Informal Green Infrastructure (IGI) and the Pursuit of Sustainable Development in Quito City

A thesis submitted to The University of Manchester for the degree of Doctor of Philosophy in the Faculty of Humanities

2019

Ignacio Loor

Department of Geography
School of Environment, Education, and Development

List of contents

Final word count: 71979

List of Tables

List of Figures

List of abbreviations

Agrupar	*Agricultura urbana participativa* [Urban participatory agriculture programme]
APQ	*Asociación de peatones de Quito* [Pedestrian association of Quito]
CAN	*Comunidad Andina de Naciones* [Andean Community of Nations]
CBD	Convention for biological diversity
CIBV	*Centros Infantiles del Buen Vivir* [Network of nurseries]
CNEL	*Corporación nacional de electricidad* [National corporation of electricity]
CONQUITO	*Agencia de promoción económica de Quito* [Agency for Quito's economic promotion]
CS	Centre-south
DTLR	Department for transport, local government and the regions
EEQ	*Empresa Eléctrica Quito* [Power distribution company for Quito]
EPMAPS	*Empresa pública metropolitana de agua potable y saneamiento* [Municipal water and sewage supply office]
EPMMOP	*Empresa pública metropolitana de movilidad y obras públicas* [Municipal office for mobility and public infrastructure]
EU	European Union
ES	Ecosystem services
GI	Green infrastructure
HC	Hypercentre
IGI	Informal green infrastructure
INEC	*Instituto nacional de estadísticas y censos* [Ecuadorian statistics institute]
INT	Interview
LID	Low impact development
MBT	Mechanical biological plants
MIDUVI	*Ministerio de desarrollo urbano y vivienda* [Ministry of urban development and housing]
MIES	*Ministerio de inclusión económica y social* [Ministry of social and economic inclusion of Ecuador]
N	North
NGO	Non-governmental organisation
NPO	Non-participatory observation
NSF	National Science Foundation
PO	Participatory observation
S	South
SDG	Sustainable development goal
SENAGUA	*Secretaría nacional del agua* [National secretariat for water]
SENESCYT	*Secretaría nacional de educación superior, ciencia y tecnología* [National secretariat of higher education, science, and technology]
SEPS	*Superintendencia de economía popular y solidaria* [Superintendence of popular and solidarity economy]
SLCP	Short-lived climate pollutants
TP	Transporte público [Public transport]
UCA	Urban community allotments
USD	US dollar

Abstract

This thesis develops an empirical conceptualisation of informal green infrastructure (IGI) intended to help anticipate the making and unmaking of green spaces in informal settlements. Using a case study of informal settlements in Quito, this study examines how people settled in these spaces use the neighbouring green landscape and unoccupied pieces of land to shape and develop IGIs as infrastructures of everyday life, which are meant to overcome some of their socio-spatial constraints. This study approaches infrastructure as both, a relational concept and a community of practice. Data collection involves a mix of qualitative methods, which includes archives analyses, transect walks, different formats of interviews, and observations. The study identifies community allotments, footpaths over and along neighbouring slopes and ravines, and pitches for football and *ecuavoley* as the most prevalent infrastructures that fit into the criteria of IGI. These are membership-based green spaces embedded in infrastructure networks of the city, which support different types of income generation locally and everyday access to urban amenities. Moreover, community allotments are used for food access, while also allow women to develop social capital that is useful to achieving daily household chores and connections in the city; footpaths provide connectivity to mobility infrastructures that allow settlers reach their daily destinations; and pitches enable leisure choices, while enhance the collective ability to mobilise resources and interventions toward improved informal settlements. Also, IGIs are developed and maintained by their users, are often altered to preserve their functionalities in harmony with changes in the city processes, and support urban transformation in still-green ways. Finally, IGIs' stakeholders are actors typically overlooked in the green space debates. For this study, policy makers and stakeholders involved in the city's food retailing, urban transportation, and sports leadership, have the ability to impact the production, transformation, and reproduction of IGIs.

Keywords: Green infrastructure, Informal settlements, Urban mobility, Urban agriculture, Urban pitches, Sustainable development

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement

i. The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the "Copyright") and s/he has given The University of Manchester certain rights to use such Copyright, including for administrative purposes.

ii. Copies of this thesis, either in full or in extracts, and whether in hard or electronic copy, may be made only in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.

iii. The ownership of certain Copyright, patents, designs, trademarks and other intellectual property (the "Intellectual Property") and any reproductions of copyright works in the thesis, for example graphs and tables ("Reproductions"), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.

iv. Further information on the conditions under which disclosure, publication and commercialization of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see http://documents.manchester.ac.uk/DocuInfo.aspx?DocID=24420), in any relevant Thesis restriction declarations deposited in the University Library, The University Library's regulations (see http://www.library.manchester.ac.uk/about/regulations/), and in The University's policy on Presentation of Theses.

Dedicatory

To my beloved wife, Lucia, who is always there to uplift my spirits in every single way, and my amazing children Ignacio and Sofia. They are the true sunshine of my life and the engine that keeps me moving forward.

To my father, Wagner, and the memory of my mother, Mariana. For their guidance, dedication, and encouragement to overcome obstacles and go far.

Acknowledgments

Writing this thesis has been my most challenging endeavour to date. None of this would have been possible without my supervisors, Professor James Evans and Dr Leandro Minuchin. They provided the knowledge, inspiration, mentoring, and friendship to make this journey happen in a big way, for which I could not be thankful enough.

I am grateful to the National Secretary of Higher Education, Science, and Technology of Ecuador, SENESCYT, for providing the financial means that made it possible to produce this thesis.

A special thanks to the participants in this research, particularly the residents of informal settlements in Quito. Their willingness to share their everyday lives was key for the completion of this research.

I am eternally grateful to my parents, Wagner and Mariana, and my brothers, Euler and Enrique. For always supporting me despite all the things that I have missed with you. And to my family in law, Piedad and Julio, for all the support throughout this journey. We owe them much of the time put into this thesis.

Finally, my absolute thanks to my beloved wife, Lucia, who also completed a PhD thesis at the same time, and my adored children Ignacio and Sofia. They make me feel the luckiest man on earth. Both our theses are outcomes of teamwork, mutual devotion, and collaboration at home and in the research field throughout the entire process. We have become an amazing team that is ready to take up new challenges in the next level.

Chapter 1

Green infrastructure as informally developed infrastructure: A necessary shift in stance

1.1. Introduction

This thesis develops a concept of green infrastructure (GI) that reflects the nuances of urban informality in the Global South, which I call Informal Green Infrastructure (IGI). This study establishes the concept of IGI as an aid to our understanding of how, despite the hardships of living in informal settlements and the unwillingness of government authorities to provide them with infrastructure, GI emerge, transform, and become essential in these spaces to many aspects of everyday life. The study questions whether the mainstream theories that inform GI research and practice are applicable in informal settlements and can comprehensively explain the making and unmaking of GI in this context. In addition, this thesis sets forth some considerations that can be helpful to increase and preserve greenspace stock in cities, and particularly in informal settlements.

A focus on informal settlements is important because they represent an escalating environmental and social challenge worldwide. Due to the concentration of people without proper access to basic infrastructure for water, electricity, mobility, and sanitation, informal settlements are generally recognised as spaces of environmental degradation and hotspots for diseases (Nzengya, 2018). This is particularly the case of cities in developing countries, where most of the urban growth is currently concentrated (Malakoff, Wigginton, Fahrenkamp-Uppenbrink, & Wible, 2016), and mainly in the form of informal settlements (Jain, Knieling, & Taubenböck, 2015). To give a flavour of the scale of the problem, according to the United Nations Human Settlements Programme (UN, 2018), 4.2 billion people live in cities today. That is 55 percent of the world population, within which 900 million live in informal settlements.

A key aspect of GI that this thesis addresses is that its conventional conceptualisation has been developed mainly in the context of the Global North (Lindley et al., 2018). It basically represents a city's greenspace with multifunctional properties and the ability to interconnect habitats, which is intended to simultaneously address economic growth, public well-being, and environmental preservation (Tzoulas et al., 2007). Also, the actors that interrelate toward GI's formation and transformation are typically government bodies, advocacy agents, and non-

governmental organisations (NGOs), for whom the challenge is often making policies that fuel pertinent investment (Mell, 2015). To mention a few examples, the concept of GI is often used to refer to city's parks, playgrounds, outdoors sports areas, farms, and corridors on river and canal banks.

Therefore, GI is often a concept embedded in well-structured institutional arrangements, whose materialisation depends on the mobilisation of formal regulatory practices of land use and funding. However, when it comes to similar greenspace arrangements in informal settlements, I argue that the concept of GI is unlikely to provide a thorough explanation of their actual existence and values, and thus, is of little relevance to attempt increased greenspace stock in this context. This is because their emergence and transformation are instead dependent on informal practices, which range from the occupation of land to the mobilisation of materials and labour.

Still, there may be instances when the differences between GI and IGI seem subtle, which are worth clarifying at this stage. Both may often look (and be used for) the same, but the values provided to their communities and users vary, and actually explain why approaches to resource mobilisation for maintenance and transformation differ widely between the two. It is likely, for instance, that a green corridor in the city shares some features with a footpath of an informal settlement. However, while in the core city such corridor may be providing a space for exercising, contemplating a green landscape or driving monetary value to neighbouring land properties, the footpath of the informal settlement may be the only way for their residents to connect with their ordinary spaces of income generation. In the end, both GI and IGI can serve economic interests, although in different ways and scales.

On the other hand, there is evidence that informality causes spatial transformation (Brenner & Schmid, 2014; Kamalipour & Dovey, 2017; Roy, 2004; Roy, 2016b). The most obvious example is precisely the process through which informal settlements change the landscape morphology. However, despite this, the nuances of urban informality have been largely overlooked in planning and policy-making. As put by Mukhija and Loukaitou-Sideris (2014) "planners… usually see informal activities at best as unorganised… and at worse as unlawful activities that should be stopped and prosecuted" (p. 1). This is problematic in light of an increasing population living in some condition of informality worldwide (UN-Habitat, 2016b), because it may fuel unanticipated forms of spatial transformation. Examples of possible transformation include the extension of cities' borders, increased traffic congestion, construction of house fencing, or unwanted odour and noise pollution.

Furthermore, previous studies have largely ignored the presence and role of greenspaces in such processes of spatial transformation. On this matter, this thesis intends to raise awareness that informality, despite the known limitations, also produces and maintains greenspaces, often with infrastructural features, and that the mechanisms that allow this to happen need to be reported and well understood. Conversely, the unawareness of the anticipated course of informality may hinder the effectiveness of GI and overall urban planning process. This is particularly worrisome in (rapidly) growing cities of the Global South, where informality is often assumed by urban dwellers as the new normal (Gaffikin & Perry, 2012; Lindell, 2010).

1.1.1. Why now?

This thesis is written at a time when the Sustainable Development Goals (SDGs) (UN, 2015) are the priority in most development agendas worldwide. In short, the SDGs outline a set of (globally common) challenges that need to be addressed by 2030 to (hopefully) achieve a better and sustainable future, in terms of social, environmental and economic outcomes, for all countries and peoples. Therefore, SDGs are meant to simultaneously tackle (among other things) issues of poverty, inequality, climate change, environmental degradation, peace, and justice.

Besides, given the rapid urbanisation trends – six in every ten people are expected to live in cities by 2030 (UNCTAD, 2017) – most of which is taking place in developing countries (Madon & Sahay, 2017), meeting the SDGs is increasingly an urban challenge (Zinkernagel, Evans, & Neij, 2018). In this regard, the concepts of informality and GI are central to sustainable development of cities for both in research and practice. It is widely argued that GI can address issues of climate change and environmental degradation more efficiently, and thus support the SDGs on climate action (Thorne et al., 2018). Likewise, informality is associated to inadequate and unsafe ways of living, and often constitutes a core concept in the SDGs relevant to poverty eradication.

Surprisingly though, the intersection between these two concepts – GI and informality – has been rarely investigated. This, despite the broad agreement that attaining the SDG agenda require identifying and leveraging on the synergies among the goals (Griggs, Nilsson, Stevance, & McCollum, 2017; Pradhan et al., 2017; Roberts, Andrei, Huq, & Flint, 2015). Nevertheless, the SDG 11, target 7 opens a line of research in that direction.

> 11.7. By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities (UN, 2015).

This SDG/target has partially inspired this study. The indicators for monitoring the progress towards the seventh target of SDG 11 demand that cities provide public access to safe, open, and green spaces for all their inhabitants. Moreover, leaving-no-one-behind, as committed to in the SDGs agenda, implies that the people that live in informal settlements cannot be ignored. Therefore, addressing this target in such a way that embraces informal settlements requires rethinking the concept of GI, because the tools that government bodies, advocacy agents, and NGOs have at hand to encourage pertinent investments are hardly adequate in this context. It is such shortage in literature about evidence-driven mechanisms of GI allocation and preservation in informal settlements that the concept of IGI introduced in this thesis promises to address.

1.1.2. Research aims and research questions

This thesis has four overarching aims, which are intended to help researchers, urban planners and policy makers to make cities greener and more sustainable: first, to provide a concept that helps to design policies and interventions that are context-specific of informal settlements. Second, to explain the triggers and mechanisms of resource mobilisation adopted for the production, maintenance, and transformation of IGIs. Third, to provide a new angle that casts light on the instances of informality and its organisation. And fourth, to register the process of spatial transformation in green ways caused by informality. The research questions addressing these aims are:

1. How are IGIs produced and maintained?
2. What benefits do IGIs provide and to whom?
3. What are the causes and mechanisms of IGIs transformation?

By addressing these research questions, beyond the overarching aims, this thesis will also explain the making and unmaking of IGIs and the organisation of informality. This knowledge is relevant to innovation in urban planning and policy making because it can lead to increased and well-preserved greenspace stock.

1.1.3. Thesis structure

This thesis is organised into eight chapters. The first chapter introduces the research topic, explains the reasons why this study is deemed opportune and necessary, presents the research aims and questions, and provides a summary of the content.

Chapter 2 lays out the theoretical dimensions of this thesis and pursues the state of knowledge from which to explore IGIs. The chapter begins by reviewing prominent definitions and mainstream perspectives used to study GI (e.g. climate change and ecosystem services) and argues that these fall short in providing theoretical resources that explain how IGIs emerge, sustain, and transform. In this regard, the chapter proposes that the concept of IGI should develop in such a way that reflects a link to infrastructural shortage and the condition of marginalisation in which informal settlements exist. Then, it attends to theories used in geography to investigate self-help infrastructure of informal settlements (e.g. entrepreneurialism, and informal infrastructures) and concludes that these are better suited to conceptualise IGI.

Chapter 3 provides a detailed description of the methodology and methods used in this thesis. A case study of (informal settlements in) Quito City is used to investigate IGIs. A single case study is appropriate for addressing exploratory research and provide in-depth understanding of complex relationships. Consistent with Yin (2009), Quito is an appropriate and revelatory case because its momentum enables to observe greenspace transformation simultaneously with growing informal urbanisation. Besides, in the context of informal settlements, Quito holds a documented history of neighbourhood organisation and civic innovation that serves as basis for analysis. The data collection uses ethnographic techniques. Borrowing elements from of Star and Ruhleder (1996) and Star (1999), this study approaches IGIs as infrastructures being both relational and communities of practice. Initial observations led to identify three forms of IGIs – community allotments, footpaths, and pitches – as prevalent in informal settlements, which were maintained and consistently used by neighbours. Then, the thesis examines these IGIs as elements embedded in everyday practices of seven informal settlements, each one providing additional insight to the aims of this research. Lastly, the analysis was organised in such a way that each chapter builds upon those before.

Chapter 4 provides the context for this study. It describes the physical, demographic and socio-political dimensions of informal settlements that add meaning

to the production, transformation, and disappearance of IGIs. These are the key processes that structure the analysis of data presented in the core chapters of this thesis. The chapter also highlights the difficulties in providing conventional urban infrastructure in informal settlements and reflects on the challenges and vulnerabilities that this form of (informal) urbanisation may bring to their residents and those in the core city. Examples of vulnerabilities are recurring floods, landslides, and presence of ashy haze from the surrounding (active) volcanoes.

Chapter 5 examines urban community allotments as IGIs. The ample literature available on urban agriculture is an opportunity for these allotments to be the first IGI examined and make of them a conceptual platform from which to study the other IGIs. The chapter emphasises the production stage of IGIs in more detail than the other two. Configuring allotments in this context often involves the (informal) occupation of land, which in some cases is meant for housing, and the mobilisation of resources in which participate actors and institutions from outside the informal settlements. These allotments are IGIs that enable income generation, access to food, and assistance exchange for informal settlements' inhabitants, particularly women. A bonus of this chapter is the (unintentional) description of gender differences in informal settlements' everyday life.

Chapter 6 examines footpaths as IGIs that enable everyday mobility in informal settlements. This chapter underlines the transformation and disappearance processes of IGIs and describes their relational configuration with formal urban processes. Footpaths transform and disappear in harmony with emerging land use patterns and transport practices in the core city. Also, this chapter highlights two important points to further understand informal settlements: first, it shows that informal settlements exist in intermittent periods of isolation, which are indeed addressed with the emergence and incremental transformation of footpaths; and second, it provides empirical support for the premise that well-preserved environments facilitate mobility.

Chapter 7 investigates football and *ecuavoley* pitches in informal settlements. This chapter examines, in further detail, the transformation process of IGIs, and how this process relates to the governmental power and informal organisation of the city. Pitches transform as they become platforms that connect networks of sports organisation with politicians and informal practices of income generation. Moreover, pitches elucidate two important aspects of IGIs: first, the mechanisms of resource mobilisation that lie at the heart of their emergence and incremental transformation;

and second, the significance of endowing informal settlements inhabitants with the ability to self-manage their territories and infrastructures.

Lastly, chapter 8 highlights the prominent arguments of this thesis, summarises the main findings and contributions, discusses the strengths and limitations, and identifies areas of future research. This chapter concludes that IGIs emerge and develop from practices already in place. Unlike GI, which, by and large, require financial and institutional resource mobilisation to be produced and maintained, IGIs are integrally linked to the social and economic life of the city. This is key for planning sustainable development in cities, especially when financial constraints are considered. Finally, it is my hope that at the end of the thesis, the reader will have gained: first, an understanding of how IGIs are different from the conventional conceptualisations of GI; second, an insight into the actors, institutions, and mechanisms involved in the processes of production, transformation, and disappearance of IGIs; and third, a new perspective from which to appreciate informality.

Chapter 2
Green infrastructure and urban informality: A literature review

2.1. Introduction

This chapter reviews the conceptual foundations of GI and investigates how GI research incorporates informal settlements, which is regarded as a constituent component of rapid urbanising cities in the Global South. Although informal settlements prevalence is associated with lower carbon footprint (Givens, 2015), increasing informal urbanisation is widely perceived as a key limitation for sustainable development, in part due to the processes of transformation in cities that informality fuels (Kamalipour & Dovey, 2017; Roy, 2004; Roy, 2016b). However, researchers have overlooked GI as an aspect of such transformation. In fact, previous studies have not addressed the link between GI and informal settlements in depth. Instead, the research agenda on the two concepts has grown in parallel and in different geographical settings, which suggests a theoretical need for empirical examination of this intersection.

GI located in informal settlements opens up several lines of inquiry. These include their course of emergence and the circumstances and mechanisms that allow their transformative development and prompt them to disappear. Equally important are the implications that GI has for the social, economic, and environmental dimensions of informal settlements and beyond. These are all themes that resonate with sustainable development research. The literature on ecosystem services (ES) and climate change have contributed partially to this issue by identifying how GI provides services and some resilience to urban marginalised communities in developing countries, particularly in Indian and sub-Saharan African cities. However, such literature has not provided theoretical resources that help planners and policy makers produce and preserve GI in informal settlements.

Alternatively, there is literature concerned with infrastructure development in the Global South, specifically in informal settlements, which can serve as a basic guideline to investigate GI in this context. As will be reviewed later, much of this literature frames infrastructure as incremental and inseparable from the everyday practices of which it is a part (McFarlane 2008; Silver 2017; Simone, 2008). Incremental means that infrastructure transforms through cumulative minor modification, while everyday practices refer to actions embedded in people's daily lives, which are often restricted to contextual conditioning. To my knowledge,

however, GI has not been investigated in detail through the incrementalism and everyday practices lenses so there is an opportunity for research in this domain, which can help urban planners and policy makers to make better informed decisions pertinent to city's sustainable development.

The rest of this chapter develops around the intersection of GI and informal settlements' infrastructure and is organised in six sections. The next section examines the use of GI in research and practice. This is an important first step because the various definitions and domains in which GI is used can lead to vague assumptions, which need to be avoided. The chapter will then go on to identifying prominent perspectives in GI research, such as climate change and ecosystem services. This is pertinent to appreciate the magnitude of the challenge in which GI research is immersed, and to highlight its importance in the informal settlement's context. The fourth section studies the informal settlement scenario, with particular attention to approaches used in geography to explain the development of their infrastructure. The fifth section investigates the processes of emergence, governance, and transformation of informal settlements' infrastructure. The fourth and fifth sections are important because they partially inform the methods used in the reminder of the thesis. The sixth section ties together themes about GI and informality and discusses the pertinence of using IGI as concept. Finally, a concluding section is presented, which highlights that the main perspectives used in GI research are little suitable in informal settlements and calls to rethink this concept in such a way that reflects the nuances of informality.

2.2. Green infrastructure: In search of a workable concept

This section delimits the dimensions of the GI concept intended for this study. The following lines examine the prominent definitions of GI and discuss what deserves the appellation of "green" and "infrastructure" for this case. The term GI was first used by Little (1990). His purpose was to conceptualise the use of greenways as an alternative to the conventional mobility infrastructure in cities of the United States, which would preserve and restore their natural landscapes. However, the concept of GI acquired different meanings in the course of its development in both functions and domains (Davies, MacFarlane, McGloin, & Roe, 2006), such that delimitation is essential before addressing its role in any context.

Wright (2011) argues that GI is a concept that is contested and ambiguous with at least two levels of meaning. The first level involves the communicated

thought, which embraces at least three core components: connectivity[1], multifunctionality[2], and "green"[3]. The inherent multi-functionality of GI, as opposed to mono-functionality of other categories of infrastructure, imposes a degree of complexity when seeking to understand its role. While other categories of infrastructure can be studied by tracing the practices that users engage in to achieve their distinctive functions, such as a water pipe for conducting water to households, GI has the capacity to act simultaneously over multiple human practices and across spatial scales (Ahern, 2007). For example, GI may simultaneously foster community engagement, connect and separate neighbourhoods, provide a platform for income generation, and enable a liveable ecosystem for the local fauna.

The second level concerns the practicality of the concept, which is often an arena for political tensions and ends up shaping the materialisation of GI. Thus, the concept is vaguely defined and often problematic for urban planning in that it allows the tailoring of features according to emerging demands and transitory political agendas. For example, GI may be put forward as a solution to air pollution in the city, but at the same time its promoters may hide the intention to increase neighbouring land value, which may lead to population displacement. Nonetheless, Wright (2011) argues that such vagueness is convenient as it makes it possible to adapt the concept to emerging issues linked to rapid urban expansion. The vagueness is better explained in the different conceptualisations of GI that environmental authorities use to guide practitioners across territories. Below are three examples:

The UK based Landscape Institute (2013, p. 2) offers a working definition of GI that is perhaps one of the most influential in the European urban planning context:

> GI is the network of natural and semi-natural features, green spaces, rivers and lakes that intersperse and connect villages, towns and cities. Individually, these elements are GI assets, and the roles that these assets play are GI functions… GI assets range from country parks, lakes and woodlands to urban interventions such as green roofs and street trees. They can be specific sites at the local level or broader environmental

[1] Connectivity refers to enabling movement of wildlife and biodiversity, and people across neighbourhoods.

[2] Multifunctionality concerns environmental protection, climate change mitigation and adaptation, providing a setting for culture, sports and recreation, and social inclusion.

[3] Green generally refers to the provision of assets that are green in colour (green space, wetlands, and woodlands) and to the provision of more "environmental friendly" infrastructure (renewable energy, public transport).

> features at the landscape scale within and between rural and urban areas such as wetlands, moors and mountain ranges.

The United States Environmental Protection Agency (USEPA, 2013) integrates alternative engineered systems as imaginable forms of GI:

> GI is an adaptable term used to describe an array of products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services.

The National Science Foundation (NSF) workshop in Auckland, New Zealand (NSF, 2012, p. 5) produced a definition that emphasises infrastructural services:

> GI refers to natural and engineered ecological systems which integrate with the built environment to provide the widest possible range of ecological, community and infrastructure services.

The GI definitions quoted above support the accusation of vagueness and elasticity against the term, as well as its adaptability to the interests of stakeholders. Thus, in some cases GI refers exclusively to natural-biological systems, and in other cases GI could also refer to engineered artefacts. A challenge of working with vague GI concepts is that they may limit the practicality of the conventional analytical lenses. Next, the concepts of green and infrastructure will be addressed individually to give a broader idea of the many constructions of GI that may be produced.

2.2.1. What does green mean?

The wide range of meanings surrounding what constitutes "green" gives substantial weight to the ambiguity of the GI concept. Prothero and Fitchett (2000) reflect that, since "green" epitomises environmental matters and concerns about ecological deterioration, the term is exploited to construct a perception of things and actions being harmonious with ecosystems. Hence, green could refer to natural resources that are green in colour, such as green space, wetlands, and woodlands, as much as it could indicate technologies that are claimed to be environmentally-friendly (Mell, 2008; Wright, 2011). For example, Meyboom (2009) illustrated this argument with a case of a reduced carbon emission transport infrastructure in Canada advertised as green. The author's criticism was that the impact of such infrastructure on the

neighbouring landscape, including species migration, increased noise and reduced quality of public space, is overlooked in the greening claim.

On the other hand, Kusno (2011) highlights the political dimension of green by claiming that the term is used widely as a mechanism of power. This is because green discourses are often easy to mobilise and adapt to different groups' struggles, on which basis it is said that democracy is enhanced. Concerning informal settlements, green is often used as the opposite to grey. This is possibly because researchers in this context have focused greatly on the issue of green landscapes versus squatting[4] (Güneralp et al., 2013; Seto, Güneralp, & Hutyra, 2012). In sum, there is no single explanation of what it takes to be labelled as green. This study uses green to refer to unbuilt areas, from a static rather than a dynamic viewpoint; not as a process but as a condition embodied in bare soils and somewhat vegetated and permeable spaces.

2.2.2. Defining infrastructure

Infrastructure, on the other hand, is also a term with multiple technical and popular meanings. It has roots in the Latin prefix *infra* meaning below, and the suffix *structura* meaning the way in which a system is put together. The term was at first used to refer to the supporting structure that permits a system to operate (Oldfield, 2010). Yet, infrastructure is a vast concept with no definitive definition, and indeed "the aspiration to unequivocal specification can be seen as itself conceptually and empirically counter-productive" (Harvey, Jensen, & Morita, 2016, p. 5).

For Rankin (2009, p. 62), "infrastructure involves a separation of human activity into two categories: the supportive and the supported". Thus, infrastructures exist inseparably from the practices they support. The modern conceptualisation, furthermore, inserts the conditionality of being a networked system. However, Rankin (2009) makes a distinction between network and infrastructure. As a network, a system is defined by the connections through which things are enabled to circulate, whereas as infrastructure, it gains meaning in its support serving to facilitate consistent practices. Larkin (2013) and McFarlane (2008a) attach to the view of infrastructure as being both physical networks and systems that support consistent practices. As networks, infrastructures enable the circulation of people, goods, ideas,

[4] Squatting can be defined, in these contexts, as living in – or using otherwise – a dwelling without the consent of the owner.

waste, water, energy and, in general, the movement of matter. As supportive to practices, they state that infrastructures pattern the place experience.

Nonetheless, infrastructures are not merely objects. Typically, infrastructure is assumed to comprise systems of concrete, pipes, and wires that admit circulation, which in the end allow more efficient use of individuals' energy (Simone, 2004b). Yet, infrastructure is also a blend of knowledge, people, relations and contexts. Take Star (1999) for instance. She addresses infrastructure as a practice that is learned through membership: "We began to see infrastructure as part of human organisation, and as problematic as any other… The taken-for-grantedness of artefacts and organisational arrangements is a *sine qua non* of membership in a community of practice" (p. 381). Thus, defining infrastructure is not limited to the physical arrangements, but equally important are the norms, values, and practices shared by a community that give meaning to such objects.

Furthermore, some conceptualisations of infrastructure transcend the physical and material characteristics, which reveals another source of ambiguity in its definition. For instance, Schuurman, De Marez, and Ballon (2013) make a distinction between material and immaterial infrastructure in their explanation of the configurations that support open innovation practices in firms as living labs. Immaterial infrastructure refers to the non-tangible assets of the living lab, such as end users, stakeholders and the environment. Also, Habermas (1973, p. 647) in his attempt to clarify the mechanisms through which the state supplants market failures in capitalist societies, used the term "immaterial infrastructure" to refer to the intangible drivers that motivate practices of innovation.

Similarly, Star and Ruhleder (1996) noted that infrastructure is a relational concept in the sense that the everyday activity of one person functions as infrastructure for another. Simone (2004b) elaborated the relational aspect of infrastructures further by introducing the notion of people as infrastructure. This notion conceptualises how people's routinised activities embody an enabling platform for resource and knowledge circulation, which support everyday activities of others often neglected in terms of access to means of formal institutions.

Having said this, can immaterial infrastructure be green? Djellal and Gallouj (2016) argue that innovation trajectories are increasingly reliant on systems in the process of dematerialisation. Innovations are linked to growing availability of big data and are becoming more environmentally friendly as these processes arguably adopt cleaner and more energy-efficient technologies. Immaterial is here assumed to be

green by its very nature. Nonetheless, this "green view" of immateriality leaves aside concerns about e-waste, which are well argued from the perspectives of digital geographies. Yet, revisiting Wright (2011), the perspective of materiality is an example of how conceptual ambiguity enables the articulation of alternative categories of GI.

On the other hand, infrastructures embrace a political dimension which mediates society, "between nature and the social, and between humans and the object world… it could be shaped in order to induce humans to behave normally" and to impact human practices (Joyce, 2003, p. 71). In the urban context, infrastructures directly intervene in the way of dwelling and promote changes in urban culture and economics (Harvey, 2008). Thus, infrastructures are highly instrumental in governing communities, and simultaneously give rise to their own form of self-governing institutions. Infrastructure analysis, consequently, may reveal ideologies and practices of political judiciousness. Concerning this, Graham and McFarlane (2014) argue that little has been done in terms of examining everyday infrastructural experience, including how actions enable or disable dwellers to connect with issues of governance. For the case of GI, the way in which it induces human behaviour and facilitates everyday practices, and how it reveals political rationality and ideology, has not been comprehensively explored.

Furthermore, infrastructures are often governed in complex ways and in contexts of continual tensions among stakeholders (Guy, Marvin, & Medd, 2011). Such tensions often arise from users' experiences, practices of operation, maintenance, expansion and innovation (Torrance, 2009). The diversity across stakeholders suggests that the purposes that single infrastructures serve are often dissimilar, whereby the differences in the perceived values across users are sources of tension that influence how the infrastructure's development and transformation is sustained (Wilcox et al., 2014). A reason why values that infrastructures deliver might be perceived as imbalanced is perhaps that the approach to planning is mainly top-down, meaning that little consideration is given to the input of occupants of spaces where infrastructures emerge and develop.

In sum, infrastructures gain meaning via the value delivered to the everyday lives of their users. Under this principle, physical arrangements, whether built or unbuilt, need to support routinised practices in order to be considered infrastructures. This reflection is key in the study of GI, as it demands thoughtful examination before accepting a given piece of vegetation-covered unbuilt land as infrastructure.

Moreover, for the sake of the present study, delimitation of the GI concept is essential to evaluating the different theoretical perspectives that help us to understand its role in informal settlements.

2.2.3. GI typologies

As suggested above, balancing the different and often conflicting demands for infrastructures is a key challenge for urban planners. Thus, deciding on suitable GI typologies, understood as the constituent features and attributes, brings with it the task of fitting GI into complex territorial cultural, and normative frameworks, and simultaneously balancing the interests of both people and nature (Borelli, Chen, Conigliaro, & Salbitano, 2015). Thus, within the top-down paradigm of GI provision, decision makers often find themselves in dilemmas concerning types and values of GI to address demands across at least ecosystems, politicians, business owners and city dwellers.

Douglas (2012, p. 388) provides some examples that are suitable to narrow the focus in this review: “Urban green infrastructure comprises managed and natural green areas such as remnant woodlands; gardens; formal parks; green corridors such as bridleways, railway and road verges and cycle paths; golf courses; sports grounds; street trees; green roofs; waterways and lakes with surrounding vegetation; and derelict land with invasive plants, both privately and publicly owned.” However, while these examples give a broad idea of GI, on the other hand, they do little in terms of facilitating patterns for typification purposes of GI.

Prominent attempts to abstract GI typologies are the GI planning guide for European cities (Davies et al., 2006), Ahern's (1995) categorisation of greenways, and the UK's Department for Transport, Local Government and the Regions (DTLR) categorisation of green space (Dunnett, Swanwick, & Woolley, 2002). Table 2.1 shows DTLR’s typologies of green space grouped into four categories: amenity, functional, semi-natural and linear green space. Although this typology provides some guidance for labelling a space as green, it provides little insight for infrastructure planning. In this regard, challenges persist in attempting infrastructural purposes that integrate multiple interests optimally.

Table 2.1. A typology of urban green space

	Main types of Green Space	Examples
Amenity green space	Recreational green space	Parks and gardens
		Informal recreation areas
		Outdoors sports areas
		Play areas
	Incidental green space	Housing green space
		Other incidental green space
	Private green space	Domestic garden
Functional green space	Productive green space	Remnant farmland
		City farms
		Allotments
	Burial grounds	Cemeteries
		Churchyards
	Institutional grounds	School grounds
		Other institutional grounds
Semi-natural habitats	Wetland	Open running water
		March, fen
	Woodland	Deciduous woodland
		Coniferous woodland
		Mixed woodland
	Other habitats	Moor/Heath
		Grassland
		Disturbed Ground
	Linear green space	River and canal banks
		Transport corridors (road, rail…)
		Other linear features (cliffs)

Source: UK's DTLR (Dunnett et al., 2002, p. 29)

Naumann et al. (2011) suggest a GI analysis tool by putting together a set of concepts that are pertinent and conventional in GI planning (see Table 2.2). This is relevant to this literature review because it gives a flavour of the complexities involved in typifying GI. These concepts are grouped in seven parameters: 1) objectives that GI pursue; 2) actions that involve issues of GI; 3) constitutive elements

of GI; 4) ecosystems covered by GI; 5) sectors affected by GI; 6) settings in which GI is established; and 7) the spatial scale of GI. This typology seems to suggest that planning for GI would involve attempting an optimal combination of this assortment of concepts. However, the changing nature of the social and environmental dynamics in which GI is intertwined leave doubts as to how practical it is to attempt narrowly-defined typologies of GI.

Table 2.2. Typology of initiatives involving GI

Parameter	Subcategories	Definition/Examples
Objectives	Water quality and supply	Includes actions on water purification and regulation – wetland restoration
	Climate change adaptation and mitigation	Enhancing ecosystem resilience and functioning – natural food management, coastal protection
	Biodiversity conservation	Combating biodiversity loss by protecting and improving areas of high conservation value
	Soil protection	Afforestation, sustainable agriculture, land management
	Human health/well-being	Establishing recreational areas, installing green roofs for local climate and air quality
	Sustainable management	Ecological quality and permeability of landscapes
Actions involved	Identification, mapping, planning	Assess existing GI features to identify how it needs to improve
	Legal designation of GI areas	Protection under the Natura 2000 network, national parks, reserves
	Maintenance/protection	Maintaining protected areas, corridors and stepping stones
	Restoration	Converting an ecosystem back to its natural state
	Creating new GI components	Creation of connectivity features, green roofs, parks
	Research/analysis	Increase knowledge of species, habitat or ecosystem functions

Parameter	Subcategories	Definition/Examples
	Increase public awareness	Involvement of local stakeholders and populations
GI Elements	Protected areas	Large areas of healthy and functioning ecosystem with minimal intervention
	Restoration zones	Increased foraging areas, new areas of habitat for ecosystem services, conversion of habitats
	Sustainable use areas	Areas of improved ecological quality and permeability of landscape
	Green urban features	Parks, gardens, grassy verges, green walls, green roofs
	Natural connectivity features	Ecological corridors (wildlife strips), stepping stones, riparian river vegetation
	Artificial connectivity features	Designed to assist species movement (green bridges) – compensation measures to recreate a physical connection lost
	Multifunctional zones	Balance of various uses: access, recreation, biodiversity, public access
Ecosystem covered	Arable land, coast, forest, grassland, river, wetland	
Sectors affected	Agriculture, built environment, energy, fisheries, forestry, health, tourism, transport	
Setting	Rural, urban, suburban, combined	
Geographic scale	Local, regional, national, transnational	

Source: Naumann et al. (2011, pp. 17-18)

Young, Zanders, Lieberknecht, and Fassman-Beck (2014) argue that known typologies of GI are ineffective as tools for planning because they treat the intrinsic social and ecological processes separately. Further, to plan GI effectively, it is vital to understand what Freudenburg, Frickel, and Gramling (1995) term their "conjoint constitution": the fact that social and ecological spheres not only influence but co-create each other. Therefore, typologies should embrace both social and ecological dynamics to better assist planners in shaping GI policies or, as Mell (2013) suggested,

connecting human interactions and ecological processes "is central to the success of GI investments" (p. 30).

Finally, debates on GI typologies have failed to address GI located in informal settlements. GI is primarily conceived as a theme embedded in planning, which tends to neglect the existence and socio-environmental importance of bottom-up and spontaneously emergent GI. Furthermore, the arguments of Young et al. (2014) and Mell (2013) suggest the need to understand GI from alternative perspectives in relation to its subsistence across settings. This in part justifies the effort to approach GI through the everyday practices lens in informal settlements, as presented in this study.

2.3. The research agenda of GI in the urban context

This section reviews the theoretical arguments that have influenced research and practice pertinent to GI allocation in cities. Also, while this study concentrates mainly on the urban context of the Global South, some issues actually remain of global concern. For example, recent cuts in greenspace municipal budgets in the United Kingdom (Moore, 2017) suggest that GI policies urgently need to be revised and re-thought also in the Global North. In reference to this, Mell (2013) and Wright (2011) agree that despite the existence of ecologically informed guiding principles and best practices (Lennon & Scott, 2014; Young, 2011), confusion remains as to what GI is and how it should be planned. Moreover, Mell (2013) claims that city stakeholders often exploit this ambiguity to guide investments, which suggests GI as a tool that is simultaneously suitable for sustainable development discourse and useful for a mere reconfiguration of "business as usual".

Nonetheless, it seems that GI approaches would be a more popular choice among taxpayers and city residents to bear the emerging challenges of increasing urbanisation. Regarding this, Kitha and Lyth (2011) argue that GI-based "soft engineering" approaches to facing climate change are more cost-effective than their grey counterparts, although GI's multi-functional nature demands complex management methodologies to maximise its value. Likewise, evidence from cities in low-income countries suggests that green space initiatives have the potential to mobilise voluntary actions and the involvement of stakeholders, for which, arguably, GI solutions would be less politically controversial than grey ones (Cilliers, Cilliers, Lubbe, & Siebert, 2013). Nevertheless, by and large, GI tends to remain framed as simply the opposite to grey.

Using a Web of Science search of green infrastructure and sustainable development in urban studies publications in the English language, I pursued the perspectives most often used when examining GI to guide this section. Below, I will refer to three of these perspectives: The first focuses on climate change impact on cities and the contribution of GI to mitigation and the socio-ecological process of adaptation. A second cluster of theoretical approaches is based on the ecosystem services that urban GI delivers. The third approach views GI as an alternative to grey human-made infrastructure and initiatives self-styled as nature-based solutions to support growing urban expansion. Also, to provide some contrast, this section includes a fourth perspective that looks into limitations and counter-effects of GI. Equally, these four perspectives often mediate the growing literature addressing GI in the Global South.

2.3.1. Climate change

As evidence of climate change in cities continues to evolve for the positions of both advocates and detractors, GI gains ground among researchers and urban planners as a platform for adopting actions aiming toward mitigation and adaptation paths. Mitigation and adaptation have been ubiquitous terms in the climate change literature and discourse since Wilbanks et al. (2003), and constitute the guiding lights for strategy formulation attempting to dealing with the pertinent vulnerabilities. Mitigation refers to actions and policies intended to slow the pace of climate change, such as limiting concentrations of greenhouse gases in the atmosphere (Ruhl, 2010). Adaptation, on the other hand, pertains to modifications of socio-ecological systems impelled to face the anticipated impacts of climate change (Moser & Ekstrom, 2010). An overlapping approach to adaptation is disaster risk reduction (DRR), which similarly relies on prediction of unfortunate natural events (Wisner, Gaillard, & Kelman, 2012). However, the high level of uncertainty and contestation relating to climate change's pace and its anticipated impacts make it problematic for planners to elaborate practical risk profiles and decide on the most suitable approaches to mitigation and adaptation (Dessai & Hulme, 2007; Simone, 2016). Nonetheless, within this uncertain milieu, the relevant role of GI remains an important subject of inquiry.

The growing body of research that links climate change mitigation with GI is by and large centred on the ability to achieve carbon sequestration. This refers to processes of carbon dioxide capture and removal from the atmosphere for transfer and

storage in the terrestrial biosphere and oceans (Brandão et al., 2013; Paustian, 2014). A number of studies support the view that urban GI incorporates carbon reservoirs. For instance, Velasco and Roth (2010) describe how GI supports capture and storage of CO_2 into the soil. Similarly, Brantley, Hagler, Deshmukh, and Baldauf (2014) provide evidence that roadside vegetation in cities absorb a kind of black carbon called short-lived climate pollutants (SLCPs) – see Booth and Bellouin (2015) on climate impact of black carbon. In the context of informal settlements, Martin, Clift, Christie, and Druckman (2014) and Simon (2016) agree in that urban agriculture is an important contributor to carbon sequestration. Consequently, studies on climate change mitigation are giving ground to activism and initiatives such as "farming the slums" (Buzby, 2013) in post-industrial cities in the United States, and "green my favela" (Rekow, 2017) in informal settlements of Brazil.

Psychology researchers have addressed the ability of climate change discourses to mobilise citizens' engagement. Demuzere et al. (2014, p. 110) explain how individuals engage in climate change mitigating actions and become "stewards of their environment". Krasny and Tidball (2009) frame such activist behaviours as practices of environmental stewardship. These involve, for instance, community gardening, park management or watershed restoration. In reference to this, Swim et al. (2009) suggest that urban GI may stimulate capacity for coping with climate change challenges by fighting the obstacles of ignorance and uncertainty. Thus, interacting with GI allows individuals to gain awareness of cause and effect relationships between their everyday practices and their environment. As a result, high carbon-emitting practices are being shifted to, for instance, alternatives to car use, and reduced waste generation and energy consumption. However, although mitigation behaviours may explain the makings of GI to some degree, these have not been examined in the context of informal settlements, in which everyday survival needs may offset this particular feature of GI as experienced in better-served urban spaces.

On the climate change adaptation side, a number of studies have explored the ability of urban GI to cope with increasingly frequent events of high temperatures, flooding, water pollution, and concerns of food security. Resilience and disaster planning are key concepts surrounding adaptation debates. Among policy makers and actors involved in shaping urban agendas, resilience is often understood as "the mechanism by which to achieve sustainability" (Evans, 2011, p. 1), and has progressively become an entrenched socio-ecological governance framework.

Concerning rising temperatures, Gill, Handley, Ennos, and Pauleit (2007) explain how the alteration of vegetation-covered land into impervious surface cover inhibits evaporative cooling and evapotranspiration. “Evaporative cooling refers to the cooling effect produced when water evaporates… Evaporative cooling is the most inexpensive way to cool air” (Bucklin et al., 2009, p. 2). Alexandri and Jones (2008), Sheweka and Mohamed (2012), and Gill et al. (2007) agree that GI promotes evapotranspiration – water extracted by plants and lost through the leaves’ stomata (Seneviratne, 2012) – and acts as a heat sink in urban spaces. Besides thermal comfort, evapotranspiration is also associated with reduced energy consumption patterns – linked to acclimatisation system use – (Yu & Hien, 2006), which essentially relates to mitigation from cuts in carbon production. Thus, GI provides adaptation capabilities to anticipated increased temperatures associated with climate change.

