala, north-western Honduras, and northern El Salvador.

there is, the more the power structure of local communities is masked, and the more disempowering the process can be.

Kothari (2002), Ferguson (1994) and Kamat (2004), have shown how grassroots participation in development processes rarely differ from or challenge the development practices of the state. Gramsci (1971) terms hegemony 'the consent given by the great masses of population to the general direction imposed on social life by the dominant fundamental group' (p.12). Participatory development projects then by 'incorporating the marginalized in an even more distant clustering of power, undermine their resistance' (Nelson & Wright, 1995, p.11). The grassroots reproduce and engage in similar relations of power, what occurs displays the hegemonic power of the oppressor, not the empowerment of the oppressed (Miraftab, 2004). This level of participation does not usually result in dramatic changes in what should be accomplished, which is often already determined.

Participatory development has become the dominant discourse, but it is by no means the same as counter power, or counter narratives (Williams, 2004). And while this section on counter-power might seem very pessimistic, it is really pointing to the idea that we must go beyond the notion that where there is power there is resistance, and that we must realize that resistance is also bound up in the same territories of power (Abu-Lughod, 1990). True insurrections overlap, are superimposed upon and unbind the borders of these territories, something which technologies and the network society may be moving us towards, but which we must remain cautious of (Murray, 2010). We should not forget at this stage the work of James Scott (2008), who so clearly showed us the ways in which insurrections can occur within and without alternative powers (Williams, 2004). People can, will, and do take control of their own resources and public spaces, pressing their claims (Sewell, 2001) and the

ability to participate effectively is expanding. The participation of these knowledges and peoples though in the development context still requires a full deconstruction of the definitions of what is important and the asymmetrical control over the codification and legitimization of knowledge (Gaventa and Cornwall, 2008). A study of resistance, counter-power and its interactions with hegemonic power though helps us to move towards building power structures and spaces (Abu-Lughod, 1990), and it is through these methods that it might be possible to develop a true reciprocity knowledge system (Murray, 2010).

3.3.5 Summary

The central challenge for theorists and practitioners of development today is to develop forms of action and organization that consider the diversity of local struggles and promote the free transformation of individual and collective subjectivities through political action, but also provide the means for collective action on a global scale (Murray, 2010). Local knowledge reflects local power and there is a need for greater understanding of knowledge and the relationship between knowledge and place in development because they have very real consequences for development practices (Mosse, 2001; McFarlane, 2006b). The translation of ideas and practices, as opposed to their transmission, is likely to involve people moving to and through *local* contexts, to which they bring their own blend of tacit and codified knowledges, ways of doing and ways of judging things (Allen, 2000). Knowledge translation involves mobile forms of information as much as it does proximate relationships. Subjugated and critical knowledges work from their situatedness to produce partial perspectives on the world. They see the world from specific locations, embodied and particular, and never innocent (Rose, 1997). Mosse (2201) challenges the populist assumptions that

attention to local knowledge through participatory learning will redefine the relationship between local communities and development organizations.

Yet, local knowledge, far from determining planning processes and outcomes, is often structured by them (Cooke and Kothari, 2001, p.8). Moreover, empirical, quantitative forms of knowing may reduce the complexity of human experience in a way that denies its very meaning, which reinforces the status quo by focusing on what is, rather than on historical processes of change.

There also remains the issue that *legitimate* knowledge still rests largely within the hands of privileged experts; dominant knowledge obscures or under-privileges other forms of knowing, and the voices of other knowers (Gaventa and Cornwall, 2008, p.74). While the different paradigms cannot be reconciled, it should be possible to devise a methodology for the exchange of knowledge across the gap (Sillitoe, 2000). Most organizations recognize that the nature of power is changing. But relatively few understand the keys to influence and impact in this new era (Heimans and Timms, 2014). In the current multicultural milieu, the concept of hegemony is crucial to disordering oppressive rationalities, logocentrisms, and knowledges of control (Allen, 1999). These concepts become increasingly important in a world in which technological determinism has seemingly gripped the development industry, leading to a proliferation of technologically driven modes of implementing post-Development, participation, and inclusive development practices. The following chapter will chart this rise and the issues that have come with this.

3.4 Technology

We are in the middle of a revolution, or so the mantra goes, the world has been reinvented through digital technologies and media (Gladwell, 2010). Data is at the heart of this revolution, and this revolution, according to the UN Secretary General's report *A World That Counts*, is a revolution for equality (Satterthwaite, 2015). ICTs have, and will continue to, change the world through knowledge sharing and codification (Hendriks, 1999). Increased computer penetration and ever-increasing speeds of internet access are transforming the world into an e-society, improving the health and wellbeing of all whom it embraces (Fife and Pereira, 2008). Tim Berners-Lee's vision of a connected world with easy knowledge sharing for the benefits of humankind seems within grasping distance (O'Hara, 2004). Technology is already playing an increasingly large role in the way in which we both understand, but also create the world around us. These technologies facilitate the ongoing globalization of space and shape the local through the accumulation of technology and techniques in society, leading to a situation in which space is not only homogenized (and global), but always fragmented as well (Kirsch, 1995). For Lefebvre (1991), technology has been increasingly influential in society, through its production of space and these ideas have huge implications for the development sector, where real time data is an increasingly important part of the design, implementation, and measurement of project success, both creating and pursuing the growing diffusion of ICTs in the developing world (Heeks, 2014*a*; Burns, 2015). Big data, geographic information systems, new data collection methods, algorithms and machine learning are leading to new epistemologies within the digital and development sectors, which are having a dramatic effect on the restructuring of space and time (Burns, 2015; Elwood, 2006; Kirsch, 1995; Mundial, 2012). There are dangers in representing technology as the

engine of social change, but there are also dangers in reducing technology to a neutral, tool-like application of scientific knowledge (Kirsch, 1995).

The study of technology only became significant at the end of the 19th century (Dusek, 2006). The majority of the ideas that now influence the philosophy of technology were developed during the 20th century (Feenberg, 1999). Even the word *technology* gained its current sense only at the beginning of the 20th century (Marx and Engels, 1848/1998). Feenberg (1999) noted, that 'the human significance of technology is largely unmapped territory' (p.1) and thus sought to identify four streams of thought on technology and its links to society. These were instrumentalism, determinism, substantivism and critical theory. The deterministic view follows the ideas of Karl Marx and Charles Darwin, suggesting that technology has its own evolution independent of humans (Haklay, 2013). Hence technology is viewed as neutral and an extension of nature outside the political realm. The substantive view, by contrast, made clear that technology has political implications, and this is very much the view taken by this thesis. Technology is seen as autonomous, but not a neutral force, rather as one that maximizes economic output.

This chapter aims to explore how technologies have changed our relationships with time and space as well as how they are used to codify and explore knowledge within the context of the development sector. It will unpick how technology is used to frame, fabricate, mislead, and interpret situations (Tkacz, 2013), and seeks to establish the extent to which these technologies are being used and deployed in the development sector, and their effect on knowledge codification.

3.4.1 Technology as a cultural product

Technology has, of course, always been an important area of research for sociologists, it has long sat beside fields of power, class, and ethnicity, but in the 1990s it took a new and bold shift incorporating the *sociologies of scientific knowledge* (SSK), drawing upon this epistemology to build a broadly social constructivist notion that technologies are as much shaped by society and society is shaped by them (Hutchby, 2001). It is clear that we are still in the throes of this shift and competing sociologies and epistemologies are vying for space, it is also clear that we have moved a great deal beyond the writings of Heidegger and Marcuse (Dumbill, 2013; Feenberg, 2005). There is something very new about the information age, an age that has seen computational capacity grow from 730tera-IPS (instructions per second) in 1986 to 196exa-IPS in 2007 (roughly $2x10^{20}$ Instructions per Second[11] (Hilbert, 2013). Of course, technology and knowledge have always been important, but the ability to generate, sort and codify knowledge though technology exists in a way never seen before (Castells and UNRISD, 1999). The affordances offered by this shift are not insignificant (van Dijck, 2011), but also call into question how our new digital traces are viewed, shared and how these might not just trace our lives, but how they might reconfigure our relationship with the world (Neff, 2013).

Latour in his work on nonhuman actors touched upon these technological questions as he developed his actor network theory. As the technological increasingly mediates society, the interconnections of humans and non-humans become increasingly complex (Kirsch, 1995). The idea that this is a simple transformation is though clearly a myth (Jordan, 2015). The appropriateness of these technologies to

[11] A number 500 times larger than the number of seconds that have passed since the big bang.

carry out this mediation is a complex issue, as they are designed by people with various degrees of understanding of sociology and technologies (Haklay, 2010b) and are positioned within western scientific patriarchal capitalism (Kirsch, 1995). When it comes to the world as experienced by humans, objects and their values can also be tied in with complex sets of concepts and conventional rules governing their use, so there is an important sense in which we can, and indeed must learn about some of the affordances that certain things offer (Hutchby, 2001).

Affordances are functional and relational aspects which frame, while not determining, the possibilities for agentic action in relation to an object. In this way, technologies can be understood as artefacts which may be both shaped by and which shape the practices humans use in interaction with, around and through them (Hutchby, 2001).

If the innovation, integration, and stabilization of a technology in society are processes moulded by the actions of scientists, workers, capitalists, commuters, and mayors, and thus a wide range of social contingencies, then where does society end, and technology begin? Theoretical analyses have constructed a divide which places humans on one side and their technics on the other, thus representing an artificially folded society (Latour, 1987), Conversely, Latour offers a process-oriented definition of high-technology as a complex and dialectical association of humans and 'nonhuman actors'. In Latour's (1999) words, high technology is ‘a shifting network of actions redistributing competencies and performances either to humans or non-humans to assemble in a more durable whole an association of humans and things and to resist the multiple interpretations of other actors that tend to dissolve away the set up’ (p.5). Technology, in this light, is a means of eliciting specific ends, but one which is always open to interpretation, resistance, and change (Kirsch, 1995). In choosing our

technology we become what we are, which in turn shapes our future choices (Feenberg, 1991).

3.4.2 Mobile devices

Mobile phones have increasingly been seen as a rich source of data in the development industry (Kirkpatrick, 2013), and the growing number of people using mobile devices has led to a great deal of optimism and speculation regarding their effect on economic and social development (Archambault, 2011). These highly portable systems bring together a range of technologies under one roof, often including GPS-based programmes and applications (Adams and Jansson, 2012). Many mobile media also support information exchange by voice, text, SMS, audio, or video; multimedia content; location awareness; and other services, either directly or through social networks or services (Martin, 2014, p.175). Mobile media allow for users to control the stream of information from news and social contacts and to subsume it into daily life in real time in ways that accelerate political information consumption, production, and exchange (Gordon *et al*., 2013). This multifunctionality, communication power and ability to disseminate information has seen a huge spike in the number of digital applications designed to solve development issues; everything from sanitation to education (Chhabra, 2014; Steyn and Das, 2015). This comes at the same time as puzzlement in some quarters about how such technologies have risen so quickly in areas that are better known for their socio-economic desperation (Archambault, 2011).

This seeming contradiction has not reduced the enthusiasm with which the potential of mobile development has captured the imagination of the development sector, with universal access to such devices being both an objective of the sector and

a solution to many of the developing world's problems (Archambault, 2011). This enthusiasm is driven further by several high-profile successes in implementing mobiles in disaster relief to reduce loss of life significantly (Kleine *et al*., 2014). It has also been shown that SMS-assisted birth registrations have been of great help in providing support for new-borns, reducing infant mortality rates (Samson and Cherrier, 2009). Projects too in the developed world have shown promise, the US Centre for Disease Control and Prevention also collects mobile data to map and predict outbreaks (Wall, 2014). Mobile devices, unlike many other technologies, are always on, location aware and also contain multiple sensors, such as the camera and microphone, and thus are hugely powerful in terms of data harvesting and collection (Tene and Polonetsky, 2012; Wall, 2014).

Beyond their use for data collection, mobile devices are also seen by many as being able to support coping strategies through shared experiences and exchange (Archambault, 2011). Mobiles have become increasingly important in terms of accessing and sharing political information (Martin, 2014), and furthermore, the interactive nature of these technologies also allows citizens to generate and disseminate their own political options, news, and information in a way that facilities interactions like never before (*ibid*.). However, the idea that mobile phones have the potential to contribute to socio-economic development by facilitating the circulation of so-called useful information has been challenged by a number of recent case studies that highlight local dynamics of appropriation (Archambault, 2011).

The issues in placing such high expectations on mobiles for development are multifaceted, just as they are with many other technologies. One significant factor, which will be discussed in detail later in the chapter, is the persistence of inequality of access, despite the ubiquity of mobiles even in the most remote areas, which has

significant hindering processes in relation to the democratic potential of mobile devices (Shum *et al*., 2012; Rojas and Puig-i-Abril, 2009). The problem to be addressed here though is that which is born of the enthusiasm itself. The most cited paper on mobile devices and development concerns the work of Jensen (2007) who wrote on the use of mobile phones by Kerala fishermen, suggesting that they used mobile phones to improve their economic situation[12.] This was shown later to be wrong, but the paper generated much interest, and it continues to be cited heavily. This is significant, not because of the failings of the original research, but because it illustrates the ease at which the development, and academic, sector is willing to blindly believe results that support an agenda in relation to mobile technologies. This kind of technological determinism masks the heterogeneous nature of telecom subscriptions (Hilbert, 2013), the way in which data collected from sensors can only ever give a partial picture (Wall, 2014), and that for all the excitement, at the end of the day, you cannot eat data or a mobile phone (Satterthwaite, 2015).

The argument has been made that mobile technologies may save Africa, and the developing world as a whole (Archambault, 2011), and certainly mobile technologies have raised the profile of and demand for location-based technologies which opens up a whole new space for development (Sheehan, 2015). Moreover, the data that can be collected within these spaces and the way in which it can be linked to sites and individuals means it offers a potentially very powerful tool in understanding vulnerable populations (Mundial, 2012). However, considerably more work is needed

[12] This widely cited paper suggested that the Kerala fishermen use mobile phones to check market prices, and that by doing so they were able to increase profits, leading to a stronger local economy. However, the paper has been repeatedly debunked, with Steyn and Das (2015) finding significant issues in both the conduct of the original research and the findings themselves when they attempted to replicate the research (*See also* Faith, 2015). Factors such as the use of two-way radios and lack of phone signal were ignored in the original research, due to what Steyn and Das suggest was an attempt to apply capitalist economic models onto a cooperative society.

to better explain the relationship between mobiles and development. Much of the research available bundles mobile use in with other things, such as social media Instead a more nuanced approach to these technologies is required in order to avoid the pitfall of determinism and to understand how they aid and hinder the codification of knowledge and the participation of people in their political spaces (Martin, 2014). This is a theme that will run throughout this chapter as each technology meanders its way through this epistemological minefield.

3.4.3 The role of ICT4D

Within the development industry the growth of globalization and the way in which this has been reflected by the cross-boundary flows of the ICT sector has given rise to the notion of Information Communication Technology for Development, or ICT4D (Heeks, 2014b; McLennan, 2016). This expansion of the role of ICTs in development practice has also been fuelled by the idea that ICTs might be effective in reducing the barriers to knowledge sharing and transfer, especially in places where temporal and geographical issues arise (Hendriks, 1999), and this reflects the general shift in attitudes of the development industry, from the structural adjustment programs of the 1990s towards programmes in which participation is at the heart (Balit, 2012). Proponents of this move hold that by introducing ICTs into the development agenda it would be possible to stimulate entrepreneurship, and participation in the political sphere (Archambault, 2011). It is though widely accepted that the role of ICTs in development is, at best, a double-edged sword (Castells and UNRISD, 1999), but there is a noted neglect of academic research about the role of ICTs in stimulating development. This is in no small part due to the extremely fragmented nature of the field (Heeks, 2014b). Yet there are significant changes

occurring, ICT4D is no longer just an assemblage of hardware, software, and users, but has developed into a fully-fledged space of development and participation, albeit one that is neither global, nor complete (McLennan, 2016).

ICTs have been considered an important part of the development paradigm since the 1990s, at least by organizations such as the UN who along with a number of other NGOs at the time already saw the potential these tools might have in strengthening the development process. They also became key to the World Bank's view of development, particularly as part of their global knowledge initiatives such as *Development Gateway*[13] and the *Global Development and Learning Network*[14], in which they invested $60 million between 1997 and 2002 (McFarlane, 2006b). These investments in ICTs were also made explicit in the writing of the Millennium Development Goals (MDGs), which placed ICTs and the reduction of the digital divide within key elements of their proposals, hardly unsurprising as they were written at the height of the dot.com bubble (Heeks, 2014a; Deane, 2004). Mirroring these aims, the two *World Summits on the Information Society* (WSIS)[15], which brought together 11,000 people in Geneva in 2003 and Tunis in 2015, emphasized ten ICT4D targets, known collectively as WSIS+10. Although these have not come to full fruition, they highlight the turn taken in the early 2000s (Deane, 2004; Heeks, 2014b). ICTs were also an important part of the *African Union Summit* in Addis Abeba in early 2010 which

[13] Development Gateway is an international non-profit organization (INGO) that provides technical tools and advisory services to country governments and development organizations. Development Gateway was founded in 1999 through World Bank before becoming independent in 2000.

[14] The Global Development Learning Network (GDLA) is a partnership of over 120 recognized global institutions (Affiliates) across 80 countries. Co-ordinated by the World Bank the GDLA runs training courses and conferences across the world.

[15] The World Summit on the Information Society (WSIS) was a United Nations summit that took place in 2003 in Geneva and in 2005 in Tunis. The summit sought to explore what it termed the information society, and to seek ways of bridging the global digital divide by enhancing access to the Internet in the developing world.

pushed for Africa to become an increasingly large part of the knowledge society, and positioning technology as a driver of development and social change. Moving toward the Sustainable Development Goals (SDGs) and the post-2015 development agenda, ICTs are still high on the priority list, both in terms of stimulating development and in terms of measuring it (Heeks, 2014a). Driven for the most part by the surge in digital connectivity through mobile subscriptions, the development sector's love affair with ICTs does not seem to want to abate just yet.

The importance placed upon ICTs by these institutions is hardly surprising given the scholarly work that suggests that they can act as conduits for information to stimulate participation, a key part of the immanent development agenda since the 1980s. This, coupled with reduced costs of access and increased connectivity, could be seen as a great boon to the development sector (Martin, 2014; Simmons and Birchall, 2008). The whole ICT4D paradigm suggests that access to information has a transformative potential, and for those who wish to be blind to it, ignores potential socio-economic issues related to this (Archambault, 2011). The overly simplistic notion that 'once knowledge is on the internet different people can download it' (Cowan *et al*., 1999) leaves a little too much to chance. Yet the deterministic model of ICT4D persists, for instance Geoffrey Sachs (2005) has called the internet 'a revolutionary tool of business as well as education and entertainment' (p.179). While this might be true, his discussions around its ability to transform society through transparency and efficiency as well as lifting the poor out of poverty may be a step to far. It may well be that some of the recent advances in ICTs can be used effectively to enable the poor and the marginalized to give expression to their opinions. So too might it be that those in positions of power in the development community might actually act upon what

they see and learn from people using these channels (Unwin, 1994). But all too often those in power are driven by other processes and measures (*ibid*.).

It is hard to argue that the internet and its related ICTs have not opened up more democratic spaces, and the emergence of web 2.0, a new conceptualisation of the internet that emphasizes user generated content, usability and compatibility, only furthered these ideas (Haklay, 2013; O'reilly, 2009). In theory these tools do facilitate dialogue and empowerment through horizontal knowledge sharing and would thus produce similar structures to those sought by grassroots movements (Muñiz, 2010; Shah, 2007). There is also a suggestion that 'ICTs can alleviate poverty, improve the delivery of education and healthcare, make governments more accessible and accountable to the people and much more' (Deane, 2004, p.48). And with communication seen as a key to participation and development (Balit, 2012) it is easy to see why the ICT4D agenda is so popular. Within the post-2015 agenda too, optimism is still high around the role of ICTs, although Heeks (2014b) worries that ICTs are still too far down the list of importance when it comes to the environment or sustainability.

Beyond fears of technological determinism, there are some other factors here which should alarm us. It is well documented that communities respond best in close-knit groups which then exude trust and a promotion of sameness, and which allows for the revealing of intentions (Platteau and Abraham, 2002). The notion of connecting everyone to everyone in a shared knowledge society counters this, although Platteau and Abraham's work perhaps forgets about those who are not welcomed to share their intentions. However, other issues persist, and there is not a sufficient amount of acknowledgement of the 'dark side of ICT4D' claims Heeks (2014b, p.12). There is a

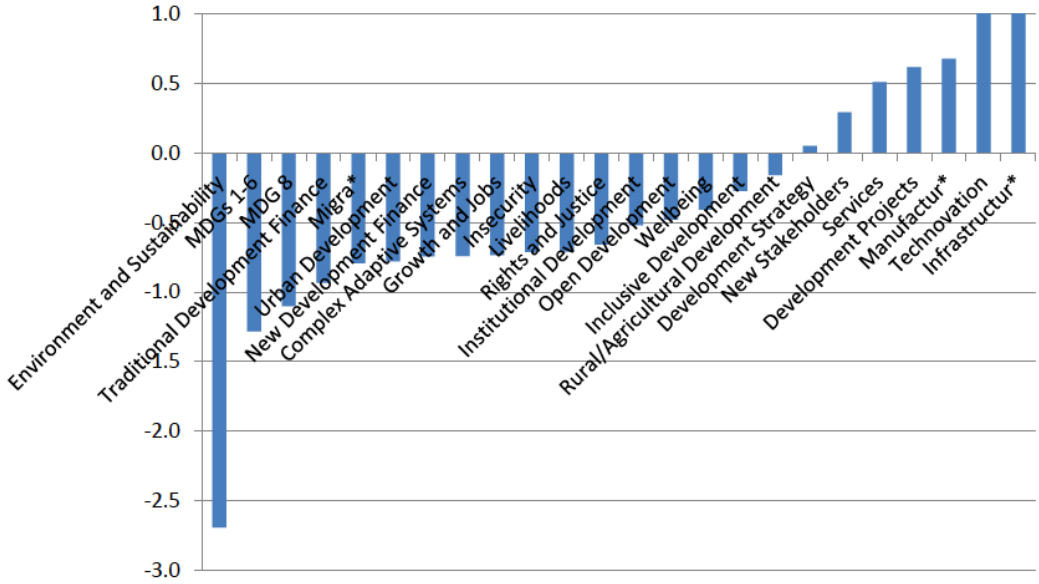
need to break out of the bubble of the ICT4D world in order to see what is really happening (Mosharafa, 2012).

It is of course important to acknowledge that any ICT based approach to development immediately puts up barriers to participation through economic and opportunity costs (Martin, 2014). Furthermore, these ICT solutions may ignore social norms, such as the oral traditions seen in many parts of Africa, which make the written and graphical nature of many ICTs unsuitable (Balit, 2012). ICTs also often ignore gender differences where women and men have differing communication needs and differing levels of access to technologies (*ibid*.). Privacy issues related to ICTs are also a significant issue It is one thing to predict which films people would like, it is rather another to dictate their development agenda (Tene and Polonetsky, 2012). Furthermore, many ICT4D projects look at financial transactions for prediction, leading to a whole range of privacy and identity concerns (O'Hara, 2004).

There are many scholars who are sceptical of ICT4D and the wholesale transfer of technology to the developing world (see for example Rodrigo, 2011; Martin, 2014; Deane, 2004). These concerns are played out in the data around the successes and failures of the industry to reach its own ICT4D targets. Figure 3 plots the *ICT4D gap* measure: the extent of difference between the post-2015 discourse and the content of WSIS+10 papers. Issues above the line are more highly represented in the ICT4D documents than in the post-2015 agenda; issues below the line are less highly represented. The larger the indicator the greater the over- or under-representation. One of the significant contributing factors to this undershoot is the failure of WSIS to acknowledge any sort of problems in the outcomes of projects. While there is a section entitled *C10: Ethical Dimensions of the Information Society*, this does not address the issues and concerns of scholars nor peoples on the receiving

end of the +10 agenda, or the development agendas born out of this, included World Bank projects, the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs) (Heeks, 2014b). Furthermore, the whole agenda fails to take into account any sort of basic needs, such as water, peace, food or other resources and so the whole ICT4D programme is designed and built as a separate entity from the key concepts of development work (*ibid*.).

Figure 3: Measure of 'ICT4D Gap' Between WSIS+10 and Post-2015 Agenda Text (Heeks, 2014b)



ICTs then can be a hugely powerful tool for sharing information, expressing opinions, and giving people a voice, but they cannot solve development issues on their own, and they certainly cannot singlehandedly change underlying social, economic, and political issues (Rodrigo, 2011). Access to knowledge is of course indispensable and is an important part of a solid development program and agenda, but citizens also need to be able to use this information, and the underlying structures of how this happens needs to be understood (Council of Europe, n.d.). ICTs in development need

to be examined in a contextual manner and the communication that they facilitate needs to be looked at in relation to cultural, social, and economic norms of the region (Balit, 2012). There requires an understanding that knowledge and ideas can change, and while ICTs can facilitate this change, they are presently not implemented in such a dynamic and fluid manner (McFarlane, 2006b).

Furthermore, it must be remembered just how many people are excluded from the ICT4D agenda though lack of access (Deane, 2004). One solution is to place less emphasis on technology-dominated structures, and greater emphasis on ICT4D hybrids such as socio-technical people and structures who combine an understanding of informatics with an equal understanding of development. One could argue for a hybridization of the ITU: a broadening of its scope to turn it from a technical into a socio-technical organization that can cover all parts of the ICT4D value chain. But that could be self-defeating in terms of politics and impact: it could create an ICT4D silo that was isolated from development. Far better for ITU to stick to the readiness and availability issues that it does best – infrastructure, standards, access, and bridging the digital divide (Heeks, 2014b).

3.4.4 (p-)GIS and counter mapping

The role of Space, in the *Lefebvrian* sense, has been made explicit throughout this thesis, but it is also a necessity to examine Geographic Information Systems (GIS) and their counterparts from a technological perspective. GIS evolved from the bringing together of a number of fields including geography, cartography and database management and requires a great deal of knowledge of these to produce materials (Haklay and Tobón, 2003). These kinds of systems have been around since the 1960s and can even be traced back to the early days of computing in the 1950s when the

military began to see the importance connecting geography with the new power of computing (Haklay, 2010a). Despite one of the most powerful mapping companies Esri[16] emerging in the 1970s, and software that would allow personal computers to develop GIS products appearing in the 1980s, the term GIS itself was not coined until 1992 (*ibid*.). The 1990s saw a great deal of development in relation to GIS with companies such a Garmin (*est*. 1989) developing ever more powerful GIS and GPS based programmes. Yet these systems still remained out of reach for most people. The level of complexity and multi-disciplinary knowledge required to operate them was too significant a barrier to entry. This too means that the control over these maps has always been with organizations connected to the military or state, for example Ordnance Survey in the UK (Evans, 2013).

Thus, these maps also represent the power held within these institutions (Ballatore, 2014). However, more recent changes in web-based geo systems and open-source GIS have reduced both the technical and financial entry points into digital map making (Goodchild, 2009). These new resources, which include Google Earth and Google Maps, introduced in 2005 (Crampton, 2009), allow maps to be built from the bottom up, by people and not governments, mapping alternative visions of society (Evans, 2013). These new modes of using GIS have come to be called many things, which shall be discussed, but most of which fall under the umbrella of PGIS or PPGIS (Participatory-GIS, and Public Participatory-GIS respectively).

PGIS in itself has a rich and diverse conceptual history drawing upon Participatory Rural Appraisal (PRA) development methods, community planning and development practices, critical theory and political economies (Weiner *et al*., 2002;

[16] Formally known by its full title, Environmental Systems Research Institute.

Harris, 2016). In the last decade though PGIS has built a new foundation for itself based upon a better understanding of the political and institutional conditions of GIS itself, and now seeks to foster ever more inclusive practices, although it still represents only one genus of the rapidly developing mass of geographic tools for public use (Elwood, 2006; Walker and Rinner, 2013). These shifts are beginning to open a critical site for understanding the relationships of power and space and the new knowledges that might inhabit these spaces (Bryan, 2011; Parker, 2006).

Until recently the process of making accurate and useful maps was a complex, expensive and skilled undertaking (Goodchild, 2009; Haklay *et al*., 2008), but the bringing together of GIS and the web 2.0 has created new participatory space of the *GeoWeb* (Atzmanstorfer *et al*., 2014). The GeoWeb manifests both in terms of individuals being able to make their own maps, but more importantly, like the web 2.0 itself, they have also allowed for crowdsourcing of information and collective map building through what is often referred to as Volunteered Geographic Information (VGI) (Walker and Rinner, 2013). VGI is certainly a significant part of the PGIS genies as many PGIS projects rely on the volunteered information of the public in order to build their maps, and in an *app economy*[17] more and more people are contributing VGI, knowingly or unknowingly (Tene and Polonetsky, 2012, p.267). VGI is itself a reasonably new concept and like other crowdsourced enterprises there is still much to be learnt about the way in which it works and the effects it has on knowledge and power. This in itself has led to a rather messy set of definitions (Brown *et al*., 2013). VGI is created by communities and complex networks and shared among lay persons

[17] The app economy refers to the range of economic activity surrounding mobile applications and smartphone devices. It especially refers to the way in which mobile apps can be used to run businesses and offer commercial services.

to build what are often seen as *mashups*[18] of maps where data is drawn from multiple sources, including base maps made available by the historical custodians of GI (Ballatore, 2014; Atzmanstorfer *et al*., 2014; Brown *et al*., 2013; Crampton, 2009).

PGIS and VGI are of course just one of several tools that communities can use to demand projects, justice, and rights in relation to development (ACHR, 2011). While it might yet not be fully understood how these tools affect our understanding of the spatial environment around us (Haklay and Tobón, 2003), what is becoming clear is that the wide range of online tools, and the bringing together of the web 2.0 and GIS into the GeoWeb has brought about a whole new set of debates and epistemologies (Crampton, 2009). These might be considered as *neogeographies,* those geographic practices undertaken by lay-persons, rather than a trained elite (Atzmanstorfer *et al*., 2014). Furthermore, this new ability to map and create maps has also reawakened the notions of community mapping and community geography (Robinson *et al*., 2017; Parker, 2006). The idea of community mapping, something based in the histories of Participatory Rural Appraisals (PRA), brings PGIS into the heart of communities and their battles for recognition, understanding and voice. Furthermore, it develops the notion that technologies in themselves cannot be of use without developing meaningful relationships around knowledge and power sharing (*ibid*.). Community mapping then might be seen as a direct response to top-down elitist colonial mapping, bringing together a new collective order which will better represent the people who are being mapped (Parker, 2006). Although counter-mapping has to some extent been regularly practiced in the third world (Perkins, 2007) PGIS now offers a great complement to, and opportunity for, more mapping practice to occur, potentially

[18] Mashups is a colloquial term used to describe maps created by combining multiple, perhaps classically incompatible, maps or data sets to create a new map. Much like mash-up tapes (Miller, 2006).

allowing for a greater empowerment of communities and the amplification of stories (Weiner *et al*., 2002). Connecting these PGIS elements to mobile devices and their inbuilt GPS (Sheehan, 2015) and thus using people as sensors will further enable the creation of crowd sourced maps (Meek *et al*. 2014). Yet, as has been discussed previously this is only possible through the participation of local peoples.

It is easy to become overly positive about such tools as they appear to bring together the best of all worlds. Projects such as OpenStreetMap have shown what can be achieved by amateurs with little or no geographic background (Goodchild, 2009). Even before such enterprises, Jane Goodall had seen the benefits of satellite images for conservation, even based on low resolution aerial photography (Tullis, 2015). Médecins Sans Frontières have stated the importance of maps and community led mapping projects in helping them to reach people in times of crisis (Smith, 2015). The mapping of card transactions and mobile phones has also helped to produce valuable information on health and GDP (Hilbert, 2013). PGIS and other mapping activities are helping communities to lay claim to land around the world (Johnson *et al*., 2005), notably the peoples of Awas Tingni and the Maya of Belize who have significantly changed the legal status of indigenous peoples in the region (Wainwright and Bryan, 2009). PGIS has been used to support The United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD), healthcare, targeting villages for development aid and forestry projects (Eisen, 2014; Catlett and Ghani, 2015). Community led PGIS projects have also helped WaterAid to invest appropriately in the poorest areas of Dar es Salaam, leading to significant improvements in the lives of people there (Glöckner *et al*., 2004). Furthermore, PGIS, through its inclusion of the community, has been shown in some cases to reduce conflict and help communities arrive at collective decisions (Carver, 2003). The diffusion of GIS through the web now

means that is it possible to both reach more places, and to work remotely with communities, or even bring remote communities together in a shared digital space (Elwood, 2006). These are all significant initiatives and achievements which should not be discounted, but nor should they have been seen in isolation from the bigger P/GIS narrative. Elwood (2006) experienced many alternatives in the use of such tools working with grassroots movements where narrative building rather than solution seeking was the aim. Likewise, the assumption that community GIS project automatically promote empowerment and the bringing together of communities is dangerous and naïve (Weiner *et al*., 2002).

The basic entry requirements for GIS have not actually moved all that much (Elwood, 2006). Fast internet, a computer or tablet are still required for producing the maps themselves, even if a mobile phone is sufficient to provide VGI. This means that the control over the data produced is still rather in the hands of the elites (Haklay, 2013). Furthermore, what lies at the heart of a mapping project, be it GIS or PGIS led, is the classification and codification of real-world objects into taxonomies and terminology. This again is done by those trained elites or corporations who make the software (Brown *et al*., 2013).

For a long time, the knowledge of local peoples has been translated into tools and language to suit the needs of the colonizer (Kitchin *et al*., 2009). What should be so different about PGIS mediated through tools invented by the military at the height of colonial worldviews (Harris, 2016; Elwood, 2006; Carver, 2003)? After all, it is an easy claim to make that more territory has been claimed by maps than has been claimed by guns (Johnson *et al*., 2005). This is something that occurs at the very level of translation of indigenous knowledge into western information particularly in relation to the often flexible, porous nature of indigenous understandings of land, and

the hard lines of scientific maps and their taxonomies (*ibid*.). In this sense PGIS and community mapping provide little more than a simulacrum of local and indigenous knowledges (Rundstrom 1998).

Furthermore, as has been noted above, there is the issue of participation in its broadest sense, with all the cultural and social implications that this brings and the balances of power that it might upset or bring to light (Sletto, 2009b). These kinds of participatory projects can serve not to diminish, but rather the reinforce the dichotomy between the local knowledge and the scientific knowledge, and so are less of an insurrection than a disempowering exercise (*ibid*.). The power of maps for indigenous peoples is often celebrated by geographers and activists like Nietschmann (1972; 1995), Herlihy (2003), Stocks (2005), and Chapin *et al.* (2005). In its basic understanding these indigenous cartographies tend to be viewed as a practice of replacing bad colonial maps with good anti-colonial ones. While it is impossible to argue that colonial representations of space which deny the existence of indigenous peoples are violent, and this violence must be addressed by a postcolonial geography, the existing literature tends to provide only superficial analysis of the dynamics shaping map production. Maps of indigenous lands are neither inherently good nor beyond question: they are open to multiple readings, and they may have potentially undesirable outcomes. Accordingly, an analysis of the social processes through which maps are produced and read is required (Wainwright and Bryan, 2009).

It is then, as with the other technologies discussed here, important to examine in detail these contradictions (Parker, 2006). With PGIS though, there is the further requirement of understanding the contradictions in what a map might be and what that might mean to different populations, what does PGIS mean to those who use it, and how does this fit with cartographic practice? Whether people even need to know

they are engaging with GIS is a rather salient question asked by Kingston *et al*. (2000). The way in which neogeographies and PGIS practice have evolved, means that the average citizen is removed from the body of knowledge that rests behind more traditional practice (Goodchild, 2009). However, to detach PGIS from its background in GIS is unwise (Weiner *et al*., 2002). The whole practice too is somewhat of a moveable feast, with both GIS and PGIS changing as technology advances and more people are connected to the resources that allow them to engage (Elwood, 2006).

Furthermore, many of these new practices are removed from the critical discourses of the 1990s (*ibid*.). Approaching mapping and PGIS as a spatial practice helps us to better understand them as a form of reframing societies rather than just remapping them (Bryan, 2011). In the same vein, PGIS should not be examined as a tool that can be picked up and then put down again, rather these mappings become an intrinsic part of the fabric of everyday life (Johnson *et al*, 2005). It is certain that the role of citizens has shifted from being the object of maps to being the creator of maps, but this has not turned maps into natural objects separated from power (Pánek, 2016). While VGI is on the increase, it will be sometime before the last billion are connected to the internet, thus any representation will always exclude them (Verplanke *et al*., 2016). Maps certainly already colonize the imagination, and it is essential then to ensure they do not continue to colonize the other through the guise of PGIS (Bayley, 2016).

3.4.5 Big Data

There are interesting parallels to be drawn between GIS and Big Data, indeed Crampton has been known to suggest that geography has been dealing with big data for considerably longer than the term has been coined (*See* Specht, 2016). It is

separated here however because of the way in which the big data paradigm generally ignores this history and because of the specifics of the ways it is discussed and employed in development work. Put simply, big data is used to describe data sets that are so large and complex that it is near impossible to examine them using any manual tools (MangoMap, 2014). The ability to hold this data and analyse it has been brought about through increased digital memory via miniaturization and the development of solid technological infrastructures. It is now undeniable that the big data era is upon us (Hilbert, 2013; Tene and Polonetsky, 2012).

The most interesting aspect of big data though is not its volume, but rather the way in which it has fundamentally changed the way in which data is viewed and collected (Burns, 2015). Multiple sensors, in phones, bank cards, GPS and medical devices are creating a flood of data every day (Mundial, 2012; Data2x, 2017). Nowhere has this change been more profound than in big development data, which specifically deals with phenomena in developing countries (Heeks, 2014a) where conventional forms of data collection such as household surveys and national economic accounts, have long been seen as inadequate and unable to adequately represent populations, particularly those that are already marginalized (Data2x, 2017). These huge new data sets have been lorded as a true revelation in development work by the likes of UN Global Pulse, but the reality is a shifting epistemology in which the locally situated person becomes even further removed from the now distantly located humanitarian (Burns, 2015). This distance returns us firmly to the opening lines of this thesis and the question of data's claim to truth, its unambiguous language and how these should be questioned (Andersen, 2015).

Big data allows us to transform tens of thousands of data points into holistic visualizations and patterns, helping to highlight global trends, local crises and to

communicate these better to the public (Leetaru, 2015). As its size grows, so too does its value as more and more data becomes sucked into the analysis (Hudson-Smith *et al*., 2009). Unwieldy imperfect, unstructured data becomes usable and actionable (Hilbert, 2013) allowing us to understand other people's experiences vicariously (Burns, 2015). For instance, Kenya, through its Open Data Portal[19] has produced 12 years of extensive data that has been used to support schools and healthcare (Mundial, 2012). UN Global Pulse have placed Big Data at the centre of their work to revolutionize development (Kirkpatrick, 2013), with their Pulse Labs around the world crunching data for development and monitoring (*ibid*.). There are also some incredibly compelling examples from healthcare to manufacturing to politics that lead us towards the idea that big data can indeed bring about revolution (Tene and Polonetsky, 2012). The data is efficient, inclusive, and actionable, and can be used to increase accountability of governments (Olafsson, 2012; Heeks, 2014a). There is evidence too that big data analytics are more accurate than human ones, showing success rates of 95% compared to a human 70% in experiments with radiologists (Hilbert, 2013). These 'extraordinary societal benefits of Big Data' (Tene and Polonetsky, 2012, p.241) are brought about because of the way the data brings together interrelated components within data models (Brown *et al*., 2013), and although still sometimes a little messy, these data are so numerous that their value still outstrips that of less data (Dumbill, 2013). Yet we can only truly benefit from these things if we ignore a number of factors, including privacy concerns, the uneven tilting in favour of large corporations such as Google, Facebook, Amazon, Apple and Microsoft (Tene and Polonetsky, 2012; Neff, 2013), and technological determinism.

[19] The Kenya Open Data Portal makes Public Government datasets accessible for free to the public in easy reusable formats, supporting the Government's drive to proactively inform citizens and be accountable. The site was however defunct at the time of writing.

While some (*See* Hilbert, 2013) see technologies as normatively natural it is hard to follow this argument through in light of other factors affecting the creation and use of Big Data. According to Kate Crawford (*Cited in* Neff, 2013) of Microsoft Research, it is dangerous to think that big data can be made anonymous, is inherently objective and includes tacit or explicit consent or an opt-out function. As we increasingly rely on big data's numbers to speak for themselves, we risk misunderstanding the results and in turn misallocating important public resources. The power to profile is also now in new hands. According to Lyon (2014) the use of big data results in the automation of analysis gives those who develop algorithms for sorting and classifying data subjects significant power over those people's lives – more so if the analysis is being used to direct development interventions (Taylor and Broeders, 2015).

This raises a Kafkaesque vision of an inhumane bureaucracy (Tene and Polonetsky, 2012, p.268). One directly impacted by an emergency has different knowledges and different motivations for communicating those knowledges. Big Data does not make these differences readily apparent. The knowledge produced through Big Data technologies, data, and practices is always partial and reflects the geographical and social contexts of the people producing those knowledges. This is an important admission because the stakes are so high: if humanitarian organizations' practices and operations eventually come to be influenced by big data, the way they come to understand on-the-ground conditions will be impacted by these partialities (Burns, 2015, n.p.). Those working remotely cannot know the direct human experience of the crisis but must instead form their knowledges through the curated representations of those impacted directly. Within digital humanitarianism, the epistemologies privileged by Big Data are often data-centric and focused on

correlations, rather than epistemologies highlighting qualitative understanding, communal and situated lay knowledges, and connections with social theory (Burns, 2015, n.p.). Naturally, the vast majority of this big data hardware capacity resides in highly developed countries. The access to these concentrated information and computation resources is skewed by a highly unequal distribution of telecommunication capacities to access those resources. Far from being closed, the digital divide incessantly evolves through an ever-changing heterogeneous collection of telecom bandwidth capacities (Hilbert, 2013). However, in a world where we desperately need further insights into development dynamics, Big Data Analysis can be an important tool to contribute to our understanding of and improve our contributions to manifold development challenges (*ibid*.).

It is then possible to see that more data does not lead to better results, but rather the social consequences can be quite the opposite of those altruistic intentions (Junqué de Fortuny *et al*., 2013). There is a rhetoric problem that surrounds big data, one that neglects power and framing (Neff, 2013), and one that fails to see that size is not un-bounded (Junqué de Fortuny *et al*., 2013). Discussions of the relationship between big data and digital humanitarianism tend to be cautiously optimistic. There is a suggestion that a big data future is, for those managing the development of digital humanitarianism, value-neutral, and mostly centred on new data sources, with obstacles delegated to technical solutions.

This conceptualization stands at odds with the research showing how technologies, data, and society are co-constitutive, such as in critical, feminist, and participatory GIS. Not only does the convergence of big data and humanitarianism depend on a social shaping of technologies and data, but big data itself embodies particular values, social relations, and epistemologies (Burns, 2015, n.p.). The

discourse on big data as a resource for development (World Economic Forum, 2012; UN Global Pulse, 2012; Taylor & Schroeder, 2014) highlights that data is primarily collected and processed by corporations and only secondarily accessed by governmental authorities. This shift has two effects: first, it translates the individual from citizen to data subject, 'a conditional form of existence whose rights are dependent upon its behaviour within digital networks' (Bauman *et al*. 2014, p.129). Second, it underlines the move to a more distributed governance model with regards to population data, 'organized neither horizontally, in the manner of an internationalized array of more or less self-determining and territorialized states, nor vertically in the manner of a hierarchy of higher and lower authorities.' (*ibid*., p.124). Instead, those who hold the data increasingly have the power to intervene, or to inform interventions (Taylor and Broeders, 2015).

To truly see a big data for development age emerge, it is important to build infrastructure in the global south to slow and halt the unequal diffusion of the analytical process and the dependency that comes with this (Hilbert, 2013). To allow greater access to all, even considering financial and analytical constraints (Tene and Polonetsky, 2012) and most importantly to see big data in development, not as new data, but as 'a shifted set of practices, as epistemology, and as an emergent social relation' (Burns, 2015, n.p.).

3.4.6 Technology of development

As noted above, technology is as much created through social relations as social relations are created through technology. All the while though technology in shaping the way humans experience space and time (Kirsch, 1995; Awan, 2016). There are of course a wide range of perspectives about what technology is, and how it

relates to society (Hutchby, 2001). What is of great concern though is the ease with which links are made both between the function of technology in producing poverty and de-worlding effects (Feenberg, 2005), and conversely its ability to solve issues of poverty through the production and analysis of data which can enable better targeting of poverty reduction schemes (Taylor and Broeders, 2015).

In the last decade, these technologies have become increasingly prolific in nature and have been further and further integrated into the work of NGOs, development organizations and embodied within poor societies (Atzmanstorfer *et al*., 2014). There is already a contradiction here, as some of the largest technology companies and philanthropists engaged in the fight against poverty are also pushing for the liberalization of public services and the virtues of neoliberalism (Zamora, 2014). Technologies corresponding to different civilizations have always co-existed (Feenberg, 1991), but as the juggernaut of neoliberal digital tools spreads across the world and the development sector, questions around what counts as data, and whose data counts are becoming increasingly urgent (Burns, 2015). The point of these technologies and the data they crunch is surely to assist and support those most in need (Satterthwaite, 2015). Yet, these technologies also create a new minefield for these very same people to negotiate in order to gain what they need, a minefield of silos, positive feedback loops, privacy concerns, accountability, transparency and illusions of participation (Castells and UNRISD, 1999). Technology is seen as a trade off against culture, a way of speeding along the process to reach quantifiable and attainable goals at any cost (Feenberg, 2005). Of course, technology has always been contradictory, both empowering and limiting, liberating, and oppressing (Weiner *et al*., 2002), and so to understand how technologies work in relation to development it is

essential to understand the affordances and social constructions that surround such technological artefacts (Hutchby, 2001).

It seems salient at this juncture to discuss some examples of technology in development work before deconstructing the affordances of these technologies. Perhaps the most famous examples of technological use for aid assistance, at least in the popular discourse, is that of the use of smartphone and Twitter to help locate and support people after the earthquake in Haiti or Typhoon Pablo in 2012. In both cases people acted like sensors through the use of mobile technologies to call for assistance (Burns, 2015). Taking a different kind of technology, satellite data, Global Forest Watch was developed by Google alongside The World Resources Institute and The United Nations Environment Programme (UNEP) to monitor deforestation to support organizations working to reduce the destruction of the natural environment (Tullis, 2015). Digital tools are also being used in attempts to strengthen and increase participation in the political sphere, both in terms of electoral participation (*See* Martin, 2014) and in terms of participating in managing their own environments (*See* Carver, 2003). Outside the mainstream development industry there are countless examples of technologies such as SMS, e-mail, blogs, and other digital tools being used by organizations to push for better conditions for education, social welfare or against the neoliberal agenda; notable examples being the Penguin protests of 2006 in Chile (Peña *et al*., 2015) and the Occupy movement (Kavada, 2017). So, pervasive have digital tools become in everyday life, and the life of the development sector, that some scholars, such as Dumbill (2013) have suggested that it would be 'morally outrageous' to not collect and use the data that is being produced everyday (p.75).

It would be hard to deny the importance of these examples and the thinking behind them. Until recently development work relied on often rather anecdotal

information, that was hardly reliable (Wall, 2014) and certainly was not standardized and sharable between organizations in different part of the world (Smith, 2015). The ability to layer data over other data has been a huge boon for the development sector allowing for often real-time interventions and support (Ross, 2015), and we can now have almost instant access too well correlated information (Hudson-Smith *et al*., 2009).

These technologies though have been developed in a world of capitalist relations and inequality, and thus the very technologies themselves embody these notions, reinforcing inequality, while new peoples and countries adopt the technologies the in-equality spreads (Rodrigo, 2011). Something that then leads to an opening of new digital divides and new exploitations (Burns, 2015). Modern hegemonies are built around technology, and thus technology is central to the will of political power (Feenberg, 1991). This is further exacerbated, as those regions that cannot adapt to these new technologies find that their 'retardation becomes cumulative' (Castells and UNRISD, 1999). This view of the process of technological change, situated principally in economics also illustrates the social consequences associated with *technological progress*, and how those social consequences have been spatialized as components to the creation of international divisions of labour and the processes of uneven development (Harvey, 1982).

A further risk posed by the new data visibilities is that of what Morozov (2013) has termed *solutionism*; the application of engineering solutions to problems that are long-term and structural in nature. The problems the new data are being applied to are old and deeply embedded. "Information overload answered by techno-political configurations that create particular forms of technological determinism that are then

implemented and managed by a specific set of actors summarizes the way technologies are embraced by information politics" (Jordan, 2015, p.47).

Technologies for development are no different to other technologies, but even more so than others they seek to promote social change, and this inevitably interferes with social arrangements, leading to enormous ethical issues (Sillitoe, 1998). These moral issues become greater as technology is transferred, adapted, and reshaped, changing, loosing, or enhancing their intended uses into something that might be altogether more damaging, while questions around the importance of context are still woefully under asked (Kirsch, 1995; O'Hara, 2004). The moral issue is even further developed as digital tools and digital data take up an increasingly large position in parallel to, or instead of, national data collection efforts (Taylor and Broeders, 2015). This is further compounded by the relative isolation of the world's poor, or peasantry, who are already subjugated by dominate hegemonies (Scott, 1977).

Only the democratization of technology can help. The spread of knowledge by itself is not enough to accomplish this. For knowledge to be taken seriously, the range of interests represented by the actor must be enlarged so as to make it more difficult to offload feedback from the object onto disempowered groups (Feenberg, 2005). It is not primarily a technical question but concerns a fundamental issue in social philosophy, the neutrality of technology and the related theory of technological determinism. If technology is neutral, then its immense and often disturbing social and environmental impacts are accidental side effects of progress (Feenberg, 1991, p.3).

3.4.7 Privacy and security

So, while we might laud the use of technology for development in some respects, a big question still persists around where the data used for the design of

development projects actually comes from. Even the rather technologically determinist voice of Robert Kirkpatrick of UN Global Pulse has mused on this topic, calling for more data to be shared through what he terms *data philanthropy* (2013, p.4). This reflects a general trend in the desire for data; 'everyone seems to want more data, more data helps target the *right* people with the *right* things' suggests Satterthwaite (2015, n.p.). However, this increase in the demand of data, and the necessity of its ability to identify populations has led to debates around the privacy of people and communities from which it is drawn, and the way in which states and companies control these data (Tene and Polonetsky, 2012; Hilbert, 2013).

Both the notion of openness in relation to data, transparency and participation in governance and the notion of privacy itself are relatively new ideas (Andersen, 2015; Potts, 2015). Before the eighteen century the concept of privacy was all but unheard of, and the idea of data-driven participatory governance is even more recent (Tkacz, 2012). The vast increase in data points, sensors and aggregation tools on the market means that these two entities often meet in conflict as the data gatherer faces concerns about violations of trust of users, while all the while calling for increased sharing (Mundial, 2012). This is something of particular concern when dealing with populations with lower digital literacy rates who may be unaware of their potential exploitation. Furthermore, it has been repeatedly shown in recent years that even anonymized data can be re-identified with relative ease unless very specific, complex, and expensive precautions are taken (Tene and Polonetsky, 2012).

Of course, while the risks of re-identification are there, it might be argued that there is only really a risk if re-identification is likely and/or likely to do harm (Tene and Polonetsky, 2012). And in the face of projects such as that where Orange Telecom in Senegal provided an NGO with anonymized voice and text data from 150,000 mobile

phones, leading to a greater understanding of population movements (Wall, 2014), it might be possible argue that data is being used for the greater good, and thus privacy should be ignored. Furthermore, to take this idea to its fullest extent we might call upon the ideas of Hayek and Popper (*Cited in* Andersen, 2015), and suggest that actually it is really the collective knowledge of aggregated data that is of use, following the notion that the direction of a society is far beyond that of any individual or small groups knowledge (Andersen, 2015). This of course is a clear fallacy and is really a rather unfair interpretation of their work. It is not so much the way in which the data can be linked back to individuals that is of concern, although this is certainly a major worry when that data is then used as a tool of control (Hilbert, 2013). Rather, the larger concerns manifest themselves in firstly the temporal nature of personal data – people are an ever-shifting sand, but that aggregated data rarely is, instead most data only show a snapshot in time. This makes the value of much data time limited (Tene and Polonetsky, 2012). The greatest concern though is one of psychology, people have already been shown to be fearful of sharing personal data because of privacy concerns, and companies too rarely wish to share, more for financial rather than altruistic reasons (Mundial, 2012). This leads us towards skewed data sets, but more worryingly these concerns of people may well have a stifling effect on society and their engagements in the political and public sphere (Tene and Polonetsky, 2012; Specht, 2017b). In terms of VGI the publication of data on geospatial web platforms does not always meet conceptions of privacy that vary throughout different cultures (Torrens, 2010).[20]

[20] Recently, web platforms such as Rotten Neighbor, where users have been encouraged to expose "bad" neighbours, or MyBikeLane, where citizens can report traffic violations like illegally parked cars on bike lanes, have raised serious legal concerns (Atzmanstorfer *et al*., 2014, p.250).

While there are some safeguards in terms of limitations of data collection, retention and storage and data privacy is becoming increasingly discussed in terms of being a Universal Human Right (Tene and Polonetsky, 2012; Shum *et al*., 2012), there are many concerns that perhaps undermine the way in which data is used in development projects in relation to privacy. Calls to allow people to access data held about them are numerous, but the infrastructure and willingness for this to happen is still woefully lacking (Hilbert, 2013; Tene and Polonetsky, 2012). Yet even if it were possible, it does not solve the deep psychological issue of feeling watched and tracked which may well reduce the desire of people to participate in the own development and politics, something which all the technologies in this chapter have been seeking to encourage. Without additional safeguards and regulation around the way that data is used, collected, shared and then utilized for resource allocation all these technological innovations become self-defeating in the face of the human desire for privacy and the randomness of life (Dumbill, 2013).