Also, ample evidence suggests that GI alleviates flooding in cities by regulating storm water runoff. Managing water runoff is a classic challenge that is linked to unfortunate incidents of flooding (Demuzere et al., 2014), soil erosion/low fertility (Ventura, Rossi Pisa, & Vicari, 2004), degradation of watersheds (Pank, 2013), and groundwater pollution (Djémin et al., 2016; Farrugia, Hudson, & McCulloch, 2013). Water runoff on impervious surfaces occurs significantly faster than on vegetation-covered surfaces (Jacobson, 2011), for which flooding is more likely to affect urbanised areas. Armson, Stringer, and Ennos (2013) compared the runoff properties of asphalt surfaces, urban tree plots and amenity grass such as that used in urban parks and sports turf (e.g. football pitches). Their study revealed that 1) asphalt surfaces are by far the highest enablers of water runoff; 2) trees reduce nearly 60% of asphalt’s water runoff; and 3) amenity grass captures almost all of the rainfall with minimum water runoff. These findings are key in planning for flooding control in cities.

Lastly, GI is believed to support long-term food security in urban areas. It is anticipated that climate change will affect the output of crops and consequently divert the dynamics of global food markets, for which urban agriculture is under consideration as a source of food resilience (Barthel & Isendahl, 2013; Barthel, Parker, & Ernstson, 2015). Thus, urban agriculture is regarded as a climate change adaptation strategy since it reduces local dependence on global food systems. In this context, the literature is packed with records of supply crises due to past economic, political and environmental calamities. However, although issues of food security

seem crucial within climate change debates, these have been little addressed in the urban planning literature. Exceptionally, Allen, Dávila, and Hofmann (2006) studied farming practices in informal settlements in Latin America. In the absence of sanitation infrastructures, farmers tend to use wastewater for irrigation. So, attempts to promote food security may be counterbalanced by health hazards to farmers and consumers.

A limitation of the climate change literature, for the purposes of the present study, is that it falls short in delivering a broad understanding of the practices and structures in which GI is embedded. Instead, it seems to conceive of GI as something autonomous and unrelated to wider systems. Thus, although recent studies address the vulnerability of GI to changing climate (Lemieux & Scott, 2005; Reynolds et al., 2018), it provides little support for planning toward the aim of GI continuous allocation in informal settlements. Moreover, the degree to which dwellers of informal settlements are motivated to produce and sustain GI based on concerns of climate change mitigation and adaptation is unknown. Likewise, the question of how to integrate informal settlement dwellers into a broad citywide policy of mitigation and adaptation remains underexplored in climate change research. This is a key aspect of the present research since it underpins the need for integrating informality in the pursuit of sustainability.

2.3.2. Ecosystem services

Following the United Nations Earth Summit 1992 in Rio de Janeiro (Brazil), the Convention for Biological Diversity (CBD) – a multilateral legal instrument for the conservation and sustainable use of biological diversity – entered into force (CBD, 1993). CBD looks at biodiversity – comprising "living organisms from all sources… …and the ecological complexes of which they are part" (CBD, n.d.) – as "resources" that "are vital to humanity's economic and social development". From this perspective, the narrative of biodiversity seems conceptually reduced to a kind of capital stock, which, as in economic theory, has to be strategically managed to yield production and benefits, and its renewability and functionality protected for the sake of future generations. Thus, biodiversity is here conceived of as a pond of living resources that need to be conveniently blended to continuously and endlessly provide services and produce goods.

Ecosystem services (ES) research emerged within this paradigm – the relationship between the so-called natural capital and economic/human wellbeing – as

a ground-breaking approach to fuel biodiversity conservation (Hartje, Klaphake, & Schliep, 2003; Maltby, 2000). “ES are the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life” (Daily, 1997, p. 3). An important aspect that is common to both concepts, CBD and ES, is the detachment of humans from the biodiversity realm. In fact, ES are regarded as being produced by biodiversity and used by humans (Bennett, Peterson, & Gordon, 2009; Naidoo et al., 2008).

When linking ES to GI, much of the relevant literature deals with the question of how to balance the supply and demand of ES in urban spaces. Regarding this, Karimzadegan et al. (2007) discuss the view that rational choice of natural landscape use should be contingent on what ES are provided and what those services are worth. This suggests that identifying and valuing services are integral tasks in GI research through the ES lens. From this widely shared point of view, various ES assessment frameworks have emerged – see the comparative study on ES assessment methods by Bagstad, Semmens, Waage, and Winthrop (2013) – looking to serve as decision support tools for green space planning, targeting particularly the urban realm.

Prominent examples of ES assessment for urban GI are studies on the role of urban green spaces in public health (Tzoulas et al., 2007), in the social and ecological health of the city (Lovell & Taylor, 2013), and in simultaneous multiple functions involving ecological, social and economic dimensions of cities (Hansen & Pauleit, 2014). However, the vast majority of findings have been achieved in the urban context of the Global North, while analogous studies are rare in the cities of the Global South (Lindley et al., 2018).

Adegun (2017) surveyed the literature pertinent to African cities on a set of benefits that GI delivers to urban marginalised communities. Using the guidelines of The Economics of Ecosystems and Biodiversity initiative (TEEB, 2007) as analytical tool, Adegun (2017) concludes that GI supplies provisioning ecosystem services, including raw water (Phukan, 2014; Vollmer & Grêt-Regamey, 2013), food and medicinal plants (Davoren, 2009), and timber for construction and cooking/heating fuel (Epule, Peng, Lepage, & Chen, 2014). Likewise, regulatory services such as temperature moderation (Oluwafeyikemi & Julie, 2015), natural drainage of rainwater (Douglas, 2016) and windstorm sheltering (Adelekan, 2012) were attributed to the green surroundings. Regarding socio-cultural services, the green landscape was found to be functional in accommodating religious ceremonies and recreational activities (Nagendra, Sudhira, Katti, & Schewenius, 2013). Lastly, in terms of supporting

services, green landscape permits accumulation of groundwater (O'Farrell, Anderson, Le Maitre, & Holmes, 2012), which is highly relevant for communities that depend on water wells for their everyday needs. Although these observations account for some everyday practices pertinent to GI, the emphasis is mainly placed on the ways in which marginalised communities consume their surrounding green landscapes, rather than on how these are produced and maintained. In this regard, these studies give little support to informing aims of long-term GI allocation in informal settlements.

On the criticism side, Nelson (2015) argues that the ES perspective is at the core of current conservation discourses and environmental management practices, especially within the capitalist paradigm. Alongside Nelson, other scholars find this problematic in that attempts to monetise the value of nature by viewing it as infrastructure with capacity to provide services to humans, far from promoting conservation, may be creating new paradigms of economic growth and dynamics of displacement (Finewood, 2016; Frischmann, 2008; Sullivan, 2013). This suggests that, at some point, the endowment of GI, similar to other natural resources such as oil or gold on a wider scale, may become a key mediator in the allocation of financial resources in the urban sphere, which would foster a new era of imbalanced accumulation (Nelson, 2015). Conversely, monetising ecosystem services may facilitate the mobilisation of financial resources for GI development (Diehl, 2018). However, this is still a little-explored dimension of GI, around which there is abundant room for further research looking into survival practices that would break out as a result of environment's monetisation, including possible displacement dynamics similar to what Harvey (2004) calls "accumulation by dispossession".

From the studies that investigate GI in informal settlements through the lens of ES, two common features are observed. 1) The assumption that the vegetation-covered landscapes surrounding informal settlements and inner green patches function as infrastructure. About this, while meeting infrastructural needs is clearly conceivable in cases such as agricultural practices, other forms of vegetation-covered surfaces are less obvious and seem to have gained their infrastructure status after being assessed on their ability to be consumed. 2) The tendency to only focus on the identification of actual ecosystem services rather than correspondingly appraising their value. This latter suggests that determining the (monetary) worthiness of GI in informal settlements might be distinctively problematic. Thus, the suitability of ES as a theoretical concept to attempt rational choices of natural landscape use in informal settlements needs further exploration.

2.3.3. An alternative to grey infrastructure

The last ten years have seen a growing body of research examining GI as a potential substitute for conventional grey infrastructure in cities. Literature that looks into "green alternatives" is submerged in the dualism green versus grey. Initiatives such as nature-based solutions, sustainable neighbourhoods, eco-cities and green urbanism have devoted considerable attention to infrastructural alternatives that lead to increased green space inventories. Nevertheless, the ecological value of these initiatives remains vaguely defined, which makes it challenging for planners framing their work in a top-down delivery context to formulate better targeted GI policies. Yet, arguments that support these infrastructural initiatives in the political realm relate to the ability to achieving sustainability, environmental preservation and ecological restoration.

One of the aims of GI most often reported – as an alternative to traditional grey – is to achieve improved urban drainage of wastewater and storm water runoff (Bell, 2018). To date there has been agreement among scholars that GI offers substantial runoff control by infiltration (Foster, Lowe, & Winkelman, 2011; Shafiquea & Kima, 2017). Nonetheless, the drainage ability of GI is not a new finding. McHarg (1971) introduced the notion of "design with nature" as an approach to meet infrastructural needs by assembling artefacts from elements of the wild landscape. His ideas inspired different approaches to infrastructure design such as the low impact development (LID) initiative (Barlow, Burrill, & Nolfi, 1977), which strives to minimise the cost of stormwater management while observing ecological criteria of infrastructure (Fletcher et al., 2015). LID acts as stormwater treatment devices, which are materialised in the form of green roofs and swales normally situated at the source of runoff.

Also, returning to the origins of GI as greenways (Little, 1990), the ability of GI to function as an alternative to grey infrastructure of mobility is generally acknowledged. Substantial evidence demonstrates that GI impacts the propensity of dwellers to walk and cycle for utilitarian purposes (Jenkins, 2017). Further, quality of physical environment, along with proximity to destination and connectivity (route directness) are key determinants of the choice between using motorised or non-motorised transport (Saelens, Sallis, & Frank, 2003). Therefore, a well-preserved landscape is highly instrumental to enhancement of route directness (Bélanger, 2015).

Examples of initiatives presented as suitable replacement of grey with green infrastructure are: 1) Urban regeneration within the European Union (EU) Community Strategic Guidelines 2007–2013, which proposes the use of green space as bio-infrastructure with the ability to integrate social and environmental objectives (Rotondo, 2011); 2) Eco-cities, which propose the use of green space networks and green corridors to preserve adjacent natural environment, enhance mobility, promote recreational spaces, and serve as a mechanism of controlling sprawl (Register, 2006); and 3) Green urbanism, which promotes the use of rooftop gardens, green roofs, greening courtyards, open underground stream canals and bicycle paths as alternatives to compensate for loss of green space and for ecological restoration (Beatley, 2012).

The above initiatives regard urban GI as a low-cost and ecological approach to address issues of mobility, drainage, energy production and waste management. Grey infrastructure traditionally tackles these everyday needs of cities, including streets and pavements, sewerage, and incinerators and mechanical biological plants (MBT) for waste treatment. However, the pertinence of these initiatives to tackling informal settlements is not yet obvious. For example, these approaches have not addressed how users engage in long-term preservation of GI, nor in systemic enablers of preservation. Thus, in relation to informal settlements, these concepts remain framed both away from the intrinsic social processes and within the state-centric top-down paradigm. Nonetheless, the low cost and ecological compatibility arguments make a strong case for further work in this direction.

Considering the opposite perspective, the study of Hungerford and Moussa (2016) focuses on the institutional restraints on implementing GI in marginalised communities, which sheds some light on the underlying factors driving the imbalanced distribution of GI. In their case study of trees in Niamey city, Niger, they found access to water, issues of land ownership and soil compaction to be the main restrictions on growing trees at the household scale in poor neighbourhoods. The study concluded that local governance of water provision and intervention in the practices of inherited land division would favour planting and maintaining trees in urban peripheral communities. This example gives an indication of both networked and institutional natures of GI allocation and maintenance issues in informal settlements.

On the critical side, lastly, Finewood (2016) warns that greening informal settlements, even with the voluntary participation of their inhabitants, does not necessarily guarantee gains in health terms as well as democracy and social inclusion.

Instead, it could actually result in the currently imbalanced urban landscape enduring, but with greener cover, also referred by some scholars as beautification or aestheticisation of poverty (Álvarez-Rivadulla & Bocarejo, 2014; Roy, 2004; Salgado, 2003). According to Taylor and de Loë (2012), this phenomenon takes place when participants of marginalised groups are little aware of their own and others' positions regarding the deliverables of GI, so that in the end their perspectives and expectations tend to be undermined to the favour of dominant political agendas.

2.3.4. Limitations and counter effects of GI

Most studies on urban GI have focused on its beneficial effects in cities, including a few cases of informal settlements. Very few have actually focused on limitations and negative experiences as reported by settlement dwellers (Lindley et al., 2018). Research on "ecosystem disservices" has partly addressed this issue (von Döhren & Haase, 2015). To cite a few examples, for Gruebner et al. (2014) and Douglas (2012), vegetation patches in informal settlements, which are frequently blended with solid domestic waste – due to often deficient solid waste collection services – foster the threat of infectious disease and can contribute to the incidence of diarrhoea. These patches are also associated with a persistent prevalence of malaria in degraded neighbourhoods of African and Asian cities. Likewise, in informal settlements it is common to find agricultural allotments that are irrigated with wastewater, which poses severe health risks to both producers and consumers (Allen et al., 2006). These examples constitute evidence that GI in informal settlements is not always a desirable feature, and in some cases, is actually connected to detriment to livelihoods. Table 2.3 shows some of the most common problems associated with urban GI in informal settlements as reported in the literature identified by Adegun (2018).

Table 2.3 Limitations of GI in informal settlements

Limitation	Reference
Attack from animals inhabiting vegetation (e.g. snakes, scorpion)	Butchart, Kruger, and Lekoba (2000)
Disease from mosquitoes in wetlands	Reis et al. (2008)
Flooding from wetland overflow	Rashid, Hunt, and Haider (2007)
Breaking up of pavements due to tree root expansion	Lyytimäki, Petersen, Normander, and Bezák (2008)
Decreased visibility because of trees or thick vegetation	Escobedo, Kroeger, and Wagner (2011)
Presence of miscreants and criminal activity	Jorgensen and Anthopoulou (2007)
Idiosyncrasies leading to fright, irritation, or allergies	Lyytimäki and Sipilä (2009)

The cases identified above suggest that, in some circumstances, GI impacts negatively upon a range of everyday practices and situations in informal settlements. Moreover, the inherent fears and threats constitute types of social barrier that impede sustainable provision of GI. In this regard, having awareness of the circumstances that turn GI into a limitation is paramount to attempts at sound interventions. Therefore, identifying what constitutes quality of GI, as perceived by informal settlements dwellers, is key when promoting sustainable approaches to GI production and preservation.

In sum, GI research to date has not yet achieved the definition of clear policy approaches that secure its production and long-term preservation in cities, and particularly in informal settlements. Attempting to provide GI in informal settlements without clear indications of viable preservation carries the risk of falling into what Roy (2004) calls “aestheticisation of poverty”, which is an undesirable temporary situation in which built environment improvement does not equal a concurrent upgrade in people’s capacities. In this regard, research has focused heavily on how GI supports urban living by consumption, rather than how it can co-exist with social dynamics and be sustainably secured. It is likely that a Global North bias in the interpretation of GI, which features both in the consistent researchers’ detachment of humans from the realm of biodiversity and a seemingly persistent top-down viewpoint in their research, in which sustainability – and GI as integral part of it – is something

that needs to be provided vertically, would serve to impede the discernment of gaps in research that support the emergence of the most suitable approaches to securing GI allocation.

2.4. The informal settlement scenario

This section reviews the literature describing the spatial context of urban informality and explores links with GI. McFarlane and Vasudevan (2014) approach informality as a range of practices performed through means aside from institutionalised alternatives, which people deploy across the urban territory to achieve their daily routines. These informal practices shape processes of urban transformation (Coutard & Rutherford, 2015; Roy, 2004, 2005), which is a key relationship that guides this research. This view transcends the conventional territorial and labour dimensions of informality, as it envisages cities as processes of dwelling through "multiple mobilities shaped by uneven relations of power" (McFarlane & Vasudevan, 2014, p. 257). This suggests that relations of power divide formal from informal practices of dwelling in cities.

However, although a considerable body of literature assumes informality as the opposite of formality, this research subscribes to the view that informality is indeed a process of urbanisation. Regarding this, Roy (2005) argues that informality is often conceptualised between discourses of crisis (Hall & Pfeiffer, 2000) and heroism (De Soto, 2000), which result from isolation of global capitalism while obscuring the role and failures of the state. She conceptualises informality, instead, as a mode of urbanisation, not a dichotomy but a continuum. Thus, informality is actually about alternative practices of urban dwellers that are little able to use institutionalised means to accomplish their everyday needs.

Thus, informal practices encompass activities and associations that "are not prescribed by law", or that are not governed by formal rules (Högenauer, 2014, p. 322). For example, informal urban transport refers to unregulated mobility services provided to those with inadequate mobility options, usually the poor (Roy, 2009). Informal electricity supply, similarly, occur in unmetered neighbours, usually away from main roads, through clandestine wire connections (Glover, 2011; Sengers & Raven, 2014). Likewise, access to water for the poor, rarely potable, is achieved through informal practices such as hand pumps and wells or water vending trucks (Bhattacharyya, 2014). These examples of informal practices have in common their reliance on supplying systems that are often governed aside from formal legislative

bodies and mandates (Akbar, Minnery, van Horen, & Smith, 2007; Wutich, Beresford, & Carvajal, 2016). McFarlane and Vasudevan (2014) refer to these systems as "infrastructure of makeshift urbanism" and "informal infrastructures of the poor" (p. 257-258).

2.4.1. Informal settlements infrastructure

Urban groups marginalised from the formal economy and power structures of society are often the engine propelling the development of infrastructures that shape urban transformation in the form of informal settlements. This category of infrastructure is not a static entity, but rather a dynamic process of evolution that results from the continuous inputs of the people that rely on them (McFarlane & Vasudevan, 2014). Such a process of continuous development partly shapes the view of Simone (2008, p. 28) of cities as being "platforms for trajectories of incrementalism". Incrementalism epitomises the capacity of poor dwellers to make use of their abilities and resources to progressively make their space functional. Such functionality is often achieved by interconnecting with other infrastructures. It likewise gives shape to and reinforces the imbalanced urban social landscapes and economies. From this view, informal settlements' infrastructures are often forms of incremental infrastructure (Roy, 2016b; Silver, 2014, 2017).

The analysis of practices that shape infrastructures in informal settlements has availed to inform urban planners across domains. For example, Silver (2017) researched the practices of the urban poor to secure sustained service provision of energy to their households in order to inform attempts to re-wire Accra city, Ghana. Similarly, Ahlers, Cleaver, Rusca, and Schwartz (2014) and Peloso and Morinville (2014) focused on the everyday practices of negotiating access to water, to gain understanding of how non-state actors of water co-production interact with users and policy makers to control water supply. Also, McFarlane (2008a) studied the sanitation practices in informal settlements surrounding Bombay city, India, to problematise public health issues that challenge its aim of becoming a "global city". Thus, focusing on informal practices may deliver perspectives valuable for innovation in the urban governance of energy, water and public health. In the same way, the present study seeks domains of urban governance that may benefit from understanding practices made possible by GI for informal settlements dwellers.

The following lines review approaches used in geography to explain the development of informal settlements' infrastructure – also referred as self-help,

community-led and makeshift infrastructure: assemblage, entrepreneurialism, and informal infrastructure. These approaches can help to identify elements involved and ways in which informal settlements infrastructures are produced, reproduced, transformed and obliterated. Assemblage thinking is a popular approach used in Human Geography and often used as a window into social and material elements and relationships involved in infrastructure production and transformation (Müller & Schurr, 2016). Likewise, entrepreneurialism, which has been popular as analytical lens since Harvey (1989), looks into agents and practices of resource mobilisation for infrastructure production (Bottema & Bush, 2012). Lastly, informal infrastructures as a perspective focuses on the extra-institutional nature of processes and transactions involved in these categories of infrastructure.

2.4.1.1. Assemblage

The concept of assemblage suggests a temporal co-functioning of heterogeneous autonomous elements, which are arranged to create human agencies. Deleuze and Parnet (1987, p. 69) defined assemblage as "a multiplicity which is made up of many heterogeneous terms and which establishes liaisons, relations between them". These multiple elements are not only material objects, but also include, for instance, policies, discourses or environmental dynamics. The temporal feature means that assemblages are in constant transformation and would be unlikely to become a finished whole. Lancione and McFarlane (2016) approximate this feature as an endless practice of infrastructural becoming. To illustrate how assemblages materialise, the literature often refers to the process of informal housing or squatting (Dovey, 2012; Vasudevan, 2015). To squat involves improvising and the ability to occupy a space and erect a shelter overnight by combining materials and objects available at hand. The stabilisation of assemblages in space and their configuration is known as territorialisation (McCann, 2011); in contrast, deterritorialising forces refer to the triggers of destabilisation and removal of components that temporarily form unity.

Assemblages are often linked to the concept of agency in the literature. Agency refers to the ability of individuals and communities to access resources regarded as necessary for everyday life (Deci & Ryan, 1995; Heron, 2008). In reference to infrastructure, agency constitutes a core notion in two moments: at formation time, which focuses on the ability of dwellers to gather materials and arrange infrastructure; and at access to amenities time, which relates to how the

infrastructure enhances ability to access needs. Thus, agency becomes a function of the assemblage. Assemblage thinking provides a window into the elements involved in dynamics of configuration and re-configuration of infrastructures in informal settlements, as well as the capabilities that these infrastructures deliver to marginalised communities (Baker & McGuirk, 2017).

However, assemblage thinking alone manifests some limitations. The assemblage perspective hardly addresses issues of power and privilege distribution when creating agencies as well as hierarchies, priorities, and conflicts within its elements. Ignoring these issues is problematic as they may relate to instability and in some cases deterritorialisation (McCann, 2011; McFarlane, 2011). Furthermore, Robinson and Roy (2016) warn that assemblages emerge from multiple interconnections and elements of urbanisation that may have different flows across contexts. In this regard, Gibbs (2014) criticises that assemblage research tends to assume that its constituting elements "behave in an uniform and homogeneous manner across time and space" (p. 4). Therefore, criticism suggests that the features of assemblages are as fluctuating as each of the elements that compose them, which places some burden on planning within this paradigm. In sum, assemblage thinking helps to expose the elements transitorily entangled in an object or infrastructure. Nonetheless, this perspective gives little assistance to understanding how these elements were brought together, which is relevant for planning intervention.

2.4.1.2. Entrepreneurialism

Urban entrepreneurialism is a framework for city management that views the urban space from a business perspective (Jessop, 1993). This concept basically covers approaches of urban authorities and dominant stakeholders to branding the city and promoting economic growth by persuading investors to allocate funds and resources locally (Jonas, McCann, & Thomas, 2015). For the entrepreneurial regime, therefore, the governance of the city is centred on the stimulation of its competitive advantage to attract investment, which is frequently realised in the form of tax-liberalision and dynamics of demunicipalisation (MacLeod, 2002). Lopes de Souza (2006) criticises that this type of regime typically ends up regulating the production of space in favour of private companies and developers. Then, gated communities, shopping malls, and subsidised corporate plazas often represent urban entrepreneurialism, which in turn fuel the exclusion of people who are not integrated in the target markets of the so-called development process (Flusty, 2001).

McFarlane (2012) extended the entrepreneurialism concept to the urban informality realm by putting forward the potential of the poor as entrepreneurial subjects. McFarlane emphasises the role of civil society groups in the co-production of entrepreneurialism, which is often embodied in community development projects and the allocation of provisional infrastructure for a wide range of purposes. Co-producing entrepreneurialism in this context involves enacting knowledge and practices, whereby informal settlements are taken as "socio-spatial laboratories where new financial instruments are tested" (Minuchin, 2016, p. 903). Thus, this form of urban entrepreneurialism may be seen as an analogous and alternative approach to shape competitive advantage to attract investment in cities, typically in the form of local development programmes funded by development agencies (e.g. regional development banks) (Stein, 2001; Stein & Castillo, 2005; Tomlinson, 2015). Hence, from this perspective of entrepreneurialism, informal settlements compete to attract highly fought-over funds usually intended to address issues such as extreme poverty, women's empowerment, or environmental restoration in developing countries.

However, the notion of entrepreneurialism applied to the informal settlements context, as put by Roy (2011), goes beyond the engagement of non-governmental organisations (NGOs) or policy consultants. Many local dwellers work in organisations that operate within informal settlements, either from home or in the shared open space (Nijman, 2010). Consequently, the assembly of infrastructure in informal settlements is likewise often linked to economic production systems that emerge within their boundaries. Despite the wide criticism that entrepreneurialism has received as an urban governance approach, however, as an analytical perspective this provides a window into the process of achieving infrastructure in informal settlements, in which the role of dwellers, actors of the civil society and capital providers as well as their relationships are elucidated.

2.4.1.3. Informal infrastructures

For Roy (2011), urban informality goes beyond aspects of space and labour; "instead, it is a mode of the production of space that connects the seemingly separated geographies of slum and suburb" (p. 233). Simone (2010) approximates the slum as the periphery, which, rather than denoting an outer place, signifies a "range of fractures, discontinuities, or hinges disseminated over urban territories" (p. 41). Informal infrastructure, hence, embodies the mechanisms and practices that the urban excluded groups employ to connect with the formal realm and produce continuity

throughout the urban space. As put in McFarlane and Silver (2017), “It is a connective tissue, often unpredictable, anchoring urban life in popular neighbourhoods across the urban world” (p. 6). Informal infrastructure is thus conceptualised from organised practices of producing connections (Star & Ruhleder, 1996).

However, the prefix “informal” frequently reflects a dimension of illegality, for which these infrastructures are in many cases criminalised. Criminalisation is particularly likely when informal infrastructures divert income from existing business owners in the formal realm. For example, in a study of informal transport infrastructure in Kampala, Uganda, Evans, O'Brien, and Ch Ng (2018) suggest that attempts by local authorities to prohibit the operation of boda-bodas – unregulated motorcycle taxis – are partly rooted in the potential diverting of monetary returns to financial institutions and infrastructure developers. Likewise, some literature addresses improvised energy and water supply, sewage systems and sanitation practices in informal settlements as illegal infrastructures (Hughes, 2016; Rufai, 2017) which are criminalised for economic reasons and because of their presumed links to the proliferation of infectious diseases.

The informal infrastructure perspective examines infrastructure with reference to its ability to produce continuity in the city and provide access to urban amenities. This suggests that informal infrastructures, rather than comprising local autonomous objects, are instead adaptations that extend the scope of formal urban infrastructures, for which purpose their shapes and services are dictated by established urban dynamics. Also, this perspective enhances understanding of the emerging process of infrastructures, as well as external forces (e.g. criminalisation) that enable or disable its territorialisation. In other words, this perspective allows the observation of the making and unmaking of infrastructures. This latter interpretation has implications for planning, since it challenges the mindset of conventional top-down approaches of infrastructure provision, and instead unveils actors and urban dynamics that inadvertently motivate the emergence, reproduction and perpetuation of infrastructures in informal settlements. Finally, this view seems key to offer an understanding of GI long-term allocation in informal settlements.

2.4.2. Lessons for research design

This section has revised informality in the urban context and identified some of the prominent theoretical perspectives used to understand infrastructures in informal settlements. The concepts of assemblage, entrepreneurialism, and informal infrastructure can produce awareness of the various issues associated with the production, transformation, and disappearance of informal settlements' infrastructure. Therefore, attempting a comprehensive understanding of infrastructures in informal settlements, including GI, needs to look into the material elements used for producing infrastructure, the diverse networks that allow its maintenance and fuel its transformation, the agents and practices that support resource mobilisation, and the practices and access to users that infrastructures produce. Hence, this section has provided some guidance as to how to research GI in informal settlements in such a way as to produce outcomes relevant for its preservation and reproduction.

2.5. Emergence, governance, and transformation of infrastructure

Section 2.2 had suggested that the actors, institutions, and mechanisms involved in the emergence and transformation of GI in informal settlements remain largely unexamined. This section provides a foundation for addressing these issues by reviewing the literature on the social dimensions behind the production and transformation of infrastructures in informal settlements. These infrastructures are often shaped by a mixture of collective unpaid labour, knowledge and resource input of residents and civil society groups (McFarlane, 2006). Such collective efforts invested in the emergence of infrastructure are often rooted in pre-existing practices of working together for mutual benefit, which is perhaps the only alternative to secure access to urban resources and opt for opportunities in the city (Simone, 2010). Putnam, Leonardi, and Nanetti (1994) recognise the elements that facilitate cooperation for mutual benefit as social capital. This is a resource that each member of a group holds in the form of tacit membership (Putnam, 2000; Scott, 1999), which by and large shapes local institutions. Social capital establishes the right of a member to be helped by the other members to produce access to livelihood resources.

2.5.1. Social capital and infrastructure emergence

Dekker and Uslaner (2003) and Lovell (2009) agree that social capital configures everyday life and prompts individuals to involve themselves in shaping place-based communities. The practice of getting involved produces collective action

capacity, agency and local institutions, which are major enablers of infrastructure development in the urban marginalisation context (de Souza Briggs, 1998; Onyx & Bullen, 2001). Strengthening social capital and local institutions, furthermore, is widely acknowledged as a key aim for addressing issues of social exclusion (Balatti, Black, & Falk, 2006), precisely because it shapes a community's ability to tackle its challenges. Thus, the ability of marginalised dwellers to implement collective mechanisms to access resources regarded as their right provides a perspective to understand social capital.

Numerous studies support the view that social capital acts as a mediator to achieve infrastructure in informal settlements. For example, Myers and Nelson (2010) claim that social capital configures the landforms that host marginalised communities, because it controls the ability of civil society groups to coordinate actions aiming toward intervention and infrastructure implementation. Likewise, Vilar and Cartes (2016) claim that the physical environment containing a community is both a condition and a result of social interactions, so the physical and the social shape each other in a reciprocal relationship. Similarly, Adger (2010) argues that the social capital available to a community determines its ability to achieve or reconfigure infrastructure toward disaster prevention related to climate change. In sum, there is agreement among scholars about the mediation ability of social capital to configure infrastructure. Social capital is often represented in the form of local institutions and mechanisms to mobilise collective action.

2.5.1.1. Collective labour arrangements

Erasmus' (1956) ethnographic study on reciprocal labour seems to remain relevant to understanding labour mobilisation for infrastructure emergence in informal settlements (Gudeman, 2013; Smith, 2017). As an alternative to the wage-based form of labour that we know today, Erasmus distinguished two practices of reciprocal labour: festive and exchange. The festive form involved compensating group labour with feasts, whereas the exchange form involved the obligation to provide equivalent labour in return. Festive labour is still an option today (Brakke, 2019), and is known by different names across Andean countries, including *convite*, *minga*, or *mingaco.* Likewise, the exchange form, which is also referred as *ayni*, *cambio de mano*, and *vuelta mano*.

Participating in forms of reciprocal labour, particularly among close relatives and acquaintances, continues to be a common practice in house construction work in

informal settlements in the Global South (Bankoff, 2015). Festive labour, on the other hand, has remained significant when undertaking larger scale community ventures such as infrastructure implementation, especially in Andean countries. The continuance of festive labour practices is perhaps associated with Erasmus' claim made 60 years ago: "their attendance at festive work parties may be a necessary condition for receiving the feudal perquisites on which their existence depends" (p. 461). It is likely, then, that the feudal perquisites suggested in the temporo-spatial context of Erasmus' study developed into modern-day rights of membership in local institutions. Currie-Alder (2003) supports this view by suggesting that marginalised communities feature a hierarchical power configuration. Furthermore, along with the fall of the *hacienda* system in Latin America – big estates owned by colonists devoted to agricultural development – a sort of local council system emerged in which the *minga*[5] practice became a form of labour tax (Faas, 2015) – receiving privileges in exchange of labour. Therefore, reciprocal labour is not purely voluntary, but is often conditional to some sort of exchange.

For instance, although not in the context of informal settlements, Armijos-Burneo (2012) describes the implementation and management of a water distribution system in rural Ecuador to illustrate the difficulties of mobilising labour in form of *minga*. Notwithstanding that building the infrastructure empowered participants to claim ownership of the system, this study revealed that preconceived notions of equity in access to water were an important predictor of the extent of the labour that households were willing to contribute. Thereafter, persuading locals to engage in the *minga* involved community leaders and members of promoting organisations visiting them in their houses and engaging them in compulsory assemblies to secure agreed mechanisms of infrastructure use and water access. In the end, participating in community labour for the construction and maintenance of the infrastructure constitutes the price, in form of labour tax, to gain access to piped water.

2.5.2. Infrastructure governance

Larkin (2013) argues that regardless of the context, infrastructures give rise to forms of government and institutions, usually entrenched in larger scale institutions. Faas (2015) approaches local institutions – also referred as non-statutory governance (Larkin, 2013) and community based organisations (McFarlane, 2008b) – as practices

[5] *Minga* refers to a type of traditional communal work in the Andean mountains.

of self-governance and mutual aid of socially excluded communities, which are "capable of adaptation, disintegration, and resistance" (p. 53). Local institutions provide some kind of legitimacy to shared accomplishments and constitute a key element in shaping what Pickerill and Chatterton (2006) termed autonomous geographies: "those spaces where people desire to constitute non-capitalist, egalitarian and solidaristic forms of political, social, and economic organisation through a combination of resistance and creation" (p. 730).

In informal settlements, Stacey and Lund (2016) studied the mechanisms through which settlers shape local institutions and allocate privileges, which are validated through forms of social contract agreed upon through informal negotiations. When infrastructures emerge, mechanisms of maintenance and service facilitation prompt the creation of new local institutions. This practice of allocating privileges configures blended governance schemes in informal settlements, which often interweave locally formed institutions with NGOs, private enterprises, and the official government. Moreover, where the government presence is weak or absent, a local alternative to government "develops anyway, as each household, neighbourhood, and business seeks its own solution to getting water and getting rid of wastewater" (UN-Habitat, 2013b, p. 235).

For example, Stacey and Lund's (2016) ethnographic research in informal settlements of Accra, Ghana describes how informal bridges configure forms of governance in the absolute absence of the official government. Three rickety wooden bridges over a large landfill ravine were assembled with local resources and became crucial shortcuts to farms, workplaces, schools, markets and public transport hubs. Except for schoolchildren, all users pay a toll to cross the bridges, which differs depending on whether the user walks, use a kind of vehicle or transports animals. The bridges are operated and regulated by local residents with no official governmental command. Prices and conditions are agreed through informal negotiation among local institutions, which usually feature a vertical form of relationship.

When an infrastructure is both community driven and derived from external intervention, partnership governance approaches are often shaped. The Orangi Pilot Project (Hasan, 2006; OPP, n.d.) for the construction and management of sewer systems in informal settlements in Pakistan is a prominent example. This is a self-financed partnership model between the government and local institutions to operate the low-cost systems, which were originally produced and funded by the local community. Similarly relevant is McFarlane's (2008b) study on the Slum Sanitation

Programme in Mumbai. This consists of large toilet blocks in which the government provides land, water, sewer and electricity; contractors and NGOs build the blocks; and the community-based organisation manages the blocks, funded with donations. These programmes are seen as paradigm shifts from traditional top-down state infrastructure provision to a participatory approach to infrastructure governance.

The examples above are also relevant as they demonstrate how informal settlements' infrastructures constitute mediums that connect with infrastructure in the formal city. They produce continuity and become networked infrastructures (Monstadt, 2009). So, the bridges in Accra achieve integration with the mobility networks of the city by connecting users to the public transport hubs. The Orangi sewer system not only managed to connect with Karachi's sanitary infrastructure, but the multi-stakeholder social capital formed around its operation also engendered mechanisms of water supply, a charitable trust to finance the system, and a health programme (OPP, n.d.). This suggests that collateral continuities may be also derived from partnership governance approaches to infrastructures. This is likewise seen in the toilet blocks of the Slum Sanitation Programme in Mumbai, which is connected to the sewer and water supply networks of the city. As McFarlane (2008b) explains, the governance approach enabled a closer relationship between the government and informal settlements to implement the toilet blocks, which beyond facilitating the practices of sanitation delivery also opened new avenues to NGOs and other organisations to attempt tailored interventions.

Finally, this section has produced awareness of the social organisation behind the production and transformation of informal settlements' infrastructures and provided further guidance on what to seek when investigating GI in this context.

2.5.3. Infrastructure transformation

This section looks at drivers of changes in infrastructure in informal settlements over time. Much of what is known about infrastructure transformation in informal settlements is embedded in the slum-upgrading literature (Das & Takahashi, 2009). This body of research often refers to the needs for increased carrying capacity and adjustment to societal transitions as drivers of change. Carrying capacity addresses the need to catch up with increased population and economic activity in informal settlements (Mishra, Sen, & Kumar, 2017). The carrying capacity lens has inspired considerably the slum-upgrading literature and is perhaps the best documented on this matter (Iweka & Adebayo, 2010; Jiboye, 2011). Societal

transitions, on the other hand, are conceived as an outcome in the form of spontaneous adjustments to radical changes in "societal subsystems such as energy supply, housing, mobility…" (Frantzeskaki & Loorbach, 2010, p. 1292). For the purpose of this research, however, I identify a shortcoming in this literature. Slum upgrading often regards progress of any kind and magnitude in informal settlements infrastructure as resulting from a state-centric or some sort of top-down mechanism. Thus, alterations produced as outcomes of regular practices as well as their causal links have been often overlooked.

As an alternative, the notion of incrementalism offers a lens to appreciate drivers of change linked to everyday practices. Incrementalism is borrowed from the literature on urban development policy to refer to a method of change through cumulative minor modifications over time. In the informal settlements context, this perspective views houses and infrastructure as objects being continuously "added onto bit by bit" (Simone, 2008, p. 28). For instance, Smets (2006) describes incremental housing as a never-ending process in which owners improve and extend their houses by themselves whenever resources, money, and time become available. Housing is in this context a continuous process of adaptability, improvisation and invention, which results in what Strauss (1962) called *bricoleur.* This refers to the practice of assembling shelters by incrementally performing many diverse tasks, which, unlike an engineering project, are not subject to availability of materials or previously required tasks. Instead, the rule is to advance with whichever materials, tools, and skills are at hand. Materials and tools, furthermore, are "always finite and heterogeneous because what it contains bears no relation to the current project" (p. 11).

Similarly, McFarlane (2011, p. 659) defines incremental housing as "the product of tinkering and tweaking through urban assemblages over time", in which new materials and epistemic resources continually reconfigure them. Also, by focusing on incrementalism of sanitation infrastructure, Lancione and McFarlane (2016) conceptualise the practice of on-going maintainence, anticipation, and improvement as infrastructural becoming. Thus, the incrementalism perspective views infrastructure of informal settlements as never-completed objects, but always becoming.

When looking into what fuels infrastructure re-arrangement, Simone (2008) and Monstadt (2009) agree that causal explanations are found in the interrelationships between informal settlements' infrastructure and larger scale infrastructure and communication networks. This implies the existence of an interdependence logic

between formal infrastructures in the city and informal ones in the periphery. Star and Ruhleder (1996) first put in place this relational view of infrastructures, which was later borrowed by Dovey (2012, p. 364) when suggesting that understanding assemblages implies knowing how "the ways that change at one level leads to adaptation at another". This suggests that much infrastructure transformation derives from a process of adaptation. Likewise, Massey (2011, p. 4) argues that territories, and infrastructures constituting features in them, "exist in constant tension with each other, each contributing to the formation and the explanation of the other". This interdependence between infrastructures, however, has received limited attention (Cass, Schwanen, & Shove, 2018). Nonetheless, research on GI may benefit from this perspective as it lays bare the processes in the city that cause changes in infrastructures of informal settlements.

Silver (2014) offers a relevant case to illustrate how incremental infrastructures function and changes are produced by examining clandestine connections to energy networks in Accra, Ghana. For many, sustaining flows of electricity into their households is only possible through incremental and provisional unauthorised connections. The study focuses "on the moments of adjustment that incrementally reshape the energy network" (p. 794). Electricians, some of them local residents and others simply sensitive to the inability of many to afford electricity in informal settlements, play a key role as they most often lead the implementation of adjustments. Among drivers of adjustment what stands out is the technology employed by local energy suppliers to control the flow of energy, which makes clandestine connections continually obsolete. To cope with this, residents engage with electricians in continuous testing and implementation of inventive practices, usually unlawful. This example substantiates the interdependence between formal and informal energy infrastructures, by showing how transformations in the urban energy network impact the choice of adjustments of informal settlements' infrastructure.

The incrementalism perspective inspired theoretical models of intervention to address everyday challenges in informal settlements. For instance, Pieterse (2013) argues that politics of radical democracy are needed to advance radical incrementalism. This notion challenges the entrenched prudent and state-centric top-down mechanism to fuel incrementalism. Instead, Pieterse (2013) suggests that empowering marginalised communities would fuel radical – rather than prudent – incrementalism, which in turn would give them the ability to take responsibility for their own development. Empowering here refers to providing means facilitating

marginalised communities to mobilise material and epistemic resources and authorities treating them as partners.

2.5.3.1. Incrementalism frontiers

An apparent shortcoming in the incrementalism literature is its exclusive focus on infrastructures represented as physical and non-human materialised objects. According to Aradau (2010), infrastructures become materialised when they adopt the ability to be disrupted. Further, materialised infrastructures are not stable hardware, but instead their materiality is corrosive, decaying, and slowly disintegrating. From this view, beyond the notion of cumulative improvements, incrementalism seems often manifest in the efforts to sustain infrastructures' minimum levels of order and functionality (Bennett, 2018), "stumbling across what works and what does not" (Pieterse, 2013, p. 5). This suggests that transformation often derives from both adaptation and preservation of functionalities. This is empirically supported in the work of Silver (2014) examined above.

Aradau (2010) also argues that these "materialities of minimum levels" (p. 15) constitute a barrier to "embody the promise and the dream of a good society" (Kaika & Swyngedouw, 2000, p. 130). This suggests a constantly growing gap between incremental infrastructures of minimum levels and their counterparts – connecting infrastructure of the formal city. This dynamic gradually subtracts relevance from infrastructures in informal settlements since it impacts the ability of marginalised dwellers to make optimal use of them. Simone (2008, p. 28) backs this view by arguing: "incrementalism can produce unacceptable stratification... and can provoke intense social conflict". GI, on the other hand, has not been addressed in terms of its ability to be disrupted, nor how its incremental arrangements relate to social conflict.

Moreover, the incrementalism argument seems less relevant in the absence of materialised infrastructure. For example, Grieco (2009) examined everyday practices in informal settlements of Ghana in sites where sanitation infrastructure is non-existent. The study revealed that such shortages are filled with child labour, which acts as living infrastructure by refuse disposal of human excrement. Similarly, Crow and Odaba (2010) described how women supply households with safe water in informal settlements of Nairobi, Kenya without a piped system. It can be said then that materialised infrastructures come to replace living infrastructures.

At the other extreme, the incrementalism concept is bounded in a context of total infrastructure loss or when physical objects stop being infrastructurally relevant

for informal settlements dwellers. This entails a state in which an infrastructural arrangement would no longer support dwellers' "energy to be more efficiently deployed and accounted for" (Simone, 2004b, p. 407). The literature on the intersection between assemblages and deterritorialisation sheds some light on this issue. This is based on the notion that territories are not fixed in space but instead experience continuous processes of being made and unmade (Allen & Cochrane, 2007; McCann, 2011). "Deterritorialisation is the movement by which territories are eroded (hawkers are removed, squatter settlements are demolished, nations are invaded)" (Dovey, 2012, p. 354). Since it is assemblages that create territories, "this constant making and unmaking process is the same with assemblages: they are always coming together and moving apart" (Wise & Stivale, 2005, p. 79). Thus, given the boundaries in the applicability of the incrementalism concept, the lens of deterritorialisation seems convenient to extend the understanding of infrastructural changes and urban transformation. Lastly, this section calls for investigation of what triggers the making and unmaking of GI in informal settlements.

2.6. Connecting informality and GI

The previous sections have dealt with conceptualisations of GI, theoretical debates in which the role of GI is prominent and a set of features and dynamics that act behind the emergence and transformation of self-help infrastructures in informal settlements. This section attempts to link these elements into one integrated concept that has an operational meaning for addressing GI located in informal settlements: informal GI (IGI). This term has been little used in academic work, so as a concept it remains poorly defined. Motzny (2015), for instance, used IGI to refer to undesigned and unmaintained vacant land in her assessment of potentially suitable assets for stormwater management in Detroit, USA. Similarly, Venn et al. (2015) distinguish ruderal vegetation, brownfield habitats, and previously developed vacant land as forms of IGI in their search for potential ecosystems to enable insect conservation in Helsinki, Finland. Although incipient, the view of informality when referring to GI seems to be framed by a circumstance of spatial abandonment, at least in the Global North.

In the Global South, conversely, informality has been addressed mainly within its territorial and labour dimensions. For instance, trees are established that provide timber, fuel wood, remedies, fruit, shade to poor urban communities, and enable informal trading of their derivatives for income generation (Kaoma & Shackleton,

2014). Likewise, community gardens have enabled group farming for food sourcing and trading for supplemental income in informal settlements (Crush, Hovorka, & Tevera, 2011; Nwaka, 2005; Van Averbeke, 2007). Parks and playgrounds have been functional for a range of social and cultural activities and expressions, such as celebrations, religious manifestations, sports and unstructured playing for children (Hernández-Garcia, 2012). What is not yet explicit in the literature, however, is how GI may constitute an alternative supply system in informal settlements, which inhabitants are eager to preserve and reproduce.

2.6.1. IGI and the agency of the poor

For the sake of the environment, cities' stakeholders in developing countries need to put in place approaches that simultaneously address ecological conservation and livelihood struggles on the peripheries (Rietbergen, Bishop, & Mainka, 2002). This calls for viewing urban poverty in a dynamic way, as a practice rather than something static (Gibson-Brydon, 2016). The static approach to poverty, which seems dominant in political practice, is characteristically embodied in sets of single variables such as minimum income and basic needs. This view is blamed for inducing fruitless interventions such as mere income increases (Corburn, 2017). These forms of intervention have little relevance when looking into preserving GI. Edmunds and Wollenberg (2013) and Tiwari and Ibrahim (2012) agree in that addressing poverty entails enhancing the agency of the poor to transform their capabilities. This involves securing access to social and physical infrastructure in ways that intervene in the relative vulnerabilities of living in the periphery. Thus, GI in informal settlements would be a subject of preservation and reproduction efforts when it becomes a clear enhancer of the agency of their inhabitants.

The notion of agency of the poor is positioned in the human agency framework. This can be conceptualised as habitual behaviours and actions that people undertake in order to provide themselves, their households or communities with essential supplies and services, in circumstances of political, legal, social, and economic restraint (Deci & Ryan, 1995; Heron, 2008). Narayan and Kapoor (2005) distinguish individual from collective agency of the poor. Individual agency is linked to material, social, and psychological needs at household level, whereas collective agency refers to community needs of organisation, representation, and identity. In informal settlements, the lens of human agency makes it possible to appreciate the disadvantageous alternatives afforded to dwellers for coping with their everyday

needs and for improving their lives. Thus, the allocation and preservation of GI in informal settlements, and even their patterns of depletion, can be framed by the mechanisms in which they relate to the agency of the urban poor.

For example, urban agriculture has been extensively studied in terms of its ability to supply food in informal settlements (Dubbeling, 2011; Gallaher et al., 2013) – according to Van Averbeke (2007), informal settlements' farms have the production capacity to supply 30% of the recommended vegetable intake for their inhabitants in Pretoria, South Africa. However, the study of Battersby (2011) from the perspective of agency of the poor revealed that the main obstacle in the household provision of food is not availability but access, which is constrained by income and trading structures. From this, the preservation of allotments is contingent on their embeddedness in mechanisms of social exchange. For instance, informal settlement dwellers often supply themselves by borrowing food from neighbours (Gonzalez de la Rocha, 2007). Thus, allotments as entrepreneurial practice looks into economic rewards not entirely in monetary terms, but to some extent in the form of credits for social exchange.

Similarly, GI is often source of medicine in the form of edible plants in informal settlements. The inadequate health care provision given to marginalised communities, combined with the well-known culture of herbal medicine use in India, for instance, make dwellers rely heavily on self-dosing with plants to address health issues. Nagendra et al. (2013) studied the prevalence of medicinal plants in informal settlements of Bangalore, India. Since plants act on the agency of the poor in healing and treating illnesses, these manage to remain in place, some planted on the public open space and others grown in small containers due to space constraints. Farming and medicinal plants are examples of where well-preserved green infrastructures connect to agency of the poor.

2.7. Conclusion

This literature review has provided a theoretical basis from which to examine the intersection between GI and informality. The chapter began by offering an explanation of the various constructs that may relate to GI, for which it remains a concept without a unique definition. The conceptualisations of GI available in the literature most often reflect the context of the Global North. GI is here regarded as a resource and tool for cities to cope with mitigation and adaptation to climate change, balance supply and demand of ecosystem services, and serve as a complement or

alternative to conventional grey infrastructure. Conversely, a paucity of research remains on GI in the Global South, especially in reference to informal settlements. This is problematic because the mainstream perspectives used in the Global North are little relevant to explain the factors and mechanisms by which GI is produced, transformed, and disappeared in informal settlements.

This chapter has also reviewed the literature that addresses self-help infrastructure in informal settlements. The aim for this was to gain awareness of theories, as well as actors, components, practices, and mechanisms involved in the production, transformation, and disappearance of this category of infrastructure, in such a way that inform the methods of this research. Finally, the elasticity of the GI concept calls for a tailored conceptualisation that addresses specific issues of informal settlements. In this regard, the remainder of this thesis develops a workable concept of GI for urban planners and informal settlements interventionists, by linking theories of GI with those of informal settlements infrastructure.

Chapter 3
Research design and methods: Tracing production, transformation, and functionalities of IGIs

3.1. Introduction

This chapter explains the methodology and methods used to develop an empirical conceptualisation of IGI. As discussed in the literature review section, infrastructures in informal settlements seldom emerge and transform because of the direct input of local governments. Instead, they are often the outcome of spontaneity and improvisation, which are constrained by difficult social and environmental conditions. For this reason, identifying the causal factors that trigger the emergence and transformation of GI in informal settlements is a complex task, which involves tracing a multiplicity of materials, actors, networks, practices and circumstances, and then fitting them together in a puzzle-like fashion. The approach herein presented aims to integrate these factors into one concept that could stand on its own, which can be called IGI.

Since IGI is a new concept in empirical research, this study relies on methodological approaches used to interrogate informal settlements' infrastructures (McFarlane, 2008a; Simone, 2004a, 2008). To attempt rich descriptions of the complexities involved in producing and sustaining IGIs in place, and to understand their course of transformation, this study uses the case study of informal settlements in Quito, the capital city of Ecuador, and captures ordinary practices, identifies materials and relevant actors, and explains IGIs as perceived directly by users.

Fieldwork was conducted in two periods that totalled six months: from October 2016 to February 2017, and from December 2017 to January 2018. Due to the exploratory nature of this study, data collection was organised in four phases: the initial phase aimed to select the informal settlements that inform this study; the second phase meant to describe the contexts of place and social processes involved in IGIs; phase three selected typologies of IGIs suitable for this study's aims; and finally, phase four focused on descriptive data examining everyday practices performed in IGIs. The research design is summarised in Figure 3.1.

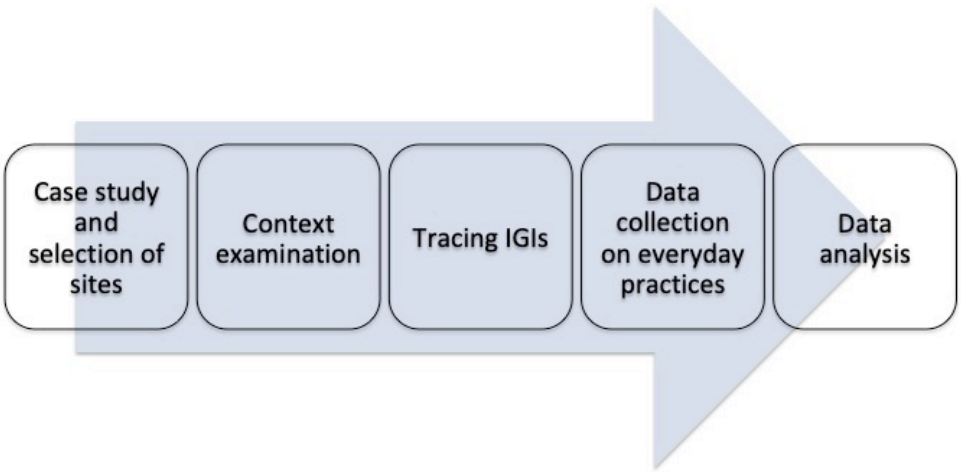


Figure 3.1. Research design.

The study involved a mix of qualitative techniques, which included systematic document analysis, interviews, and observations, both participatory and non-participatory. Selection of participants was defined purposely as the fieldwork progressed. The remaining part of the chapter proceeds as follows: section two introduces the research approach; section three discusses the case study and selection of sites; section four describes the methods used to examine the context; section five explains the selection of IGIs; section six explains the examination of everyday practices that are relevant to IGIs; section seven addresses the methods of analysis; and section eight reflects on issues of positionality, ethics, and safety. Lastly, a concluding section summarises the main arguments in this chapter.

3.2. The research approach

As discussed in 2.4.2, understanding IGIs comprehensively involves at the least examining their constituting materials, users, supported practices, networks that allow their maintenance and fuel transformation, and the actors involved in resource mobilisation for their production. Due to this wide spectrum of possible factors to be traced, this study approaches IGIs as communities of practice (Star, 1999), which essentially entails investigating the embeddedness of IGIs in everyday practices of informal settlement dwellers. Theories on community of practice argue that practices emerge from collective processes of learning by groups of people engaged in mutual action (Morgan, 2011). “Learning in this context is situational, meaning it occurs as a result of active participation in practice where learners construct their understanding by using and contributing to a range of common resources” (Anil, Tonts, & Siddique, 2015, p. 220).

The approach used in this study is based on the premise that investigating everyday practices involves learning from participation in the interactions between members of a social structure, both within their spatial domain and with their derived networks. Thus, investigating IGIs from the everyday practices angle involves focusing on what sustains the interaction among IGI users. This entails tracing flows of actors, interests, resources, and organisations that withstand IGIs in place. With this approach, the purpose is to understand how IGIs emerge, what access informal settlement dwellers gain to resources by engaging in everyday practices that depend on IGIs, and how these practices trigger the transformation of IGIs.

Little research on GI has used the everyday practices perspective. The study of Petersen (2013) on materiality of everyday practices in urban green space is one of the few exceptions, although it was conducted in urban settings in Denmark. The everyday practices approach contrasts strongly with the accounts of ES, which is mainstream in GI research. ES often involves attributing values to assumed benefits as perceived by users, so it is possible to associate the value of natural capital with the societies that depend on it (Villa et al., 2014). The ES approach is widely used in a context of top-down provision of GI, but so far, it has been of little relevance to addressing GI in the context of informal settlements.

Along with addressing the wider purposes of this research, the study of every practice pertaining to IGI may yield some practical implications for intervening in terms of climate change adaptive capacities and green-based solutions, as introduced in 2.3. What is at stake here is what can be learned from the practices that sustain and transform IGIs despite informal settlement dwellers' multiple deprivations. Such knowledge could be used, for example, to address green space maintenance and sustainability in urban centres when funding disruptions arise. In this regard, this methodology also maps out a research agenda that may contribute to achieving greener cities and broader access to green space.

3.3. Case study and the selection of sites

Case study research is inherent to the investigation of everyday practices. For the purpose of this research, Quito city makes a suitable case study for several reasons. To begin, Quito is located in Latin America, which is the world's most urbanised region. According to the World Economic Forum, about 85% of Latin Americans live in cities. In the last four decades, Quito has featured fast growing population and urbanisation, both formal and informal. Its population grew from 435k

in 1774 to 891k in 1982 and to 1.1million in 1990. In 2013 Quito's population was estimated at 2.7 million (UN-Habitat, 2013a). According to the Ecuadorian Statistics Institute (INEC), the population growth rate was 1.4% in 2016. This is above the Latin American average of 1.04% in the same year. Also, following the last official census in 2010, Quito features some 800 informal settlements, which host nearly half the number of households (Hernández, Franco, & Angelica, 2010; Starkoff & Ortíz, 2012). This proportion is one of the highest in Latin America – see the UN Habitat report on the population living in slums[6].

Moreover, discourses of environmental preservation and conservation are gaining considerable grounds in the local political processes. For example, as an approach to addressing environmental degradation in recent years, the municipality has teamed with the Andean Community of Nations (CAN) and various NGOs to intervene among the system of slopes and ravines that surround the city for restoration and preservation. These spaces host the majority of the informal settlements of Quito and were by and large the physical context of my fieldwork.

The research design involved data collection in several informal settlements, also referred to in this study as sites. The selection of multiple sites intended not to establish comparison of IGIs as single phenomenon across informal settlements, but instead to expand understanding by tracing IGI connections throughout informal settlements and in the core city. Therefore, the aim when pursuing every additional site was to discover something new, which could be actors, materials, networks or dynamics. Although working with multiple informal settlements implied overcoming a range of limitations such as access to informants, restrictions of time and budget, and even issues of personal safety, this approach was sensitive to the exploratory and descriptive nature of this research.

The selection of sites was based on a threefold set of criteria. The first selection criterion involved the existence of trans-local linkages among informal settlements (Hannerz, 2003). The municipality-led Integral Environmental Intervention Plan for the ravines of Quito (NOVUM, 2014) informed this criterion. The prominent trans-local linkage is the system of ravines on the flanks of the volcano Pichincha and the surrounding Andean landscapes, which is where most informal settlements are located. Ravines are the natural channels for the streams that fall from glaciers. Quito features 182 ravines. The Environmental Intervention Plan involved

[6] https://www.indexmundi.com/facts/indicators/EN.POP.SLUM.UR.ZS/map/south-america

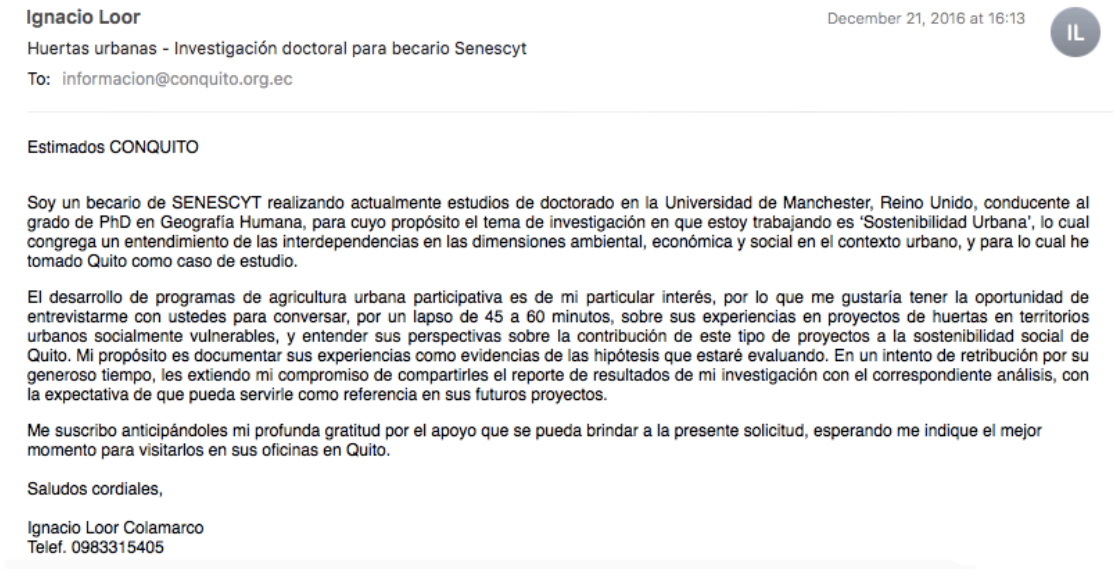
intervening in 32 fragments of ravines, all of them located in informal settlements, which are considered the most problematic in terms of production of pollutants. Thus, the preliminary selection of sites involved contemplating 32 informal settlements.

To address actors engaged in the ravine intervention plan, I attended the United Nations Conference on Housing and Sustainable Urban Development (UN-Habitat, 2016a) held in Quito in October 2016. These actors were in the list of attendees to the Conference from the programme that was available on the website for Habitat 3 (UN, 2016). In addition, details for contractors engaged in this project were previously investigated using keywords "Quito" + "*quebradas*" + "*remediación*" and "*restauración*" in the official website for Ecuadorian government procurement – http://www.compraspublicas.gob.ec, as seen in Figure 3.2. The conference opened routes for networking and meeting prospective informants, as well as representatives of institutions, NGOs, and bureaucrats involved in various forms of intervention in informal settlements. Furthermore, these actors were helpful in providing directions and recommendations for finding these spaces – invisible in the official maps of Quito – as well as the identification of key people that could provide guidance during the preliminary visits.

Figure 3.2. Summary of contract – ravine recuperation project in Quito (Government of Ecuador's procurement website https://www.compraspublicas.gob.ec).

The second criterion focused on the ability to engage with suitable gatekeepers to explore the sites. I investigated established relationships between local institutions and informal settlements. Engaging with these institutions was critical to conducting data collection. To pursue this, I interviewed informants from eight institutions

involved in informal settlements – including NGOs, religious organisations, and governmental agencies. This activity resulted in an open avenue to both workers and community leaders in several informal settlements. The approach to these informants involved addressing formal letters delivered to their offices or their institutional email accounts as shown in Figure 3.3. I identified myself as a PhD researcher at the University of Manchester and a scholarship recipient from SENESCYT.



Ignacio Loor December 21, 2016 at 16:13

Huertas urbanas - Investigación doctoral para becario Senescyt

To: informacion@conquito.org.ec

Estimados CONQUITO

Soy un becario de SENESCYT realizando actualmente estudios de doctorado en la Universidad de Manchester, Reino Unido, conducente al grado de PhD en Geografía Humana, para cuyo propósito el tema de investigación en que estoy trabajando es 'Sostenibilidad Urbana', lo cual congrega un entendimiento de las interdependencias en las dimensiones ambiental, económica y social en el contexto urbano, y para lo cual he tomado Quito como caso de estudio.

El desarrollo de programas de agricultura urbana participativa es de mi particular interés, por lo que me gustaría tener la oportunidad de entrevistarme con ustedes para conversar, por un lapso de 45 a 60 minutos, sobre sus experiencias en proyectos de huertas en territorios urbanos socialmente vulnerables, y entender sus perspectivas sobre la contribución de este tipo de proyectos a la sostenibilidad social de Quito. Mi propósito es documentar sus experiencias como evidencias de las hipótesis que estaré evaluando. En un intento de retribución por su generoso tiempo, les extiendo mi compromiso de compartirles el reporte de resultados de mi investigación con el correspondiente análisis, con la expectativa de que pueda servirle como referencia en sus futuros proyectos.

Me suscribo anticipándoles mi profunda gratitud por el apoyo que se pueda brindar a la presente solicitud, esperando me indique el mejor momento para visitarlos en sus oficinas en Quito.

Saludos cordiales,

Ignacio Loor Colamarco
Telef. 0983315405

Translation:

Dear CONQUITO,

I am a SENESCYT fellow currently doing PhD studies at the University of Manchester, United Kingdom, leading to the PhD degree in Human Geography, for which purpose the research topic I am working on is 'Urban Sustainability', which brings together an understanding of the interdependencies in the environmental, economic and social dimensions in the urban context, and for which I have taken Quito as a case study.

The development of participatory urban agriculture programs is of my particular interest, so I would like to have the opportunity to meet with you to talk, for a period of 45 to 60 minutes, about your experiences in garden projects in socially vulnerable urban areas , and understand their perspectives on the contribution of this type of projects to the social sustainability of Quito. My purpose is to document their experiences as evidences of the hypotheses that I will be evaluating. In exchange of your generous time, I extend my commitment to share with you the results of my research with the corresponding analysis, expecting that it can serve as a reference in future projects.

I subscribe in anticipation of my deep gratitude for the support that can be given to the present application, hoping that you indicate the best time to visit at your offices in Quito.

Best regards,

Ignacio Loor Colamarco
Telef. 0983315405

Quito, D.M., 17 de octubre de 2016

Asunto: Levantamiento de datos para tesis doctoral

[redacted]
Subsecretaria de Desarrollo Infantil Integral
MINISTERIO DE INCLUSIÓN ECONÓMICA Y SOCIAL
En su Despacho

De mi consideración:

Soy un becario de SENESCYT realizando actualmente estudios de doctorado en la Universidad de Manchester en el Reino Unido conducente al grado de PhD en Geografía Humana. El tema de investigación en que estoy trabajando es sobre "Sostenibilidad Urbana", lo cual involucra un entendimiento de las interdependencias en las dimensiones ambiental, económica y social en el contexto urbano, y para lo cual he tomado Quito como caso de estudio.

Dentro de la dimensión social, uno de los aspectos de mayor relevancia con respecto de los propósitos de desarrollo sostenible urbano es la vulnerabilidad territorial de quienes viven en asentamientos informales. Al respecto, el cumplimiento de la misión institucional del Ministerio de Inclusión Económica y Social ha permitido acumular en vuestro entorno una cantidad de conocimiento de significativo valor para el propósito de mi investigación, lo cual aspiro documentar como evidencias de las hipótesis que estaré evaluando.

Es por ello que me dirijo a usted solicitándole brindar apoyo a mis procesos de levantamiento de datos en y con el MIES, lo cual involucra períodos cortos de observación, entrevistas a funcionarios que laboran en territorios urbanos vulnerables de Quito, y permitirme acompañar a funcionarios que realizan labores con los beneficiarios de los programas CNH y CIBV en los territorios referidos. En retribución a ello, le extiendo mi compromiso de compartirles el reporte de resultados de mi investigación en territorio con el correspondiente análisis, con la expectativa de que pueda servirles como referencia en futuras tomas de decisiones en el desarrollo de vuestra magnífica labor.

Me suscribo anticipándole mi profunda gratitud por el apoyo que se pueda brindar a la presente solicitud.

Muy atentamente,

Ignacio Loor Colamarco
Cédula: 1305320077

Translation:

Dear MIES:

I am a SENESCYT fellow currently doing PhD studies at the University of Manchester in the United Kingdom, leading to the PhD degree in Human Geography. The research topic I am working on is 'Urban Sustainability', which pursues a understanding of the interdependencies in the environmental, economic and social dimensions in the urban context, and for which I have taken Quito as a case study.

One of the most relevant aspects regarding the purposes of urban sustainable development in fast-growing cities in Latin American countries is the territorial vulnerability of the population living in conditions of social exclusion. In this context, the fulfilment of the institutional mission of the Ministry of Economic and Social Inclusion has allowed to accumulate in your environment knowledge of significant scientific value, and that of my research in particular, which I aspire to document as evidences of the hypotheses that I will be evaluating.

This is why I am writing to you requesting to support my purpose of data collection in and with MIES, which involves short observation periods, interviews with officials working in vulnerable urban areas of Quito, and allow me to accompany officials while they carry out tasks with the beneficiaries of the CNH and CIBV programs in the referred territories. In return for this, I extend my commitment to share the report of results of my research in the territory with the corresponding analysis, so it could serve as a reference in future decision-making in the development of your extraordinary work.

I subscribe in anticipation of my deep gratitude for the support that can be given to this request.

Very truly yours,

Ignacio Loor Colamarco
ID 1305320077

Figure 3.3. Sample of meeting request letters.

The third and last criterion involved capturing perceptions from informal vendors in Quito. I was interested in conducting this study in established informal

settlements, which feature minimum risk of eviction for settlers and are somewhat mature, and which would also be significant for informal workers of the city. Casual interviews in the form of informal conversations with ambulant vendors in the hypercentre (HC)[7] informed this criterion. Prominent opinions were recorded in field notes containing details of directions to places that might be of interest for this research. The HC is where street vendors most often concentrate. Informal vendors seem to stratify informal settlements by attaching meanings linked to sorts of specialised provision of the space. So, *La Argelia* concentrates on agricultural allotments, *La Pulida* manufactures and supplies bricks to informal settlements in the north, and so on. This activity was useful to explore places perceived as significant from the viewpoint of informal vendors (Puren & Roos, 2016) and to identify some of the prominent informal counterparts of formal Quito. Their inputs, including stories of daily struggles to travel to the city, along with very incipient maps indicating places of interest, were valuable to make an informed decision on the sites that would be suitable for the study's aims.

In the end, based on rapid analysis of data gathered and aware of the limitations of this, the sites selected for this study comprised seven informal settlements. Five of them are spread on the western peripheries towards the slopes of Pichincha, and the other two are on the eastern margins of the city. The sites selected, as shown in Figure 3.4, were: *Quitumbe*, *Guamaní*, and *Ciudadela del Ejército* in the South West, *La Argelia* in the South East, *Guápulo* towards the Central East, and *La Roldós* and *La Pulida* in the North West.

[7] Hypercentre (HC) is a south-north longitudinal merger between the historic colonial centre and the post-oil financial and bureaucratic centre (Vallejo, 2008).

Figure 3.4. Case study – Informal settlements of Quito (adapted from Google Maps).

3.4. Examining the context

I produced the context chapter from a combination of systematic document analysis, observations during preliminary visits, and open-ended interviews with experts. The systematic document analysis facilitated preliminary understanding of the physical vulnerabilities in which informal settlements exist, as well as their social organisation. Observations produced field notes and photographs of informal settlements. Finally, the interviews with experts were useful for interpreting the links between the physical vulnerabilities and the practices of assembling IGIs.

3.4.1. Systematic document analysis

A systematic review of technical reports, newspaper articles and government documents was conducted simultaneously in the initial stage of the fieldwork. In reference to the features of the space, I first examined four reports addressing practices used in the course of land occupation (both formal and informal) on the peripheries of Quito. The library of the Latin American Social Sciences Institute (FLACSO Ecuador) – http://www.flacsoandes.edu.ec/libros – using keywords "Quito" + "*vulnerabilidad*" + "*barrios periféricos"* was the source of this information. I also examined three documents that offer an account of the prevalence of Andean Indigenous and African descendants in the informal settlements of Quito from a historic perspective – keywords "Quito" + "*étnico*" + "*barrios*". These reports

were complemented by newspaper articles and news videos covering events of landslides, forest fires, and violence in informal settlements between 2014 and 2016. I searched for this material by combining keywords on the websites of local newspapers *El Comercio*, *Últimas Noticias*, *La Hora*, and *El Telégrafo*, which included "Quito" + "*deslizamiento*" + "*laderas*" + "*barrios*" + "*comunidad*", and "*incendios*". I analysed these documents by performing triangulation between findings in technical reports and news.

Regarding everyday practices of inhabitants, I began by reviewing publications by NGO *Ciudad* – http://ciudad.org.ec – which were recommended and facilitated during the interviews conducted in the first cycle of this research. These documents address the occupation and consolidation processes of informal settlements, as well as their struggles to cope with insufficient infrastructure provision. Additionally, I analysed leaflets and local classified ads – i.e. *Diario Últimas Noticias* – to gain descriptions of the place and representation of realities, as well as awareness of terminology, trading practices and landmarks (schools, health centres, stadium, etc.) in informal settlements. For example, the advertisement of Figure 3.5 from http://olx.com.ec – "Butchery *Pisuli* for Sale – Opportunity sell of butchery located in *Pisuli* a block above the stadium…" gives an idea of local semantics, as well as the local approach to describing access to locations – given the lack of formal addresses – involving a landmark (stadium).

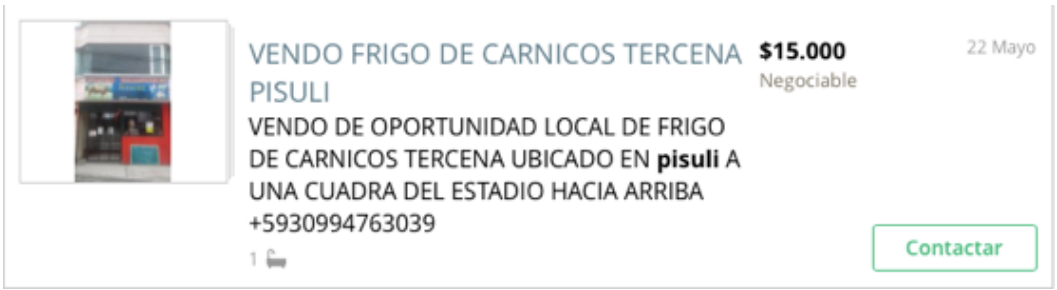


Figure 3.5. Advertising in informal settlements.

To gain awareness of the social organisation of informal settlements and their scope of action, I first reviewed the study "*Las organizaciones barriales de Quito*" by García (1985) about the territorial organisation of Quito, available in the FLACSO library. Because of the age of García's study, I complemented this knowledge by reviewing the legal framework that allows right of association. The latter involved examining the Constitution of Ecuador and ministerial acts of approval for the statutes

of associations in informal settlements – searchable in *Registro Oficial* website – http://registroficial.gob.ec keywords "*comité*" + "*liga barrial*" + "*[name of informal settlement]*". Moreover, I examined newspaper articles covering incidents in which associations in informal settlements were involved. The search was conducted in websites of local newspapers *El Comercio*, *Últimas Noticias*, and *La Hora* using keywords: "*comité pro mejoras*" + "*liga barrial*" + "*cooperativa de vivienda*" + "*organización social*". This material was analysed by means of triangulation between legal frameworks and news.

3.4.2. Preliminary observations

Preliminary observations involved navigating informal settlements to experience the place and observe people, natural surroundings and infrastructural resources. To conduct this task, I requested support from MIES, as explained in section 3.3 of this chapter. I had learned that this bureau provides several services tailored to informal settlements, including a network of nurseries (CIBV – *Centros Infantiles del Buen Vivir*). I joined a team in charge of performing follow-up visits to the nurseries in informal settlements for three days. We drove to and walked around in nine informal settlements (the 7 selected in stage 1 plus *Calderón* and *Consejo Provincial* in the North of Quito). This allowed for preliminary descriptions and mapping of potential places as forms of GI that could be included in the study. This activity also functioned to meet workers from MIES in informal settlements and take photographs. These visits to informal settlements were useful to corroborate information gathered through other sources, as well as to perform triangulation of methods.

3.4.3. Interviews with experts

Interviews with experts were helpful to perform triangulation and expand understanding of the spatial settings of informal settlements, the legal framework in terms of freedom of association and their social dynamics. Six experts, including four local academics, one ecological activist, and one worker from MIES who is resident in an informal settlement, shared their views and provided a detailed explanation of the geomorphological vulnerabilities of informal settlements, processes and practices of occupation, social organisation, and everyday struggles of settlement dwellers. These experts had engaged in some projects in informal settlements in the past, in activities such as constructing bridges, planting trees, supporting on-going cultural

manifestations, organising groups of women, giving technical advice on issues of concern to local organisations, and conducting research. Beyond enhanced understanding of the context, this activity also produced contact information for community leaders, along with directions to find important places in informal settlements such as the community houses or the football pitches. Again, having attended the Habitat 3 Conference in Quito opened a pathway into this network of informants.

3.5. Tracing informal green infrastructures

With the assistance of gatekeepers, I explored the sites on foot in search of spaces that could constitute IGI. The selection of IGIs in the first place had to be based on observable features that could be consistently identified in multiple sites. Observable features in this case are spatial patterns and shapes, as well as ways in which the space is used, and by whom. In a second phase, less observable features were validated against McFarlane (2008a) and Simone's (2008) conceptualisation of informal infrastructures. Non-observable features are, for instance, the motivations that local residents have for using the spaces and whether they interrelate with established networks.

To consider a space worthy of inclusion in this study from simple observation, a twofold criterion had to be met: 1) the spatial patterns and shapes had to reflect a reconfiguration of the green landscape after which the soil surface remained pervious; and 2) the space had to be used consistently by the communities in same way(s). The first criterion is what entitles these spaces to be called green. As discussed in the literature review section, the claimed environmental benefits of soil permeability are varied, and in the context of informal settlements include improving rainwater retention and improved flood control (Yamashita, Watanabe, & Shimatani, 2015), protection from soil erosion (Goonetilleke, Yigitcanlar, Ayoko, & Egodawatta, 2014), and reduced risk of pollutant reproduction (Nayebare, 2012). The second criterion, on the other hand, partially grants infrastructure status to these spaces. Infrastructures are used in consistent ways and facilitate flows and access. Lastly, trans-local linkages of these spaces were pursued. Such linkages are not directly observable; so, complementary interviews and observations were required to decide on inclusion.

In the end, the infrastructures worthy of inclusion as categories of IGI were three: Agricultural allotments, footpaths on slopes and ravines, and football/volleyball pitches. Other categories of GI found in informal settlements, which were not

considered IGIs, are local park/playgrounds, small shrub areas, and a flower garden. Local parks are actually common across the informal settlements investigated. As mentioned in 3.3, these informal settlements are mature and consolidated, and have obtained the parks through the municipality or donations by politicians and NGOs. In most cases, these parks are visibly abandoned, unclean, unsocial, and avoided by locals for being considered unsafe. Similarly, shrubs are often blended with rubbish, occupied by abandoned dogs, and have unpleasant odour. While on the subject, the dog population is appreciably large in these informal settlements and can make an interesting case for studying urban fauna in the context of marginalisation. The parks and shrubs observed are barely used, and thus, unsuitable to meet the IGI criteria. Conversely, the flower garden, although it is well-preserved and used consistently as social space for a group of elderly residents, it was only one case and not a sample of cases in multiple sites.

3.5.1. Agricultural allotments

Allotments have been widely assumed to be green infrastructure in the literature (Cameron et al., 2012; Gill et al., 2007). Nonetheless, I tested them for inclusion by disentangling the networks to which they belong. Many allotments located in informal settlements are sources of produce for trading in the farmers' marketplaces of the city, in which case they are embedded in the fresh food trading networks. Some larger and better sorted community allotments offer their produce in *bioferias,* a network of organic food marketplaces run by the municipality. Then, *bioferias* located in the urban sectors *La Delicia*, *Itchimbía*, *Quitumbe*, *Las Cuadras*, *La Floresta*, and *La Carolina* were explored to appreciate the networks in which the allotments were embedded. Data relevant to locations, features, and people involved were recorded in field notes.

3.5.2. Footpaths on ravines

I began the search for IGIs in the ravines of *La Roldós*. The first finding was the shape of bare footpaths on slopes and ravines. The ravines in *La Roldós* had not been intervened in for rehabilitation at the time of the fieldwork. This made it possible to explore the footpaths in practically their raw condition*,* which was propitious to producing evidence about pre-intervention ways and scales of usage. In the site *La Pulida*, the ravine had been in the process of intervention for approximately a year at the time of fieldwork. In this context, it was evident that the footpaths were playing a

more active role in the everyday life of the community. Thus, a favourable condition was given to recording patterns of scaling and to approaching locals for interviews on the move. In sites *Quitumbe* and *Ciudadela del Ejército*, ravines had been intervened in between five and ten years before the municipality's restoration programme started. Their footpaths were more established and safer to walk on (from my own experiential perception), so these ravines offered a rich description of a setting in which restored ravines are embedded into the everyday practices of neighbours. Finally, in order to test footpaths for inclusion as a category of IGI, their trans-local linkages were traced. I experienced footpaths and located neighbourhoods and places of interest that footpaths connect. In most cases, these places were transport hubs. Data were recorded in field notes, which included location, features, and people involved.

3.5.3. Football and volleyball (ecuavoley) pitches

At each of the sites observed there was more than one football and *ecuavoley* – volleyball of three – pitches. The main football pitch in informal settlements is normally identified as "the stadium", and often constitutes a local landmark that functions as a reference when offering directions to locations. In the cases of *ecuavoley* pitches, users would often wish the surfaces to be coated with cement. However, the majority of *ecuavoley* pitches observed were still dirt-made, such that their soil remained permeable at the time of fieldwork. During the walk exploration in *La Roldós*, the municipality had delivered upgrade works in two of their football pitches, for which a re-launch ceremony for the pitches had been arranged. This ceremony, which included a mayor's speech and overlapped with the launching of the league season, was auspicious to "catch the significance" (Weick, 2007, p. 16) of the football pitches. In *Ciudadela del Ejército*, the gatekeeper involved was himself a player in both the local football league and the *ecuavoley* local games. This facilitated engaging in the dynamics produced in the pitches. In *Guamani*, the pitch is the venue for the local carnival celebrations every year.

3.6. Collecting everyday practices data

The collection of everyday practice data was organised on three spatial scales: IGIs, informal settlements, and citywide. A variety of qualitative data collection techniques were employed at each scale.

3.6.1. IGI scale

Beyond the observable features explained above (3.5), data collection at IGIs had a threefold aim: 1) determine how IGIs were shaped, are maintained, and transform; 2) describe the functionality of IGIs for residents of informal settlements; and 3) trace the networks of relationships and flows in which IGIs are embedded. Methods involved participatory observation, non-participatory observation, and interviews on the move. Participatory and non-participatory observations were conducted to capture the forms in which communities use IGIs (beyond the obvious), understand relevant cultural dimensions, and gain an approximation of the scale of usage and networks in which IGIs are embedded. Interviews involved gaining rich insights into experiences, attached values and attitudes towards IGIs.

Participatory observations were performed 40 times, distributed across IGIs and sites. These consisted of examining IGIs by experiencing the space and taking part in the social situations and practices they produce, so understanding of behaviours is appreciated as they occur in the natural setting (Kumar & Phrommathed, 2005). Participatory observation involved engaging in working shifts at community allotments, walking the trails of dwellers through the footpaths on different days and at different times of the day, and engaging with those attending games at football and *ecuavoley* pitches. Participants with whom the study was conducted, thus, involved farmers in community allotments and their trading networks, users of footpaths on ravines and slopes, and players and audiences engaged in football and *ecuavoley* pitches. Observations were recorded in field notes including data about the space, actors, activities, objects, time, and feelings. Notes were taken immediately after completing the observations.

Non-participatory observations were performed 20 times. These observations were unstructured and conducted from the perspective of a distant observer. This activity aimed to identify consistent practices and variables such as scale of use and differences in male/female usage. These observations consisted of two-hour intervals of observation across IGIs and sites (Altmann, 1974). Observations were recorded in field notes containing logs on space, actors, phenomena observed, and counts.

Interviews “on the move” were conducted with 63 participants “while using IGIs”, and comprised farmers while they were working at community allotments, pedestrians using footpaths for their mobility needs, and users of football and *ecuavoley* pitches while games were being played. The interviews were conducted in unstructured conversation format and were either audio- or note-recorded.

3.6.1.1. Procedures of data collection at community allotments

Data pertinent to community allotments were collected in two periods, between December 2016 and February 2017, and between December 2017 and January 2018. For the allotments in *Guápulo* and *La Argelia*, the first approach was made in the *bioferias*. This allowed me to obtain consent and plan for data collection in UCAs. In the case of UCAs in *Guamaní*, an NGO informant that had assisted in launching the UCA introduced me to the members. Data collection in UCAs comprised field notes from 12 participatory observations, 8 non-participatory observations (including six *bioferias*) and audio/note records of 9 interviews, distributed among the sites as detailed in Figure 3.6.

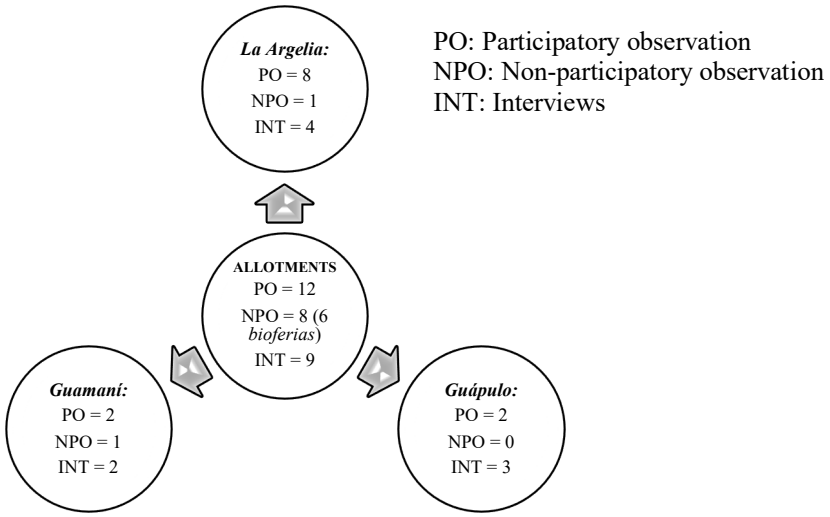


Figure 3.6. Data collected in UCAs.

Participatory observations were conducted by engaging in allotments' working shifts of between two and three hours. These observations involved 8 work shifts in *La Argelia*, and 2 each in *Guápulo* and *Guamaní*. The shifts, although consistent in time duration, differed slightly in terms of day of the week, time of day, and weather. I engaged in tasks such as preparing a hotbed for planting, registering the produce sent for trading at *bioferias*, and sharing tea during break times. Observations were recorded in structured field notes containing information as to date, site, space features, descriptions of actors sharing space and time, descriptions of activities being performed, and themes being discussed among actors while undertaking their tasks. Teatime was particularly rich for producing data, since this is the time at which farmers share their daily concerns with peers.

Non-participatory observations were conducted once on each of *La Argelia* and *Guamani*, and in 6 *bioferias*. This activity involved recording the number and gender of participants, activities, technologies, and visitors for two hours every time. In *bioferias*, it involved observing and recording the practices of retailing organic food in marketplaces intended for promoting organic urban agriculture. Also, the initial contact with farmers from *La Argelia* and *Guápulo* was achieved during these observations in *bioferias*.

Interviews were conducted with 4 farmers in *La Argelia*, 3 in *Guápulo* and 2 in *Guamaní,* all of them being women. These were conducted and recorded during tea break times in a one-to-one open-ended conversation format of between 30 to 40 minutes each. Among the themes discussed were their roles in households, the contribution of allotments to those roles, how they became engaged in the allotment, how they organise tasks, how the association is stratified, what they seek by taking part in the allotments, and how satisfied they are with being part of the associations.

3.6.1.2. Procedures of data collection at footpaths

Footpaths were investigated during two periods of fieldwork, between November 2016 and January 2017, and between December 2017 and January 2018. In *La Pulida*, *Quitumbe* and *Ciudadela del Ejército*, the experts referred to in 3.4.3 were key to entering these communities. Since their work approaches in informal settlements had relied heavily on the labour of local communities, it was possible to directly approach local households and engage them. Data collection in footpaths comprised field notes from 14 participatory observations, 7 non-participatory observations and records of 30 interviews, distributed as detailed in the diagram in Figure 3.7.

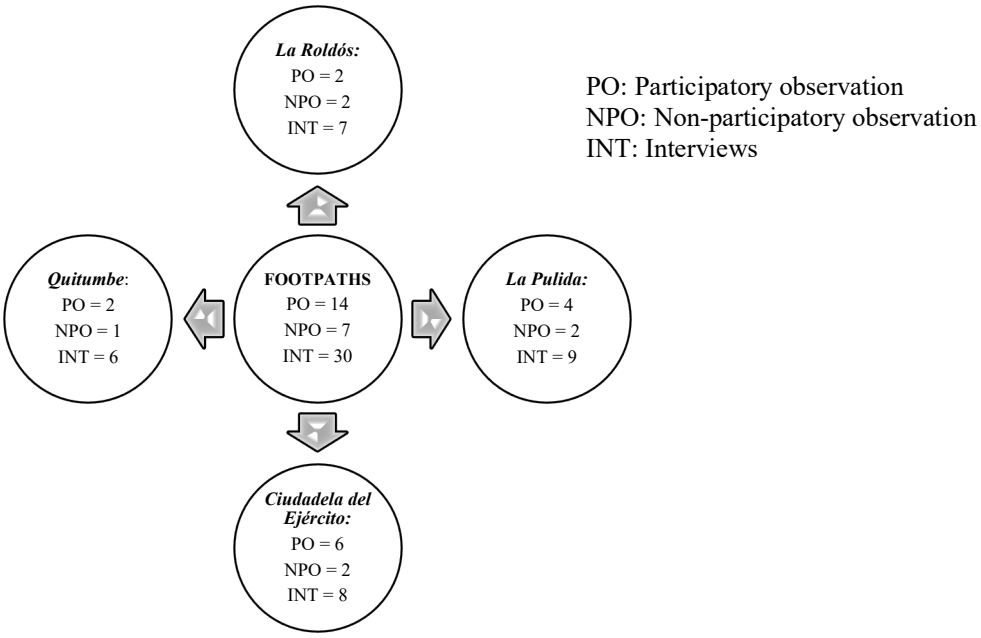


Figure 3.7. Data collected in footpaths.