3.4.8 Digital divides

One of the major factors that has led to the proliferation of digital and communications tools being used in development projects is the lowering of barriers to access of these technologies (Crampton, 2009). This increase in access, so the mantra goes, means that technologies can be used to enhance the voice of people and to allow them to participate more fully in the political and public spheres (Kleine *et al*., 2014). Organizations such as the World Bank acknowledge that access is not universal but see the rate of growth as an indicator that soon the whole world will be able to participate in 'ICT-Based knowledge strategies' (McFarlane, 2006b). Yet, this is barely half the story. There are increasing concerns that using limited metrics of

improvement in access may well mask inter- and intra-country issues and hiding other inequalities (Heeks, 2014b). There is much evidence too that while access has increased, other digital divides – the gap between who has and who doesn't have access to technology – have appeared and are growing at alarming rates (De Zúñiga *et al*., 2009).

These divides, which are borne out of existing unevenness in economics and geography (Hilbert, 2013) manifest themselves in three areas. Firstly, an extension of the classical divide on access, secondly social divides, and thirdly knowledge or codification divides. It is already possible to see how the traditional access divide manifests when considering than less than half the world's population is digitally connected (Fuchs, 2012), and the three new divides have all been touched upon previously, but are worth exploring in depth here, especially given their deep rootedness in neogeographies (Elwood, 2006).

Beginning with the first of these divides, access, we will not trouble ourselves with the well documented discussions around who has physical access to tools (*See* Kirsch, 1995) although this is clearly important. We know that access to inexpensive technologies could empower citizens (Mosharafa, 2012), and we know than if only people with the internet can access your platform you are missing the most vulnerable people on the planet. In this sense Facebook is a classic example, claiming to connect the world, but really only connecting a subset of the world (Burns, 2015; Taylor and Broeders, 2015).

So, what then of what we might term the illusion of access? Efforts to provide universal access tend to overlook this dimension by supposing, rather than demonstrating, than once they gain access, users will start accessing 'useful' information and development will ensue (Archambault, 2011). Rather, to gain value

from these technologies, people need to be able to gain access to the information they need, when they need it (O'Hara, 2004). This is already problematic in terms of privacy as explored above, but also in terms of additional costs. As the amount of available data grows the necessity of processing it grows too, and while people such as Dumbill (2013) have claimed than services like Amazon AWS[21] are significantly reducing these costs, there are still financial as well as educational barriers to the kind of analytics needed to process vast swathes of data. And again, the right to actually access this data itself has been severely curtailed by the implementation and conversely non-implementation of various legislations, and a lack of standardization than further decreases the ability of lay persons to access or process data (Tene and Polonetsky, 2012). This question of who has the right the access big data sets, and who has access to the analytical tools required is once again stratifying the world into the haves and the have-nots (boyd and Crawford 2012). An understanding of the gaps and spaces in these datasets is also important in terms of access, there are a great deal of very expensive satellites orbiting the earth, with the data being made relatively cheaply to NGOs (for example Skybox) (Varshney *et al*., 2015). However, without access to the data processing tools, storage, and knowledge that some people are occluded even from huge data sets (Crawford, 2013), the data becomes useless as best, and undemocratic at worst (Weiner *et al*., 2002).

This issue then touches upon another important aspect of the digital divide, again, something which will be discussed in more detail later, but which deserves a brief attention here, namely the role of knowledge codification. There is a great deal of

[21] Amazon Web Services (AWS) provides on-demand cloud computing platforms to individuals, companies, and governments, providing both storage and a virtual cluster of computers that can be used to run computationally intensive programs without the need for owning vast physical computing infrastructure.

evidence to show than the intern*et al*ready has a significant effect on reinforcing people's information-seeking habits (De Zúñiga *et al*., 2009). And this is something than is then further exacerbated by the internet and the data flows within it being generally held within systems than work towards corporate interests and values, and because 'epistemologies, vocabularies, and categories of data structures do not or cannot encompass the experiences, knowledge claims, and identities of some social groups or places' (Elwood 2008, p.178). This further divides the world into the haves and the have-nots.

Then add the compounding issue of algorithms, a requirement for such enormous amounts of data – but which are increasingly difficult to understand as machine learning moves to the fore – and past behaviours become even more reinforced (Hilbert, 2013). This constant, seemingly data driven, reinforcement of views is ruinous to democracy, our understanding or the world, our position within it and even our own needs (Habermas, 2000 *Cited in* Hilbert, 2013; Elwood, 2006). At every stage of information seeking, searching with algorithms, interpretation and use, the data is passing through stages of mediation, contextualization, and codification (Newsom and Cassara, 2011). If these mediated stages are based upon the historic prejudices and colonial power structures of old, then access to data in and of itself does not create equality, but instead drives a further divide between peoples (Catlett and Ghani, 2015).

In order to overcome this issue, there needs to be a great deal of understanding and willingness to work through these problems. And while there are many who might wish to do so, in the face of the juggernaut of the development and capitalist machines finding community members and activists who can spare enough time and who are suitably motivated and knowledgeable is difficult at best, and their

motivations can hardly be separated from their personal needs (Harlow, 2012; Mercea and Funk, 2014). Tools than bring people together are needed, but this is not a solution in itself, and empowerment remains a complex issue (Perkins, 2007). People have a desire to be better informed generally (Carver, 2003), but no population is homogenous in the way data often presents. The goals and aims of a community are often diverse (Weiner *et al*., 2002; Bennett and Segerberg, 2012), yet the new digital divide of algorithms and big data seeks homogenization, which conversely leads to bigger divides between the haves and the have-nots. This can also manifest as increased divides within a community, who are now presented with data to support the idea than they are all different.

The digital divide then is not gone, and where it has been reduced, much like *Hydra* it has grown more heads. Large development organizations risk a 'Tower of Babel' moment in the way they present the success of reducing the digital divide without acknowledging these emerging issues (McFarlane, 2006a). Participation and understanding in these systems is becoming a new stage on which the divide plays out (Haklay, 2013). The commodification of data and the seemingly unquestioned authority of such large data sets leads to both solipsism and division (Hilbert, 2013; Meek *et al*., 2014). These problems play out, with statistical apparatuses in lower-income countries being widely judged as inadequate and under-resourced (Jerven, 2013). This high-level institutional interest in *data-driven development* has led to organizations seeking alternative ways of sourcing and collecting data, and this has driven the rise in *data philanthropy* (World Economic Forum 2012; Kirkpatrick 2011).

3.4.9 Power

It has become clear throughout the preceding pages than power is of great importance in relation to the way in which development projects are designed, and the way in which technology is incorporated within these projects. It is though worth taking some additional time to explore power in and of itself in relation to technologies and development. It has been suggested by many than ICTs, and particularly ICTs for development actually increase disparity and create new forms of exclusion (Archambault, 2011). This is partly because even the largest of datasets are unable to accurately reflect the social world (Crawford, 2013). It is also because when drawing data from local knowledges these knowledges are reflecting local power models and structures, at times even romanticising the notion of local and downplaying social inequalities (Rodrigo, 2011).

This plays deeply into the politics of sorting, and of finding the meaningful in the meaningless, something which can only be done through a certain frame or lens, a lens built of unconscious bias and power relations (Tkacz, 2013). This becomes a particular issue when data is collected through the internet, a system whose roots are embedded in western ideologies and epistemologies and becomes exacerbated when these digital tools are used to filter rather than just collect. There is little choice but for local knowledges to be filtered and codified through a western epistemology (McLennan, 2016; Burns, 2015). Power is then asserted through the collection, sorting, codification and access to data, a job than is falling increasingly to the private sector (Taylor and Broeders, 2015; O'Hara, 2004).

While increasingly power is being given over to the private sector, it is worth taking time to examine the role of the state, which particularly in relation to development work, still holds a great swathe of power. In relation to digital tools and

internet-based data collection and sharing this has some very clear and obvious examples of abuses of state power. For instance, during the Tunisian uprising WikiLeaks was cut off, while the Facebook data of activists was mined by the government (Jordan, 2015). There have been multiple cases of governments blocking access to Google, The Economist, and Al Jazeera (Chattapadhyay and Garg, 2016). And in the UK the British Army have even put together a new battalion with the sole aim of using psychological operations through digital tools (MacAskill, 2015).

Yet, these brazen attempts at holding or blocking power are in many ways negligible to the underlying issues of power exercised by the state. Maps and data sets produced by the state are seen as being scientific, accurate and true reflections, but they are just social products, reflecting perceptions and beliefs and creating narratives and stories that fit the agendas of the state and the relationships between people that the state wishes to foster or destroy (Meishar-Tal, 2014; Archer *et al*., 2012). These modes of control are rarely questioned, they are not even 'seen', yet they are born of fragmented data (Hilbert, 2013), struggles of ethical uses of data for which legislation has not kept up (Tene and Polonetsky, 2012), slow moving democracy (Mundial, 2012) and the kind of algorithms that push for austerity while letting those who caused the financial crisis off the hook (Morozov, 2014). It can only be through a concerted effort by the state and the development organizations with whom it works that state run digital tools actually help those in need rather than consolidating existing power structures (Mundial, 2012).

These failures of the state then have seen a proliferation of private companies attempting to fill the gap and to make the world a better place. But these companies are affected by the ideological and cultural influences placed upon them in their role in society. As corporations acquire the power to make data subjects visible, they also

acquire the power to monitor (Taylor and Broeders, 2015). Furthermore, corporate projects are often devoid of any scheme or desire to help leaders govern better and more responsibly. Take for example the efforts to help eradicate Ebola. The companies involved had a simple goal. They saw in Ebola an opportunity to make money and all their engagements and interactions with any form of data (opened, shared or otherwise) were solely and ultimately directed to than end. Thus, they collected any and all forms and sources of open data that they could (Bah, 2015).

One of the major concerns in the privatization of data and codification is embedded within capitalism, and the need for automation in order to cut costs. Automation of data codification is done through stereotyping and profiling (Jordan, 2015). However, the way in which this is programmed and carried out, reflects the politics of those who build the systems, prominently western, white, male; rarely do they include the epistemologies of local people (Weiner *et al*., 2002; Hilbert, 2013). It is rare that a programmer is able to consider the complexities of society while creating algorithms to process data, to consider all the goals, needs, biases, power, strategies, holes in data, is an enormous task, and programmes are not trained in those fields (Hilbert, 2013). Code is necessarily political, and while there have been some programmers who have attempted to untangle this mess, one of the biggest issues facing a world that increasingly relies on the digital, is the refusal of programmers to acknowledge that their code is political (Tkacz, 2012). It is for this reason that data analytics has become the new battleground of power and representation (Taylor and Broeders, 2015).

So, what of counter narratives, those initiatives born from the ground up which are challenging these present power models? There is the argument then for the first time in history that the tools for global cooperation are not held by governments or

institutions, but because of their low cost and ubiquity are in the hands of all (Shirky, 2008; Watson, 2009). These tools, including Participation Geographic Information Systems, are about empowering users from all walks of life and enabling them to use technology purposefully to capture their local knowledge and advance their goals (Talen, 2000). Although usability has improved in recent years, they still require users to have or acquire considerable technical knowledge to operate them (Traynor and Williams, 1997). This presents major obstacles to non-expert users in terms of navigating an interface that embeds a language, world view and concepts that support the system's architecture rather than the user's work view (Ghose, 2001; Elwood and Leitner, 1998; Traynor and Williams, 1997).

This is especially true of GI platforms. Gryl and Jekel (2012) state than the use of geospatial-web tools is a major factor for democratic negotiation and public participation in the spatial domain referring to the concept of *actualizing citizens* than act through loose networks using social media and the geospatial web for communication and interaction (Atzmanstorfer *et al.*, 2014). If using a professionally produced dataset, it is reasonable to expect that coverage will be relatively consistent over a defined area. Such assurances cannot be assumed with data sources such as VGI which very much depends on volunteers being interested in providing information for a specific area and there is no guarantee than all areas will generate interest. This lack of completeness may not be apparent in the dataset. As recently as 2008, half of the town of Helensburgh in Scotland was shown in very great detail on OpenStreetMap, but the other half appeared as open countryside. A user unfamiliar with the area could only assume the town was less extensive than is actually the case (Brown *et al.*, 2013). Perhaps more worrying however, is the increasing evidence than rather that increasing participation and inclusion, in development contexts, online networking and social

media tend to reflect and multiply offline power imbalances and inequality. Baillie Smith and Jenkins (2011, p.175) note 'a very real need to consider the power dynamics and hierarchies embedded in transnational development networks and global civil society more broadly'. Disempowerment has been observed through the reconfiguration of established community groups and the threatening of existing elites in response to the introduction of new technologies (Weiner *et al*., 2002, n.p.).

Data then are not objective (Crawford, 2013), but are rather deeply connected to formal power structures, both political and based within capital (Andersen *et al*., 2016) and privilege certain epistemologies over others (Burns, 2015). Hegemony pervades all aspects of life, the school, the media, the church, bureaucracy (Scott, 1977) and thus it would be absurd to assume it did not pervade technology in the same manner. To the extent that we technologize the public sphere by transferring its functions to experts, we destroy the very meaning of democracy. 'The redeeming power of reflection cannot be supplanted by the extension of technically exploitable knowledge' (Feenberg, 1991, p.8). As noted in the previous chapter on technology, the choice of civilization is not decided by the immanent drift of technology, but can be affected by human action (Feenberg, 1991). Since technical control influences technological development, new forms of control from below could set development on an original path (Feenberg, 1991). Individuals are not isolated decision makers. They are part of primary groups and networks that create a frame of reference where opinions and behaviours brew. Even if it is still impossible to create 'one global map of the world that everyone used' as Ed Parsons, Google's geospatial technologist, hoped in 2014 (Usborne, 2016, n.p.), we must then continue to question power and the political when we discuss technology (Elwood, 2006).

3.4.10 Summary

The conception of the world shrinking to a global village first coined by McLuhan and Powers (1989) is generally seen as the product of technological advances in telecommunications, information, and transportation. For Harvey (2001a) the global village is not an end product, but instead a midpoint between a regime of accumulation and a mode of representation (Kirsch, 1995). The natural next step is the evolution from the *Information Age* and *Information Societies* to *Knowledge Societies* (Hilbert, 2013). This evolution also takes place in the development sector, however, there is no formal relationship between the traditional humanitarian institutions and digital humanitarian organizations (Burns, 2015). This is a worrying prospect when considering the process of *datafication* underway in low- and middle-income countries, where the use of new communications and database technologies is generating digital data that is machine-readable and computationally manipulable, particularly for big data analytics (Taylor and Broeders, 2015). Whether this data collection technology is driven by economic, military-strategic, or even scientific motives, it is subject to a variety of influences during its innovation, diffusion, regulation, and codification (Bijker and Law, 1992; Latour, 1987). The forms and functions of a technology are transformed by its innovators, market strategists, government regulators, and through social use (Kirsch, 1995). It is also worth noting that many of the key components of the networked society – the digital computer, the internet, GPS – all have military origins and have been developed within capitalist social relations of production and unequal gender relations. They therefore build upon and reinforce existing spatial and social divisions (Potts, 2015; Perrons, 2004). Furthermore, the adoption of new technologies by developing countries can lead them to a new form of dependency as they become more vulnerable to the increasing

complexity of the hardware and software used by the providers of key ICT services (Lovink and Zehle, 2005).

The opposing argument supports the datafication of the world, stating firstly, that the process is empowering for individuals. The internet, unlike television or radio, is relatively difficult, though not impossible, to censor, and the barriers to entry are much lower. This suggests that people's voices can be heard through these media and that more people can receive the information they need. Secondly, the amount of information made available by the Internet is colossal (Varian, 2001). Not only is this quantity many orders of magnitude greater than other media, but also there are many fewer delivery restrictions. This though in itself creates many issues, rather than re-creating existing knowledge (World Bank, 1999). Poor countries are encouraged to acquire knowledge from the North through open trade regimes, foreign investment, and Western digital tools (McFarlane, 2006a). With the widespread collection and processing of data, there are increasing numbers of initiatives encouraging North to South transfer of information that the poorest are persuaded to download, but which is actually built upon recodifided data supplied by the very same people who are now accessing it. Under traditional forms of participation, public involvement in decision making is only a few rungs up the public participation ladder and extends little beyond the right to object, however, when participation is through digitally collected data, about which the average citizen knows very little, even the right to object is removed. This then might be seen as a step down the ladder of participation, This, is especially true if you consider Robert Kirkpatrick's statement about use of data at the UN; 'what we at Global Pulse are still not sure about is exactly what types of digital data sources would be most useful to the field of international development' (Kirkpatrick, 2013, p.3).

Late twentieth century communication and information technologies have produced such a blurring of what is real and what is representation than the two can no longer be distinguished (Corner, 1999). Maps, both cartographic and data visualizations, are in-between the virtual and the real. Here Winnicotts questions on maps becomes salient in relation to data; *did you find the world, or did you make it up?* The use of GI has changed dramatically in the past decade and continues to do so; in particular users themselves are being encouraged to *crowd*-source data, and with this questions over ease of data access become increasingly important (Goodchild, 2009). It is data accessibility rather than underlying data quality that makes it useful (Goodchild, 2009), therefore the tools available to manipulate data, and their compatibility and consistency with other development tools are important factors impacting GI use and counter mapping narratives (Brown *et al*., 2013). In practice though, community mapping is much less frequent or emancipatory than might be hoped. In the developed world, it has been largely subsumed into the burgeoning literature around participatory GIS. Participatory GIS in theory delivers a more democratic spatial governance, but the majority of this work still emphasizes the incorporation of local voices into maps produced and controlled by specialists, and articulating their agendas, rather than subverting mapping, or changing what is mapped (Perkins, 2007).

A common theme flowing through all the writings of Lefebvre is a critique of how capitalism has come to dominate all areas of social life, how society has been turned into a bureaucratic society of organized consumption. Not only was consumption controlled, but the spaces of the society and their production as well. The same could also be said of data and maps, and about us using our own data. 'The individual does not disappear in the midst of the social effects caused by the pressures

of the masses, but is instead affirmed', Lefebvre wrote. 'Certain rights come to light' (1993, p.435 *Cited in* Dikeç, 2001, p.178). As John Berger (1972/2008) stated, it is seeing than establishes our place in the surrounding world; we explain that world with words, but words can never undo the fact than we are surrounded by it. The relation between what we see and what we know is never settled. Each evening we see the sun set. We know than the earth is turning away from it. Yet the knowledge, the explanation, never quite fits the sight. In much the same way 'one can wear a dozen powerful sensors, own a smart mattress, and even do a close daily reading of one's poop, but [the world's] injustices would still be nowhere to be seen, for they are not the kind of stuff than can be measured with a sensor. The devil doesn't wear data. Social injustices are much harder to track than the everyday lives of the individuals whose lives they affect' (Morozov, 2014). Data are meaningful because of how someone collects, interprets, and forms arguments with it. Data are not neutral. This is why Lisa Gitelman calls raw data an oxymoron, a contradiction in terms that hides the reality of the work involved in creating data (*cited in* Neff, 2013).

4. Methodology

All theories and research methodologies are based on ontological and epistemological assumptions. Ontology deals with assumptions about our existence, the nature of the world in which we live, and how we create knowledge about the world. Drawing upon Soja (2010), who himself was building on the work of Foucault, there are three ontological qualities of human existence, from which all knowledge flows: the social, the temporal and the spatial. Human existence is hence conceived of as being shaped by a triple dialectic; 'all forms of knowledge production, [...] are always simultaneously and interactively social, historical, and spatial' (*ibid*., p.71). It is the bringing together of these three elements that ensures that this spatial research also has sound ontological grounding in relation to historical, and tacit contexts.

Epistemology, the theory of knowledge, refers to how we can know about the world, a key element of this research (Sumner & Tribe, 2008). Epistemological assumptions shape our ideas about what constitutes knowledge, how it is produced, how it can be applied and ultimately how we can affirm our knowledge (*ibid*.). Discussions about epistemology hence relate to discussions of research methodologies and approaches. This research is positioned within social constructivism, rejecting critical realism. While critical realism recognizes the existence of a world independent from our experiences, which the literature has perhaps drawn us toward, it also states that we cannot grasp the essence or truth of it (Fleetwood, 2013). Social constructivism on the other hand deals with how knowledge is constructed by actors (Burr, 2015). While this research is interested in how different knowledges about the same subject exist in apparent isolation from each other, it is still the construction of these knowledges that is paramount, as opposed to the multiple realities of critical realism.

The research, taking this social constructivist approach, is based upon a case study of the Humanitarian OpenStreetMap Team (HOT), an imminent development[22] organization working in Tanzania and employing digital cartographic tools in order to elicit tacit knowledge of local people involved in the two projects that form the units of analysis for this research. HOT attempts to design what they see as inclusive development projects that are participatory, representative, non-exploitative and lead towards intentional, imminent, development. To this end, the research will seek to address the questions laid out in section 4.1.

[22] This description is one that became increasingly contested throughout the research.

4.1 Research questions

To what extent were the Humanitarian OpenStreetMap Team (HOT) able to challenge the colonial and dependency dynamics of traditional development models through the use of open-source participatory mapping technologies and ICTs in Dar es Salaam, Tanzania?

a) To what extent did the projects of HOT between 2014-2018 empower the local population to collect and manage data and knowledge about their own lives without falling into the trap of dependency?
b) How have HOT managed the relationships and tensions between local populations, government officials, their own staff, and donors?
c) To what extent did the work of HOT in Dar es Salaam disrupt or reinforce the colonial gaze of cartographic representations of the city?
d) How have the affordances of the OpenStreetMap platform and other tools used by HOT supported or hindered their aims of being participatory, non-colonial and non-hierarchical?
e) How representative of the local population are the maps produced by HOT? And to what extent do they include local knowledges that would otherwise not be mapped?

In order to answer these questions, two of the projects run by HOT in Dar es Salaam – Ramani Huria and Data Zeta – were examined using a concurrent transformative mixed methods approach to establish the relationships between the theoretical ideas and the process of designing the project, and the outcomes produced by the project. In this way the moment at which knowledge is transformed by the NGO collecting and codifying the data could be highlighted (Creswell *et al*., 2003). Following

the work of Gimenez *et al*. (2020) this research first set out to design two heuristics based on the literature to aid in the tracing of knowledge as it is codified and transformed, allowing for a framework to explore how the actions of HOT related to the theoretical ideas presented in the literature review. This would later need to be revised in order to better see the conditions on the ground in Dar es Salaam within the international HOT framework.

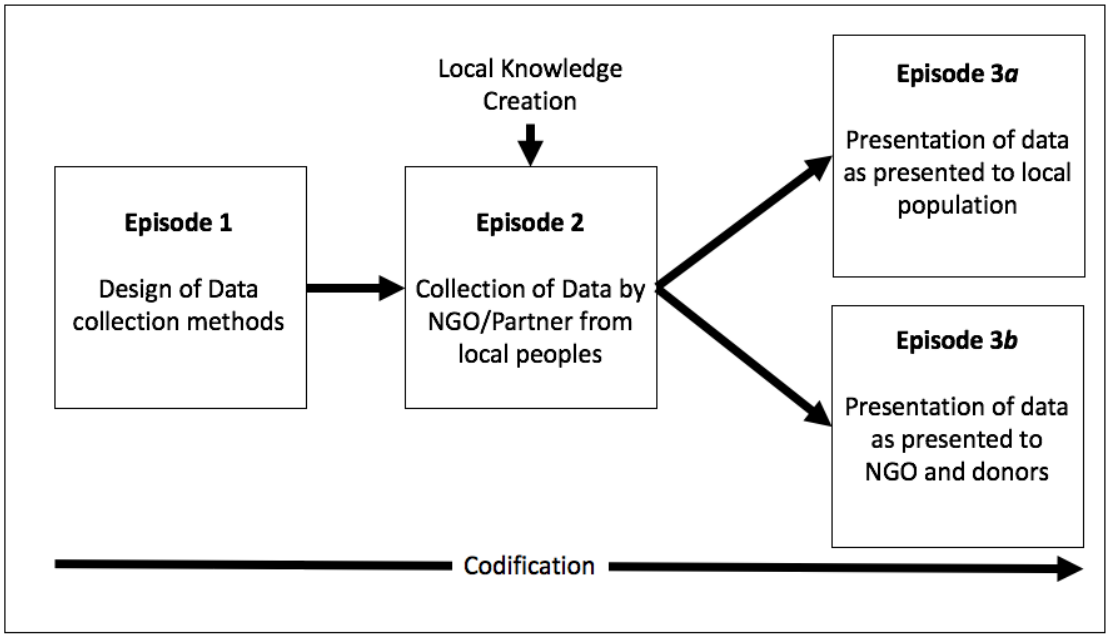
The main aim of this research was to examine the practices involved in the codification of locally produced knowledge by HOT. As a starting point a heuristic for tracing the trajectories of this knowledge was designed (See Figure 4). This heuristic allows for an overview of the patterns of trajectory taken by knowledge as it passes through collection, cleaning, and presentation as geospatial information. A second heuristic (See Figure 5) was used to trace this knowledge back as it is then applied and presented to donors and the local population.

4.1.1 Heuristic 1: CoLK (Codification of Local Knowledge).

Heuristic one (CoLK) shows the predicted process of collection and codification of knowledge. These processes comprise a series of episodes that show how knowledge travels across space and time and provides a view of the actors and artefacts involved in the codification practice. As shown in Figure 4, the first episode in the process entails the design of the data collection process to meet the aims of the development organization. The subsequent episode or episodes involve the collection of data on the ground and the way in which this is carried out. Attention is given to changing terminology and language at this stage. The third episode looks then at how this data is now presented. Here the path may divide as different outputs are presented to different actors involved in this stage, for example funders or

beneficiaries. It is worth noting at this point that although the episodes may appear to be rather neat and discreet spaces in terms of the actors and artefacts they represent, this will not always be the case. Rather than being very sharply delineated, it was expected even before data collected and analysis began that the episodes would likely show traces of previous episodes and in some instances even replicate sections or artefacts from them. These heuristics were designed only to serve as guides to start the analytical process and to draw out see the emerging themes.

Figure 4: CoLK (Codification of Local Knowledge).



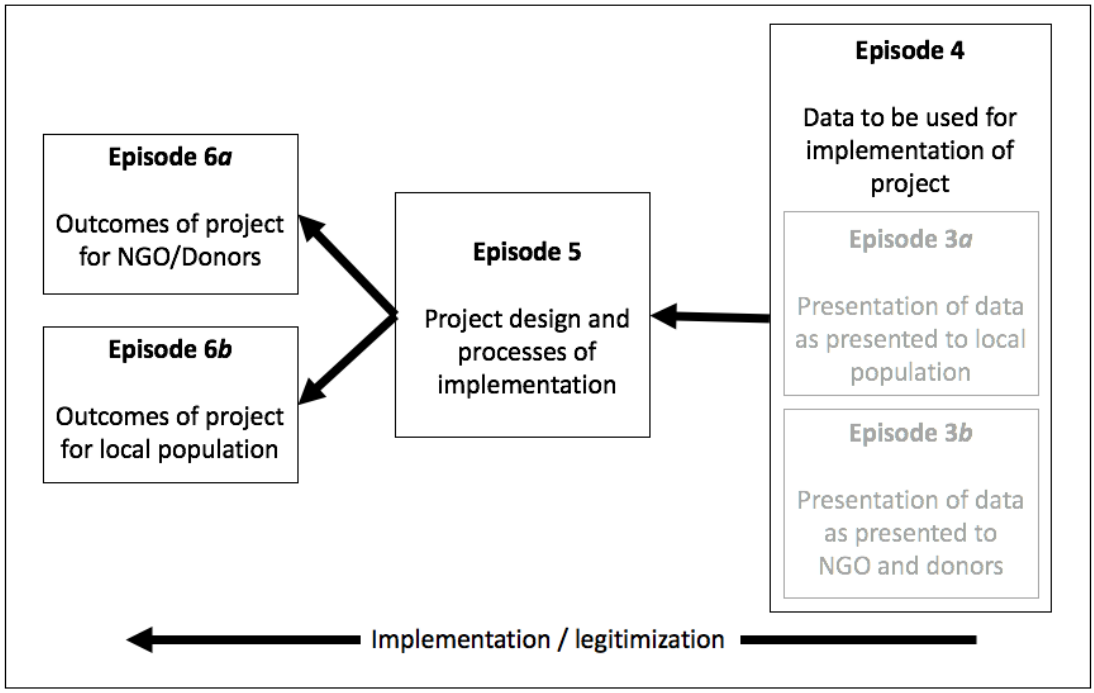
At the centre of each episode we find actors (e.g., HOT staff, mapping supervisors and community leaders and members) and their artefacts for knowledge codification (e.g., data, geographic or otherwise, and analysis tools), both interacting in a given space and time. In Episodes 2 and 3 as knowledge is codified actors make their own interpretations of the knowledge presented to them and their particular aims and objectives are seen in how they codify this knowledge to communicate with a new

audience. These may be conscious or unconscious, but often involves projecting their own forms and meanings onto the new instance of this knowledge. The processes involved in recreating knowledge and its meanings become clearer when examining artefacts with heuristic two as explained below.

4.1.2 Heuristic 2: ACKDP (Application of Codified Knowledge in Development Projects).

The second of the heuristics (*See* Figure 5), was designed to draw out how this newly codified knowledge is then implemented within a development project itself, completing the full looped trajectory of knowledge. Again, the actors and artefacts are considered, but now in reverse – following the more 'traditional' development model of sending knowledge *to* the local people (Sachs, 2005; Escobar, 1992). Here, the transformation of knowledge is again traced to see how the codified knowledge may change further as it is 'returned' to the people. This part of the process also looks to compare the knowledge found in Episode 1 of Heuristic one, with the outcomes of episode 6*a* and 6*b* in Heuristic two. Comparing the outcomes with the initial inputs, and triangulating this with additional interviews it is hoped to identify where knowledge changes and to chart any gaps between the local needs/desires, and the projects as then implemented. The overarching aim is to produce an understanding of how the codification of knowledge contributed to these potential disparities.

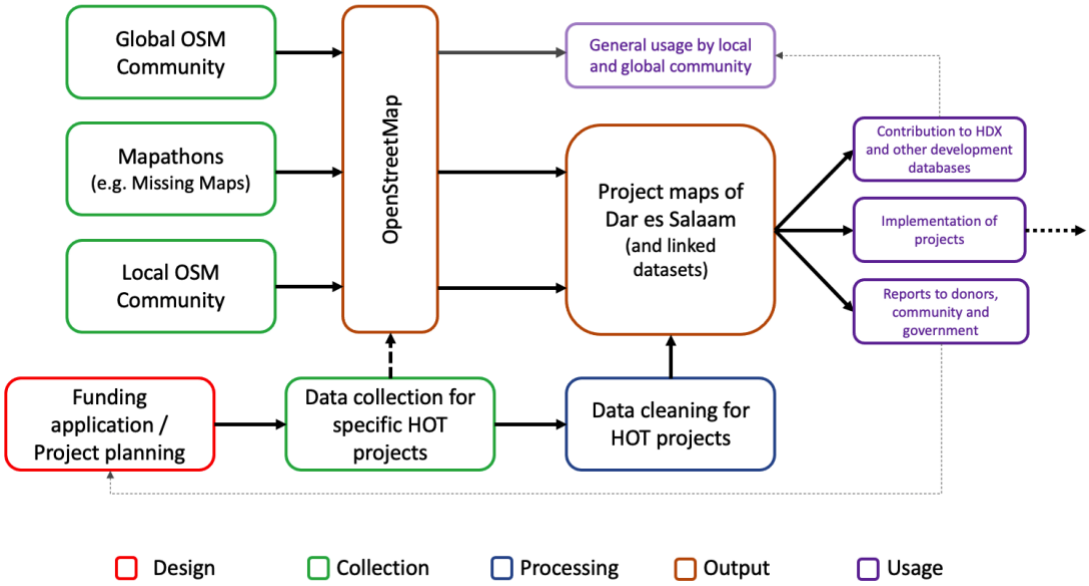
Figure 5: ACKDP (Application of Codified Knowledge in Development Projects).



4.1.3 A new Heuristic from the data

While these heuristics (one and two) were extremely helpful in the design of data collection for this thesis, through the course of the research, it quickly became apparent that HOT does not operate following models that might be fully predicted from either the literature, or in the way suggested in their own publicity materials. HOT does not follow the predicted flow of project design, implementation and presentation as described in the heuristics. And while the way in which HOT worked was not completely different, still having each of the phased predicted, the way in which these manifest are significantly more complex and thus a new heuristic was developed during the course of the research and during the stages of analysis to better understand and demonstrate how HOT operates. This new heuristic is outlined below in Figure 6 and helps to demonstrate the more complex nature of HOTs working, while also attempting to capture how ad-hoc and unplanned much of their work ended up being.

Figure 6: New Heuristic based on observed processes



This heuristic will be explored in greater detail in the results chapter (Chapter 5), but a short introduction to its design and shape will be useful here. The heuristic represents the way in which HOT operates better as a single unit in Dar es Salaam, rather than as a series of separate projects. While the original heuristics were designed to study two individual projects, it became clear that HOT themselves make little delineation between these projects, or indeed between their local and global operations. It was also found that the range of influences on mapping Dar es Salaam were considerably wider than those that could be discussed in the heuristics developed from the literature, and this new model gives space to explore the range of inputs which form part of the mappings of Dar es Salaam. This includes those generated specifically for the project work, and those which are separate but continuously influencing the work. Some of these are accidental, others originate from individuals within HOT having their own intentions about how outputs might look like.

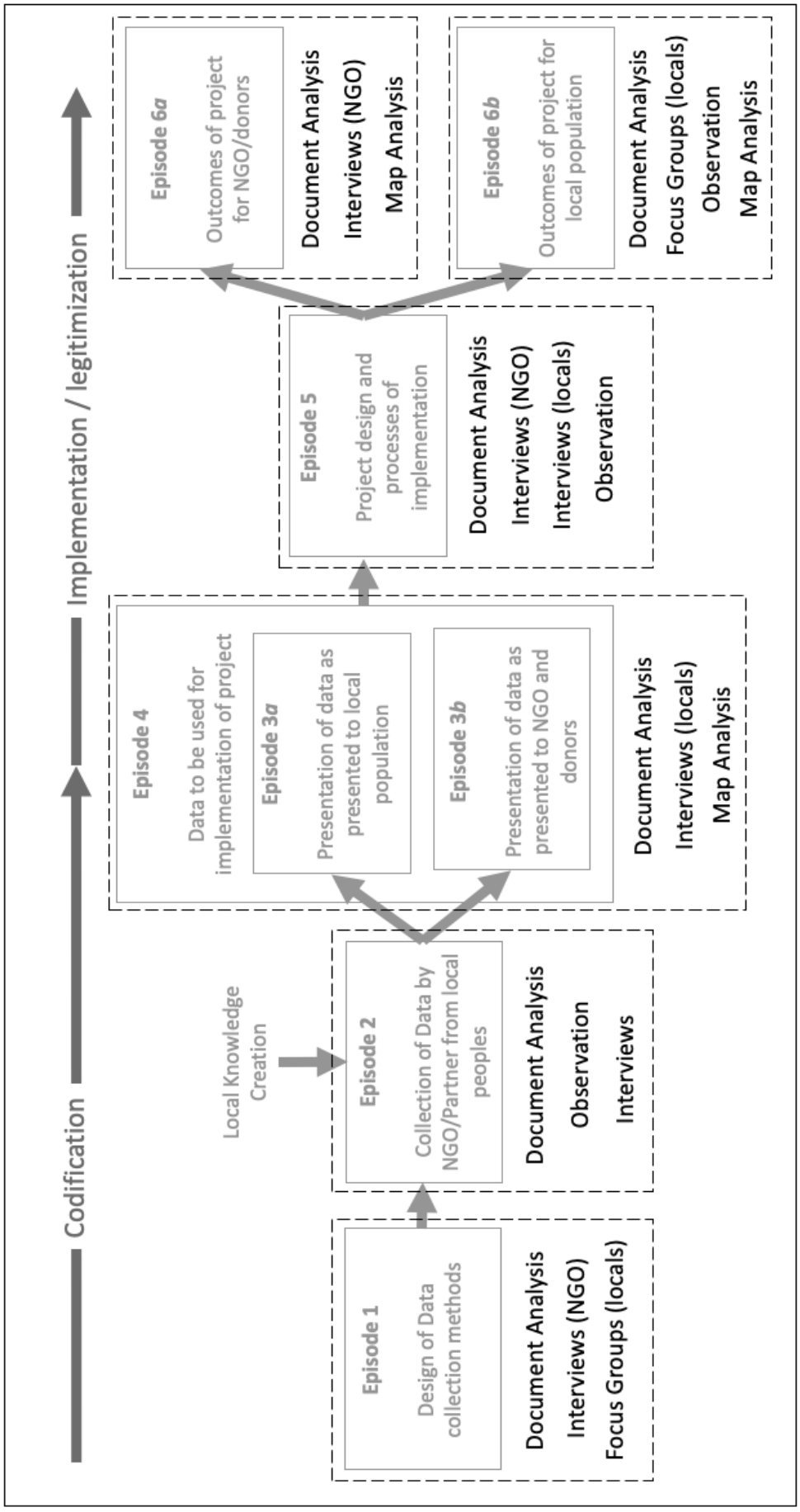
This heuristic also provides more opportunity to discuss the wide range of outputs coming from the work in Dar es Salaam – which again are more multifaceted than those that could be seen in the first two heuristics.

Overall, this new heuristic (Figure 6) allows for an exploration of HOT's work following the processes that they themselves actually undertake, rather than those predicted through literature of HOTs promotional material. That is that in the first instance HOT designs a project, most often based around the funding that is available rather than the direct needs of the local population. With the project designed and funding secured, HOT collects data, this includes both, the data collection processes implemented by HOT within the city, and also the data collection that happens alongside through the wider OpenStreetMap (OSM) community. There is then a processing and outputs phases, which is also influenced not only by the local teams, but again also by the wider OSM community. Before finally producing a wide range of outputs designed to please a wide variety of actors, including funders, the global OSM community and local officials. While the core elements match those of the original heuristics, this new model allows for a much closer examination of the successes and problems of HOT's work in Tanzania, as well as making it possible to explore in more depth the way in which HOT is viewed by the numerous stakeholders involved in the analysis of the stages of data processing. As noted above, this heuristic will be explored in more detail in the results chapter as it is used to fully explore the findings of this research throughout the rest of this thesis.

4.2 Methods and techniques of data collection

Data was initially collected following the two starting heuristics. Figure 7 shows how these methods relate to each stage of the heuristics. As this data was collected heuristic three began to emerge, allowing for a tweaking of focus of the methods, especially in interviews where challenges could be explored in depth. The methods used are divided between qualitative methods, including document analysis, interviews, and observation, and quantitative methods, in which map and data accuracy tests were applied to the outputs from the projects. Each of the methods is now described in detail.

Figure 7: Methods used at each stage of pre-research heuristics



4.3 Qualitative analysis: Interviews, observation, and documents.

Document analysis

Given the importance of transforming knowledge into data before the implementation of a development project, the use of document analysis was paramount throughout this work, being employed during all episodes of both sets of heuristics, following the methodologies of Bowen (2009) and Saldaña (2015). Document analysis was used to understand the aims of the project and how was set to be implemented. Document analysis was also used to look at the artefacts presented to the community and to the NGO sector itself, both staff and donors. Map based artefacts were further examined through Map Accuracy Analysis which is discussed at length later in this chapter. Here the aim is to see what data from that collected made it into the data visualizations, reports, and maps of the region, how data was prioritized, what was not included and whether some data has been ranked more highly or of more use. 'Episode 4' was predicted to show very similar data to 'episode 3', but these overlapping episodes were designed to see firstly if the data shown to NGOs and locals differ across episodes 3a/b, and then to ascertain which data was then used in 'episode 4' as the starting point for the project itself. Finally, episode 6a/b examined any documentation around the finished project, looking at post project reports where possible and on-going analysis of the project by HOT. Document analysis was a key part of developing the new heuristic and documentation from the field supports the new shape across all episodes presented.

Interviews with HOT Management Staff

In order to triangulate the information held in the documents, it was essential to also talk to on the ground staff in order to ascertain the extent to which these

documents are the full story. While acknowledging that these interviews are difficult to have on the record, due to the potentially sensitive nature of their content (employees may feel they cannot speak out against the HOT), they were seen as paramount in gaining the deeper insights to the workings of the sector and form the backbone of this research. Much of the access to the NGO was facilitated by the FOSS4G[23] conference, and the HOT Summit that followed in August 2018, both of which were held in Dar es Salaam. Interviews (n=10) of a semi-structured nature were conducted with management level staff at HOT. These interviews allowed for free-flowing conversation about the projects, their limitations and the accuracy of the documents presented. The option of anonymity was given to all participants, in an attempt to elicit more honest, open and useful data – only one respondent explicitly asked for this.

Interviews with Mapping Supervisors

It was expected, following the work of Moore *et al.* (2016) that the HOT management staff would provide little talk of failure, lost data, or power dynamics. Nor would this be apparent within documentation, methodologies of codification or in the design of the projects. To counter this potentially one-sided narrative, and to ascertain to what level it may or may not present a picture of reality, interviews (n=9) were also conducted with the community mappers themselves. These persons were identified through a snowballing technique starting with contacts formed through the HOT Management team, and then seeking to reach beyond the points of contact to other community mappers. These interviews, also semi-structured in nature, were

[23] Free Open-Source Software for Geospatial Conference.

designed to examine if the mapping supervisors felt that they were as involved in the participatory projects as promised or indeed if they felt the projects were meeting their aims or the aims of the community. Carried out to explore a number of episodes (1, 4, 5 and 6b) they also helped shape the new heuristic and to ascertain whether the project aims and outcomes changed, and/or whether the initial inputs of the local population were codified in a way that was no longer recognizable to them. While many factors around power and personal desires motivated and influenced the responses in these interviews, they provided a complimentary (or competing) narrative to that given by the HOT management, and by the data, allowing for a better understanding of knowledge change.

Interviews with other stakeholders

In order to complete the cycle of information and understand the way in which information is codified and presented to different groups it was also important to conduct interviews with other stakeholders and donors. These interviews (n=3), which took place with staff from the World Bank and IREX, both major donors to HOTs work in Dar es Salaam, enabled the analysis of parts 3b and 6a of the knowledge transfer heuristics, as well as to establish new outputs in the revised heuristic. These interviews were carried out following the fieldwork in Tanzania through a combination of face-to-face interviews held in London, and interviews conducted via Skype. The contacts for these interviews were provided by members of HOT and may have been skewed towards staff that the HOT staff felt would be complimentary to their actions. The interviews though were balanced and where possible the interviewees were open and honest in their responses, making clear when they were not able to comment because of operational or financial reasons. These interviews, as will be seen in the results,

made clear the level of outside influence on the work of HOT – something which differs from their described mission of independence and grassroots working.

Observation

Given the numerous difficulties presented in the methods above – the biases of documentation, the unwillingness of interviewees to be open (for fear of jobs at the NGO level, and fear of losing projects/funding at the local level), and other issues of access – observation played an important part in the research (Laurier, 2010). Observation was undertaken in an attempt to 'fill in the gaps' left by the other methods, such as the power plays and complex dynamics of the projects. Observation was used to identify actors and internal power structures in order to ascertain who is, and who is not, included in various points of decision making. Observation also helped to give an idea as to the reasons for this, be they political, technological, or social (Laurier, 2010). While observation can be a rather broad house, it was crucial in its employment in this work. Observation was helpfully facilitated by the vast majority of HOT staff being in Dar es Salaam for FOSS4G and the HOT Summit. This allowed for unprecedented access to the team, and to see them in the unusual setting of all being in the same room. Having everyone from local community mappers, country managers, project leads, HR, and senior management, as well as coordinators from other projects around the world (principally Uganda and Turkey) meant that it was very easy to observe the inner dynamics of the organization and to identify who the main players were. I was also fortunate enough to be invited into the fold in a way that allowed me to see how the organization socialized together, providing an additional layer of observation data while peoples guards were down. In total I spent 4 weeks emersed within the HOT community. Throughout this time extensive notes were kept

within a notebook, as voice messages on my phone, and in memos to self. These were collected together later and used to tigger memories of key moments, group dynamics and other incidences that helped to understand the workings of HOT.

4.3.1 Access

Gaining access to the groups and processes being studied is often mentioned as one of the main challenges in participant observation and in-depth interviews (Lichterman, 2002). However, this was less problematic in this case, partly due to the open, or at least attempts to be open, nature of the OpenStreetMap community and its offshoots such as HOT. This openness is seen in its open data, open access documentation, wikis, community mailing lists and even applications to the board – and this has embodied an openness in real life interactions too. The open character of the organisation extends to a tolerant, even appreciative, attitude towards researchers. HOT views 'self-reflection' as an important part of their process and welcomed outside perspectives and were indeed pleased to have a researcher interested in their work.

Before undertaking the fieldwork, I had also already been introduced to a number of people by a mutual contact, which also helped to facilitate trust in what I was doing in relation to the work of HOT. The FOSS4G Conference was also an opportunity to network in and around HOT and presenting my own work at the conference helped to open doors as this demonstrated my credentials and served as an introduction to my work and aims. By the time the HOT Summit took place following FOSS4G I was already well ingratiated within the organisation, both as a researcher and socially.

My status in the group was not then that of the 'outsider', as the inclusiveness of HOT did not really allow for anyone to be treated as such. I was of course, also not an insider either, despite later carrying out work with organisations such as Médecins Sans Frontières connected to HOT. Although at times difficult to manage, this Insider/Outsider status aided me in developing trust and rapport with my interviewees without hindering my ability to challenge their underlying assumptions and recognize the beliefs that were taken for granted (Blee and Taylor, 2002).

Managing this status required a self-reflexive and honest approach. With HOT being so open to researchers it was not problematic to be truthful about my research intentions, or my personal feelings about the sector. This helped to build a relationship between myself and the interviewees that was more contractual in nature, bringing about a convergence of interests – 'the researcher's interest in gathering information, the actor's interest in increasing her/his capacity for action' (Melucci, 1996, p.391-2). It was also important to reserve judgement of the interviewee's ideas, acknowledging that what 'the informant believes is indeed a fact (that is, the fact that he or she believes it) just as much as what "really" happened' (Blee and Taylor 2002, p.95)

Most interviewees seemed to relish the opportunity to air their views and to be engaged in a self-reflexive process where they could ponder on their motivations, identities, and experiences in the organisation. Many tensions exist within HOT, and it seemed that the interviews offered a space for airing some of these to someone who was willing to listen rather than dispute. This partly accounts for the often-surprising degree of openness in the interview data. As many of the interviewees were also involved in the collection of data from the field, they were perhaps more open to sharing.

Securing the necessary trust and rapport was also facilitated by my past experiences as a Charter Geographer of the Royal Geographical Society, a member of IST/36[24] and having published widely on the notions of humanitarian mapping. Members of HOT from different parts of the organisation appeared comfortable to talk to me at which ever level they felt most comfortable – management talk, technical mapping, logistics, communications etc., although there were some cultural barriers as will be noted in the limitations section.

4.3.2 Interview sample

Interviews for this research chosen in a deliberate rather than random way, however, the FOSS4G Conference and the HOT Summit meant that I was able to quickly and easily gain access to most of the HOT Tanzania Team, as well as their international management staff who had flown in for both events in Dar es Salaam. This meant that rather than having to be selective, I could interview the majority of the team. Further deliberate seeking of interviews with donors, recipients, and remote mappers was carried out following these initial interviews.

The sampling process of open-ended interviews is less governed by representativeness. Instead, 'individuals are selected because they have particular experiences [...] rather than because their experiences are representative of the larger population' (Blee and Taylor, 2002, p.100). In that respect, the selection process also involved taking note of interviewee's positions within HOT – from managers to community mappers, to donor and recipients, also encompassing both 'local' and 'international' staff and partners to ensure the full spectrum was included.

[24] The IST-36 Standards Committee is the official BSI (British Standards Institution) committee for geographic information (known as BSI IST/36).

While initial sampling was guided seeking diversity, aiming to garner the opinions of as diverse a group of participants as possible, as knowledge about HOT grew, sampling choices started to be influenced by the emergent patterns and understandings of the study. Therefore, in later stages of the study my sampling choices were dictated by the principle of 'similarity and dissimilarity', with interviewees 'chosen to see how the interpretations or accounts of similarly situated respondents compare, as well as to ascertain how

Figure 8: List of interviewees, their roles, and nationalities

Name	Position	Nationality
Amedeus Raphael Kimaro	Mapping Supervisor	Tanzanian
Amelia Hunt	FORMER: Mapping Training and Project Assistant	British
Asha Mastapha	Associate Project Manager (Data Zetu)	Tanzanian
Barnabas Caro	Associate Project Manager (Mini Grids). Now supporting Raman Huria	
Caroline Margaux Gevaert	Consultant working for the World Bank mainly in Tanzania but also with GFD in Washington	
Dara Lipton	Senior Program Officer at IREX	
Iddy Chazua	Digitizer (GIS expert)	Tanzanian
Innocent Maholi	Deputy Country Manager (Tanzania)	Tanzanian
Ivan Gayton	Country Manager (Tanzania)	
Nuru Kalulunga	Finance & Admin Officer	Tanzanian
Rachel VanNice	Operations Manager (based in Washington)	American
Rebecca Firth	Community & Partnerships Manager	
Richard Kegel	Volunteer at Mapathon London	British
Roza Vasileva	Consultant at the World Bank	
Rupert Allan	Country Manager (Uganda)	British
Russel Deffner	Associate Project Manager	
Sara Amadi	Associate Project Manager (Data Zetu)	
Steve Penson	Volunteer with MapAction, HOT and Mapathons	British
Tonny John Kanyenye	Mapping Supervisor	Tanzanian
Tyler Radford	Executive Director	
Pete Masters	Head of Community (formally Médecins Sans Frontières)	

those respondents with very different characteristics or in different circumstances differ' (Blee and Taylor, 2002, p.100). The aim of the interviews was to gain a complete

picture of HOT's work in Dar es Salaam and as interviewees began to provide the same kinds of responses and stories as other interviews, following Blee and Taylor, 2002) it was felt that completeness had been achieved.

4.3.3 Interview design and preparation for analysis.

Interviews were semi-structured in nature, loosely following an interview guide, but allowing interviewees to elaborate on certain points or to bring new ideas into the discussion (Kvale, 2008; Rowley, 2012). The guide was updated and added to throughout the research as new themes and patterns began emerging. The guide was used in all interviews to ensure a consistency of core questions, even if some of these evolved over time or the interviewee took the conversation in another direction. It was important to see the directions the interviewee wanted to take the discussion but being able to return to the interview guide and more specific questions enabled more comparable conclusions to be drawn from each meeting (Rowley, 2012). In this way interviews followed the same general structure that, after an initial period of trial and error, seemed to facilitate the establishment of trust and rapport. Interviews always began with a brief explanation of the research as well as the purpose of the interview and the topics being explored. The establishment of rapport aided in discussions around contentious issues, such as an interviewee's opinions on the internal disagreements within HOT, its processes and of its successes and failings thus far.

Interviews ranged from forty-five minutes to almost three hours and were conducted face-to-face. All interviews, bar one, were recorded with permission (extensive notes were taken, with permission, in the case where the interviewee preferred to not be recorded). The recorder was positioned so as to be as unobtrusive as possible, being on the table or floor (some interviews were conducted sitting on the

ground), but out of eyeline. This made transcription more difficult, particularly for interviews held in noisy venues, but allowed for a more natural flow of conversation. It is for this reason that personal information about interviewees was cross-referenced with other sources, such as the HOT team website to ensure accurate representation of names and job titles.

Interviews were transcribed in MS Word with a separate file for each interview. These were later loaded into Atlas.ti where notes from the field as well as cycles of coding allowed for a deep analysis of the discussions in Tanzania. This process is explained in detail later in this chapter.

4.3.4 Document sampling

While the principal concern of this research is the codification and transfer of knowledge through digital cartographic artefacts, document analysis also forms an important part of the analysis. The maps produced by HOT, and their partners tell a great deal of the story, however these maps are often embedded within additional materials and in broader reports. These documents (n=46) help to give an understanding of not only how the maps were intended to be read, but also provided insights into how HOT sees itself, and how they present themselves to the Tanzanian Government, local stakeholders, and their national and international donors. They also provided an insight into how the Humanitarian OpenStreetMap Team (HOT) presents itself to the Geographic community, the OpenStreetMap community, and the wider development and humanitarian communities. The documents selected for this research (see Figure 9) were chosen to give as broad an overview as possible of the above features. They were drawn from official documents, tweets, working papers, websites and handed to me by members of HOT or other interested parties. My work

with IST/36 and connections to Ordnance Survey and the United Nationals Committee of Experts on Geospatial Information Management (UN-GGIM) formed through work and events such as the Geospatial World Forum also allowed me to gain access to additional documents that helped contextualize the work of HOT in a broader sense, especially in relation to International Standards and the UN's Sustainable Development Agenda.

Documents were compiled alongside interview transcripts and were analysed using the same coding systems. This allowed for a quick comparison of the official documents with the accounts of HOT given by their staff, mappers, and donors. A fuller account of this process is given in the next part of this chapter.

Figure 9: Documents used within document analysis

	Name of document	Type	Provided by…	Episode
1	Draft new Recommendation ITU-T L.1603	White Paper	UNECE and ITU	1
2	Ethical OS	Presentation	Institute for the Future and Omidyar Network.	1
3	Ethical OS: Risk Mitigation Checklist	Guidelines	Institute for the Future and Omidyar Network.	1
4	Geospatial Data: Key to achieve SDGs	Opinion piece	Geospatial World	1
5	Empowering Citizens with Open Map Data	Presentation	Melanie Eckle – Board of HOT. Presented at Geospatial World Forum	1, 2, 5, 6a
6	Contributing to the UN Sustainable Development Goals with ISO Standards	Policy Paper	ISO	1
7	OSM SWOT	Wiki	OSM	1
8	Overcoming Data scarcity for energy access planning with open data – the example of Tanzania	Presentation	Catherina Cader – Presented at FOSS4G 2018	1
9	Tanzania, FOSS4G and the world of Open-Source Geospatial Technology	Blog	Steven Penson – reflections on FOSS4G	1
10	A Guide to the Role of Standards in Geospatial Information Management	Policy Paper	ISO, OGC, IHO	1
11	A Guide to the Role of Standards in Geospatial Information Management: Companion document on Standards Recommendations by Tier	Policy Paper	ISO, OGC, IHO	1
12	The drone pilot whose maps are saving lives in Zanzibar	News item	BBC	1, 6a
13	Using innovative methods to report against the Sustainable Development Goals	White paper	ONS	1
14	Charting the Uncharted	Video		2

15	HOT Tanzania – Knowledge Sharing from the field	Presentation	Presented at FOSS4G 2018	2
16	How Maps Are Preventing Female Genital Cutting	Video	Crowd2Map	2
17	Dar Ramani Huria	Presentation	World Bank Group	2
18	Why we map	Video		2
19	Integrated Geospatial Information Framework		UNGGIM	5
20	What we learnt from mapping African Megacity Dar es Salaam	Blog	HOT	5
21	Data for Evidence-Based Decisions: Data Zetu	Project website	HOT	6a
22	HOT Tackles Dar es Salaam's Waste Problem – on Dataset at a Time	News item	The Guardian	6a
23	Local People, Local Devices, Open Knowledge: Inception Report and Data Capture Strategy (Rumani Huria)	Report	HOT	6a
24	Annual Report 2017	Annual Report	HOT	6a
25	Annual Report 2018	Annual Report	HOT	6a
26	Annual Report 2019	Annual Report	HOT	6a
27	Piloting Tanzania's First Patient Organ Tracking System	Blog	HOT	6a
28	WB7185315 – Detailed village mapping for off-grid rural electrification in Tanzania	Report for International Finance Corporation's (IFC)	HOT	6a
29	Putting Innovation Stakeholders of Tanzania Under One Platform – Innovation Ecosystem Map	Blog	Innovate Tanzania	6a
30	Solving the Missing Map problem with OpenStreetMap	Video	TED Talk by Rupert Allan	6a
31	Community Insights (Data Zetu)	Report	HOT / Data Zetu	6b
32	Rumanihuria.org	Website	Rumani Huria	Project Context
33	Datazetu.dlab.or.tz	Website	Data Zetu	Project Context
34	hotosm.org	Website	HOT	Organisation context
35	The State of Open Humanitarian Data	Report	OCHA / HDX	Context
36	Opening the Door to Geospatial Innovation	Report	DGI	Context
37	Joint UNGGIM Europe-ESS meeting on the integration of Statistical and geospatial information	Presentation	European Commission – Welcome address	Context
38	UN Open GIS Initiative	Presentation	UN Open GIS – Presented by Kyoung-Soo Eom at FOSS4G 2018	Context
39	Geospatial Information Management Perspective on the Outcome Document of the Open Working Group on Sustainable Development Goals	Report	UNGGIM	Context
40	The Geospatial context for the SDGs and Indicators	Presentation	UNGGIM – Olav Eggers. At the Joint UNGGIM Europe-ESS meeting on the integration of Statistical and geospatial information. 2016	Context
41	Twitter	Twitter	Accounts of HOT, projects, and staff	Context
42	Humanitarian Information Management Failures Report	Report	OCHA	Context

43	The state of Mobile Data for Social Good Report	Report	UN Global Pulse / GSMA	Context
44	Geographic information — Preservation of digital data and metadata	ISO	ISO	Context
45	Humanitarian Technologies Project	Website	Humanitarian Technologies Project	Context
46	Transforming our world	Report	Digital Globe and Geospatial Media	Context

4.4 Qualitative data analysis

In order to fully understand the materials collected through interviews, documents and observation it was important to undertake a structured and systematic review of the data collected. Following the work of Saldaña (2015), Stuckey (2015) and Wolcott (1994) this process involved pre-coding, first cycle coding and second cycle coding – including eclectic coding, simultaneous coding, writing memos and theming. Finally producing a series of heuristics, charts, and insights about HOT and their projects in Dar es Salaam. This work was carried out in Atlas.ti, a qualitative data analysis research tool developed by ATLAS.ti Scientific Software Development GmbH. These processes are detailed below.

4.4.1 Pre-coding

Following Stuckey (2015), the first step to qualitative data analysis is reading and having a general knowledge of the data before the commencement of coding. Therefore, each of the interview transcripts and documents were read through, with the focus of the first reading to give a general idea of what the interviews and documents were about. A second reading of the interview transcripts specifically, allowed for a deeper understanding of the flow of participants' narrations and for the development of a meta-narrative. These initial readings found that nearly all the participants tended to narrate four important concepts a) the process of generating geospatial data b) the motives underlying mapping and household-level data collection c) the relationship with funding organisations and their influence on the data generation, and d) the challenges faced at project or organisation level and how this shaped the respondents' view of the future. Following the establishment of the meta-

narratives, the data was coded in two cycles based on Saldaña's (2015) coding recommendations.

4.4.2 First cycle coding

The first cycle of coding used descriptive and versus coding. According to Saldaña (2015), descriptive coding involves the summarization of a passage of data. It involves devising words or phrases that provide a summary of the substance or message of the passage. Examples of descriptive codes from the research included: 'year', 'job description', 'satellite', 'drones', 'reliability', 'accuracy', 'participation', and 'students' among others[25]. Versus coding, on the other hand, involves identifying areas of conflict (Wolcott, 1994). In this case, the phrase used in many codes " literature versus ground" was used to mark areas of conflict between the participants' narratives and narratives in the documents or conflicts identified by the participant in their narration.

Rather than just coding the interview transcripts, the documents collected were also coded. The coding, however, differed when working with documents. While the aim of coding the interview transcripts was to effectively describe all the conversations, the aim of coding the other documents was to describe only the related content. For example, where only part of a document was relevant to this research, only that part of the document was coded – this was of particular necessity with some of the longer documents that ran into the hundreds of pages, but of which perhaps just one chapter was associated with this work. Aside from reading the transcripts and documents sequentially, descriptive coding was also enabled by other forms of data

[25] Over 100 codes were generated at this stage, thus a summary table in not included here.

exploration such as word frequencies, word clouds, and document search. Recurring words were also used to identify potential issues that could be brought to the fore and coded in the second cycle.

4.4.3 Second cycle coding

The first cycle coding techniques helped in identifying the major issues and described the sentences and paragraphs. However, this process generated too many codes (more than 100) and did not reflect a logical flow of message or storyline. It became necessary to re-examine the codes and the context of participants' message. Moreover, some of the descriptive codes only contained one or two quotations which did not provide sufficient evidence for theming or theorisation. The second cycle coding techniques, therefore, helped in not just contextualizing, but also clustering the codes into words and phrases that best captured the message of the text. It involved using several techniques simultaneously, each of which is further outlined below:

4.4.4 Eclectic coding

This involved the use of a combination of the first cycle coding techniques, although in this study, the combined use of first cycle techniques slightly differed from the approach provided by Saldaña (2015). More specifically, the codes were combined in a way that essentially brought together the same concepts, even if they had been coded in a different manner in the first cycle. For instance, 'job description', 'position', and 'years' were combined to form one inclusive code-profile of 'the interviewee'. Also, 'mobile phones', 'satellites', 'drones', 'software', and 'machine learning' were combined to form 'technology'. This helped reduce the number of codes from more

than 100 to 35, with an increased number of quotations per code. See Figure 10 for full coding framework.

Aside from eliminating codes with very few quotations, the purpose of consolidating the codes was to develop descriptions that bring together a more contextual narrative as opposed to breaking parts of the narrative. For instance, using the profile of the interviewee instead of three different codes helped to solidify the participant's story and described their education, career, and experience. In the same way, using the code 'technology' helped in capturing other contextual implications such as challenges with technology, uses of technology in data collection, or even funding the development of purchasing of technology.

4.4.5 Simultaneous coding

Consolidating the codes led to the challenge of adequately describing the context. For instance, how could technology be described in a manner that captured all the nuances of its funding, challenges, or even different uses? This was solved by simultaneously coding additional descriptions of the narrative. This coding technique was also useful when coding unrelated texts that could not be separated without losing the context or meaning. For instance, some participants' narrations were not sequential in the sense that they would keep bringing in unrelated narratives before continuing with their statements. To capture the entire narrative, it became important to simultaneously code the description in the core narrations and the mini narrations.

4.4.6 Writing memos

In Atlas.ti, memos can be recorded as comments. These became crucial in communicating the interpreted meanings of texts, implied relations, and tensions. The researcher recorded the implied meanings or insights from the quotations as

comments on quotations, while implied relationships were coded as comments on codes. This separation made it easy to identify and differentiate between relations during the coding process. It also made it possible to identify tensions in participants narratives. For instance, participants who were Tanzanian nationals perceived the government as cooperative, helpful and welcoming. On the contrary, non-Tanzanians thought of government as non-cooperative and bureaucratic.

Also, one participant had contradictions about their perception of government, at one point indicating no challenges with the government and at another point indicating the government as a challenge. Writing comments helped in keeping a journal of such contradictions. Memos also helped in identifying the relationships between the documents and the interview transcripts. Building on the coding of 'literature versus ground', comments on documents such as 'confirmed', 'deviation' and 'new' were used as pointers to the links between the information provided in the documents, and those on the quotations from transcripts.

4.4.7 Theming

The final part of the second cycle involved theming. First, the implied relationships as recorded in the comments on codes were used to create networks. These were based on the available default relationship terms on Atlas.ti such as 'is a', 'is part of', 'contradicts', 'is the cause of', and 'is associated with'. These were then sorted by codes based on their densities (number of code-code links). The codes with the highest densities were used as leads to identify possible themes and subthemes. Themes identified using this technique included 'challenges', view of HOT, and 'achievements' among others (See Figure 10). However, this was not efficient in identifying all themes. For instance, the code *data process* had a lower grounding

(number of quotations) compared to the code *data collection*, yet *data collection* is a *data process*. Therefore, the logical flow of the meta-narratives combined with the implied relationships were useful in identifying themes and subthemes. These were presented in network diagrams, which were used to develop the results chapter.

Figure 10: Codes and their contents from Second Cycle of coding

Code	Encompasses Themes of:
Accessibility	Accessibility is associated with ethical responsibility Ways of achieving access 1. Online availability 2. Printing maps and taking them to towns Ethics also means restricting access on sensitive information e.g., HIV hotspots Accessibility is part of training Training focuses on increasing access through knowledge of the use of tools, and knowledge of the available data Accessibility contradicts challenges [government's outdated data]
Accuracy	Accuracy is part of data cleaning It is during data cleaning that data accuracy is ensured Accuracy is associated with technology The accuracy of GPS is associated with the smartphone Accuracy is a challenge Many times, they do not find people with phones that have accurate GPS
Achievements	Achievements associated with objectives The projects met their main objective Achievement is associated with uses of data Community is empowered to use data as evidence Achievement contradicts challenges HOT has successfully navigated through the challenge of bureaucracy
Bias in data collection	Bias in data collection is caused by government and politics
Challenges	Challenges
Data cleaning	Data cleaning contradicts missing data [component of quality] The role of data cleaning is to ensure there is no missing data
Data collection	Data collection is explained as a step in the data process Data collection contradicts challenges Solves the problem of non-performing organizations Data Collection is associated with HOT Data collection is part of view of HOT Its integral to HOT as a community led initiative or program Data collection is associated with government and politics You need leadership to access locals
Data process	Data process is associated with training The content of training covers a range of data processes

Data quality	Data quality is a challenge
Donors, partners, or clients	Client [World Bank] is associated with data collection, cleaning and use Partner [Deltares] is a user of data Donors are a challenge
Ethics and social responsibility	Ethical responsibility is associated with the use of data Ethical responsibility associated with donors Responsibility to donors: honesty about challenges upfront
Funds & money	Finances are a challenge Root of all challenges Finances are associated with donors and partners Funding comes from them Funds are associated with the vision Need funds to fulfil the vision
Government & politics	Government is not a challenge They provide permission for drain mapping and have no issues with the project Contradiction: government is a part of the challenge Passively obstructing the solution – solving the problem stops the flow of money into the country Active obstruction- Project mini-grids Politics is a challenge Disagreement between local leaders derails a project in an area Government is associated with training [government is trained] Government associated with local community-selecting community members to accompany mappers
Groups	Groups are associated with data process Data collection Data cleaning Groups contradict accuracy A larger number of people in a group could lead to confusion in the data
Impacts of data usage	Impacts of data usage is associated with objectives of use World Bank has pushed the government Drains have been constructed
Inclusivity	Inclusivity [Including Swahili translations] is an ethical responsibility Inclusivity is associated with the design of data collection tool
Instrument design/mapping methodology	Instrument design/mapping methodology
Language	Language is a challenge Language is associated with data collection
Leadership	Project leadership is a reason for success Project leadership is a challenge: do not think like donors Project leadership is associated with donors

Local community	Local community is a challenge They are eager to know the solutions that mapping brings to them. Non participation Local community is a user of data They come to the office to check the data Local community is associated with training The local community is trained Local community is associated with data collection They collect data (map problems) in their own neighbourhood Local community leaders involved in determination of areas affected by floods Local community associated with achievement: participation and impact of trainings and mapping
NGOs and other organizations	Other organizations are a user of data Data used for rural electrification Data used for healthcare purposes (patient tracking) NGO is impacted by data Patient registration changed, able to be automated Other organizations is a challenge They complain that government is aware of their delay in service delivery since the information about their service is available on the maps NGOs is associated with training They are trained on data processes
Objectives of data	Objectives of data contradicts challenges 1. The community's anxiety is alleviated when they know the purpose of mapping Objectives of data contradict challenges due to politics We are collecting data to support your objectives Objectives associated with data collection [influence the data collection process]
Objectives of project	Objectives of the project associated with donors
Profile of the interviewee	Profile of interviewee is associated with technology use Those handling technology used have training and experience
Reasons for success	Reasons for success is a cause of achievement
Recommendations	Recommendations contradict challenges Recommendations associated with data quality Recommendations associated with ethical responsibility
Staffing and operations	Staffing is a reason for success
Students	Students associated with data collection: Mapathons Students are part of the local community Students are associated with training: they are the ones trained Students are associated with the type of project: Students contradict bias in data collection Students are associated with achievements: they are being capacity built, mentored to become staff Number of students involved is an achievement

Technology	Technology is associated with data collection Smartphones and ODK (a smartphone app) are used for the data collection process ODK-used to collect and trace drain segments, and take information at the site Technology is associated with accessibility A server is used to ensure access through multiple devices Technology is associated with data cleaning Aerial imagery used in the data cleaning process Technology is associated with training Local community are trained on how to use various technologies Technology is a challenge Technology is associated with the objectives of projects
Training	Training is an ethical responsibility Training is associated with data collection [locals trained to collect data] Training is part of operations Training contradicts challenges
Type of project	1. Drain mapping – involves mapping drains using ODK Was conducted in the city – Dar es Salaam Carried out in July 2017 Part of Ramani Huria 2.0 2. Shina mapping Part of Ramani Huria 3. Data Zetu – under USAID AIDS The projects are considered to be resilience projects
Uses of data	Uses of data is associated with objectives of data uses 1. Community access to the data to inquire about their drains 2. World bank access of data 3. The objectives mainly address users [local community first, and then donors] Uses of data contradicts challenges Selecting what data to provide when requested
View of HOT	Associated with Sponsors, clients Some definitions are geared towards the need for increased corporate partnerships The view of HOT is a challenge The profitable model faces the greatest challenge- community thinks others should be mapping for them, not they, for themselves View of HOT associated with operations -Having volunteers or staffing
Vision for HOT	Vision of HOT is associated with uses of data
World Bank	A user of data Ramani Huria 2.0: client is World Bank Influences operations Pushed for hiring communications specialist

4.4.8 After the second cycle methods

After the second cycle coding methods, further analysis and documentation on the process and results were undertaken. Since coding itself is analysis, the term 'analysis' here refers to identifying two processes: identifying redundant codes, and co-occurring codes. Redundant codes were eliminated through merging the codes and co-occurring codes were documented. Documentation involved: Generating the coding manual (See Figure 10) and exporting it to an MS Excel document; Generating, exporting into MS Excel format, and consolidating co-occurring codes based on code densities (See Appendix I); Generating a report based on the code-code links (MS Excel format); Generating a code report for all codes (PDF and MS Word documents)[26]; Exporting the networks into JPEG format (See Appendix II).

Once coding had been completed the codes were used to draw together network diagrams in Atlas.ti. These diagrams, developed following the methods of Popping and Roberts (1997) help to show where ideas are linked, how different codes, or ideas stated by staff and documentation, influence and inform each other. These network models were used, in combination with coded quotes and comments in order to provide insights for each aspect of HOTs work, as explored in the results chapter.

[26] This coding consisted of 530 pages of documentation and thus inclusion as an appendix would not be appropriate. The full coding report can be downloaded from: https://doug.specht.co.uk/wp-content/uploads/2022/05/HOT_Coding-Summary_LEVEL-2.pdf

4.5 Qualitative map analysis

Given the importance of mapping in the process of codifying knowledge within the two projects – Ramani Huria and Data Zetu – it was important to also undertake a detailed analysis of the maps produced independent of the opinions and feelings of those who made them or used them. In order to do this an analysis of the accuracy of mapping practices was carried out following the methodologies outlined by Haklay (2010a) and Barron *et al*. (2014). An examination of data available prior and post community mapping, along with a comparison with post-project reports was carried out, quantitatively assessing the map data for accuracy.

Haklay (2010a) presents a methodology for the comparative assessment of mapping data, following ISO:19157: Geographic Information – Quality Principles. While his work is primarily concerned with Volunteered Geographic Information (VGI), the principles and method can be applied more broadly. Mooney *et al*. (2012) and Barron *et al*. (2014) further the analysis of mapping quality, proposing an analysis of the intrinsic factors of the data, such as metadata and attribution when no such comparative dataset exists. In order to undertake this work, a comprehensive dataset was built comprising of historic, official and HOT data and maps. This data was drawn from the OpenStreetMap historical data archives, and also from data uploaded to the Humanitarian Data Exchange (HDX) and GitHub by HOT themselves (See Figure 11), and was drawn together in QGIS for remapping and analysis of mapping development.

Figure 11: Mapping Artefacts uses in Map Accuracy Analysis

Artefact	Owner	Format	Source
OSM Data for Dar es Salaam (2006)	OSM	osm.bz2	https://planet.openstreetmap.org/cc-by-sa/
OSM Data for Dar es Salaam (2010)	OSM	osm.bz2	https://planet.openstreetmap.org/cc-by-sa/
OSM Data for Dar es Salaam (2014)	OSM	osm.bz2	https://planet.openstreetmap.org/cc-by-sa/

OSM Data for Dar es Salaam (2016)	OSM	osm.bz2	https://planet.openstreetmap.org/cc-by-sa/
OSM Data for Dar es Salaam (2018)	OSM	osm.bz2	https://planet.openstreetmap.org/cc-by-sa/
OSM Data for Dar es Salaam (2020)	OSM	osm.bz2	https://planet.openstreetmap.org/cc-by-sa/
Dar es Salaam 2012 Census Wards	HOT / HumData	Shape	https://data.humdata.org/dataset/2012-census-tanzania-wards-shapefiles
HOTOSM Waterways	HOT / HumData	.kml	https://data.humdata.org/dataset/hotosm_tza_waterways
HOTOSM Railways	HOT / HumData	.kml	https://data.humdata.org/dataset/hotosm_tza_railways
HOTOSM Roads	HOT / HumData	.kml	https://data.humdata.org/dataset/hotosm_tza_roads
HOTOSM Building	HOT / HumData	.kml	https://data.humdata.org/dataset/hotosm_tza_buildings
Health Facilities	HOT / HumData	.kml	https://data.humdata.org/dataset/hotosm_tza_health_facilities
Accessibility to Healthcare	HOT / HumData	.xls	https://data.humdata.org/dataset/data-zetu-accessibility-to-health-care-services-in-temeke-mbeya-district-tanzania
Drainage Data	HOT / Ramani Huria	Shape	https://github.com/hotosm/RamaniHuria/tree/master/QGis
Location of Hospitals	Esri	ArcMap	https://livingatlas.arcgis.com/en/browse/#d=2&q=Dar%20es%20salaam

To assess the quality of the mapping undertaken by HOT in Dar es Salaam the selected maps were subjected to a range of tests and monitoring – following the work of Barron *et al*. (2014) and influenced by the processes developed by Goodchild and Hunter (1997), Mooney *et al*. (2010), Haklay *et al*. (2010) and Haklay (2010a). Work started with the OSM maps which were collected to cover the earliest mapping undertaken by OSM in Tanzania, the period leading to the arrival of HOT in 2014, the years following projects undertaken by HOT and then the most recent data available from OSM in 2020. This was followed by looking at specific HOT datasets downloaded from the Humanitarian Data Exchange (HDX) or from project reports. Each map was subjected to a series of tests designed by Barron *et al*. (2014) to examine completeness and accuracy of mapping. These tests were also selected in line with

HOT's objectives for local projects and their ambition to map the world for the Humanitarian Data Exchange (HDX). As Executive Director Tyler Radford (2019) stated in an article;

> "*One of our future plans is to better align with the HDX Data Grid. Country pages on HDX get updated with three types of data from OSM. First is the road network, which can be used for things like routing, or GPS navigation on the ground. Second is buildings, which is useful for layering with other types of data. Third are 'points of interests', which are basically everything else, such as schools, health facilities, evacuation centres, or shelters*".

Further to this data collected from the Tanzania government, the DCC (Dar es Salaam City Council) and satellite photos from Google, Bing and NASA were used as benchmarks and as part of the assessment of map quality.

4.5.1 Routing and navigation

One of the defining features of a complete map in OSM is its road network. Road networks are often completed first by mappers as routing and navigation are key uses of maps, and of the OSM system, which forms the basis of a number of navigation tools and locative media (including Facebook). Furthermore, roads are generally mapped in a similar pattern across the world making the growth of mapped roads a useful benchmark for deciding mapping quality and completeness. Neis *et al*. (2012) noted that roads are generally mapped in the order of their hierarchy, with larger roads such as motorways being mapped first, followed by major roads, residential areas, and then down to rural roads and tracks. From this it is possible to devise a metric for the road network for a given area as complete, or near complete. In order for us to say that a road network is finished the following factors should be true:

a) The monthly increase in additional road length is near zero,

b) this can be corroborated with a higher number of users adding to roads from lower hierarchies – this indicates that mappers did not just stop mapping, but instead had switched to lower ranking roads. Using this as a benchmark, further analysis can be applied in the form of checking

    i. roads which are erroneously not connected to other roads at junctions,
    ii. roads which appear in duplicate,
    iii. intersecting roads which do not share a common node.

Taking all of these factors into account allows us to estimate the completeness of the OSM road network for Dar es Salaam, before, during and after the work of HOT. It also allows for the testing logical consistency of the OSM road network.

4.5.2 Geocoding

Geocoding is the process by which exact locations are marked with data within a digital map (Amelunxen, 2010). In order to do this, exact address information is required. It has already been noted in the background chapter that addressing information is lacking for large parts of Tanzania, however providing addressing information is important for many of the activities that HOT engages in, and allows for more than just a 'flat' map, but rather one that is fully digital. OSM generally uses the *Karlsrihe Schema* for the adding of addresses (OpenStreetMap, 2013). This schema allows for addresses to be mapped either as single nodes or as additional tags on existing features (Ramm *et al*., 2011). The overall distribution of house numbers and addresses can aid in providing an overview of how much the map will suit particular needs.

To this end, all buildings which are likely to contain a house number or house name are calculated. In doing this, not only are annotated building polygons considered but also information derived from spatially intersecting nodes or interpolation lines with address information are considered. No algorithm is known which can distinguish between buildings which should have a house number or house name or not. Therefore, all buildings with a smaller basis than 10 m^2 and with a specified list of tags are excluded (e.g., *building = roof*, *building = garage*, etc.). Subsequently the development of the ratio between all buildings and those actually containing a number or name can be taken as an intrinsic indicator of the data's attribute completeness. Ideally, the cumulated number of house numbers and house names always corresponds to number of buildings, even if the number of buildings increases significantly (e.g., due to an import, a mapathon or better aerial images).

Following this process, we are able to determine which buildings which should contain a house number/name, the completeness of address annotations, and the overall distribution of house numbers/names. This provides a further reference point as to how accurate and usable OSM and HOT's maps are for various tasks.

4.5.3 Points of interest search

Points of interest (POIs) in mapping terms are more than just sight-seeing locations, but rather encompasses all buildings and map features that are deemed important locations. This includes places such as hospitals, restaurants or even bus stops. Noting the number of POI can act as a good quantitative indicator of map completeness and quality. Within OSM, POIs can also have additional characteristic attributes, and it is also hypothesized (following Barron *et al*., 2014) that a large list of such attributes indicates high quality mapping as the POIs will more closely resemble

their real-life counterparts. It should be noted though that these attribute tags can be automatically assigned, and thus are only an approximation of the additional time spent in enhancing the map of Dar es Salaam. Further to this it is also possible to draw out attribute completeness, following a series of Keys developed through the OSM Wiki (Keßler and de Groot, 2013). The number of details, such as address, house number, phone number and accessibility, were also counted. This allows for an intrinsic measurement of attribute completeness.

The points of interest search allows for an analysis of the attributive completeness of the POIs, the average number of POI tags, and an analysis of the more qualitative development of POIs.

4.5.4 Map applications

The final test to be carried out on the maps collected through this research is map applications. This is perhaps the most salient measure of map development by HOT as it links directly with the way in which HOT produces many of its maps – through a combination of remote mapping and on the ground attribute adding. Earth surface characteristics in OSM are generally represented as polygons that are then tagged with either a natural label, such as woodland, or a land use label such as forest, or residential. The accuracy of these polygons is directly related to the way in which data is collected and mapped, whether it is the tracing of satellite images, bulk imports or other methods. Mooney *et al*. (2010) propose that the best way of measuring the accuracy of these polygons is to examine the distance between polygons' adjacent vertices. It is also possible to examine this in a historical way, examining the distance between polygons when they were first laid, and when they were later updated and

likely made more accurate. The lower the equidistance in more recent maps the better the development of the map over time.

However, it is important to note that divided or merged polygons can also lead to biases within the calculated equidistance because of their significantly increased or decreased area. To exclude these outliers, it was chosen iteratively to consider only polygons which do not differ in size between the two compared versions by more than 50%.

The intra-theme consistency as a part of the parameter logical consistency has a major influence on the quality of a spatial dataset. This is depicted by means of erroneously overlapping land use polygons. Within OSM, polygons attributed with a "land use" tag represent the primary use of an area. These polygons should not overlap each other to avoid inconsistencies. These overlaps are mainly caused by inaccurate digitizing or data imports, because in each case spatial integrity of the contributions is not necessarily examined (Girres and Touya, 2010). However, sometimes multiple uses of an area make sense (e. g. militarily used forests). To take this fact into consideration, only overlaps with a size of less than 10% of the origin polygons are considered, because they more probably represent unintended overlaps. The lower the number of these detected cases, the better the intra-theme consistency concerning the land use polygons within the dataset.

These methods allow for an analysis of the improving map quality through measures of the erroneously overlapping land use polygons and the evolution of the natural features' equidistance

These processes were repeated for each of the map layers and datasets listed in Figure 11, building up a comprehensive examination of the accuracy of each layer in comparison to other layers. While this does not fully answer questions as the quality

of representation within the maps, it gives a benchmark from which to explore the territorial accuracy. Over this the codification of knowledge can be examined though the analysis of supporting documentation and interviews.

4.6 The Case Studies

The projects to be examined have been discussed in more detail in the background section of this thesis. However, it is salient to recap the projects here, and contextualise how the above methods were used in order to better understand knowledge transfer within the two cases.

Both projects are run by the Humanitarian OpenStreetMap Team, or HOT for short. The organisation is an offshoot of the OpenStreetMap project – which aimed to produce an open access map of the whole world, and which was established in 2004. HOT came into being in 2010 following the earthquake in Haiti. Indeed, it was one of the first organisations to be involved in crisis/disaster mapping on such a scale (Radford, 2019). HOT operates as a sperate entity to OpenStreetMap but employs the OSM platform as an interface for data visualisation and collection tool. HOT describe themselves on their website as "an international team dedicated to humanitarian action and community development through open mapping. We work together to provide map data which revolutionises disaster management, reduces risks, and contributes to achievement of the Sustainable Development Goals" (HOT, 2020a). These broad aims are then subdivided into "Reaching those in need through maps"; "Putting the world's most vulnerable people and places on the map"; "Expanding knowledge across partners and communities"; "Developing innovative new technology to serve the humanitarian and development communities"; and "Working to support and build OpenStreetMap" (*ibid*., n.p.).

To achieve this range of activities HOT works with many partners and funders around the world, including, but not limited to United Nations Office for the Coordination of Humanitarian Affairs (OCHA), World Bank, The International Research & Exchanges Board (IREX), and UK Aid. These are broad and varied aims, and the

variety of partners involved, from multinationals to grassroots, along with HOT's diversity of objectives led to much discussion through the empirical work. However, this range of activities and partners means that HOT finds itself at the centre of the codification of knowledge and data in the Development and Humanitarian sector. HOT is suitably well established, with a near global reach, for their work to have a significant impact on the sector. They are often employed by NGOs to work with local people in the collection of data for the design of development projects. They are also small enough to allow for clear examination, this makes them again a suitable choice for research. Furthermore, as HOT had a central office in Dar es Salaam out of which a number of projects are run, it made it possible to see variations in projects, while keeping the central premise the same.

Two projects from Tanzania were chosen for this this research, each involving different NGOs, different funders, different communities, and different objectives, but both sit under HOT Tanzania. By keeping the umbrella organization, the same throughout the research, it is hoped that the other factors at each episode of the heuristics will be more clearly shown.

A final note on using HOT as an umbrella case study is one of access. As noted above, a personal contact, with whom I have worked for a number of years was able to provide access to the HOT staff by way of introductions and confirmation of credentials. This meant that the research could begin quickly, with trust and contacts already established. Furthermore, the community nature of the organization means it is easier to access both data (which is open) and members of the community for interview. While this did not guarantee access, or quality, it provided a useful entry to the sector, that might otherwise have proven to be difficult.

As noted above, a longer description and introduction to Tanzania, HOT and the two projects is given as part of the introduction. Below follows a briefer recap and information on the data gathered about each of the projects.

4.6.1 Ramani Huria

In 2015 HOT began an initiative to map infrastructure data in various parts of Dar es Salaam. In 2017 this became part of the Dar Ramani Huria project, in which HOT employed community mapping techniques to engage with local leaders and teach community inhabitants free, open-source data collection tools from their smartphones. Dar Ramani Huria (Swahili for "Dar Open Map") uses OpenStreetMap to create sophisticated and highly accurate maps of Dar es Salaam with the aim of improving resilience to natural disasters. Ramani Huria activities formed part of the Tanzania Urban Resilience Programme, a partnership between the United Kingdom's Department for International Development (DFID) and the World Bank established to support the Government of Tanzania in its endeavour to increase resilience to climate and disaster risk. The project was supported by the World Bank's Global Facility for Disaster Reduction and Recovery and implementation and was guided by the Humanitarian OpenStreepMap Team (HOT).

Every year during the rainy season, Dar es Salaam suffers from devastating floods that wipe out roads, destroy houses, kill many people, and cause millions of dollars' worth of damages. The damage these floods cause could be prevented with adequate planning, but much of the city is made up of unplanned and informal settlements. HOT posited that by helping communities to map residential areas, roads, streams, floodplains, and other relevant features, Ramani Huria would bring disaster prevention and response to areas that were previously off the map. The project also

highlighted the need for flood prevention and risk reduction to the local level, while teaching participants valuable computer and mapping skills that they can also put to use elsewhere. The finished maps were made publicly available online, available for download, and also delivered in printed form to the local governing bodies of each ward.

Ramani Huria to 2015 had worked with 2 million citizens, mapping 29 wards, 1254km of waterways and 3396km of roads, training 450 mappers and establishing 10 disaster prevention teams (Ramani Huria, 2019). The scale of this project is reflected in the materials collected and the amount of time given to its discussion in interviews. The maps produced for Ramani Huria are also a significant part of the map analysis chapter.

4.6.2 Data Zetu

The HOT Tanzania team also been mapped healthcare data, particularly in the Temeke District, through the Data Zetu project. Data Zetu was a coalition of Tanzanian and international organizations that aimed to empower communities to make better, evidence-based decisions to improve their lives. An initiative of the Tanzania Data Lab (dLab), the coalition consists of Sahara Sparks (SS), Humanitarian OpenStreetMap Team (HOT), and Tanzania Bora Initiative (TBI), with global expertise from SBC4D and IREX. It was funded by the United States President's Emergency Plan for AIDS Relief (PEPFAR) and administered by the Millennium Challenge Corporation (MCC) as part of the Data Collaboratives for Local Impact program (DCLI).

In partnership with Data Zetu, the HOT Tanzania team collected health data in Dar es Salaam and the Mbeya region to improve public health services. Through community mapping initiatives, the team trained local people to better understand

access to maternal health, childcare, HIV services and sexual reproductive facilities. This data could be used by community members, government officials and health initiatives to pinpoint areas in need of health facilities and resources (HOT, 2020b).

Local residents have been asked specific questions about health and health care services such as access and travel time to health facilities. Using the community-driven data collection model, community members have conducted over 22,882 health care surveys. The digitised maps of healthcare access issues were designed to help shape the development of facilities in Dar es Salaam. It was expected by HOT and Data Zetu that the maps for maternal and child health care would play a major role on health planning.

The project has surfaced data about hyperlocal *Shina* boundaries, which offer local communities and leaders unprecedented information about the most granular level of community administration that exists in Tanzania. The maps produced from this data can help analyse and prioritize development work at a micro level and equips community members with visual representations of the issues they are facing (HOT, 2020b).

In this research the processes included in Data Zetu are secondary to those of Ramani Huria, but as discussions with HOT staff often conflated the two projects, and the methodologies behind them (as well as wider HOT ambitions), it is more than salient to include Data Zetu as part of the analysis of this research.

4.7 Ethics

Ethics is a hugely important consideration in the field of International Development and humanitarian intervention (Astroulakis, 2013; Larrison, 1998; Rubenstein, 2015). Indeed, this thesis is in itself a series of questions on ethics, after all what is more of an ethical question than the representation of the self and of the other? (Goldstein, 2009; Spivak, 1988). It was then paramount that this research itself was conducted in an ethical manner, and did not cause harms to participants or projects, or reinforce problematic or dangerous normative attitudes within the development context. This was a difficult balance to get right, since as an outsider to HOT there were of course dangers of mere knowledge extraction. Conversely, my position as a white British male researcher connected to a university in the United Kingdom allowed me a level of instant access to HOT – its management team and their data – that was already difficult for the long-standing Tanzanian staff working in Dar es Salaam.

In order to best mitigate the numerous ethical concerns, the principles of ethical research presented by Bell and Bryman (2007) were followed, along with compliance with the University of Westminster ethical guidelines. While Bell and Bryman (2007) contextualise their work within business research, the principles were easily applicable to an organisation such as HOT, which, while in many respects an NGO, also operates as a business. HOT's projects in Dar es Salaam employ staff, and follow similar management structures to a business, and thus the same considerations apply. The following were undertaken to meet these high ethical principles;

a. All participation by respondents was voluntary. Each was informed of the basis of the discussions before they took part and were informed as to how their information was to be used. No participant was required to take part by their senior or

other staff within HOT. Moreover, participants had the right to withdraw from the study at any stage if they wished, although none did so.

b. Respondents participated on the basis of informed consent. Following the principle of informed consent under which researchers provide sufficient information and assurances about taking part to allow individuals to understand the implications of participation and to reach a fully informed, considered and freely given decision about whether or not to do so, without the exercise of any pressure or coercion (Saunders *et al*., 2012). Information was provided to participants in the form of a consent form which outlined the purpose of the research, how the data would be used, made clear that a PhD thesis is a matter of public record, and that they could withdraw their consent at any time before publication of the PhD.

c. It was important to avoid the use of offensive, discriminatory, or other unacceptable language in the formulation of interview questions, and during other more casual conversations with members of the HOT team and their donors and beneficiaries. Phases such as 'third world', 'developing countries' and 'LEDCs' (Less Economically Developed Countries), are widely regarded as problematic in development literature, however their use is still widespread. Care over the use of such words, and the connotations and power that comes with their use were of the upmost importance when planning and conducting interviews. Where these and similar words were used, participants were invited to critique or suggest alternatives with which they were happier.

D. Privacy and anonymity of respondents was also of importance. While only one member of HOT staff requested anonymity, it was important to offer such an option to all who were interviewed. In using the data produced by HOT much is already aggregated to avoid the identification of individuals, but where this might not

be the case, especially when looking at health provision, it was important to ensure that no personally identifiable data of people who were not able to consent crept into this research.

e. All data sources collected as secondary data are fully acknowledged to the author(s) of the dataset or outputs. Where individuals are not identifiable, the organisations that produced the data are instead credited. Efforts have also been made to point to the funders of different data collections used in this research in order to reveal any biases of quality concerns. As with other sources these items are referenced using the Westminster Harvard system.

f. Throughout the research it was important to maintain the highest level of objectivity in discussions and analyses. My position as a Chartered Geographer, and member of IST/36, as well as previous research in the fields of International Development and Humanitarianism were all influential in the approach to this research. It was important, though at times difficult, to be open minded to the information being given by participants, and the skill of reserving judgement was one that became of the upmost importance through this work. The openness of the participants made this easier in many respects, as I was not required to probe them deeply in order to illicit information that might be controversial or that might meet my expectations and biases about what was happening. A clear interview guide coupled will strong pre-planned frameworks for analysis allowed for increased objectivity in the work.

g. All data collection and storage were carried out in adherence to the Data Protection Act (1998). Digital information as stored on an encrypted hard drive or on the University of Westminster Google Drive which complies with EU data regulations.

Further to these explicit steps, ensuring a continued dialogue with participants, HOT and the other actors involved in the process allowed for any concerns to be raised – though none were. Further to this, participants were provided with the sections of this thesis that named them prior to submission, allowing them to withdraw or alter their statement – again none asked to withdraw, and where additions were made this has been noted in the text. Finally, my supervisor was kept abreast of any concerns I had about this work and the research plans were reviewed through viva at APR2[27] before being taken into the field.

[27] Annual Performance Review two is also know the upgrade, and denotes the move from working at MSc level, to PhD level.

4.8 Limitations

All studies have their limitations, and this research is no exception. The limitations to this work were numerous, and while every effort was made to mitigate as many of the arising issues as possible, some remained insurmountable. However, these limitations, outlined in more detail below, do not invalidate the findings of this research. They do however limit the scope of the conclusions meaning that it is not possible to make complete statements as to the nature of knowledge transfer in Development mapping practices. Rather we are limited to making assertions about the work of HOT in Dar es Salaam during the time of the research, and then inferences as to what this might mean in a wider context.

The first limitation to be addressed is that of sample size. With just 22 interviews this research is in many respects reliant on the thoughts and opinions of a very small group of people to cover a wide heuristic. However, this small sample represents a very high percentage of those involved in the work in Dar es Salaam and the range of contexts of those spoken to means that a rounded picture of the organisation was possible. Access to community mappers was more limited, and while this means that less insights were to be gained directly from these members of the team, the lack of access also spoke volumes about the relationships within the organisation and revealed power dynamics and hierarchies that might otherwise have been occluded.

Data also presents some issues. While HOT make much of their data available open access this is only after they have cleaned and altered it to meet the needs of the database they uploading to (predominantly HDX), or to present the data in a report. Access to raw, unedited data was hard to come by, and this limited the ability to examine where data was removed or changed as is it was codified. This led to a

research project that was more qualitative than perhaps first intended. However, the map analysis work still provides a good benchmark of data use and accuracy against which to contextualise the interviews and document analysis.

Coupled with this issue is one of self-reporting. Both the interviews and other data sets became self-reported data – in as much as the data available was only that which HOT and its staff chose to present to me or to the wider community. In terms of the interviews this can lead to issues of selective memory, telescoping (remembering events as if they occurred at another time), attribution (describing events to in a way which highlights, or heightens, one's own agency), or exaggeration. It is hoped that by speaking broadly, and at length, with each of the staff that these issues resolved themselves within the interview – indeed many of the interviews contain internal contradictions which needed to be addressed. It is also hoped that by triangulating interviews against each other, documents, and the data produced by HOT, that issues of self-reporting are eliminated, and contradictions were examined in detail. The process of using Atlas.ti for detailed coding and network building allowed for these issues to be brought to the fore early on in the analysis and to either be removed in the second cycle or highlighted for further examination.

The most significant limitation of this work however was that of cultural bias. As has been alluded to above, access was relatively easy due to my position as a university researcher, being white and male. This gave me easy and unprecedented access to the managerial staff at HOT, meant that I was able to establish links and interviews with organisations such as the World Bank and UN-GGIM with ease, and on the face of it smoothed my way through the research. However, it was also clear that this position put me 'on the side of management' and it was felt that when speaking with community mappers, the majority of which were Tanzanian, that I was not only

more of an outsider, but that indeed I was there to check up on them. While some were open to the research, others saw it more as a questioning of their skills. This also reduced my ability to work with and see community mappers more often in the field. Further to this, and again mentioned above, issues of language that is tied up in cultural biases was also a potential barrier to discussions with some respondents. Descriptions and terminology that are commonplace (rightly or wrongly) in the development industry were at times visibly jarring during discussions. To mitigate these issues as much as possible, snowballing was used in order to get contacts and to be introduced to respondents in a way that would enable me to break down some of these barriers and allow me to retain as much of a position of neutrality as possible. This worked to the extent that it is felt that the interviews conducted were honest and open. However, there were a handful of further community mappers that I would have liked to have talked to, but with whom I was unable to make contact.

While these limitations are significant in many respects, they were mitigated as best they could, and it is felt that the results of this research are valid and present an accurate portrait of the codification of knowledge through the mapping activities of HOT in Dar es Salaam. It was also felt, that although the work cannot be fully extrapolated up to the development and mapping sector as a whole, this research is sufficiently rigorous and rounded as to be able to make recommendations to, and draw conclusions about, the sector more widely.

4.9 Summary

The methodology outlined above, drawing upon a social constructivist approach and using a concurrent transformative approach (Creswell *et al*., 2003) worked to build up a case study of HOT working in Dar es Salaam. Using a combination of qualitative interviews and document analysis, along with quantitative map analysis, the research was able to detail the way in which HOT operates and to highlight the process of knowledge creation, codification, and loss. The way in which digital cartographic tools are used to elicit local tacit knowledge of people living in Dar es Salaam through Ramani Huria and Data Zetu are explored in detail. The following chapters will present the results of this research and discuss the extent to which HOT reaches its aims of being participatory, representative, and non-exploitative as they undertake their work within the imminent development arena. The following chapters will also use the guiding research questions of this thesis to explore what this means for the wider development sector, participatory mapping and the role of local knowledge in designing and implementing development projects.

5. Results

Following the literature, this research initially set out with a strict framework of how development projects should take place. The first heuristics presented in the methodology (Figures 4 and 5) were built on a number of assumptions about the discrete nature of development work (Archer *et al*., 2012; Azi, 2006; Booth and Unsworth, 2014; Chambers, 1983; Heeks, 2014a; Lele, 1975), and the flow of information gathering and transformation (Cowan *et al*.; Dunkels *et al*., 2011; Gimenez *et al*., 2020; Hendriks, 1999; Hovland, 2003; McFarlane, 2006b; Newsom and Cassara, 2011). To this end the planned results chapters might have followed each of the Data Zetu and Ramani Huria projects through the heuristic, selecting key moments along the way. However, results from the field show a very different outcome. While there are similarities between the initial ideas presented in those heuristics, a new model needed to be developed in order to better explain conflicts, entanglements and contradictions within the Humanitarian OpenStreetMap Team, and specifically within their projects, that have been carried out in Tanzania. As we shall see in the coming chapters there is a great uncertainty about, what HOT is, how it should operate and what its goals should be. This permeates through all of the work observed, making it difficult to follow the original heuristics, as decision making has not been driven by a solid vision. Secondly, despite early insistence from interviewees and the literature, that HOT is not influenced by the donors and is able to act in a radically independent way, it became clear that this is not the case and that HOT finds itself chasing money as much as working on projects. Generally, projects were funded through short-term grants and funding rounds, leaving the organization constantly hunting for the next round of income, which diluted their focus on the projects at hand. Not only did this take up more time than actual development work, it also made them vulnerable to a

lot of donor influence, even if they themselves were not willing or able to see this. The confusion over what the Humanitarian OpenStreetMap Team (HOT) is, and its objectives are, was further muddied by the way in which they collect data and its relationship with OpenStreetMap itself. Data for mapping Dar es Salaam comes from a number of different places with a range of agendas, some of it outside of HOT's control, some of it directly controlled by HOT, with a lot of it falling into a middle ground. This will be explored further in section 5.3. As will be shown in section 5.3.1, this had a highly positive impact on the extent and accuracy of the maps being produced of the city, but for HOT this actually presented further issues, and further diluted the discrete lens that this project anticipated viewing HOT through.

This has a number of implications on the way in which the rest of this thesis is presented. One of the most significant is, that while the Data Zetu and Ramani Huria projects are in many ways separate projects, the level of overlap in the collection, processing, presentation and even at times funding of these projects makes it hard to separate them out when examining the processes involved in codifying knowledge through the maps produced. This was not just an issue for this research project, but also for the HOT team itself, which rarely discussed the two projects as individual distinct undertakings, but instead talked about the work of HOT as a whole and its collective program. This will as well be explored in section 5.7.

This also originated from HOT's confusion about the direction of its work. HOT takes a very top-down position, in which all work is HOT's and little belongs to the individual projects. In the documentation about the projects, they were discussed as separate work streams, but this had more to do with the presentation for donors than for the empowerment of the communities HOT was working with. This difficulty in separating out the two projects, especially in the interviews, meant that rather than

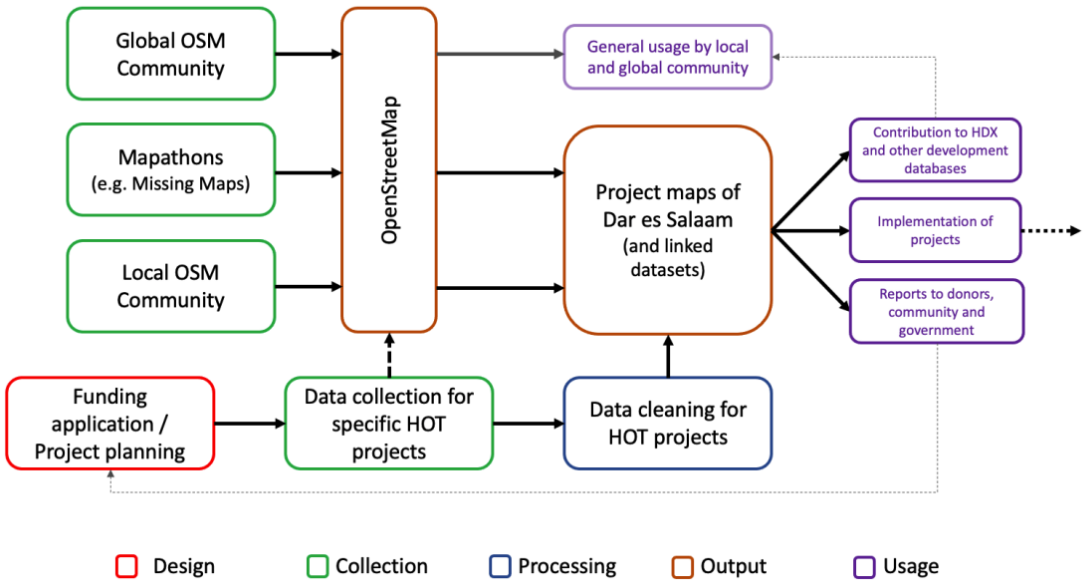
following each project through the heuristics, the results will instead focus on the holistic work of HOT. Differences between projects, where they might occur, are highlighted, but generally this thesis sees the presence of HOT in Dar es Salaam as one single intervention, which might have a number of strands, but only one delivery team and one approach.

To allow for a fuller understanding of this issue, the next section will explore the way HOT operates and is formulated, giving an overview of their working patterns and introducing the key actors in the HOT team, nationally, internationally, and on the ground in Dar es Salaam.

5.1 The Operational makeup on HOT

As noted in the methodology, during the collection of data and its subsequent analysis, it became clear that HOT does not follow the predicted flow of project design, implementation, and presentation. To this end, a new heuristic has been developed, that better represents the range of actors, influences, data, and operational instances seen in Dar es Salaam. This heuristic helps to give shape to this chapter and the following discussion (see Figure 12).

Figure 12: New Heuristic based on observed processes



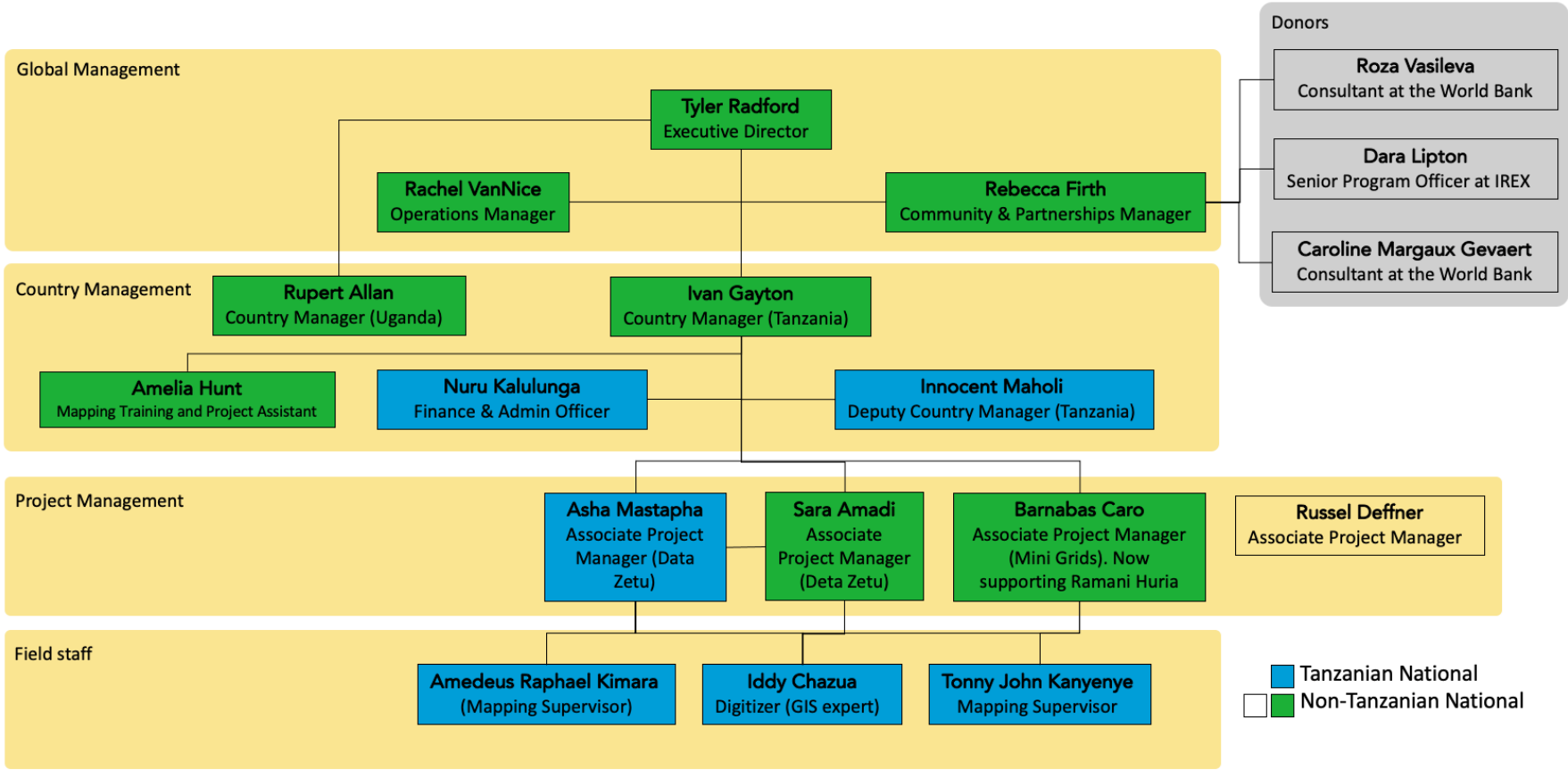
This new model better represents the way in which HOT operates as a single unit in Dar es Salaam, rather than as a series of separate projects. It also gives space to explore the range of inputs which form part of the map of Dar es Salaam, including those generated specifically for the project work and those separate, such as those generated through the global OSM community and events such as mapathons run by MissingMaps. This heuristic also makes the wide range of outputs clearer coming from

the work in Dar es Salaam. These include those which were expected such as project reports for donors, and the development project outcomes themselves, but it also adds in more global contributions to the development of OpenStreetMap (OSM) and the UN-OCHA Humanitarian Data Exchange (HDX).