Participatory observations involved experiencing the footpaths by playing the role of a local pedestrian. This was performed 14 times as detailed in the figure above and consisted of walking alongside participants – previously arranged – who use footpaths on a daily basis. This comprised walking between informal settlements through footpaths, and between informal settlements and public transportation stops in main roads. Information was recorded in field notes. Non-participatory observations, on the other hand, were performed 7 times from the ends of footpaths for two hours each, on different days and at different times of day, and involved recording the volume of pedestrians and their behaviours. Lastly, 30 interviews "on the go" that lasted between 8 and 10 minutes were conducted with random pedestrians. Participants were asked in an informal manner where they were going, why they use the footpath, what alternatives they have, in what circumstances they avoid them, what stresses them when walking on the pathways, how they manage stressful situations on the footpath, and how their mobility needs can be better served.

3.6.1.3. Procedures of data collection at pitches

Pitches for football and *ecuavoley* were explored in sites *La Roldós*, *Ciudadela del Ejército*, and *Guamaní* between November 2016 and February 2017, and in December 2017. For the case of *La Roldós*, the community leaders – *Cooperativa de Vivienda* – put me in contact with an informant from the local football league, who assisted in collecting data from both football and *ecuavoley* pitches. In *Ciudadela del*

Ejército, the gatekeeper was himself a user of pitches and an active actor in the everyday activities of the football league and *ecuavoley* games. In *Guamaní*, one of the participants in the focus groups was an active member of the local league and ended up supporting this exploration. Data were recorded in field notes from 14 participatory observations, 5 non-participatory observations, and records of 24 interviews, as detailed in Figure 3.8.

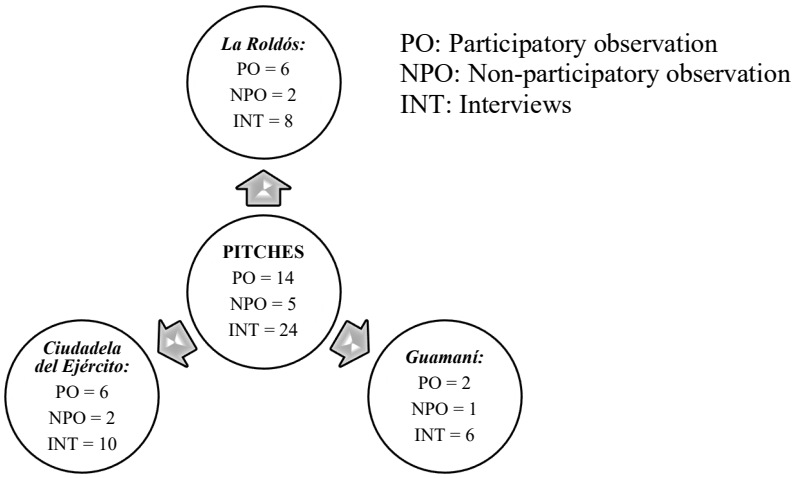


Figure 3.8. Data collected at pitches.

Participatory observation involved taking part in the football games as a spectator, and in *ecuavoley* games as gambler/spectator. Participatory observations at football pitches were performed 9 times, and 5 times in *ecuavoley* pitches. In the case of football pitches, these observations involved engaging with supporters of either of the teams on the field from about 30 minutes before the beginning of the match until 30 minutes after the match was over. This comprised sharing views and comments with adjacent spectators about the performance of the teams and players, or about the correctness of the referee's judgements. At the *ecuavoley* pitches, I took part in betting pools, and as in the case of football games, also shared views on the referee's decisions. Field notes documented date, time, site, features of the pitch, description of actors sharing the space, practices, incidents, languages, behaviours, and stories. Non-participatory observations, on the other hand, were conducted 3 times at football pitches and 2 for *ecuavoley*. In these cases, I played the role of distant observer focusing on features and surroundings of the pitches, number of actors engaged by gender and age, practices, and behaviours. Lastly, 13 interviews were conducted at football pitches and 11 in *ecuavoley*. These were performed during breaks while

games were in progress and took between 15 and 20 minutes each. Themes addressed included the history of the pitch, what they seek by being engaged in sports, how important the pitch is in their personal lives, how they organise games, how stratified actors involved in the pitches are, practices of pitches maintenance and sports playing, and aspects of competition among teams and neighbourhoods.

3.6.2. Informal settlement scale

The aim of data collection at the informal settlement scale was threefold: 1) appreciate everyday struggles; 2) understand community organisation and the roles played by relevant actors; and 3) capture perceptions of local residents toward IGIs. The methods used at this scale comprised deep interviews with 6 community leaders from *La Roldós*, *Guamaní*, *Quitumbe*, and *Ciudadela del Ejército*, along with focus groups with local residents, which involved 24 respondents from *La Roldós*, *Quitumbe*, and *Guamaní*. Participants in focus groups at *Quitumbe* and *Guamaní* were mostly housewives, who were simultaneously looking after children, as shown in Figure 3.9, while the data collection process was being performed. In La *Roldós*, participants were more heterogeneous in terms of gender and age. Further, participants were accessed with the assistance of MIES.

Figure 3.9. Focus group in CIBV in *Guamaní*.

Interviews with community leaders were conducted at their offices for approximately 1 hour. These were organised in 5 parts: 1) past and current issues at

community level; 2) views and expectations in terms of access to green spaces; 3) approaches to enhancing mobility and access to the city; 4) views on community allotments; and 5) views on football and *ecuavoley* practices. Typically, they were asked the history of how the informal settlement and IGIs started, how they describe the main events in the history of the site, what contributed to enhance the space, who was involved, who is desirable to be involved now, how they deal with everyday situations (illnesses, going to work/school, organising celebrations and funerals, etc.), how they visualise green space in the site, what help managing the site and IGIs, how they organise the management of the site and IGIs, and what is detrimental to the site and IGIs.

Focus groups, on the other hand, lasted about 1 hour 30 minutes, and were organised in two parts: 1) discussions centred on participants' struggles to access and use green spaces; and 2) perceptions of IGIs. Concerning the former, the purpose was to appreciate hints about their environmental consciousness (Schlegelmilch, Bohlen, & Diamantopoulos, 1996), and that of the rest of the community based on the participants' perceptions. Deliberations about the importance of preserving natural landscapes, and how local practices endanger the environment were encouraged. Additionally, I aimed to capture descriptions of what it takes for them to access green spaces. These descriptions unveiled rich accounts of their daily lives – issues of mobility, local pollution, physical vulnerabilities, spatial anarchism etc. – and of actors that play prominent roles in the community. Concerning perceptions of IGIs, the aim was to capture clues about the conveniences and difficulties that residents associate with IGIs. They were asked to reflect on good and bad aspects of IGIs, what stresses them, how they cope with stressors, and what constitutes a good and a bad day in the neighbourhood in reference to IGIs.

3.6.3. Citywide scale

On the citywide scale, data collection had the purpose of capturing perceptions of city stakeholders regarding informal settlements, particularly in terms of the challenges they pose to the city's aims of green space provision and preservation. This included: 1) views of local and national government on the most pressing issues in informal settlements; 2) views on issues of mobility and infrastructure provision; and 3) views on intervention approaches. Deep interviews were conducted with 17 informants classified according to their roles in three sets: 1) 6 informants from local development agencies, 2) 6 specialists and bureaucrats engaged in projects and public

service provision in informal settlements, and 3) 5 governmental officials involved in the environmental management of the city. Interviews of approximately 1 hour were conducted between November 2016 and February 2017 at informants' offices. These informants were approached through letters. They were mainly asked about their experiences in informal settlements, what it is like to deal with everyday situations, what they believe would contribute to enhancing lives in informal settlements, who are involved and who are desirable to involve, who has been helpful, and what should be done.

3.7. Data analysis

Data analysis was iteratively performed in two periods: 1) during the fieldwork phase as data were collected and 2) after the fieldwork phase. Data analysed during the fieldwork phase had the purposes of selecting sites, analysing the context, and deciding on typologies of IGIs in which the study would expand. Also, reviewing material simultaneously with data collection in the field made it possible to write clarifying notes when needed, identifying emerging concerns, proposing and testing some preliminary propositions and venturing into early relevant findings. After fieldwork, data collected in field notes, photographs and audio recordings were organised, transcribed (in Spanish, since it was the language of data collection), and edited for inductive analysis. This latter consisted of the iterative examination of field notes and interview transcripts to discover themes and conceptual relationships. The voices of the participants were privileged in this process. The following lines provide specifics of the analysis process:

3.7.1. Data analysis pertinent to case study/sites, context examination, and IGI selection

Raw data had the form of handwritten notes, audio files, and visual files. The first phase of this research was aimed at selecting the sites – informal settlements – in which this study would be expanded. This phase relied on interviews from three sources: 1) consultants attending Conference Habitat 3, 2) bureaucrats and NGOs, and 3) street vendors in the city's HC. A number of sites (*barrios informales*) and details of attributes were audio recorded, and then imported to spreadsheets for rapid coding. Most frequently mentioned informal settlements were evaluated against stories involving a ravine (*la quebrada*) and the ability to have gatekeepers engaged in the study.

Data analyses for the context examination and IGI selection were performed simultaneously. Context examination aimed at gathering descriptors of informal settlements. Data had the form of technical reports, press releases, fragments of laws (right of association), flyers, photographs, field notes, and audio files. Physical and social descriptors in technical reports (from a perspective of vulnerabilities and community organisation), as well as fragments of laws, were identified and linked to press releases relevant to prominent events in the sites (i.e. landslide, forest fire), and to activism on the part of social organisations (football league, housing cooperative). A list of themes emerged, which was analysed in depth during interviews with experts. Iterative triangulation was performed to articulate the context description.

IGI selection aimed to create a typology for categories of IGI. It relied on observations recorded in field notes and photographs. Field notes had descriptions of space and of ways in which space is used. Field notes were examined along with photographs. Grounded on theories about informal urbanism and infrastructure (McFarlane, 2008a; Simone, 2004a, 2008), verification that these infrastructures follow incremental patterns and that their soil surfaces remain pervious was performed. Also, clues indicating that these spaces were embedded in networks were attempted.

3.7.2. Data analysis pertinent to everyday practices

Investigating everyday practices involved analysing field notes of participatory and non-participatory observations, photographs, handwritten notes, and audio files from interviews, which were related specifically to the three forms of IGI. During the fieldwork phase, data were organised in spreadsheets as data collection progressed. After fieldwork, audio files, photographs, and field notes were organised and transcribed. For each type of IGI, data were scanned for units of meaning that would be relevant to the research questions and to theoretical propositions concerning informal infrastructure, including assemblage, incrementalism, human agency, networks, and governance. The resulting units of meaning were sourced from the informants' own words, essentially comprising the interview data, and from my own created meanings from observation records. Analysis of commonalities and differences among units of meaning shaped the relevant themes for each type of IGI. Lastly, findings for each type of IGI were reported following a rich description approach.

In addition, different approaches to triangulation were performed. Data triangulation involved cross-validating different sources of data that gave shape to the units of meaning. With the notion of triangulation in mind, data were collected in different times and places, and from different informants. Thus, community allotments explored were located in different informal settlements and sponsored by different organisations, footpaths were observed and experienced in different sites on different days and at different times of the day and with different users, in addition to which, pitches were examined across different informal settlements and in different places within informal settlements. Furthermore, interpretation of data was triangulated across methods, for instance, between data collected from interviews and observations. This approach was effective for validity and to elucidate early inconsistencies.

3.8. Considerations on positionality, ethics, and personal safety

This section reflects on my outsider positionality to the communities studied in this thesis. As suggested by Merriam et al. (2001), unanticipated issues happen during fieldwork, which are worthwhile sharing to advance understanding of this subject. Specifically, this is an important point because it yields key information about informal settlements that future researchers can take into consideration when pondering data collection methods. The following paragraphs address positionality imbalances, ethical dilemmas, and safety considerations in conducting this fieldwork.

3.8.1. Addressing possible positionality imbalances

Throughout my research, I have been aware of my positionality as a researcher from outside the communities investigated, and as a former worker at certain government agencies. This translated into different world-views and expectations about the roles of actors, artefacts, and spaces that contribute to IGI emergence and change. To provide a flavour of the differences, although I am Ecuadorian and "speak the language", I am culturally different from the communities I studied. Unlike residents in the informal settlements of Quito, I grew up with access to household amenities that are conventional in urban centres. Also, I had held managerial positions at the Secretariat for Water (SENAGUA) and the National Corporation of Electricity (CNEL) in Ecuador, where I had to deal with commercial losses of water and energy respectively due to informal connections in informal settlements. Because of the latter experiences, I became trapped in endless debates about approaches to

reducing losses. The highest executives at the mentioned agencies often addressed losses as being related to technology obsolescence, for which smart grids and emerging technologies in metering systems would potentially solve these problems.

Nevertheless, by taking part in the "hunt" for informal connections in informal settlements during my days at SENAGUA and CNEL, I gained a better understanding of what it is to live in urban peripheral communities without formal access to basic infrastructure and fundamental necessities. As a consequence, my perspective on losses shifted from being a technological challenge to instead being a failure of markets and institutions. In addition, these experiences made me aware that informal settlements feature their own forms of GI. In part, these experiences shaped my research questions for this study, as well as my interactions with informal settlement dwellers.

From there, I take the position that urban marginalised communities are often neglected from the public interest. However, these communities would continuously find ways around the wider city's social and institutional structures and dynamics to see themselves provided with what they consider essential. For example, similar to Silver's (2017) study cited in 2.4.1, electricity infrastructure in informal settlements manages to count on the continuous input of skilled electricians, who are often from outside their communities, and bureaucrats of pertinent agencies, which despite losses, simply turn a blind eye to everyday informal practices in these spaces. It is likely that this position biases my interpretation of the data obtained. To overcome the influence of preconceived ideas, this study avoids intuition and relies instead on the information that participants provided. Besides, for validity purposes, the findings and interpretations were subject to multiple triangulations among participants in this research.

3.8.2. Overcoming ethical dilemmas

During the course of the fieldwork, unforeseen ethical dilemmas arose, which were particularly evident when I attempted to play the role of an insider. The nature of these dilemmas can be grouped into three categories: first, the political positions of participants; second, the informal nature of income-generating practices; and third, the conflicts within the community governance structure. These dilemmas were present in all the sites examined, so it may be worthwhile to investigate them as contextual variables in future research on informal settlements.

Concerning the first dilemma, investigating the informal settlements of Quito at the time of this fieldwork involved navigating between supporters of antagonistic political forces: that of the central government – PAIS led by former president Rafael Correa, and SUMA, which was the party of Quito's mayor, Mauricio Rodas. As will be explained in the empirical chapters of this dissertation, informal settlements are highly politicised spaces. Indeed, political clientelism is often a mechanism by which to achieve legitimisation of informality. To deal with this, I attempted at all times to keep politically neutral and avoid partisanship on controversial issues. However, to play the role of an insider, I was confronted with taking political positions in more than one occasion.

In relevance to legitimacy of income-generating practices, while conducting fieldwork I met actors immersed in a wide variety of activities deemed illegal in Ecuador. These ranged from vendors of drinks made with unregulated sources of water to owners of clandestine brick factories. I was aware of relevant legal provisions, and thus, of the ethical dilemmas I was confronting. However, interviewees seemed less concerned about these issues, perhaps because I made it clear that the information they would provide had to be anonymised. Since practices of income generation were not the focus of this research, I avoided asking questions on this matter and focused instead on what was pertinent to IGI.

Lastly, as to conflicts within the community governance structures, I came across participants who openly stated their discontent about leaders or organisations within their communities, whom I also had to meet. For example, when conducting a focus group in one of the informal settlements investigated, participants – being women mostly – eagerly complained about and discredited their neighbours involved in the local football league because of violent events associated with alcohol consumption. I later conducted participant observation with the alleged football league, for which I had to disregard information that could influence my attitude towards them. In sum, I negotiated ethical issues on a case-by-case basis throughout my different research roles: as interviewer, participant observer, and focus group leader.

3.8.3. Personal safety considerations

From the moment I decided to conduct research on informal settlements, I was aware that these spaces had a reputation as the most violent spaces in Quito. I had conducted preliminary research on the sites I wanted to investigate by examining local

newspapers, in which it was usual to find pieces of news about violent events, including crimes. To minimise safety risks, I built up a network of gatekeepers. I began this by asking the Ministry of Social and Economic Inclusion of Ecuador (MIES) for assistance after I had gained awareness of the intervention programmes that they perform in informal settlements. Being myself a scholarship recipient from the Government of Ecuador (SENESCYT) was an advantage in gaining access to decision makers at MIES. Through MIES, I had access to community leaders in informal settlements. Likewise, other institutions, such as the Quito Municipality and NGOs (e.g. Ciudad and CONQUITO) also put me in contact with community leaders, most of whom ended up looking after my exploration of the sites. Finally, while conducting data collection, I was accompanied by a local resident of the informal settlement being investigated at all times.

3.9. Conclusion

This chapter has described the research design and methods that were used to conceptualise IGI. As suggested in the literature review section, the elasticity in what GI may entail posed an initial challenge for this research. In this regard, this study required delimiting IGI to human-made physical arrangements of a mix of bare soil and vegetation-covered surfaces located in informal settlements, which neighbours would use consistently in the same ways. From there, since the concern of this study is the emergence and transformation of IGIs, the research design addressed these arrangements as self-help infrastructures that needed to be examined from the everyday practices perspective. This involved tracing the range of actors, dynamics, interests, resources, and organisations that put IGIs in place.

This research follows a case study approach. Fieldwork was conducted in Quito city, with specific attention to IGIs located across seven informal settlements and their connecting spaces and processes in the formal city. The research used a mix of qualitative techniques for data collection. Working with multiple sites suited well the exploratory nature of this study. I can say at this juncture that every additional site and IGI investigated opened a door to the discovery of new actors, contextual factors, and processes that drive IGI relevance and transformation. Also, this approach shaped the way in which the empirical chapters were developed. In this regard, a description of the context that gives meaning to IGIs and the everyday practices involved is a convenient starting point, while IGI typologies are presented in such a way that each

one builds upon the other. Lastly, data were analysed iteratively from multiple pieces of evidence and constant triangulation.

While this research approach produced the evidence needed to address the questions guiding this study, it also presented both opportunities and challenges that are worth examining. On the opportunities side, the data collection process allowed the shaping of a network of participants from a wide range of institutions, both local (Ecuadorian) and international, which are concerned with issues of urban sustainability. These included NGOs, academics, community leaders, and participants in the United Nations Conference Habitat 3, which took place in Quito in October 2016. As for challenges, these were related to ethical dilemmas unanticipated when designing this research. These involved, for instance, negotiating personal political positions to fit in as an insider in the informal settlements investigated. The next four chapters present the empirical findings of this thesis, including the context of informal settlements and specifics for each of the IGIs, followed by a discussion about contributions and implications.

Chapter 4
The context of informal settlements in Quito city

4.1. Introduction

This chapter introduces the informal settlements of Quito and describes facts and circumstances that give meaning to everyday practices in these spaces, which impact the configuration of their surrounding green landscapes. Context is a key issue in understanding the interaction between communities and infrastructure because it influences ability to adopt everyday practices. This chapter is important for this dissertation for at least three reasons: 1) it is that context which needs to be transformed to ensure the continuous functioning of communities that live in it and those disturbed by its alteration; 2) it identifies structural challenges that threaten the preservation of green landscapes and the development aims of peripheral communities; and 3) it facilitates understanding some practices of informal settlers when viewed from the perspectives of other disciplines and of practitioners that influence sustainable development policy.

To give some indication of the magnitude of the problem, municipal authorities estimate that about 60% of the houses in Quito were built informally (Jácome, 2017) and a significant proportion of them were developed on land occupied by informal means. Thus, most of these houses are located in peripheral neighbourhoods that often lack the preconditions for conventional infrastructure supply and exist in a perpetual condition of vulnerability. Although the dynamic and unregistered nature of informality makes it difficult to size this problematic accurately, Quito is estimated to hold about 800 informal settlements, which would host over 50% of the city's households (Hernández et al., 2010; Starkoff & Ortíz, 2012).

Irregular access to land in Quito often entails settlers paying for the privilege of occupying and exploiting a plot without lawful property title. This puts informal settlers in recurrent confrontations with local authorities and former landowners, by whom they are portrayed as invaders. In most cases, these plots are distant from the central corridors and disconnected from urban amenities, while the continuous conflict that their inhabitants experience perpetuates their relegation from the city's conventional infrastructural system. In response, the surrounding green landscapes are often altered, in part to make up for the infrastructure shortage.

This chapter seeks understanding of infrastructural practices in the informal settlements of Quito, for which a combination of secondary data analysis and fieldwork were conducted. The reminder of this chapter is organised as follows: section 4.2 builds upon the discussion around the informal settlement scenario in the literature review to provide understanding of environmental resources and vulnerabilities, which may mediate the production of IGIs; section 4.3 expands on the analysis of social capital presented in 2.5 by examining informal settlements' inhabitants, including their social and political organisations; section 4.4 elaborates on the understanding of informality introduced in 2.4 by describing the local process of land occupation and informal settlement development; and section 4.5 builds upon the discussion concerning agency of the poor in the literature review and describes infrastructural practices in the local context. Finally, a concluding summary is provided in section 4.6.

4.2. The space: Where do informal settlements sit?

Quito is located in the Andes Mountains, 2800 metres above sea level and just south of the equator (0° 10' of latitude south), at the foot of the active volcano Pichincha (alt. 4794 m). The city was first established on a tectonic plate situated approximately 300 metres above the Andean Plateau between the Oriental and Occidental cordilleras[8]. The city sits on a narrow passage of some description of 30 km by between 3 and 5 km in the orientation north-south (Peltre, 1989). However, the urbanisation process stretched the city boundaries onto the slopes of the volcano Pichincha and the network of mountains and deep ravines that surround the early territory. A layer of volcanic ash of aeolian origin of between 10 and 20 metres thick coats the terrain on the slopes consistently, which makes ravines' banks vulnerable, among other things, to fluvial erosion[9]. Also, Quito has a typical equatorial mountain climate, with an annual mean temperature of 13.5°C, fluctuating between 8° and 25°.

The green landscape that surrounds Quito has suffered continuous transformation since colonial times. Figure 4.1 shows how informal settlements have

[8] The Andes Mountains constitute the longest continental mountain range on the planet, covering over 4,000 miles. In Ecuador, there are two narrow Andes' ranges that run parallel to each other: The Cordilleras Oriental and Occidental. Sitting in the middle is the Central Valley, and it is home to the majority of the country's major cities.

[9] Erosion happens when the flow energy of the water exceeds the resistance of the material of the riverbed and banks (Wynn, Henderson, & Vaughan, 2008).

transformed the landscape. Frank (1980) claims that before the colonial occupation in 1533, a wide variety of tree/shrub species typical of the Andes Mountains, such as *cholán*, myrtle, cedar, walnut, alder, and *pumamaqui* made up for the forest. During the colonial period, however, Spanish households demanded large amounts of firewood and charcoal, which altered the landscape considerably (Carvajal, 2005). In 1865, in an attempt to remediate deforestation related to the practices of the *Colonia*, Jesuit missions influenced former president García-Moreno to import and plant forest species from Australia such as eucalyptus and acacia. These species were later to serve as wood sources in the construction of railroads (Kingman-Garcés, 2006).

Figure 4.1. Landscape transformation through informal land occupation in neighbourhood *Calderón* in the Northwest of Quito (author's photo).

During the 1950's, pine, casuarina and cypress were also introduced, and, together with eucalyptus and acacia, these constitute the substrate of the current biome map of Quito's surroundings. Nonetheless, the combination of cyclical environmental events and advancing sprawl has intensified this landscape's

continuous transformation. For example, in 1983, an "El Niño" current[10] triggered a series of massive and destructive landslides, following which municipal authorities declared Pichincha volcano's eastern flank protected forest. Forest fires, similarly, have been responsible for continuous changes in the landscape. However, changes associated with urban expansion are more obvious these days. Urban sprawl patterns have continued to replace the forest with gated communities and informal settlements, which have perpetuated the landscape transformation dynamic. On top of this, everyday practices of households in informal settlements play a role in this perpetual landscape alteration.

The latter two processes – urban sprawl and everyday practices in informal settlements – are in part what inspired this research. Although this dissertation seeks to learn from what works well in informal settlements to inform policy and practice, I am also interested in how informal practices develop and transform cities. Particularly in cities in developing countries with a high prevalence of informal settlements, urban planners and stakeholders need knowledge about the impact of their plans and policies on informal practices, and how the latter affect the urban systems, especially their spatial features. The example of Silver (2014) used in 2.5.3 on "the moments of adjustment" serves to illustrate these concerns. Likewise, the empirical chapters of this dissertation also reflect my interest in these dynamics by giving attention to adjustments in informal practices that follow changes in urban processes.

4.2.1. The physical vulnerability of informal settlements

The urbanisation of the slopes and ravines surrounding Quito is in general blamed for today's recurrent flooding and landslides in the city. Figure 4.2 shows in darker colours the most vulnerable areas of Quito in terms of landslides. Peltre (1989) documented 517 natural detrimental events of different scope and effect between 1900 and 1988 in which informal settlements were by and large the most affected communities. Ravines of between 10 and 20m in depth on the slopes of the cordilleras and volcano Pichincha make up a natural drainage network for the mountain streams that surround the city. An important number of these ravines have been (and continue to be) filled with impervious material in the course of the urban expansion process to

[10] El Niño is characterised by unusually warm ocean temperatures in the Equatorial Pacific. El Niño is an oscillation of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe, such as increased rainfall.

provide land for both formal and informal residential purposes. Simultaneously, the sewer system that serves residential developments, which in part diverts the natural drainage, often fails to carry both wastewater and stormwater. Thus, when the carrying capacity of sewers and wastewater pipes is overwhelmed, stormwater and mud overflow the streets, provoking soil erosion and, in some cases, road sinking.

> "34% of emergencies in Quito occurred on the slopes… The communities on the slopes of volcano Pichincha are so far, the most affected of the season. This year, the municipal Centre for Emergency Operations has reported 865 emergencies, among landslides, structural collapses, floods, trees downfalls, etc. 34% of them occurred on the slopes in neighbourhoods *La Libertad*, *San Juan*, *Cochapamba* and *Chilibulo*, which account for 293 cases…" (Jácome, 2017)

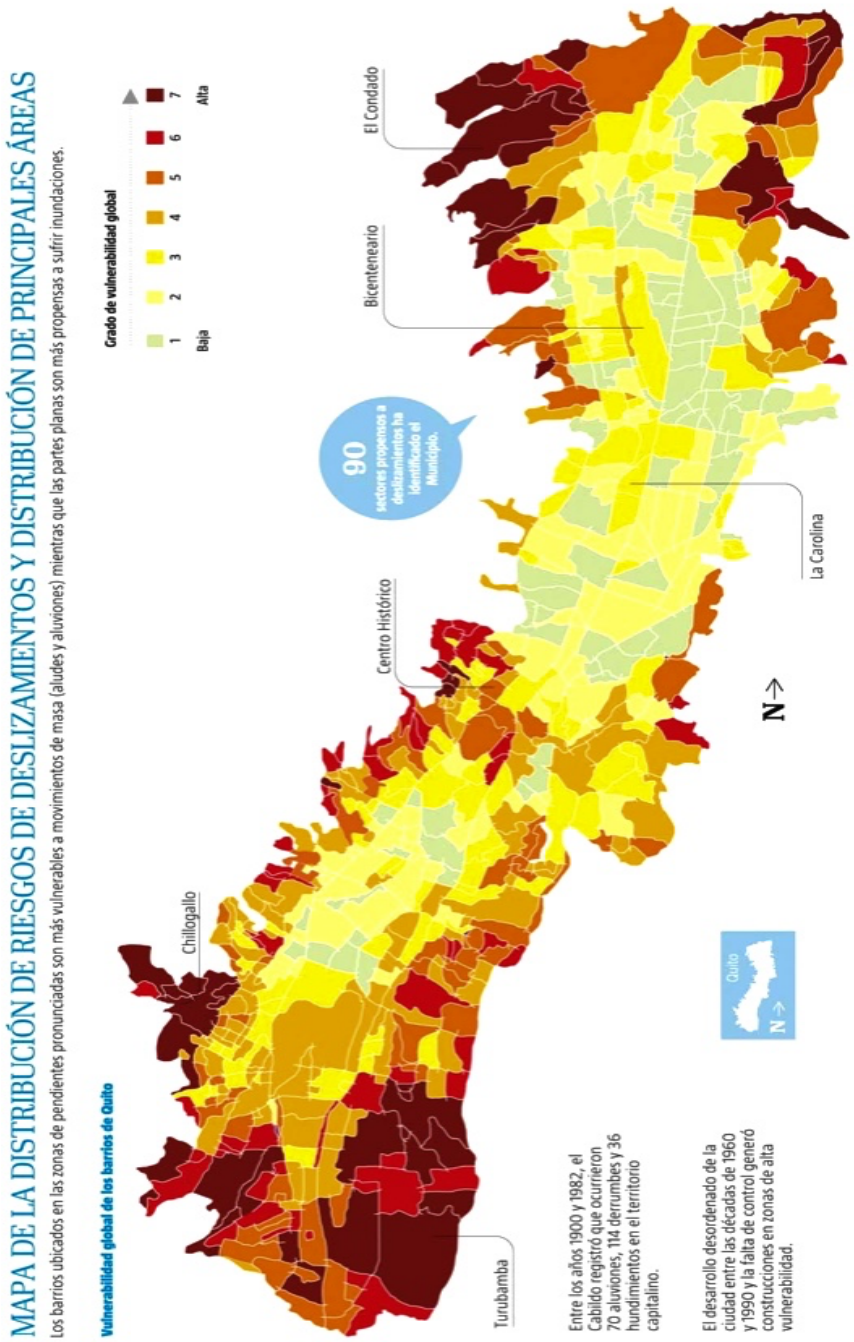


Figure 4.2. Map of risks of landslides in Quito. Neighbourhoods located on slopes on the peripheries are more vulnerable to landslides (colour coded in red gradient), while the plains are more vulnerable to floods (yellow gradient) Scale approx.: 1:150000 (El Telégrafo, 2015).

Local academics and public infrastructure planners agree that both building technologies and urban land use regulations contribute to this context of physical vulnerability in Quito (Barreto-Vaquero, 1994; Peltre, 1989; Zevallos, 2002). Zevallos (2002) claims that the urban occupation of slopes, for both formal and

informal residential purposes, has overseen morphological, hydrological, and geological threats, on which basis the management of the conventional urban infrastructure became complex and expensive.

> "…When heavy rains occur, the surrounding ravines overflow and flood all these neighbourhoods. This usually causes interruption in the supply of drinking water and energy for days, and overloads the sewer system…" (Resident of *Guamaní*, personal interview, 23rd November 2016).

In general, the process of occupation of slopes and ravines has used simplistic technologies that barely address complex problems of drainage, surface runoff, erosion, and sediment transport. On top of this, the accelerated regularisation of informal settlements in the last decade has forced the municipality to improvise infrastructure such as paved roads, which adds to the burden of the already vulnerable context. Such a distressing scenario has turned the heads of scholars, NGOs, politicians and informal settlers. These groups have put forward demands for improved management practices of ravines and slopes to mitigate and overcome the known threats.

The Quito's Metropolitan Plan for Development and Territorial Management 2015 – 2025[11] has welcomed some of these demands. The plan aims to provide quality of life for all citizens and promote sustainable development by intervening land-use. This involves expanding the scope of services and infrastructure in peripheral neighbourhoods and articulating economic activity in such a way that integrate these communities. In terms of environmental issues, the plan focuses on waste reduction and management, and on the preservation of ravines, because of the key roles they play in the city's flood control and water supply. In this regard, this thesis aims to aid planners by addressing knowledge gaps that may hinder the effective implementation of such plan.

4.3. The people: Dwellers of informal settlements

Informal settlements around Quito in general host communities that are historically segregated by both race and income/labour supply. Morocho and Ramiro (2012) in the case of Andean Indigenous people, and Santos (2015) for the case of those of African descent, agree that these populations have been overlooked

[11] See *Plan Metropolitano de Desarrollo y Ordenamiento Territorial* Chapter 3: Quito *Ciudad Inteligente: Ambiente* https://www.quito.gob.ec/documents/PMDOT.pdf

traditionally and excluded systematically from policies of housing supply in the formal urban space. Similarly, Rahier (1999) claims that Ecuador shows a spatial-racial order in which the urban centres are associated with modernity and white/white-mestizo groups, while rural areas are seen as places of racial inferiority, violence, and barbarism.

Although Rahier's claim has not recently been revisited and was primarily the result of comparing urban and rural settings, the racial attitudes claim still seems relevant and suitable for understanding the human groups living in informal settlements. Such attitudes are rooted in colonial and slave times, in which, for instance, the white elite obstructed any attempts by freed Africans to buy properties in neighbourhoods that whites inhabited (Santos, 2015). Besides, before the agrarian reform took place in 1964, *haciendas*[12], which were located on the outskirts of the city, shaped the territorial and economic organisation of Quito. Andean Indigenous people dominated the physical labour supply in *haciendas*. In exchange for labour, indigenes gained the "privilege" of exploiting small plots termed *huasipungos*[13] as shown in Figure 4.3, which were often located on the prominent slopes and had low agricultural fertility. The fact that some of the most populated informal settlements of Quito are former *huasipungos* (Mena-Segura, 2010) in part explains the ethnic characteristics of their residents.

[12] *Hacienda* is a term which was used in the Spanish empire to refer to a large sized estate, which in most cases were plantations, but could also be mines or factories.
[13] *Huasipungo* means "a piece of land" or "door gardens" in the indigenous *Quichua* language (Glynn, 1984).

Figure 4.3. Indigenous people ploughing on *huasipungos* (Avilés-Pino, 2014). Note the rocky slope. *Huasipungo* means "a piece of land" or "door gardens" in the indigenous *Quichua* language (Glynn, 1984).

Patterns of discrimination are also evident from the perspective of labour supply. Residents in informal settlements perform a wide range of the lower-paid jobs. These include, for instance, factory workers, ambulant vendors, construction workers, micro-merchants, minor craftsmen, bus and taxi drivers, low-wage governmental employees, low-ranked personnel in the military and police forces, and domestic workers. Three decades ago García (1985) reported that about 80% of heads of household in informal settlements were factory/construction workers or performed an autonomous job. In *Guamaní*, for instance, a decade ago, 55% of head of households reported having a low-wage formal job, while the other 45% were informal workers (D'Ercole & Metzger, 2004). Unfortunately, no up-to-date data exists about the origins and composition of jobs in informal settlements.

> "…Most neighbours do some kind of autonomous work in the city. Here you find construction workers, carpenters, micro-merchants, plumbers, electricians, or whatever it takes to earn their daily bread… …also, this neighbourhood has about three blocks of Afro descendants only. They have an Afro ballet group that is very active in the community…" (Resident of *La Roldós*, personal interview, 20th December 2016).

Also, most recently, there are communities of foreign immigrants, in most cases from neighbouring Colombia and Venezuela, and on a minor scale from Haiti, which have established camps in informal settlements in the north of Quito (Juárez, 2018). While no study has yet mapped and addressed housing conditions of deprived immigrants, what is evident is that they contribute to the diversity of people and cultures in the informal settlements of Quito.

4.3.1. Social organisation

Article 66 (13) of the Ecuadorian Constitution guarantees the freedom of assembly and association. In the exercise of this right, informal settlements of Quito have adopted the practice of arranging governance schemes to manage their evolution and mediate their collective demands with municipal and country's authorities. Demands are most often linked to the shortage of infrastructure and conventional urban services. Throughout their existence, however, these organisations have experienced ups and downs, passing from moments of deep cohesion, particularly in times of confrontation to impede evictions, to moments of passivity and indifference about collective efforts of social mobilisation. Yet, these organisations have managed to persist. Frequently, their leadership style is authoritarian. They often seek to engage in clientelist practices and relationships with local politicians. For this reason, it is common that leaders of these organisations mobilise their communities to support politicians uniformly at election times. Figure 4.4 shows a tweet of a Quito Mayor candidate seeking votes by engaging with the league.

Figure 4.4. Social media post of candidate in the 2019 race for mayor in Quito from Twitter. Translated tweet: "We in *Comité del Pueblo* are happy to participate in the *Minga* of League *La Quintana*, where we work together with its leader Edison Ñacato for the well-being of the neighbourhood".

The diverse nature of the needs of residents in informal settlements has driven the creation of different types of organisations within these communities. Examining these organisations is pertinent to this dissertation because these often create spaces which are associated with some sort of infrastructure in informal settlements. Moreover, these organisations give meaning to the shape and dynamics of the transformation of informal settlements and their infrastructures.

While social organisations have been investigated extensively in recent years (Klaufus, 2010; Lind, 2018), particularly those involved in self-help housing and women's particular demands, the study of García (1985), despite its age, remains perhaps the most comprehensive and relevant as a basis to examine social organisations in the informal settlements of Quito. This author grouped organisations

into four sets: 1) those that demand land for housing development; 2) those that demand infrastructure for provision of water, electricity, sewerage, healthcare, education, solid waste collection, mobility, and transport; 3) those that engage in mobilisations directed toward gender equality; and 4) those that perform cultural, religious, and physical practices. Respectively, the most frequently found organisations – as registered with governmental agencies such as the Superintendence of Popular and Solidarity Economy (SEPS) – and perhaps the most influential too, are land and housing cooperatives, pro-improvement committees, women's organisations, and sports leagues. Moreover, these local organisations engage with their peers from other informal settlements to scale their political influence, which creates other forms of social structures referred to as central committees, federations, coordinations or unions.

In addition, the study of Moser (2009) in Guayaquil city on gangs as neighbourhood organisations is perhaps worth mentioning, although no link with the transformation of space has been reported. Moser explained that, in part, these organisations emerged from the need to protect household processes of asset accumulation in urban spaces with limited to no presence of government. Gangs are less likely to be recognised formally as social organisations; however, during the last decade, the Ecuadorian government ventured into granting regular recognition to some of the prominent ones in Quito and Guayaquil. This was an approach aiming to reduce violence in streets, which supposedly reduced homicides by 70% (Miranda, 2018). Although gangs becoming social organisation recognised regularly is not the norm in Ecuador, this would make an interesting case for studying "people as infrastructure" (Simone, 2004b), as discussed in 2.2.2. This is because former gangs' social networks were used as platforms for intervention and articulation of urban security policies.

In terms of the most popular social organisations, land and housing cooperatives (*cooperativas de vivienda*) are often the first type produced in informal settlements. The SEPS is the official bureau that endorses regular recognition and deals more closely with their demands. See in figure 4.5 an electronic form by the SEPS that constitutes proof of active status for a land and housing cooperative. Cooperatives' main purposes are twofold: accrue money to buy land and provide loans to members (land buyers/emergent informal settlement households) for the same purpose. Oftentimes, land traffickers found and initially govern these cooperatives. Land trafficking refers to irregular processes of occupying and trading (often-third-

party's) land, so land traffickers are central actors in the creation of informal settlements (Moscoso-Rosero, 2013) – section 4.4.1 explains the role of land traffickers in informal settlements. By taking part in the cooperatives, land buyers/informal settlers gain a sense of legitimacy of land occupation and are more willing to commit to contributing money, voluntary labour, and support for politicians.

Figure 4.5. Electronic proof of registration and status "active" for land and housing cooperative *La Roldós* (SEPS, 2018).

For example, from the view of residents of informal settlement *La Roldós,* their land occupation process was legitimate because they bought the *hacienda* – this estate was previously *hacienda Pisulí* – through their cooperative, for which they hold a property deed signed in 1983. Besides, clientelist practices allowed them to negotiate and achieve recognition as "regular owners" of the estate in the National Congress in 1996. The practice of creating cooperatives is also convenient in that, upon formal recognition and conferral of regular status, cooperatives hold the privilege of collecting and managing money from members formally. However, land traffickers often exploit this autonomy, sometimes to their own benefit, with the

argument that they are funding basic infrastructure in the community (Starkoff & Ortíz, 2012).

> "… The land trafficker said that his family had bought the *hacienda* from the Ministry of Health and then divided it in plots. Next, he created the cooperative to manage the loans to buyers of the plots…" (Resident of *La Roldós*, personal interview, 11th January 2017).

Following the granting of ownership, the next concern for informal settlers is often access to basic services and amenities. Pro-improvement committees (*Comité pro-mejoras*) are organisations that emerge to mobilise resources for infrastructure development. This is the most common type of informal settlement organisation in Quito. Since their most common interest relates to issues of habitat and housing policies, pro-improvement committees engage with the Central Government through the Ministry of Urban Development and Housing (MIDUVI). Through this bureau, the Government encourages and supports pro-improvement committees by arranging workshops, legal advice, and representation for gaining formal title. Also, these organisations facilitate the implementation of public policies of habitat improvement (MIDUVI, 2015a). For instance, MIDUVI's programme *"Yo, Mi Barrio, Mi Ciudad"* – Myself, My Neighbourhood, My City, which involves direct cash transfers to improve housing in informal settlements, relied on pro-improvement committees to facilitate the allocation of bonuses (MIDUVI, 2015b).

As informal settlements mature and consolidate, other social organisations emerge, such as Women's organisations and Football Leagues. Regarding women's organisations, in most cases these developed with the intervention of NGOs (CEDEAL, 2017; Children International, 2017; MAFRE, 2017; SEMBRAR, 2017). The creation of these organisations is somewhat framed in western feminist discourses, in particular those related to aspects of gender violence and exclusion from equal access to labour and income opportunities. These organisations have proven functional in facilitating women's everyday needs and practices in these territories. For instance, in the informal settlement *Tiwintza* in the north-west of the city, a women's organisation was formed to look after each other's children while some work. Nevertheless, since houses in this neighbourhood hardly offer the physical conditions to attend to several children simultaneously, these organisations manage to create community spaces, often over green remnants. Also, they are often responsible for keeping improvised playgrounds alive, or even chapels. Furthermore,

women's organisations are often engaged in entrepreneurial practices in informal settlements, such as community gardening and poultry farming (Employee at CONQUITO, personal interview, 12th February 2017).

Lastly, sports leagues (*ligas barriales*) emerged in the 1930's in the populous neighbourhood of *Chimbacalle* (central-south of Quito). Railway and factory workers that settled around this neighbourhood started to practice football, and by 1930 there were various teams that shaped the first league. Nowadays, the leagues make up one of the most politically influential types of organisation in the city. According to the municipal bureau for sports and culture – *Dirección Metropolitana de Deporte y Recreación* – the city hosts 350 leagues that embrace about 7600 registered clubs, which accounts for near 3000 official matches of different categories (i.e. gender, age, and territory) every week (El Telégrafo, 2014). Also, leagues shape organisations at a wider scale such as the Federation, Association, and Union of Leagues. Local leagues often create and manage football pitches in informal settlements, which are of different sizes and condition, some with grass and many with dirt surfaces. Apart from water and electricity, furthermore, the provision of football pitches has been one of the most frequently negotiated issues between the informal settlements and politicians at election times.

Examining social organisations in informal settlements not only supports understanding of the context of Quito, but also offers an angle to observe informality as a continuum that shapes the urbanisation process of the peripheries and the para-institutional governance arrangements of the city. Also, this section has shown that the politics of informal settlements are embedded deeply in the political dynamics of the city. This is in part evident in the clientelist relationships of leaders of informal settlements with municipal and central government. Therefore, while many tensions relevant to informality remain in the everyday politics of the city, these organisations have achieved the outcome that local authorities address informal settlements' demands with tolerance and acceptance. Finally, this section has identified actors and their roles in the everyday activities of informal settlements of Quito. The section that follows extends the understanding of these actors and their roles in processes of resource mobilisation.

4.4. The occupation of land in current informal settlements

Based on historical maps drawn since times of city's colonial foundation, Peltre (1989) identified three periods of marked shifts in the occupation of today's

urban space, which clarifies the urbanisation progress of slopes and ravines: 1) from the city's foundation in 1534 until the early 1900s, urban growth was slow and concentrated around what is currently known as Colonial Centre, reaching barely 200 Ha. 2) During the subsequent fifty years, the city grew more rapidly in form of thin tentacles that emerged from the roads constructed to connect the north and south, reaching 1,300 Ha. in 1950. 3) From then, the urbanisation process accelerated intensely, reaching 12,500 Ha. in 1988. The occupation of slopes and filling of ravines became a practice to provide land for residential development in this latter period. Slopes and ravines on the peripheries host the vast majority of informal settlements today. According to The Atlas of Urban Expansion (UN-Habitat, 2013a), Quito reached 38,308 Ha. in 2013, with a population of approximately 2.7 million. Figure 4.6 shows the ravines of Quito as of 1932, before filling them for urban land supply.