While an extensive overview of HOT and how they are supposed to operate has been given in Chapter 2.3, along with more detailed overviews of the individual projects run by HOT in Dar es Salaam in Chapter 4.6, it is salient at this point to contextualize further the shape that HOT takes on the ground in Tanzania (See Figure 13). This process will also help to provide a clear understanding of who interviewees were and how their contributions to the rest of the thesis fit together.

At the time of this research HOT followed a model that relied on Country Managers for each of the places they were operating. In this case the Country Manager was Ivan Gayton, a non-Tanzanian national appointed by HOT to oversee operations in Dar es Salaam and all Tanzania. Gayton was supported by Innocent Maholi, who worked as Deputy Country Manager, and Nura Kalulunga who worked as a finance and admin officer – both Tanzania nationals. Directly reporting to Gayton were three project managers. Asha

Figure 13: Organisational structure of HOTOSM in Tanzania.


Donors
Roza Vasileva
Consultant at the World Bank
Dara Lipton
Senior Program Officer at IREX
Caroline Margaux Gevaert
Consultant at the World Bank
Global Management
Tyler Radford
Executive Director
Rachel VanNice
Operations Manager
Rebecca Firth
Community & Partnerships Manager
Country Management
Rupert Allan
Country Manager (Uganda)
Ivan Gayton
Country Manager (Tanzania)
Amelia Hunt
Mapping Training and Project Assistant
Nuru Kalulunga
Finance & Admin Officer
Innocent Maholi
Deputy Country Manager (Tanzania)
Project Management
Asha Mastapha
Associate Project Manager (Data Zetu)
Sara Amadi
Associate Project Manager (Deta Zetu)
Barnabas Caro
Associate Project Manager (Mini Grids). Now supporting Ramani Huria
Russel Deffner
Associate Project Manager
Field staff
Amedeus Raphael Kimara
(Mapping Supervisor)
Iddy Chazua
Digitizer (GIS expert)
Tonny John Kanyenye
Mapping Supervisor
Tanzanian National
Non-Tanzanian National

Mastapha and Sara Amadi, who both led on Data Zetu, and Barnabas Caro, who had previously worked on the mini-grids project[28] (not included in this study), and who was now leading on Ramani Huria. Under these project leads came Amedeus Raphael Kimaro and Tonny John Kanyenye, mapping supervisors who would oversee the collections of data, and Iddy Chazua, a GIS expert who oversaw much of the processing of data and the production of cartographic artefacts.

As this description stands, the organizational structure of HOT appears to be robust and in many ways sensible – if rather top heavy with non-Tanzanian staff at the helm. However, the structure is muddled by a number of things. The global management team were a primary source of confusion over operational processes. The team consisted of Tyler Radford as executive director, supported by Rebecca Firth as Community and Partnerships Manager and Rachel VanNice (who was at the time employed part-time) as Operations Manager. This team had a huge amount of direct control over the day-to-day operations of projects in Dar es Salaam. This led to issues of line management. For example, Amelia Hunt, Mapping Training and Project Assistant, complained that she would get contradictory information from Gayton and Radford, and was rarely confident about who she was reporting to, "my contract is a mess" Hunt noted, "I'm pulled in different directions by the local and global teams, and they seem to not be co-ordinating with each other" (Hunt, interview, 2018). Closer working relationships between project leads Amadi and Caro with Radford and Firth also worked to isolate Maholi and Kalalunga at times. This was something that most clearly seen in the way in which interviews such as Amadi and Firth would most frequently direct me to people such as Caro and Radford when seeking information,

[28] Mini-grids was a project run by HOT in partnership with the International Finance Corporation to collect data to inform rural electrifications plans in Tanzania.

rather than to those who might have been closer to the action, but who were Tanzanian – Radford especially was out of the loop of most things related to working on the ground in Dar es Salaam, but was still often cited as being more knowledgeable than the locals. This was also true of Deputy Country Manager, Innocent Maholi, who would find himself bypassed in conversations that occurred between non-Tanzanian project leads and the out of country executive group – this was clearly observed in workshops and the HOT summit where Maholi and the other Tanzanian project leads were not positioned on stage alongside their non-Tanzanian colleagues. This exclusion of the Tanzanian Deputy Country Manager from key decisions highlighted the way in which official management structures were often ignored in favour of more fluid communication structures that allowed for the for exclusion of key actors.

A further influential actor was Rupert Allan, the Country Manager for Uganda. Gayton and Allan had previously worked closely together on shared projects. While in many ways they disagreed on how things should be done, Allan still appeared to have considerable influence over the ideas, design of projects, and how HOT should be operating in Dar es Salaam. Indeed, during our first interview Rupert Allan stated that "Me [Allan] and Ivan [Gayton] are the most operational part of any mission out of any of them" – referring to the work in Dar es Salaam and Uganda where mission was more frequently used to describe a project. While Allan was no longer directly involved in the work of HOT in Tanzania, he did see his role as one of considerable significance, and that he should operate to ensure Gayton and his team kept on the right path to complete the work – This is something Allan further reflected on in a chapter for the volume Mapping Crisis (Allan, 2020).

HOT leadership for the most part was unaware of the issues that this was causing and instead viewed this muddled management structure as being helpfully

horizontal. Executive director Tyler Radford (2018, interview) went as far as to suggest that "like AA [alcoholics anonymous], there are no headquarters, there is no real leadership. […] You don't have to come to me and say, 'Can I have approval to do it?' I'm not in charge of that, so that's pretty cool, I think".

The idea of a non-hierarchical structure, with supposedly anyone being able to offer up ideas sounds good and is seen by many as a holy grail of development work (Cornwall and Nyamu-Musembi, 2004). However, on the ground in Tanzania this actually left space for a great many issues. Some of these were operational, such as Hunt not knowing who her manager was. Others manifest themselves as a lack of HR processes and procedures, which led to complaints of inequality between genders and in/out of country staff.

This fluid working, as will be seen through the rest of this chapter, also created the gaps into which unwanted biases, influences and power could flow. This was something that was seen clearly at the HOT Summit in 2018 in Dar es Salaam. At this event the predominantly white, outsider executive attempted to create an open forum for all HOT members globally. As the same time, they positioned themselves on stage and with the power to speak and to choose who else would be allowed to speak (See Figure 14).[29] These issues could also be seen in the way in which Tanzanian members of HOT were more frequently overlooked than those from outside the country. Rather than a weak management structure creating a non- hierarchical organisational structure that would allow for voices from across HOT to be included in decision making, the system instead defaulted to hierarchies of race and power – an issue will

[29] It should be noted that HOT is working to address this issue and will no longer be holding HOT Summits after 2022.

be discussed at length in section 5.7.4. This was seen in the lack of local understanding, increasing influence of donors and Western-facing narratives around HOTs work.

There was also little consensus around what leadership or good management should look like. The organisation appeared torn between a sort of start-up culture epitomised by a tech first, horizontal, libertarian approach to management and planning (Gerbaudo, 2019), and the more traditional hierarchical models of working that reflect the history of the development sector. This confusion surrounding even the type of management structure HOT was seeking meant that even when problems were acknowledged there was no clear direction of travel to solve them. Russel Deffner (2018, interview), an Associate Project Manager from another HOT team based in Turkey, but working under the same global executive team, puts it thus:

> "*I used to hold the chair of the voting members, and at that time there was some dissent happening. People wanted to take the traditional NGO route, some people wanted to stay as far away from the traditional NGO route* [Here Duffner refers to the difference between 'top-down' and 'grassroots' working]. *It came out to be a hybrid, anyway. We lost really good people. It's more about the people that we lost in conflict between the members. […] We just never took the time to set up governance. One way or the other, we needed to set up governance and strategy for the organization as a whole because at the time it was just, "Oh, there is a disaster here, we're going to go work on it." It just wasn't very cohesive. I would attribute it to lack of governance*".

In the vacuum created by this lack of consensus, governance and direction, big personalities rule the roost, and projects are designed, selected, and carried out in the way the country manager sees it fit, even if these processes or actions are a frustration to others. However, this style of leadership is seen by HOT as being a good thing, priding themselves on not having robust structures in place. A lack

of robust structures allows for HOT to be agile and responsive went the narrative. A flexible organisation that can pivot to the needs of the community as they arise, bringing in new people or projects as required. This concept of being agile was important to many of the interviewees but appeared to be little more than a way or making unstructured management and ad-hoc working sound like something cutting edge, modern, and borne of a 'cool' start-up culture vibe (Gerbaudo, 2019).

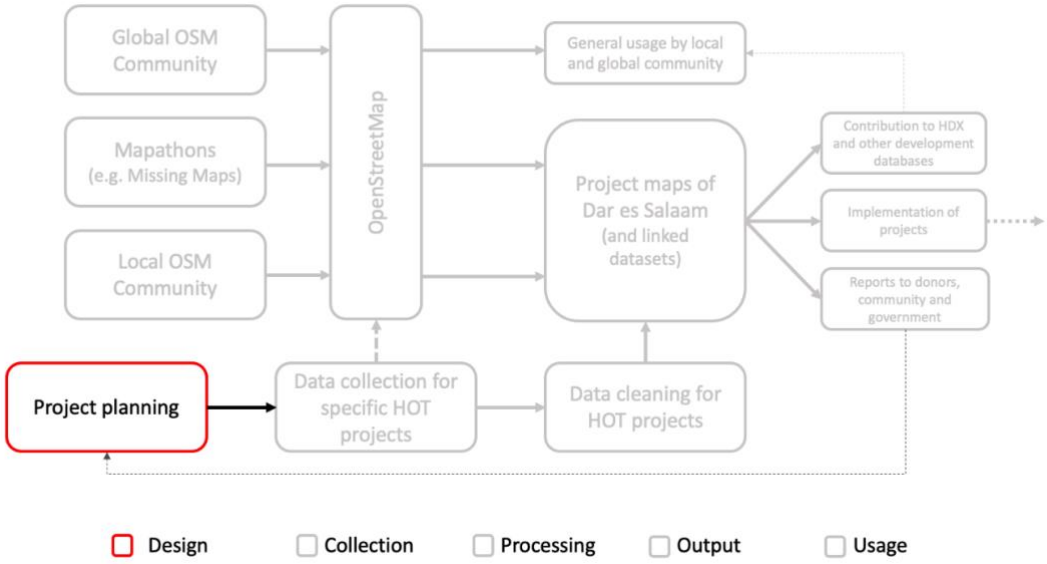
Figure 14: HOT Summit 2018 in Tanzania. The 'outsider' HOT executive position themselves as the leaders of the work and discussion.

This way of working also caused problems for this thesis. While the research expected to find a number of distinct projects taking place in Dar es Salaam under the HOT umbrella – and indeed did find managers assigned to each project – the reality on the ground was considerably different. The chaotic management structure that persisted under the illusions that HOT was working in a usefully non- hierarchical way, meant that actually there was little delineation between different projects. HOT instead operated as a single entity with data from different projects feeding back and

across. There was little to suggest that HOT was working on discrete projects beyond names and reports written to give that impression to donors. This was one of the further influences on reworking the heuristics used in this thesis.

Now we have a better understanding of the operational make-up of HOT in Dar es Salaam, the rest of this chapter will explore the operational processes using the new heuristic (see Figure 12) to explain the transfer of knowledge within the work of the Humanitarian OpenStreetMap Team. To draw out these processes, the rest of this chapter will be laid out as follows: Firstly, section 5.2 will examine the designing of projects, the way in which HOT seeks funding, and who gets to control what a project might be designed to do. This will be followed by sections 5.3 and 5.4 which will explore the collection of data. This includes both the data collection processes implemented by HOT within the city and also the data collection that happens alongside through the wider OpenStreetMap community. Processing and outputs will then be discussed in sections 5.5 and 5.6 respectively. Again, these will look at both the work led by HOT and the wider influence of the OSM community on this work. Section 5.7 provides a deeper analysis of the overall arch of the work being carried out in Dar es Salaam. These sections will look to the success and problems of HOT's work in Tanzania, as well as exploring in more depth the way in which HOT is viewed by the numerous stakeholders involved in the analysis of the stages of data processing. Finally in this chapter, section 5.8 will concentrate on new interviews and data collected in 2021, in which members of HOT's own staff is reflecting on work carried out in 2018, the way issues are being addressed and the new direction HOT now is hoping to take. Following this chapter, a further discussion about the results and a conclusion to this project will be given.

5.2 Designing projects and project planning



Throughout the literature review chapters it was made clear that good project planning and design was the key to providing development and humanitarian assistance that is meaningful, well thought through and which meets the needs of the local population. The theoretical idea is that a project would be planned in conjunction with the beneficiaries to meet the needs of the local population or to address a particular issue in an area. In the case of mapping Dar es Salaam and the HOT projects that come from this (Ramani Huari and Data Zetu being just two of these) there is an expectation that the planning and project design phase would take the form of consultation with local and national government, alongside the local population, in order to devise and develop programs that would support the population of Dar es Salaam. This consultation could take many forms, but the literature provided by HOT themselves points to a model that shares much in common with participatory Rural Appraisals (PRA), albeit within the context of an urban environment. On the ground however, a slightly different story of project planning and design emerges than that

expected from the literature or HOTs own promotional materials. HOT argues that their projects are planned and designed to move citizens from being objects of geographical research, towards being the decision makers within their community (Pánek, 2016). At a managerial level they are very keen to push the notions of participation, opportunity, and empowerment – words and phrases designed to keep both, the donors and the local community happy.

The processes through which HOT claim to work with a community are designed to include as many people in the process as possible, and this is something that is clearly stated in as one of their main ways of operating on their 'what we do' pages of their website, explaining it thus; "we work together to provide map data which revolutionises disaster management, reduces risks, and contributes to the achievement of the Sustainable Development Goals" (HOT, 2020*a,* n.p.). The aim is to incite community engagement and participation (Parker, 2006). More than this, HOT plans projects in a way that would dig into the local, or even the hyperlocal; "training local people to collect the data for themselves" in the words of Amelia, project assistant and comms officer (Hunt, 2018, interview); as well as "creating the map in a really detailed local way" according to global community and partnerships manager Rebecca Firth (2018, interview).

This thesis was interested in two projects – Ramani Huari and Data Zetu. However, getting to the crux of the design of these projects specifically was not an easy task. Like other aspects of the Humanitarian OpenStreetMap team's work in Dar es Salaam, the process of designing a project was discussed in broad and general terms. Like many of the conversations held, they were filled with contradiction, some confusion and certainly with an atmosphere that not everyone had been told the same about how a project was developed and decided upon. While it was near impossible to

differentiate the planning process of each project, three key narratives emerged from the interviews and documents. Firstly, the narrative primarily held by the local population and community mappers was that the design of HOTs projects arose from the needs of the people. Secondly, a narrative from the Western HOT staff who spoke at length about being autonomous in project design and being some kind of free radicals, able to do as they wished. And thirdly, in contrast to this, there was a sense that the donors were pulling far more strings than anyone would acknowledge during interviews or in their literature. Furthermore, HOT was also somewhat hemmed by its past models of working, which required them to continually seek financial support in a piecemeal way, and the way data is added to OSM – an issue which will be discussed in section 5.3.

The involvement of the local population, seen as one of the key elements of designing and making preparations for a new project, is indeed evident in the work HOT is doing in Tanzania. This is most apparent in the training that is given to Tanzanians, enabling them to help design the collection of data and ensuring that it is local people on the ground who are carrying out the work, meaning that these projects are seen as being more relevant to the local population. For example, Mapping Supervisor and local community member, Amedeus Raphael Kimaro (2018, interview) explains how it works in the view of those who are tasked with collecting data "we are not mapping for the World Bank, we are not mapping for the government, we are mapping for the community. Actually, we teach them how to map and use the tools to map".

Asha Mastapha, Associate Project Manager (Data Zetu) (2018, interview) explains who has been trained, "we were recruiting people from the communities and mostly we're using university students to do these activities". HOT's ex-

communications-staffer Amelia Hunt (2018, interview) further explains the way in which HOT frames the narratives around the designing of projects and how they are intended to feed back into their own communities through training and resource sharing;

> "*We've taken these people's data. We have a responsibility to teach them how to read a map, and use the data for themselves, and help them understand where that data is being used, because we have an ethical responsibility to do so. And the World Bank had given this a fairly unlimited […inaudible…] There were very few requirements in the contract*".

Hunt also touches on the influence, or not, of donors in the design of the project. While scholars such as Burns, 2019; Meier, 2015; and Moore *et al*., 2016 have argued that it is hard to resist the influence of donors in the planning of a project, HOT is keen to fight the image that the donors might have influence over their work. In interviews there was a lot of feedback when asked about the role of the donor in the projects:

> "*it's really about the things we do because we see the need for development purposes. And if there's a donor or somebody who recognizes this need also and feels the need to invest in it, then absolutely that can work*" (VanNice, Operations Manager, 2018, interview);

> "*There is always the negotiation between what the donor wants on the project and what we believe should happen as an independent organization*" (Radford, Executive Director, 2018, interview).

Through the analysis of the interviews, there was little evidence of influence from the donors within this stage of the process. There was no overt requirement to teach anyone involved in the projects any particular skills. For Rebecca Firth, Community and Partnerships Manager, this is core to the work of HOT,

> "*I think its core mission is like flipping our model, to make map data accessible. And because it's obvious [inaudible 00:02:31]*

> *purpose is very much like – there is a really good line*" (Firth, 2018, interview).

Ivan Gayton (Country Manager, Tanzania) says,

> "*I don't care about maps; I care about equitable distribution of health care. I don't care about maps; I care about people in rural areas having good communications and means of transport*" (Gayton, 2018, Interview).

This rather suggests that those in management roles within HOT have a very specific set of ideas about the role of HOT and their projects, democratization of data, and that this is something they would pursue with or without the support of donors, or at the very least make a core part of their work even where it was not the core aim of a donor organization. However, Hunt (2018, interview) notes, reporting back to donors was still required and she would often have to remind HOT staff that they "actually need to tick the very few boxes we've given you" or "can you actually give us a report and give us something to report back to whoever's donated the…". This need to report back to the donor was also seen in more subtle ways in later stages of the project development and implementation. This is something that will be examined more closely in sections 5.6 and 5.7.

The desire for the democratization of data clearly did have some influence over the design and choice of projects that HOT undertook. However, during interviews discussion around the use of data was mentioned considerably less in relation to the local community than in relation to outside users of that data (NGOs and other organizations, donors, patters of clients, World Bank) or in relation to HOT and HOT's own aims on objectives. For example, Hunt (2018, interview) noted that there is then an implied idea that HOT is more focused looking at how data can be used to meet HOT's own organisational objectives, rather than focusing on the needs of donors or

the desires of the local population – this mismatch between who data is being collected for and who will be the beneficiary of this data is explored in more depth in section 5.6 and 5.7. This is not to suggest that this is a conscious aim or a desire by HOT to mislead the local community, but rather a suggestion that HOT, despite its lofty aims and outward image of inclusion, has been unable to avoid the kind of biases and entanglements with colonial approaches to development that have long plagued the development sector. Issues of technology and expertise transfer leading to dependency – as discussed throughout the literature review – are a significant part of the HOT model. This is coupled with a version of white saviour complex – as demonstrated in part in the organisation dynamics discussed above – in which outsiders much teach the 'uneducated' Tanzanian population to manage their own country and data. These issues will be returned to throughout this chapter and into the discussion, as it is this neo-colonial development model that sits at the centre of much of what HOT was doing in Tanzania, and which remains embedded in their operations around the world. This is it should be noted is an area that HOT itself is now reflecting upon, as will be seen in detail section 5.8 since this research was carried out HOT itself has admitted to the colonial overtones of its work and has gone as far as to close their country office in Tanzania (Masters, 2021, interview).

One of the barriers that emerged to truly designing and planning inclusive projects was the leadership within the organization. Ivan Gayton, the country lead, rather divides opinions. He himself does not shy away from that fact and, indeed, takes some pride in it. He is seen as someone who worries about solving the problem first and not scaling things up. This leads to Gayton jumping quickly to new ideas and fast solutions to issues as they arise, leaving others to try and scale these or them being just short-term fixes with little overall strategic thinking. This is in contrast to the

donors who prefer solving one problem at a time in a thorough way, and leads to a lot of tension in deciding what projects should look like, who the beneficiaries might be and what outcomes might be planned. While Gayton (2018, interview) openly states that:

> "*I am always challenging myself to do things that don't scale. Don't worry about if you can do it with a million people, figure out if you can help one child to get to the hospital earlier when they have [inaudible], so that they live instead of die. Figure that out and then we'll worry about scaling it, solve the problem first. […] like this is the scale that we are trying to work, that's hard to mesh with the developing and logging because donors don't think that way. How many people you help across the country well, two, both were boys. It doesn't play well to do things that don't scale, venture capitalists might get it, but donors may be less so at this time*".

This can lead to confusion around the meaning and intention of projects, and furthermore who should be leading on them – and who the benefactors might be, the local community, or the donors. This would often lead to decisions about which direction to take a project and how to plan for it falling to the Country Manager, with influence from HOTs executive, rather than planning with the local population. This, coupled with the constant need for donor money, creates a situation in which projects are designed and chosen based on where the set of donor funding is coming from. This leaves HOT in a constantly vulnerable state where chasing money to keep the organisation alive and their international team employed becomes a key objective of their work. Tyler Radford, The Executive Director makes clear that the seeking of donations is more about keeping the HOT entity itself solvent than it is about investing in the local community or facilitating the sharing of knowledge between communities;

> "*I think money will definitely help. It's not a lot of money, but it's funding to help. We can only be in so many places right now and it doesn't have to be Europeans or Americans going there,*

> *it could be – Our team in Tanzania is amazing. We could be sending our Tanzania team to Zambia, Botswana, or neighbouring countries. So, we'd like to do more of that, but it takes money to fly people around and to provide training. It's definitely a bit of – We imagine in the single millions of dollars we could be covering all of Africa for example. We're not talking about hundreds of millions here, we're talking about fairly 5, 10 million dollars. We could be producing a significant result*" (Radford, 2018, interview).

In this assessment, Radford seems to ignore that sending himself or a Tanzanian to another country to provide training would cost the same in terms of airfares.

This perhaps, creates the perfect storm for HOT. An organisation based around mapping has a huge appeal to donors because they are producing artefacts seen as perfect tools of instrumental development, and which are serving easy to please financers. Donors are putting forward proposals for the democratisation of the digital space and data and HOT is able to latch onto these, offering not just data, but the ever-appealing mapped data. As an organisation that is living hand-to-mouth, HOT must please the donors through their map making, and it is this that became the primary driver of project design.

This is also why there is little to separate the planning/designing of each project. HOT has found a winning formula of what to offer donors and present the same solution to solve a wide range of issues – mapped data. HOT believes this makes them unique and that they are operating on their own terms, however, designing projects that first consider the outcomes for donors leads to the donors having a lot more influence over the operations of HOT than they would care to admit, or perhaps even notice. This drags HOT into a position of never being quite sure who they are

designing projects for, resulting in designing projects that perhaps speak loudest to the donors, and planning them around the outputs requested by donors, not locals.

As will be seen later, the collection of huge amounts of data for the Humanitarian Data Exchange, a project run by UN-OCHA might seem separate to this, but it also demonstrates HOT's desire to feed its donor level organisations with more data, falling into the fallacy, that larger data means better development (Johnson, 2018b). Building in the collection of data for the Humanitarian Data Exchange (HDX) as part of planning would seem to be more about ensuring future funding than about the people on the ground who have little or no access to this data.

The issue that seems to be facing HOT in the design phase is designing and planning projects that can create outputs, coded in suitable ways for numerous stakeholders. In order to achieve this, they have developed something of a one-size fits all model that can be sold well to donors, but which can be sold equally well to a local population as something participatory. However rather than each project being planned through shared cultural readings and understandings (Kitchin *et al*., 2009), HOT draws in large numbers of people, not to help design projects, but rather to have them work on collecting data. While they call this participation, this has resulted in diluting projects. The planned outputs for donors and governments and for local communities had little in the way of differences, even where needs appear to be quite different.

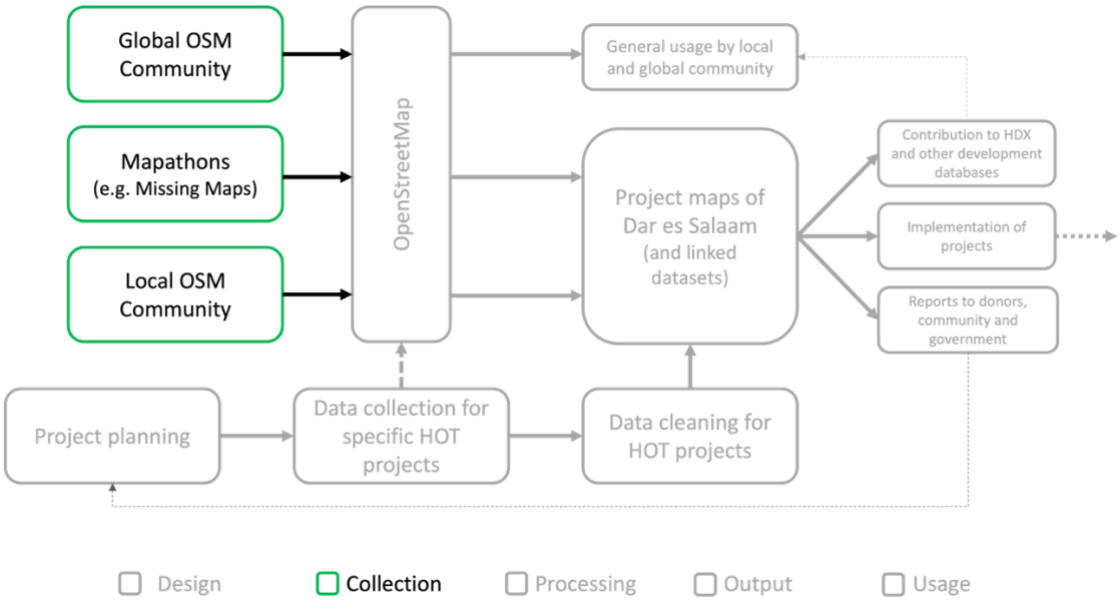
So, the planning and designing phase is beset by numerous issues. Poor leadership, which seeks its own directions. The influence of donors, which goes so unacknowledged that it actually lets this influence seep deeper into the projects. A need for constant money chasing which absorbs resources and time, and which

increases the influence of donors. A disconnect between the aims of locals, non-local project leads and the source of income.

HOT has tried to smooth over these problems with glossy documents that talk of participation and inclusion of local people, but this uncritical invocation of 'local' consultation in planning can play a role in recreating binaries between the mapper and the mapped. The global entity of HOT, and the local people. Those who are active (mappers) and those who are passive (the mapped). It is within these binaries that we see that HOT has been completely unable to escape the colonial dependency model of development. The outsider organisation needs to keep Tanzania and the population of Dar es Salaam in a position that justifies the existence of HOT, and to do this must require a degree of subjugation.

Both of the projects examined in this thesis were born as much from the desires of donors and the prospect of continued funding as they were the self-articulated needs of the local population. Whilst it could be argued that the motivation for the projects does not matter if they are of benefit to the community, the 'one-size fits all' way in which they were planned leads to numerous issues with inclusion across all stages of implementation and reporting. This will be explored further in the coming sections.

5.3 The remote mapping of Dar es Salaam



The collection of data in relation to the mapping of Dar es Salaam is multifaceted. While projects such as Ramani Huria and Data Zetu collect some project specific data, there is also an underlying need for the collection of general mapping data, and some of this falls adjacent to the work of HOT. This section will first examine the remote mapping of Dar es Salaam that takes place via three main processes. These are through the Global OSM community, through the local OSM community connected to HOT, and through specific activities such as mapathons run by organisations such as HOT or Missing Maps. The data held within these remote mappings underpins the work of HOT and makes it possible for them to work with the local community to collect additional layers of information that are more specific to the projects they are running, a process that will be expanded upon in section 5.4.

5.3.1 Creating an OpenStreetMap of Dar es Salaam

The base mapping of Dar es Salaam has been produced using OpenStreetMap (OSM). OpenStreetMap is a global collaborative project to create a free and editable geographic database of the world. Following a similar model to Wikipedia, OpenStreetMap seeks to bring together geographic data into a single source of information, and one that works particularly to map areas where mapping data is restricted or is inaccessible due to costs. Anybody globally can contribute to the underlying map hosted by the OpenStreetMap Foundation[30], and across the world thousands of people volunteer their time to add new roads, points of interest, buildings and more to the map.

However, there is a general trend suggesting that people are most likely to map the areas local to them and the routes that they most frequently use (Ramm *et al*., 2011). This means that whilst there was a small group of people interested in mapping Dar es Salaam through OSM, prior to the arrival of HOT, the city – like many others in areas where access to technology, time, and geographic knowledge might have been limited – did not have a large enough community for the map of Dar es Salaam to grow organically. In such places where contributions from the Global OSM community and the local OSM community are not sufficient to build the underlying maps, HOT works in two ways. Firstly, to partner with organizations, such as Missing Maps, who mobilize remote mappers around the globe to target specific areas to map in detail – most often through the tracing of satellite or aerial photographs. And secondly, to train and mobilize the local population to enable them to become more active members of the OSM community, adding their own data and narratives to the maps.

[30] The OpenStreetMap Foundation oversees the OSM mapping project. Membership of the foundation is separate from the user account required to contribute to OSM. Being a member of the OSM Foundation entitles members to a vote at general meetings.

A key area of planning in each project HOT undertakes in Dar es Salaam is a promise to improve the underlying geographic data held about the city on OpenStreetMap (OSM) platform. Thus, the first area of analysis is an examination of the basic underlying mapping of Dar es Salaam, the building of which HOT claims was only possible due to their intervention. People had begun mapping parts of the city before the arrival of HOT. However, the Humanitarian OpenStreetMap Team has been making a concerted effort to map Dar es Salaam as a basis for their other work. This they claim now means that one of Africa's fastest growing cities (Lubida *et al*., 2015) is also one of its most well mapped.

The mapping of Dar es Salaam involves three groups of people, the OSM community – global and local – and remote mapping brought in by organisations such as Missing Maps. To build the basic map of Dar es Salaam, all three groups predominantly work to digitize satellite images – effectively using a set of tools to trace roads and buildings from aerial data to turn it into a digital map (See Figure 15). This technique, and the technologies employed to do so, drastically reduce the cost and time for mapping (Kleine *et al*., 2014). Through the HOT Task Manager[31] desktop application, whether solo or at an organised mapathon, anyone around the world (including in Dar es Salaam) can take part in mapping the city. Mapathons were used as a way of quickly added large amounts of data to the map in one go. These would consist of a coordinated mapping event in which volunteers come together to improve the data held on OpenStreetMap. This often takes the form of tracing satellite data or aerial photography. A Mapathon might even be sponsored by an organisation through providing space or refreshments. They often focus on a particular geographic area or

[31] https://tasks.hotosm.org

use case need. They are often held inside (armchair mapping) but can also be an outside or combined activity.

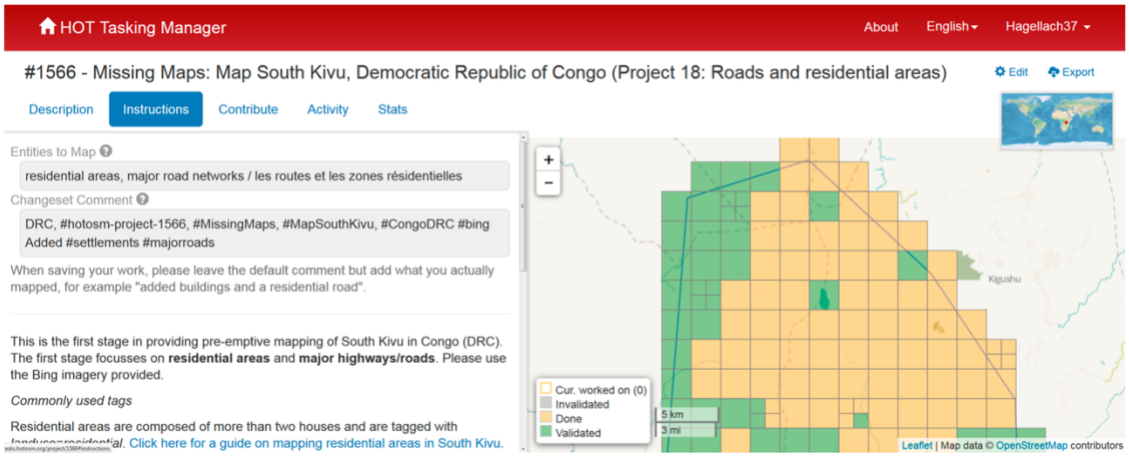
Figure 15: Example of buildings traced from a satellite image during a mapathon. These polygons are then used to enhance the data on the map of Dar es Salaam. Image from OpenStreetMap.

Those involved in the mapping, even if thousands of kilometres away, are encouraged to feel connected to the project and the location they are mapping. As one remote mapper, Richard, (Kegel, 2018, interview) noted during a Mapathon in London, UK, “it’s a very low-pressure way of helping other people who are in some cases in dire need. This is a very direct way of helping people”.

This remote process though, comes with a range of issues. When pressed further, about what he was mapping that day, Richard admitted that “I’ve just followed the process, just opened the map not really looking where I’m mapping, mapping residential areas [I think]” (Kegel, 2018, interview), suggesting this connection is more transient. Whilst the degree of connection will vary for different remote mappers, there remains the issue that for many remote mappers there is a lack of

direct connection with the area being mapped, and while many will take a great degree of care over their mapping – indeed checking and validation processes happen at Mapathons – this remoteness and lack of connection has the potential to lead to a more relaxed approach to accuracy due to a lack of local understanding.

Figure 16: Example of the mapping task manager used at mapathons. Areas of the map are shown as unmapped, in progress, done, and validated, depending on their status.



The issue here is that for data to be appropriate for any further tasks, including as a basis for HOT's other projects, it must be accurate (Sieber, 2006), and a reliance on using remote volunteers to trace satellite images and aerial photos has a potential to create inaccurate datasets upon which to base other projects or further mapping activities. Even when mappers were in Dar es Salaam, tracing satellite images was a primary source of producing the map, and so while additional local understanding could be present, the remoteness to being on the ground in the city persisted.

Figure 17: A Mapathon taking place in a bar where volunteers trace and digitise satellite data to improve OpenStreetMap. Photo curtesy of Missing Maps.

Amelia Hunt (2018, interview), former HOT Tanzania project assistant and communications officer, raised some concerns about the use of data from remote sources, noting "a satellite image might not be accurate or up to date.". Donors too, recognized that the data being collected in this remote way was rougher than expected; "you're not only getting the data because the data might be a little bit more untidy, a little bit less quality or let's say a different quality than we are used to" (Gevaert, 2018, interview). Despite these concerns, Executive Director Tyler Radford still believes that remote mappers to trace satellite images is the most suitable method of collecting mapping data for Dar es Salaam:

> "*There are a lot of professional land surveying and consulting companies doing this, and sometime' we're competing against them for projects. They'll go in and do a highly accurate survey of an area, but the data is not always open and it's usually more expensive. And once they leave, as the world changes, the map doesn't get updated. So, our approach is different -- The idea i' we're building an interest in open data and an interest in*

> *mapping* […] *and the map can continue to be kept up to date all the time, and it's at a lower cost as well*" (Radford, 2018, interview).

Here, Tyler Radford touches on one of the key things that HOT uses to differentiate itself, the openness of the data. This will be examined in more detail in sections 5.6 and 5.7. First though, this section will provide a deeper examination of the data collection and base mapping process, and how extensive this has been.

While much of the OpenStreetMap project is about creating an alternative map of the world that is open, there was an additional emphasis in Dar es Salaam. Not only should remote mappers help to map the city as they had done in other parts of the world, but these improved maps of the city should also be suitable to feed into other projects and to form a base level of data about Dar es Salaam that other data and mappings can be overlaid on. Given that HOT not only places the production of this map at the centre of its project planning, but also uses it as the basis for all other projects, it is salient to start with an examination of this base data created through the work of developing the OpenStreetMap of Dar es Salaam.

As noted above, some small efforts have been undertaken to map Dar es Salaam previously on OSM. HOT through was keen to accelerate this in order to support further projects. HOT wanted to collect and provide data that covers three areas to aid their other work, and these were the areas that remote (and local) mappers were encouraged to focus on. First is the road network which can be used for things like routing or GPS navigation on the ground. Second are buildings, which is useful for layering with other types of data. Third are 'points of interest', which are essentially the labelling of key infrastructure, such as schools, health facilities, evacuation centres, or shelters (Radford, 2019). The extent to which they have achieved this complete mapping of these features will serve as a benchmark to their

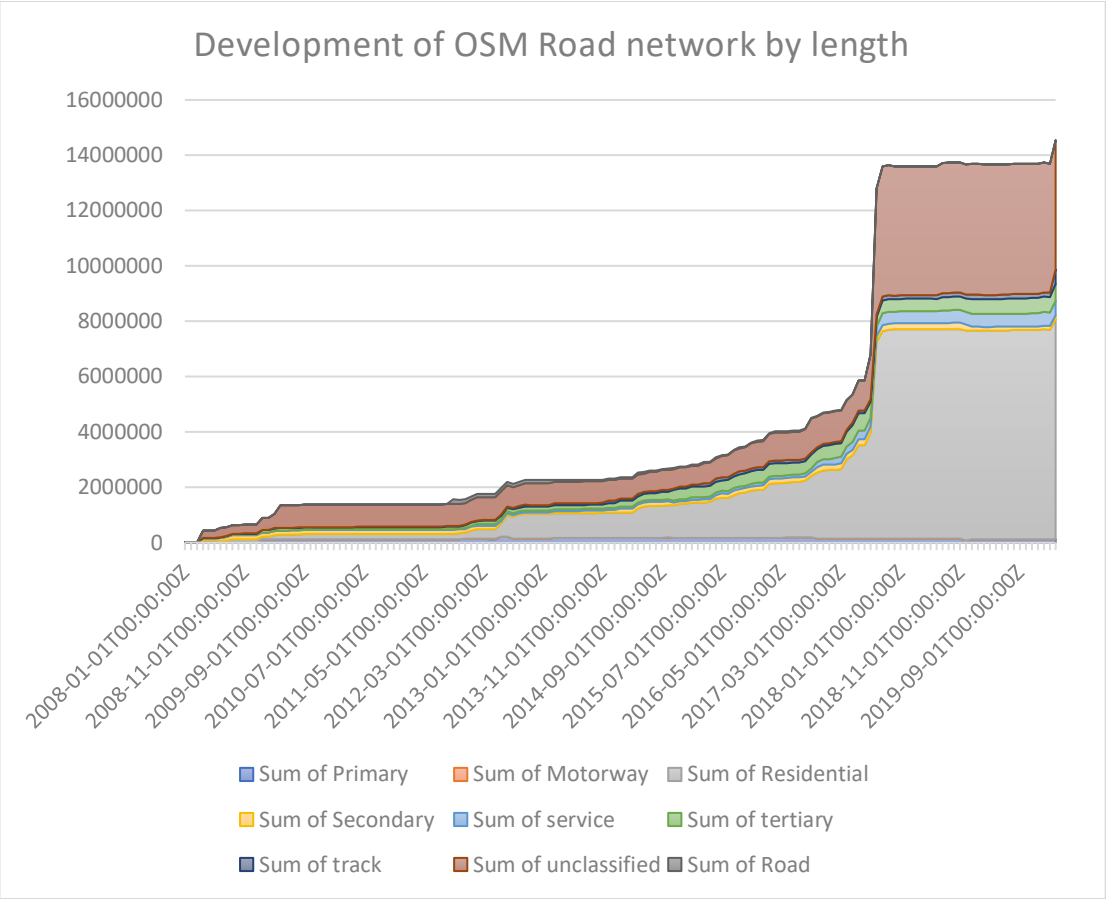
other work. Following Barron *et al*. (2014) and through using OSM edit data and numerous snap shots of OSM mapping of Dar es Salaam, ranging from 2007 to 2020, the degree to which HOT has been successful in mapping Dar es Salaam is measured across the following sections.

5.3.2 Road network completeness

Figure 18 shows the total length of roadways mapped in Dar es Salaam for the period 2007 – 2020. For the majority of time the total length of roadways remains stable for Dar es Salaam. Mapping of roadways progresses from 2,246.34km in Jan 2008 to just 2,671.98km by Sep 2014. However, the arrival of HOT in 2014 appears to have had an immediate impact on the mapping of the city. In 2017 the total length of motorway mapped increased to 16,484.78km – indicating a major map development project that year. Since then, the total length of motorways has remained the same, except for an addition of 854.89km in Feb 2018, after which Dar es Salaam shows stable motorway length. Similarly, lengths for all other categories of roads, as Figure 18 illustrates, have remained stable since September 2017[32]. The mapping of the road network for Dar es Salaam, therefore, can be deemed to have reached completion with little more to add to the mapping of roadways – this notion of completeness will be cross-referenced with other factors for validity. This also indicates the presence of an active community of volunteer mappers in Dar es Salaam.

[32] The small rise in 2020 is likely due to an expansion of the city and the mapping efforts relating to this. However, this is outside the scope of this study which is focused on the work of HOT up to 2018.

Figure 18: Development of road network length for categories of highway in the city of Dar es Salaam, Tanzania. It can be observed from the chart that all types of roads have stable lengths after May 2017 until April 2020. Data from OSM historical databases, available from https://planet.openstreetmap.org

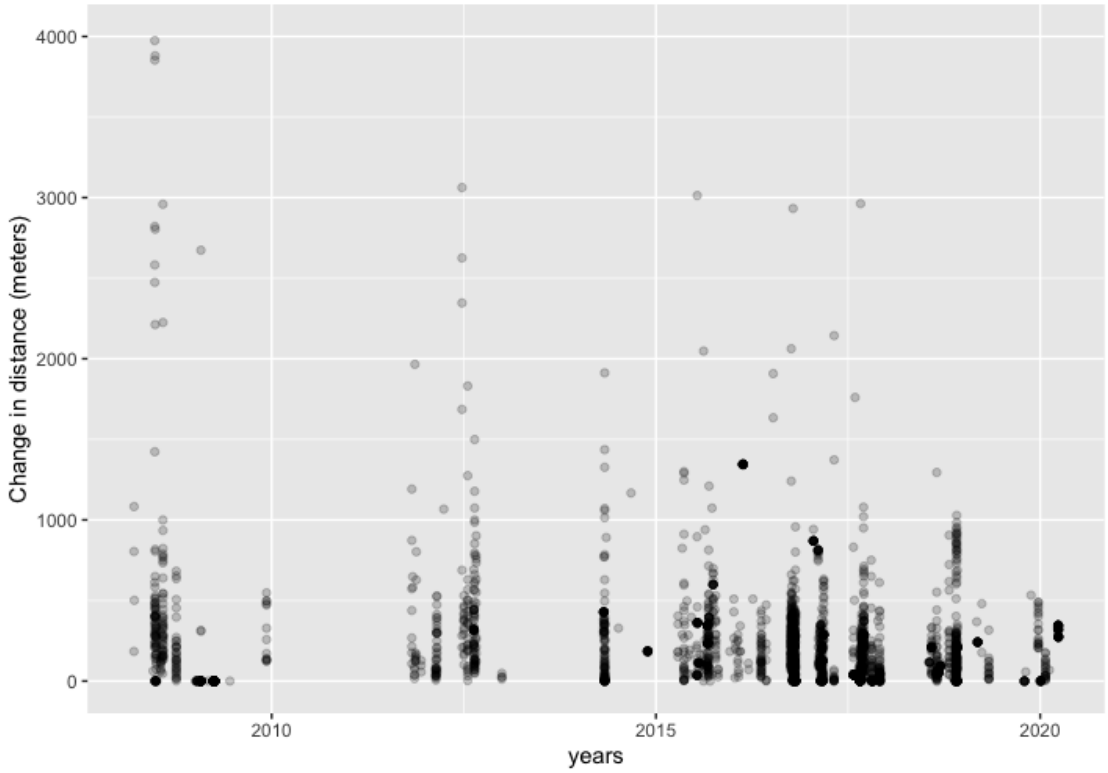


5.3.3 Positional accuracy of the dataset

While examining the changing total road length gives us a good indication of completeness, this can be cross-referenced with point accuracy of the road set data. It is hypothesised that as road mapping becomes more complete (i.e., most roads are on the map) that people will work to increase the geographic accuracy of those maps. Thus, to triangulate against road length an analysis of road junction accuracy improvements was undertaken. Figure 19 represents distribution of change in distance between road junction, as it was observed in period 'n' and period 'n-1'. For each time period, a distance of zero indicates no change in the current location of a road junction and its location in the preceding period. Changes in location of road junction over the

period could indicate both an increase in mapping accuracy and also a decrease, as errors could be added to the map. In this case, changes as an intrinsic measure of quality of data are less effective, and a ground truth reference dataset would be used to ascertain the accuracy of the data (Barron *et al*. 2014). However, it is clear that over the period studied, there has been a stabilisation of the differences in location of road junctions, and this would indicate improvement of the accuracy of data. Figure 19 shows that differences of road junction geolocations have decreased over the period and stabilised towards 2020, with change in the distance, remaining 0 for majority of observations. There continue to be some changes, implying that not everything is accurate yet, but that there is still active engagement in improving the map. Whilst it might seem to be unfair to criticize the map for having some nodes and features that are only marginally misaligned, it is important to remember, that because of the scaling of maps, misplacing a line by a few millimetres might misclassify data by half a mile (Sieber, 2000). This also serves as an indication that the map of Dar es Salaam is not fully complete.

Figure 19: Distribution of change in distance for road junctions observed in period n and n-1. Data for Dar es Salaam 2007 – 2020.



5.3.4 Buildings with a house number/name

The mapping of buildings was also a key part of constructing the underlying bas map of Dar es Salaam by HOT – and a process that was very often undertaken by remote mappers who would trace polygons from satellite or aerial photos. Figure 20 shows that until April 2015 the OSM data for Dar es Salaam had just 4,252 polygons registered as buildings, a starkly small number for a city that in 2015 was reporting a population size of 5.12 million. Even accounting for multi-occupancy households, it is clear that this are far fewer buildings than would actually be present in the city. From May 2015 to March 2020 there was a huge explosion in the number of buildings mapped across the city (n=1,011,657), this a 23,692% increase in 5 years. Since such a vast increase of new buildings over the years cannot be attributed to new construction, it is thus safe to assume that this significant growth in building polygons

is due to them being added to the map by an active community, both remotely and local, but pushed by HOT who had begun work in the city around this time.

This is also correlated by the increase in users adding to the map (Figure 21), a rise that follows the same trend, confirming that the increase of new buildings is attributable to mapping activities of a growing and active group of volunteer mappers. This increase in activity also directly coincides with the Dar Ramani Huria mapping project, which started in July 2015 with support from the World Bank and DFID. Dar Ramani Huria will be discussed at length in section 5.6. This project trained over a thousand university students and volunteers to map – adding these to those already mapping remotely – and explains the sudden and vast increase in data on the map. Furthermore, the development of all Points of Interest (POI's)/elements (Figure 22), including polygons of buildings also coincide with the project in 2015, and the need for a solid base map in order to get that project started. The mapping activity that started with the Ramani Huria project would, therefore, account for the observed increase in POI development in the OSM data, another key indicator of completeness and an area of focus for HOT.

Figure 20: Buildings mapped (polygons) and tagged in Dar es Salaam. Data from OSM historical databases, available from https://planet.openstreetmap.org

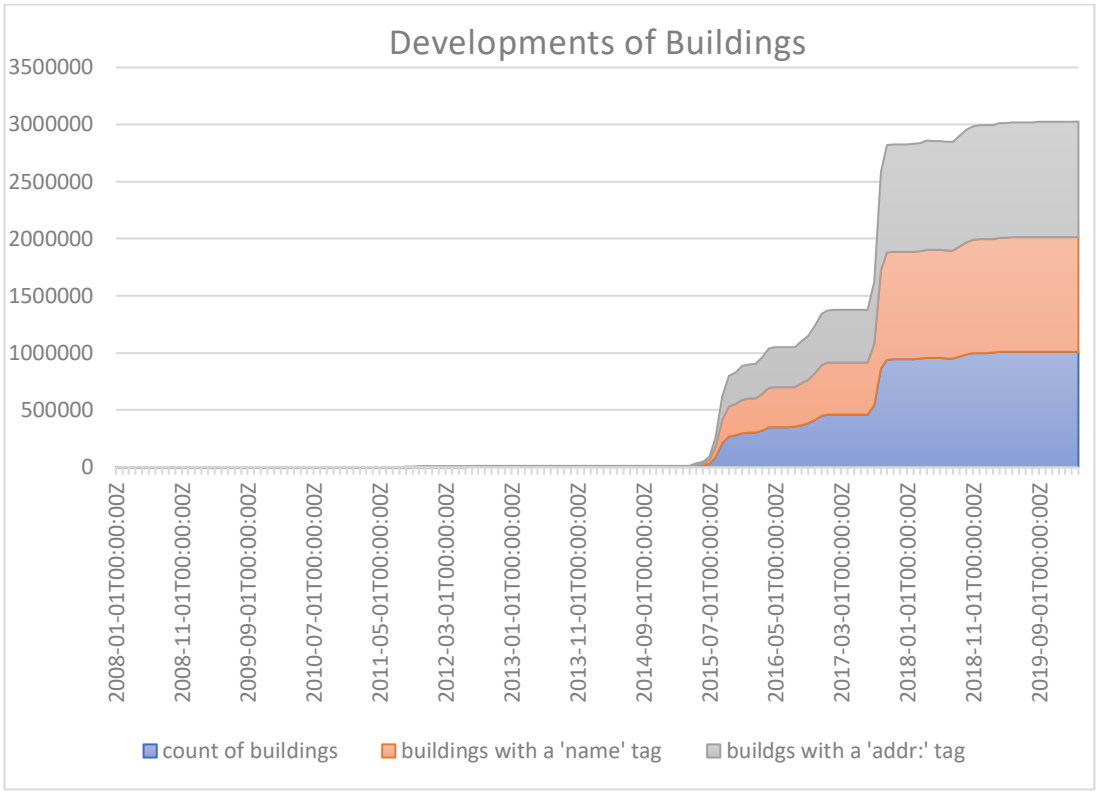
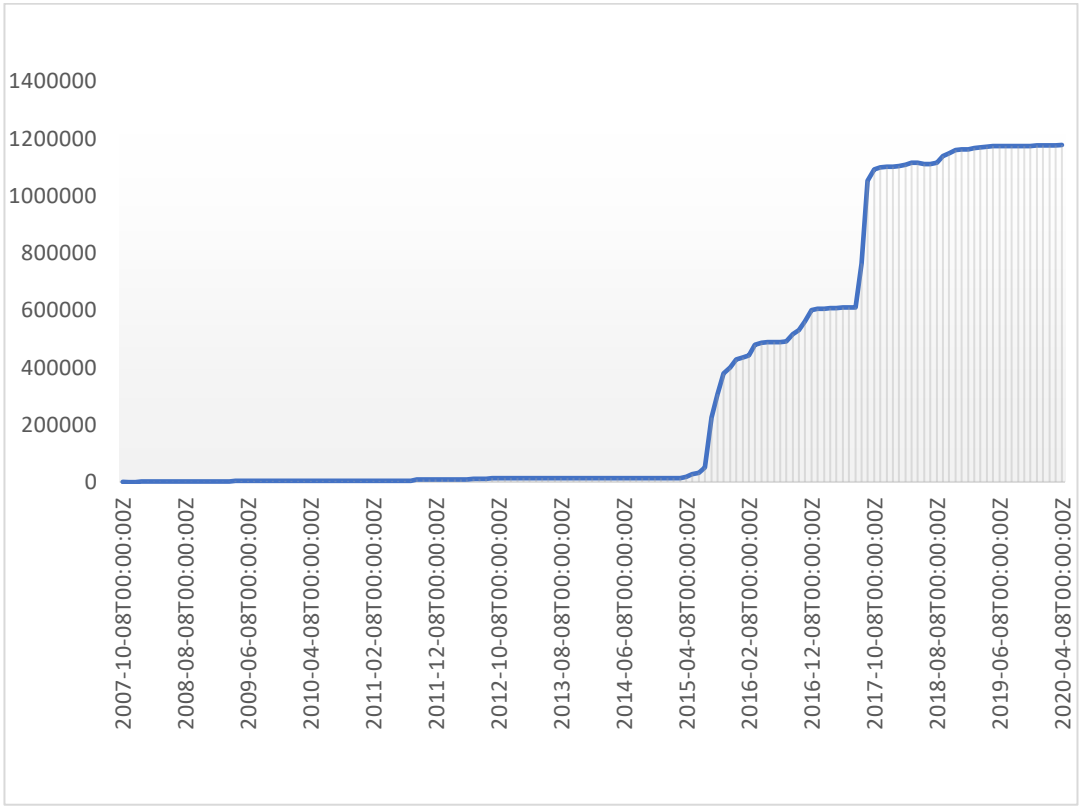


Figure 21 Number of active contributors for OSM in Dar es Salaam.



Analysis reveals that currently, 99.3% of the buildings have a name tag, and 99.9% have an address tag attached. In terms of attribute completeness, the case of Dar es Salaam seems exemplary. However, it is more difficult to make full assumptions as OSM now makes the *name tag* and *address tag* compulsory attributes to be completed when an OSM member makes an entry. Therefore, a *name tag* or *address tag* may not necessarily indicate attribute completeness and may include holding text in order to allow the user to place the attribute. To counter this issue, a further analysis of the latest data available (as of April 27, 2020) on buildings in Dar es Salaam was used to ascertain the completeness of attributes.

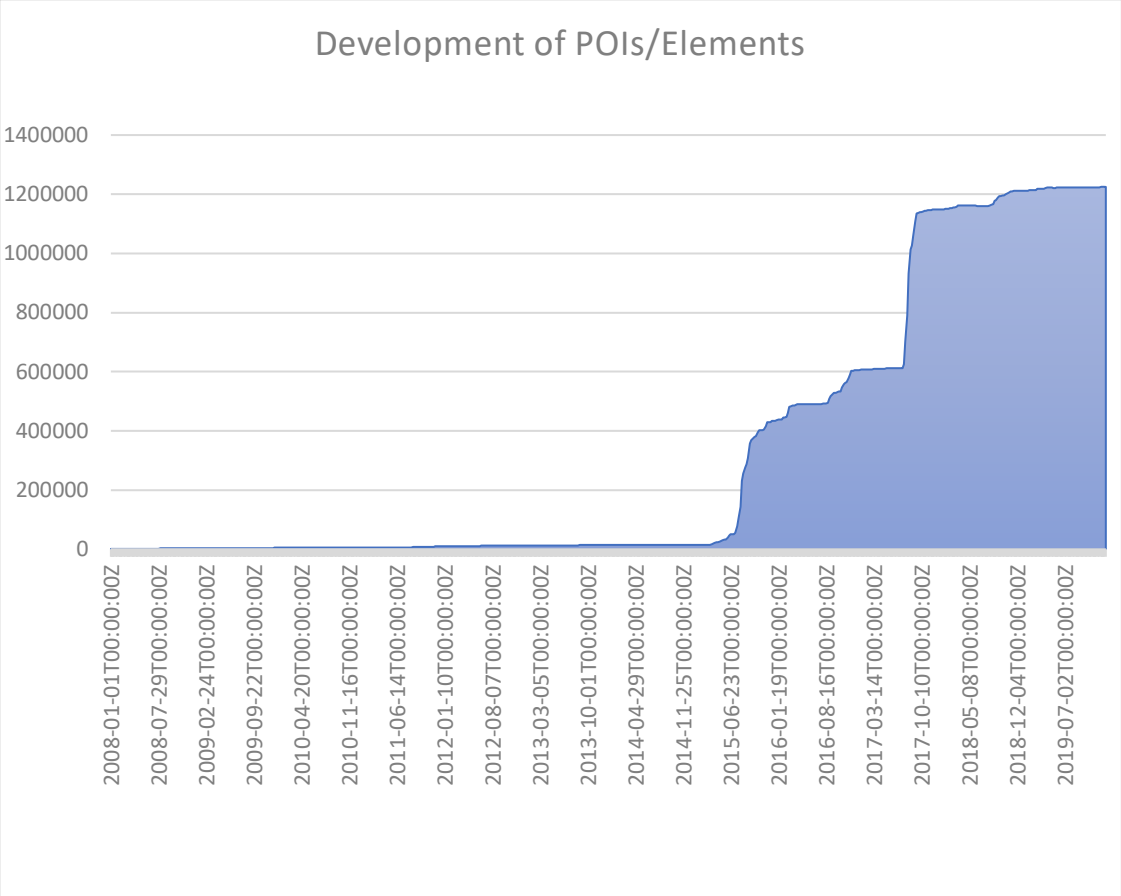
To measure the attribute completeness of the buildings, Barron *et al*. (2014) proposes to categorise all the building polygons based on their area and choose polygons with area greater than a specific number as relevant for attribute completeness test. They theorise that only those buildings with an area of >10m^2 are likely to have house names/numbers. Therefore, their framework attribute completeness is only tested for buildings with a size greater than ten square meters. The assumed relationship between the size of the building and its likelihood of having a name or number, however, is not necessarily warranted. For example, animal sheds on farms with an area larger than 10m^2 do not necessarily need to have a name or house number. A better way to select the building polygons for the measurement of attribute completeness would be to categorise buildings by types and run the analysis on a few building types that ought to have a name or number tag attached, such as, hotels, commercial buildings, apartments.

Tag completeness score emerge through undertaking an attribute completeness for four categories of buildings: apartments, hotels, hospitals, and

government offices (municipal, and provincial, town halls, government agencies etc.) – which by their type are likely to have a name or house number. Under these circumstances only 11.8% of all the apartments in Dar es Salaam have house numbers and 10% have a house name. OSM data on hotels shows that 37.5% of hotels in Dar es Salaam have name tags and 16.7% have a building number[33]. Furthermore, just 24.7% of the hospitals in Dar es Salaam are name tagged and only a 7.1% have a building number. Attribute completeness for government agencies, divisions and sectaries similarly remain very low: only 18.2% are name tagged and just 4.5% have a house number. In terms of attribute completeness, while the initial extraction of data suggests near completeness, this is due to the way in which data must be entered into OSM, with tags now being required for all entries. The forced requirement for adding tags does not though guarantee improved data quality. On closer analysis, Dar es Salaam has a relatively low number of house numbers and house names – with these tags having either holding data or data that does not correspond to the field being tagged. While enforced tagging might help in some situations, without data validation at the input stage (e.g., ensuring house number tags are numerical) there is only an increase in data, not necessarily an increase in accuracy or information. Remote mappers especially are unlikely to know the information required for these tags and they are forced towards using holding text in order to complete the task.

[33] As noted earlier in this thesis, this lack of addressing also caused the author to spend many hours trying to find his hotel, even with the aid of a taxi driver.

Figure 22: POI added to the OSM map of Dar es Salaam. Data from OSM historical databases, available from https://planet.openstreetmap.org



5.3.5 Development of natural polygons' geometrical representation

A final area of measurement to examine is natural polygons. Natural polygons are about land usages rather than specific buildings, but allow for vector accuracy measurements as well as tagging and meta data analysis leading to further completeness models. The number of natural polygons shows a general increase across time (Figure 23), however, here the quantity data is of less interest, with the dips in the graph being of less concern. Sudden losses of polygons here are not an indicator of information being removed from the map, but rather the combining of polygons to form larger land use areas, having land use areas reassigned or having false information corrected. To this end, it is more important to examine the changes

in these polygons in order to predict the accuracy of each iteration of the map. Figure 24 demonstrates these changes and shows the difference between the location of the polygon vertices observed in period *n* and *n-1*. Stabilisation of the difference indicates the improvement in the positional accuracy of the data. For Dar es Salaam, the difference in the location of polygon vertices seems to decrease over the period with more polygon vertices exhibiting no change in the location from the preceding years. However, the graph registers a sudden increase in the differences in year 2019. The reason for this is unclear but could be due to improved satellite imagery over which polygons could be more accurately redrawn, or merely a concerted effort by an individual or small team to improve accuracy.

Figure 23: Changing rates of land use mapping in Dar es Salaam (Natural polygons).

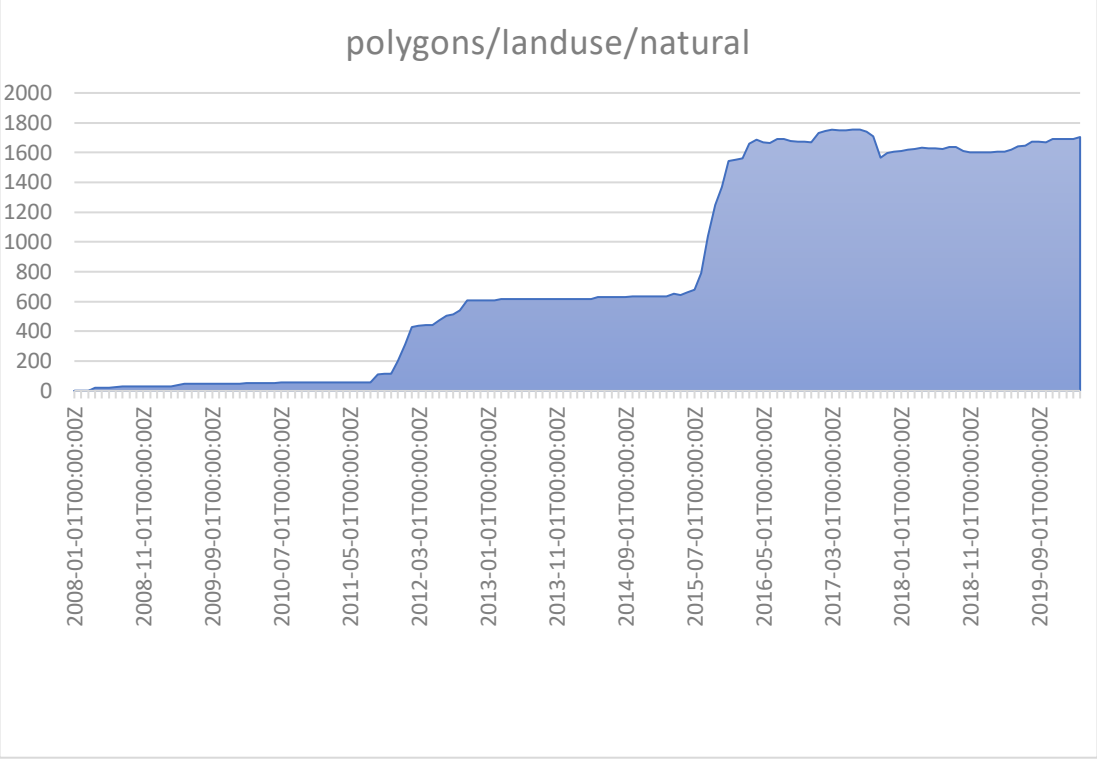
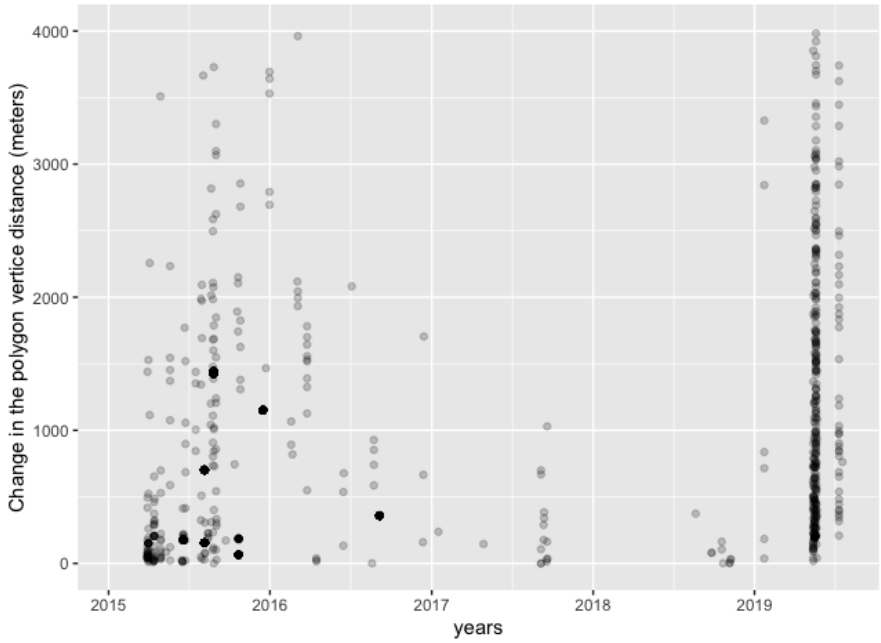


Figure 24: Development of change of polygon vertices with natural or land use tag, Dar es Salaam.



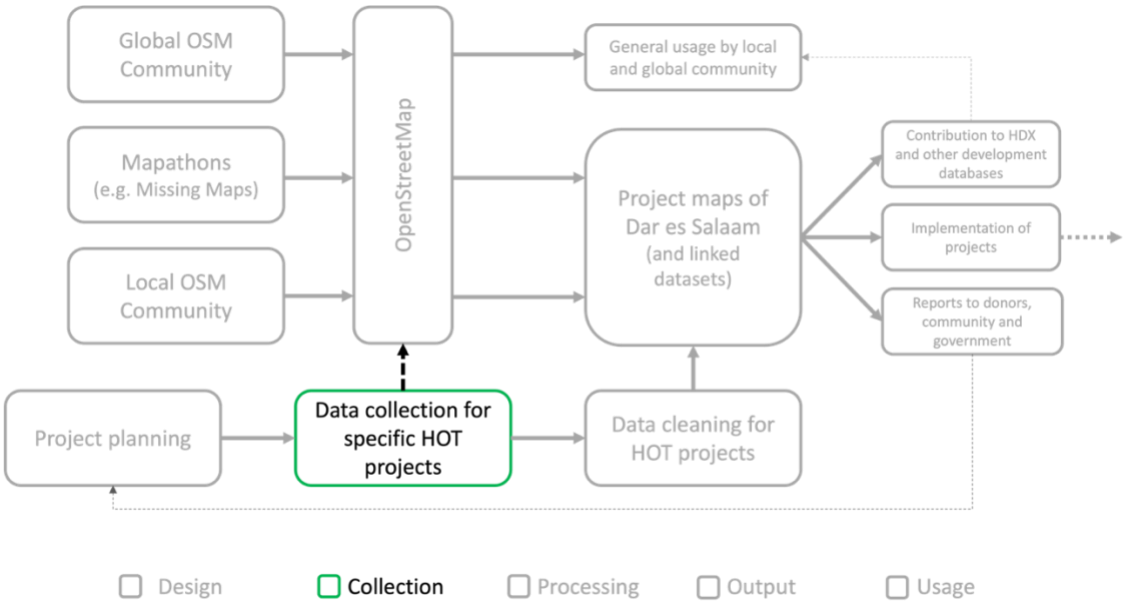
5.3.6 Summary

The data presented above is then rather conclusive. While mapping had taken place previously, the arrival of HOT in Dar es Salaam was the catalyst that led to the extensive development of the OSM map of Dar es Salaam. This process was fuelled by the use of remote mappers. Not only did the quantity of geographic data increase significantly, the accuracy did too (by the above metrics). There are some notable issues, such as the absence and inaccuracy of building names and numbers, which can be occluded by the affordances of the OSM platform that forces Tag attribution, without accurate data always being attached to the tag, and then exacerbated by the remoteness of the mappers.

The completeness by these metrics is generally high, indeed as a mathematical, data collection exercise the OSM map of Dar es Salaam is a job well done. There are though larger questions of accuracy remaining, deriving from not having additional grounded truth data to compare the information with. This grounded truth comes

through the examination of the maps related to the specific projects HOT undertakes and a deeper look at how well these maps fare when being used by the community and HOT for development or other projects.

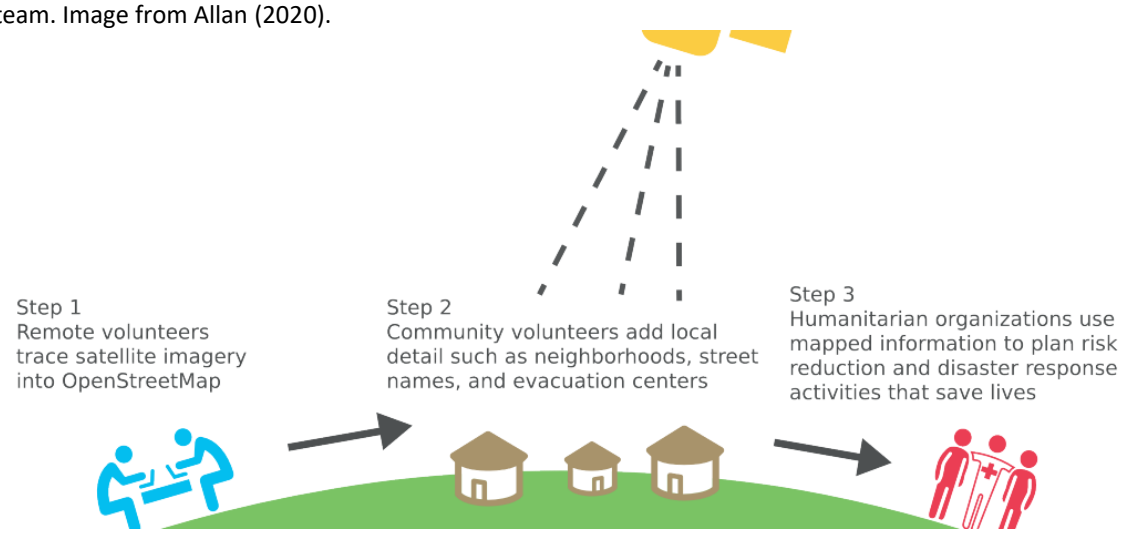
5.4 Data collection for HOT Projects



It is hard to argue that HOT has excelled in mobilizing both, local and remote mappers in the endeavour of collecting data for the production of the OpenStreetMap of Dar es Salaam. This map – which is not owned or controlled by HOT – does not in and through itself solve the development issues that HOT pertains to be working on. Further layers of data are required, and this is collected in a range of ways. Project specific data is collected by local people known as community mappers. HOT, of course, does not really include the whole community. While individuals are trained to go out into the community to collect data, these are few in numbers compared to the population. HOT is though improving the accuracy of the maps and adding extra data through door to door checking of the mapping data to ensure as much positional accuracy as possible. And by surveying the population about specific issues they are able to pick up on some local needs. As stated by Maholi (2018, interview); “after

infrastructure mapping, we also conduct something called extent mapping"[34]. For example, when considering flooding in the city, "we go door by door and ask citizens if they've experienced floods. If they say no, then that means that's the end of the survey but if they say yes, we explore more information on what year they experienced that" (Maholi, 2018, interview).

Figure 25: The process of mapping remotely, locally, and for specific projects as understood by the HOT team. Image from Allan (2020).



This helps to broaden the information on the map, turning it from a navigational tool towards something that contains sufficient data to allow for social change. It should be noted though, that while these surveys are useful in gaining data the mere act of answering a survey or having your house mapped does not constitute participation, even if it might result in representation. Indeed, the barriers to working with HOT as a community mapper are high – leading to potential issues in data collection. Whilst it is suggested that they are "recruiting people from the

[34] Mapping extent normally refers to the limit of the physical area shown on a map. However, here it was used to describe the process of 'discovering' the extent to which a problem exists – in this example, the extent to which the city would be flooded.

communities", as Asha Mastapha, Associate Project Manager (Data Zetu) notes, they are "mostly […] using university students to do these activities". She continued, "for example, I was a university student and I started working with HOT as a volunteer" (Mastapha, 2018, interview). HOT prides itself on working with universities, but as Edwards (2015) noted in their research, the more technologies being used in citizen engagement the more we see only the tech-savvy getting involved, at the expense of other communities.

There are also significant human/socio-cultural factors which continue to be barriers to participation in project specific data collection. Gender, self-confidence, and background for example all represent inclusion challenges (Verplanke *et al*., 2016). While donors, via the reports provided by HOT, were under the impression that when selecting mappers and fieldworkers for this community data collection, "technical skills, literacy, and gender balance were all factors of consideration" (HOT, 2018a), the story on the ground appeared to be rather different. As the Operations Manager, Rachel VanNice noted on a visit to Dar es Salaam;

> "*I came in and saw and went and visited and did some mapping with them locally, and they were giving out just a basic semi-structured interview survey. And there's something very clear-, they take a geo-point, ask these questions about maternal child healthcare. They didn't ask the gender of the respondent. So, there are some obvious survey design issues and limitations there. But because I have that background and I've done community and participatory based kind of projects and research and things like that, I'm thinking about those things and I think just providing one more, that's not quite so deeply embedded in what's happening*" (VanNice, 2018, interview).

These concerns reflect those of Radil and Jiao (2016) who have noted that participants in PGIS projects – whether data collectors or analysists – are generally 'middle class, affluent' community members – this despite the issuing of stipends to

provide a payment of sorts to cover the cost of the time spent on the work. This in itself can lead to a diminished inclusion of people with different identities – indeed, the notion that the 'local' population is in some way homogenous, reflects a naivety of the project's data collection methods, and is fed by the colonial gaze that presents all 'others' as the same. Some though, see the narrow recruitment program as positive.

> "HOT is really training the next generation of urban planners through university students" (Anonymous, 2018, interview).

> "University students[35] recruit community members who have interest in mapping their own neighbourhoods […] We were recruiting people from the communities and mostly we're using university students to do these activities. We were going out to the communities explaining the project to communities. And those who have interest in working and helping their own communities, we're training them, how to use the tools, and then they go back mapping their own communities. That's how it was done every day" (Asha Mastapha, 2018, interview).

The role of the students is seen by management and donors as a real key to the work. It was noted though that "University students […], are not always representative as mapper" (Mastapha, 2018, interview). However, as the students are then tasked with recruiting other members of the community, HOT hopes that a more representative dataset, not influenced by personal gains or vendetta, is collected:

> *"Students become the supervisors (takes 1 year). They go to a district to find mappers (anyone with a smartphone). This, then snowballs to other people. While it is acknowledged, this could be a problem, those being recruited, generally do not know enough about the project to be biased or to bring an agenda – so it might not affect data quality. Mappers are sent to a village they have never been to before, again to limit bias. As you work down to the community level, people know less and less of the*

[35] At the time of this research Tanzania had 181,897 university students. Of this 40% were female (73,242). The majority of students in Tanzania study courses related to Business, Education or Social Sciences. With most students completing their studies at a Bachelor level (Tanzania Commission for Universities, 2022).

> *whole situation – this can create other problems of course"*
> (Anonymous, 2018, interview).

This interviewee, who played a significant role in the manging of some projects in Tanzania on behalf of HOT, has here highlighted some of the colonial logic employed by HOT, even as they have attempted to explain why their data collection methods are able to avoid bias. In suggesting that mappers must be sent to places they are unfamiliar with in order or avoid biases suggests that HOT is worried that locally rooted knowledge is somehow biased rather than grounded. Or that there is a lack of trust that the mappers will not somehow try to 'game the system' to direct resources to communities where they themselves have interests. This was also something that came through in relation to the stipends issued to people when giving up their time to provide information to HOT or when collecting data from the field. There was a great deal of suspicion that these stipends would unduly influence the data collected, despite them being so small that data collectors remained primarily middle-class and relatively affluent. These views of the local population, be they conscious or not, are concerning and serve to further highlight the mismatch between the published intentions of HOT in Dar es Salaam and the actions on the ground.

The community mappers themselves also reported many problems of including local people.

> "*We were facing some difficulties, like communities sometimes could not trust the person who was going to your house, like, 'I know you are living in my neighbourhood, but why are you asking me this question, why should I answer you?' So, we were facing some difficulties like that. So, we had to come back and sit down again and think what can we do to make it work?"*
> (Asha Mastapha, 2018, interview).

To overcome these issues, local leaders would be approached as mediators in data collection. However, this comes with its own issues if the data being produced and mapped challenges their authority or questions whether the leader is upholding his job sufficiently. For example, should HOT produce a map that shows one ward leader is better at preventing flooding in their region than a neighbouring one, this could have significant consequences for the power structures and dynamics in that ward. While HOT might see this as creating an improvement by highlighting where failures happen, there was little acknowledgement of the local power dynamics and how changing these might have an effect on other aspects of civil life.

Furthermore, some of tensions about who the data is for already begin to emerge at this stage of data collection. For example, Mapping Supervisor, Amedeus Raphael Kimaro (2018, interview) notes that people are told in the field that “we are going to collect this data and this data will be used – We are not the ones who are going to use it, but we will push it through, to the government, NGOs, institutions and will do everything to make sure that, okay, your problems are getting their solution". While he reported that people were happy with this explanation, he goes on to contradict himself explaining that local communities have been frustrated by the lack of action concerning the mapping of drainage systems by HOT, resulting in them having to tell people "Okay, we are not the ones that are going to construct for you. Stop expecting us to go and construct it next week”. The data collection methods employed by HOT imply that the data will be used to fix drainage – something that might be termed a *local community* use of the data – but in reality, the data is used to inform the government, which then chooses how to allocate their budget, an external (non-community) use of the data. While the outcome might be better drainage and reduced flooding risk (which has been the case in many parts of the city), this result is

not guaranteed and there is an emerging mismatch between the processes of collecting data and the outputs of the projects which the data is supposedly collected for – a contradiction that will be further explored in section 5.6. This is an issue also found by Mapping Supervisor Tonny John Kanyenye (2018, interview), "In rural areas maybe there's—it's usual for many people not to understand what we're doing. There're expecting that [inaudible 00:07:18] we're doing it. If I say I'm doing this for this, they don't understand me. They expect that the actions, the little actions, that's what they want".

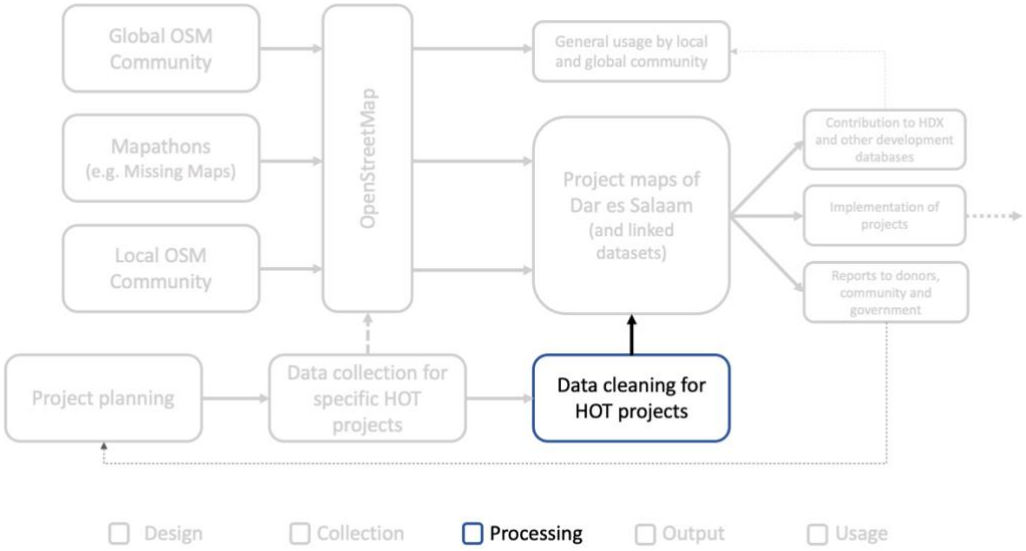
It is worth also noting that one way in which technology was used in collecting data was to place barcodes on the door of homes and buildings. These were used to link the building to OpenStreetMap and amenity information (or POI data). The Ramani Huria team in particular used these barcodes to keep tabs on the buildings, their use, and for sharing with GWPL (Private company Green WastePro Limited)[36] to ensure the collection of waste disposal fees (IPP Media, 2019). Whilst the data collected in this way was likely to be of high accuracy and easily mapped and updated, collection in this way is less participatory than invasive. This data was used as much as to collect a waste collection tax as it was used to collect waste itself, leading to questions as to who benefited from the data. There are also risks about how the data might be used when shared in an open forum. As Ivan Gayton, Country Manager Tanzania, (2018, interview) reminds us, "there's all kinds of shit that you can use the map for to do harm to people or to exploit them or to act against their interests", he does though, feel that HOT isn't making this worse; he notes, "my general sense is that most of the time the bad guys already have more data". This final statement is interesting, and it is

[36] Green WastePro Limited are a waste disposal company in Tanzania who specialise in disposing of waste in an environmentally friendly way, with a strong emphasis on recycling.

not clear if Gayton believes that HOT is competing against these 'bad guys', who are presumably and based on his other comments, to be more corporate interests, or if they are running in parallel.

HOT, and the wider OSM community, have collected vast amounts of data about Dar es Salaam. It has gone from a city that was relatively unmapped to one which analysis suggests, is mapped in almost its entirety. There are also indications that the geospatial accuracy of the maps of the city has continued to improve, based upon the metrics derived following the work of Barron *et al*. (2014). The collection of data specific to the projects being carried out by HOT is though perhaps more problematic, with issues around accuracy, expectation, and participation emerging during the collection stage. As this stage in the process HOT still feels as though it is the creation of the base map that is paramount. The adding of additional layers feels somewhat ad-hoc, pushed by a philosophy that if enough data is collected then issues to be addressed will emerge and then a more focused approach can be taken in resolving these emerging issues. – although this moment of having enough data never seems to quite arrive, instead data continues to be collected with issues to be addressed remaining a secondary task. These issues will be explored further in the following sections as we undertake a closer examination of what HOT, and the OSM platform does to this data to clean, codify, and present it to the numerous stakeholders, and what actions may result from this.

5.5 Cleaning and processing data



Data that is collected by the community mappers and through remote mapping activities is processed and cleaned in two main ways before it makes it onto a map of Dar es Salaam. The data collected through the OSM global community, including specific mapathons goes through various degrees of checking and validation. Some of these are automated, such as the POI tagging noted earlier, some are validated by other members of the online mapping community in a similar way to Wikipedia. At mapathons, such as those organized by Missing Maps, work is often validated in the moment by more experienced mappers and longer-standing members of the OSM community. The data collected by HOT for specific projects goes through a much more extensive set of processes to ensure it is 'ready' for mapping and use. This section is more concerned with the second of these, however, some brief discussion of the OSM process will also be provided later.

5.5.1 Data processing by HOT

For HOT projects the process of cleaning data involves the data moving from being collected by individuals, being passed to mapping supervisors via the data collection tools, then being cleaned and passed to digitizers, who then use this to create maps (See Figure 26).

Figure 26: Data collection and processing flowchart

Before examining the way in which staff discussed the cleaning and processing of data, it is worth looking at how HOT itself describes the data collection and processing to donors and in their publicity literature. Taken from a HOT (2018a) report on another project, not included in this work, (Mini-Grids) the process of data collection and processing – which, like their project design and all other aspects of their work is broadly the same across all HOT's work – is described thus;

> *"Pre-data collection – First, mapping supervisors took buses to the site to visit the Town Director or District Executive Director in order to notify them about their presence and upcoming activities. This was done to attain cooperation and follow the correct administrative hierarchy. Meeting officials also allowed HOT to better understand the culture and traditions of the district. This also was done out of security considerations, so that staff would be safe.*
>
> *Next, mappers were selected in order to meet project needs. Technical skills, literacy, and gender balance, were all factors of consideration. Once mappers were selected, two different mobile applications for data collection were installed*

on mobile phones – OpenDataKit and OpenMapKit (ODK and OMK). Finally, these mappers were trained by supervisors to understand the goals of the project, how to introduce themselves to the community, and how to use the data collection tools.

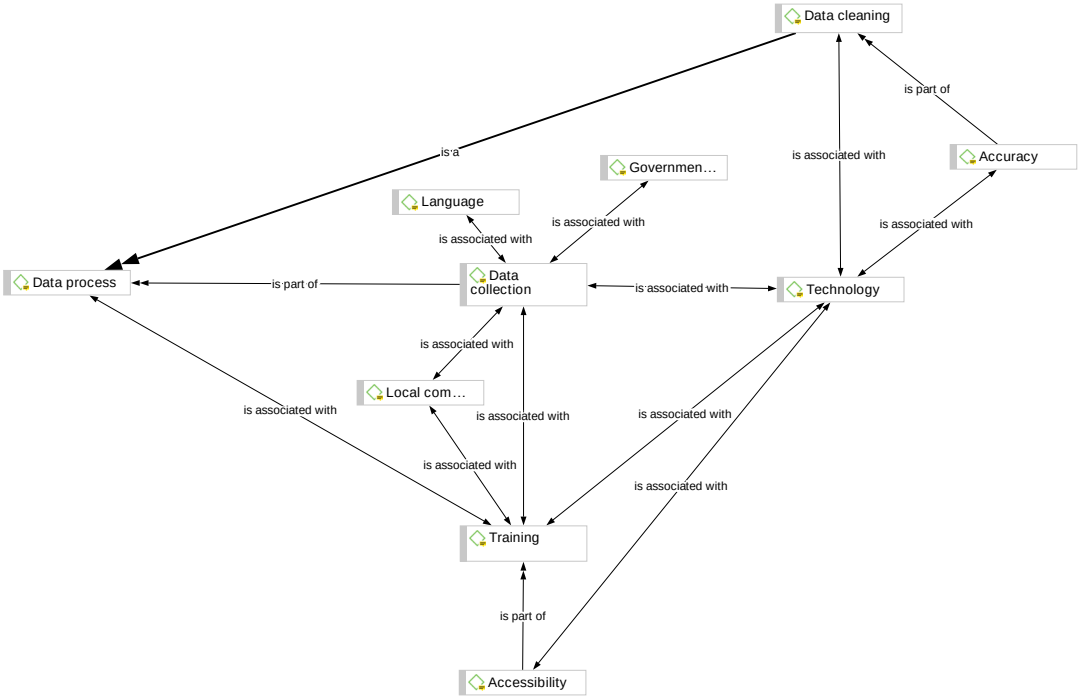
Data collection – After obtaining permission in the form of a letter from the District Executive Director, mappers went into the field. They collected information from village leaders and community members, aimed at the objectives of the project. Mappers worked with motorcyclists and selected one settlement at a time to map.

Post-data collection – Different methods were used in a data validation process in order to ensure the quality of the data before upload. Supervisors also spent significant time reviewing the data for any errors and correcting it. In addition, village leaders were contacted in order to verify certain information.

Data was then uploaded." (HOT, 2018a).

In order to establish the extent to which this description matches the reality on the ground and the perceptions of the HOT management and staff in Dar es Salaam, a deep analysis of the way in which interviewees talked about the process of data cleaning was undertaken. The multifaceted nature and complexity of these discussions are best presented as a network diagram showing the links between coded ideas from these interviews. From this diagram (Figure 27) it is possible to start joining up some of the dots of HOTs processes in cleaning data – a process that on the surface is one that is hidden and difficult to draw out. Cleaning of data is generally only discussed in an informal way, almost as if it is not part of the process at all. Looking then closer at the network diagram (Figure 27), we can see many of the themes from the HOT (2018b) documentation, but with some notable differences.

Figure 27: Data Processing – Developed from coding interviews and documents in Atlas.ti



We also see the re-emergence of some previously discussed themes, alongside some new ones that relate more closely to data processing. What is of most interest here, is the positioning of *data processing,* outside of many of the other codes. This tallies with the way in which HOT staff almost didn't see processing/cleaning of data as a part of the project – it 'just happened'. *Donors*, *NGO*s, and other outside influences are also not directly linked to the *data processing*. Nor though are notions of *local community* or *government*. There are, of course, links between the *data collection* and the *process*, as there is, with discussion of *cleaning* – these coding's are very close, although explicit in their meanings. Training is also heavily associated with *data processing* – understandable perhaps given the levels of knowledge required to undertake this work.

Looking more closely at how *cleaning* and *processing* were discussed, it became clear, that there are numerous moments at which inaccuracies or bias could creep into

the data collected and sorted by HOT. Referring to the *data collection* process, Asha Mastapha, associate project manager for Data Zetu, discussed what happens following the door-to-door collection of data,

> "*we came back and filled all that data we had collected, since the community are the ones who were collecting sometimes, they might have made mistakes because they are in the survey, there are places that we have to type, not selecting. So, we have to sit down and clean all data that we have collected so far and produce maps*". (Mastapha, 2018, interview).

Whilst interviewees suggested this mostly involves the correcting of spellings, there is a risk of additional ideological changes being made at this stage. Iddy Chazua (2018, interview), a digitizer of incoming data and GIS expert, suggests that even after this process, not all the data is immediately usable: "some data can be like a technical problem, maybe someone filled the information which can lead to block off something like that". This might be contradictory information between two fields or entering information in the wrong format or into the wrong part of the form. Whilst he suggests that many of those technical problems are 'fixed' at the digitizing stage, he also notes that sometimes "the feedback from that question is not what we were expecting" and question whether "we can keep it".

Discussing some of the missing or 'incorrect' data, Innocent (Maholi, 2018, interview), deputy country manager, suggests the issue is minimal, "I can talk of the 35,000 points we collected, we only had like 50 points that never had a location". Sara Amadi (2018, interview) though, implies, this is a rather bigger job than just adding a few missing location points;

> "*So, the data cleaning, before you're able to actually analyse the data, you need to have a clean data set. So, the data cleaner is generally an intern or a student, who, kind of works, a few hours a week, has an office pay rate, and so, is doing, a kind of quite monotonous work, in a way. But a very integral*

> *part of the work that we do, is, by having a clean data set. And so, I think it's because they're actually not involved in that process because by the time the data is clean enough to start playing around with, the analyst, his time is worth a lot more, we need to think about the time and cost. And so, I think it's just a matter of the data cleaner, not being involved in that process but that's, not to say that is okay. I think there's huge value in them, understanding that part as well, but I think this field is very new and we're still, kind of learning, and making things up as we go, and trying to see how can we be most effective, and bringing in different actors, to do the best job we can*".

Amadi here raises some interesting points. First, it seems that the mapper supervisors – who mainly collect data – are perhaps unaware of the level, of data cleaning that is taking place once the data is brought to HOT. Enough cleaning and processing is happening to provide someone with regular employment. Second, the cleaning process is not spoken about in relation to the projects and outcomes, only as a process of making things fit the forms better. However, whilst mapping supervisors reported a disconnect between collection and action, as noted in section 5.1, managerial level staff denied there could be any data loss or misinterpretation in the flow - a claim that would be hard for anyone who has worked with data or mapping to believe. Sara Amadi (2018, interview), Associate Project Manager for Data Zetu, sums these sentiments up thus, "this data belongs to the community, and it reflects the collective nature of what communities are saying about the challenges they face". She goes on to explain these issues in the data might arise at the community level, "however, you have to keep in mind that just because a community says something, we cannot just take it for plain or as a fact. It gives us a starting point to go into that community and actually investigate, what that problem may be". While some scepticism around data and community responses can be useful, where these decisions are being made by outsiders there is plenty of scope for issues.

A further consideration of processing is making the active choice about which data to map once it has been cleaned and prepared. Not all data should go on all maps, and decisions over which should be included are some of the key questions in critical cartography (Edney, 2019; Specht and Feigenbaum, 2018). However, in terms of other processing of data, little was said, beyond the process of cleaning, and only one interviewee expressed that the choice of what to put on each map was also part of the process. Amedeus Raphael Kimaro (2018, interview) states:

> "okay, they're collecting data from the site and then the data is cleaned. And then after data cleaning, okay, we already have the data now. Manipulating that data, okay, we need maybe some maps, maybe to show something, that you have data, and then that process of changing that data, and representing it in maps".

Despite most interviewees not discussing these topics, there are numerous issues in the way in which data is being collected and then codified for use. One place where this is highlighted is in the time that it took HOT to realise the way in which power is distributed through the city. Whilst the projects had been working at Ward level[37], it became apparent that informal administrative areas known as *Shina* also existed. These are subdivisions of wards, each managed by a *Mjumbe*[38], who yields a great amount of influence over the people of that *Shina*. Without knowing that these zones and their connected power structures existed, HOT was unable to note, until much later in their work, that these power dynamics might affect the data being collected or explain why some areas were more reluctant to part take in the work

[37] Dar es Salaam Region is one of the 27 regions of the United Republic of Tanzania. It has three Districts, namely, Ilala, Temeke and Kinondoni. Each District is headed by a District Commissioner. The districts are divided into Divisions, which are in turn divided into Wards.
[38] Mjumbe translates literally to mean delegate or envoy but is closer in this case to meaning 'a representative'.

(Kimaro, 2018, interview; Adinani, 2018a). As one HOT staff member puts it "You can't just ask people about their community. You need to have permission of the Regional, District, Ward etc. It is an 8-layer cake" (Anonymous, 2018, interview). Before knowing of the *Shina*, these places names did not fit within the known boundaries of Dar es Salaams districts, and thus people were asked for different information on location to fit with the boundaries fixed by the Western cartographic representation. Place names related to *Shina* were deleted or 'corrected' to match names already known to HOT. This meant, it took longer for the *Shina* boundaries to be drawn, and local residents may have also felt as if their ideas were being dismissed because they did not match HOT's pre-determined view of the city and its administrative levels (See Johnson *et al*., 2005). This situation, whilst rectified, highlights one way in which information can be lost through codification, particularly where boundaries are concerned. It also raises questions about how much 'local' knowledge the Tanzanian staff at HOT possessed. They themselves were either unaware of *Shina* – suggesting that perhaps they were not representative of the community they were serving – or they were not listened to by the more senior members of HOT producing the maps. Both troubling conundrums.

As was shown in Chapter 5.3, the accuracy of the maps increased greatly, but even in 2018 when this research was undertaken, there remained some unmapped roads and missing or inaccurate nodes. Although the map analysis showed its remaining inaccuracies at the time of the research and did not include aspects such as *Shina* boundaries, field mappers, such as Amedeus Raphael Kimaro were adamant that data was accurate and correct. "We make sure that everything is traced very well, we don't have missing data and everything, and to make sure that, Okay, our data is accurate and everything". He later though, goes on to note that one challenge they are

facing is, “having the phone with accurate GPS […] That’s the challenge. Also, for them that is working, sometimes it [is] changing the accuracy” (Kimaro, 2018 interview).

Overall, the processes of how data was being cleaned and processed by HOT, appeared almost ad hoc, with no clear procedures or processes, and certainly no consideration for differences in the process needed by the different projects. This led to the accidental hiding of *Shina* boundaries and may well have led to other important local information being ‘cleaned’ and processed out of the data because it did not fit the normative collection and processing plans. This process was likely exacerbated by the use of the OSM platform and its associated tools that limit the range of features that can be added to predetermined parameters.

5.5.2 The influence of OSM on data processes

As has been previously noted, HOT bases its work on the OpenStreetMap (OSM) platform, using this both as a base map and also to add layers of data for specific projects. While OSM is a community mapping project in the sense that mapping is carried out by volunteers from a community around the world, the platform itself has a uniform design and mapping process. OSM relies on normative symbology and design, which by their nature can exclude other ways of looking at the world. Whilst OSM operates like a wiki, with editors able to change other people’s mappings, the system still locks options in place the types of tags that are allowed in terms of symbology and styling. And when things get too political, they make very political choices, as seen in decisions made about naming and mapping in Palestine which excludes local mappings in favour of Israel’s outsider/oppressor perspective (Bittner, 2017; Carraro and Wissink, 2018). The use of OSM and other technologies by HOT enables them to reach a lot of people, and to use people from all across the world

to map and develop projects. This though does not automatically mean this is better and may indeed work to reinforce and amplify inequalities (Edwards, 2015). Without a deeper understanding of the entanglements between data and power, the creators of OSM, may have created a false flag of representation, imbued with ideology and colonialism.

In using this as their principal tool, HOT too becomes unchallengingly a part of this process. This lack of challenge was noted in the interviews, in which all those spoken to had very positive opinions about OSM and its use for the mapping of Dar es Salaam; “OpenStreetMap is certainly a movement. It’s a cultural movement. It’s a place to encounter” suggested Allan, Country Manager of Uganda, (2018, interview) This, despite the large amount of work demonstrating the importance of understanding, how PGIS is situationally and culturally influenced (Sieber, 2006).

This will also have an effect on the way in which the information is gathered and then cleaned and codified. There were already marked differences in opinion on how much cleaning was being done to the data, with the mapping supervisors suggesting that the data collected was of very high quality (Maholi, 2019, interview), whilst staff from further up the chain, suggested that so much work was required to clean the data that whole sets of additional staff was employed (Amadi, 2018, interview). These differences might raise concerns over how much those on the ground, and thus, those answering surveys, really know about the data being collected and the cleaning processes it would pass through. Of course, data will also represent and reflect social relations and power, this can hardly be avoided. However, the approach of HOT to employing technology wholesale, with the idea that more data is better, suggests an epistemological position that is not fully embracing the participatory model (Burns, 2015). As Ivan Gayton, HOT Tanzania Country Manager,

states, rather gleefully, in relation to data cleaning: “the robot overlords are going to take care of that. The machine learning is going to take care of the digitization in a couple of years. So, what's left for us? This leaves some room for us to act. As for the implementation that's, when the computers can do that, then we'll have other problems or other opportunities” (Gayton, 2018, interview).

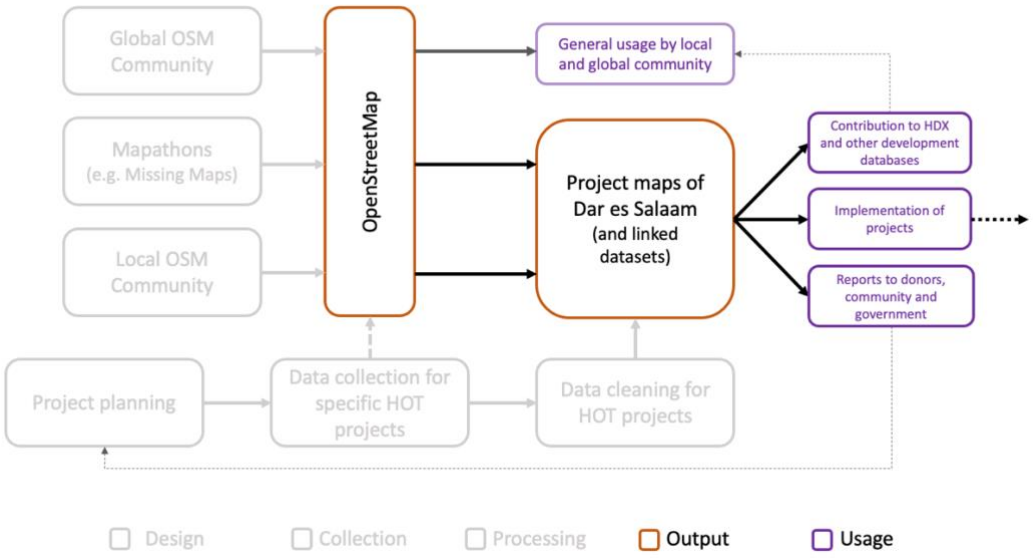
There appears then a mismatch between how HOT presents itself and its aims (both publicly, and internalised), and how individuals discuss these topics in interviews and in the field. This further highlights the tensions between community mapping as emancipatory politics or as reproducing power relations (Parker, 2006). HOT may have found itself entangled in the idea that anyone is able to make a self-representation, if they want (regardless of means), and that this, in and of itself, opens the public discourse around issues (Kidd, 2016). A romanticized notion of ‘the local’, which might be seen as rising from much post-development literature also provides HOT with a sense that local places are homogenised or are sites that might constitute grassroots action (Hart, 2001). Whilst HOT eventually took note of the smaller *Shina* for data collection, they also began to fetishize, the ‘Hyper-local’ as being a sign that they were achieving even more in terms of participation, while changing little of their actions – potentially embracing, a revisionist neoliberal approach to development, masked by the fetishized role of individualized data (Jordan, 2015; Hart, 2001; Adinani, 2018a).

“Maps are valued for their indexical aspect” (Paglen, 2008, p.44). Maps are seen as, holding an unquestionable truth, that they can only be created by high quality data and highly skilled experts. They reflect the divine gaze of Gods and put the map maker in such an office (Specht and Feigenbaum, 2018). To this end, the data held in the maps certainly makes the information seem more reliable. It is worth noting though that the idea of map data being either reliable or valid, was not something that

was mentioned in any of the interviews, even not by those who expressed concerns related to the quality of data collection and cleaning. Yet, it was a notion that was heavily noted in the documents examined, appearing in almost each report and the majority of other documents. The idea that maps provide a valid and reliable data source (rather than the data itself) was mentioned no less than 18 times across the analysed documents (See HOT, 2017; HOT, 2018b; HOT, 2020a; HOT, 2020b). So, while it was not mentioned in interviews explicitly, it is reasonable to assume that HOT seeks, as other cartographic and GIS enterprises do, to present the data collected as a truth. (Kitchin *et al*., 2009).

There are clearly some contentions about who the data is for and what happens to the data once it is collected. These tensions appear to exist not only between the community and HOT, but also between members of HOT itself. This is not to say that HOT is failing completely in improving the lives of people in Dar es Salaam, rather, it suggests a point of reflection on how data is processed and managed by the organization. In the next section these tensions will be drawn out further through an examination of the materials and maps produced by HOT and who they might be for.

5.6 Outputs and usage



The previous section looked at cleaning data and processing, including beginning some examination of the discussion – or lack of – around choosing what should be placed on the maps produced by HOT. This section will expand on those concerns, as well as building on the map analysis in section 5.3. The outputs from the geospatial data collection undertaken in Dar es Salaam broadly falls into two categories: improvements to the OpenStreetMap of the city, and maps for projects organised via HOT which contain specific data. The usage of these outputs though, is more complex, with numerous conflicts and contradictions, presented by HOT members and donors. Broadly four uses can be seen; improved navigation of the city, contributions to the Humanitarian Data Exchange, the implementation of action related to projects, and visualisations for donors, community, and the government. This section will look at these uses and explore these contradictions, starting with an examination of the improvements to OpenStreetMap, which underpins many of HOT's

projects and forms the base map for other data as well as providing improved navigation, routing and addresses of the city, regardless of any additional projects.

5.6.1 OpenStreetMap improvements

As seen in section 5.3, the gathering of data for the OpenStreetMap of Dar es Salaam, grew rapidly in the last 13 years, and by 2020 it was possible to see from analysis of the changes being made to the map that it was near to completion by the metrics laid out by Barron *et al*. (2014). To put this into more perspective, the following maps (Figures 28 to 36) demonstrate the growth in data about Dar es Salaam, and how it has now been presented through OpenStreetMap.