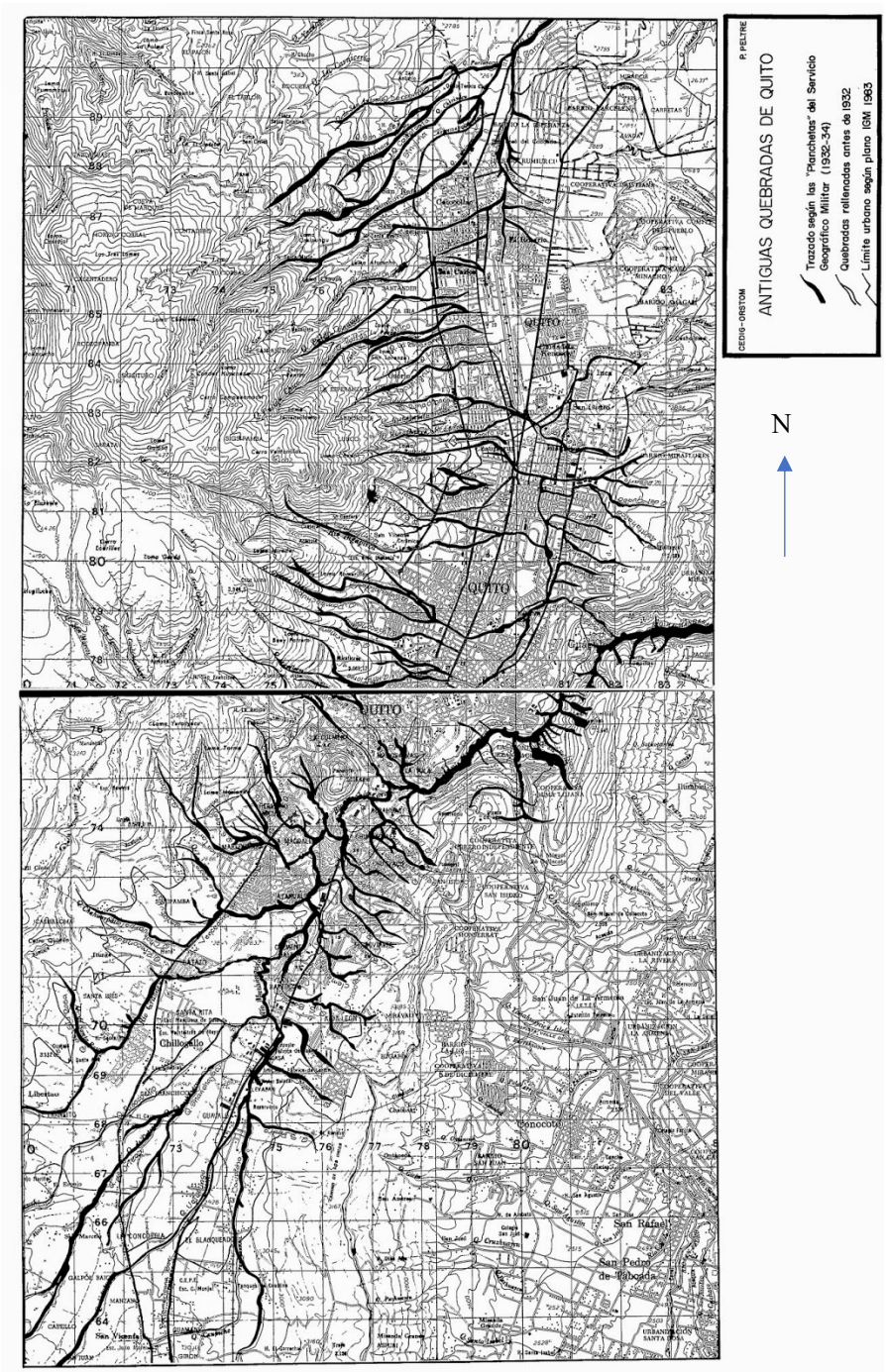


Figure 4.6. Ravines of Quito before filling for urban development in 1932 (in black bold traces). Scale 1:150000 (By Ecuadorian Geographic Military Service).

For Carrión and Vallejo (1994), the coincidence of the agrarian reforms of 1964 and 1973 (*Ley de Reforma Agraria*) with a period of aggressive rural-urban migration triggered informal settlement propagation in Quito. Agrarian reforms shifted the classification and holding size patterns of lands that colonial *haciendas* earlier occupied on the slopes surrounding Quito. The reforms basically split the lands of *haciendas* among three destinations: 1) a part of these estates was given to former *hacienda* servants – mostly indigenous people; 2) another share was sold to land

dealers, who later divided and promoted plots for residential purposes in both formal and informal markets; and 3) the rest was expropriated by the central government and then distributed to ministries. This distribution of land in part explains why informal settlements today are often located near formally established neighbourhoods.

For example*, La Roldós* is located in the north-west of Quito, virtually above (further up on the slope) the luxurious neighbourhood of *El Condado*. In 1982 occurred the irregular occupation and informal vending of 100 Ha. (out of 358) of the former *hacienda Pisulí*, which according to official records was owned at the time by the Ministry of Health. Approximately 4500 households, mainly migrants from the Coastal, Central Andean provinces, and Amazon regions, became members of the Housing Cooperative *La Roldós* and occupied this stake of the *hacienda*. The same year, another land trafficker occupied another stake of the *hacienda*, establishing what today is the settlement *Pisulí*, which in subsequent years witnessed perpetual violent conflicts between these bordering settlements.

On the other hand, the period between 1964 and 1973 also recorded a massive migration from rural to urban areas. The main reasons for this exodus were: 1) the adoption of upgraded technologies in agricultural production in rural Ecuador, which reduced agriculture labour demand; and 2) concurrent increase in job opportunities in booming Quito, which resulted from the implementation of an import-substitution policy and the beginning of oil exports in the 1970s (Carrión, Vásconez, & Bermudez, 2003). These migrants formed the first target market for informal land supply, and along with former *haciendas*' servants, became the initial occupants of the informal settlements.

On top of this, urban regeneration schemes in the early 1980's forced the poor living in the city centre to seek housing elsewhere. This intensified the demand for cheap land and housing on the periphery, which gave shape to new informal settlements (Baeza, 2006; Salazar, 2015). According to Salazar and Cuvi (2016), early occupants of informal settlements were unaware of the physical inadequacy of those territories for the implementation of conventional urban infrastructure. These introductory paragraphs for this section allow the reader to appreciate the potential impact of policies on informality and subsequent urban transformation. As introduced in 4.2, this section reflects my interest in how informality transforms cities, while it is also pertinent for this dissertation in that it explains the dynamics and processes associated with the emergence and transformation of infrastructures.

4.4.1. The practice of informal settling

Lacking elementary urban planning criteria and neglecting environmental burdens, pieces of lands that resulted from the division of former *haciendas* were traded as groups of plots of different sizes and shapes for housing purposes. According to Salazar and Cuvi (2016), the occupation first involved deforestation of long-standing species, land burning, removal of surface soil and filling of ravines. Some were established on pronounced slopes over the volcano Pichincha where geological risks are significant. Others were situated on spaces susceptible to recurrent floods.

Since the occupation of such inhospitable and distant lands was based on commercial transactions with land traffickers rather than arbitrary take-over by current settlers, the early stages of informal settlements can be understood from the perspectives of market logic. Agents that fuel the formation of informal settlements, which interact in a mere supply and demand forces dimension, often involve landowners both public and private, land value speculators, land traffickers (locally known as *lotizadores irregulares*), politicians, and (ultimately) the buyers/settlers. As discussed above, settlers are often individuals living in low income, own low value tradable assets, are frequently migrants or descendant of migrants from rural areas and dwell in precarious conditions.

The first step in promoting informal land occupation often involves advertising the plots for sale. Normally, dealers stand on selected street corners and spaces where street informal vendors congregate, such as parks, business and bureaucratic districts, schools, and near to stadiums when massive events occur. While standing, they perform advertising by yelling and circulate flyers. In addition, dealers also use Internet ads, radio ads, often during live coverage of the professional football league, and the classified ads section of most popular (and usually yellow) newspapers[14]. Typically, advertisements include expressions such as “opportunity”, “cooperative”, “sector”, “water and electricity access”, “regular documentation”, “we provide financing”, and eye-catching messages like “separate your plot with only 200 USD”. Similarly, the contact details for the dealers are in most cases a mobile number. Figure 4.7 shows an example for this.

[14] Yellow press is a type of journalism that presents little or no legitimate well-researched news and instead uses eye-catching headlines to sell more newspapers. Techniques may include exaggerations of news events, scandal-mongering or sensationalism (Biagi, 2012).

Figure 4.7. Advertising land in *Guamani*, south of Quito: 200 metres plot available on plains. Price is 10600 USD. Access to trolleybus and *Ecovia* (mobile numbers) (author's photo).

Dealers then gather potential buyers who show interest and offer them transport to visit the plots. The trips usually involve mid-size trucks, lorries or buses with the ability to drive along the improvised roads. Once in the plots, traffickers expound a well-elaborated sales pitch and simultaneously offer some snacks and soft drinks to their audience. In most cases, potential buyers end up motivated to own a piece of land for housing. During the discourse, the traffickers in general adopt a role of superhero or "justice maker", delivering phrases such as "I do what the government is not willing to do. I want to help the poor own a house" (Starkoff & Ortíz, 2012, p. 474). In addition, traffickers use maps, as shown in Figure 4.8, and architectural plans to display the urbanisation project, which always includes areas for streets, public spaces, and delimitation of plots. Likewise, traffickers offer to connect the plots to the utilities networks and assure their listeners that the titles will be handled after the loan is paid in full. Finally, it is explained that access to the plots is given to start to build as soon as the first instalment is paid, and that it is mandatory that buyers start construction and occupy the land immediately.

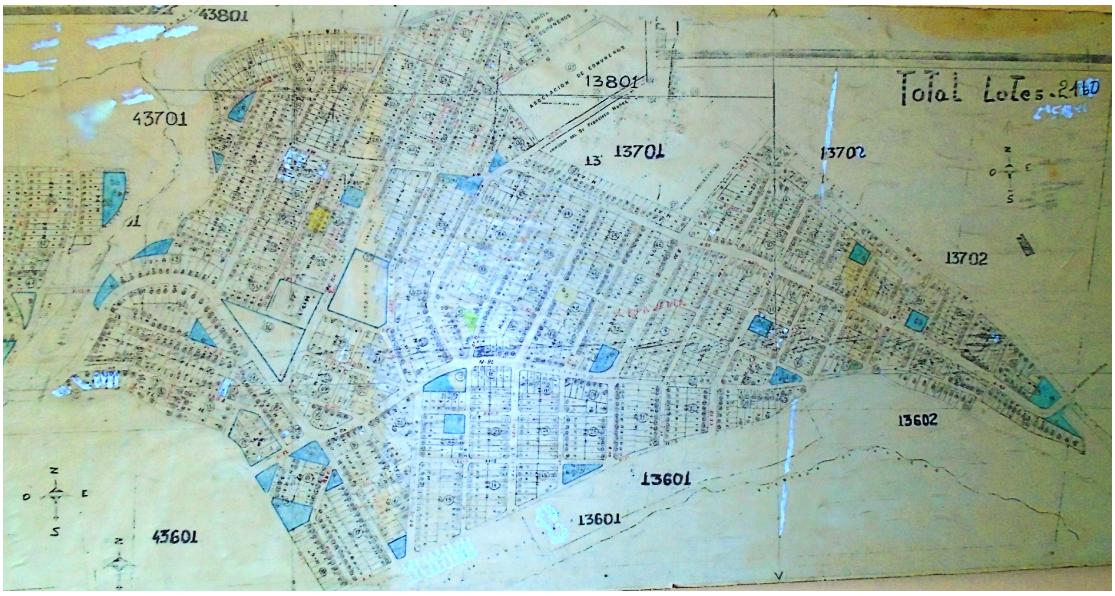


Figure 4.8. Map used for informal trading of 2,160 plots in *La Roldós* (author's photo).

The initial payment produces a non-binding informal buy/sell promissory note, which by no means confers a legal right to occupy and exploit the property. In seeking to honour the outstanding instalments on time and to avoid loss of the property, buyers often engage in informal lending schemes with *chulqueros*[15] at (usually) exorbitantly high interest rates. When buyers realise the risks of eviction implied in this occupation mechanism, they likewise understand that any attempts to reverse the occupation process involve losing their possessions in place. Furthermore, buyers are well aware that such attempts would imply not only holding expensive debts with *chulqueros*, but also a loss of the accrued money and effort put in assembling their incipient houses. Such circumstances forge a cohesive social structure which, in turn, is effective to both defend informal settlements from expulsion efforts by authorities and others that may claim legal rights over the lands, and demand municipal infrastructure and public services.

> "…They also received the offer consisting of 4000 USD for a plot, 200 down payment and monthly instalments of 150…" (Orquera, 2011).

Nonetheless, not all attempts to settle on the peripheries are successful. Some informal settlements have faced eviction in less than a year after attempting to

[15] *Chulqueros* refer to informal money lenders or usurers (Soruco, Piani, & Rossi, 2008).

establish themselves. Dwellers in *Guamaní* have witnessed recent evictions from nearby lands.

> "… I heard about the plots in *Gutuglagua* from my parents' neighbours. I reserved my plot with 150 USD, which were only for registration and copies. Although the land was just an open space, I knew which plot was mine because the land trafficker showed to me in the map. We were confident that the trafficker was the owner of the land, so we did not anticipate eviction as likely to happen. This settlement lasted only 6 months. The trafficker formed the cooperative, which forced us to look after the land 24/7. I had to be there in the night shift. There were 380 plots of 200 m^2 each. When the police demolished the settlement, we learnt that the trafficker had sold the land twice: 1) to a cooperative as one large piece, and 2) to all of us divided in plots…" (Resident of *Guamani*, personal interview, 9th February 2017).

The occupation of informal settlements in Quito, beyond helping describe the context in which this study unfolds, also allows in part a disentanglement of a structure of informal networks and practices that often embodies the only option for the poorer urban dwellers to cope with their everyday struggles. It is revealed, then, in the first place that the urban poor would usually gain awareness of goods and services accessible to them through means of informal advertising. Also, in exchange for the initial payment towards land ownership, the urban poor receive a non-binding informal agreement covering future tenure upon the end of the loan. Similarly, informal lenders often fulfil the short-term financing needs of the urban poor. In sum, the urban poor, although evidently sharing several aspects of the physical space with dwellers of the bourgeois city[16], by and large exist in a parallel dimension. This is described by McFarlane and Vasudevan (2014) as practices deployed through means aside from institutionalised alternatives to achieve daily routines. Thus, any attempts to mediate effectively in favour to the urban poor demands understanding of how players in such parallel dimension are governed, how rules are set, and what resilience strategies for such practices are deployed.

4.5. Urban living with infrastructure deficit

The concept of informal settlement in general indicates an unplanned and unauthorised occupation of land for dwelling purposes by poor, marginalised communities (Huchzermeyer, 1999). Yet, there are dissimilarities in multiple

[16] Bourgeois city refers to the core of the city dominated by formal practices (McFarlane, 2008a).

dimensions across informal settlements of Quito, which translate into different types and severity of vulnerabilities and deprivations for their residents. Thus, in some cases, everyday practices differ between one informal settlement and another. This reflects what I have mentioned in 3.3 regarding the rationale for working with multiple sites. Thus, this section should not be taken as a generalised representation of what it takes to live with infrastructure deficit for all households, but instead, as an attempt to describe the everyday practices in the initial stages of occupation, which are often moments of more restricted access to conventional urban amenities. The relevance of this section then is twofold: first, it suggests the link between infrastructure shortages and assemblages over the green landscapes that surround informal settlements as an approach to coping with everyday needs; and second, it permits understanding of informality as a process of urban growth rather than a steady state.

Carrión and Vallejo (1994) attribute the heterogeneity throughout the informal settlements of Quito to the following reasons: 1) the historical settling process, which embraces the geographical and cultural origin of settlers, mechanism of occupation, and plot shapes and sizes; 2) maturity of the settlements defined in terms of age, housing/population density, and access to public services and infrastructure; 3) differences in land use in terms of proportions devoted to housing, agriculture or industrial activities such as informal brick factories; and 4) socio-economic characteristics of settlers, in terms of households' sources of income. However, I would also claim that average precipitation, distance to the central corridor of the city and characteristics of neighbouring ravines contribute to the heterogeneous vulnerabilities and deprivations. About this, Chapter 5 will show how informal settlements located in spaces with less rainfall find it more challenging to develop practices of urban agriculture. On the other hand, Chapter 6 discusses how informal settlements neighbouring wider segments of ravines are less likely to configure footpaths to enhance their mobility power.

Moreover, differences in the composition of residents by age and gender also translate in different types and depths of vulnerabilities and ways to use and experience infrastructure. According to D'Ercole and Metzger (2004), approximately 26% of the population of Quito faces vulnerability by reason of age. At the time of his research, the proportion of residents below 10 years old and over 65 was higher in the marginalised communities than in the formal city. These groups' relative fragility is embodied in overall reduced autonomy. Physical characteristics and infrastructure

deficits of informal settlements, as well as shortages in specialised services for senior- and childcare make these groups exceptionally susceptible.

> "… When a neighbour needs emergency medical care at midnight, there is always the – *señor de la camionetita* – little-truck man to help and take us to a hospital in the city. I would say that every neighbourhood has one. Here in (neighbourhood) *Victoria del Buen Vivir*, all neighbours know where the truck man lives. He is the ambulance and the taxi here. Likewise, there are nurses in the neighbourhood…" (Resident of *Guamani*, personal interview, 8th February 2017).

Furthermore, the level of schooling is very low in the informal settlements of Quito. The 2010 national census revealed cases of informal settlements in which 60% of inhabitants had no elementary schooling. This adds to the vulnerability profile in that it is likely that communities poorly educated might be less aware of the risks of dwelling in spaces not meant for urbanisation. Yet, further research is necessary to examine whether low levels of education impact the ability to adopt practices of hazard prevention.

> "…The most urgent need we have is security. We have a police camp here, which somewhat helps to attenuate vandalism, but drug trafficking persists. We all know where the drug is. Second, we need roads and internal streets. If we improve access to the city our lands gain value. Also, we need elementary schools. The child population is growing fast here. The ravines also need attention. Neighbours use them to put their wastes, which turn ravines into focus of infection. And definitely a cemetery is also critical. Dying here is a problem because there is no space for burial…" (Resident of *La Roldós*, personal interview, 28th January 2017).

Housing is achieved typically in incremental steps, as indicated in 2.5.3 (McFarlane, 2011). At the time of occupation, given the urgency of inhabiting the space and defending it from eviction attempts, settlers assembled shelters with bricks or cement blocks stuck together with mud, with plastic or clothes covering stick-framed roofs. However, their concept of a finished house on a 200 m^2 plot involves concrete blocks, as shown in Figure 4.9, as the main building material – *casa de cemento*. This is why informal brick/block factories are popular across informal settlements in Quito. Moreover, certain practices in building concrete houses do not differ much from the formal practices in the city's core. As for this, while settlers would avoid conventional bureaucratic procedures such requesting approval of

design, and material compliance with the municipality's regulations, they would still notify the local housing cooperative, for instance, about their house upgrading project.

> "…In the beginning of the settlement in 1982, our houses were very precarious, often assembled from a combination of wood, plastic and zinc roof. But for many of us, the goal since the beginning was to have a concrete home…" (Resident of *La Roldós*, personal interview, 19th December 2016).

Figure 4.9. Incremental concrete housing in *La Roldós* (author's photo).

Finally, access to energy and water is likewise in general inadequate. Although the municipal electricity supplier *Empresa Eléctrica Quito* (EEQ) claims that 97% of households are connected to the energy distribution network, this proportion seems inaccurate since a large proportion of informal settlements are still not yet regularised, or worse, even identified. It is estimated that 30% of informal settlement households still have no adequate access to mains energy (El Comercio, 2011). Similar proportions are seen in households with access to water, according to the municipal water and sewage supply office *Agua de Quito* (EPMAPS). Conversely, this is not the case for telecommunications. In reference to this, the number of mobile telephone accounts has surpassed the population in the country since 2013 (SENATEL, 2014). The scope in mobile telecommunications has underpinned the introduction of electronic money.

4.5.1. Green landscape and infrastructural practices

In 2.5.3.1, I have argued that materialised infrastructures come to replace "living infrastructures" and explained that in the absence of physical infrastructure, pertinent needs are filled by labour. This section builds upon that argument and introduces the supporting role that unoccupied green landscapes come to play in incipient infrastructural practices of informal settlements. The green landscape makes up for the shortage of conventional urban infrastructure in different ways. Because of this, informal settlements dwellers have some awareness of the importance of keeping their surrounding green landscape uninhabited. The following lines take as their perspective the practices of "accessing and disposing of water" in the absence of conventional piping infrastructure to illustrate what it takes to live in the initial stages of informal settlement. Although for many, access to safe drinking water continues well after the initial stages to be the most pressing and crucial everyday issue in the informal settlements of Quito. Since the green landscape mediates the ability to access and discharge water, this perspective is helpful in setting the context from which to explore IGIs in the coming chapters.

This section relies on preliminary observations and interviews in informal settlement *La Roldós* in the north-west of Quito. Two ravines border the neighbourhood to the north and to the west, which were sources of fresh water at the beginning of the occupation in 1982. None of these ravines have been subject to rehabilitation or any form of ecological intervention since the occupation. *La Roldós* achieved access to piped water in 1997 and to electricity in 1992. Yet, the protection and rehabilitation of bordering ravines is nowadays one of their most pressing demands directed to municipal authorities.

Informal settlements in general are located far above the limits of drinking water sources in Quito. For this reason, the implementation of pumped water technology is one of the most pressing challenges of intervention. To mention just one limitation, the inadequate access roads make it difficult to transport the materials needed to install conventional piping infrastructure. See, for instance, Figure 4.10 showing a helicopter transporting pipes meant to be installed in peripheral neighbourhoods.

Figure 4.10. Implementation of piping system to provide water in the north-west neighbourhoods of Quito. Transportation of material required helicopters (García, 2017).

During the initial stages of occupation, informal settlers managed to secure water by storing rainwater and by capturing water from the mountain streams in ravines. Ravines constitute an essential component of the hydrological system of Quito. These play important hydrological roles such as regulating the water flows that cross the city and the stabilisation of riverbanks. Simultaneously, ravines are crucial for everyday living at the beginning of informal settlements in Quito, not only because they are the principal or only source of fresh water, but also because they represent a permanent threat of flooding.

> "…Accessing water of ravines involved collecting it in containers and transporting it from the mountains to their houses, and finally storing it in barrels. Those that lived closer to the streams used hoses to pump water to their houses. Hoses and elementary pumping machines were often offered to neighbouring households for a fee..." (Resident of *La Roldós*, personal interview, 19th December 2016).

In more established neighbourhoods, a variety of social organisation known as *Juntas de Agua* (water union) often emerge to implement pipe systems that transport water from streams to their households' reservoirs. This mechanism of water supply

raised concerns among informal settlers about the implications of deforestation and further occupation of slopes and ravines. Further occupation would restrain locals' ability to access water by obstructing streams, as the one shown in Figure 4.11, and by increasing water demand. This is why it is common to find *Juntas de Agua* actively and often aggressively protecting their surrounding green unoccupied landscape.

Figure 4.11. Water stream in neighbourhood *Ciudadela del Ejército* on the slopes of volcano Pichincha: Ravine *Calicanto* (author's photo).

As informal settlements developed, the implementation of access roads enabled private vendors and the municipality to deliver water in trucks. At some point during the transition to piped systems, truck delivery became the main water supply mechanism in informal settlements. Besides every day long commutes to their sources of income, water in trucks also helps explain why, although it implies heavy deforestation, access roads have been one of the most frequently demanded actions in these territories (Godard, 2015). However, truck delivery presented two important limitations: first, their supply was not consistent and there were periods in which it was difficult for the trucks to access the communities, in particular during rainy seasons; and second, paradoxically, truck delivery is the most expensive option to

access water in the city, such that for many households in informal settlements it remains a function of income.

According to EPMAPS, about 93% of households are connected to the piped water distribution system, so reliance on trucks is nowadays minimal. While the 93% claim is poorly grounded, given the uncertainty around the number of informal houses, the mechanism of water provision in settlements recently regularised involves a network of reservoir tanks and pipes installed on the mountains just above informal settlements. These tanks store and treat water captured from streams (García, 2017). Nonetheless, access problems persist for households not able yet to formalise their status of housing/occupation and/or to afford the equipment to connect their houses to the piped networks.

Unfortunately, the surrounding green landscape also serves for settlers to release wastewater, which contaminates and clogs ravines and surrounding green spaces. Informal settlers blame the lack of appropriate infrastructure for their practices of sanitation and solid waste, which cause pollution of water sources. This suggests that more than pipe systems are needed to address access to safe water. The inadequacy of sewerage in place is often dealt with through improvised septic tanks and cesspits. Septic tanks, as shown in Figure 4.12, are a form of rudimentary sewerage, whose outlets are located on ravines and banks of streams.

Figure 4.12. Wastewater pipe/septic tank *La Roldós*. Note outlet (circled in red) on ravine wall (author's photo).

EPMAPS claims that over 92% of households in Quito are connected to the sewage system (EPMAPS, 2017). However, similar to septic tanks and cesspits in informal settlements, the sewage system often expel wastewater into rivers (specially *Machángara* and *Monjas*) and streams with no advance treatment. These rivers provide water to some informal settlements and for irrigation of farms located in the lower lands that surround Quito. So, although the sewerage eliminates wastewater for informal settlements in the higher parts of the slopes, it also transfers the sanitary risk from one point in the city to another, or from some communities onto others.

The path of water in the informal settlements of Quito exposes some ways in which the green landscape is used to supplant the infrastructure shortage. First, the landscape allows the capture of stream water. So, if the streams were diverted as a result of deforestation or occupation, countless settlers would see their sources of fresh water reduced. Second, as discussed in 2.3.2, the surrounding green landscape supplies energy in the form of firewood and charcoal (since colonial times) to fuel the boiling of water and cooking. Third, the green landscape is used to release wastewater and solid waste. Although this perspective reveals just a few aspects of what it takes to live in the informal settlements of Quito, it invites people to think of suitable unconventional ways to supply conventional urban amenities, which lead to both enhanced agency of dwellers and green landscape preservation. Finally, this section sets the stage for the subsequent chapters of this dissertation. As stated in 3.5, the IGIs analysed next were selected on the basis of their ability to meet infrastructural requirements while still remaining green.

4.6. Conclusion

This chapter has described dimensions of the context in which the informal settlements of Quito exist. This involves the historical transformation of the space and circumstances of occupants, which give meaning to everyday practices and infrastructural roles played by surrounding green landscapes. The landscape in which the informal settlements of Quito exists is overall inhospitable and embodies major physical challenges for the installation of conventional urban infrastructure. Such challenges not only relate to the costs for transporting materials, but also, and most importantly, to technological paradigms of urban infrastructure. For this reason, attempting equality in access to housing for the poor in the slopes of an Andean volcano could be far pricier than housing the wealthier segments of society. This

suggests, as seen in section 4.5.1, the need for suitable materials and technologies that enhance the ability of informal settlers to accomplish everyday needs while safeguarding their surrounding green landscapes. In terms of people, informal settlements continue to be inhabited by groups segregated along historical lines. They rely on organised collective action to mobilise resources and have authorities attend to their demands, which often involves engaging in clientelist exchange of votes for favours. Oftentimes, favours include regularising land tenure or improvising infrastructure and equipment. Finally, by describing the practices of land occupation and social organisation of informal settlements, this chapter has provided a lens to zoom in on the organisation of informality in Quito. This is key knowledge to addressing IGIs emergence and transformation, as explained in the coming chapters.

Chapter 5
Community allotments: The emergence of IGIs of food supply and the transformation of the socio-spatial context

5.1. Introduction

This chapter shows how urban community allotments (UCA) located in the informal settlements of Quito constitute a type of IGI that inserts their users, especially women, to multi-scale social networks of reciprocal exchange and mutual help. These are social networks embedded in practices of food supply, which enhance the ability of UCA users to accomplish their everyday personal tasks while transforming the landscape. Although the literature is full of worldwide evidence that urban agriculture enhances access to food and income, the mechanisms through which UCAs emerge, transform, and produce gains in social capital remain subtle and little supported by empirical evidence in urban marginal contexts. This chapter uses the concept of social capital expounded by Putnam et al. (1994), as introduced in 2.5, and is also concerned with dynamics that produce and transform UCAs in informal settlements. This latter is relevant knowledge for informing policies on greenspace production and preservation in degraded urban spaces.

The methodology chapter stated that the empirical chapters of this dissertation would be presented in such a way that the examination of one would build upon the other. In this regard, UCAs make a convenient first IGI to explore. The wide literature addressing spaces of urban agriculture as GI puts UCAs in an advantageous position to set up a platform from which to explore the other two IGIs investigated in this study. This is because, unlike footpaths and pitches, previous studies have dealt with a fairly wide range of actors and processes fuelling UCA emergence and transformation, although in different contexts.

Furthermore, by describing the formation and everyday practices involved in UCAs, this chapter not only examines variables that fuel transformation in informal settlements, but also extends the literature that connects urban agriculture and gender in spaces of marginalisation (De la Rocha, 1988; Mezzetti et al., 2009). While gender was not meant to be the main focus of this dissertation, the prevalent presence of women in UCAs raises questions about their unique roles in spatial transformation of informal settlements. Besides, the focus on gender is important because theories and policies that address urban development and sustainability tend to overlook differences in men and women's interests and roles in this context.

Also, this chapter challenges some established views on urban agriculture. Much of the literature of the West assumes that UCAs as a practice were adopted primarily to alleviate hunger and joblessness (Wade, 1987), or as a phenomenon that addresses problematic vacated spaces in cities, in which neighbouring households share their own resources spontaneously (Glover, 2004; Landman, 1993; Linn, 1999). Instead, this study shows that much of the spaces used for UCAs in informal settlements are actually contested and not necessarily vacant. Furthermore, participants have very limited resources to share for a community endeavour, and the social capital produced turns into the main force behind upholding farming practices.

Finally, this chapter shows UCAs as assemblages, as discussed in 2.4.1.1., which strengthen the agency of the informal settlements' households. In doing so, it allows the observation of the continuum nature of informality by describing how a practice that emerges informally inserts itself into well-established urban networks. The rest of this document is organised into five sections: section 5.2 discusses types of ownership of agricultural allotments in informal settlements; 5.3 identifies actors and key ingredients used to build UCAs in informal settlements; section 5.4 builds upon the understanding of infrastructure developed in 2.2.2 to explain the ways through which UCAs enable participants to build on their own capacity to facilitate their everyday practices; section 5.5 explains dynamics that both support and constrain scaling of UCAs. Lastly, a concluding discussion is given in section 5.6, which recaps the elements and dynamics fuelling UCAs' production and transformation.

5.2. Ownership and management of agricultural allotments in informal settlements

Although the main focus of this chapter is on community practices of farming in informal settlements – UCAs – it is opportune to consider essential differences from allotments owned and managed within households. Normally, these two types of ownership and management of the farming space follow dissimilar processes of creation and patterns of gaining scale. Thus, awareness of such differences is convenient because public policies seeking to preserve the green landscape with the emergence and escalation of urban agriculture in informal settlements may impact the two types of farms in different ways.

5.2.1. Household-run allotments

Normally, household-run allotments in the informal settlements of Quito are located in the households' backyards or in an uninhabitable space adjacent to the residence, which often involves a slope or a ravine. Most often, this type of allotment emerged shortly after the times of the informal settlement's occupation, mainly for food access and income making purposes. Nonetheless, there are also allotments created long after the initial occupation, in some cases as an approach to address issues of health, for which medicinal plants are often grown.

> "…My father was diagnosed with gout disease. His doctor suggested him to cut red meats and dried grains from his regular meals, because the consumption of these foods is associated with high uric acid levels. So, we (mother, sisters and herself) took his health seriously as a family project. We cleaned our backyard of roughly 8 x 7 metres, prepared the land and started planting vegetables and some medicinal plants… …We consume all our produce…" (Private allotment owner in *Guápulo*, personal interview, 3rd February 2017).

In household-run allotments, household members engage in the production, consumption, and trading of the farm produce. Oftentimes, the head of a household that runs this category of allotment is an immigrant from a rural area who holds some traditional agricultural skills. This suggests that knowledge and abilities carried and transferred within the household unit during processes of rural-to-urban migration enabled to some extent these allotments' creation. When compared to UCAs, household-run allotments often look poorly arranged. Their farming practices tend to be monoculture, in most cases comprising tomato, potato, medicinal herbs, or very few varieties of horticultural crops.

> "…I began planting tomatoes and potatoes mainly in the ravine facing the back of my house shortly after we moved here about 30 years ago. My plot was not fenced by then so I used a few metres of the slope off the border of my house and ended up assembling a somewhat big allotment of about 200 m^2 today… …My occupation of the ravine never bothered neighbours, I believe, and for some unknown reason, neighbours here avoid getting into farming. So, at first, I occupied just a couple metres beyond my plot limits, but along the way, my farm stretched down into the ravine... …I remember that my brother helped me "clean" the space with machete and fire. Also, I am fortunate that my spouse has always had jobs, so she helped me with money for setting up the allotment in the beginning, and with labour after her everyday chores... …But before we all (family unit) engaged in producing and vending, I abandoned the allotment many times, at least every time a got a job. I am also a

> construction worker so I had sporadic jobs in the city…" (Private allotment owner in *La Roldós*, personal interview, 2nd February 2017).

When the main purpose of the allotment is income generation, the produce is often vended informally on the streets. Depending on the scale of the output, furthermore, excess produce is also used in informal mechanisms of food trading with other household-run allotments.

When the head of household is not a rural immigrant or simply lacks relevant knowledge and skills to undertake agricultural practices, the allotment is often the result of promotional efforts that NGOs or governmental agencies carry out, which normally involve knowledge and skills transfer, as well as donation of tools and seeds.

> "…It took me a while to make a decision on assembling the allotment or not. My house is on a deep slope in *Guápulo*, and although we are connected to the potable water system, water is not unrestrictedly available. It has been six years since I decided to attend one of the *Agrupar*[17] workshops and learnt how to prepare the land and how to plant on the slopes. I also requested their technicians to visit me at home and advise about the most suitable alternative to assemble the allotment and irrigation system…" (Private allotment owner in *Guápulo*, personal interview, 5th February 2017).

Household-run allotments feature a strength in the ability to organise the completion of farming tasks. However, according to a technician of an NGO that promotes urban agriculture in Quito, the aim of escalating produce outputs hits limits in two aspects: one is that household members that share tasks in the allotments tend to be unlikely to expand their knowledge and skills to fuel improved farming practices; and the other, the fact that unlike UCAs – as will be explained in the next section - household-run allotments tend to exist and navigate within narrow networks of trading and knowledge/resources exchange. This focus on networked flows is consistent with the conceptualisation of infrastructure as introduced in the literature review. The following section offers a clearer picture of the exchange networks in which agricultural allotments may exist in and how these networks drive transformation and produce outputs.

[17] *Agrupar* (Urban Participatory Agriculture Programme) is a municipal programme by Quito Municipality that promotes urban agriculture.

5.2.2. Urban community allotments (UCA)

At community level, local forms of membership-based organisation, such as the women's groups introduced in 4.3.1, often govern this type of farm. These may be found in both plots privately owned and those on uninhabited spaces on slopes and ravines. Unlike household-run allotments, UCAs often emerge from a combination of local resources and the input of external actors that act as promoters of urban agriculture. Cases of external actors involved are NGOs like Children International, which launched the campaign Seeds of Hope (Puderbaugh, 2016), corporations like *Holcim* Ecuador and their Strategic Community Investment programme (Holcim, 2016), and government supported organisations such as *Agrupar* (Rodriguez & Proaño, 2016) and *Inti* (MIDUVI, 2013).

> "…Sometimes we scan neighbourhoods that host the families that we intervene in for potential plots to establish allotments. After finding a promising space, meeting its owner when there exist one, and making preliminary arrangements, we gather between 8 and 15 families to develop the project… …We first organise them for a *minga* to clean the land, and provide them with seeds and tools… we distribute the space within the allotment that each family will be responsible for cultivating. This is achieved through the creation of seedbeds or rows. Despite this division of space, the work approach is collective. So, we also identify the skills and their daily activities, and help them organise their tasks in the allotments around their abilities and time or physical restrictions…" (Employee from NGO Children International, personal interview, 19th January 2017).

All of the UCAs investigated in this study emerged after the consolidation and official recognition of land tenancy in informal settlements. Here, groups of neighbours and acquaintances, being women for the most part, engage with the aforementioned external actors in the co-production of the space for food growing – which is most often organic – and the consumption and trading of excess produce. The trading, moreover, is attempted through two dynamics: food bartering and a network of municipality-owned farmers markets, in which a day or two are devoted exclusively to organic food trading, and are known as *bioferias* (organic food market). Also, unlike the monoculture phenomenon observed in household-run allotments, the external actors discourage this practice in UCAs as an approach to farming resiliency.

> "…We say no to monoculture because it augments the vulnerabilities to plagues and diseases that may turn uncontrollable. So, they produce food that they did not even know about such as arugula, celery, or radish, as

> this improves resiliency of the farm…" (Agriculture technician from NGO *Agrupar*, personal interview, 23rd January 2017).

Furthermore, access to space and water are well-known barriers to venturing into farming in informal settlements, regardless of the type of ownership. However, the practice of having allotments started in this context also demands at least two key inputs: technology and pre-existing social capital. In the case of household-run allotments, technology is manifest in the traditional agricultural knowledge and skills that the head of household holds, and on a minor scale, in the skills transferred by external actors. Their pre-existing social capital is often confined to the members of the household unit.

In the case of UCAs on the other hand, the engagement of external actors serves to transfer and circulate relevant knowledge and skills continuously, which influences changes in technological approaches to farming and trading. Moreover, relatives and friends that share the territory, who were often those that carried out the occupation and regularisation processes of land, as discussed in 4.4.1, frequently comprise the pre-existing social capital of UCAs. Also, UCAs tend to insert themselves into established and growing networks of food production and trading, whereby the flow of resources over this type of farm is higher and enables the course of incrementalism earlier than the cases of household-run allotments. Finally, although solidarity is a rule for associates to take part in UCAs, the organisation of work shifts remains a challenge and is often contested. This latter resonates with the review on collective labour in 2.5.1.1 in terms of the challenges that communities face when seeking to mobilise work. Further details on the organisation of work are presented in the following section.

In sum, this section has identified dissimilarities in the way agricultural allotments of informal settlements develop, based on their patterns of ownership and governance composition: household-run and UCAs. Understanding these spaces' governance is pertinent to the aims of this study because it constitutes a feature that explains differences in the allotments' processes of spatial and social transformation. The rest of this chapter focuses on UCAs. This is because, as explained in 3.5, one of the criteria set for qualifying a space as IGI is that the space has to be used consistently in the same ways by the community. It is the communal aspect of UCAs that defines them as informal infrastructures, as discussed in 2.4.1.4. Moreover, revisiting the inspiration behind this study, the results are meant to inform planning and interventions to increase access of communities to greenspaces, rather than to

promote private exploitation of the urban space, as criticised by Lopes de Souza (2006) reviewed in 2.4.1.3. The next section builds upon the above introduction to UCAs to investigate the actors involved and their roles in the production and transformation of the space.

5.3. The who and what of external actors

This section examines the role of external actors in the emergence of UCAs in the informal settlements of Quito. Establishing and operating an allotment, regardless of its context and type of ownership, resembles an entrepreneurial process (Jamison, 1985). Allotments demand methodical inputs of specific knowledge and resources, as well as continuous sourcing of labour, water, energy, seeds, fertilisers, soil, tools, and a number of materials and devices that gain meaning as components of food production assemblages. At the heart of the UCA trajectory is a set of urban agriculture-promoting organisations, which articulate the entrepreneurial process until UCAs become an everyday practice for the people involved.

> "…My neighbour encouraged me to attend a free workshop that *Agrupar* was giving in a demonstrative farm in the contiguous neighbourhood. The training was easy to follow as we learnt by doing ourselves, so I realised that it was not difficult to prepare the soil and plant… …we were about twelve attendees, all women, and by the end of the workshop we had committed to form the association …" (Farmer of UCA in *Guápulo*, personal interview, 29th January 2017).

These organisations often target vulnerable communities in the city, aiming to intervene in their landscapes with community farming programmes oriented to addressing a range of problems, unemployment, and child undernourishment being the most frequent. Across the sites investigated in this study, farmers involved in UCAs mentioned having worked with these organisations: *Agrupar*, funded by the municipality of Quito; *Inti*, sponsored by the Ministry of Housing; Children International, which is a non-profit child sponsorship organisation; *Holcim* Ecuador, which is a multinational corporation that supplies building materials; and *Novum Consultares*, which is one of the companies that operates a municipal project to restore the ecological values of ravines.

Before the identification and intervention of a space for farming, starting an UCA involves an idea-selling process that very much resembles the franchising business. Organisations that promote urban agriculture play a role similar to that of

franchisors who seek to expand their pool of franchisees. On the other hand, pre-existing social networks of informal settlements – most often shaped by women with some access to land – play the role of potential franchisees.

> "…Having people from informal settlements to participate in urban agriculture is by no means an easy task. Even though they are not conditioned to contribute with anything material to take part, it demands much of persuasion. Favourably, we leverage on the network of mothers that have been beneficiaries of our aid for years. Actually, the partners that manage the allotments that we promote are often mothers of children that are or have been assisted in our programmes. Thus, our starting point for setting up the UCAs is usually far beyond a long process of trust building between the communities and ourselves. Also, we aim to integrate their children into the labour of the allotments…" (Employee at Children International, personal interview, 31st January 2017).

Following the informal creation of the social organisation as introduced in 4.3.1, which often takes the form of a women's association, promoters and the new farmers arrange a *minga* to clean and prepare the land for planting. As introduced in 2.5.1.1, *mingas* are culturally entrenched mechanisms of reciprocal labour and community participation, which serve to undertake unpaid tasks that mainly demand manpower. Depending on the condition of the land, in a very few cases the cleaning does demand the use of machinery like farm tractors. However, most of the time the cleaning task implies intensive human labour with the help of simple instruments such as rakes, machetes, and weeding tools, which are often provided by the promoters.

> "…Cleaning the land comprises first removing the weeds and levelling the surface, usually by machete and weeding tool. It is important to identify local herbs that can be beneficial for the allotment since they aid in reducing vulnerabilities to plagues, so not all the vegetation is removed. Then, the soil is decompacted with a kind of digging fork until it turns somewhat soft… …time spent in cleaning the land is uncertain; it much depends on the initial circumstances of the land and the skills of apprentice farmers, so for estimating the timing it is crucial at least to know how compacted the soil is and how skilful the farmers are. We have seen cases in which the new farmers had no previous experience with a machete whatsoever…" (Gardening technician of *Agrupar*, personal interview, 1st February 2017).

For the planting stage, promoter organisations would supply the seeds at the beginning of the UCA's life. As UCAs grow in production, however, a collaborative network develops with other UCAs and recyclers, giving shape to a social and trading network that enable exchange of seeds, produce, and materials. Promoter

organisations and the network of UCAs agree on using seeds made up almost exclusively of local species. This is because of the twofold assumption that these would preserve native ecosystems and that local species would be quicker to develop healthily, thus reducing uncertainties about the productive outcome of the crops. In terms of the planting process, seeds are initially planted in seedbeds and hotbeds[18] and later transplanted to the soil. Hotbeds are often made in-situ by assembling recycled materials. Similar assembling processes apply to improvised anti-hailstorm shields. These latter are in some cases self-provided from the materials and skills that farmers have at hand, and in other cases exchanged with other UCAs or skilled recyclers that achieve insertion in the networks as suppliers.

> "…Our intervention approach aims at delivering organic production on an agro-ecological basis[19]. It implies that we strive to preserve the native biodiversity, apply crop rotation, use green fertilisers, prepare organic compost, and use as much local plants and materials as possible for controlling plagues and minimise the use of external inputs…" (Employee at *Agrupar*, personal interview, 28th December 2016).

Furthermore, promoters not only intervene in production and trading, but also in consumption of allotments' produce. This is because promoters of urban agriculture, the municipality, and local health authorities believe that patterns of food consumption in informal settlements favour carbohydrates disproportionally, especially potatoes, rice and pasta.

> "…They normally consume rice, potatoes, carrots, bread, and soda. People from the marginalised communities sometimes have beautiful gardens because they learnt how to grow, but they have little idea of how to eat a zucchini, a roman cauliflower, a broccoli, an arugula, they have no idea but still harvest, so they produce for others to eat. Then we aim to teach them how to combine their produce with what they can find in their local grocery shops, or with animals they also grow…" (Employee at *Agrupar*, personal interview, 28th December 2016).