Figure 28: Dar es Salaam OSM Map 2007, while OSM started in 2004 this is the first data for Dar es Salaam. Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

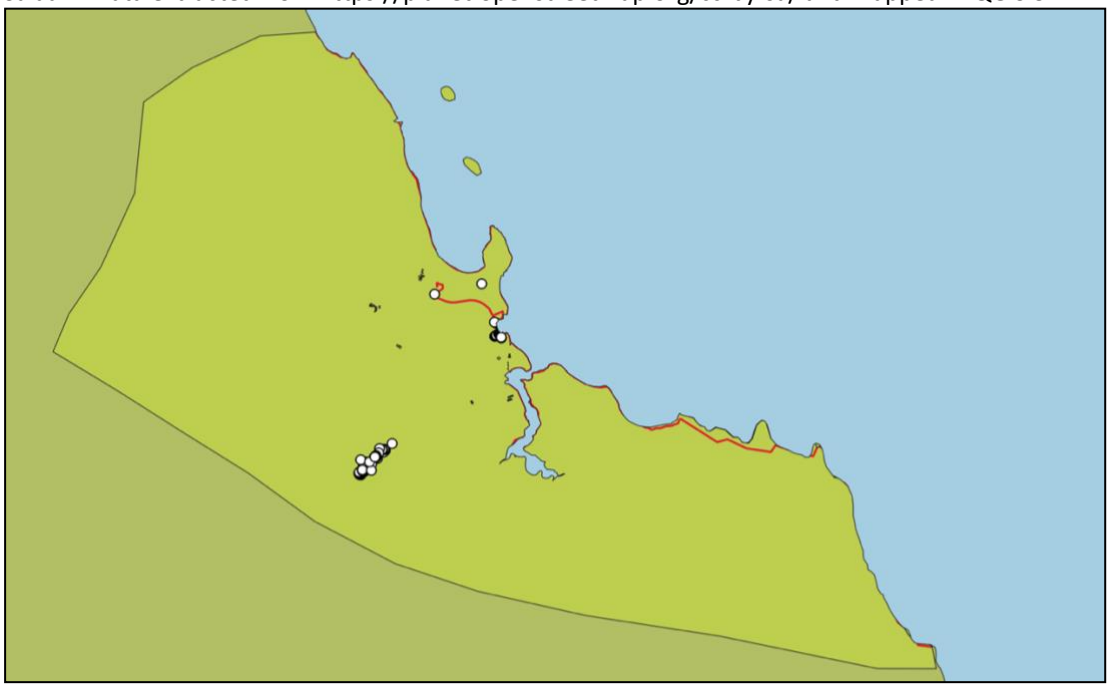


Figure 29: Dar es Salaam OSM Map 2010 By 2010 the map of Dar es Salaam was already beginning to develop, with many more roads and points of interest added. Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

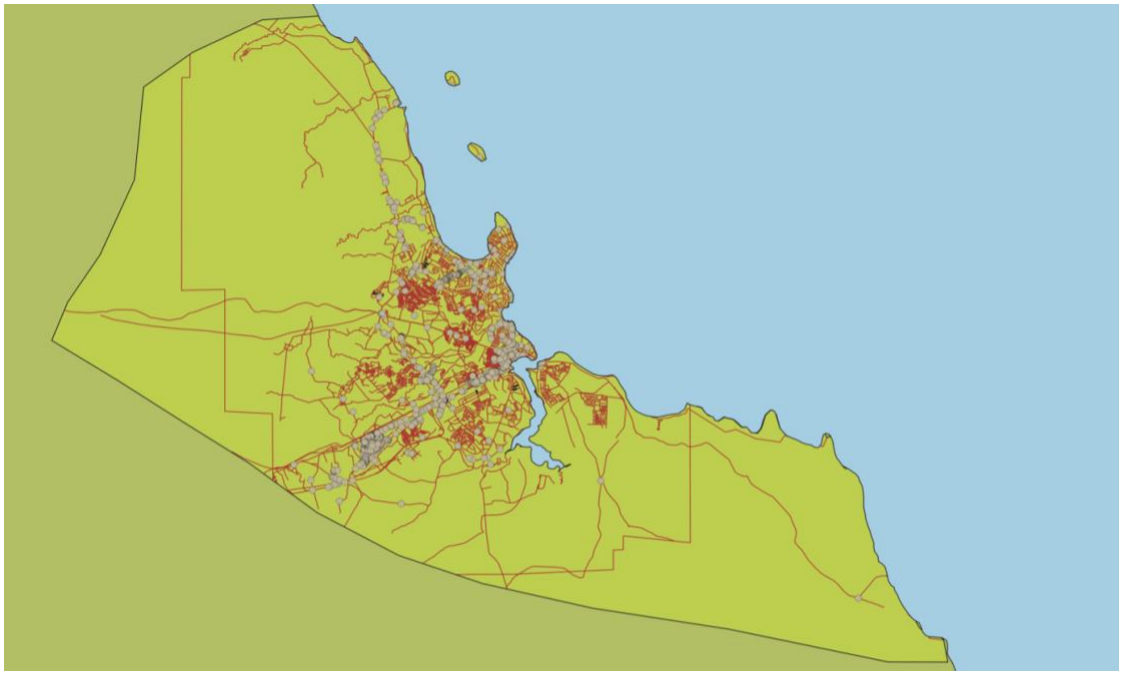


Figure 30: Dar es Salaam OSM Map 2014: The year that HOT arrived in Dar es Salaam. Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

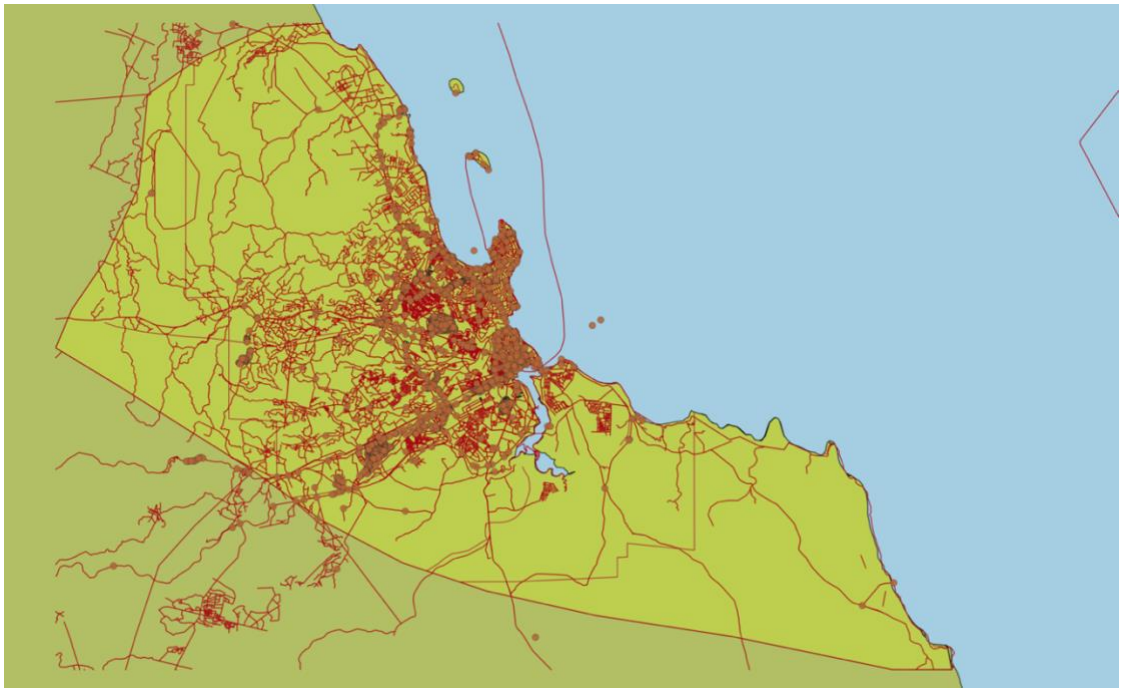


Figure 31: Dar es Salaam OSM Map 2016, shortly after HOT arrived. Many more points of interest are now listed, and roads extend into wards previously unmapped. Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

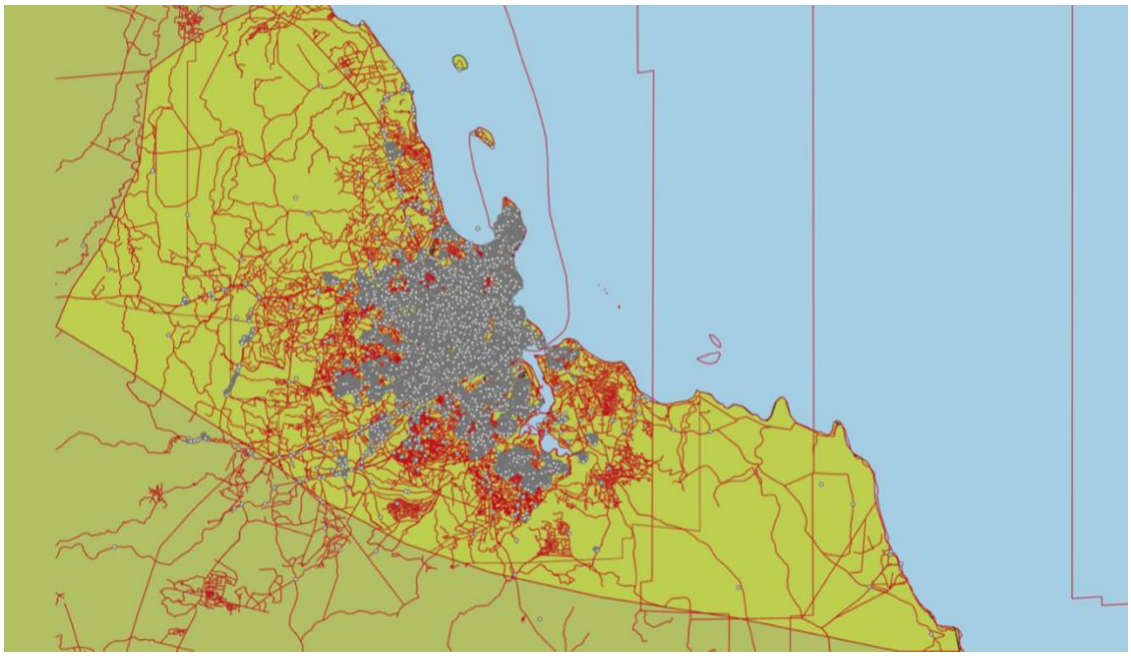


Figure 32: Dar es Salaam OSM map 2016: A version of the map from this year which shows how extensive the road network has become (POI removed). Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

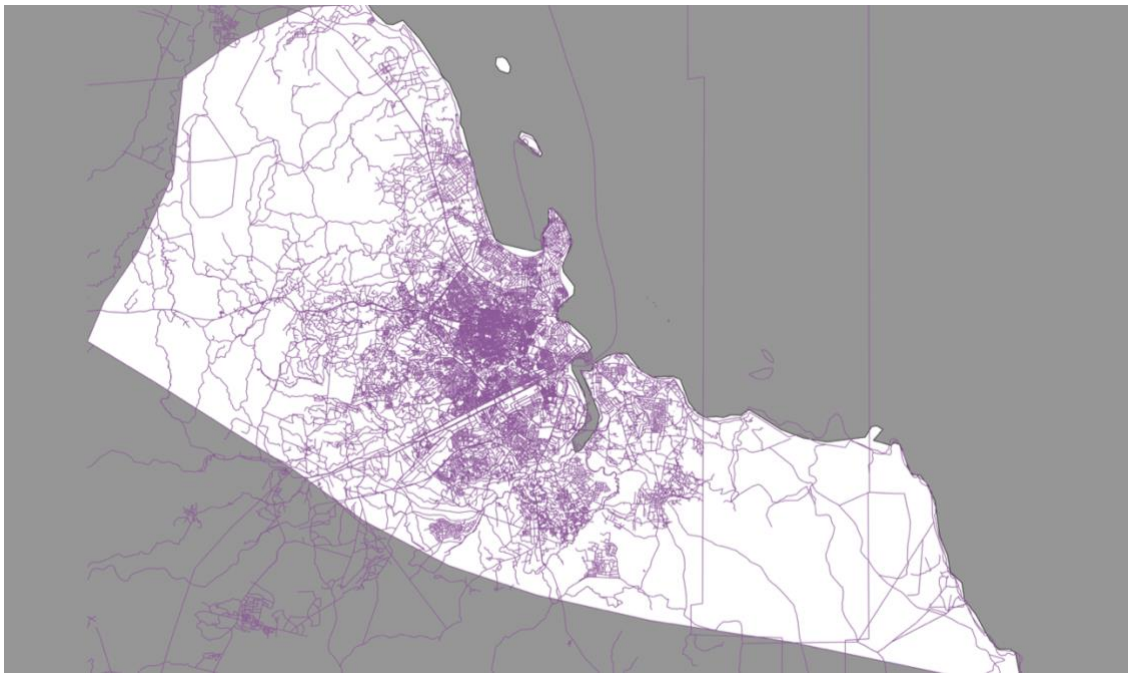


Figure 33: Dar es Salaam OSM Map 2018 -Year of the field work. Roads and POIs are now extensive throughout the city. Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

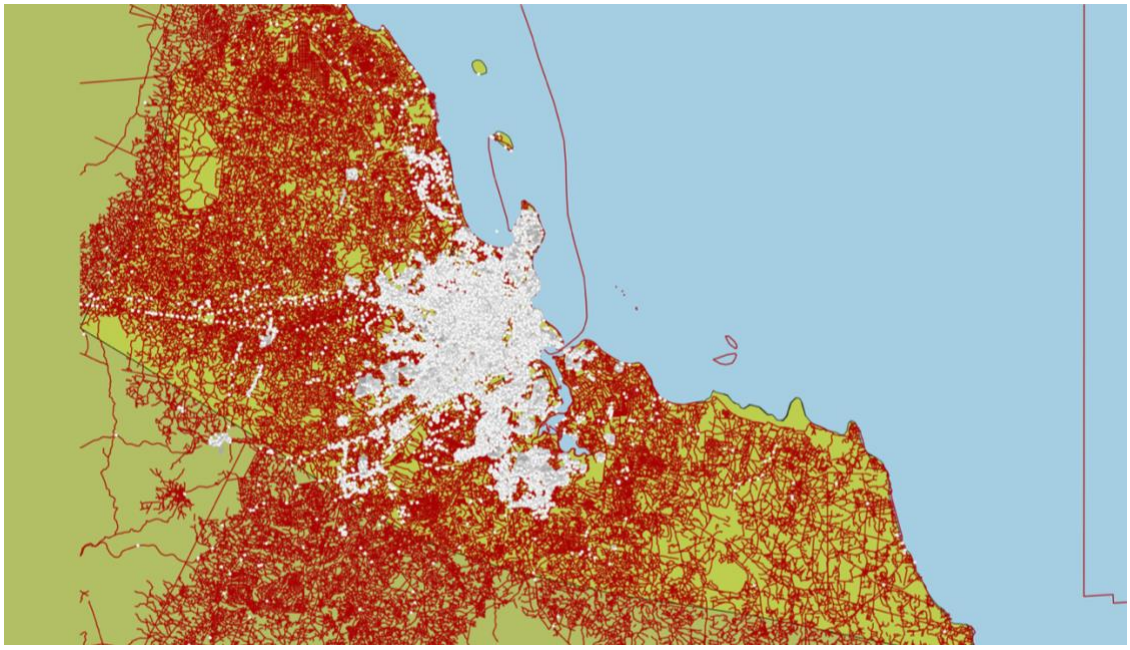


Figure 34: Dar es Salaam OSM Map 2018 -Year of the field work. POI removed to highlight extent of road network now mapped. Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

Figure 35: Dar es Salaam OSM Map 2–20 - Most up to date information. Data extracted from https://planet.openstreetmap.org/cc-by-sa/ and mapped in QGIS 3.12.

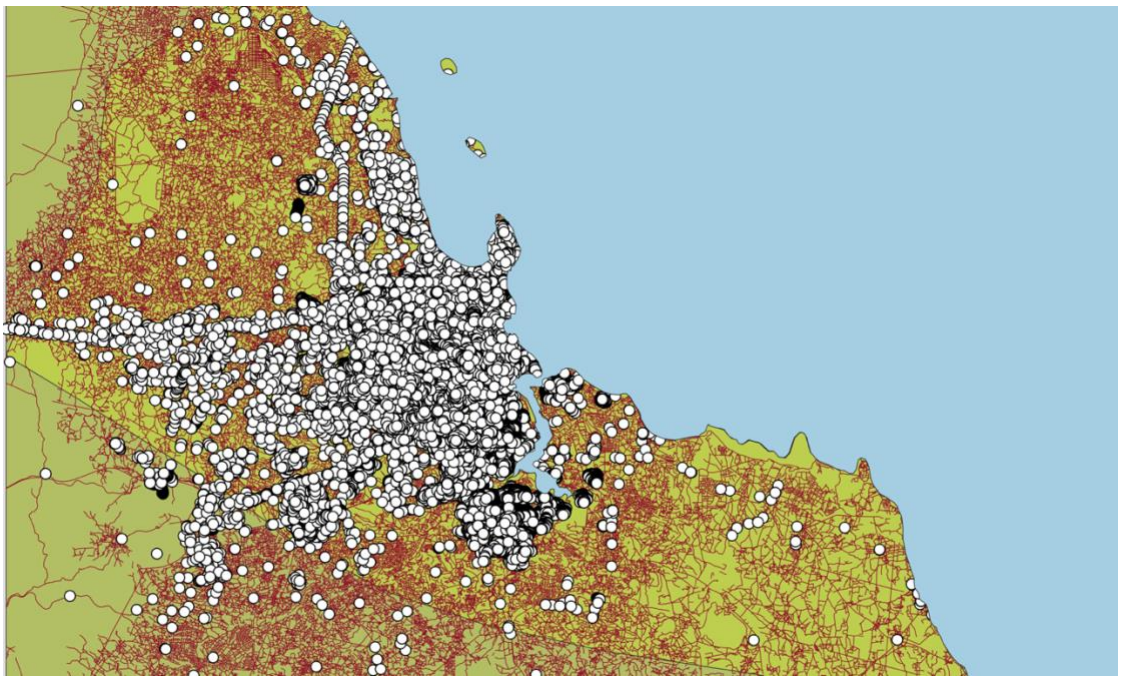


Figure 36: Central Dar es Salaam, OSM data as viewed in QGIS rendering and on the OSM platform.

This data is now available, free and globally, and as OpenStreetMap grows in popularity with companies, such as Apple and Facebook, these maps increasingly form an important part of ensuring that Dar es Salaam is open to such tech companies. Indeed, Gayton (2018, interview) sees these developments as a way of encouraging companies that require geospatial data to operate in Dar es Salaam; “imagine that our goal is to be able to get the Uber driver to come to me without having to do that

intervening phone call" (Gayton, 2018, interview). This is a process he sees as immanent development – the unintentional processes of development. And perhaps something more important than the work carried out by HOT in the name of imminent development, those that are willed processes of development policy. The production of these maps is also very useful for the work of HOT, providing it with a base map upon which to overlay their other projects. The next section will deal with these specific maps.

5.6.2 Analysis of maps produced for Ramani Huria and Data Zetu.

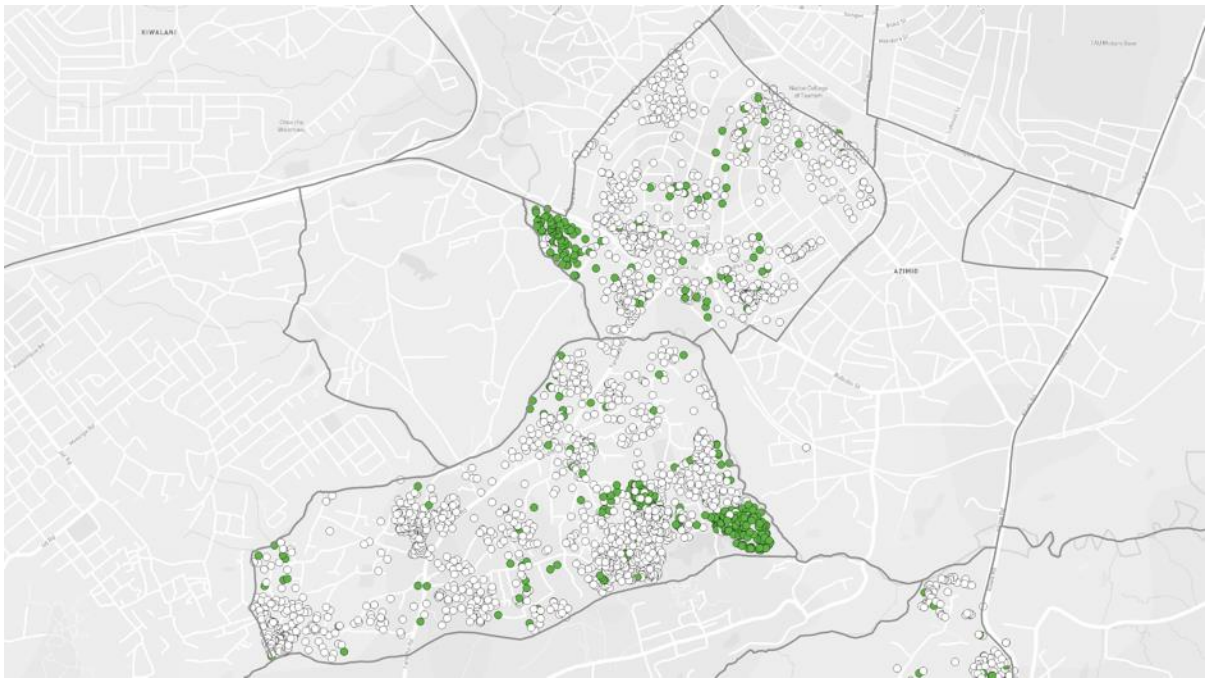
One of the few places where it is possible to disentangle the various projects being carried out by HOT is at the stage of mapping outputs. While the design, collection and cleaning process have vast overlaps between projects – often with staff working across different projects simultaneously and seamlessly, the outputs at the end are very clearly 'branded' as to which project they are for. This is unsurprising given that these outputs also need to be given to donors who will want to see the outputs for the investment in a specific project. Given the more discrete nature of these maps, these outputs are presented as the separate projects they were intended to be.

Data Zetu

One of the main outcomes that Data Zetu was geared towards to, was mapping surveys about maternal health provision. During the collection phases community members were asked questions relating to their access to health services, including the affordability of health centres, travel time to access services, availability of medicines, and the medical care provided (Adinani, 2018b). Maps like the one in Figure

37, produced by HOT as part of the Data Zetu project were able to show clear gaps in access to sexual and reproductive health services. This type of data was collected with the aim of allowing decision makers to make informed resolutions on where to prioritise their investments into medical infrastructure, training, and advocacy.

Figure 37: Community mapping efforts identified “hotspots” in parts of Tandika and Makangarawe wards in Dar Es Salaam, where some citizens reported the longest travel times of over 40 minutes (green dots) to access sexual and reproductive health (Adinani, 2018b).



One of the key things that came out of this work though was less about the health provision, but more about the way in which areas are governed at a much more micro, informal way than was expected by the HOT team. This was something that took a long time as HOT previously rejected data that fell outside of the expected results of their surveys – masking the boundaries and power models witnessed by people within the city. This left boundaries between local government jurisdictions unclear. Once it became clear how these Shina and other boundaries worked though HOT, in parallel to collecting data on maternal health needs, HOT also mapped

administrative boundaries by conducting household-level surveys to determine the jurisdiction of local leaders, *Mjumbe* (Adinani, 2018a). Understanding who is responsible for public services at a hyperlocal level is vital in providing accountability and improved resources to community members.

Figure 38: Individual household data of Mjumbe jurisdiction, Makangarawe Ward, Dar es Salaam, Tanzania (Adinani, 2018a).

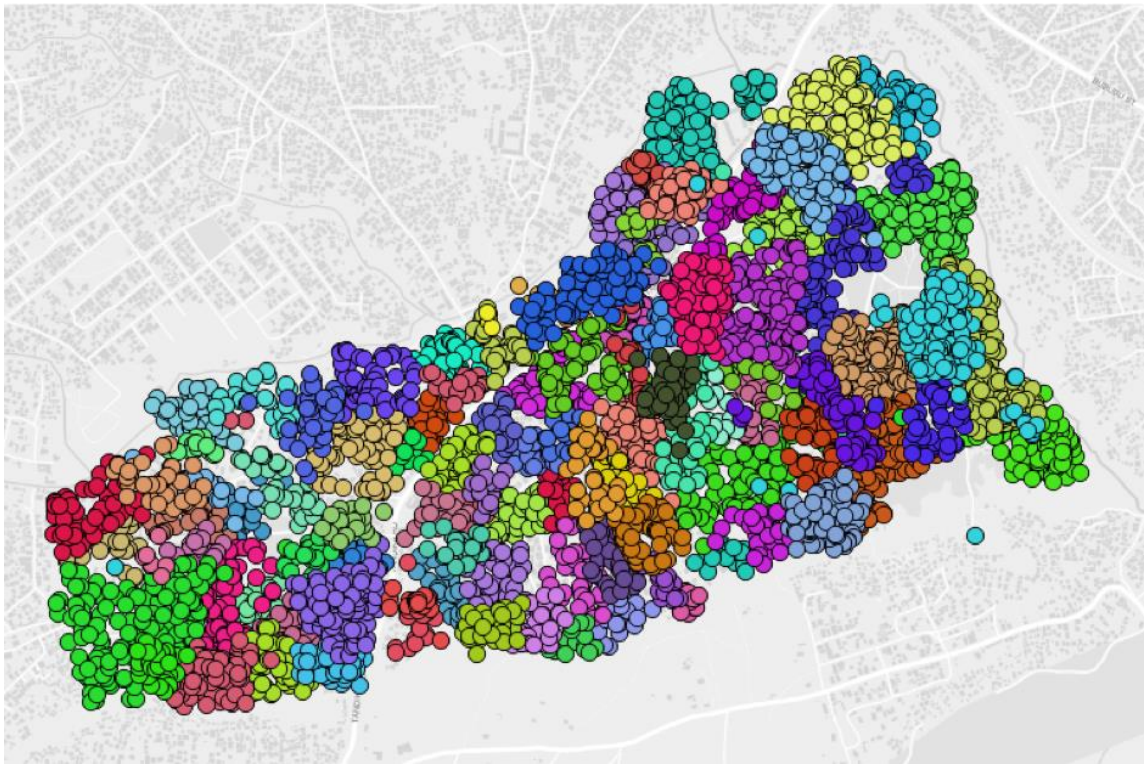
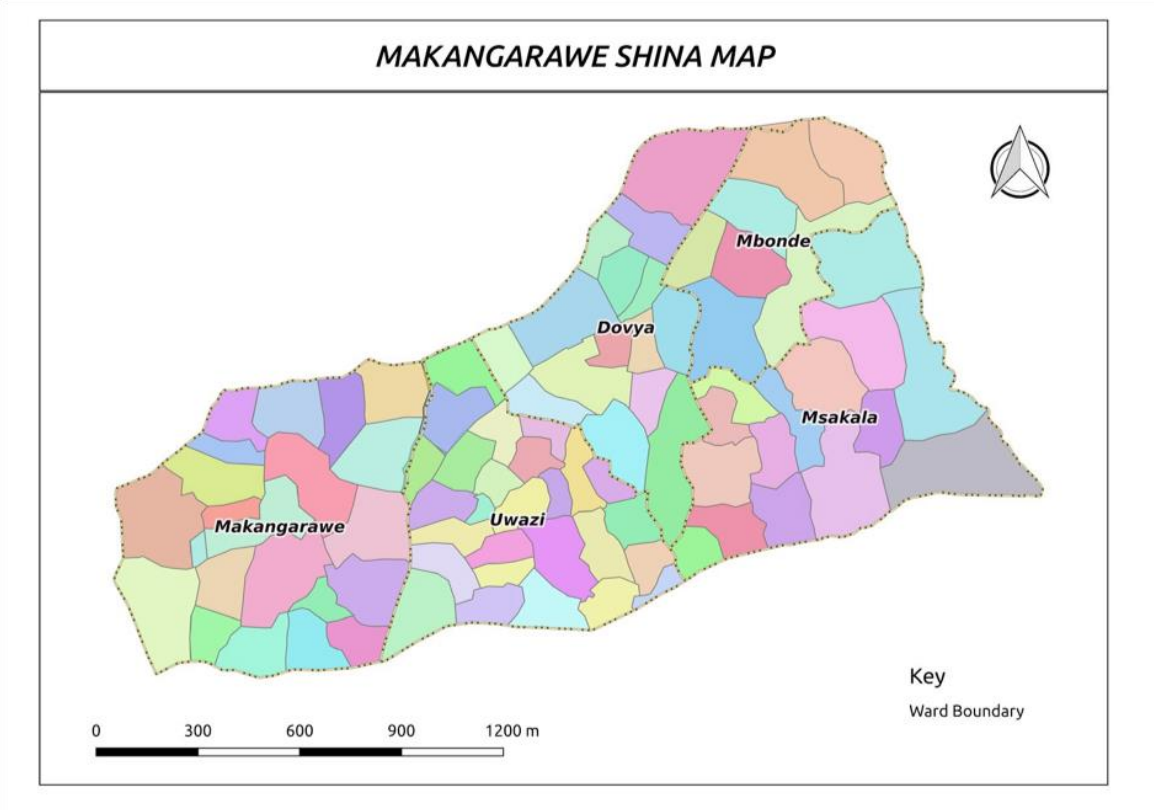


Figure 39: Processed data with Shina boundaries in Makangarawe ward, Dar es Salaam, Tanzania. The size and boundary of the specific Shina matters a lot in distribution and allocation of resources and services such as water and sanitation needs (Adinani, 2018a).



While the data processing efforts almost led to these maps never being created, now that they are, they are clearly very useful in being able to highlight some issues of health and to help redraw boundaries of community leadership.

These maps provided by the Data Zetu project are however not readable without good data literacy. Here we might want to also look at the symbology used in the maps. The use of small circles and colours laid over the landscape does not reproduce the characteristics of the concepts being mapped. Rather these maps rely on what are known as arbitrary signs (Schlichtmann, 1985). These signs require a higher level of cartographic literacy in order to read the map. Thus, a better or different choice of symbology could improve the readability of these maps. This would

make them more useful to a wider audience without training, rather than only facing those with cartographic of data skills.

This issue of using arbitrary signs or falling into symbology that is not appropriate for the target audience was also brought to the fore in a conversation with Rupert Allan (2018, interview), Country Manager for Uganda. Allan is someone who also exercised a great deal of influence over how HOT worked in Tanzania. In mapping the informal refugee camps in Uganda – another HOT project – water-points were marked with a picture of a rather British looking tap. These bore no resemblance to the water pipes and hand pumps within the mapped area. Whilst it might be assumed that everyone knows what a tap looks like, this is really a projection of one type of authoritative worldview which reduces the ability to read a map without being dependent on training. Or a wider understanding of how taps look in different parts of the world.

Ramani Huria

Dar Ramani Huria, Swahili for 'Dar Open Map', is a mapping programme designed to improve the map of Dar es Salaam, and alongside this capture local data on areas of historical flooding (Ramani Huria, 2016). Ramani Huria is the project that is most responsible for the vast increase of data on the OSM map of Dar es Salaam. In the years to 2015 Ramani Huria had worked with 2 million citizens, mapping 29 wards, 1254km of waterways and 3396km of roads, training 450 mappers in using open-source mapping software and established 10 disaster prevention teams (Ramani Huria, 2019; TURP, 2019). The scale of this project is reflected in the materials collected and the amount of time given to its discussion in interviews. These maps, capturing details such as drainage points, water levels and ad-hoc flood shelters are now being used by

local governments to develop community risk reduction plans which will help influence evacuation routes, waste management and future construction.

Figure 40: A map showing flooded areas in Tandale Ward, Dar es Salaam, Tanzania. Mkunduge sub-ward can be seen as completely flooded Ramani Huria (2019).

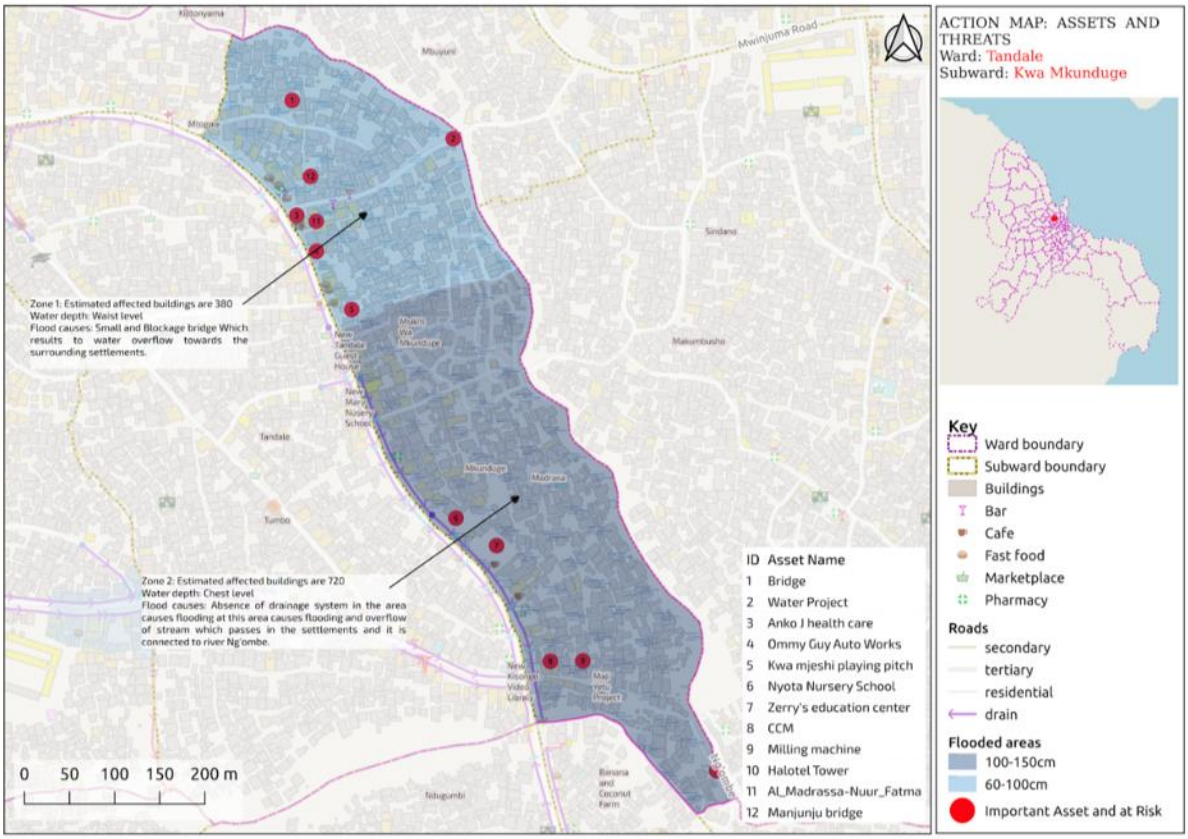
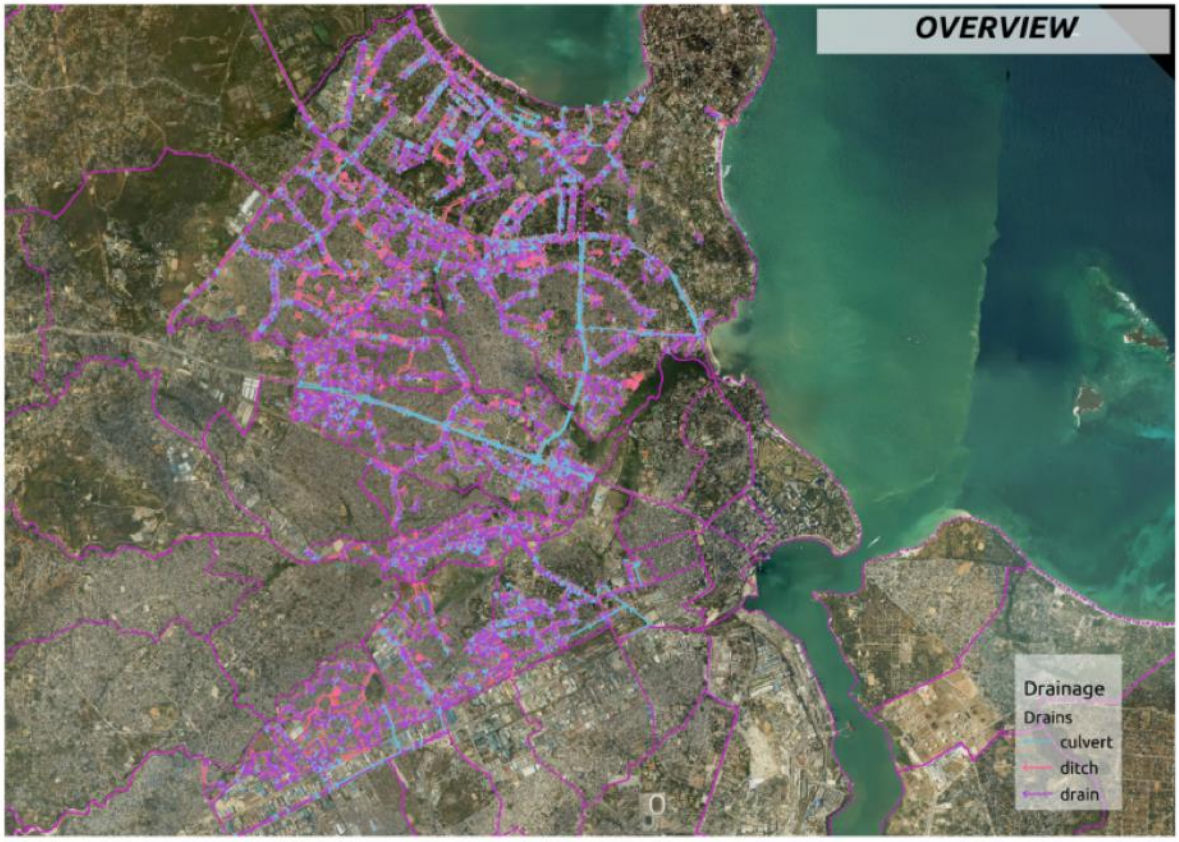


Figure 41: Ramani Huria (2019) QGIS layout of all drainage data available in June 2018 in Dar es Salaam, Tanzania



5.6.3 Distribution, conflicts contradictions

As the last few sections of this thesis have contented, HOT has made a huge impact on the mapping of Dar es Salaam. Navigation is now considerably easier, with a significant increase in road mapping. Much of the city is indeed, now 'on the map'. Buildings too, are more easily identified and this has led to a growth in companies, such as Taxify and Uber. The two projects have also produced a range of high-quality maps, that demonstrate the upskilling of the community mappers and the GIS staff at HOT and their partners. These maps are also clearly of great use for showing community concerns and exploring the issues around flooding and disaster management. For all of this, HOT should indeed be commended.

It is important though that, as researchers, we do not get pulled into the maps too much ourselves. The authority that is given to data through its mapping is alluring indeed. Furthermore, it is essential to reflect upon these maps, as stated above,

remembering that there is always a tension between good intentions and good maps (Kennedy *et al*., 2016). Very different images can be produced, depending on how the data is seen or processed. These differences maybe created because of overt political ends, because of misunderstanding or because of the constraints due to cartographic conventions (*ibid*.; Edney, 2019). To whom and when such maps are distributed is also key.

HOT Executive Director, Tyler Radford (2019), champions the way in which HOT shares its data through the Humanitarian Data Exchange (HDX) – a database of humanitarian data organized by UN-OCHA, and which has seen HOT's data downloaded more than 38,000 times[39]. This is where the donors get their data too. While HOT does not directly make maps for the donor organisations – rather sharing with them the same maps that everyone else gets – HOT makes efforts to ensure donors have ready access to the data they have collected from the community. Vast amounts of 'locally' sourced data is provided by HOT through HDX, often as part of the reciprocal nature of donations (though not necessarily a contractual obligation). This data is given authority through accompany reports on how it was collected and the continuing narrative of participation. The readily available data may serve a wide range of uses for other NGOs and organisation, although it is unclear the extent to which this data has been used in other projects.

In the field, it is a different story. Poor internet and data infrastructure means that whilst the HOT executive celebrates how much data they have provided to donors, on the ground simple "printed maps of A1 size [are provided] to the ward offices and sub-ward offices" (Maholi, 2018, interview). And while the officials have

[39] At the time of writing.

been “very, very happy with those because, somehow, it has always helped them to solve some of the cases beyond flood resilience” (Maholi, 2018, interview), this highlights a significant difference between open data, maps, and the action taken. The mismatch, as Hunt (2018, interview) puts it, is that “yes, everything is public and data is accessible online, just like these people are not online. Yeah, let’s print out maps, take them out to the towns people, give them access”. This is salient as at the time of this interview internet penetration rates in Tanzania were just 43% (TCRA, 2021), with 95% of those accessing the internet doing so via a smartphone (TCRA, 2022) – not always an appropriate way to access the large form maps produced by HOT, and without a dedicated OSM app for either Android or Apple.

This is not to suggest a failing on the part of HOT per se, indeed, as Innocent (Maholi, 2018, interview) went on to say, the Ward Officers find the print maps very useful, reporting that “the maps have always helped me in trying to figure out where the most affected places are and sometimes, you have new people coming in my ward, and they want pieces of land, so this is very easy for me to recommend to them, ‘Hey Just don't go there” (Maholi, 2018, interview).

Efforts are being made to ease the distribution of the digital maps and to provide access through training for those who HOT presents maps to. Innocent (Maholi, 2018, interview) while acknowledging that “it’s very hard sometimes to just embrace a new technology if you’re used to another system of the data and all that”, also discussed how they

> “are trying to push, as much as we can. And mostly, I think sometimes, not only sometimes, because sometimes I get calls from government officials like, “Hey, I just need that kind of information, do you have it?” “Yes, we have it.” And we give them training, on how they could go, and download the data by themselves. Not only, they can go through us, because the data

> is out there, we have tools that they can access easily, they just need to open accounts and all that, and from there they can just download the data and use the data by themselves".

Even where data is presented in a helpful way or training is provided in order to better access it, there is a tension between HOT and local leaders, many of whom, when presented with the data, state that they do not agree with it. As Sara Amadi (2018, interview) puts it, "they're the local leaders and if you, kind of show, highlight the fact, that they are not doing their jobs by direction of what the data says, you've kind of, faced some confrontation". This suggests that local leaders are not significant stakeholders, in any of the stages of the projects run by HOT. Asha Mastapha (2018, interview) recalls that "sometimes you might find leaders themselves, they don't want to work with you until you pay them. Because of the nature of the country itself, most local leaders, they're not being paid by the government. So, when they see something like this, they feel like it's an opportunity".

Data of course is only useful, if it is being used and is usable (Kleine *et al*., 2014). Indeed, there is much consideration that needs to be given to who has access to this data and its visualisations (Graham, 2017). While Innocent (Maholi, 2018, interview) has noted that it was important to provide paper maps to communities, this does not allow them to fully engage with their own data. Instead, the community is provided with a mediated version of their reality. While this might be a perfectly good representation, it is clear, from the interviews, that many different influencers are questioning those outputs, and that these outputs are more closely related to the desires of HOT's team than to those of the local community. While codified knowledge may travel more easily around the world, with projects such as Humanitarian Data Exchange (HDX), making HOT's data more accessible, it is clear, that this data is in the shape desired by HOT and not that desired by the local community. As Mapping

Supervisor Amedeus Raphael Kimaro (2018, interview) reminded us, the process of compiling the data also involves

> "*collecting data from the site and then the data is cleaned. And then after data cleaning, okay, we have already have the data now. Manipulating that data, okay, we need maybe some maps, maybe to show something that you have data, and then that process of changing that data and representing it in maps*".

This may well also lead to some of the challenges that HOT faces in terms of getting the government to use their data;

> "*In terms of using the data we've been trying to push the use of the data, the use of OpenStreetMap data for decision making within the government officials. So, there is still a debate there, of which, if I remember correctly, one of the senior people in the Ministry of Land was saying, this is citizen generated data. And somehow, it's not official data, but it can be used to serve the purpose. Like, if you have a project somewhere, that involves the citizen generated data, this is where you can bring the data that we collected, and it can be used. But the challenge or the discussion, the biggest discussion is, we want to push to make sure that the data could be first recognized as kind of official, the government can recommend it to anyone. But the challenge that the government mentioned, "Okay, we know that, this is the data, and it seems like it's good data. But this is not engineering data," those kinds of discussions are really evolving*" (Innocent Maholi, 2018, interview).

On the face of it this all sounds reasonably good, and while there are questions around the use of symbols and who is able to access the maps, there is some important work happening here. However, the question of how involved the local population is persists. And this also relates to the Tanzanian staff within HOT itself. In discussions about the output from these projects and whether HOT produces different outputs for different groups, Kimaro (2018, interview) stated "They g*et al*l the same". When pressed further with the question 'they all get exactly the same data, the same

maps? Everything is the same?', the reply came "Yes". While it is clear to see from the maps above that there are different outputs for different projects, this does not always come across to those who have been working on the projects or who might be using the maps. This perhaps relates to a level of mapping literacy, where the arbitrary signs lead to all maps appearing the same. As Edney (2019) notes, even maps that are directed towards local consumers, perhaps imbued with local flavour, still follow the same western normative discourse. North is at the top, buildings shown by their footprint, roads by official names, etc. This is not always reflective of how a community sees their own space, as will be seen later. Indeed, the process of mapping to this *Ideal* is one that is inherently political, and inherently aligned with a western perspective of development (Kennedy *et al*., 2016). The process of mapping Dar es Salaam through the OpenStreetMap platform was a process of codifying knowledge into predefined 'objective', 'scientific' categories rather than drawing out new concepts or knowledge (Quijano, 2007; Edney, 2019). However, it would be expected that those who have been working with HOT, as a paid member of staff, would be more aware of the outputs and the specific readings of each map. This further internal confusion about what HOT was doing in Dar es Salaam, and what the organisation was producing as outputs, leads to questions of what is HOT and what purpose was it serving in Tanzania in 2018.

5.7 A portrait of HOT in 2018

As noted in the previous sections, a great many complications are leading to HOT's projects failing to meet their intended goals of participation, inclusion, and the ability to fully provide what the community requires. Some of the causes of these issues have already been alluded to. However, charting a better path for the future of the Humanitarian OpenStreetMap Team and other similar projects and organisations requires a deeper examination of these issues and their causes.

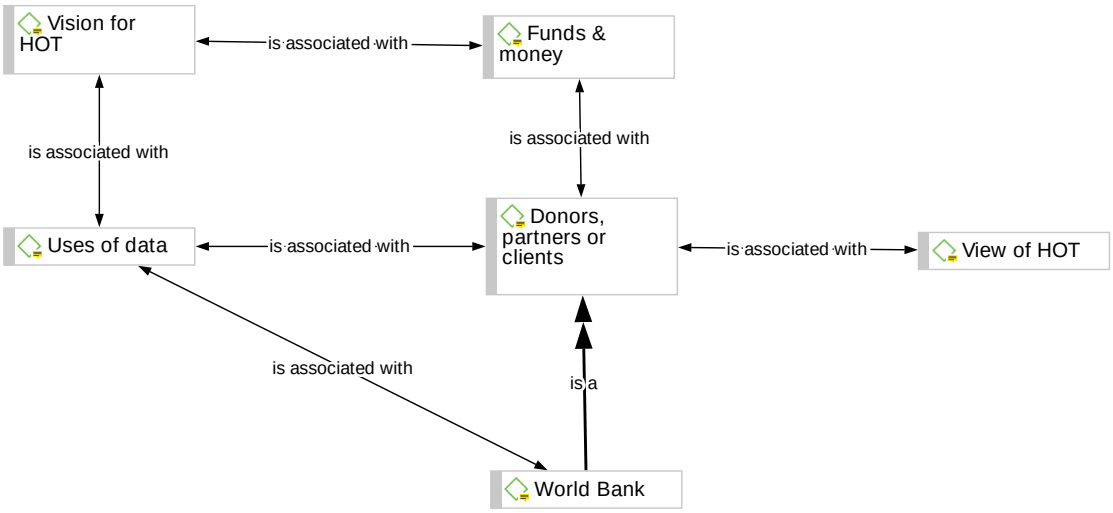
5.7.1 A vision for, and a view of HOT?

The first two areas one can address are the *vision for* HOT — what people and documentation claim HOT is aiming to achieve — and the *view of* HOT, the opinions of interviewees on the subject of what they believe HOT is and how well it performs. To preface this area of analysis, it is worth noting that each person interviewed had a different understanding of HOT's identity and goals. The organisation was described as a "development organisation," a "humanitarian organisation," a "tech company," a "mapping company," an "offshoot of OSM," a "social enterprise," and a "business," among other descriptions. These different ways of expressing HOT's work were concerning to some, but others saw it as a strength.

Bringing together the codes used in ATLAS.ti, a flow chart was developed that represents how people interpreted the vision for HOT (Figure 42). Out of the 35 codes available, when talking about what HOT should aim to achieve, most discussions revolved around funding and donors. Although "uses of data" was also featured as a code for this analysis, a deeper look at the interview quotes shows it is possible that comments related to the vision for HOT and "uses of data" are also strongly associated with donors, clients outside of Dar es Salaam, and funding. When asked about the use

of data, the Tanzanian respondents frequently suggested that that the data was for other organisations or government bodies rather than for HOT or the community themselves. “If [the] government needs a certain data [set], you can give them [this],” noted Amedeus Raphael Kimaro, a mapping supervisor at Ardhi University (2018, interview). Asha Mastapha, the project manager for Data Zetu (2018, interview), suggested something similar when asked about who HOT was making the maps for. “It depends on the project,” she stated, but when she was pressed for more, she added, “For example, [the] Ramani Huria project. For example, what we’re doing right now — there’s another partner called Deltares[40] who [is] doing some planning and interventions to flood areas. Actually, they’re the ones who say what kind of data they need.”

Figure 42: A flow chart was developed from coding interviews and documents in ATLAS.ti that represents how interviewees interpreted the vision for HOT.



[40] Deltares is a Dutch independent institute for applied research in the field of water and subsurface.

A former employee of HOT also noted that there were some concerns within the local staffing community that the way in which collected data was to be used wasn't always explained. "All that [HOT] could tell them was, 'We are collecting it for this reason, and the World Bank intend to use it for this resilience planning and finding better ways to stop your house [from] being flooded.'" (Amelia Hunt, former communications specialist for HOT Tanzania, 2018, interview). It was the donors who most frequently referred to 'uses of data' in relation to the local community. Caroline Margaux Gevaert, a consultant to the World Bank (2018, interview), noted that 2 years after HOT first made maps of a ward in Dar es Salaam, the maps were still on a wall in the ward leader's office. "The people were using the maps but using the maps in a way that was completely unexpected," Gevaert said. "So, it was really that they were saying, for example, [that] somebody's going to move into the area [and] see that [. . .] the house or the plot already has a road, so they're like, 'Oh, OK. You know, I can come here because there's already a road.'"

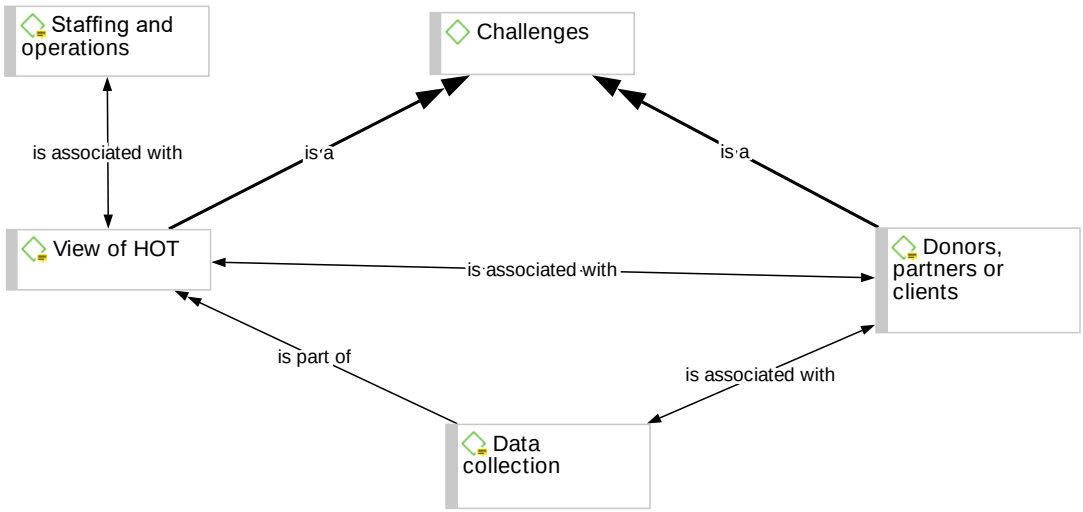
It is clear from Figure 42 that the vision for HOT is influenced by the donors and external recipients of their data. Staff had reservations about this idea. For example, Rachel VanNice, Senior Global Operations Manager of HOT, challenged the prevailing literature on the influence of donors while also highlighting the complex relationship and power dynamics:

> *I would say that I want to see the literature because I would question it, because truly it's about alignment. We have a giant multinational law firm that's invested in our work, because the, I think, pessimistic view would be they want to put a pretty face on something or [are] working with other kind of large organisations that may have a negative rap around data security and things like that. But then there [are] areas where there's a lot of potential for a collaboration where our purposes align [. . .]. Foundations have a mission, just as large corporations do — and visions and things like that — and they see your work, when they give you a grant, as fulfilling their mission, which is why they want all*

> *the irritating reports back and things like that and the thing[s] that arguably [take] away some of your time and [those things that] there's a big kind of pushback [against]. Also, I think one of the major kind[s] of focuses now is on assessing: How good is the donor themselves? We're like, "OK. Money is great and grand, but are you making us do more for that? And are you lessening our ability to do our work by giving us that money?"* (VanNice, 2018, interview)

Examining HOT's own literature and reports suggest a different story, one in which the data is directly available for the use of the community and donors are rarely mentioned. For example, in the literature surround the Data Zetu project it is stated that "the HOT Tanzania team are collecting health data in Dar es Salaam and Mbeya region[s] to improve public health services" (HOT, 2020b). A sentiment that is echoed by those undertaking more remote mapping of the city through mapathons; "through these projects HOT aims to use OpenStreetMap to create sophisticated and highly accurate maps of Dar Es Salaam to support the local community" (Penson, 2018, interview). These kinds of quotes and statements align much more closely with the vision for HOT. What is perhaps of note here, though, is the lack of Tanzanian voices within the vision for HOT (Figure 42). Despite all interviewees being asked a similar set of questions, nothing from the Tanzanian staff was coded as being about the vision for HOT. This suggests that they did not feel that they were part of that conversation, to the extent that they either did not see themselves as contributing to the future vision, or if they did, they did not feel it appropriate to voice these thoughts.

Figure 43. A flow chart of the view of HOT was developed from coding interviews and documents in ATLAS.ti.



In Figure 43, we see that data collection is not just associated with the view of HOT but is seen as a part of this view. Although it is still associated with donors and clients, the view of HOT is more aligned with challenges, data collection, and staffing than with donors. This would imply that the view of HOT (relating to how HOT is seen at present) is still about looking back to where it came from — the early life of HOT, which was driven by pure data collection to be used to improve maps. The vision for HOT (relating to hopes and aspirations for the future of HOT) is being driven by outside influences. This is seen in the very central position of challenges that sit between the view of HOT and its donors. Here the question of what HOT *is* and where it should be heading was more fraught. Country Manager Ivan Gayton was clear about how he saw HOT:

> *There's a faction of people who really resist . . . becoming a sort of official corporate entity. It is an incorporated company [...] It's a charitable corporation in the United States. There are people who see that as selling out the principles of community activism and organisation, accepting money and resources from the American government. Nobody, least of all me, fools ourselves [into thinking] that the American government gives money away for purely altruistic*

> *reasons, and there are people who feel that accepting the penny from the United States government means that you are purely an instrument of the United States soft power, and certainly HOT gets a lot of money and support from the US government* (Gayton, 2018, interview).

These sentiments seem to be at odds with those of the operations manager, VanNice, mentioned above. The different directions that HOT is being pulled in are also highlighted by Community and Partnerships Manager Rebecca Firth (2018, interview): "I think it's a bit of a continuum between organisation and community. So, a lot of people talk about that in one breath, like HOT is one thing. Like, personally that doesn't really make sense to me." Sara Amadi (2018, interview), the associate project manager for Data Zetu, sees HOT as more of an "activating agency, [and] that their whole premise is around humanitarian data." This view is one in which HOT provides the catalyst, start-up money, and resources for new projects, using their international connections to activate projects and people to the cause. This lack of consensus around what HOT is and should be makes the organization susceptible to others influencing their work and direction. Regardless of whether this influence is good or bad, the space for influence is rarely acknowledged by the HOT team, who thrive on an image of independence.

5.7.2 The influence of donors

Placing *donors*, *partners*, and *clients* directly at the centre of the analysis reveals more of the wider relationships and influences affecting the work of HOT in Dar es Salaam. Donors, partners, and clients are associated with funding and money, as well as uses of data. And here we also see that once again they are highlighted as a significant challenge. This would be expected, given the literature on the influence of donors, partners, and clients, which suggests that because projects are often rigidly

tied to the agendas of the donors who are funding them, they can become tokenistic (Mohan, 2002; Mosse, 2001).

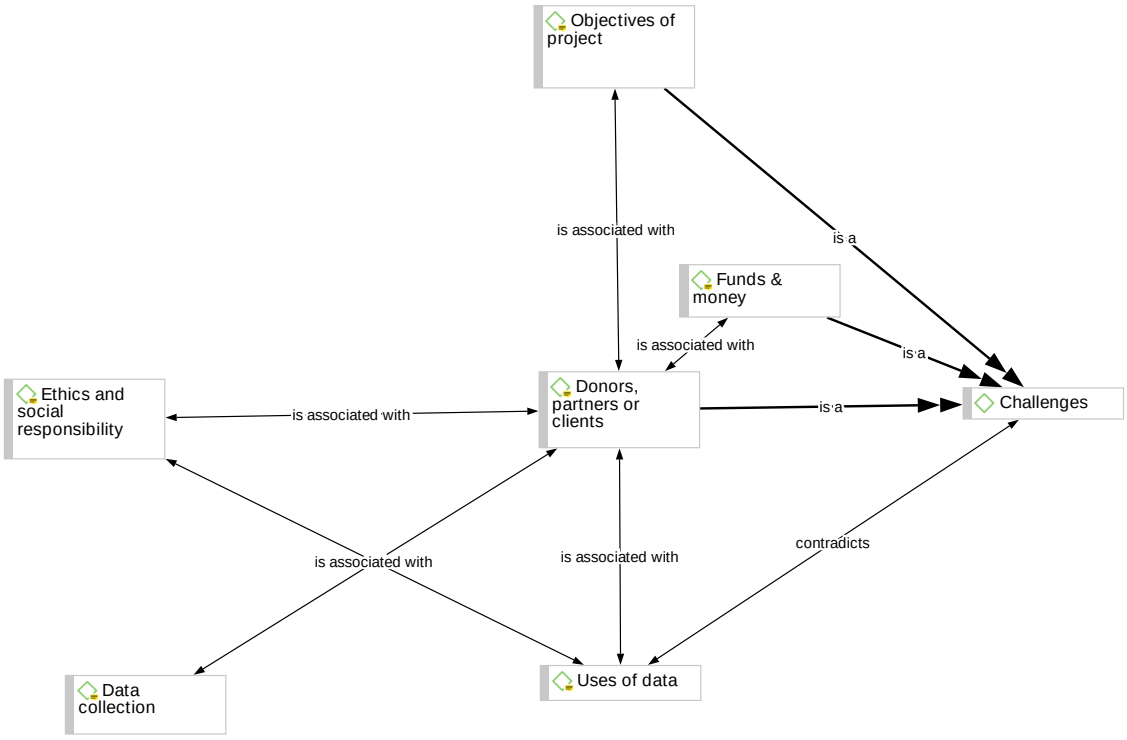
Furthermore, practitioners are often unable to remove their own biases or disconnect themselves from the demands of their donors (Balit, 2012; Chambers, 1998). There is also an association with the objectives of specific projects, which is expected, given the noted influence above and the literature. This influence was highlighted in the way in which Innocent Maholi, Deputy Country Manager at HOT Tanzania (2018, interview), introduced the Ramani Huria project:

> "We were working on a project called Ramani Huria, which means "free maps." And the project aim — first, it's a World Bank and DfID[41] funded project, and the aim is to map the unmapped places of Dar es Salaam that are very, very affected by floods so that the maps can be used for decision-making within the government agencies and other interested NGOs and other stakeholders."

Although the goal of evoking the World Bank might have been to add authority to the project, this introduction clarifies who Maholi feels is overseeing the project and for whom the project is being produced.

[41] Department for International Development

Figure 43. A flow chart of donor/funding and community (partners) was developed from coding interviews and documents in ATLAS.ti.



The unclear nature of these relationships is also associated with themes of ethics and social responsibility of the projects. If it is unclear who the project is for — the community or the donor — then ethics begin to be blurred. HOT Mapping Supervisor Tonny John Kanyenye (2018, interview) reported that "in rural areas maybe there's — it's usual, for many people don't understand what we're doing. If I say I'm doing this for this, they don't understand me. They expect that the actions, the little actions, that [it's] what they want." He went on to discuss how people needed convincing to take part in projects, and although he discussed the importance of convincing through "friends, people [with whom] you're close. Convince [inaudible 00:07:59] because I know the project also — there're goals of the project. The object of the project, it is easier to convince the person." He noted that having good-quality data and showing people that one knows what he or she is doing means they are more

likely to engage. Following this, he said they also might engage, "Because we are giving them the stipends[42]." This was not a topic he was keen to continuing discussing.

Speaking under anonymity, another HOT staff member (2018, interview) was more open about the way in which financial incentives are used. "To get anywhere and to do anything, you need money. A 'posho' — the money you would have earned if you were not working on the HOT project (meetings, mapping, etc.) [It] translates as a Sitting Fee." Although paying people for their time working for this project is seen by many as appropriate, this staff member was adamant that the "posho means people are sometimes coming for the wrong reasons" and that "it is often possible to tell who is coming for money and who is more genuine." The interviewee went on to say that "this is like paying money for ideas" and suggested that these methods had "poisoned the well here since the 2000s" by diluting any meaningful participation. When pressed on how this works with the donors, the interviewee stated that "donors have to accept that this is what is happening."

Although there are successes and failures in these relationships, there is one glaringly disconnected part of this network, that of *inclusion*. HOT puts inclusion at the fore of its mission on its website (HOT, 2020b), but it is less clear that this is part of the everyday experience of working for or with HOT. The notion of *inclusiveness* was hardly mentioned in further documentation or interviews. Where it was discussed, it was around questions of how can HOT be more inclusive. "Let's write Twitter posts in Swahili. Let's write blogs in Swahili. And they're not going to be edited to depth by [the communications team]" was how staff member Amelia Hunt (2018, Interview) described their efforts discussing inclusion of local voice.

[42] A small amount of money, primarily to cover expenses, known locally as a posho.

There is also concern about gender imbalances in the mapping teams. Rachel VanNice (2018, interview) noted that "what's good about the open community is that's called out," but conceded that "that doesn't necessarily lead to a productive discussion either, because these are people from one set of perspectives. And that's the thing — the global community is still whoever shows up and their individual perspectives."

What was clear from an observational perspective is that not all voices were presented equally, and HOT appeared to be far from the horizontal, inclusive environment that it attempted to portray. Following the suggestions in the literature that there are often genuine inabilities to see the community as partners or leaders in the project (Platteau and Abraham, 2002), the HOT summit, a platform for equal discussion of the projects and organisation, was as noted above, dominated by the white, non-Tanzanian members. They sat in the front row, took the stage, and chose who could speak and when — regularly excluding the voices of Tanzanians through their actions (See Figure 14).

5.7.3 Staffing, operations, and communication

In terms of *staffing* and *operations*, although there were those who found things to be problematic, on the whole responses were positive. Iddy Chazua (2018, interview), a digitizer and mapping supervisor at HOT, says

> "*We are doing like a team, but I'm the one who was mainly dealing with those trainings, so in case of any trainings, I was the one who was going and giving the training* — [and] *maybe other people from the team that* [were] *helping me*."

HOT Executive Director Tyler Radford (2018, interview) also supports this view, stating that;

> "*Ivan's* [country manager, Tanzania] *team and Innocent's* [deputy country manager, Tanzania] *team have done a really good job, but also* [at training] *community members who are often underemployed and just hanging around, waiting for something to do. Well, they've trained them to use their own phones and go out and survey their neighbours. It's not just HOT staff or HOT interns or HOT students asking about flood* [things 00:05:13]. *It's [a] neighbour asking another neighbour about flooding."*

These issues of neo-coloniality are not only seen in the way in which mapping tools are selected and used without much questioning but also in the structures of the organisation and the ways in which respondents spoke in interviews. As was discussed briefly in the analysis of the interviews, HOT's makeup is divided along ethic and national lines. The management of the organisation, both at the international and national level, is predominantly white and from outside of Tanzania. Digitizers and GIS teams comprise more Tanzanians, although they are generally closely monitored by senior staff. Additionally, those collecting data in the field, who are without access to basic employment rights and safety nets, are all Tanzanians reporting to other Tanzanian staff members. This is no accident. The structures are built this way because of biases and paradigms that suggest only Western staff members can be rational, reliable, and capable of making decisions (Quijano, 2007). Names have been removed from this section, but in interviews, the Tanzanian staff were often spoken about as being needing to be closely managed, with timestamping being added to their data collection to ensure they did not take additional time out from the data collection process. Although HOT sees itself as a network of people working together for the same ends, the protocols through which this work happens are strict, involving hierarches of control and power (See Jordan, 2015).

These hierarches are perhaps seen as a necessary part of running a business, and HOT still has a bottom line to look after. However, these structures are not working to avoid slow responses or poor-quality work at the executive level. The white outsiders who are in positions of management are equally criticized for a slapdash approach to filing reports. As one interviewee put it;

> "*One of those requirements was doing reporting, which again had been neglected for however long and would turn up as a Word document. [I would have to say], you actually need to tick the very few boxes we've given you. Can you actually give us a report and give us something to advertise back to [the donors]?*'" (Anonymous, 2018, interview).

If the company structure is not to improve the systems, then the maintaining of privileged positions within the organisation by these staff members is nothing more than a maintaining of colonial privilege. Although some senior staff members were vocal about how much Tanzanians gain from working with HOT (Amadi, 2018; Gayton 2018; Allan, 2018, interviews), others on the condition of anonymity, said that the Tanzanian staff members are too afraid to speak out; "They're scared of complaining" (Anonymous, interview, 2020).

HOT, however, is very keen to push the image of undertaking Tanzanian-led work in Dar es Salaam. Although no specific visual content analysis was completed for this work, a quick look at the project websites for Data Zetu and Ramani Huria, as well as reports that come from the projects, show plenty of images of Tanzanians working in the field, mapping, collecting data, etc (see Figure 44, 45, or 46 for example).

Figure 44: Example of Data Zetu project page on the HOT website.

A closer look reveals that the HOT staff members who are leading these projects remain white and outsiders. However, images of these staff members are all but eradicated from the website and documentation. This might be seen as an accidental occurrence or even as a reflection of the level of engagement of Tanzanians, but interviews reveal that this is perhaps more a case of "brown-washing" (Daus-Magbual, 2016). Under the condition of anonymity, one interviewee revealed that many of the posts and articles about HOT that claim to have been written by Tanzanians were, in fact, written by white communications staff members and then attributed to Tanzanians who were not trusted to write articles themselves about the projects they were involved with. In discussing one such article, the source stated, "I'm just a bit pissed off about this particular piece, because I actually wrote it but had to publish under [name redacted], as they wanted a local." The source went on to say that "like every blog I wrote . . . they needed it to come from a 'local perspective,' for donor purposes" (Anonymous, 2020, interview). Even when Tanzanians were involved in the writing of reports, these were edited and changed by staff from outside

Tanzania: “[She] dealt with the more localized stuff, so she did a lot of the content-gathering and then often about draft blogs. I would then review them because we were writing for the World Bank. It needed to be in quite precise English” (Anonymous, 2018, interview).

Figure 45: This photograph is an example of one of the images used to illustrate an article about the work of HOT.

Figure 46: Further images from HOT documentation

This leaves HOT in a difficult position despite its best intentions, assuming that these are genuine intentions — and there is no reason to suspect they are not. They appear to have become embroiled in neo-colonial development tendencies. This has occurred through their selection of technology, the implementation of that

technology, the hierarches of the organisation, and the decisions made, all of which resulted in Tanzanian participation often being a low-level role that involves the giving of data rather than using it. These issues then are compounded by attempts to ensure it does not look like this to outsiders, brown-washing articles and reports, perhaps to keep donors happy or perhaps to fool themselves into feeling that the Tanzanian community is more involved.

Furthermore, HOT may have slipped into a kind of "data fundamentalism," in which the pursuit of data has become fetishized beyond everything else (Crawford, 2013). This is evident in the notion that the data will help and in the ideas that (1) technology brings everyone to the table in an equal way to pursue hegemony through technological mastery (Feenberg, 1991) and that (2) knowledge is property, to be collected and extracted, sorted and refined on behalf of those who own it. The colonial imagery here is no accident (Quijano, 2007; Couldry and Mejias, 2019).

This is a damning indictment on which to finish this section. It is clear, though, that there are some fundamental issues that are not being addressed or perhaps even considered. The potential damage here, though, might be lessened if the population themselves is happy with the results of HOT's work, that the benefits of the tasks outweigh the problems of neo-colonialism — although, this argument runs dangerously close to the "what about the railways?" argument trotted out by apologists of the British Empire.

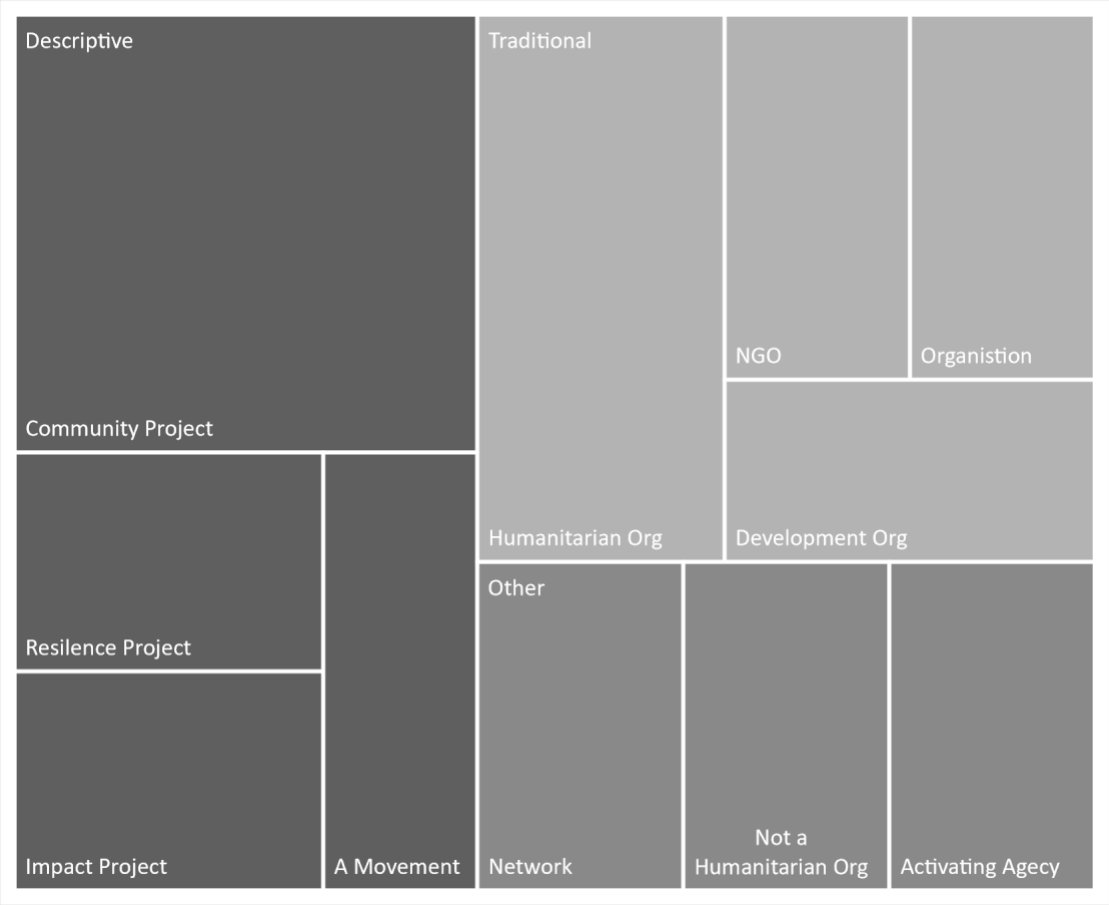
5.7.4 HOT and it's contradictions – Power, coloniality and participation.

What has emerged from this research thus far is that the Humanitarian OpenStreetMap Team (HOT) has achieved some amazing things, including being able to improve the quality of the OSM maps of Dar es Salaam, mobilizing nine projects

consisting of 204 mapping campaigns, training more than 1,000 people, collecting huge amounts of data, and building a network of more than 120,000 people around the world. They have fed this into resilience on flooding, health, and waste collection. They may have also done this through exploitative processes in which the local community is paid less, or nothing, for their time and data, in which foreign staff run projects where donors have more influence than anyone would dare admit. They are experimenting with new technology, regardless of its appropriateness, and may have lost their goals of being an inclusive and locally led organisation. Of course, mapping alone cannot create empowerment, especially if it becomes divorced from its socio-political context (Sieber, 2006). HOT emerged at a time when digital humanitarianism was becoming mainstream but also at a time when there was an increased move towards privatization of public sphere roles and responsibilities, and it is within this context that organisations like HOT became incorporated within humanitarian and development work (Burns, 2019). There is little doubt from the discussion and analysis above that there is much confusion, both inside and outside of HOT, about what they want to be, and this section will draw out those ideas before the final part of this chapter attempts to answer the overriding research question.

At times during the research, it was humorously implied that if you asked people what HOT was, you would get as many different answers as you asked people. But in fact, this banter turned out to be true — barely two people gave the same answer as to what HOT is and does, and although there might have been some overlap in terminology, the expressions of these terms differed wildly. Figure 47 demonstrates just how broad the spectrum of what the interviewees of this research thought of HOT.

Figure 47: A chart was developed that shows how interviewees described HOT when asked, “How would you describe HOT?” during interviews in Dar es Salaam, 2018.



Although Community Project (n=3) comes out as the most repeated description, it is hardly an overwhelming narrative. The second most popular was Humanitarian Organisation (n=2), but this though is countered by one definition of “not humanitarian”: “‘Humanitarian’ is wrong […] I don’t have any alternative for it, but humanitarian is wrong […] We’re not doing humanitarian work” (Hunt, 2018, interview). This is a view that is taken by many people. Ivan Gayton, the country manager, was keen to point out that this could not be humanitarian work, as it was not frontline enough, not Syria or somewhere. He had his own insights as to what HOT is and does, and these are worth looking at in full as he takes us through what he sees are the different visions for HOT:

So, what it is, is it's a vehicle to accomplish that goal of ensuring that everyone on the planet is mapped, is acknowledged, has rights, is undeniably present and undeniably a member of the kingdom of ends. So, that is an instrument that I see as being able to use to accomplish that goal. And how do I use that instrument? Well, it gets money from donors and we like new stuff. There's another HOT that is in some other people's minds — that is [that it's] a fun tech project that throws mapathons and puts them on OpenStreetMap. There's another HOT that is seen by some disgruntled former members. They call it HOT US Inc. That [HOT] is an extension of American soft power. There is another HOT that is in the minds of some of my colleagues here that it is an implementation agency working in a hospital to improve the collection of patient data so that we can actually save lives. So, broadly speaking if I step away from the abstract philosophy, HOT does four things. It builds tools, so like the tasking manager that we now maintain and all the [expletive] around that, Open Map Kit and all these things. It does digitization, those mapathons and those activations and digital volunteers, trace buildings — and that's the very sort of like grown out of the OSM movement sort of digital volunteering organization, or association really, it's not even organisation if you go to that level. It does field data collection, so that's a large part of what happens here. And fourthly, and this is the one that I'm mostly kind of trying to develop here, it's an [inaudible 00:36:43] agency that finds people that are having an impact, saving life, alleviating suffering, [and] restoring dignity, and [it] actually proactively goes to them saying, "We can help you do your job better. We can help you have more impact." We don't fool ourselves, [it's] just sort of [the] corner of HOT that [says], "I'm out to save lives directly," but if you find somebody who's doing something useful — and broadly speaking — you don't ask them if they are, you ask the community, "Is he useful?" (Gayton, 2018, interview)

Numerous versions of HOT are given here, and what is perhaps most interesting is that at the start of this, HOT is seen primarily as a mapping organisation, but by the end of the quote Gayton is looking more towards the descriptions of resilience, impact, and community. These latter views mirror those that were more prevalent among the local Tanzanian teams. Kimaro sees HOT very much as a resilience project,

> *because the data that we are collecting [on] them, OK, they can be used for development but most of all targets — target on resilience, [making] sure that community know their issues, problems, [and] know where are the problems in their societies. [We can use the data to] map them and make sure that they know even if something happen[s] [to] them, they can help themselves. We are not mapping for World Bank, [and] we are not mapping for government. We are mapping for community. Actually, we teach them how to map and use the tools to map* (Kimaro, 2018, interview).

Similarly, Associate Project Manager (Data Zetu) Asha Mastapha saw the work of HOT as being more about impact, "because the changes — such as, if this project works — the changes that we'll make on the ground . . . will last more than years. People are going to hear about it […] For example, [in the] Ramani Huria Project, if the river is going to be clean, [it] means the flood will be history in Dar es Salaam, so that's impact" (Mastapha, 2018, interview). It was also one local staff member, GIS expert Iddy Chazua, who felt that it was a humanitarian organization: "Yeah. [It's a] humanitarian organisation but [it's] using maps in the humanitarian cases" (Chazua, 2018, interview).

Staff from outside Tanzania saw things a little differently. Executive Director Tyler Radford sees HOT as a "weird hybrid of this global network" (Radford, 2018, interview). For Sara Amadi, Associate Project Manager (Data Zetu), this also rings true: "for me, HOT kind of acts as like this activating agency, [in] that their whole premise is around humanitarian data." She went on to say:

> *I think in a lot of ways, depending [on] the years that have gone by and the diversity in the projects that HOT has taken on across all the different country offices, what we are, as HOT kind of changes, is different in different contexts. So, the Tanzania office has obviously [a] different context from Indonesia. But what I always pictured as HOT being, even before I started working with HOT, [is that] it's kind of like an*

> *activation agency that exists as a bridge between a local community in either an under-resourced or underdeveloped community — whether that's in a developing context or even just in the West somewhere, in New Orleans, for example. Acting as a bridge between those communities who may be in a vulnerable situation where, say, there's a disaster, they act as a bridge to the international community, specifically aid and response units. They are able to help that vulnerable community when the local services are overwhelmed by the disaster in place*" (Amadi, 2018, interview).

This description, along with Gayton's, hints towards the multifaceted nature of HOT, what Duffer (2018, interview) described as "controlled chaos." He saw HOT as having just three roles: "Disaster services, that's what we started doing. Then we went into Haiti and did what I call community building or community development [and] the role of building these technology tools."

It quickly becomes apparently that HOT wants to be all things to all people and that the liquid nature of the work, along with the competing visions and ideas for what the organization should be doing, leads to a mismatch in aims, objectives, goals, and outputs. And while HOT might be generating a great deal of success, much of this is fragile and could be toppled with a small change in staffing or funding. The local people see the work as building resilience, but perhaps HOT itself is not all that resilient. As one of HOT's donor organizations put it, "If they really tried to focus a bit more, the learning goals sometimes might be better" (Gevaert, 2018, interview).

The bigger concern for this research, however, is not that a project might happen or not happen, but it is about the processes within the projects. It is within all this confusion about what HOT is trying to achieve that power, westernization, technological determinism, and inequality begin to creep back into the cracks in the organization and the projects. The "get things done" attitude becomes a fertile ground

for closing down reflection and careful processes that deconstruct development binaries and colonial messaging.

While HOT seems to be extremely aware of the potential for their maps to make change within the city of Dar es Salaam, the consequences and power held in these representations (Kidd, 2016) seem to have been lost along the way. HOT has potentially fallen foul of the rhetoric of digital humanitarianism, influenced by Silicon Valley corruption of language that push for endless disruption and increasing efficiency, concepts at odds with democracy and participation (Morozov, 2014). Constant innovation, such as now adding drone-building to the list of activities HOT is involved with in Dar es Salaam — "drones, they're expensive . . . so let's actually replicate that in locally, appropriate fashion" (Gayton, 2018, interview) — is not how problems are solved. Improvisation and constant innovation impose their own costs, including finding employees with increasingly mismatched skills and ensuring reliance on outsiders persists. The local population, no matter how much its members are being upskilled and trained, is constantly chasing innovation, never allowing its members to reach a capacity where they can stand on their own; rather, dependency is built in (Rekha, 2016; Sieber, 2006; Mills, 2018). Such constant goalpost moving and continuous innovation is the opposite of the small-scale interventions that are often needed to solve complex problems in transformative ways (Alford and Head, 2017).

HOT then might have lost its way. The analysis shows a mismatch between the visions and aims of HOT across different stakeholders, and that community is no longer at the heart of their work, even if it is still the most often used term to describe the organisation. The projects in Dar es Salaam have perhaps become overloaded with technology and all the biases baked into their design (Jordan, 2015). Permanent staff, local staff, and volunteers are treated differently and held to different standards and

pay, a huge problem in humanitarian and development work (Sieber, 2006). HOT, like many, has tried to remove the elitism and mystery of mapping for the population of Dar es Salaam, encouraging co-adoption of maps for community benefit (Parker, 2006). But the haphazard approaches borne of the multiple directions in which HOT is being pulled limit the empowerment that could occur from such activities. With much more information being put into the maps than is being retrieved, there are some clear imbalances of flows and pooling of knowledge (O'Hara, 2004). HOT will not be as effective as it could be — in terms of communication, mapping, participation, and breaking down colonial development tropes — until it decides what it wants to be. Is it mapping for commercial or something else? Is it empowerment? Development? Humanitarian? Other? These are no longer practical issues but become issues of theory and philosophy.

It is clear from the results thus far that the main body of this research, carried out in 2018, uncovered an organisation that was very unsure of its own place in the world. The processes of making a map of Dar es Salaam were complex indeed, and the issues and contentions noted here are of deep concern. It is though also important to remember that the maps presented here are static snapshots in time. Yet, OSM, nor the work of HOT is not static and nor is the data they use and present through their maps and other outlets. Indeed, mapping as a social practice is contingent and fleeting. Maps circulate, change meaning and use, they are reconstructed or destroyed, and any such analysis should ensure to keep that in mind (Bryan, 2011; Edney, 2019). It is then important to take a new snapshot closer to the submission of this thesis to see how HOT may have moved their practices forwards. To facilitate this, further interviews and research was carried out in 2021 to serve as a sort of 'right to reply', and this will be examined before moving to a wider discussion of the findings in chapter 6.

5.8 A new portrait of HOT in 2021

One limitation of this research was the length of time over which it took place. The project was conceived in 2015, with research carried out in 2018 and much of the analysis and writing up happening during the 2020–2021 timeframe. Much like the issues of mapping itself, this led to a thesis that is a static snapshot in time and does not allow for the changes in working and thinking that might have taken place in the years following the core data collection. Analysis of the mapping progress was readily added, with data from up to 2020 being used to examine the completeness of those maps. However, the more qualitative work presented additional challenges. Although the portrait of HOT in 2018 presented in the previous chapters is one that was painted from the information provided at the time, the subsequent years have seen several changes occur in the way that HOT operates. It was felt that it would be remiss to omit an update to the portrait of HOT that reflects changes that have occurred already — some of which mirror early drafts of recommendations from this thesis. To add this update, new interviews were completed, along with an examination of new materials produced by HOT. In the next section, some key flash points from the period 2020 – 2022 will be discussed.

5.8.1 Correcting narratives

In September 2020, a post entitled “A Call to Correct Narratives about Geospatial Work in the Philippines” was posted on the listserv of the OpenStreetMap community (OSM-PH, 2020a). The post linked to a video developed by Amazon Web Services about the work of the Humanitarian OpenStreetMap Team (HOT) in the Philippines, especially the work that had been carried out in the town of Guagua,

Pampanga. The post also linked to a statement from the OSM-Philippines community expressing concern about the video (OSM-PH, 2020b). While clearly the context and the location of the statement differs from that of Dar es Salaam, it also contains several familiar themes highlighted in this thesis. The main point of contention was that the video placed HOT as the centrepiece of the work in the Philippines and failed to adequately recognise the work of the community of mappers themselves. This chimes with the results presented above, in which the presentation of HOT and its aims wins out over all other aspects of the organisation's mission.

The statement also pointed to the "very problematic centring of white, male, and western voices and perspectives all throughout the episode's production and the relegation of Filipinos as mere workers or beneficiaries" (p.2) and goes on to note how the film is "a reflection of the colonial geospatial patriarchy." Again, these were narratives that emerged during the analysis of the maps and documents produced by HOT, as well as in the tracing of common themes through interviews. The statement also comes to similar conclusions about the role of geospatial technology in development, that "While OpenStreetMap provides avenues and opportunities to help correct such mistakes of the past, it is not enough to merely give access to the mapping platform and geospatial technologies" (p.3).

The statement was met with a counter statement by HOT Executive Director Tyler Radford (2020a). In this statement, Radford reiterated HOT's strategic plan for working with communities and pushed forward HOT's vision statement. He also responded that the video was intended to showcase the work of HOT and the technologies used by HOT, as these were sponsored by Amazon Web Services. He also suggested that HOT's resources were spread too thin to have been able to pick up on these issues and that the failure to include the long-standing community of mappers

was Amazon's rather than HOT's fault. These reasons, though, only further play into the narratives that emerged during the research work in Tanzania. HOT worked so hard and fast to promote itself as the "saviour" entity to attract more funding from donors, that they did so at the expense of inclusion of the HOT community. In response to the complaints, HOT themselves did not further promote the video and instead promised to better "elevate community voices" (Radford, 2020a).

This event acted as a validation of what had been seen in Tanzania. Although the community in Dar es Salaam had not reached a point of overtly calling HOT out, the same tensions were bubbling beneath the surface throughout the interviews. The instances of brown-washing and referring to those community members who saw themselves as partners as mere "beneficiaries," also reflects the issues in the Philippines. What is also clear is that the local chapters of OSM and HOT were now sharing their views on the way in which HOT operates, and they were not happy. Critical mapping theory is becoming more mainstream than the narrative that says maps will solve all issues. Questions of coloniality, patriarchy, and the cartographic gaze are being raised by those communities who have been subjected to another version of outsiders mapping them — albeit in the name of participation.

In the face of this sea of change, HOT could either double down on its model — which appeared to be the organisation's first reaction given the statement by Radford (2020a) — or shift towards truly listening to communities. The confusing and conflicting narratives about the vision and view of HOT are to be put to the test in a profoundly serious way. The interviews conducted suggested that there is enough understanding within the organisation about what true collaborative and participatory working could be, but to get there will involve relinquishing a great deal of power and dramatically changing HOT's relationship with its donors.

5.8.2 A new direction for HOT

By the end of 2020, it was becoming clear that HOT was indeed intending on moving in a new direction and learning from the statement put out by OSM-PH (2020b) and the response that that document received from the rest of the HOT and OSM community. It was also becoming clear that the OpenStreetMap platform itself was now at a crux moment, finding itself at the "centre of an unholy alliance of the world's largest and wealthiest technology companies" (Morrison, 2020, n.p.). Both HOT and OSM are losing their sheen as being community-built, community-led, and "for the community." It is likely that OSM will find itself fully consumed by big tech companies, but the future of OSM is beyond the scope of this thesis. HOT has choices though, and in December 2020, Tyler Radford began to lay out some of these ideas in a video posted to the HOT YouTube channel, ideas which formed part of the HOT 2020 Summit (renamed the Humanitarian OpenStreetMap Summit as a signal to the proposed demising role of HOT).

While Tyler Radford was speaking as the Executive Director of HOT and as the organising team behind the summit, it was clear that attempts to listen and address concerns were being made. The summit featured a "fail fest," in which people were encouraged to learn from past mistakes and share issues that arise from these working models. The summit, Radford suggests, should not be about what we do well but what we need to do better. Mirroring the findings of this thesis, he said, "we need to recognise what HOT is and what HOT isn't" (Radford, 2020b). One key thing Radford noted was that it was a mistake to keep using HOT as a catch-all to describe everything done by anyone connected to the HOT team. This, Radford admits, has enabled HOT to take the credit for other people's work. As noted by Radford, and in a further interview

with Pete Masters in 2021, “Communities stop talking to HOT because HOT only talks about HOT.” (Masters, 2021, interview). The video also acknowledged that HOT needs to be part of a movement that champions local people, local devices, and open knowledge and data. “The future is not HOT,” concluded Radford.

This all sounds particularly good, but the language used here continues to reflect that of documents analysed from 2018, in which championing local people, local devices, and open data were key terms used to seek funding for projects. The video acknowledged that funding structures were wrong in past, as they were based on short-term projects and glossy reports to donors, leading to underinvestment in local communities and contributors. However, it also went on to promote HOT as being shortlisted for funding by *The Audacious Project* run by TED. Radford then continued to use the language of the potential donor throughout the video, shoehorning in the word “audacious” in ways that felt uncomfortable. Has HOT really learned anything about not being beholden to donors and the language of colonialism?

To examine this further, an additional follow-up interview was carried out with Pete Masters, Staff Head of Community at HOT. Masters was not interviewed in the first round of the research as at that time he worked for Médecins Sans Frontières, but I spoke with him on numerous occasions in Dar es Salaam in 2018 and following. Masters has been an active member of the HOT community in many ways for some time, but it was not until late 2020 that he joined HOT as an employee. Masters reflected much of what had been said in the video during his interview in March 2021. The key issues were brought forward, those that state that HOT should no longer talk about the HOT community as a wholesale thing and that for too long HOT had been taking credit for other people’s work. Asking about whether the issues in the Philippines had been the catalyst for this realisation, Masters suggested that HOT had

thought about these things for much longer and was planning to change but that this sped up the process somewhat and laid it out on the table. This suggests that HOT has been stuck thinking about how to solve the problem of funding rather than how to solve the problems of working with communities. Again, this mirrors the problems found in this research. This is all far from solved, though, and there was a sense during the interview that Masters is concerned that HOT is too quickly moving to self-congratulation and winning people over with glossy statements. The proof will be in the coming years when we will see how HOT changes its model and if it can really step back into being a supportive rather than a leading actor.

5.8.3 HOT's future in Dar es Salaam

Both Tyler Radfords's video and the interview with Pete Masters noted one of HOT's concrete moves: HOT will open no more new country offices; instead, HOT fully transitioned to independent local offices by the end of 2021. This, the two hope, will develop longer sustainable projects that draw from and create local power. One of the first places this happened was in Dar es Salaam. The HOT country office has closed and the work of mapping the city and developing new projects has been fully taken over by a Tanzanian organisation — OMDTZ. OMDTZ was born from the work of HOT but now works independently, gaining its own multi-year project funding and aiming to become a fully-fledged local NGO. This is a model that HOT would like to follow across all its country offices and one that reflects the direction in which this thesis suggests they need to move.

6. Discussion

Maps are powerful tools, they create and reconstitute power (Parker, 2006). Moreover, they are often viewed unquestioningly. Many interviewees from this research suggested that they themselves could not see any issues with the mapping practices of the Humanitarian OpenStreetMap Team (HOT) or the outputs generated. Several problems arise from this unquestioning approach. HOT, like much of the PGIS world, finds itself using the words 'data', 'information' and 'knowledge' interchangeably, despite these words having discrete meanings (Sieber, 2006). Furthermore, the emphasis that HOT places on maps as the driving force of its work somehow suggests that it has overturned Korzybski's notion that 'the map is not the territory' (cited in Evans, 2013). Rather, HOT has elevated the locations and data on maps, giving them more importance than the political or ideological influence of said data and maps, potentially aligning HOT with the ideologies of donors, western discourse and the local political power. The power *of* the map is used to draw in money and support, but the power *in* the map might well be ignored. As Steve Penson (2018, interview) – a volunteer with MapAction and HOT, as well as a regular participant at mapathons – proclaimed in the results chapters, 'basically a map is a map'. Any chance of seeing to these concerns is shielded by the supposed legitimacy of mapmaking and the Cartographic Ideal (Neumayer and Valtysson, 2013; Edney, 2019). In this relationship between HOT, the community, the remote mappers, and the map itself, we can examine the extent to which HOT was able to challenge the colonial and dependency dynamics of traditional development models through the use of OpenStreetMap (OSM) in Dar es Salaam, Tanzania.

It became clear during this research that the use of maps added weight to HOT's work. HOT's maps impressed donors and local governments alike, but this also

meant that HOT rarely explored the nuances of what they were doing and the role of power, technology, and mapping in the forming of relationships with the community. Praise for the quality and the completeness of the map trumped other discussions, and although these map production accomplishments should be lauded, it is clear that there were frictions and some significant theoretical issues at play. In a discussion on the codification of knowledge, such frictions must abound; knowledge has certain properties, but how it is represented and codified will change, mutate, affect, or remove these properties, and that must be examined closely (O'Hara, 2004). This becomes especially salient when a project creeps towards data collection at high speed and volume, led by outsiders of the community.

In order to answer the overarching question of this thesis – *To what extent were the Humanitarian OpenStreetMap Team (HOT) able to challenge the colonial and dependency dynamics of traditional development models through the use of open-source participatory mapping technologies and ICTs in Dar es Salaam, Tanzania?* – a closer examination of the way in which the technology includes or excludes knowledge and how it changes relations with space is required. The lived experience of people is difficult to translate into GIS technology and maps, and to suggest that this might be happening in Dar es Salaam would be a myth. Community mapping and mapping the community should be seen as different practices here, and HOT has engaged more so in the latter, creating maps *of* people and locations and not those that encapsulate social and cultural meanings or relationships of power (Harris, 2016; Parker, 2006). As seen in section 5.3, HOT has utilised a range of technologies to create vastly improved maps of Dar es Salaam, and these can be used for all kinds of civic and economic projects by those who are able to access them. However, in terms of the inclusion of knowledge and the local community, they have a long way to go, and the growing level

of technology – which has increasingly involved drones and machine learning – sees them moving further away from the inclusion of the 'local' and positioning themselves as a mapping company.

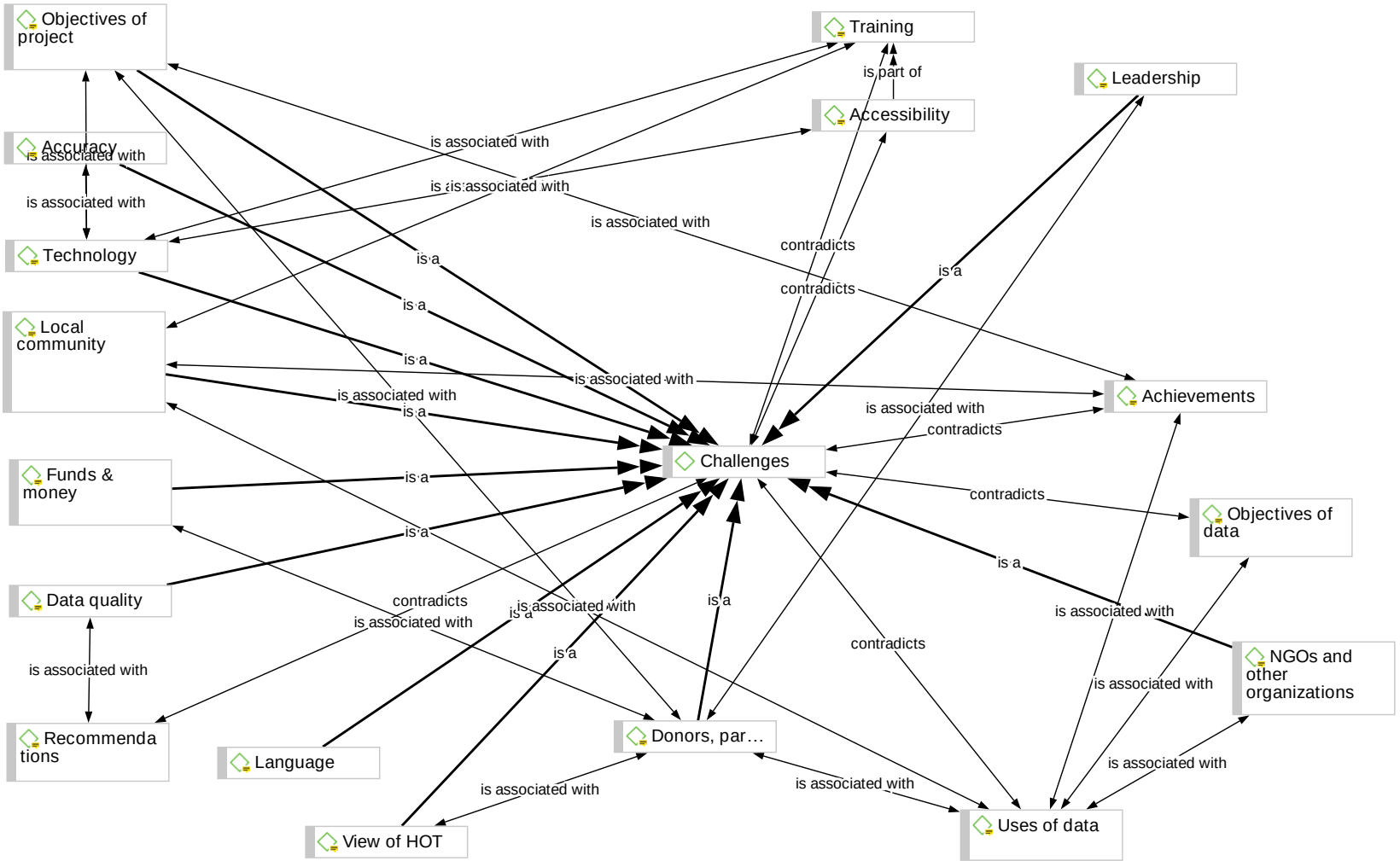
There are also some clear and stark differences emerging around the way in which different groups view the use and purpose of maps and technology in the pursuit of the goals of HOT, Ramani Huria, and Data Zetu. Some of these differences stem from the differing aims of the projects, and some are because of the different positions that are held, such as manager, mapper, and donor. However, the majority seem to stem from the lack of coherence around what HOT is, what it should aim to do, and who should be doing it. These contentions are borne of several issues highlighted in the literature and seen in the field. Maps are hugely popular with donors and large NGOs, as they offer a quick and easy way for NGOs to provide their current and future financial backers with information about how money is being spent and where it might be needed (Elwood and Leszczynski, 2013). The Large donors, such as the World Bank and IREX, who supported the work of HOT in Dar es Salaam, are instrumental in their nature and have an instrumental view of technology and mapping. Maps and technologies are viewed as tools, rational and neutral from the activities around them (Feenberg, 1991).

As with all of the analyses thus far, among explorations about how people view the technologies and maps employed and created by HOT there are numerous contradictions, competing narratives and differing ideas. Although an important part of reaching democratic results in participatory projects is the viewing and arguing over competing ideas and views (O'Hara, 2002), there also needs to be a consensus on the actions to be taken and what the aims might be. To make bottom-up development work, there must be a capacity to hold together loose-knit ideas and assemblages of

individuals with diverse goals (Crowfoot and Wondolleck, 1990). Perhaps HOT is doing this internally, holding together its own diverse viewpoints and directions for the organisation, but is this at the cost of being able to facilitate true participatory work, bringing together the competing arguments of the community? HOT may have been lured by the counterpoint to globalisation and mainstream cultures offered by working with 'local' communities in Dar es Salaam, but it seems still confused as to why it is there and what it is trying to achieve and for whom.

All these challenges have been mapped into a network of the discussions and documents collected in relation to Rumani Huria and Data Zetu. Figure 48 features a diagram showing the complexity of the narratives and environment within which HOT is working. Some of these challenges were predicted in the literature – for example, in the diverging viewpoints on how data should be used (Kim, 1998); whose knowledge should be included (Kyem, 2001; Chambers *et al*., 1979); the influence of donors (Mohan, 2002; Mosse, 2001) and the affordances of technology (Hutchby, 2001). Others, such as the way in which HOT views its past and future, have emerged directly from the research itself. These issues will be discussed in full throughout the rest of this chapter, focusing on key themes that emerged from the literature review and the empirical work. These are empowerment, representation, colonialism, and their relationships to mapping and development work.

Figure 48: Challenges faced by HOT - Developed from coding interviews and documents in Atlas.ti



6.1 Empowerment and relationships

Empowerment and relationships to the community are areas that HOT discusses at length in its own literature and promotional materials. These are also areas that have been discussed at length in the humanitarian and development studies literature, as seen in the literature review (Ghose, 2001; Glöckner *et al*., 2004; Kyem, 2001; Miraftab, 2004; Mohan and Stokke, 2000; Tandon, 1996). The literature noted the contradictions that can readily play out when attempting to create empowerment as an outsider. True empowerment of a population involves the process of gaining self-control over the ideologies and resources of power (Quarry, 2008), one in which stakeholders are given equal, if not more, power over decision-making (Tufte and Mefalopulos, 2009; Miraftab, 2004). However, all too often, as Lead (2007) notes, it is the process of trying to bring about empowerment that leads to the upholding of power structures in ways that preserve the status quo.

As noted in the literature review, the failure of empowerment to do more than reinforce the status quo led to the development industry, pushed by the World Bank, to redefine the notion of empowerment (White, 1996). Instead of seeing empowerment as connected to the dismantling of societal power structures and the issues that cause poverty and disenfranchisement, empowerment became about relationships and partnerships within smaller, defined projects. Although these shorter-term projects and activities may well have a positive impact on the populations that are involved, Guijt (1998) reminds us that without an analysis of the causes of oppression and marginalisation, there can be no true empowerment.

This then leads us to pose the following key questions regarding HOT: (1) To what extent did HOT's projects undertaken between 2014 and 2018 empower the local

population to collect and manage data and knowledge about their own lives (and moreover, what type of empowerment was this)? and (2) During these projects, how did HOT manage relationships and tensions between local populations, government officials, HOT's own staff and donors? These relationships would be key to understanding both the local population's and the World Bank's notions of empowerment.

Although the results showed that HOT's work could often end up multifaceted in its nature, the core of its work always returned to the production of maps – and principally, the overall mapping of Dar es Salaam. This focus on the map is useful in deconstructing the relationships developed by HOT and the empowerment this may have brought about. After all, it is the practice of creating, as well as using, maps that most readily helps in our understanding of power relations around knowledge and how these are contested (Bryan, 2011). In examining these balances, though, it is important to note that, as discussed at length in the literature review, terms such as 'participation' and 'inclusion' are subjective and multiscale, which makes it difficult to gauge how well they are achieved in a mapping project (Parker, 2006). Indeed, Parker (*ibid*.) goes as far as to suggest that the study of inclusion within maps is near impossible due to its complexities and the way in which such concepts are obfuscated. However, it is important that an attempt is undertaken to see the way in which inclusion/participation takes place within the projects of HOT and how this relates to notions of empowerment.

The design of HOT's projects initially showed signs that for all of its claims to participation and empowerment, the work it was undertaking fell much closer to the short-term, small scale, project-based empowerment as defined by the World Bank, as opposed to the broader questioning of power and attempts to overturn this. The way

in which HOT 'sells' their work to donors is a key component in this understanding. It is worth repeating the words of Gevaert (2018, interview), a consultant to the World Bank, who managed its relationship with HOT: '…it's the focus on participatory mapping and really the integration with the local ecosystem, that's what was extremely [appealing]'. Although this endorsement might seem to be one that indicates that HOT was taking steps towards empowering communities, its source suggests this might only be within the limited framework of empowerment through participation.

Taking a closer look at the way in which HOT collected the data required for mapping Dar es Salaam and the needs of the community further positions its work as being of limited value in terms of empowerment. HOT was keen to communicate the notion of individualised data collection – that is, that it was responding to the individual needs of people and mapping data that was personalised. In its literature and in some interviews, this notion was put forward quite strongly, with the suggestion that this type of data could have a real, direct impact on the way in which the local and national governments in Tanzania might respond to people's needs. In this respect, it might be argued that HOT was trying to create what Edwards (2015, n.p.) termed 'an individualized relationship between a citizen and their government.' However, it became clear that the situation in the field was different. Although it was true that many household surveys were carried out to collect data – and these certainly reached a degree of individualisation and participation – they met similar issues as the Participatory Rural Appraisal (PRA) work that came before them. Although these data collection methods were designed to be politically smart and locally led approaches to development (Booth and Unsworth, 2014), factors such as gender, self-confidence, and background for example all represent inclusion challenges

(Verplanke *et al*., 2016). PRA remains33 ill-equipped to capture the knowledge and experiences of the poor, which were often still, or even increasingly, marginalized (McFarlane, 2006b), as they were in the results that were presented from the surveys administered by HOT.

Furthermore, although the data collection process might have reached a level of discussion on an individual basis, the cleaning and processing of data worked to erase much of this. Some key data were initially ignored and erased, such as Shina boundaries, because they fell outside the scope of HOT's preconceived understanding of the city and its population. Additionally, the aggregation and sorting of data served to erase the individual, as well as communities at the Shina level. The population was turned into what Ballatore (2014) referred to as a virtual reality of place, populated not by individuals but by what Deleuze (1992) terms 'dividuals', masses rather than people, encased in data that suggests homogeny. Through this presentation of homogeneity, there can be little true empowerment, as the population is no longer represented by their own words and actions on an equal footing as those collecting the data. Instead, the power to decide what was 'true' in the data, what was included on the maps and how it was represented on the maps produced by HOT stayed firmly with HOT itself.

However, it is odd that we should think of any of the geospatial technologies HOT employed as being able to enhance empowerment of populations or participation in policymaking. HOT was just collecting data, and the collection of data itself is not a participatory action nor is it true participatory, empowering mapping (Sieber, 2006). True participatory mapping creates space to challenge relationships of power and space and the new knowledges that might inhabit these spaces (Bryan, 2011; Parker, 2006). So, although HOT presents itself as highly participatory and able to access local

knowledge, this knowledge is not actually seen as much more than pure data by HOT – collect and catalogue as much as possible. The use outsiders, be they remote mappers or university students from other part of the cities also led to significant questions around the quality and 'localness' of data collected. The use of payments to facilitate some of this data collection further complicates the issue and runs the risk of skewing the results and data collected (Sieber, 2006).

These issues are further compounded through the sharing of the maps and data collected with the community. The way in which different actors within the process of mapping and sharing viewed the projects puts pay to any notion that the work HOT was carrying out was empowering or participatory. And it further brings into question HOT's relationships with the community, local staff, governments, and donors. Stark differences emerged around the way in which different groups view the use and purpose of maps and technology in the pursuit of the goals of HOT, Ramani Huria and Data Zetu. As noted above, some of these relate to the roles of individuals, but they mostly stem from a lack of coherence around what HOT should be doing.

The lack of a common goal is a clear indicator of a lack of empowerment and a potential breakdown in relationships (Alejandro Lead, 2007), and thus, it is important to examine why such differences might occur in relation to geospatial technology within the development sector and how these hinder attempts at empowerment. The literature review has already made abundantly clear that there is nothing so simple as an empowering PGIS, community mapping or counter-mapping project, especially one that encompasses notions of the developing world or humanitarianism. Maps are hugely popular with donors and large NGOs, as they offer a quick and easy way for them to provide their current and future financial backers with information about how

money is being spent and where more might be needed (Elwood and Leszczynski, 2013).

One of the things that many donors enjoy, although they might not articulate it in so many words, is that maps offer a pseudoscientific and institutional rigor to their work, work that can often be very ethereal, personal and intangible (Gerlach, 2015). Although much of this intangible work is the most important work, it is harder to measure and catalogue for funders. Instead, work becomes about 'impacts' and 'benefits' for target populations. Indeed, as noted in the analysis, the donors interviewed used these words numerous times during interviews. This kind of terminology is concerning, as it implies a passive voice for beneficiaries. The creation of the beneficiary as passive creates the conditions in which outsiders would be prompted to administer treatments to societal issues without the involvement of the population (Stern, 2015). This way of conceptualising outputs of work, in terms of measurable 'impact' would appear to be at odds with the work HOT aimed to undertake in Tanzania. This was seen as an obvious disconnect when discussing output in the results. HOT do, though, commit themselves to the creation of maps. Again, it is worth repeating Amadi's (2018, interview) feeling that 'having a shiny map at the end of an engagement or at the end of the project is what the donor wants'. This chimes much closer to the World Bank's notion of empowerment that relates to relationships and partnerships within smaller, defined projects (White, 1996).

In presenting back data and maps to communities and donors, it was already noted in the interviews that both parties received the same information; 'they all get exactly the same data, the same maps', Kimaro (2018, interview) reminds us. It is also worth noting the process by which HOT chooses what to relay back. Within the tight confines of the OSM platform, data that did not immediately conform was cleaned or

altered to make it fit or else it was removed – such as places that did not conform to prior spellings, data about issues that might have been tangential to a project or where data was unreadable and not recollected. This was being done at several levels by the mapping supervisors, the digitizers, and the GIS experts. This led to a narrow conceptualization of the knowledge in Dar es Salaam (Burns, 2015) and one that for a long time obscured the notion of *Shina* and the power of their leaders, *Mjumbe*. Of course, the codification of knowledge into a digital artefact will always require a trade-off. However, one might ask here whether HOT had gotten this balance right, with a sense that its outputs were more geared to the donors and official maps than to the community, who were instead left to receive trickle-down benefits or were provided with open data and open maps that they were unable to utilize. It is the unequalness of those involved in HOT's work in Dar es Salaam that allows us to say, without doubt, that their work was not empowering in a true sense and indeed barely met the World Bank's watered down and limited definition of empowerment.

Now that we have established that HOT was not positioned to facilitate any sort of empowerment, what then of their relationships with the community? It has already been seen in section 5.8 that these reached such a dire state that HOT pulled out of Tanzania and was also met with a barrage of complaints from other local partners around the world. These issues were also clearly seen during the main period of research, with all aspects of the collection, cleaning and presentation of mapping data being marred by beneficiaries having little more than passive roles and voices. The projects continued to be designed in such a way that it was always outsiders who would administer treatments to societal issues (Stern, 2015).

However, this passiveness does indeed lend itself to the creation of maps. Maps place the mapped in the same position of being passive recipients of the map

(Specht and Feigenbaum, 2018). Large donors – such as the World Bank and IREX, who support the work of HOT in Dar es Salaam – are instrumental in their nature, and an instrumental view of technology and mapping follows. Maps and technologies are viewed as tools, rational and neutral from the activities around them (Feenberg, 1991). It has already been noted at length in the results chapters that the connection between community and the aims and outputs of projects are lesser than those between other stakeholders.

This leads to one of the big issues that is seen in many such participatory projects: much more information, knowledge and data has been put into the projects than has been taken out (O'Hara, 2004). This leads to a mismatch in ownership over the data and thus of the community knowledge, which has, in many ways, now been transferred to HOT – an issue highlighted in the Philippines. There are still significant barriers to accessing ICTs and data in Dar es Salaam, and although OSM and the Humanitarian Data Exchange (where HOT shares the information collected) are open, this does not automatically mean such data can or will be used in specific projects. There still needs to be a key leader involved, as well as a development and implementation of policy and procedures. Clearly, the implementation of HOT's data into other projects is pushing economic and technological advances, but as both Lefebvre (2009) and Sen (2008) remind us, neither are synonymous with social development or the enrichment of social relations. HOT is implementing data-driven quick fixes but not necessarily social change. These mismatches mean that there is little hope of HOT ever being able to develop an empowering project, and the use of mapping as the tool of choice has been the final nail in the proverbial coffin of any such notion.