Such nutritional imbalance is often blamed for mounting incidence of diabetes, obesity, and cardiovascular disease, as reported in the official survey of

[18] Hotbeds are structures used in gardening to provide space to raise heat-loving plant species (Gardner, 2014).
[19] Agro-ecological basis refers to the environmental condition and ecological suitability of systems, based on the assumption that certain types of systems can be more appropriate for certain ecological conditions (NABU Project, 2016).

health and nutrition (INEC, 2017). To address this, *Agrupar* and Children International also engage in intervening in consumption habits by providing training on the cooking of vegetables grown in the UCAs. Moreover, in some cases personnel of Children International make surprise visits at lunchtime to verify that farmers involved in their sponsored UCAs are eating from the farm.

> "…Our concern goes beyond farming. We want them to learn how to prepare food with their harvest. So, we provide cooking training for mothers with children… Also, we provide training to prepare jams, syrups, and ketchup. Some families are exploiting these skills to make some extra income…" (Employee at Children International, personal interview, 20th January 2017).

Following the harvesting period, the produce is stored in the same location or in neighbouring stockrooms and shared among farmers. Promoters of UCAs often intervene in starting the practice of sharing and trading produce. The excess produce is traded either through bartering or by vending it at farmers markets arranged for organic food exchange by the municipality, or to a network of restaurants that offer organic food on their menus. Bartering is performed under a scheme that UCA promoters arrange named "solidarity commercialisation", which is sometimes accomplished in spaces of informal settlements by gathering farmers from several UCAs. This practice involves principles such as that farmers will not leverage the bartering system to intermediate for profit purposes. In other words, bartering is not meant as a mechanism to support business competitiveness, but instead to share produce and reduce the visits of farmers to grocery shops.

Concerning market places for trading organic food, often referred as agroecological fairs, these are of different types: some are arranged by household-run allotments, others by associations of organic producers, and the most prevalent in Quito – *bioferias* – are sponsored by the municipality and operated by *Agrupar*. Promoters manage to insert UCAs into these retailing networks, which avoid intermediation costs for farmers.

> "With the support of *Novum Consultores*, the community formed an association and agreed with the municipality to use 2250 m^2 of ravine *Habas Corral* to grow organic food… they will launch a community shop for selling their produce…" (El Telégrafo, 2017).

As of 2016, fourteen *bioferias* were organised two or three times every week. In most cases, *bioferias* would operate between 7am and 5pm in spaces of the municipal markets throughout the city. The *bioferias* offer a wide variety of organic food grown locally, as shown in Figure 5.3, as well as fresh food prepared with the growers' produce ready to eat or to take away, and elaborate goods likewise made with the input of growers' produce. As for the restaurants, they often shop for ingredients in the *bioferias*; however, sporadically, some prefer to do their shopping directly in the community gardens.

> "32 places are the paradise of agroecological produce… Quito features about 1100 active allotments… About 100 micro entrepreneurs participate in *bioferias*… About 150000 kg of produce were sold in *bioferias* during the last year" (Alarcón, 2016).

Figure 5.1. *Bioferia La Floresta*: selling food ready to eat and vegetables (author's photos).

Promoters also play a role in the spatial distribution of UCAs across the city. The belief that the informal settlements of the south feature the most acute problems of child undernourishment has prompted promoters, especially *Agrupar* and Children International, to concentrate their intervention efforts in the settlements of the south. In this regard, official reports on undernourishment affecting children may play a role in the different patterns of urban landscape transformation in the north and south of the city. This suggests that official reports drive, to some degree, NGOs decisions on interventions, which subsequently transform the urban space. Thus, the quality of official reports should be of singular concern to urban planners and geographers, because they carry an ability to fuel transformation of the space.

> "…The neighbourhoods of the south feature the most problematic indicators in the periodic measuring of child development control reported by the Ministry of Health…The most pressing problem these days is obesity… today, the number of children with diabetes and cardiovascular diseases is scandalous…" (Employee at Children International, personal interview, 20th January 2017).

Figure 5.4 shows the map of Quito with the distribution of UCAs promoted in the programme *Agrupar* and the location of *bioferias* – represented in shopping carts. The red areas feature the most acute problems of child chronic undernourishment and are where the majority of *Agrupar* intervention is concentrated. Prevalence of child chronic undernourishment is represented in the colour palette at the bottom-right, ranging from 7.2% with green gradient to 46.8% with red gradient. Areas where *Agrupar* has intervened are represented with a light-blue dot.

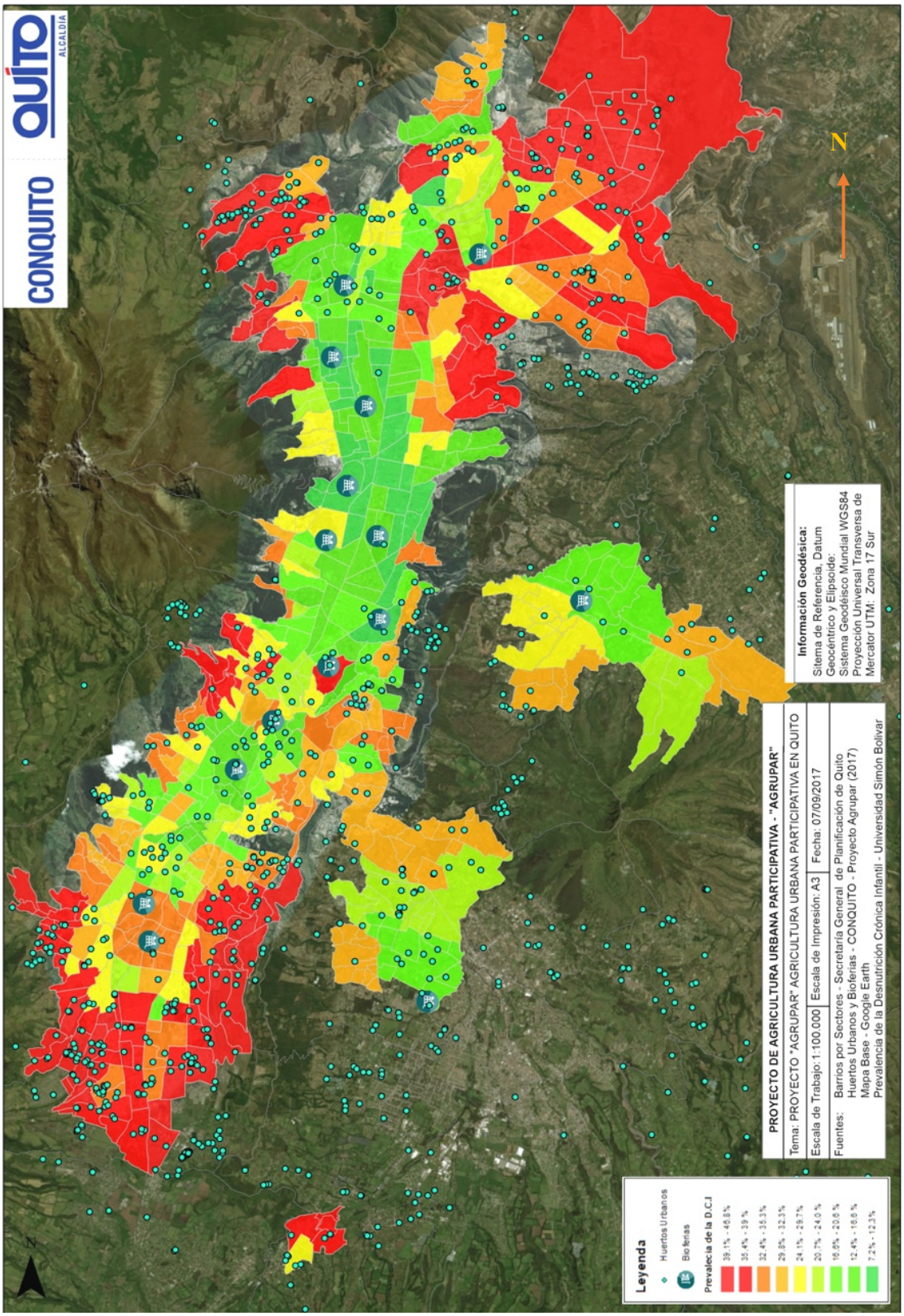


Figure 5.2. Project *Agrupar*. Note that intervention with UCAs concentrates on areas with higher rates of child chronic undernourishment (marked in orange and red in the map) while *bioferias* locate where child chronic undernourishment is less likely (marked in green and light green in the map) (image by CONQUITO).

This section has shown the emerging process of UCAs and identified the prominent actors and their roles in this process. Regarding this, the work of urban agriculture promoters often blends with the mechanism of *mingas* in informal settlements to produce the space for UCAs. Promoters are key players in the emergence of UCAs and during the initial stages of their life, usually until the UCA achieves entry and performs in the trading networks and become self-supporting. *Mingas*, on the other hand, have been effective for farmers – members of the social organisations governing UCAs – to perform cleaning, maintaining, and preparing the space for planting. This finding is consistent with the argument in 2.5.1.1 about reciprocal labour. *Mingas* are not purely voluntary but instead are performed in exchange for access and sense of ownership of UCAs. Similarly, *minga* is also the mechanism through which ravines are maintained and football pitches created. Therefore, this section shows that *minga* is a constituent feature of IGIs in the informal settlements of Quito. The following section shifts the focus onto the benefits that farmers perceive from UCAs and explores the social networks in which UCAs help them to insert themselves.

5.4. UCAs and the formation of social capital in informal settlements

This section describes how participants in UCAs – in particular women – enhance their personal capabilities while co-creating the farming space. The UCAs investigated are forms of IGI operated and governed, in most cases, by women. During the exploration of UCAs across informal settlements, at least eight in every ten individuals standing in the sites were women. This is consistent with the findings of Clavijo-Palacios and Cuvi (2017) in their survey of 82 allotments in Quito in which they reported that 97% of those involved in their sample were women. Similar figures for the prevalence of women in urban agriculture were reported in the peripheries of Bogota, Colombia (Rodríguez-Pava, 2017), with an incidence of 80%, and approximately 85% in Buenos Aires (Cieza, Davies, & Gómez, 2003). Thus, UCAs located in informal settlements of rapid urbanising cities in Latin America seem to be in essence infrastructures of women. Accordingly, the exploration of UCAs provides a window into some of the distinctive struggles that women experience in informal settlements, as well as their agency to be responsive to their everyday needs and chores.

Women that live in informal settlements, particularly those playing the role of head of households, experience poverty in a distinctive manner with features often neglected in relevant anti-poverty policies. Vickery (1977, p. 28) coined the concept of time-poor to emphasise the necessity to consider, as a component of poverty/wealth measurements, the unpaid time and labour involved in "home production for the well-being of the household's members". Householding in informal settlements involves housekeeping, providing food to family members, being in charge of domestic chores such as looking after children, sometimes also looking after sick household members, running errands, and taking children to school. For women in informal settlements, householding is a key descriptor of their social capital. The relationship between social capital and infrastructure has been discussed in 2.5.1. Thus, this section focuses on the patterns of change in householding capabilities that result from gains in social capital after engaging in UCAs.

The relationship between householding and social capital has been addressed from the perspective of gender studies across different contexts. The networks knitted from the practices that involve accomplishing domestic chores have been studied in both urban and rural realms (LahiriDutt & Gopa, 2006; Wellman & Wortley, 1990). Nieves (1979) studied the social networks of women in informal settlements of El Salvador city, and found that these served to exchange help with childcare, and sometimes food and cash. Despite the age of Nieves' (1979) study, her findings are still relevant to the informal settlements of Quito. I present here evidence that UCAs in informal settlements open an avenue for social capital formation, which is indeed effective for women involved to enhance their agency in providing food to household members, generate additional household income and conduct everyday chores.

5.4.1. Providing food to household members

The agency in providing food to household members in informal settlements contributes to shaping women's social capital and provides a lens to observe time-wealth differences by gender. The following lines describe some of the most pressing challenges that keep women living in informal settlements back from undertaking income-earning and self-constructive activities, and hence fighting poverty. When not engaged in UCAs, the practices involved in providing food to household members often interlink women with actors of their territorial food system, which comprise at least cooking-energy suppliers, grocery shopkeepers, weekly flea/farmers' market vendors, and street food vendors on a minor scale.

The most common source of cooking energy across informal settlements in Quito, just as in the rest of Ecuador, is liquefied petroleum gas. This is delivered in cylinders (approximate weight when empty is 14 kg) with the capacity to hold 15 kg of gas, and because of a heavy subsidy scheme targeted to alleviate the costs of cooking at household level nationwide, the official price for the cylinder is 1.60 USD. However, because of the habitual shortage in storage infrastructure complying with the relevant regulations to store and handle gas cylinders at warehouse level, gas in informal settlements is often vended informally, at around 3 USD. Informal trading implies here that gas is delivered through unauthorised networks that involve the use of clandestine stockrooms and light trucks or cargo motorcycles, which would occasionally stand at a noticeable spot in informal settlements for retailing. Beyond the physical effort that involves carrying the cylinder back and forth between households and retailing spots, the inappropriate handling of gas is blamed for having taken many lives in Ecuador, with households in informal settlements being the most vulnerable and frequently affected.

To address issues of safety when cooking, reduce the budget burden that comes from subsidising gas and utilise the energy excess of the generation infrastructure recently built, the central government introduced a programme to promote the use of induction kitchens. This programme was in its initial stage at the time of fieldwork, such that a comprehensive assessment of its value in informal settlements is not yet available. Although UCAs do not address cooking energy issues, it provides a lens to describe a component of the space and identify a struggle that affects women disproportionately.

> "There is one explosion of gas cylinders every 82 hours in Quito… a woman was taken to the hospital *Eugenio Espejo* to treat her burns and wounds because of the explosion of a gas cylinder in her house located in the community *Martha Bucaram* in the south of Quito… fire-fighters reported that in 2015, one explosion occurred every 82 hours in Quito… another woman was victim of an explosion yesterday in her house located in the avenue *Ten. Hugo Ortiz and Químiag* at the south of Quito…" (Jácome, 2015b).

In terms of grocery shops in informal settlements, these not only supply food and cooking materials but also provide credit as form of payment facility for the vended items to their known neighbours. Reputation of buyers is crucial to managing the credit relationship with shopkeepers. In the local slang, grocery shopkeepers, depending on their gender, are referred as *el vecino* or *la vecina,* meaning "the

neighbour". These shops are often attached to the owner's household and attended through a barred window. Shopkeepers keep written record of credit transactions on anything available on which to take notes. These notes have the form of lists of items, including quantity and unit prices, and identifiers for the buyers and transactions such as name and date, and sometimes also the buyer's signature which represents the binding acceptance of the transaction. Grocery shops often have in stock rice, fresh foods, in most cases including potatoes, tomatoes, onions, garlic; processed foods in the lowest price range available in the country's markets but still registered with the appropriate sanitary licence, including pasta, canned sardines and mackerel, vegetable oils and lard, white sliced bread, and cured meats. These also source bottled milk, water, sodas, eggs, and cheese and meats with no sanitary registration packed in rudimentary plastic bags, including beef, pork, and chicken. Lastly, very rarely, local grocery shops offer UCA produce. They are more likely to supply produce from neighbouring household-run allotments instead.

A mix of independent and corporate suppliers stock grocery shops in informal settlements. Usually, independent suppliers – including household-run allotments – stock the fresh food and unregulated meat packs, whereas corporate suppliers deal with all licensed processed items. Goods are often delivered to retailers on consignment with cycles of 15 to 30 days. A typical challenge for suppliers, especially corporate ones, is a kind of unofficial right to supply the territory in the form of a cash toll. The toll price is in most cases a fixed 5 USD and entitles suppliers not to be troubled in their performance of stocking of grocery shops in the neighbourhood. Failing to pay the toll has led to violent episodes in which suppliers have faced appropriation of supplies by locals through armed means.

> "…Suppliers know that they have to carry 5 USD for every neighbourhood on their distribution routes. Normally, the suppliers that stock here (*La Roldós*), also include in the same delivery route *Pisulí, Consejo Provincial, Rancho Alto, and Plan Techo*, so on that route the supplier has to carry in the pocket five notes of 5 USD…" (Shopkeeper in *La Roldós*, personal interview, 26th January 2017).

Weekly flea/farmers' markets are also an important source of fresh food for informal settlement households. These are referred to locally as "*la feria*", meaning the fair, and are often set out once a week. The fair is an informal vending arrangement that consists of truckloads of fresh produce arranged privately, which are unloaded and deployed in an open space of the neighbourhood in a matter of minutes.

Transactions at the fairs are strictly cash and, as in the case of suppliers of grocery shops, they are also subject to payment of cash tolls for the right to supply the territory. Although *ferias* play a crucial role in the provision of food, neighbours lament the waste and hygiene issues that this causes. An interesting finding is that none of the allotments investigated, neither household-run nor UCAs, supply the truckloads vended in these flea markets. In this regard, the way these suppliers stock themselves with produce remains an enigma for the municipal authorities and organisations that promote urban agriculture. However, tracing a potential link between this popular mechanism of food supply and transformation of the urban space would be of great value for urban planners looking to increase stocks of green space in the city.

> "…One of the challenges in designing a food resiliency policy for the city is the characterisation of the food system of Quito. Whoever produces, how producing is performed, from where produce comes, are by and large unknown issues. So, in seeking to formulate an effective public policy that recognises and integrates urban agriculture in the food sourcing system, we need to be aware of the territories and systems that currently supply us with food…" (Employee at *Agrupar*, personal interview, 28th December 2016).

Ambulant street vendors also constitute a source of fresh foods in informal settlements, although on a minor scale. Usually, these kinds of vendors are found either walking or riding cargo bikes and offer their stock at households' doors. When supplying vegetables, vendors tend to obtain their stock from neighbouring household-run allotments. In some cases, vendors are household members of neighbouring allotments. Normally, for this kind of supply, the produce is offered in plastic bags which count as a unit. Thus, price is set per bag of tomatoes or potatoes.

> "…We don't have an association registered formally, so I am here as a sole vendor. But still, a network of four allotments run privately comprises our association. Most of our allotments are located around *Chillogallo* (south of Quito). Our allotments combined have about 700 m^2… we have records of having grown around 30 varieties of produce. I estimate that about 90% of my household's food consumption comes from our allotment network. So, at the grocery shop I only buy rice, bread and cooking materials like oil…" (Vendor at *bioferia* of *La Floresta*, personal interview, 8th January 2018).

Besides vegetables, fish is also vended in this form in informal settlements. This fish is often leftovers from municipal markets. Usually, the price is appraised by

the piece, as vendors would hardly carry a scale. Street vendors, as in the case of grocery shops, also tend to provide some credit to buyers, but normally these are settled in a matter of hours or a day. This happens because stay-at-home women that barely carry cash are the ones that would most often deal during the normal hours of ambulant supply, so usually, they would wait for their male partners to bring the cash and honour the dues.

By involving themselves in local production of food in UCAs, farmers prompt the creation of new social networks, which enhance their agency in feeding household members. This replaces, by and large, visits to the grocery shops and farmers markets for procuring fresh food. Also, UCAs support knowledge exchange in reference to, for instance, ways to consume, which causes a shift in the eating habits of household members. Moreover, UCAs allow farmers not only to bring to the table their own grown food, but also that acquired through means of bartering. Lastly, involving in UCAs reduces households' reliance on debt with shopkeepers to access food, as this mechanism is replaced by the UCA solidarity scheme for sharing resources. These latter are all motivations for informal settlement dwellers to engage in farming locally and reflect on the discussion of reciprocal labour in 2.5.1.1 – dwellers engage because UCAs empower and facilitate them, as discussed in this section, to provide household food.

5.4.2. Generating household income in informal settlements

Following on from the discussions about income of informal settlement dwellers presented in 4.3, households build their periodical income by combining different sources. They often perform a mixture of the least skilled and lowest paid jobs in the job market or are involved in an informal vending or sporadic service provision. Some households also make extra income by letting a space in their houses. In this context, dwellers rely heavily on their local networks to access multiple sources of income to cope with their everyday needs (Wellman, 2018). UCAs constitute forms of IGI which enable the creation of new networks that are effective in providing additional channels for households' income generation, in particular for women of informal settlements. Specifically, the excess produce of UCAs, after self-consumption and bartering, enables farmers to make monetary income from trading.

The disadvantages for residents of informal settlements to competing and taking part in the formal job market in cities have been demonstrated widely in the relevant literature (Auyero, 2000; Davis, 2006; Rashid, 2009). Beyond evident

constraints for dwellers of informal settlements in reaching the city every day – due to distance and poor mobility – aspects such as perceived stigma of living in violent environments, having low-quality instruction and poor academic achievement add onto their already disadvantageous condition when they compete for job opportunities. This is pressing in particular for women, who are more time-poor than males normally, as discussed above, since they have assumed historically the chores involved in householding. Thus, women from informal settlements are perhaps the most disadvantaged contenders when aiming for a place in the formal job market of the city.

> "…I was born and raised in *San Roque* (south of Quito), got married and continue to live there with my husband and child. Being indigenous makes it even harder to compete for jobs in corporations or government. I had to work informally during my university years because nobody would hire me despite the hundreds of applications I filled. I was blessed in that my parents worked so hard for me to attend the university and complete a degree, and that this government found a way to force institutions to include minorities and people with vulnerabilities in the workforce… Paradoxically, living in informal settlements and stigmatised communities was an advantage for me to obtain this job. My main responsibility involves periodical visits to informal settlements and preparing follow up reports to assess the intervention programmes of the Ministry… …since I live only one block away from my parents' house, they help me looking after my child…" (Employee at Ministry of Social Inclusion, personal interview, 26th October 2016).

More than half of women involved in the UCAs investigated are beneficiaries of the cash transfer programme of the central government – *bono de desarrollo humano* (MIES, 2017), which also constitutes a recurrent and secure source of income. The bond consists of monthly cash transfers of 50 USD, subject to a set of conditions related to the context of vulnerability. According to a finance official interviewed from the Ministry of Social Inclusion, which is the institution that manages the direct cash transfers, the vast majority of recipients of the bond are women. Commonly, within cities, this bond is concentrated in the marginalised communities. The networks of women formed in UCAs are also effective for supporting each other through the bureaucratic process of becoming recipients of the bond. But, conversely, the bond also enhances women's freedom to engage in UCAs. Income generated from UCAs is not fixed but fluctuating; thus, securing a fixed income gives them the ability to take on ventures of uncertain income. This finding suggests a link between alternative income and spatial transformation – in the form of

GI – in the context of informal settlements. Furthermore, this is a link worth exploring from the perspectives of Geography, which, for instance, can be inserted into emerging debates about the convenience of adopting universal basic income policies (Reed & Lansley, 2016).

For UCAs of bigger size and produce output, organisations that took part in co-producing the space, such as *Agrupar* and *Children International*, manage to introduce them into the city's retail networks of organic food supply. The most important of these networks across the sites observed are the municipality's *bioferias*. This resonates with the discussion in 2.4.1.4 about informal infrastructures, in that UCAs produce continuity in the city, which is a constituent feature of IGIs. Moreover, the dynamics involved in organic food retailing in the city become relevant to the preservation of the UCAs' space and their patterns of transformation and "moments of adjustment" as suggested by Silver (2014).

> "…The income varies every month depending on the produce output. Last month I made 120 USD. The highest monthly income I had was 190 USD last April. There have been cases in which we made only 30 USD…
> …We do our bookkeeping here for the allotment, which a promoter taught us how to run. Every month we determine the profits, agree on a part to feed the savings account of the association, and distribute the rest equally among the associates…" (Farmer from UCA in *Guápulo,* personal interview, 16th December 2017).

The commercial dynamics produced from UCA trading networks certainly constitute a mechanism for women in informal settlements to make additional income. However, some of the structural dimensions of living in informal settlements, which keep women from pursuing income-making opportunities systematically and disproportionally, remain despite involvement in UCAs. Involvement in UCAs should be thus accepted as an additional source of income, not an exclusive one. This is relevant for policymaking in that addressing poverty in women not only implies the creation of employment opportunities in the city, but equally important, finding alternatives to produce income in informal settlements, near their households. This implies shifting informal settlements from being purely providers of labour to become providers of goods and services for themselves and for the formal city, within which paradigm UCAs seem to fit well. In sum, this section has shown that IGIs provide access for peripheral communities to participate in the economic system of the city and give a space for money circulation.

5.4.3. Conducting domestic chores in informal settlements

The householding responsibilities of women of informal settlements that become involved in UCAs are interwoven with their farming duties in a kind of symbiotic dynamic. Following involvement in UCAs, the new farmers often assume everyday tasks that comprise at least weeding, securing soil nutrition, preparing compost, planting seeds, irrigating, harvesting, storing, cleaning and maintaining tools, for which they devote greatly variable numbers of hours every day. On top of this, within their communities' cultural boundaries regarding gender division of labour, women in most cases undertake household chores that often encompass looking after children and elders, taking children to and from school, shopping for groceries, preparing food, or taking household members to (often distant) healthcare facilities as suggested in Figure 5.6. UCAs are beneficial in that they prompt the emergence of social networks that support women in accomplishing these everyday domestic chores. This resonates with Simone (2004b), as discussed in the literature review, in that UCAs, as infrastructures, support "energy being more efficiently deployed" (p. 407).

> "…We (associates of a UCA) organise our tasks in such a way that our children are always looked after by any of us, so we kind of assume the role of aunts for the children of the associates. For instance, I am looking after three children today while their moms are at work. Two of them are in the allotment now, and the other one is at her regular workplace in the city…" (Farmer from UCA in *Guamaní,* personal interview, 18th December 2016).

Figure 5.3. On the left, farmer looking after partners' children in child centre of *Guamaní*; on the right, woman returning child from school in *La Pulida* (author's photos).

Participating in UCAs also enhances women's agency in decision-making that is relevant for householding. In relation to this, the ability to supply food to household members, plus the contribution to household income and the power to solve problems autonomously have supported women in expanding their spectrum of decisions at household level. For instance, interviewed women farmers reported having originated a sort of house improvement project since they became involved in UCAs. Some of the projects include planting at home, upgrading house materials and connexions for energy, gas and water, expanding the house or having it painted. Likewise, they reported having gained the freedom to get out of the house for leisure purposes. In reference to this, some of them mentioned that after engaging in the UCAs, they started to participate in forms of cultural manifestation, some supported by the municipality's division of culture promotion, such as indigenous dances and dance therapy as shown in Figure 5.7. Thus, the gain in social capital that UCAs enable also serves to avail "time for self".

Figure 5.4. Flyer posted on pole in *La Roldós* announcing dance-therapy in the "community house" (author's photo).

UCAs have also enabled women from informal settlements to participate in trading networks, which have served to accrue political capital and demand relevant actions from authorities. Through the associations and trading networks, increasingly, women have been involved in collective action of the informal settlements to demand improved local infrastructure, land tenancy regularisation, sanitation, public illumination, playgrounds etc. Thus, the social capital developed through engaging in UCAs has enabled their voices and demands to be heard in their neighbourhoods and among relevant authorities. This finding connects with the discussion of infrastructure governance in 2.5.2. IGIs give rise to institutions that are embedded in networks of institutions, which allow communities to increase their capacity for adaptation and resistance.

> "…When I first engaged in the association for gardening I remember my sisters telling me that I was wasting my time, that my obligation was to look after my husband and family and have the house clean. Today, after 8 years in the association, I motivate women of the neighbourhood to plant in their houses, or to associate and have their own farms. I gained freedom with farming; I am no longer slaving in the house… …I take partial credit for the regularisation of land for the whole neighbourhood as I took part in all forms of collective action to demand attention…" (Farmer from UCA in *La Argelia,* personal interview, 7th January 2017).

In the vast literature that links agriculture and poverty in Latin America, the gender perspective has produced substantial evidence of gains in women's material, social, sexual, and intellectual autonomy (De la Rocha, 1988; Lagarde, 2012; Reyes, 2002; Rubio, Bordi, Ortíz, & Muro, 2017). Similarly, taking part in UCAs in the informal settlements of Quito provides support to women's everyday practices by which they experience gains in autonomy. UCAs enable tighter relationships through the performance of routines in the allotments every day, which enhances a sense of possessing things to give and opportunities to take from peers, leading to positive impacts in their agency in householding. As women work, they talk to each other about their personal challenges and abilities, which gives shape to dynamics of mutual support. These relationships produce a social infrastructure – see Simone's (2004b) conceptualisation of "people as infrastructure" in 2.2.2 – through which knowledge and assistance circulates to help relieve their immediate challenges. Typically, they exchange experiences on how they dealt with needs such as bureaucratic processes, access to specific healthcare for a household member, using local medicinal herbs, acquiring goods such as clothing, travelling to destinations in the city, and also seemingly less complex and everyday matters such as cooking recipes. Break times in the allotments, often accompanied by an herbal infusion, are particularly auspicious for practicing collective brainstorming and coordinating collaborative action to address individual challenges of farmers.

> "…Think of frequent duties such as performing bank transactions, since we have a bank account for the association, or filling bureaucratic forms to secure a municipal space in the marketplaces, or to renew the formal recognition of association. Those are things that we cannot get done nearby our homes. In the queue at municipal offices or banks we are all equals. So, we organise ourselves to run those errands and provide petty cash to cope with the expenditures involved in travelling…" (Farmer from UCA in *La Argelia,* personal interview, 8th January 2017).

Finally, having "something to do" in the city related to the UCAs engenders a sense of right to be and circulate throughout the contested spaces of the city. Hence, IGIs provide access and support for the claim to "the right to the city" (Harvey, 2008; Marcuse, 2012). This reveals that women from informal settlements perceive a degree of dispossession of rights to access the resources available in the city. The interviewed women of the informal settlements of Quito agree in that "feeling well and rightful" in the city implies that they have some disposable money in their pockets to spend or

have a motive to reach a destination for which circulating through public transport and the system of walkways is necessary. Otherwise, being in the city feels like a barrier to the flow of others. UCAs provide them with motives to travel to the city and make legitimate use of its features for their own benefit and that of their households.

5.5. Patterns of UCA scaling

The previous section focused on how UCAs transform their users' everyday life. This section turns attention towards the processes and causes that fuel UCA transformation and escalation. To provide some background for the subsequent discussion, there is no agreement in terms of land extent, production outputs and number of individuals involved in UCAs and, in general, in urban agriculture in Quito. Official records from the municipality indicate that by the end of 2015, urban land used for agriculture occupied about 20.2 ha (Alvear et al., 2016). This number contrasts with records of organisations that often focus their intervention efforts on informal settlements. For instance, *Agrupar* claims to have records of intervening in 29 ha of the urban territory, which involved more than 13000 households in 2015 (Rodriguez & Proaño, 2016). What is incontestable, nevertheless, is that the proportion of land devoted to urban agriculture is still marginal in Quito, constituting roughly 0.1% of the territory.

Besides, urban agriculture is not distributed evenly throughout the city or informal settlements. Instead, this is practised more intensely in the neighbourhoods of the far south. There are basically three reasons for such clustering patterns: first, the difference in water availability across informal settlements, which is more consistent in the south. Second, the differences in the human composition of the settlements in terms of skills and traditional knowledge endowments. Informal settlements with a prevalence of rural immigrants are more likely to feature spaces for urban agriculture. Third, as discussed in 5.3, the biased disposition of urban agriculture-promoting organisations to intervene in informal settlements of the south. When it comes to UCA units, however, no previous studies have examined the drivers for their escalation and de-escalation, which is relevant for both, understanding how IGIs transform and informing GI planning in a context of prevalent informality.

5.5.1. Incrementalism of UCAs

Building upon the discussion on incrementalism in 2.4.1, this section shows that UCAs in the informal settlements of Quito are platforms for incremental space-

making (Simone, 2008). This means that users engage in keeping the space and its infrastructural abilities functional to satisfy multiple growing demands. Incrementalism of UCAs normally happens through two dynamics: one is the continuous input of goods and services that are relevant to enhance practices of production and produce outcomes; the other is the increasing integration of UCAs into networks that support sourcing, trading, and participation. To have a clear view into the trajectory of incrementalism of UCAs, this section focuses on the gradual improvements that facilitate everyday practices of farmers in securing produce output and delivery.

> "…The most frequent threat to the allotments is weather. As you know, weather in Quito is unpredictable; sometimes we lack water for irrigation, and some other times it rains in excess... …particularly adverse are hailstorms… …Also, plagues are always around, but unlike weather, usually, we would find a way to control them and have a fruitful crop…" (Farmer from UCA in *Guamaní,* personal interview, 11th January 2017).

Usually, farmers at UCAs engage in continuous transformation of the space into a fertile ecosystem for growing food. Likewise, they often seek gains in efficiency when sourcing raw materials, consuming, altering the produce, and trading. Typically, the approaches to these permanent improvements spread to nearby UCAs through mechanisms of knowledge transfer, through the circulation of suppliers of raw materials, through inter-UCA trading or produce exchange and through farmers that engage in community labour away from their own UCAs. These practices of continuous improvement and innovation are common in clustered regions, and according to Carpinetti, Gerolamo, and Galdámez (2007), help in consolidating a culture of cooperation.

> "… With the *vecinos* (neighbouring UCAs) we always learn from one another. We know when a procedure or a supplier is convenient or not for the farm from the others' experiences…" (Farmer from UCA in *La Argelia,* personal interview, 14th January 2018).

Knowledge and skill transfer is a domain almost exclusive to NGOs and promoters. As addressed in 5.2.2, these organisations provide training in form of workshops in demonstrative farms and in the UCAs to mobilise skills and abilities that are relevant to the core processes. Moreover, these organisations provide raw materials and tools in the beginning, and also educate on ways to avail people of

materials. This includes teaching them how to improvise from what farmers have at hand and introducing them to networks of suppliers. Besides, in the course of gaining abilities and producing output, UCAs establish exchange networks that allow them to secure raw materials such as seeds, recycled tools and equipment, along with services that support all processes. For example, in seeking to protect crops from hailstorms, protector screens improvised with recycled materials at hand are most often found in UCAs. Other provisions that involve external actors are, for instance, pots for planting, baskets, recycled tires, mulches, compost, fertilisers, and services such as cargo transport from allotments to marketplaces.

> "…For those with no access to land for farming, there is the possibility to recycle bottles, tires, and boxes, which are used as part of the production equipment, such as the cases of hotbeds …" (Technician from *Agrupar,* personal interview, 19th January 2017).

In terms of labour arrangements, weeding and managing the irrigation schedule are most often referred to as routine. Since the majority of farmers involved in UCAs are women, organising the production in the UCAs involves not only routines restricted to farming, but also mastering ways to give each other support to make available time and resources for householding, as discussed in 5.3. For the case of weeding and other cropping activities, these often rely on tools and training that NGOs and promoters provide, as explained above in 5.2.1. Irrigation practices, however, vary across informal settlements' contexts.

> "… Access to water for irrigation purposes is one of the most pressing challenges, particularly in the settlements of the north. Policies in regard to water supply are upside down. It is easy for a stadium or for the football leagues to have water to irrigate the pitches, or for car washers to work with water provided formally, but it is difficult for urban farmers to have water for supplying food… Besides, in the south it rains much more, and the soil is better for agricultural practices, whereas the north is sandy and dry, which makes it more problematic to develop the allotments…" (Employee from *Agrupar,* personal interview, 27th December 2016).

The practice of sourcing water differs across locations mostly because Quito features eleven climate types with minimum temperatures of -2°C (near the picks of the volcano Pichincha), maximum temperatures of 27°C, and rainfall ranging from 350 mm to 4000 mm (Alvear et al., 2016). Precipitation is far more intense in the south, so allotments in the south often rely on rainwater reservoirs for their irrigation

needs, which is inexpensive compared to using potable water or pipes that capture water from the streams. However, during the dry season (between June and September) farmers supply themselves with other sources, including potable water and sometimes water truckloads. Incrementalism is here manifested in the progression from assembling tanks for capturing rainwater to implementing drip irrigation systems, for instance.

Preparing the produce for display and arranging for its transportation to the marketplaces are the next important scheduled routines.

> "… Informal settlements always have a truck man at hand, who in most cases lives in the neighbourhood. The truck man is not only available for allotments, or to serve as informal taxi. They also perform as the local ambulance, so whenever there is an emergency in the neighbourhood they are always available and willing to go anywhere in the city…" (Residents of *Guamaní,* focus group, 9th January 2017).

Normally, UCAs in informal settlements would lack their own mean of transportation, so arrangements are often made with neighbouring light truck owners that provide informal mobility to the city. This process that supports trading and access to income streams relies on both pre-existing social networks in the neighbourhood and on exchange networks of UCAs.

> "…They decide what to produce, but under the principle of agroecological base, so they have to maintain biodiversity. Thus, we encourage them to produce not only what they normally eat or vend and would like to continue eating and vending, but also, other species as an approach to improve the resiliency of the farm…" (Employee from *Agrupar,* personal interview, 27th December 2016).

NGOs and promoters are also key in introducing practices whereby farmers can consume their own grown food. They teach farmers how to prepare and combine the UCAs' produce with what is available at hand. Equally important, they connect the UCAs to trading networks in the city, the *bioferias* being the most frequent, which constitute their income stream. Both consumption and participation in trading networks are determinant in deciding what to produce and how to enhance the ecosystem's ability to the benefit of the produce wanted.

A limitation shared among some of the UCAs is ownership of the farming space. Particularly when the space is rented to a person who is not involved in the UCA, the farming practice is vulnerable to the disposition of landowners in terms of alternative options to exploit the space.

> "…The use of public space for agricultural production is on the agenda. There are regulations that make it difficult to use public spaces for production, such as the need for a formal association, which requires payments and bureaucratic processes that usually demand sponsorship of attorneys. This limits the possibilities of marginalised communities to associate for farming. Staying informal always implies uncertainties that prevent them from further enhancing their capabilities..." (Employee from *Agrupar,* personal interview, 27th December 2016).

Incrementalism in these cases is manifested in the act of securing land tenure to continue farming, which is more often found in longstanding UCAs. This vulnerability reveals a gap in the urban regulations aiming to support UCAs. This is particularly pressing in informal settlements where land tenure is not yet fully formalised. Despite the formal recognition of rights to occupy land for some informal settlements, while land tenure of single owners is not fully regularised, the space remains as public land. This finding suggests that IGIs are vulnerable and may be supported with land use regulations and policies of incentive.

5.6. Conclusion

By investigating UCAs, this chapter has revealed four aspects of IGIs: 1) Instead of planned and built, as discussed in 2.4.1.1. and argued by Lancione and McFarlane (2016), IGIs emerge and become infrastructures. UCAs are IGIs that emerge from the interventions of external actors – inputs of knowledge and resources, which in most cases are NGOs – and become infrastructure by producing food and interweaving themselves in multiple social networks on a citywide scale. These dynamics allow UCAs' users to exchange assistance, generate income, and facilitate everyday practices, in particular for women; 2) IGI functions as a perspective from which to study informality. This chapter has exposed several struggles with which women in informal settlements deal every day to achieve householding. By taking part in UCAs, such women largely evade some of the structural realities that keep them poor; 3) Expanding on the previous finding, and in line with Roy (2005), UCAs permit discerning informality as a continuum rather than as a static condition. Farms that emerge aside institutional means become key components of the food supply system of the city. Hence, IGIs develop in networks in which interrelate both formal and informal practices; and 4) IGIs are vulnerable to local disputes over land. The spaces over which UCAs are established are rarely previously vacant lots. Instead, these spaces often remain contested because these were first intended for housing.

Concerning this, as discussed in 2.2.2, it is likely that the perceived values of UCAs differ across neighbours.

Finally, the four aspects identified above provide a basis to further investigate IGIs. So far, the study of UCAs has been mainly descriptive of the production process of IGIs, with particular attention to actors, institutions, and mechanisms, and the ways in which they interact. In the following two chapters, the study of footpaths and pitches deal in more detail with IGIs' processes of transformation and disappearance.

Chapter 6
Footpaths as mobility infrastructure of informal settlements: Examining IGIs vulnerabilities

6.1. Introduction

This chapter shows that the slopes and ravines neighbouring the informal settlements of Quito provide a platform for pedestrian infrastructure, which constitutes IGI for mobility. This IGI is meant to facilitate access to other mobility infrastructure such as roads and means of public transport, which informal settlements dwellers use to reach their everyday destinations. However, the functionality of this type of IGI is often sensitive to the ecological context, meaning that the more polluted the environment the less suitable it is for mobility.

Through the investigation of UCAs in the previous chapter, a platform has been provided to build upon and extend our understanding of IGIs. The platform guides us through the exploration of actors, resources, practices, processes, networks, benefits, and vulnerabilities that interplay in IGIs' emergence and transformation. This chapter advances the conceptualisation of IGIs by identifying actors and tensions arising from the use of footpaths. An important difference between UCAs and footpaths is the ability of neighbours to access and use the space. While UCAs are community-driven, these are also membership-based spaces, so access is not open to all. Conversely, footpaths provide access to neighbours for their mobility needs indiscriminately.

Mobility is a multidimensional concept embedded in the social and spatial arrangements of cities, which provide a distinctive angle to appreciate the relationship between informality and transformation of the urban landscape. In urban studies, mobility refers to movement of people, objects, and information (Cresswell, 2006, 2010; Ohnmacht, Maksim, & Bergman, 2009), as well as the relevant physical means such as roads, railways or telecommunication networks. In this chapter I consider the green landscape surrounding informal settlements as enabler (or disabler) of movement for people and objects and describe the process through which IGIs are shaped as a physical means for mobility. By investigating footpaths, this thesis links back to Little (1990) and the original Western conceptualisation of GI as greenways discussed in 2.3.3.

The relevance of this chapter is twofold: first, it shows that utilitarian walking is an everyday practice for many in the informal settlements of Quito, and thus, a

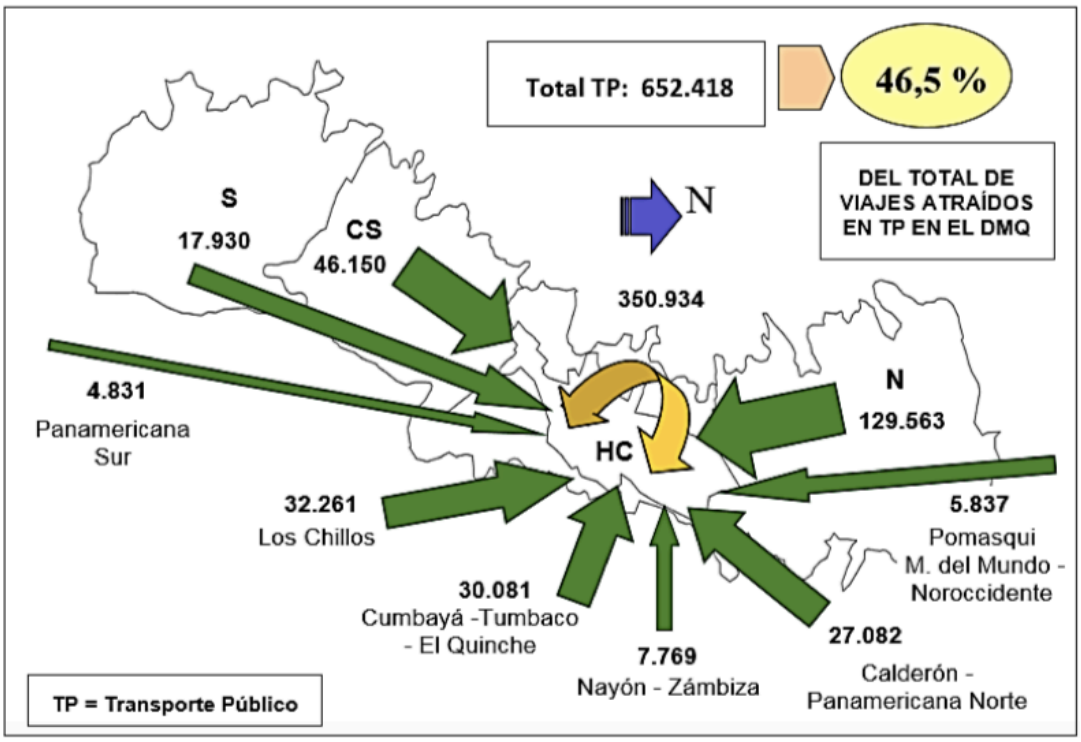
means of sustainable mobility that is feasible to spread. This suggests that pedestrian infrastructure is worth exploring further, perhaps beyond conventional motorised means of transport, to address mobility in informal settlements. Second, this chapter shows how informality produces alterations in the landscape to meet mobility needs, which may still be labelled as green. Therefore, this study has policy implications to address both mobility and environmental management of urban growth.

In part, this chapter is leveraged on an environmental intervention programme led by the municipality of Quito – *Plan de Intervención Ambiental Integral en las Quebradas de Quito* – which aims to rehabilitate the ecological functionalities of ravines. Correspondingly, four ravines at different stages of intervention were explored to capture ways in which they transform to support mobility practices for informal settlement dwellers. The remainder of this chapter is organised into four sections as follows: Section 2 describes commuting practices in Quito and discusses the politics of mobility in relation to non-motorised modes of transport. Section 3 addresses mobility in informal settlements and presents the footpaths, including their origins, practices of production and descriptions of experience. Finally, Section 4 addresses the drivers of footpath alteration from the perspective of incrementalism. Finally, a concluding remark is given in section 6.5.

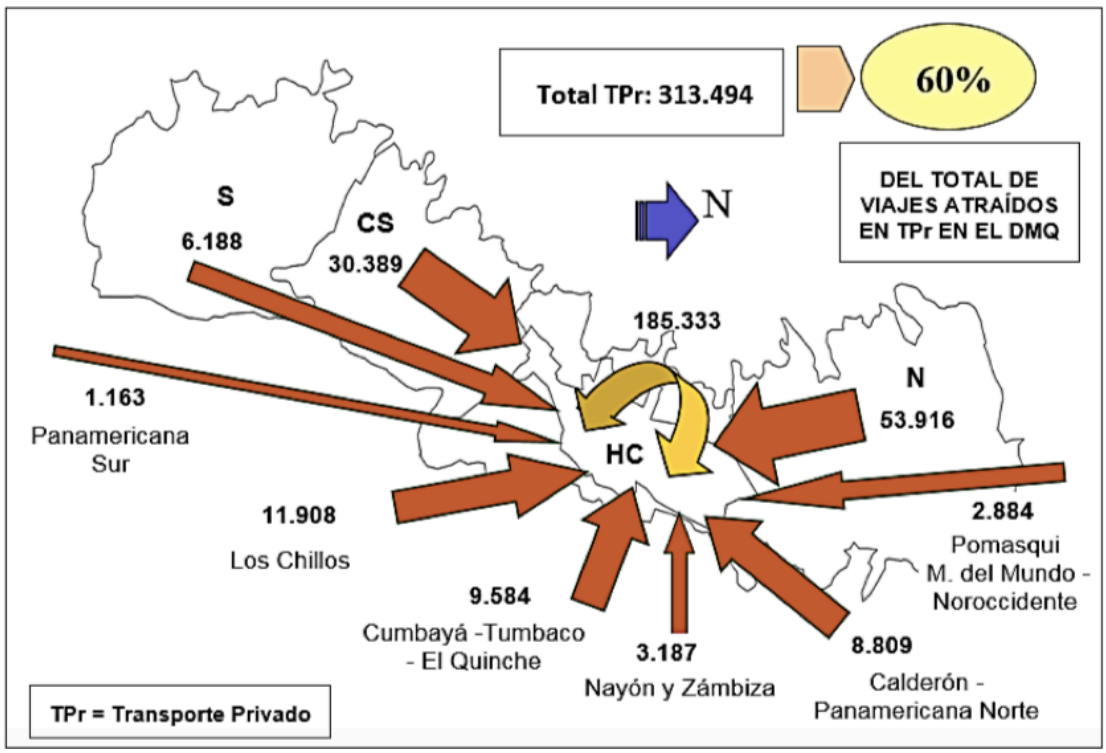
6.2. Commuting in Quito city

This section introduces the mobility dynamic of Quito. Understanding this dynamic is important because it shows the core of the mobility network in Quito, which gives meaning to the emergence of IGIs for mobility. To understand the dynamics of mobility in Quito, it is crucial to observe the city from what is referred to as the HC. This space concentrates most of the urban infrastructure value, equipment, marketplaces, and jobs, and is by far the most frequent destination for all modes of transport in the city. Thus, at least in terms of motorised means of transport, Quito features a marked monocentric[20] urban dynamic as shown in Figure 6.1.

[20] Monocentric city refers to a city with one centre (or downtown, also called Central Business District in many Third World Cities). Most cities have such a single downtown during their initial phases of growth. Overtime, however, one downtown cannot serve the growing population, and other problems arise (traffic congestion, pollution, etc.). Hence, cities become polycentric (Ganapati, 2017).



TP=public transport, S=south, CS=centre-south, HC=hypercentre, N=north (DMQ, 2014)



TPr=private transport, S=south, CS=centre-south, HC=hypercentre, N=north (DMQ, 2014)

Figure 6.1. Number of trips to the HC in public and private transportation. The HC is the most frequent destination for both public and private means of transport.

Short trips between destinations in the HC account for the majority of trips in Quito. This is followed by the trips that connect the HC with the districts of the north and centre-south, which happen to host the most populated informal settlements. This is true for both public and private motorised means of transportation. However, the volumes of trips and actual inhabitants travelling between informal settlements and the HC every day are difficult to estimate. This is because inhabitants of informal settlements often assemble a combination of commuting alternatives, which include both motorised and non-motorised modes and make their trips difficult to track.

Frequently, motorised means of transport for informal settlement dwellers involve informal transportation. Examples of this are the open cargo area of light trucks or motorcycles acting as taxis. These providers often lack a license to operate as public transportation suppliers, so there are no official or reliable records regarding their scope of practice. Besides, since their ability to operate in the HC is restricted, informal transporters more often circulate in spaces between informal settlements and near bus stops, or somewhere feasible for commuters to embark on the public transportation network.

> "… I take the truck every evening when I return home after work. It costs twenty cents but I don't have to walk about 2 km up the slope. Their stop point is some fifty metres inward from the Occidental avenue…" (Resident of *La Pulida*, personal interview, 22nd November 2016).

Moreover, the few paved roads that connect the core city to the informal settlements of Quito by motorised means are often over-congested. This situation worsens considerably during peak hours on weekdays. For instance, reaching neighbourhood *La Roldós* in the north-west implies taking *Rumihurco* Avenue, which is the only road that ascends from *Occidental* Avenue (one of the busiest roads that run north-south). Halfway along *Rumihurco* Avenue to *La Roldós*, the road gradually turns into a bottleneck and the traffic congestion deteriorates further. At 9:30am the traffic congestion may become chaotic. It is usual for drivers to invade the rudimentary sidewalks to move forward. Also, it is normal for users of both informal and public transport to disembark and walk instead, usually by dodging the many cars trapped. All this while car horns sound incisively. Figure 6.2 shows the route to *La Roldós* as described above.

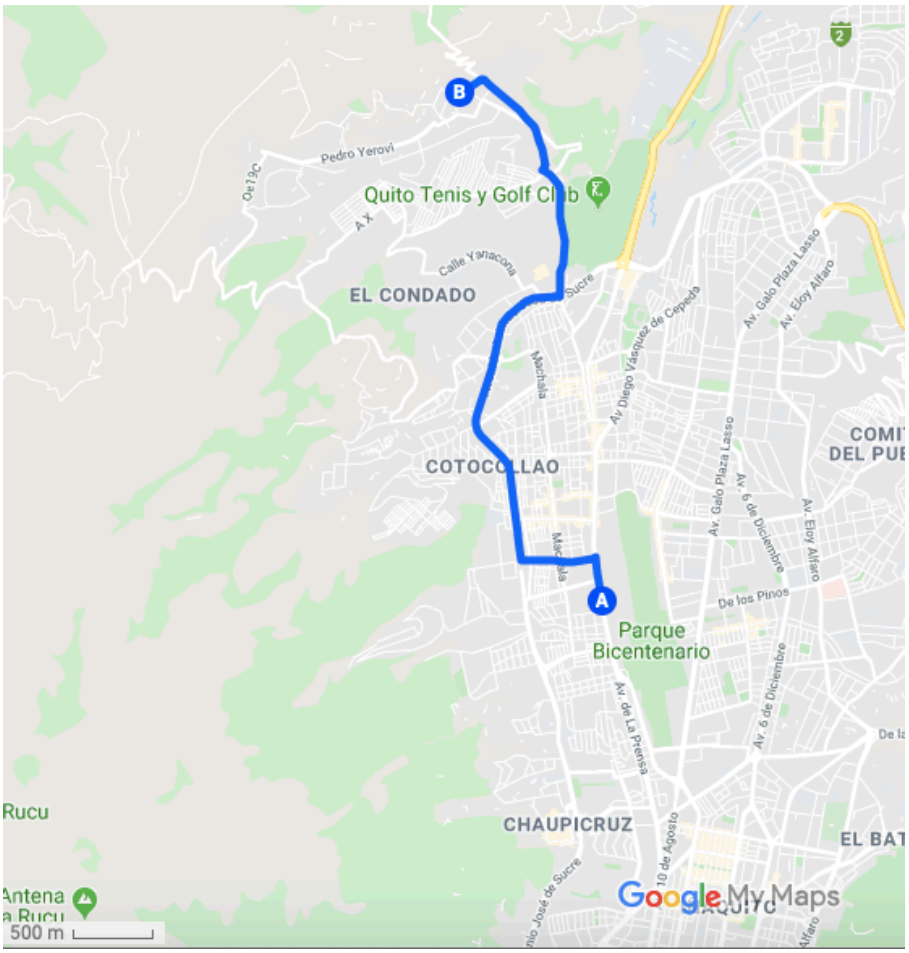


Figure 6.2. Route from *Cotocollao* (A) to *La Roldós* (B) on *Rumihurco* Avenue (slope) (Adapted from Google Maps).

On the formal side, public transportation is available in the majority of consolidated informal settlements. Quito features almost 2500 buses that cover 186 routes, which includes service to many of the peripheral neighbourhoods. Approximately 1 million residents city-wide use the public transportation system every day. This comprises basically the network of buses and two trolleybus lines that run north–south on main roads *10 de Agosto* on the west, and *6 de Diciembre* on the east. Besides, there are roughly 30 thousand taxis, of which half are considered irregular or unauthorised to operate. Lastly, according to the transit authority bureau – *Agencia Metropolitana de Tránsito* – around 2 million private vehicles were registered in 2017, 30% of them being aged 12 years or older.

In addition, the municipality is venturing into a cable-car system – *Quitocables* – just as in other Latin American cities such as Medellin, Manizales, Caracas, La Paz, and Rio de Janeiro. The aim is to connect the peripheral communities, most of them informal settlements, to the public transport system of the central corridor, which will include an underground railway system in the near future

– still in the construction stage. Beyond traffic congestion, though, the *Quitocables* project attempts to address issues of car accidents, people being run over, violence in informal settlements, as well as environmental aspects such as air pollution, and noise. Nonetheless, although this project targets the mobility issues of informal settlements, it still frames mobility exclusively as a function of motorised transport systems and infrastructure. Figure 6.3 shows a map for *Quitocables'* routes.

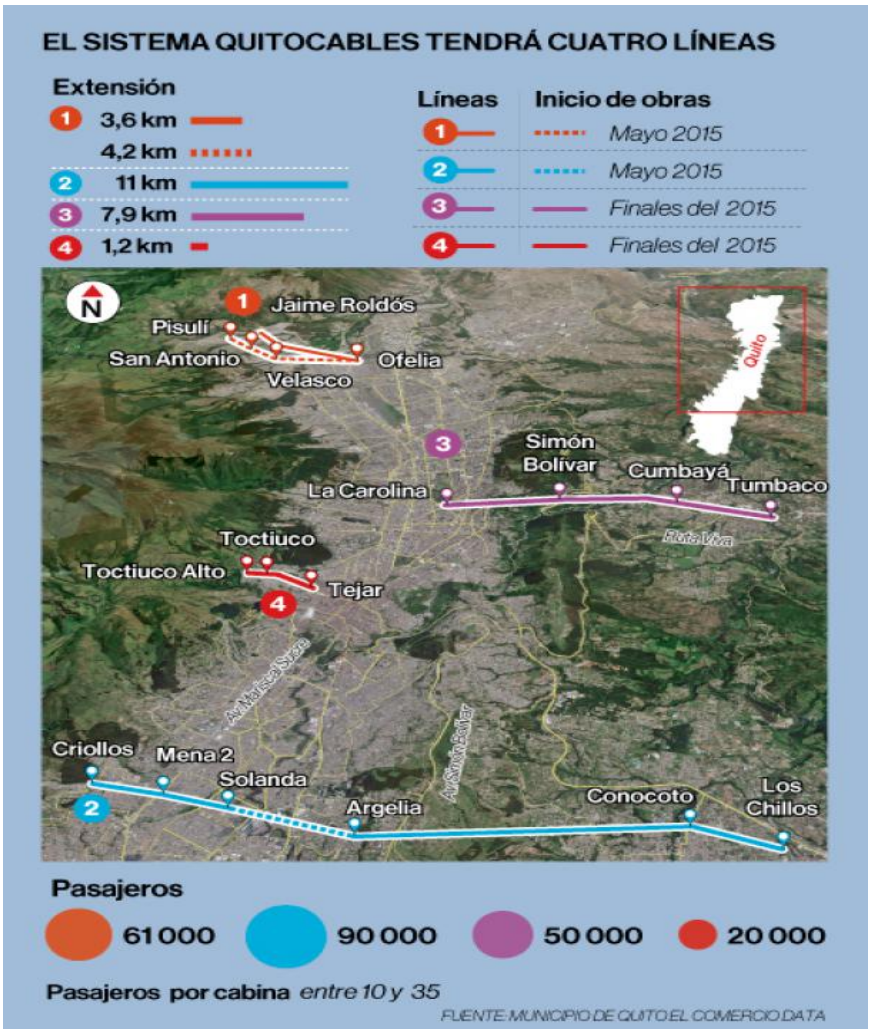


Figure 6.3. *Quitocables* extension and passenger capacity. System has four routes (colour coded) (Pacheco, 2015).

6.2.1. Non-motorised means of transport and the politics of urban mobility in Quito

This section provides an idea of the political tension that prevails around mobility issues in the city. Its relevance lies in the identification of barriers to means of more sustainable mobility. A marketing consulting firm revealed recently the perceived most pressing problems in Quito as of March 2016. Traffic-related issues occupied the second place (25% perceived this as being the most pressing problem),

second only to safety issues (31%). Inadequate maintenance of local roads was in fourth place (17%) (CEDATOS, 2016). The sampling was performed in the HC, which suggests that the opinion of informal settlement dwellers is unlikely to be represented in these figures. Surprisingly, the survey suggests that mobility is a political issue with a higher level of agitation than poverty, informality, and air/water pollution. Indeed, in the last major election of 2014, the campaign of winning candidate Rodas focused mainly on the traffic problems of Quito. His discourse was most often associated with policies that restrict private vehicles' circulation.

> "Quitenians waste 5 years of their life in the traffic while the city mayor says that everything works wonderfully, according to Rodas" (Ecuador en vivo, 2013).

Traditionally, mobility policy in Quito, just as in other main cities in Latin America, is framed within two broad paradigms: rapidity of reaching central spaces and connectivity to emerging real estate projects (Rodrigue, Comtois, & Slack, 2016). So, mobility infrastructure in Quito is mainly determined by the convenience of motorised modes of transportation. Happily, however, the growing embeddedness of concepts such as social responsibility and inclusiveness in Latin American political discourses during the last decade is gaining ground against traditional views of mobility. Examples of these discourses are "The Right to The City" and the "Living Well"[21] paradigm. In connection to this, ideas of public interest and sustainable accessibility have in part been guiding recent mobility-related debates in the municipality (Oleas-Mogollón & Albornoz-Barriga, 2016).

Among the prominent outcomes of these debates is municipal ordinance 0194 of 2017 to favour pedestrians and cyclists (DMQ, 2017). This ordinance somewhat suggests a shift of attention onto the mobility needs of individuals who have traditionally been excluded from transport infrastructure and related policy.

However, mobility infrastructure in Quito continues to consist of a network of spaces which are highly contested. Indeed, commuters who use non-motorised means of transport remain disproportionately vulnerable, and to some extent stigmatised. Except in the HC, pedestrians and cyclists are outsiders and unnatural to the roads in

[21] Buen Vivir (suma qamaña in Aymara, sumak kawsay in Quichua, ñandareko in Guaraní, küme mongen in Mapuche, and living well in English) is a cultural concept of well-being that emerged in Latin America in the early 2000s, when the indigenous movement became a major social and political actor in Ecuador and Bolivia (Guardiola & García-Quero, 2014).

the imagination of users of motorised means of transport. Figure 6.4 shows a tweet suggesting the inadequacy of streets for bicycle riders and the little consideration they receive. Likewise, forms of mass public transport are often blamed as if they are the main problem of slow and clogged traffic. The entrenched notion of mobility for Quito's residents, thus, is foremost reduced to transit flow rather than the ability of all to access everyday spaces. Because of this, many condemn initiatives aimed at restricting circulation of private motorised vehicles in Quito. Examples of such initiatives include municipal ordinance "*pico y placa*"[22], which restricts private vehicle circulation based on the digits of the plate. Likewise, restricted parking zones, exclusive lanes for mass transport, and more recently the implementation of bicycle lanes are unpopular.

Yesterday, the cyclist xxx was run over in Cumbayá. The car driver fled. The car's plate was scanned so the driver will be soon jailed. But beyond this. I don't want to live in a city in which whoever kills a person on the roads run away. Humanity is missing.

I like cycling too,
but Quito's streets are not appropriate, neither for vehicles, and even worse for bicycles. The mayor never did a thing to solve the traffic. Council members the same.

Figure 6.4. Tweet about a cyclist being runover and the inconvenience of traveling by bicycle in Quito.

> "Quito features an average of seven run-overs (pedestrians and cyclists) per day" (Jácome, 2015a).

[22] Literally "Peak and Plate" is a driving restriction policy aimed to mitigate traffic congestion. The system restricts traffic access into a pre-established urban area for vehicles with license plate numbers ending in certain digits on pre-established days, and during certain hours.

Non-motorised trips, according to the master plan for mobility 2009-2025 (DMQ, 2014), account for only 15% of all trips in the city and the tendency for this figure is to decrease. Non-motorised trips entail, basically, journeys by foot and bicycle. While this figure seems biased and distorted, what is at stake here is that this neglects the ability of pedestrians and cyclists to commute to their daily destinations. Furthermore, the master plan for mobility overlooks the needs and claims of pedestrians and cyclists. The plan indicates the long distances between urban centres, inadequate mobility infrastructure, and perception of walking as being a practice of low status as reasons for the 15% proportion. Still, according to EPMMOP – municipal office for mobility and public infrastructure – Quito features 36 km of cycleway, and a 15 km cycle route on avenue *Simon Bolivar* (Romero, 2018a), which is one of the most important freeways of the city. Figure 6.5 shows a capture from a municipal ordinance detailing the number of daily trips by mode of transport.

ORDENANZA METROPOLITANA No. 0194

Tabla No. 1

Número de viajes en los diferentes modos de transporte proyectados al 2014

Motorizado	Transporte Público[4]	2.800.000	61,3%
	Transporte Privado[5]	1.050.000	23,0%
No Motorizados	Peatonal	700.000	15,3%
	Bicicleta	15.000	0,3%
		4.565.000	100,0%

Elaboración Propia. Fuente: Estudio de movilidad - proyecto Metro de Quito - 2011

Figure 6.5. Number of daily trips in Quito 2014 by mode of transport: motorised (public and private) and non-motorised (by walk and bicycle) (DMQ, 2017).

Nonetheless, the master plan acknowledges non-motorised transport as a valid approach to reducing traffic congestion and for its indirect effects on economic, public health, and environmental concerns. Moreover, based on the master plan, article 5 of municipal ordinance 0194 of 2017 (DMQ, 2017) established hierarchies for the use of public space for mobility purposes in the following order, as shown in Figure 6.6: 1) pedestrians, in particular those with reduced mobility, 2) cyclists, 3) users of public transport, 4) cargo carriers, and 5) users of private and commercial transport.

Pay attention to this pyramid and know better

Pedestrians and cyclists are the most vulnerable actors on the road. Let's respect transit signs for a better coexistence between us all.

Pedestrians
Cyclists
Public transport commuters
Cargo transport carriers
Private vehicles

Figure 6.6. Social media campaign for inclusive mobility (Twitter @AMTQuito, 2018).

On the other hand, local political leaders and prominent employers have joined efforts spontaneously to push the environmental significance of non-motorised means of transport. This has encouraged the use of bicycles for utilitarian purposes for many when commuting to work.

> "Government employees went to work yesterday by bike… employees of the Municipality, Ministry of Environment, National Secretariat of Planning, and Ministry of Patrimony gathered in different parts of the city to go to their offices by bicycle…the Minister of Environment – Marcela Aguiñaga – led the journey… the city mayor Barrera and some members of the city council also participated in the journey… the short term goal is to cut 2000 short car trips daily, which would save 333 gallons of fuel and 715 kg of carbon dioxide…" (El Telégrafo, 2012).

In terms of intervention approaches linked to the master plan for mobility 2009-2025, there is the implementation of pedestrian networks, which takes into account aspects of security and handicapped access. Most of these networks, nonetheless, are intended to promote tourism and a specific set of attractions, which constrains relevant infrastructure plans to the historic centre, while walking and cycling remain in the dimension of pleasure rather than that of utilitarian means of mobility. Also, the municipality has introduced a public bicycle service – *biciQuito* – that consists of 425 bicycles that circulate in a network of 25 stations in the HC.

> "… The president of the association of pedestrians explained that roundabouts are the most vulnerable points for pedestrians in the city because they make it difficult to cross streets. Also, zebra crossings at intersections are problematic because right-turns are designed for cars to not stop… so, to promote the use of zebra crossings, the design of a new practice of mobility is first needed …" (Romero, 2018b).

Thus, it is evident that the plan relevant to non-motorised means of transport overlooks informal settlements. Moreover, the association of pedestrians – *Asociación de Peatones de Quito*, APQ – criticises that the scale of interventions as insufficient to impact utilitarian walking and cycling significantly in Quito. This does not only concern scope to reach all spaces of the city, but also to promoting culture and practices of sustainable mobility. APQ is a 15-year-old organisation, the first in Latin America, which looks after the rights of pedestrians.

6.3. Mobility in informal settlements of Quito

> "…. I wish there were a slide that took us down the hill to main road in seconds. I really think it would be more effective, inexpensive and fun than riding the bus or cable cars down to the city…" (Resident of informal settlement *La Pulida*, personal interview, 17th December 2017).

This section begins by discussing the theoretical perspective used to study mobility in the informal settlements of Quito. Typically, mobility in informal settlements has been addressed as an issue of transport-related social exclusion (Cass, Shove, & Urry, 2005; Preston & Rajé, 2007). However, since Quito features bus lines that serve many informal settlements, as well as an increasing number of private vehicles that provide informal transport, transport-related social exclusion is perhaps an incomplete framework to address mobility in this context. Instead, the concept of mobility presented by Uteng (2009, p. 1056) seems better suited to frame the coming arguments: "…mobility entails… …possessing an inherent knowledge of the potential trips that are or were not made due to constraining factor(s) (social, cultural, technological, infrastructural, political, and financial)".

Take for instance the ever-growing vehicular traffic between informal settlements, as described in the example of 6.2 about *Rumihurco* Avenue on the way to *La Roldós*. Congestion weakens the ability of dwellers to access the city in opportune fashion, while also wearing out the improvised roadways. Since informal settlement dwellers often navigate between restrictions of time and budget, for many,

mobility actually relies on knowledge and the ability to arrange a portfolio of varying modes, suppliers and routes to reach everyday destinations. Thus, frameworks should be selected with this in mind.

> "… If it rains heavily it is better not to walk on the footpath (*chaquiñan*)… if it is too late at night, or at dawn, it is risky because of miscreants…" (Resident of informal settlement *Ciudadela del Ejército*, personal interview, 17th December 2017).

In addition, the proportion of dwellers that commute between informal settlements and the city every day is also a variable that supports the practicality of Uteng's (2009) perspective. Contrary to what Salon and Gulyani (2010) found in informal settlements in Nairobi, commuting away from home is actually an everyday practice in the informal settlements of Quito. This is true at least for school-aged and working adults (not so much for the elderly people though). A community leader in *La Roldós* estimates that half of their population travels to the city every day. This is observable in the spatial and temporal distribution of people concentrating in informal settlements. Usually, during regular working hours, informal settlements seem nearly deserted. Conversely, very early in the morning (between dawn and 7am) and towards the end of the afternoon and the first hours in the evening (between 6 and 8pm), informal settlements look crowded. Demoraes (2015) surveyed the reasons for travelling between peripheral neighbourhoods and central Quito in 1998 as shown in Figure 6.7. Going to work, doing paperwork, and going to school together accounted for 70% of all trips those days. Unfortunately, no up-to-date figures are available on this matter.

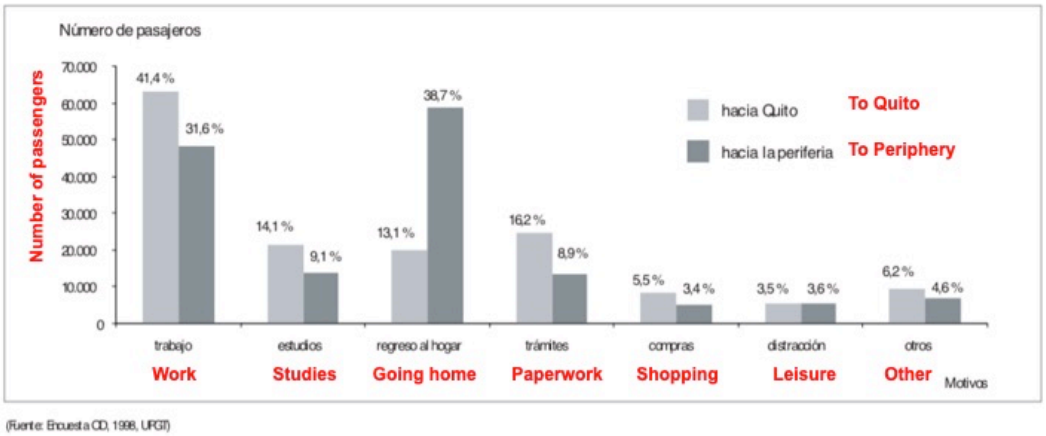


Figure 6.7. Survey of motives for travelling between the periphery and the city (Demoraes, 2015).

Furthermore, the continuous production of gated communities, both formal and informal, inserts informal settlements into an on-going dynamic of isolation and diversion of everyday practices of commuting. This provides additional support to the perspective that relies on knowledge rather than transport infrastructure for everyday mobility.

Therefore, in overcoming constraining factors (Uteng, 2009), informal settlements dwellers put together knowledge, abilities, and resources in incremental steps. This practice of continuous development remains until dwellers achieve more consistent and reliable mechanisms for connecting with larger transport infrastructures (Mitullah & Opiyo, 2017). This incremental assembling of commuting practices for informal settlements dwellers allows the observation of three concerns: first, the continuum nature of informality, since at some point, consistent practices of informal commuting integrate with the wider mobility infrastructure of the city; second, the knots that hold dwellers at relative disadvantage in accessing the spaces of opportunity in the HC; and third, which is the main focus of the present research, the roles that neighbouring green landscapes play in shaping alternative and supplementary practices of commuting.

6.3.1. Production of footpaths as IGIs for mobility

Informal settlements in Quito present at least two challenges to integration in the city's road network in a way that enhances mobility for residents: 1) a high and growing housing density, which contributes to inhabitants' continuous isolation; and 2) the inhospitable characteristics of landscapes that host informal settlements, as referred to in Chapter 4. Both challenges combined make it more difficult, costly and polluting to provide informal settlements with conventional urban mobility infrastructure.

> "…There was a plan to extend the *Machala* road and build a new road down to the city for the benefit of settlements neighbouring *La Roldós*. But when the building equipment started opening the road, they realised that the soil was not compacted enough and stopped working immediately. Our only hopes now are on the cable cars…" (Bus driver of line that connects *La Roldós* to the trolley station, personal interview, 16th January 2017).

This translates into making it more problematic for those living in such a context to travel to school, work, healthcare or leisure. So, in coping with these limitations, mobility in informal settlements not only involves "frequent use of more than one mode of transport" (Richards, O'Leary, & Mutsonziwa, 2007, p. 380), but also walks through footpaths and improvised precarious bridges, which are in general perceived as unsafe. Locals often refer to footpaths as *chaquiñanes*. Thus, communities in a constant process of densification and subsequent isolation produce these walkable trails on neighbouring green landscapes to secure access to spaces of opportunity in Quito. The role that these footpaths play in the mobility of informal settlement dwellers has been overlooked in mobility policies and wider debates historically.

> "In my home, from Monday to Friday, my wife wakes up at 4:30am. She then prepares breakfast and the uniforms for the children to go to school. Children wake up at 5:45am. They have to be at school at 7am. My wife is self-employed. She is a seamstress working from home. We have the workshop at home. However, dressmakers and tailors often subcontract her, so she would usually go to their workshops to take orders and deliver her work. Most workshops are in the city centre, which is not close to home at all. My children's school is about 15 blocks away from home and my wife would normally take them back and forth by walking. To reach these destinations, unavoidably, they walk through a footpath and cross the bridge over ravine *Calicanto*. On top of that, my wife walks to the trolleybus station, or takes a bus to the station when it rains. In my neighbourhood, at least for households with children, people start their day between 4 and 5am…" (Resident of informal settlement *Ciudadela del Ejército*, personal interview, 13th January 2018).

Moreover, the expansion course of the city, in terms of housing and urban infrastructure allocation, continuously fuels both the interruption or disappearance of old *chaquiñanes* and the production of new ones. Normally, these are established on uninhabited slopes and ravines, where attempting to build houses is by far more challenging.

> "… In the old days, it was feasible to reach the city through the *chaquiñanes* in roughly half an hour. But then wealthy neighbourhood *El Condado* occupied the lower part of the slope and the *chaquiñanes* were interrupted. From then, it was never easy to reach the city through the ravine again. Not only *El Condado*, but also the military fenced part of the forest, and we heard that they keep explosives buried there…" (Resident of *La Roldós*, personal interview, 19th December 2016).

In addition, the development and expansion of urban infrastructure has encouraged significantly the spontaneous production of new *chaquiñanes.* For instance, for dwellers of informal settlement *Bolaños,* near to tunnel *Guayasamin*, which has been in operation since 2005 and through which circulate about 32 thousand vehicles every day, it would take a 30-minute walk through a *chaquiñan* on a dry day to reach a city pavement. Although the tunnel connects the HC with high-end residential communities in the valleys of eastern Quito and one of the main roads to the airport, it generated a barrier to mobility for residents of *Bolaños* and stimulated the emergence of a footpath.

6.3.2. History of footpaths in informal settlements: The chaquiñan

Chaquiñán is a term borrowed from the indigenous language *Kichwa*, which means walkways (Montero, 2002). *Chaquiñanes* – Spanish adaptation of the plural for *chaquiñán* – are sinuous trails with surfaces of stones and flattened grass shaped by the continuous walking of neighbouring inhabitants, which build up a road network that connect communities in the Andean mountains.

The term *chaquiñan* has been used since the Prehispanic – Inca – period (between 1438 and 1533), to refer to the walkways used by monarchs, authorities, and traders to transit through communities of the Empire of *Tahuantinsuyo*[23]. The main pathway (Inca pathway, also referred as Royal pathway) extended throughout current territories of Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina as shown in Figure 6.8. Stones covered the surface of the Inca pathway, whose width fluctuated between 4 and 6 metres on average. Thus, walking on *chaquiñanes* and crossing ravines have been an everyday practice for inhabitants of the surrounding landscape of Quito since before colonial times.

> "… During the colonial domination, ravines were stigmatised and relegated from the political, cultural and economic dynamics of Quito. The Spanish colony developed the bureaucratic centres of the city on the plains. Meanwhile, the system of ravines was functional to protect the city from attacks, as these make the city difficult to access. So, indigenes, and in general all those who were not close to the colonial administration were displaced and relegated systematically to occupy those spaces. Thus, the

[23] *Tahuantinsuyo* was the largest and most ancient empire on the American continent. Its imperial seat was the city of Cusco. It dated from 1200 AD. It occupied nearly 3,000,000 km², with over 5000 km (3107 miles) of Pacific ocean coastline, representing double the present Peruvian territory (Rostworowski, 2015).

link ravines – marginalisation is not new…" (Local academic, personal interview, 16th January 2018).

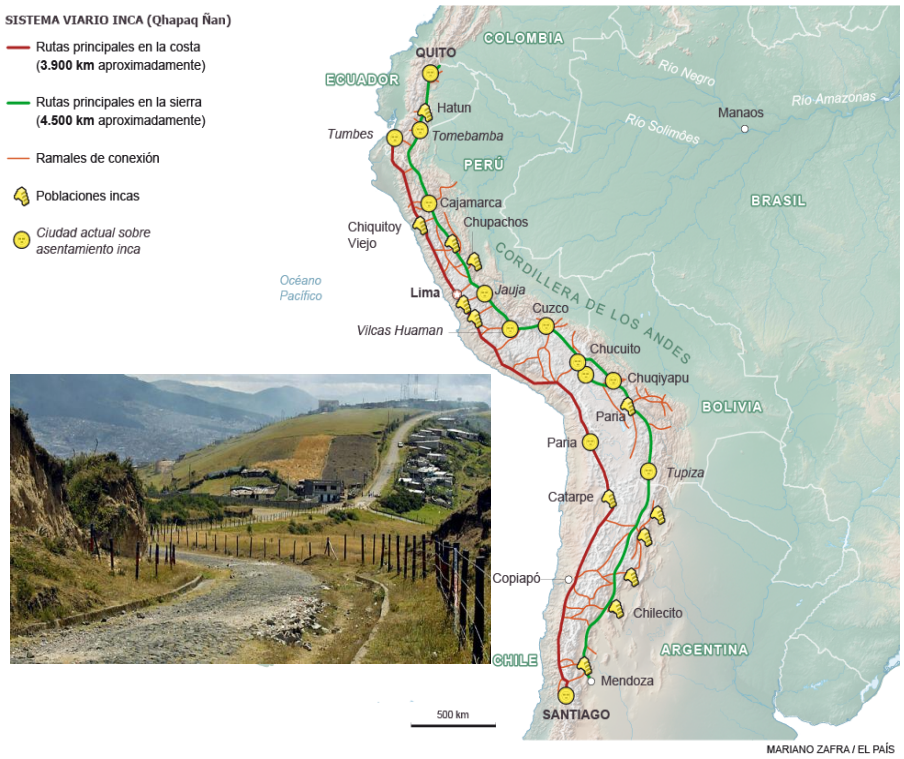


Figure 6.8. Vestiges of the Inca pathway in *La Forestal*, Southeast Quito (El Comercio, 2014), and map of the Inca pathway. 3900 km on the coast side and 4500 km on the Andes (Zafra, 2014).

During the Hispanic occupation, the territory that surrounded Quito was organised in *haciendas* – large landed estates for plantations, mines and factories owned by the colonial government. *Chaquiñanes* facilitated trading and moving cargo between *haciendas* and to the city. Nonetheless, the trails were known almost exclusively by natives/indigenous peoples who had historically inhabited these territories (Kingman-Garcés, 2006). Even during the rapid expansion of informal settlements in the last four decades, the *chaquiñanes* network continued to be known mainly by indigenes and marginalised communities. Local journalist Herrera-Aráuz (2001) quoted a radio interview with indigenous leaders during their march from rural territories into Quito, which ended up in massive revolts that forced former president Jamil Mahuad to resign in January 2000. The interview emphasised that *chaquiñanes* were domain of the indigenous:

> "…We, the indigenous people, know how to reach Quito through the same trails and *chaquiñanes* through which we have walked for centuries and that are unknown by the government and its bureaucrats. They have never walked through them. For us, however, these are the everyday walkways. It is through them that we have gathered and arrived in Quito. You will see, the only thing I can be sure of is that this government leaves this week…" (p. 44).

6.3.3. Limitations of footpaths

Bearing in mind the notions of constraints and constraining factors (Uteng, 2009), the slopes and ravines of the green landscape neighbouring informal settlements become platforms for infrastructures that act as materiality of movement. Nonetheless, while mobility often relies on walking or on other non-motorised means, there are forces that alternately enable and restrain these modes.

> "…Nowadays neighbours of *La Roldós*, *Plan Techo*, and *Pisulí* circulate between settlements through these footpaths, not too often though because sometimes its slippery and the stream makes it more challenging. If there is a flood, for instance, a new pathway would emerge… …besides, it is useable only under daylight conditions. I wouldn't walk around the ravine at night time…" (Resident of *La Roldós*, personal interview, 19th December 2016).

Hence, far from romanticising footpaths, the practices they support are submerged in continuous threats that not only relate to landslides, flooding, and forest fires. Walking through footpaths in informal settlements often also causes anxiety associated with potential injuries, as well as the possibility of being assaulted. This is in particular true for women, many of whom even fear being sexually attacked.

> "…This ravine (*La Roldós*) is infamously known as "*la carnicería*" (the butcher). Walking around this area was a risky move. Until recently it was common to find dismantled cars and dead bodies every day. Happily, the municipality and the police installed both public light poles and cameras…" (Community leader in *La Roldós*, personal interview, 19th December 2017).

This reveals two aspects of footpaths: first, that the mobility practices in informal settlements present imbalanced vulnerabilities in terms of age, gender, and physical capabilities; and second, that the related infrastructure is submerged in a somewhat anarchical governance mode.

> "…Even today, where my grandparents live, there is no way for cars to access there. It is a scary journey to go visit them. Their house is located on the top of a little mountain, like a hill, and going there inescapably involves crossing a *chaquiñan* and a ravine …" (Resident of neighbourhood *Puertas del Norte* in the north-east of Quito, personal interview, 1st December 2016).

The statement of a resident of *Ciudadela del Ejército* further elaborates on the notion of "scary journey":

> "…The trolleybus starts running with normal frequency at 4:30am, and the buses in my neighbourhood operate from 5am. For people that work in the city very early in the morning, they could walk to the trolley station but not through *chaquiñanes* and ravine. Between 11pm and before 4:30am, the trolley runs once every hour. The *chaquiñanes* and ravine way is not an option because it is dangerous. The risk of being assaulted is high at night, or to fall onto the ravine, because it is dark. No normal person would walk through a ravine late into the night..." (Resident of *Ciudadela del Ejército*, personal interview, 3rd December 2016).

Moreover, the fear involving walking on footpaths is more evident when these are located in polluted ravines:

> "…Crossing the *chaquiñan* involves dodging rubbish and rocks, absorbing the bad odours coming from the ravine, and being extremely cautious while walking. If drunk it is better not to walk on the *chaquiñan*…" (El Telégrafo, 2016).

In addition, rains pose substantial mobility challenges to informal settlement dwellers who depend on footpaths to reach their everyday destinations. Not only is commuting time unpredictably increased, but also, walking on slippery slopes carries an inherent danger of falling on to the ground or ravines at high speeds. Particularly vulnerable are children who attend schools, as they commute with the constraint of arriving on time to class. Cases of accidents and rescues in ravines are frequent in the local press:

> "A 17-year-old male was rescued from a fall on a 15 metre deep ravine in *Llano Chico*" (Alarcón, 2017a).

Even in ravines that have been already intervened in for rehabilitation, such as the case of *Pasocucho* in *Quitumbe*, injures are likely to happen:

> "Young female was rescued from slipping 20 metres down a ravine" (Alarcón, 2017b).

Furthermore, knowing the routes and the network of pathways is essential when walking through footpaths on slopes and ravines. When the route is unknown, and vegetation is abundant, there is always the threat of getting lost in the forest.

> "…Neighbours of *Plan Techo*, *Pisulí*, *Tiwintza*, and *La Roldós* circulate between neighbourhoods through the *chaquiñanes* and the ravine. Knowing the trails is vital, as these trails are normally solitary and the height of vegetation could blind walkers at some points…" (Community leader *La Roldós*, personal interview, 19th December 2017).

The following is a description of walking on a footpath from an informal settlement to the city that a researcher of ravines in Quito posted on Lab Quebradas (2014):

> "…We arrived at the limit of the ravine of *Atucucho*, which divides neighbourhoods *La Pulida, Atucucho,* and *San Carlos*. There, we began our walk downhill through the *chaquiñanes*. This segment of the ravine features abundant vegetation. The walk turned suddenly into a pleasant experience in the middle of endless eucalyptus forest, on which *Luis* (resident of informal settlement *Atucucho*) guided our walk through old hidden *chaquiñanes*. After about 25 minutes walking down the hill we started to hear the noise of the city, car horns, emergency sirens, and a coo that did not exist 300 meters back uphill. Before we entered the formally urbanised Quito, we noticed some rudimentary infrastructure for capturing water and a big containment wall that provides some protection when landslides occur…"

In sum, although footpaths cause walkers anxieties and fears, they support the ability of informal settlement dwellers to access their destinations every day.

6.3.4. Ecological restoration and mobility: Ravines rehabilitation programme

"Built Environment Correlates of Walking" (Saelens & Handy, 2008).

This section provides evidence of the link between ecological restoration and mobility. In general, ravines remain the least conquered vegetation-covered spaces in informal settlements. This is because exploiting ravines often involves dealing with harmful pollutants accrued during the course of urban growth. Aware about the environmental effects of the continuous deterioration of ravines, the municipality of Quito declared the system of ravines as a natural, historic, cultural and landscaping

patrimony in 2012. This entailed that integral rehabilitation and maintenance of ravines became a priority. The municipality's discourse suggested that the purpose for this was twofold: 1) prevent environmental risks to the city, and 2) provide recreational amenities for the peripheral communities (DMQ, 2012).

According to a planning official of the municipality, the approaches to ravine intervention developed from inputs and demands of the neighbouring communities. Thus, elements of the socio-spatial context are supposed to be central in the intervention design. However, it seems that the rehabilitation of ravines, far from integrating informal settlements' shortages as discussed in Chapter 4, is framed mainly around the hydrology-related risks of Quito, such as floods and landslides. In addition, the intended – undisclosed – role of informal settlers in both the rehabilitation and post-rehabilitation stages seems to be that of custodians of the ravines. Yet, although the assistance to informal settlement dwellers is not clear in the ravine rehabilitation aims, the course of ecological restoration has fuelled the configuration of IGIs which serve to enhance their everyday mobility.

> "…The rehabilitation programme seeks to protect, preserve, and regenerate the environmental functions of ravines, as well as promote citizen engagement in conservation initiatives. One of the first challenges is to empower the communities, often by endorsing symbolic ownership of the ravines. In the ravine *Habas Corral*, for instance, you will find the *Angeles de la Quebrada* (Ravine Angels), which involves about 20 families of neighbourhoods *La Pulida* and *Ana María.* They are very active in looking after the ravine…" (Ravines rehabilitation contractor, personal interview, 11th January 2017).

The intervention approach involves three broad steps: 1) environmental restoration, which comprises performing technical analyses, clean-up of ravines, planting native species, and fencing the spaces that are crucial for maintaining somewhat healthy hydrological processes. 2) Concientisation of neighbours, which seeks to endorse a sense of belonging for the ravines. Relevant action involves environmental education, training for community clean-ups, and implementing mechanisms of territorial supervision. 3) Establishing a governance system. This involves assembling a permanent commission that will act as liaison between the community and municipal authorities aimed at assuring the proper functioning and preservation of ravines (DMQ, 2016). In the designing of the intervention approaches so far, neither neighbours nor those that lead the intervention design have yet addressed the potential benefits of ravines to enhance mobility.

6.3.4.1. Ecological functionality and mobility

The ravine rehabilitation programme allows observing alterations in the everyday uses of the green landscape neighbouring informal settlements across stages of intervention. In terms of mobility, observations in four ravines provided evidence that their degrees of intervention, and thus, ecological functionality, define the magnitude and intensity in usage of footpaths. The ravines were explored in the informal settlements of *Quitumbe* and *Ciudadela del Ejército* in the south, and *La Pulida* and *La Roldós* in the north-west. The ravine in *Quitumbe* was rehabilitated years before the municipal intervention programme. *Ciudadela del Ejército* has performed incremental improvements to the ravine for years. *La Pulida* was in a process of intervention at the time of the fieldwork, and *La Roldós* has not been yet subject to intervention. See Figure 6.9 to gain a flavour of the differences between rehabilitated and unattended ravines.

Figure 6.9. Footpaths on ravines in *La Roldós* at the top (unattended) and *Quitumbe* at the bottom (rehabilitated) (author's photos).

The unattended ravine in *La Roldós* (images above) is less likely to attract pedestrians, and in general users of any kind. Sporadically, and often before the sunset, neighbours crossing a ravine and walking on the adjacent footpaths can be observed. Conversely, in the case of the ravine in *Quitumbe*, neighbours often visit the areas equipped for recreation before sunset. Visitors are mostly teens, students of nearby schools, parents with children and young couples. However, it is far more common through the day to find lone walkers on the spontaneously shaped footpaths. Peak hours are between 7 and 8am, and between 5:30 and 6:30pm, during which about 500 walkers in both directions pass through. This suggests that the footpaths are used intensely as a shortcut to somewhere. Similarly, hundreds of dwellers rely on the

bridges and footpaths of the ravines in *Ciudadela del Ejército* every day. Likewise, the everyday dynamics of *La Pulida* and *Ana María* depend heavily on the system of stairs, footpaths and the bridge.