The role of the map in eliminating opportunities for empowerment and eroding the inclusion of different voices also reflects one of the more significant areas of the literature review: the contentions between development and colonialism. The failure to achieve participation, empowerment and social change was enhanced by the colonial, saviour tone of HOT's interventions. And at the same time, attempts to address those failures in an ad-hoc, piecemeal way further damaged relationships and let even stronger colonial tendencies seep into projects.

6.2 The colonial gaze and technological affordances

Colonialism is still the most dominant way in which the world is ordered. Although it is no longer an explicit political order, the exploitation, domination, and subjugation of people remains (Quijano, 2007). Maps have long been seen as a tool of the colonial project, tools of the affluent and the powerful, and much has been written about how they have been used in this way (see Specht and Feigenbaum, 2018; Harley, 1988). Furthermore, as it is additionally noted in the literature review, cartography is often a poor way to represent the qualities and relationships of everyday life (Specht and Feigenbaum, 2018; Paglen, 2008).

HOT sought to overcome these concerns through the use of user-generated content and locally sourced information collected through surveys. However, relying on user-generated content or volunteered geographic information does not automatically alter these uneven colonial geographies (Graham, 2017). Indeed, the collection of such information and materials may instead exacerbate the situation. Anthropologists once seized upon the archival nature of mechanized media, cataloguing and organising the *other* through new data. These processes became an important part of the territorializing of the *other* (Collier, 2016). Even as neogeography and countermapping practices have become more mainstream in the last 15 years, issues of power, inequality and representation remain (Wainwright and Bryan, 2009). In fact, some might argue that the highly technical nature of mapping, which now often requires a smartphone or high-end computer, also plays into the requirement for Africa to be a source of technology (minerals etc) and not the beneficiary of its development (Collier, 2016). Indeed, the process of mapping is a process of codifying knowledge into 'objective', 'scientific' categories that fit within the ideal of cartography (Quijano, 2007; Edney, 2019). By this metric, HOT's work can be nothing

other than a neo-colonial project, in which many people are excluded from the process, even when working for HOT, and where the Tanzanian experience is forced into the shape of a mapping platform (OSM) designed in the United Kingdom, the former colonial overseer of the territory following the end of the first world war.

This then leads us to ask whether HOT was able to disrupt these colonial tendencies or whether it reinforced a colonial doctrine through its representations of Dar es Salaam. It is also salient to question the extent to which the choice to use the OSM platform as the basis of HOT's work, along with associated tools such as OpenDataKit, supported or hindered HOT's aims of being participatory, non-colonial and non-hierarchical.

In relation to the maps produced by HOT, the results sections have made several things abundantly clear. HOT, through its work in Dar es Salaam, has vastly improved the maps of the city by marking the huge increase in road length and by mapping buildings and points of interest (POIs). This is an impressive feat, given that this work was predominately undertaken by volunteers. As Executive Director Tylor Radford (2019) noted, when HOT began working, much of the map of Dar es Salaam was blank. The HOT volunteers added everything from street names to health clinics to data on the kind of care given at particular medical facilities.

It is also clear that these maps and the vast amounts of data being produced have indeed been mobilized in aid of a great many life-benefiting projects – improving access to hospitals through better navigation routing, providing resources to informal settlements that were previously unmapped and about which there was little to no data, and clearing drainage ditches to improve sanitation. Furthermore, this data was organised in such a way as to be able to contribute to the growing Humanitarian Data Exchange (HDX). HOT is one of the 200 organizations feeding in such data and is

building what is seen as an increasingly important source of humanitarian data (Johnson, 2018a; Mills, 2018).

The maps then delivered the objective of providing data about the city and allowing for suitable routing and navigation. However, there is a sense that the 'poor quality' and 'incomplete' maps that came before HOT's arrival were not necessarily replaced with something better for the local population, per se. Wainwright and Bryan (2009) discuss at length the way in which old 'bad' colonial maps are replaced with new 'good' anti-colonial ones. But HOT was generally not replacing colonial maps. Many of the initial maps of Dar es Salaam were made following the independence and unification of Tanzania, and some of the same issues persist. There is a sense that HOT is sweeping away the authoritative work of the Tanzanian government and replacing it with new, better maps, but these maps follow the same tropes and designs of the old maps and indeed bring new and potentially problematic Western biases to the fore.

The maps produced by HOT were hemmed in by the constraints of cartographic conventions, what Edney (2019) refers to as the *Ideal.* That is to say that the ways of mapping Dar es Salaam followed the cartographic conventions laid out by the OSM platform, and those conventions were modelled heavily on the maps of the British Ordnance Survey maps that they sought to replace. Ordnance Survey (OS) itself was founded in 1745 as part of the efforts to map Scotland to aid in the quelling of the Jacobite uprising. The influence of OS maps on the OSM platform is plain to see, with roads, buildings and even POIs sharing similar colourings and symbology. Importantly, the choice about what counts as a POI on OSM remains like that of OS. Although this presents little issue in the UK, where OSM was founded, this can lead to the ossification of ideas and POIs that do not fit within the Cartographic Ideal of the OSM platform (Edney, 2019). This was demonstrated in the results through conversations

with Allen (2018, interview) who, when mapping waterpipes in refugee camps in Uganda, found that a symbol that looked like a UK faucet was unhelpful in guiding some parts of the population to water sources that were in fact standpipes or simple hoses with no tap at all.

Within the work of Dar es Salaam, it was harder to see what might have been missed with the OSM platform. It is, of course, always hard to assess what is not there rather than what is there, and as the results discussed, access to pre-cleaned data was not forthcoming. What was discussed, though, were the layers of cleaning that the data went through and the mismatch between how much cleaning the population, collectors and project leads thought was happening. This extensive cleaning of data was done under the guise of ensuring that the data would be accurate. However, the measure of accurate was determined by the needs and ideals of the OSM platform into which the data was being entered. Thus, things that did not chime with the OSM platform, a British cartographic view of the world, were removed or altered to ensure that they fit. This was seen most clearly in the initial ignoring of things such as *Shina* and the way in which people describe their own existence. Cleaning data to fit the maps' objective aims and narrative means the eradication of individual voices and loss of engagement with the community.

The maps HOT produced are incredibly detailed, and Dar es Salaam is by many metrics one of the best mapped cities on the African Continent. However, for all the promotion around these maps, it must be remembered that they were not produced by the community, and they were not produced in a participatory way. They are not objective truths, just as the satellite imagery they are based upon is not (Harrison, n.d.). The geographical coordinates do not reveal place names passed down through generations (*ibid*.), and articles published by HOT such as 'Newly revealed Shina

boundaries offer unprecedented hyperlocal data for decisionmakers' (Adinani, 2018*a*)[43] reveal the colonial undertones and deafness of such projects. These *Shina* were no more newly revealed than the Americas were discovered by Columbus. There is a great deal of politics in the way in which HOT chose to represent the knowledges they are working with using symbology, representations, and icons on maps that, in many cases, do not reveal but instead mystify (Elwood and Leszczynski, 2013; Quijano, 2007). Their maps are no more than a simulacrum of non-Western geographies, forced into Western geographic conventions, and in this way, these maps help make the Third World by measuring the city of Dar es Salaam against a metric of Western modernity (Johnson *et al*., 2005; Escobar, 1992).

The affordances of OSM and the way in which it was implemented by HOT in Dar es Salaam meant that it was very unlikely to produce anything more than an outsiders mapping of the city. Some members of HOT were keen to suggest that everyone be included through the use of technology, that more sensors and sensor data and better satellite images meant that nobody will be missed off the map. But still, research shows that only about 10 percent of populations share geographic data through VGI, and although this would be higher in Dar es Salaam due to the carrying out of surveys, the majority of the population would not be asked and would instead be mapped through satellite data, scraped data, and aggregated data provided by their next nearest source. These people were then either missing or mapped without consent (Verplanke *et al*., 2016). Even if this were more complete, Morozov (2014, n.p.) rather graphically reminds us that 'one can wear a dozen powerful sensors, own a smart mattress and even do a close daily reading of one's poop – but injustices would still be

[43] It is understood that this is one of the artefacts written by an outsider and later attributed to a Tanzanian author in order to appear more inclusive and participatory.

nowhere to be seen, for they are not the kind of stuff that can be measured with a sensor'. Furthermore, the map completion analysis suggests that although there are significant improvements in the OSM maps of Dar es Salaam, there is still a reasonable margin of error – and although this might seem small, Sieber (2000) reminds us that the misplacing of a line by just a few millimetres can misclassify data by half a mile.

Of greater concern is the way in which the city was mapped itself. OSM is a volunteer platform, with hundreds of thousands of people contributing to its creation around the world (Chilton, 2009). Like Wikipedia, this has allowed it to become a community project of sorts, with the social aspect of mapping pushed heavily. This kind of volunteer mapping has certainly met the aims of founder Steve Coast, who wanted to challenge the lack of openness in OS' data. However, one might question whether the use of predominantly free labour for mapping the city of Dar es Salaam is moral and just in and of itself. Although HOT did employ a number of people in Dar es Salaam, almost all of whom were interviewed for this research, most of the mapping was done by volunteers at mapathons. Although building a community to map their own city could be seen an empowering exercise, something that might give people control over the narratives of their lives, we have already seen that this might not be the case in Dar es Salaam. Many of the volunteers mapping Dar es Salaam were doing so remotely, and those on the ground were rarely from the locality they were charged with mapping. Furthermore, the maps produced by this free labour were shared with governments and companies as much as the local population who made them. Indeed, governments and companies will reap greater benefits from these maps. As seen in the results, country manager Ivan Gayton was delighted to be able to share these maps with companies such as Taxify – a gig-economy taxi company – to improve their services, services that themselves rely on cheap unregulated labour, are improved by

maps made by majority free labour, and are used by the richest members of the Dar es Salaam population and foreigners. This kind of extraction of data to create wealth for outsiders has been increasingly referred to as data colonialism by scholars (See Bah, 2015; Couldry and Mejias, 2019). The affordances of digital technology, and particularly participatory-GIS make this extraction and repackaging extremely easy, and potentially hugely profitable.

HOT then was trapped. Its model of empowerment was already watered down by following the model of the World Bank. Its mode of data collection and cleaning was forced by the affordances of the OSM platform and its Cartographic Ideal. It relied on cheap and free labour, while foreign project leads and country managers were paid European wages. This would suggest that HOT was far from able to break free of colonialism in its thinking, working, or planning. Rather, it further emphasised the erasure of local knowledge through the need to meet the Cartographic Ideal of a British style of mapping.

It might be argued that HOT fell victim to the idea of 'totalizing', that the issues it was trying to solve were so big and so complex they might only be solved through having all the data first (Alford and Head, 2017). This requirement for totality, which is the position of OSM, drives the need for digitalization of satellite data. The idea that a satellite is an all-seeing eye and that by collecting and digitizing the images collected from space you can build a complete picture is the epitome of the cartographic gaze and places the mapmaker – in this case, HOT – in an all-powerful, all-seeing position (Specht and Feigenbaum, 2018). This is not a position that will be able to trace community bonds or the viewpoints of individuals but creates a gap between the spectator and the spectacle (Harrison, n.d.). HOT's collection methods then were primarily based on the model of OSM to complete a map of the city, while additional

data would be collected on the ground. HOT was trying to implement a project in what it saw as a void rather than conditioned by the laws, culture, politics, and history of the city (Sieber, 2006).

6.3 Representation

Thus far, it has been suggested that HOT was only able to achieve a poor version of an already watered-down notion of empowerment and that it was unable to break with the colonial gaze of the outsider due in no small part to their choice of mapping platform but also because of their operational make-up, which privileged outsiders over locals. Yet, at the same time, it is also true that HOT, through its work, has raised the profile of a number of issues in the city, including waste management, flood risks and access to healthcare. This is in keeping with the organization's aim to map the highest risk areas of the world (Radford, 2019). HOT has also overseen the training and development of community mappers, GIS digitizers and data analysis, as well taught people how to develop drones and other tools to collect geospatial data about the city and provided 'essential' map reading skills beyond the boundaries of its projects (Sieber, 2006). If the other problems could be forgiven due to these 'successes,' then it becomes salient to ask if HOT, as an outsider, entangled in colonialism, was able to at least be representative of the populations about whom they were collecting data. Where they able to be advocates for the local population?

Representation, as a concept, has a complex and frustrated relationship with reality (Kidd, 2016), and this is compounded by the use of mapping and cartography as the principal tool of representation. Cartographers and mapmakers have long struggled with the issue of how to gain the right information, how to capture it accurately and then how to convey it in a way that effectively communicates what it means so that it might be understood (Edney, 2019). Furthermore, as discussed in the literature review, post-colonial geographies have been unable to fully overturn the historic issues of mapmaking (Wainwright and Bryan, 2009). This increases the challenge of being representative.

This challenge has become seen as something that can be overcome through the use of digital technologies. As more and more technology becomes available for the collection and processing of information or knowledge, it has had a profound effect on the information itself and what knowledge is included and seen as legitimate (Elwood and Leszczynski, 2013). The ability to deal with huge amounts of data with relative ease has fundamentally changed the way in which data is viewed and collected (Burns, 2015). The development industry has certainly plugged into this, and as seen in the assessment of big data in the literature review, multiple sensors in phones, bank cards, GPS and medical devices are creating a flood of data used by development organisations every day (Mundial, 2012; Data2X, 2017). This new data is being used to replace conventional forms of data collection, such as household surveys and national economic accounts, that have long been seen as inadequate and unable to properly represent populations, particularly those that are already marginalized (Data2X, 2017).

It was also noted though that although this generation and collection of this data is rising dramatically, not all people leave a digital trace, and thus any representation will always exclude them (Verplanke *et al*., 2016). As Burns (2015) notes, the reality is a shifting epistemology in which the locally situated person becomes even further removed from the now distantly located humanitarian. To this end, HOT may well have found a good balance. Although the base maps that were produced were done so in an often remote way and often by people not even in Dar es Salaam, the information was supplemented by local surveys carried out in the city itself. The need for this local input was noted by Tyler Radford (Executive Director at HOT) in the results when he said that 'by having local contributors, we [HOT] believe that we can build a more representative map of the world' (Radford, 2019). However, it has already been seen in the analysis of the interviews that *donors* and the *vision for HOT* have more

influence over data collection than the local population. This chimes with the work of Sieber (2006), who has noted that the data which is important to social scientists may well have little significance to community groups. And as an idea summarised wittily by Neff (2013), 'data is only data in the eye of the stakeholder' (p. 119). Radford (2019) also contradicted himself, suggesting that 'the more global our [HOT's] team becomes, the better maps we produce', not the words of a locally focused project.

Interviews and discussion with the staff of HOT in Tanzania at times positioned the local community even further outside of the 'partnership'. Even the community mappers that were interviewed only briefly mentioned the local community they were representing through data collection. At times they were almost hostile to the community. '…the biggest challenge is, I think, the community that we are working with' (Kimaro, 2018, interview), said Kimaro, who was concerned that the community itself did not know what they wanted. Other mentions of the community from interviews were about how the community was benefiting, not how it was participating, suggesting a lack of self-representation.

These ways of discussing the local community were perhaps due to the way these mappers were selected. As discussed previously, the mappers were already themselves outsiders in the communities they were mapping. Even when they had come from the same community, their education might well have moved them to a position of an outsider. Perkins (2007) reminds us that, although few humans do make maps, people do have natural abilities to do so, and this has been seen in many examples around the world (Crampton and Krygier, 2005). Yet, HOT focuses on university students to be mappers, playing into an elitist discourse that is built upon the idea that maps must be made by skilled and expert mappers to be valid, a notion explored at length in the literature review (see Goodchild, 2009; Haklay, 2013; Specht,

2017a). It is worth reiterating that at least one member of HOT, who wished to remain anonymous, saw this as an issue; 'university students, though, are not always representative as mappers,' said the member (Anonymous, 2018, interview).

Although surveys were carried out with real people with real lives, the processes of codification and the cleaning of this data – no doubt influenced by the epistemological shift of the development industry (Burns, 2019) – led to even the most personal interactions being seen as pure data collection. The community mappers themselves had been drawn into the idea that the rest of the community was little more than data points, as seen through their lack of desire to discuss the community at length in the interviews. The community was just a unit of analysis by this point.

If it is the case that the projects see those outside their immediate circle as data points, a risk that is well documented in the literature (see Taylor and Broeders, 2015), this apathy may also account for the lack of inclusion of local voices within the results of these projects themselves. Although people may be interested in the outcomes of projects like Rumani Huria, there is no specific reason they would want to be involved in the process (Carver, 2003). Just as not every citizen of a British coastal town would want to help plan flood defences, all are interested in the outcome of not being flooded. Not only should it be considered that not all would have the time or space to be involved, the lack of accessibility of the data being produced is also shown to lead to communities being disengaged from projects (Sieber, 2006).

Alongside all of this was a creeping sense of commercialisation and that one of the true beneficiaries of the data being produced by HOT in Dar es Salaam might be private corporations. This provides the final entanglement in the story of whom HOT is mapping for and whether they were able to be representative of the population they were producing maps about. And is also embroiled in questions of privacy and

ownership rights. Almost all the cleaned data produced by HOT are publicly available, either through their own website or through HDX and OSM. Despite the worrying potentials for turning knowledge collected through a participatory project into data for commercial gain noted by Jordan (2015), the commercial benefits of that were acknowledged and even celebrated by the staff;

> 'OSM and/or maps.me, it's knocked it out of the park. And so, both of those are commercial companies developing commercial applications. They're open source, but they're commercial. And they make money by serving customers our data. Somebody that I know makes a living selling OpenStreetMap data. How, you are asking, do you get away with making money selling something free? Well, ask the people who bottle water. You provide it in a useful format for people, you do some analysis on the data, and you can make a six-figure income if you're clever, selling free data to somebody in such a way that they can use it for their operations. […] So, there are people earning a living off this open data, which I think is great. I'm at least as excited about that as I am about the UNHCR using it to do camp planning – in fact, way more' (Gayton, 2018, interview).

This is, of course, the view of an outsider to Dar es Salaam, which, although it might reflect the worries of some of the population, is based on a Westernised perspective of what needs to be improved upon within a city - HOT's desire to improve maps for the likes of Uber and Taxify seems to stem from personal frustrations around getting a cab, as much as anything else. HOT appears to have little concern about allowing Facebook to profit from the inclusion of their OSM maps, created mostly through cheap or free labour. The increased use of mobile devices and smartphones demonstrates the willingness of people to reap the benefits of heavily marketed products, with little concern over their personal data. People are happy to leave it to others to deal with the law and ethics (Shum *et al*., 2012). There has been a significant shift in the way in which people are surveyed, but most people are too disengaged or

disempowered to care what happens to their data (Elwood and Leszczynski, 2013; Shum *et al*., 2012). HOT, though, appears to be taking a gung-ho approach to this data itself. Perhaps its own staff are dazzled by the opportunities that are offered by conceding data to corporations.

HOT, like many other pseudo-humanitarian organisations, demands more and more data from the community through more and more sensors (Morozov, 2014). The ends of this are no longer as clear as they might be, and warnings from the packaging and selling of data during the Ebola crisis should be more apparent (Bah, 2015). Again, it is important to note that HOT has produced good maps and that these maps have produced some good outcomes. Is it possible to say that these maps are representative? That is much less certain. The maps produced by HOT represent the perspectives of outsiders and for the most part the educated classes of Dar es Salaam. Does this make them useless to the population at large? Of course not. They do allow for quicker trips to hospitals, for response to sanitation issues, for improvements to infrastructure. However, these are not automatic results from the map production and require other parts of civic society to act. The maps HOT has produced are much more useful to donors, corporations and governments seeking their taxes – not the aims HOT claims to have set out with.

6.4 Legacy

The years since the empirical work for this thesis was carried out have seen a great deal of change. This change has happened globally and locally, within HOT and outside of it. Many global events have brought to the fore issues of power, consent over data and colonialism. This has empowered communities to question the extent to which they are partners within projects or pawns used to gain funding. Within this, HOT came under some very public criticism, criticism which reflects this (at the time unpublished) thesis. The HOT office in Dar es Salaam, which was the site of this research, is now closed. Many of the Tanzanian staff have moved to the new OMDTZ (OpenMap Development Tanzania) organisation. Many of the Western HOT staff have left the organisation completely or moved to new roles. Does this invalidate the findings of this thesis? It is hoped not. It is welcomed that HOT has already begun a journey of change and that many of the issues and recommendations of this thesis are already being considered. Indeed, that the OSM and HOT communities have begun to address these issues is validation that they are important and necessary to address.

A great many challenges were facing HOT as it carried out its work, and many of these will continue to do so, despite efforts made to change these practices in the years following this research. One of the most significant issues that the organisation will need to address as it seeks to improve the work it carries out and to create more meaningful and equal relationships with the communities it works with is conflict around the *vision for* and *view of* the organization itself. In Dar es Salaam, there was seemingly no clear direction or consensus, even within the Tanzania team, as to what HOT should have been seeking to achieve. This was coupled with being pulled in different directions by donors and local communities, with the local community being left in the dark compared with other partners. This lack of consensus, drifting

priorities, and uncertainty about whom the beneficiaries of the projects were meant there was little chance of HOT achieving the aim of being participatory, representative, or anti-colonial.

Although strong leadership appeared to be helping hold everything together, the primary role of the leadership was related to keeping the global entity of HOT running and funded rather than informing the projects themselves. In Dar es Salaam, HOT staff found they had backed themselves into a corner in which leadership was obtained from outside the country, and HOT was structured in a way that withdrawing this leadership would decapitate the projects. Many of the key people interviewed for this thesis are either no longer employed by HOT or have moved elsewhere, suggesting a level of unhappiness with the work or organisation. This was occurring even before the formal closing of the Dar es Salaam office. This led to a short memory and lack of institutional knowledge, as well as driving constant innovation rather than consolidation of ideas and practice (Moore *et al*., 2016). HOT also continued to rely upon volunteers and underpaid staff even where these staff are highly skilled, which brings a level of fragility to the organization (Sieber, 2000)[44]. This combination meant that a kind of dependency on 'Western' experts was baked into the framework of the HOT systems in Tanzania. There are also issues of how data was collected, sorted, cleaned, processed, and mapped. Again, members of HOT from different stages in the process appear to have very different ideas about what the data is being used for, whom the data is for and the levels to which it is being cleaned and reorganized – potentially by people who are quite outside the project.

[44] It is understood that following the research period, efforts were undertaken to address the significant pay gaps between international and local staff.

HOT's legacy in Dar es Salaam is then a complex one. Certainly, the base maps of the city are vastly improved, and as noted in the results, are near complete. Furthermore, these maps have been used to create improvements for some in relation to transport and health. HOT also leaves behind OMDTZ, a Tanzanian-led and -run organisation that will continue the work started and which has already gained independent financing. It is perhaps hard to argue that HOT created direct harm in Tanzania, but it must also be said that its use of free labour, outside power structures, and pseudo-participatory models helped subjugate areas of the population while claiming to donors that they were creating perfect partnerships. HOT's greatest achievement, though, might be that it got so many things so wrong in so many places at the same time, including the complaints from Philippines, that these local communities who were connected through the HOT umbrella became empowered to rise up against HOT itself and call for more self-determination in mapping their own communities.

HOT's global influence is diminishing and being replaced with more fully locally led projects. How long HOT, as a global organisation, continues to exist remains to be seen, but it will likely be as long it can convince donors rather than communities of its worth. HOT's legacy might well be that the world no longer stands for 1980s and 1990s models of dependency and that the 2000s vision of how digital tools and mapping will change the world does not need a Western NGO to lead it.

7. Conclusion

Where, then, does this leave us? What does it mean for HOT in Dar es Salaam, or perhaps for its wider work? What might be said about mapping within the context of international development and the codification of local knowledge as part of the development agenda? Did the work of HOT move us closer to non-colonial, participatory mapping practices? Firstly, HOT has made a significant impact in terms of putting Dar es Salaam and other parts of Tanzania 'on the map'. In this respect, it has achieved one of its primary goals – and for some of its staff, their only goal. The literature, though, makes very clear that the act of mapping somebody does not equate with representation or participation and might even have negative consequences. Mapping, as a spatial practice, works in relation to neoliberalism, and the maps created by HOT also serve this end, allowing for increased government rationality and creating recognizable patterns into which policy and economic reform can be placed (Bryan, 2011). Mapping also creates the possibility of other neoliberal moves, such as the creation of new property regimes, which have very different political agendas from the work of HOT (Ferguson, 1994). Space is not a reflection of society. It is society. It is produced by human action, and this is always expressed and performed in the interests of the dominant class (Castells, 1983). HOT was formed on a utopian notion that maps and data could save lives and readdress imbalances in the world, and there is certainly an argument that this is something that is possible. Scott and Rajabifard (2015), for example, point to the successes of using geospatial information in achieving the Sustainable Development Goals. HOT thought is far from utopian, but for all the good they have achieved in Dar es Salaam, there is an equal and opposite set of issues. These are borne of three interwoven problems: firstly, institutional organization; secondly, a misunderstanding of what HOT is for, leading to

them pushing into a development sector without theoretical caution; and finally, a (wilful) lack of acknowledgement of the construction of space and power through mapping practices.

Looking to the first of these, what became very clear throughout this research is that HOT has significant internal conflicts. Many of the interviews reflected infighting, and vast differences of opinion about what HOT is and does were up front and centre in many of the discussions. This was further seen in the issues that arose in the Philippines and was acknowledged as an issue by Radford (2020b) at the Humanitarian OSM Summit in December 2020. There is a mismatch between the published aims of HOT and what its own staff, volunteers and locals believe it should be doing. This leads to a wide range of projects and actions, some of which appear disjointed and others that are implemented without wider consideration.

HOT also falls into many of the traps and issues identified by Moore *et al*. (2016) in their report on Humanitarian Information Management failures. Moore *et al*. (2016) point to a lack of leadership resulting in a lack of willingness to invest in technology or to be flexible with funding leading to organizational failure, HOT has almost the opposite issue of leadership that is too flexible, too reactionary and hardly reflective, simultaneously chasing new technology and new donor money but not considering longer-term impacts on the local population. As Dikeç (2001) reminds us, technological developments can ironically widen the digital divide.

These issues are one of the reasons that HOT lacks focus, and out of this lack of focus an organization that started with coordinating emergency remote mapping of crisis zones now finds itself embedding in development projects – not that any of the staff recognize it as such. This lack of engagement with the notion of development allows HOT to continue working in a reactionary fashion rather than taking deeper

consideration of the impacts of its work. A lack of engagement leads to HOT recreating many of the issues of development that have long been critiqued. Although many of these critiques have fallen short of designating a different way of doing development (Escobar, 1992), in some places, HOT has turned back the clock, recreating levels of dependency and colonialism that the development sector has long been struggling to shake. The 'discovery' of *Shina* 'boundaries' by HOT is a clear indication that they arrived in Dar es Salaam with very preconceived ideas of the map of the city, based upon cartographies of post-colonial landscapes (Sletto, 2009b). With local ideas and concepts, such as *Shina*, being forced into a Euro-centred formation of the city, carving hard lines across the urban environment and denoting who is where, the parallels in colonial mapping are stark (Quijano, 2007). Local knowledge was then transformed into a tool that serves the needs of HOT – the outsider (Kitchin *et al*., 2009). The theory suggests that those who miss out in this wrangling are the local population itself, the so-called beneficiaries of PGIS projects, such as those being run by HOT in Dar es Salaam. Beneficiaries, in this case, follow the definition put forward by Sieber (2006), being those who bring power and influence to a decision or program. Community mapping projects are about what people bring to the table. A beneficiary should not be only a passive recipient of a map.

The use of the word *discovery* and the *brownwashing* of publications and literature also point to HOT relying on stereotypes and tropes to create a sense of exotic achievement for the outside and a saviour complex internally. The projects are, for the most part, headed by white foreigners, with the local population presented as both backwards and innovative (Said, 1985; Kidd, 2016). This technology is pushed, seen as a driver of not just improved health and waterways but also economic growth (Pilling, 2018). Vast amounts of data are now collected about the local population, and

although they are made public, they are generally only useable by small parts of the population. Information has always been used for both exploitation as well as liberation, and HOT's sense that only the latter will come from their data is naïve at best. Information politics is always transformed into other struggles, and data becomes a tool and weapon in times of political antagonism (Jordan, 2015). In this respect, then, the tools of development being used and implemented by HOT in Dar es Salaam should be viewed as what Escobar (1992) termed Janus-faced. No amount of mapping will solve social issues, especially those outside the Euclidean space (Dobson, 1993). Although the push for more geographic data to aid in development is one that should perhaps be encouraged, there needs to be more critical reflection on development issues by those undertaking the task, else this collection of data can become nothing more than the creation of abnormalities – the poor, the malnourished, the illiterate, pregnant women, with the implication that these then need treatment, seeking to eradicate all problems (Escobar, 1992).

HOT is not the organization to shift this status quo or to build any kind of new, truly participatory technologies or working practices. Rather, HOT seems to enforce those old processes. There are now changes happening within HOT, such as the closing of country offices and the re-shifting of their focus to a model of solidarity rather than leading projects. These are very welcome moves, but they will not automatically free them from the confines of OSM and the influence of donors and neoliberalism. They might help fix their internal struggle, which could reduce the spectres of dependency. Yet, neo-colonialism and exploitative capitalism will continue to seep in through the gaps, undermining what is, by other measures, impressive mapping and data collection but not development or humanitarian work.

To understand maps, it will always be necessary to understand the cultures, technologies, and mechanics of how that map came to be (Kitchin *et al*., 2009). This will help reveal the maps contingencies and relationalities. Although this research acknowledges fully that no map can address social issues (Schuurman, 2000), it has sought to understand the mapping and technological practices of HOT through examining their work in Dar es Salaam. What has emerged is a picture of a highly complex situation in which the lofty aims of HOT have become obfuscated by confusion over their goals, objectives, and mission creep. This has led to colonial attitudes leaking into their work, their maps and their codification. It begins to manifest as dependency, and as HOT continues to innovate, it leaves the local population always one step behind, ensuring that HOT is still needed. To this end, the data-driven nature of the work also ensures that the project can never finish. There can be no 'after the map', and the citizens of Dar es Salaam have no choice now but to map again, to perpetuate their relationship with OSM and to constantly chase Western modernity, even if this has been imposed without thought for the local knowledge needed (Bryan, 2011).

Ultimately HOT, like many other organisations had failed to recognise the 'multiplicity of mapping practices and that maps themselves are semiotically stable only within particular spatial discourses indicate that the proper subject of analysis is not maps, in whatever form they might take, but the mapping practices that make them', Edney (2019: 44). Again, the institutional issues of low-paid and changing staff, colonial power structures and a lack of focus and coherent vision make critical reflection on the process of mapping a near impossibility for the organization. But this philosophical thought around maps is of huge importance, as it dictates the way we think about and produce maps. Further, it influences how we think about measuring

the world and the role of ethics, ideology and aesthetics, the fundamental aspects of mapping (Kitchin *et al*., 2009). As discussed at length in this thesis, maps are representational objects. They are based upon signs and symbolic activities. They are tools of place making, and thus they are always tools of power (Schlichtmann, 1985; Sletto, 2009b). HOT, like many mapping advocates, sees the map as a way of enabling people to be counted, to help make 'better' decisions using more qualitative measures, to promote data transparency and awareness (Sieber, 2006). But this notion of 'doing good' is tied heavily to the idea that information is a means of empowerment and lacks the nuances and theories that point to mapping and data as having been used for unwriting indigenous occupations of places, shaping public opinion in times of crisis and war and creating expectations for the proper ordering of the social and the natural. Maps put things and people in their place. Not only do they order the material world and make us visualize the *where*, but through their rhetorical power, they also simultaneously obscure the *why.* Most maps are mute about the social context and consequences of their own existence (Sletto, 2009b: 445).

There is no such thing as a 'true map', only representations of the world. All maps are partial and selective, and they all serve to tell a particular story. No amount of mapping of data will help the world's ills. That would be a descent to technological determinism (Hutchby, 2001). At the same time, technophobia is not a solution, as progressive use of technology can indeed enhance the human condition, and geographic data lies at the heart of much of this (Morozov, 2014; Rekha, 2016; Scott and Rajabifard, 2015). But caution is needed. The digital divide has not gone away. It has merely shifted (Deane, 2004). Neo-colonialism and neoliberalism operate in tandem to ensure the perpetuation of power, and overly simplified 'participatory' mapping exercises do little more than lend new legitimise to the status quo.

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Appendix I: Consolidating co-occurring codes based on code densities

Source	Relation	Target
Accessibility	is associated with	Ethics and social responsibility
Accessibility	is part of	Training
Accessibility	contradicts	Challenges
Accuracy	is part of	Data cleaning
Accuracy	is associated with	Technology
Accuracy	is a	Challenges
Achievements	is associated with	Uses of data
Achievements	contradicts	Challenges
Achievements	is associated with	Objectives of project
Data cleaning	is associated with	Data quality
Data collection	is part of	Data process
Data collection	is part of	View of HOT
Data collection	is associated with	Government & politics
Data process	is associated with	Training
Data quality	is a	Challenges
Donors, partners, or clients	is a	Challenges
Donors, partners, or clients	is associated with	Uses of data
Donors, partners, or clients	is associated with	Data collection
Ethics and social responsibility	is associated with	Uses of data
Ethics and social responsibility	is associated with	Donors, partners, or clients
Funds & money	is a	Challenges
Funds & money	is associated with	Donors, partners, or clients
Funds & money	is associated with	Vision for HOT
Government & politics	is cause of	Bias in data collection
Groups	is associated with	Data process
Groups	contradicts	Accuracy
Impacts of data usage	is associated with	Objectives of data
Inclusivity	is a	Ethics and social responsibility
Inclusivity	is associated with	Instrument design/mapping methodology
Language	is a	Challenges
Language	is associated with	Data collection
Leadership	is associated with	Donors, partners, or clients
Leadership	is a	Reasons for success
Leadership	is a	Challenges
Local community	is associated with	Uses of data
Local community	is associated with	Training
Local community	is a	Challenges
Local community	is associated with	Achievements
Local community	is associated with	Data collection
NGOs and other organizations	is associated with	Uses of data
NGOs and other organizations	is a	Challenges

Objectives of data	contradicts	Challenges
Objectives of project	is a	Challenges
Objectives of project	is associated with	Donors, partners, or clients
Profile of the interviewee	is associated with	Technology
Reasons for success	is cause of	Achievements
Recommendations	contradicts	Challenges
Recommendations	is associated with	Data quality
Recommendations	is associated with	Ethics and social responsibility
Staffing and operations	is a	Reasons for success
Students	is associated with	Data collection
Students	is part of	Local community
Students	is associated with	Training
Students	is associated with	Type of project
Students	is associated with	Achievements
Students	contradicts	Bias in data collection
Technology	is associated with	Objectives of project
Technology	is associated with	Training
Technology	is a	Challenges
Technology	is associated with	Accessibility
Technology	is associated with	Data collection
Technology	is associated with	Data cleaning
Training	contradicts	Challenges
Training	is part of	Staffing and operations
Training	is a	Ethics and social responsibility
Training	is associated with	Data collection
Uses of data	is associated with	Objectives of data
Uses of data	contradicts	Challenges
View of HOT	is associated with	Staffing and operations
View of HOT	is a	Challenges
View of HOT	is associated with	Donors, partners, or clients
Vision for HOT	is associated with	Uses of data
World Bank	is a	Donors, partners, or clients
World Bank	is associated with	Uses of data
World Bank	is associated with	Staffing and operations

Appendix II: Interview network diagrams from coded interviews in Atlas.ti

Figure 49: Achievements of HOT

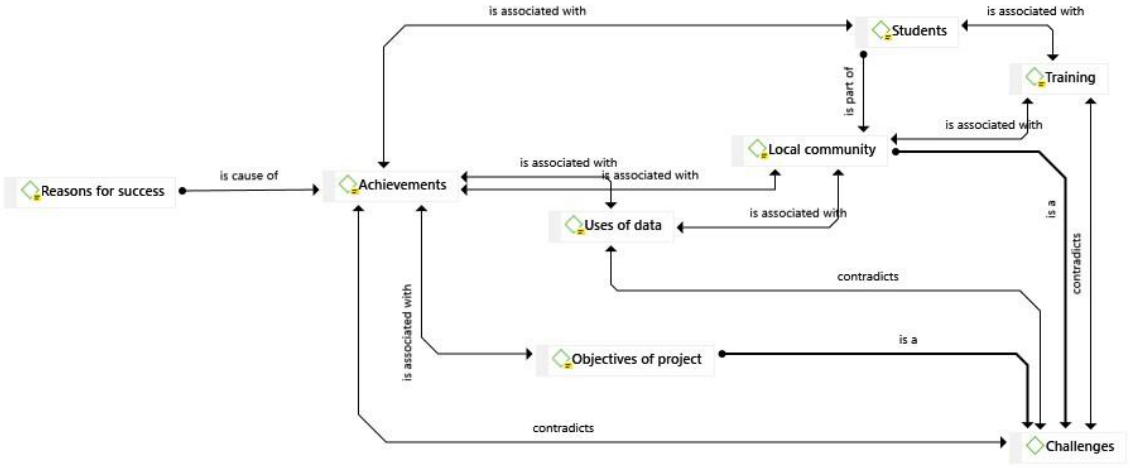

Figure 50: Donors, Partners, and Clients

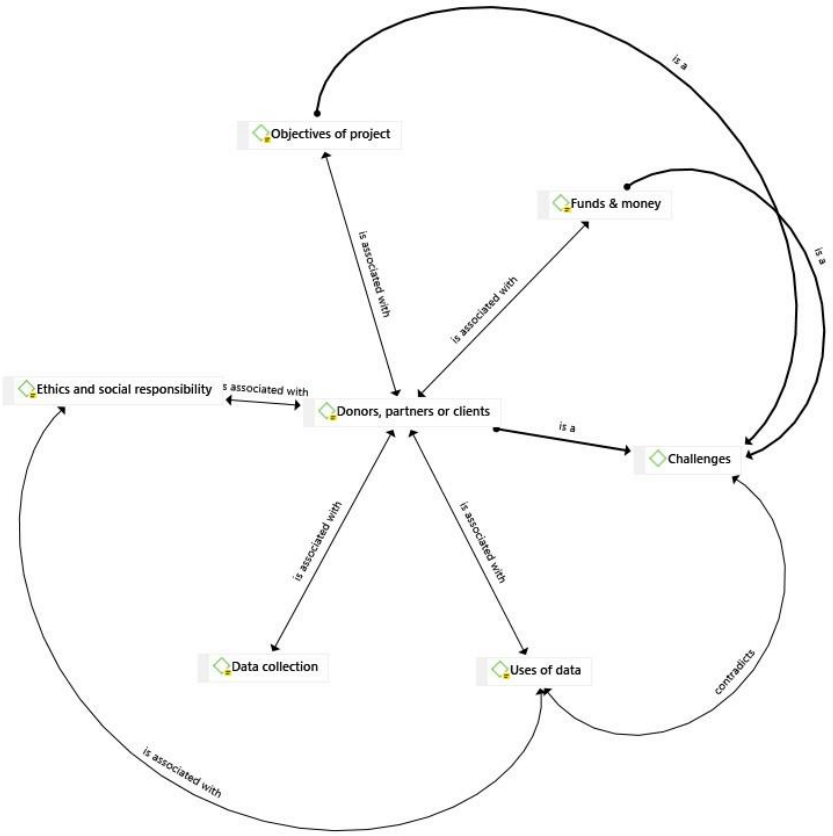

Figure 51: Ethics and Social Responsibility

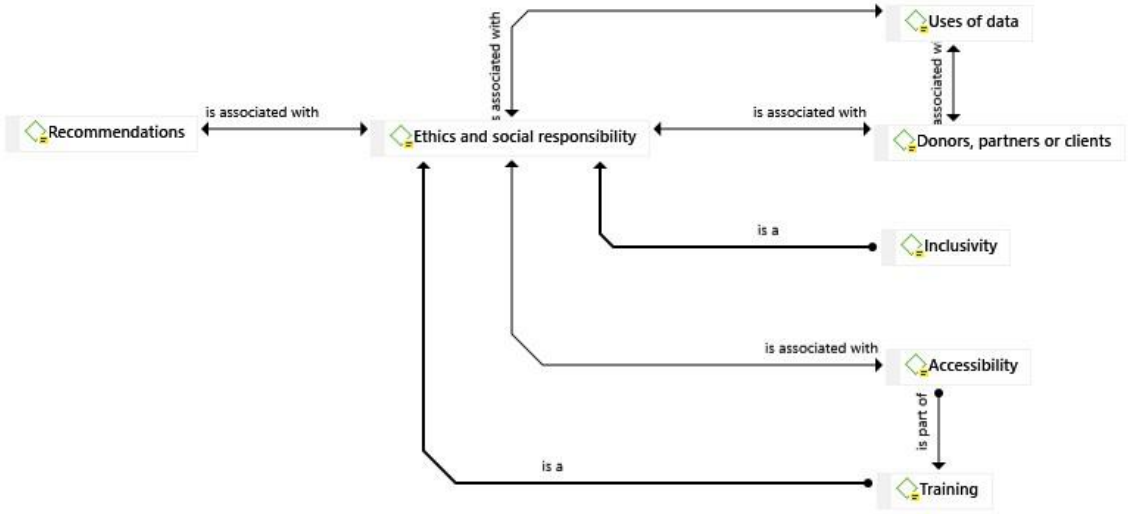

Figure 52: Reasons for Success

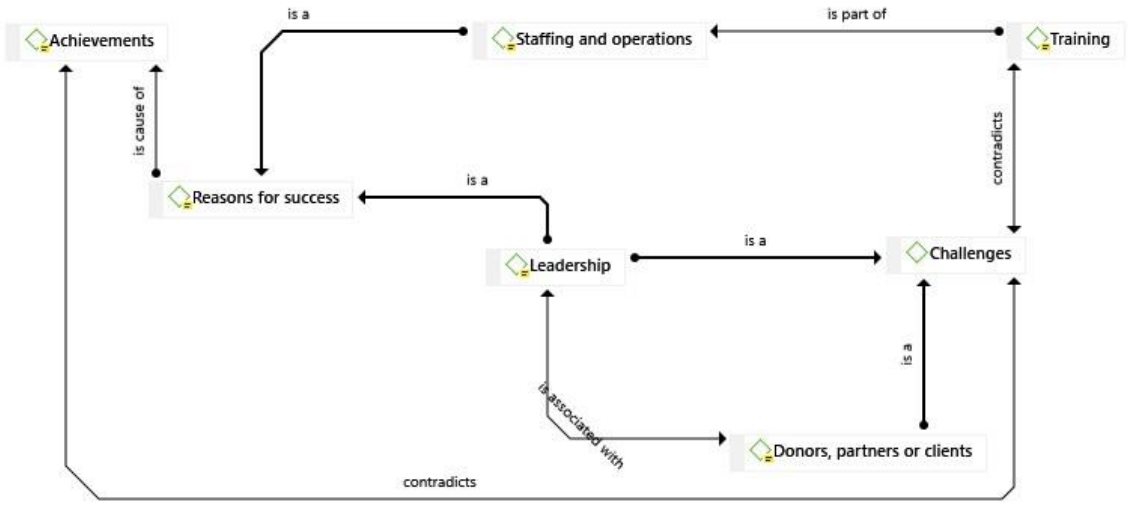

Figure 53: Uses of Data

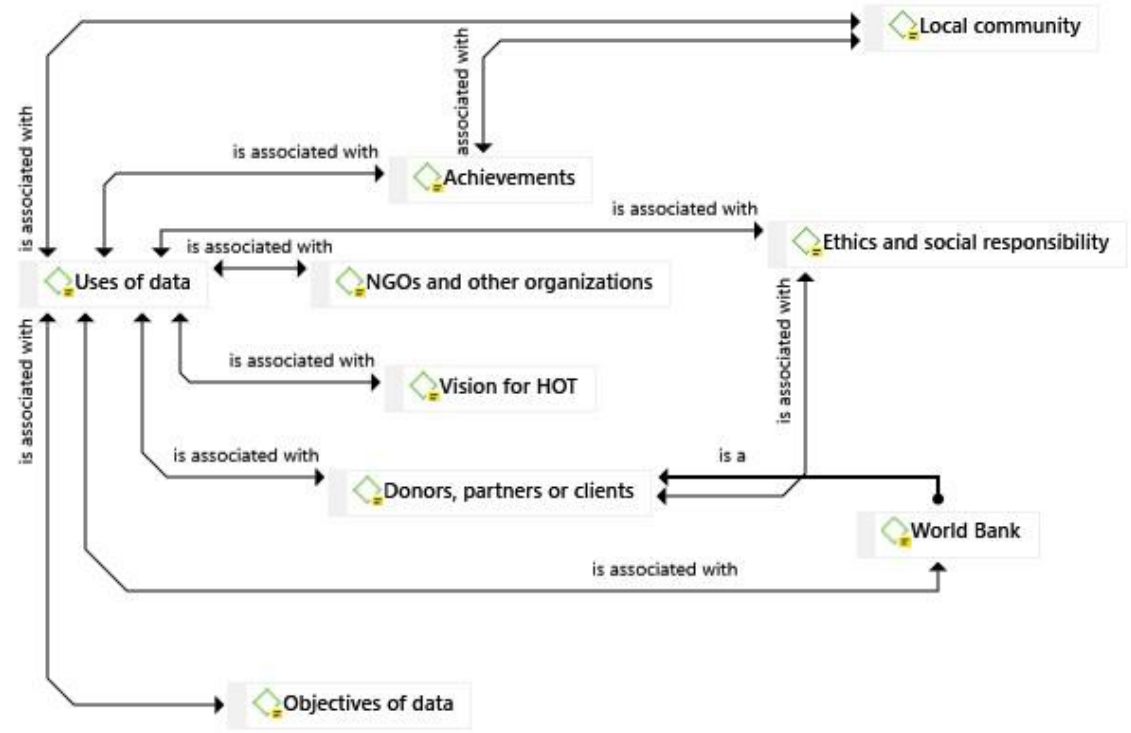

Figure 54: Data Processing

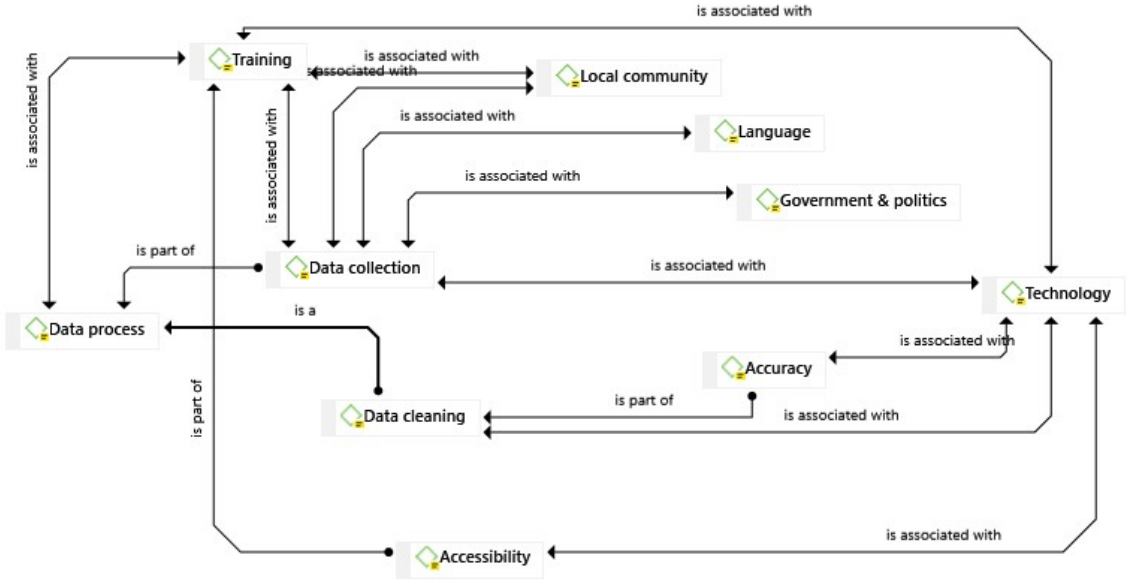

Figure 55: View of HOT

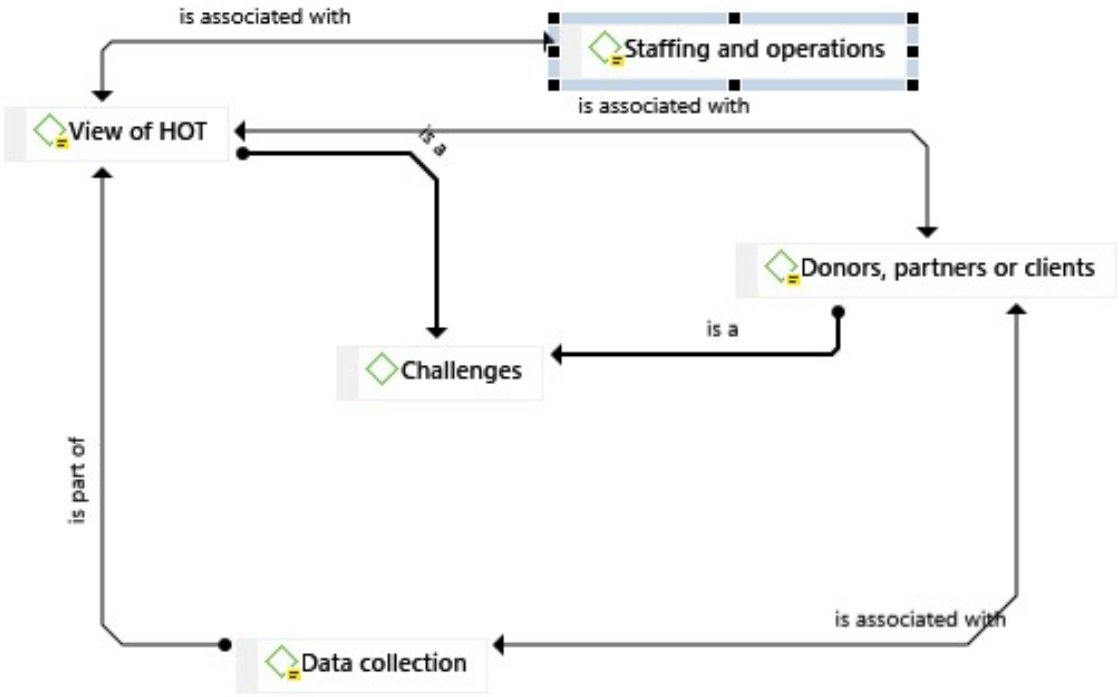

Figure 56: Vision for HOT

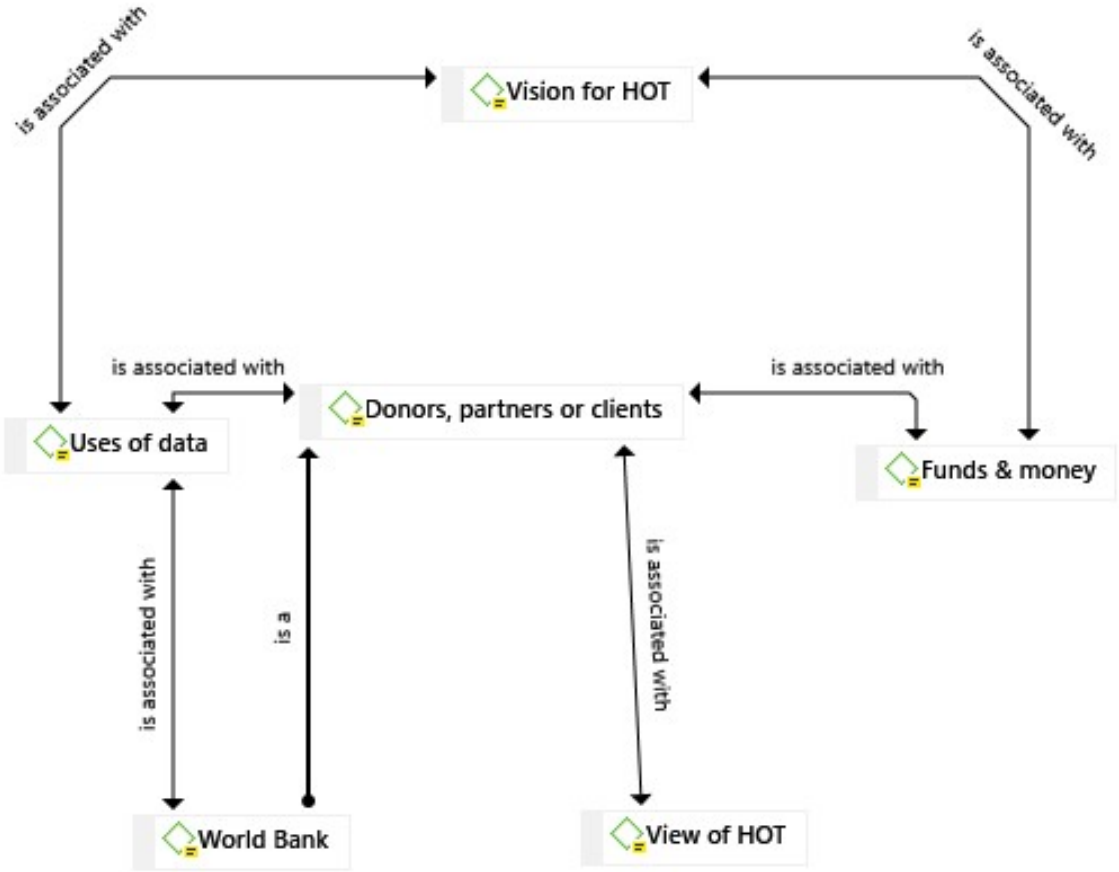

Figure 57: Challenges faced by HOT