6.4. Transformation of footpaths: IGIs "added onto bit by bit" (Simone, 2008, p. 28)

This section identifies footpaths' drivers of change and presents evidence of the course of their alteration. Although precarious, footpaths in informal settlements have followed an incremental pattern, in both extension and functionality. In line with Mitullah and Opiyo (2017), this type of mobility infrastructure in Quito connects to other mobility infrastructures. The ability of footpaths to connect to bus stops, trolleybus stations, paved pavements, bridges, and main roads inserts them into the city's mobility networks. This is how footpaths shaped informally integrate into the wider mobility infrastructure of the city as shown in Figure 6.10. The ability to integrate into the mobility network is in part what shapes footpaths' incremental trajectory.

> *"…Chaquiñanes* are of great assistance because people save time and money. Nonetheless, *chaquiñanes* are not always appealing for a walk, particularly when it rains, because falling into the ravine would most likely kill a person. In my neighbourhood (*Ciudadela del Ejército, south of Quito*) we have two bus lines. These buses go to the city centre, but the trips take ages. During rush hours, a bus ride to the HC may take more than two hours. Buses also pass by the trolleybus stations *Quitumbe* and *El Recreo*. From these two stations, it is possible to reach any part of the city, but then, if reaching the stations by bus, a person would end up paying two fares for the trip: one for the bus and another one for the trolley ride. By walking on the *chaquiñanes,* it is possible to both reach the *Quitumbe* trolley station faster and save 0.25 USD…" (Resident of *Ciudadela del Ejército*, personal interview, 17th December 2017).

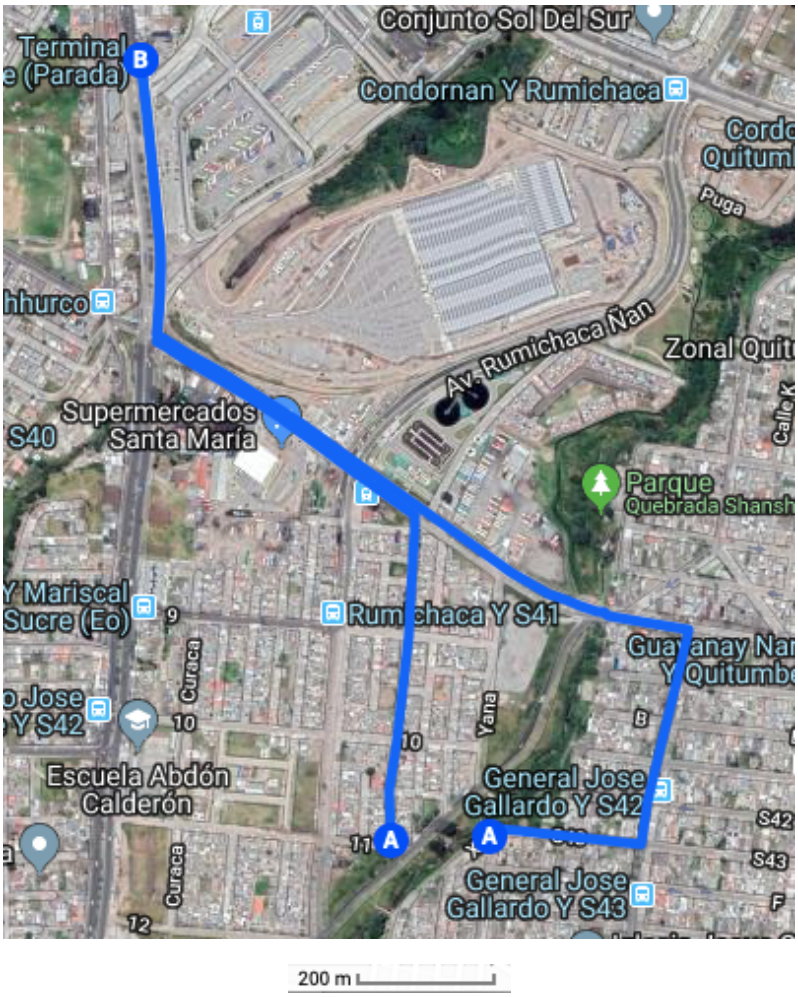


Figure 6.10. Walking route from *Ciudadela del Ejército* (A) to trolleybus station *Quitumbe* (B). Note that one route implies crossing ravine and the other walking around the neighbourhood (adapted from Google Maps).

For communities neighbouring higher and wider segments of ravines, building on old *chaquiñanes* to enhance their mobility remains problematic. As a result, these informal settlements tend to be more distant – difficult to access – and isolated. Contrariwise, communities settled near narrower segments of ravines tend to be more accessible. These are often inserted in dynamics of incremental improvements, embodied for instance in steps and bridges that extend the scope and functionality of footpaths.

The ravine *Calicanto,* which splits neighbourhoods *Ciudadela del Ejército* and *La Ecuatoriana,* provides some evidence of the incremental trajectory of mobility infrastructure. As a result of a *minga* about 10 years ago, the community improvised a bridge with three felled tree trunks to cross a segment of the ravine. The bridge had an elevation of about 20 metres over the stream and was roughly 12 metres in length. In another segment of the ravine, about 30 metres further south, a cement bridge with

metallic handrail was years later implemented, likewise from efforts of the community.

> "…It usually takes less than 20 minutes to reach the closest trolleybus station on a dry day. This involves walking through the *chaquiñanes* and the bridge that crosses the ravine and connects neighbourhoods *Ciudadela del Ejército* with *La Ecuatoriana*. If not crossing the ravine, however, the walking would imply walking around the neighbourhood or taking the bus, although it would take respectively 30 and 45 minutes to reach the trolleybus station. So, there is a time saving of 10 and 25 minutes when using the *chaquiñan* and the bridge that crosses the ravine, and the 0.25 USD of the bus fare…" (Community leader in *Ciudadela del Ejército*, personal interview, 10th January 2017).

In addition, the community assembled a linear park along the ravine – *Calicanto* Park – which makes reaching the bridge and everyday destinations on foot somewhat safer. Finally, attempting disaster mitigation, which most often involves landslides, the municipality intervened on the bridge in 2016 by reinforcing the structure with containment walls on both sides of the ravine. The bridge allows mobility for hundreds of dwellers every day who travel to schools, to the trolleybus stations, and to main road *Av Mariscal Sucre* to take the buses to the city. Figure 6.11 shows the two bridges mentioned earlier that cross ravine *Calicanto*.

Figure 6.11. On the left, an improvised bridge between *Ciudadela del Ejército* and *Ciudadela Ibarra* (Últimas Noticias, 2013). On the right, a bridge (built years later) 30 metres away from the first to cross ravine *Calicanto*.

Similarly, ravine *Habas Corral*, which splits neighbourhoods *Ana María* and *La Pulida* in the north-west, provides evidence of the trajectory of incrementalism of IGIs for mobility. This ravine was being intervened in for rehabilitation by the time of the fieldwork. Before the rehabilitation works began, this space was a landfill and

informal settlements developed over both sides of the landfill, where residents were mainly recyclers. The ravine is now clean and transforming gradually into a garden on which neighbours routinely walk. Now it is feasible for neighbours of *La Pulida*, *Ana María*, and other nearby settlements that abut *Cochapamba Alto*, which accounts for approximately 16 thousand inhabitants, to reach by foot the health centre *La Pulida*, the farmers market, and schools for the children. Moreover, the community had long ago implemented a system of steps and a rudimentary bridge that connects both sides of the ravine, as shown in Figure 6.12. The rehabilitation project also involves enhancing these infrastructures, so it is safer now to cross the ravine. This mobility infrastructure, which comprises a system of footpaths, steps, and the bridge, is crucial for dozens of nearby residents every hour to reach their everyday destination.

Former improvised ladder

New steps

Bridge that connect neighbourhoods *La Pulida* and *Ana María*

Chaquiñan alongside ravine in *La Pulida*

Figure 6.12. Mobility infrastructure in *La Pulida*: Footpaths, ladders and a bridge (author's photos).

Improvements in the walkability over slopes and ravines deliver immeasurable benefits to informal settlement dwellers. For instance, after intervening in the ravine *Habas Corral*, walking from *La Pulida* to neighbouring settlement *Ana María* takes less than 10 minutes, and implies first walking downhill through a rudimentary dusty path of roughly 50 meters, then taking about 120 steps down. Approximately 20 meters ahead is the bridge of about 25 metres long, and 50 metres further along a dusty road is a door to enter the lower part of neighbourhood *Ana María*. Also, a *chaquiñan* alongside the ravine connects neighbouring settlements by foot. Moreover, it is feasible to reach main road *Occidental Avenue* in roughly 25 minutes. The experience differs widely depending on if it is a rainy or dry day. On a rainy day, the

steps and bridge become slippery, and footpaths muddy, whereby the risk of falling into the ravine increases sharply.

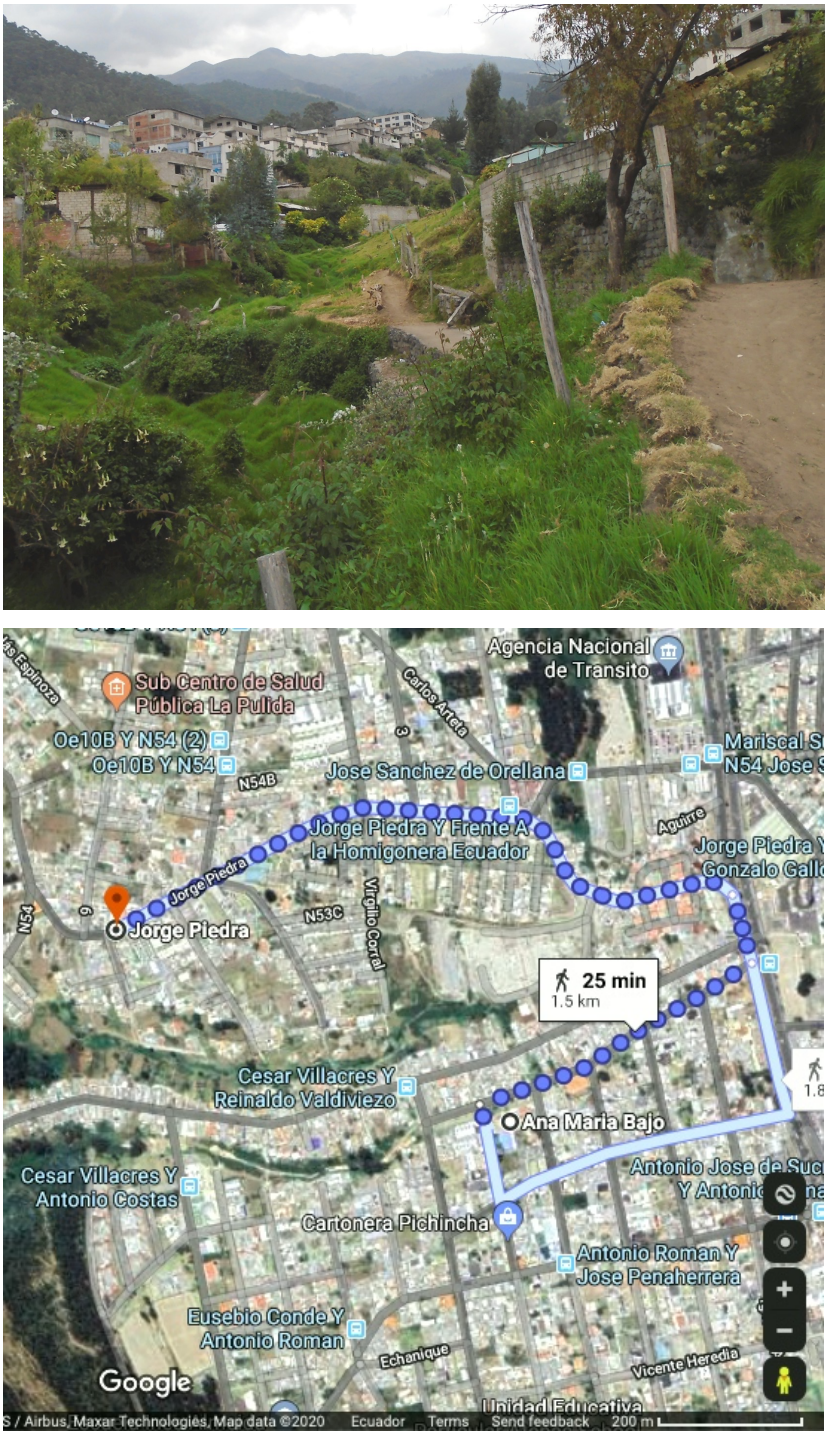


Figure 6.13. Walk between settlements *La Pulida* and *Ana María* if not using footpath and bridge on ravine *Habas Corral* (author's photo and adapted from Google).

The course of progress in functionality of spontaneous footpaths, passing from *chaquiñan* in still unattended ravines to convenient pedestrian shortcuts in fully

rehabilitated ones, constitutes a trajectory of incrementalism as defined in Simone (2008). For the cases observed, although the ravine rehabilitation effort did not seek to address issues of mobility, informal settlement dwellers incorporated ravines in their practices of mobility by configuring footpaths and assembling complementary infrastructure. Further, not only do the morphological alterations of the green landscape with footpaths represent the incremental trajectory, but also, reflecting on Uteng (2009), other constraining factors were overcome as well. This includes social, cultural, and financial constraints, which allow for a more fluent mobility in informal settlements. For instance, in terms of social constraints, police officers indicated that violence in the public space of *Quitumbe* reduced considerably when the ravine was restored. Furthermore, reduced distress encouraged neighbours to increase use of ravines as pedestrian shortcuts, which often replace bus rides in parts of their everyday commutes.

6.4.1. Footpaths vanishing: The counterproduction of mobility

The occupation and pollution of slopes and ravines are responsible for the disappearance of countless footpaths, which translates into progressive isolation of informal settlements that rely on them for their everyday mobility. This happens by extending travel time and distance to everyday destinations. Occupation often occurs in the form of gated communities, as suggested in Figure 6.14, urban infrastructure allocation, creation of new informal settlements, and privatisation of public space. Pollution, on the other hand, is the outcome of using ravines to dispose of wastewater and solid waste.

> "… Unfortunately, *El Condado* and other gated communities located on the lower part of the slope interrupted and discontinued the *chaquiñanes,* limiting thus the capability to walk any further…" (Community leader *La Roldós*, personal interview, 17th January 2017).

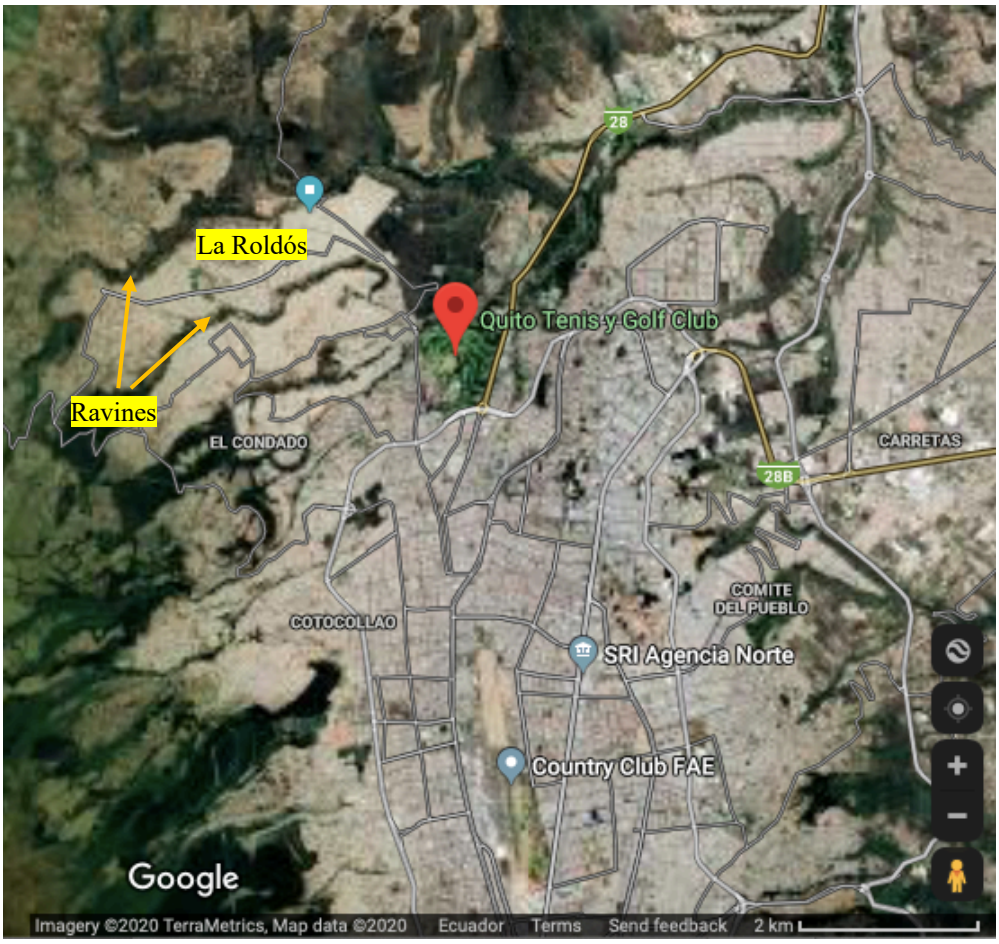


Figure 6.14. Informal settlements in *La Roldós* and neighbouring gated community *El Condado* (adapted from Google Maps).

Therefore, mechanisms of urban expansion in Quito, both formal and informal, play a role in the progress of disconnection and isolation of informal settlements, which is referred to here as counterproduction of mobility. To further provide evidence of this argument, I present the aims of leaders and residents in *La Roldós* to allocate land for a cemetery on the slopes adjacent to a ravine and argue about the mobility implications that such a project would have. This example shows how privatisation of public space makes footpaths vanish and subsequently impacts the mobility capabilities of neighbouring households. Similarly, this example is relevant in that this thesis is concerned with the types of GI that urban informality produces, which transform both the landscape and everyday mobility practices simultaneously.

6.4.1.1. Cemetery La Roldós

This case provides evidence of how occupation processes linked to informality restrict mobility. The case involves actors of the municipality, in which clientelist

practices are also unveiled. For the last five years, members of the housing cooperative *La Roldós* have been demanding permission from the municipality to put in place an ecological cemetery. By ecological cemetery they mean that the graves will stand below ground level, covered with a cement lid, and on top of them, a local species tree would be planted. If implemented, this would be a novel type of green infrastructure linked to informality. The cemetery would occupy a ravine flank and part of the protected forest. The intended site of occupation is located two kilometres away from *La Roldós*, on the way to rural town *Nono* on one flank of volcano Pichincha. Leaders of *La Roldós* look at the ravine rehabilitation programme as an opportunity to establish the cemetery, because, according to their claims, the cemetery would protect the ravine from further occupation. In terms of scale, they expect to develop a first stage of 4 thousand graves.

> "…This is an opportunity to plant native species, because the eucalyptus is not from this territory. Thus, in the first stage, the forest would need to be cleaned up (meaning, trees would be cut)" (Leader in *La Roldós*, personal interview, 19th December 2017).

Also, regarding the link to the ravine rehabilitation programme, another community leader mentioned:

> "…What we expect from the rehabilitation programme is the allocation of a greenspace with playgrounds for children on one fringe of the ravine, in the form of a linear park. This should be connected to walkways to the inner parts of the ravine, which would allow for contemplating nature. On the other fringe, we are negotiating with the municipality the approval to allocate an ecological cemetery. This is conceived as a large-scale project intended for the settlements of the north-west of Quito…" (Community leader of *La Roldós*, personal interview, 13th January 2017).

The eucalyptus tree smell is dominant in this landscape, where vegetation and temperature differ (colder) greatly from two kilometres downhill. The space features several footpaths in different directions. At about 10am on a weekday these footpaths look deserted. There was only one pedestrian in a 30-minute period. One of the solitary footpaths connects settlements *Plan Techo* with *La Roldós* in about 10 minutes, and avoids the two-kilometre road (way to *Nono*) that one would take if avoiding the footpath. The community leader explained that the cemetery will be fenced, and that at the entrance, by the road limit, there will be a chapel. With the cemetery fenced, the functionality of footpaths will vanish.

Because of the local practice of honouring death, a cemetery is an evident need for the densely populated communities in the north-west of Quito, especially because they are burying their dead in the cemeteries of *El Condado* and *El Batán*, both approximately 7 kilometres away. However, the idea of further occupying the protection forest lacks legal grounds. Moreover, since ravines and the protection forest are ecological reserves, whereby these are technically publicly owned spaces, the allocation of a cemetery would produce a situation of privatisation of public space, which would have further implications for the mobility of residents. Yet, it is likely that the income potential of the cemetery combined with electoral calculations of the municipal ruling party might challenge the legal constraints linked to ecological preservation aims. In this regard, an employee from the municipality mentioned:

> "…Since the electorate of *La Roldós* has proven loyal to President Correa (2007 – 2017), the municipality (headed by an opposition party) is offering what it takes to capture their votes in the coming presidential elections… besides, we all know that a private cemetery means business, so we really don't know what economic interests may be around this reasonable demand of the community…" (Municipal employee, personal interview, 12th November 2016).

6.5. Conclusion

This chapter has shown how informal settlement dwellers in Quito transform their neighbouring slopes and ravines into platforms that enable mobility to their everyday destinations. This transformation takes the form of pervious footpaths and supplementary assemblages over the landscapes, which gain meaning gradually as they facilitate connections to destinations in shorter times, less expensively, and (often) more safely than the available alternatives. These arrangements are IGIs for mobility. These IGIs are continuously changing, either by incremental steps as suggested in 2.5.3, or by vanishing. Incrementalism is evident in the implementation of linking steps and bridges, the improvement of access by producing public spaces adjacent to ravines, and the illumination of surrounding roads. However, the permanence of these IGIs is also fragile and vulnerable to the course of urbanisation, densification, and expansion of privatised spaces, which lead them to vanish.

Also, unlike UCAs as explained in Chapter 5, for footpaths, the form of membership-based spaces takes a different dimension, which adds depth to understanding of IGIs. While footpaths are not fenced – informal settlement dwellers have open access to them – membership is instead based on knowledge about the

(changing) routes connecting the locations. Thus, the footpaths investigated are of concern to all residents in the informal settlements they connect. Nevertheless, residents across the locations that footpaths connect perceive their value differently, so the communities perceiving less value are more inclined to use land in a way that hinders the footpaths and leave them irrelevant. The implication of this is that patterns of land use may accentuate inequalities in mobility.

Finally, the (frequent) making and unmaking of footpaths indicates that informal settlement dwellers have little ability to safeguard them. In this regard, footpaths make a suitable case for realising IGIs' vulnerabilities. The next chapter builds upon this argument by presenting pitches in informal settlements as IGIs which users, instead, successfully manage to sustain and enhance.

Chapter 7

Pitches as IGIs: Community empowerment meets spatial change

7.1. Introduction

This chapter shows how the football and *ecuavoley* pitches of informal settlements constitute IGIs that generate, attract, and anchor productive activity. They do so by enhancing their users' ability to pursue professional careers, income opportunities, leisure, and community development. These IGIs often emerge and develop during the land occupation and consolidation processes, but unlike footpaths, they (often) manage to stay in place, look well-kept, and renew themselves by mobilising resources from various stakeholders from both private and public sectors. However, access to pitches is discriminatory on the basis of sex and age, and carries risk factors of interpersonal violence within communities and households. Therefore, benefits of pitches are not fully and proportionately delivered.

Few studies have addressed the spaces and assemblages that support practising football and other popular sports in the informal settlements of Latin America. Also, pitches have been hardly seen in the green infrastructure debate. This is an important omission considering that pitches are consistently prevalent spaces in informal settlements, as I demonstrate in this chapter. Yet, the study of Schwab (2017) in the informal settlements of Medellin gives some hints in this direction. She argues that football fields are successful spaces in informal settlements because they serve both necessary and optional functions beyond playing sports. However, the mechanisms and struggles that put pitches where, and how they stand today remain subtle.

Instead, to a large extent, scholars have addressed football as an approach to articulating actions for new social arrangements. To mention just two examples, Schwartz, Costa, and Fleck (2013) describe how football is used in Brazilian cities as a mechanism to disseminate information throughout *favelas* – informal settlements – intended to mobilise political action. Similarly, Van Gelder, Cravino, and Ostuni (2016) discuss the leading role that football clubs play in creating residents' organisations in informal settlements in Argentina: "these clubs stimulated social contacts and encouraged community participation and organisation (e.g. organising tournaments, building a clubhouse, creating and maintaining the pitch) (p. 1964). Thus, the focus has been by and large on the people that produce football as practice, rather than on pitches as enabling platforms.

A focus on the pitches is crucial to extending our understanding of IGIs, particularly in reference to what makes them look the way they do and what makes them sustainable. Thus, rather than concentrating on the obvious functions of football and *ecuavoley* playing, focusing on the pitches provides a window into multiple domains and practices that sustain them in place, despite all the struggles of living in informal settlements, including attempts at eviction. This is particularly interesting because pitches in informal settlements challenge conventional Western concerns as to how to create and maintain green spaces in cities.

This chapter is organised into three sections: 7.2 provides further evidence that informality produces incremental GI, which is achieved by the continuous reconfiguration of the space with the labour input of dwellers, materials available at hand, and resources mobilised by vote-seeking politicians; 7.3 shows how pitches become infrastructure as they provide the physical means on which to pursue personal goals of inhabitants, and enable them to articulate political action relevant to local development; and 7.4 shows how pitches reproduce inequalities in access to green space, which in turn jeopardise the perception of safety within informal settlements. Finally, a concluding discussion is provided in 7.5.

7.2. Emergence and transformation of pitches in informal settlements

This section examines the current physical and social embodiment of football and *ecuavoley* pitches in informal settlements, and describes their formation course and the maintenance-related practices involved. In the course of this section, a new set of actors, materials, networks, and processes in the city are identified, which adds to those identified in the investigation of UCAs and footpaths in the preceding chapters, and extends our understanding of the elements that fuel the production, reproduction and incrementalism of IGIs.

7.2.1. Pitches as "birthmarks" in informal settlements

This section shows how pitches emerge and are inserted into the everyday practices of informal settlements. Despite the differences in vulnerabilities across the informal settlements of Quito as discussed in 4.5, these spaces also share similar patterns of configuration in several dimensions. One of these shared features is inescapably *la cancha* (the football pitch). Pitches have been often assembled at the very beginning of informal settlements' occupation, by reconfiguring the green landscape and adding materials available at hand. Hence, establishing a pitch seems to

be a constituent practice embedded in the process of informal land occupation in Quito. In the informal settlements, football as an everyday practice begins in the pathways and between plots among dwellers of the community. In turn, football forges friendships, relationships, alliances, and rivalries, which progressively build identity of place and give shape to clubs and competitions.

> "…We made the pitch from the time when we occupied the neighbourhood. Those among us that were more outgoing tried to persuade the *lotizador* – land trafficker – to leave a space for the pitch. So, we achieved a small space in the beginning, but he kept fooling us all the way and instead sold it nearly all. So, among the neighbours we started playing on the space that had the most even surface. Some neighbours ended up giving small pieces of their land for the pitch because the plots were big…" (Community leader of *Guamani*, personal interview, 8th February 2017).

Pitches are green and informal at their birth. These are permeable spaces between impervious surfaces. Pitches are unplanned and self-regulated built spaces that enable users achieve part of their everyday routines. These spaces change and are often enhanced through the labour and material input of their users and extended community. See Figure 7.1 below the contrast between the green of the pitch and its surroundings.

> "…Since we came to inhabit this land, the pitch has been gradually built up through continuous *mingas*…" (Resident of *Guamani*, personal interview, 9th February 2017).

Additionally, pitches are informal infrastructures that follow a trajectory of incrementalism. These are spaces that "embody the capacity of residents to use what they have and what they are doing as a base to further elaborate and diversify urban economies, as well as reflect particular interrelationships with larger scale infrastructures…" (Simone, 2008, pp. 28-29). Pitches transform gradually from sharing temporal space with streets and underexploited spaces. In the beginning, pitches are represented by a mixture of dirt and shrub remnant surfaces with imaginary lines to delimit the playing space, and detachable large rocks or wood sticks representing the goals. Then, new features are progressively added, which ultimately may include pitch grass, fencing, electric power, grandstands, and toilets. Alongside this, the demand for water for irrigation and maintenance become a key

issue, which forges the circumstances for the emergence of local organisations and the creation of income streams.

> "…When I was a child we (family) lived in the neighbourhood *Combatientes del 41* near the *Mena 2*. I enjoyed playing with the grown-ups. That is how I became confident. We used to play football in the streets, the goals were made of wood sticks, and the pitch was drawn with chalk… Then we moved to *Guamaní*, which instead had a real pitch. I remember my parents leaving me here to play every afternoon. But this was a dirt pitch in those days, and there was no grandstand or toilets…" (Football player in *Guamaní*, personal interview, 10th February 2017).

Figure 7.1. Football practice session in league *El Rocio* in *Guamani*. Note the contrast between the fenced green surface of pitch and the surrounding roads (author's photo).

Nowadays, although cautious due to unresolved issues of land tenure and building regulations, both the municipality and the central government are engaging in enhancing pitches across the city, including in informal settlements. For example, some of the pitches that were produced informally in the most populous neighbourhoods in Quito are being transformed into small-scale stadiums, in some cases with synthetic grass. From this, football pitches are being positioned increasingly as the most attractive and most convenient meeting points for informal settlements. Similar to UCAs, as discussed in 5.1, access to water is often the most pressing resource issue for leagues when it comes to maintaining the infrastructure. In the case of the drier soil settlements of northern Quito, such as *La Roldós*, water is often a disputed resource among the pitches, neighbours for their survival needs, and other green infrastructures such as community gardens. This is why pitches in informal settlements in the north of Quito are less likely to feature a grassed surface than in the south.

> "… Access to water for irrigation purposes is one of the most pressing challenges, particularly in the settlements of the north. Policies in regard to water supply are upside down. It is easy for a stadium or for the leagues to have water to irrigate the pitches, or for car washers to work with water formally provided, but it is difficult for urban farmers to have water for supplying food… Besides, in the south it rains much more, and the soil is better for agricultural practices, whereas the north is sandy and dry, which makes it more problematic to develop the allotments…" (Technician from *Agrupar,* personal interview, 8th December 2016).

In terms of *ecuavoley* pitches, since these occupy less space than football – that is, 18 by 9 meters and the net at 2.85 meters high – producing them has been somewhat easier. Unlike the trajectory of football pitches, though, neighbours, and in some cases households, assume substantial parts of the space that *ecuavoley* demands. Figure 7.2 shows an incipient *ecuavoley* pitch in *La Roldós*.

> "…The *ecuavoley* pitch is sitting on a privately-owned plot whose owner does not live in the neighbourhood. A son of his has shown up saying that he wants to build a house on this space, so he needs us to leave, but we have gone through the same for about five years. I believe it is difficult to have us evicted from the pitch, because we are not the only ones that use it for playing. Sometimes neighbours organise bingo games or celebrations in this space…" (*Ecuavoley* player in *Guamani*, personal interview, 12th December 2016).

The *ecuavoley* pitches, akin to UCAs and as will be further discussed in section 3 of this chapter, facilitate the circulation of money in informal settlements. The pitch atmosphere can be described as a place with a high density of male concentration. In these IGIs, money that is normally produced in the urban dynamics of the core city, from both formal and informal sources, is mobilised, accrued, and redistributed among players, referees, spectators, and local vendors. This dynamic is sustained through a scheme of bets. Such money-redistributing practice plays an important role in upholding the permanence and evolution of *ecuavoley* pitches in informal settlements.

Figure 7.2. *Ecuavoley* pitch in *La Roldós*. Note the net tied between a light pole and an improvised pole (author's photo).

A desired characteristic of *ecuavoley* pitches in informal settlements is often a cemented surface. However, these pitches normally start out as any space in the settlement that allows a rope to be stretched between two trees or poles.

> "…Pitches made of dirt need irrigation and the cane rods are frequently substituted. If it rains the pitch floods and there is no way to play. If it does not rain the dust rises as we play, and we not always have water to

> let the dust settle..." (*Ecuavoley* player in *La Roldós*, personal interview, 14th December 2016).

Thus, although pitches are green at their birth, their incremental trajectory may lead to transforming these spaces into impervious surfaces. This is because, according to informal settlement dwellers involved in *ecuavoley*, the cemented pitches require less maintenance.

7.2.2. Historical context of football and ecuavoley in Quito

This section describes the historical configuration of football and *ecuavoley* as everyday practices all over the city, and particularly throughout informal settlements. The historical context is here important because it shows that the popularity of football and *ecuavoley*, which often leads to securing a space for pitches in informal settlements, is linked to a nearly century-old tradition of organising sports encounters.

Football was introduced to Quito in the first decade of the twentieth century. This happened in parallel with the arrival of railway transportation. In 1908, the *Chimbacalle* rail station was established in the south of Quito to link the capital and surrounding territories with the coastal town *Duran*, near the port of Guayaquil, the largest urban centre of Ecuador. The descendants of cocoa exporters, some of whom studied and lived in Paris, are believed to be responsible for bringing football into Quito at that time (Ramírez-Tarapuez, 2004). Cocoa was the main export produce of Ecuador and the core of its economy, while France remained its most significant market for decades (Maiguashca, 1996). The cocoa hegemony in the Ecuadorian economy lasted until petroleum was discovered in 1967 (Valdivia, 2008). Soon after the train's arrival in Quito, workers from the railway and nearby factories started to play football spontaneously in the streets, in the esplanades, and in the open spaces of the city (Salgado, 2014).

> "…The street is the primitive cell where football simply begins. In the streets, the state does not exist… The street is multi-functional, since it is a space that simultaneously enables transit, socialisation, and sports playing. However, this is not true for all streets. It is actually the street of the neighbourhood which facilitates encounters rather than flows… the street assumes the function of pitch when players momentarily expropriate and demarcate it with the goals…" (Carrión, 2006, p. 180).

Besides football, *ecuavoley* is also a sport spread widely in Quito's neighbourhoods. *Ecuavoley* is a variant of volleyball played by three players per team

with a football size-5 ball. While there are no clear records of its origins, it is believed that indigenous communities near the centre of the Ecuadorian Andes played an approximation to volleyball in the nineteenth century, but it was not until the 1940s that playing *ecuavoley* became a trend among the military, and spread as everyday practice in the neighbourhoods of Quito. Since gathering 12 players – as in conventional volleyball – was not always a practical task, the "volleyball of three" emerged to stay.

> "… Since learning how to play "volleyball of three" was somewhat easy, its practice spread across popular neighbourhoods of Quito, where it was common to find servicemen living with their families…" (Tamba, 2017).

Nowadays, football is perhaps the most frequent topic of discussion among Quito's male residents, and *ecuavoley* the most popular street show. This is manifest in everyday situations such as reading or listening to news during breakfast, or riding a taxi or a bus, or when walking by the parks of the city centre and across informal settlements. Local media are in part responsible for consolidating these sports in the culture of Quito's residents. For decades, newspapers *El Comercio* and *Últimas Noticias* have devoted entire sections to covering news about both the professional and neighbourhood leagues. Also, the popularity of morning football radio-show "*Con las pelotas al aire*" (with the balls in the air) on station "*La radio redonda*" (the round radio) is disproportionate in Quito. On this radio show, which is broadcast widely in public transportation, taxis, and local cafes, commentators address football issues of the professional league in a humorous and sarcastic way for an hour from Monday to Friday and transmit live during football seasons. Figure7.3 shows a social media post by *La radio redonda* station announcing the broadcast of a match of neighbourhood's leagues.

The *radio redonda* station 96.9 Quito

League *Primero de Mayo – El Calzado* (neighbourhood)
Saturday 4th of August – 12:00pm
Final of first category

Flamengo vs Boca Jr.

Listen to us and take part in this sports party with your score prediction
Saturday from 6 to 8am on 96.9 FM.

Figure 7.3. Social media post of *La radio redonda* announcing the final of the neighbourhood league *Primero de Mayo* in *El Calzado*, South of Quito: Flamengo vs Boca Juniors (Twitter, 2017).

Similarly, at bureaucratic agencies, while queuing to be seen, it is usual to overhear people debating issues concerning the professional football league. Furthermore, football is not only a continuous fashionable topic, but also produces expectations and hopes for Quitenians throughout different stages of their life cycles and from all walks of life. For children, it is about having the opportunity to play in their favourite team of the professional league. For adults, on the other hand, it is about seeing their cherished team win the championship and the opportunity to make extra income from bets. Thus, Quito is a "footballised" city where residents often enjoy informal bets on sports.

7.2.3. Sports governance: Clubs and leagues

This section addresses sports clubs and leagues as prominent organisations in the governance of sports and pitches in informal settlements. Understanding the dynamics of clubs and leagues is paramount for this thesis because these organisations

fuel space transformation and are key actors in the management system of pitches. Thus, they constitute stakeholders of IGIs.

By 1930, residents and workers around (rail station) *Chimbacalle* had formed several teams, referred to locally as clubs. Clubs gained popularity among Quitenians and became channels for football players to show off their abilities every day. The popularity of football inspired the creation of an entity responsible for organising and keeping records of the matches. This is how the first neighbourhood-scale football league – *liga barrial* – was created (Salgado, 2014). As Quito continued to grow in population and area, children and teens in emerging neighbourhoods reproduced the *Chimbacalle* process: that is, that they would use the pathways and open spaces in the initial stages of their communities – which in informal settlements constitute the beginning of IGIs in the form of pitches – to play football, and eventually shape the local league. Thus, playing football turned into a spontaneous behaviour practised among neighbours and friends in Quito, often males, while forming the local league became practice for organising, keeping records of encounters, and connecting with other leagues and players in the city.

Most frequently, football clubs in informal settlements adopted the names of clubs playing in the most popular leagues worldwide. In the league of *Guamani* (*El Rocío* league) for instance, we can find competing the local clubs *Borussia Dormunt*, Manchester, Chelsea, and *Atlético Olimpia*. The position table in Figure 7.4 provides an example. This is how IGIs also address communities' needs for identity, as discussed in 2.6.1. As for the motivations for adopting these popular names, there seems to be a link in those names with the momentum of the Ecuadorian professional league, which, as mentioned above, is widely covered in the local media. Thus, the name *Borussia Dormunt* for example was inspired by interest of that professional German league team in the Ecuadorian player Fernando Gaibor.

> "…I believe we adopted the name "Manchester" because of Antonio Valencia[24]…" (Father of a player of *El Rocio* league in *Guamani*, personal interview, 27th January 2017).

[24] Antonio Valencia was an Ecuadorian football player performing in Manchester United of the Premier League of English football.

LIGA BARRIAL "EL ROCÍO"
TABLA DE POSICIONES CATEGORIA SEGUNDA
GRUPO A

		Total							
Pos	Equipo	J	G	E	P	GF	GC	DF	Pts.
1	CICLON	2	2	0	0	9	4	5	6
2	BORUSSIA DORTMUND	2	1	0	1	8	7	1	3
3	MANCHESTER	2	1	0	1	7	6	1	3
4	ATLÉTICO OLIMPIA	2	0	0	2	2	9	-7	0

J= PARTIDOS JUGADOS
G= PARTIDOS GANADOS
E=PARTIDOS EMPATADOS
P=PARTIDOS PERDIDOS
GF=GOLES A FAVOR
GC=GOLES EN CONTRA
DF=TOTAL GOLES GF-GC

Figure 7.4. Liga Barrial El Rocío position table. Note the names of clubs: *Ciclon, Borussia Dortmund, Manchester,* and *Atletico Olimpia* (Facebook, 2017).

While the adoption of football as a local practice is foremost spontaneous, the actual foundation of a club follows an elementary social entrepreneurial path. This entrepreneurial process differs from that of UCAs in that the input of external actors is less likely in the beginning of neighbourhood football leagues. Clubs often emerge from blending football as everyday practice in the neighbourhood, the enthusiasm of local leaders who are often aware of the league system, and a regulatory framework. Although the origin is informal, founding a club demands resources, knowledge, and completion of bureaucratic steps toward registration in the local leagues. However, forming a club in a situation of resource scarcity demands distinctive entrepreneurial talents. Among the initial expenditures, the price for a kit with shirt, short pants, and socks fluctuates between 8 and 20 USD. Shoes start in the 25 USD range, and balls fluctuate between 10 and 20 USD, and are usually made and bought in workshops of the city centre. The learnt entrepreneurial practice to source and stock these necessarily involves a recurring search for sponsors, the preferred ones being government executives, small business owners, and novice vote-seeking politicians in times of elections in the early stages.

> "…When the club was forming, the founders requested me to ask my boss for a meeting with them at the office. Two gentlemen and the team beauty queen[25] visited the office to request a contribution. I remember my boss giving them all the cash he had in his wallet, which was not much. But that is how they accumulate the money they need to have the team

[25] In the amateur football context, the godmother or beauty queen refers to a practice in which usually a young lady is elected to represent the team as the image of it.

> started…" (Employee of the municipality and resident of *La Roldós*, personal interview, 19th December 2016).

Frequently, players have to also contribute money to participate in the local tournaments.

> "…Usually between them, the teams' players chip in to pay the referees 15 USD. The referee shares the 15 USD with the linesmen. So, presidents (of the clubs) often collect from players between 0,50 and 1 USD for the referee. Besides, at the beginning of the championship clubs have to pay – to leagues – a 150 USD registration fee. With that money, leagues' leaders purchase the trophy and offer a *baile y comelona* – dancing party and free food fest – at the final of the championship, which traditionally consists of traditional roasted pork… Spectators normally pay 0.25 USD per ticket to see the matches. Children don't pay. Players also pay the 0.25 USD fee to enter the pitch…" (Club president in *Ciudadela del Ejército*, personal interview, 16th December 2017).

The registration of the club in the local league validates the club existence as an entity. At the same time, the local league, which is formed of the clubs that compete within the neighbourhood, pursues formal recognition on a wider scale, such as the *Federación de Ligas Deportivas Barriales y Parroquiales del cantón Quito* (Federation of Neighbourhood and Parochial Leagues) and the *Asociación de Ligas Deportivas Barriales* (Association of Neighbourhood Sports Leagues), and submit to its norms and the rule of its laws. This latter resonates with the discussion on social organisations in 4.3.1. The bylaws provide a framework of formality and commitment to the clubs and the neighbourhood league. Playing for a different club or league is not permitted to players, unless a formal transfer is conducted appropriately through the institutionalised channels and the administration fee is paid. Tournaments are played in four categories jealously supervised by the local leagues: youth (14 to 18-year-old), senior (18 to 39-year-old), master (more than 40-year-old), and female (open age). The association of leagues keeps records for every player across leagues (Asoligas, 2012).

> "… The most important organisation of leagues are: 1) the *Federación de Ligas Deportivas Barriales* – Federation of Leagues – which gathers nearly 100 thousand football players distributed in 110 neighbourhood leagues, 2) the *Asociación de Ligas Deportivas Barriales* – Association of Leagues – which features 28 neighbourhood leagues and about 50 thousand players registered, and 3) the *Unión de Ligas Independientes de Quito* – Union of Independent Leagues – which features about 70 thousand football players registered in 77 neighbourhood leagues... I

> estimate that Quito has about 400 pitches…" (Executive of Association of Leagues, personal interview, 11th January 2018).

Terán-Fierro (2015) surveyed the non-professional football clubs and neighbourhood leagues in Quito as of 2014. His investigation provided an approximation of the scope of organised neighbourhood football. This author identified 420 pitches – see figure 7.5 on the distribution of pitches in the city – which hosted an average of 4900 official matches every week. Also, there were near to 269 thousand football players registered in 12250 clubs, which were grouped into 350 leagues. These figures suggest that pitches produced economic activity valued at more than 15 million USD in 2014, just from uniforms, shoes, and club registration fees in neighbourhood leagues. In addition, nearly 75 thousand USD in average were paid to referees every week, while players paid about 40 thousand USD to their local league weekly merely for the right of playing. It is likely that, to some extent, the money involved in the neighbourhood football system functions as incentive for informal settlements' leaders to engage in founding clubs, and registering them in leagues. This, in turn, prompts the demand for pitches. Thus, pitches may also be conceived as forms of informal occupation of land intended for income generation.

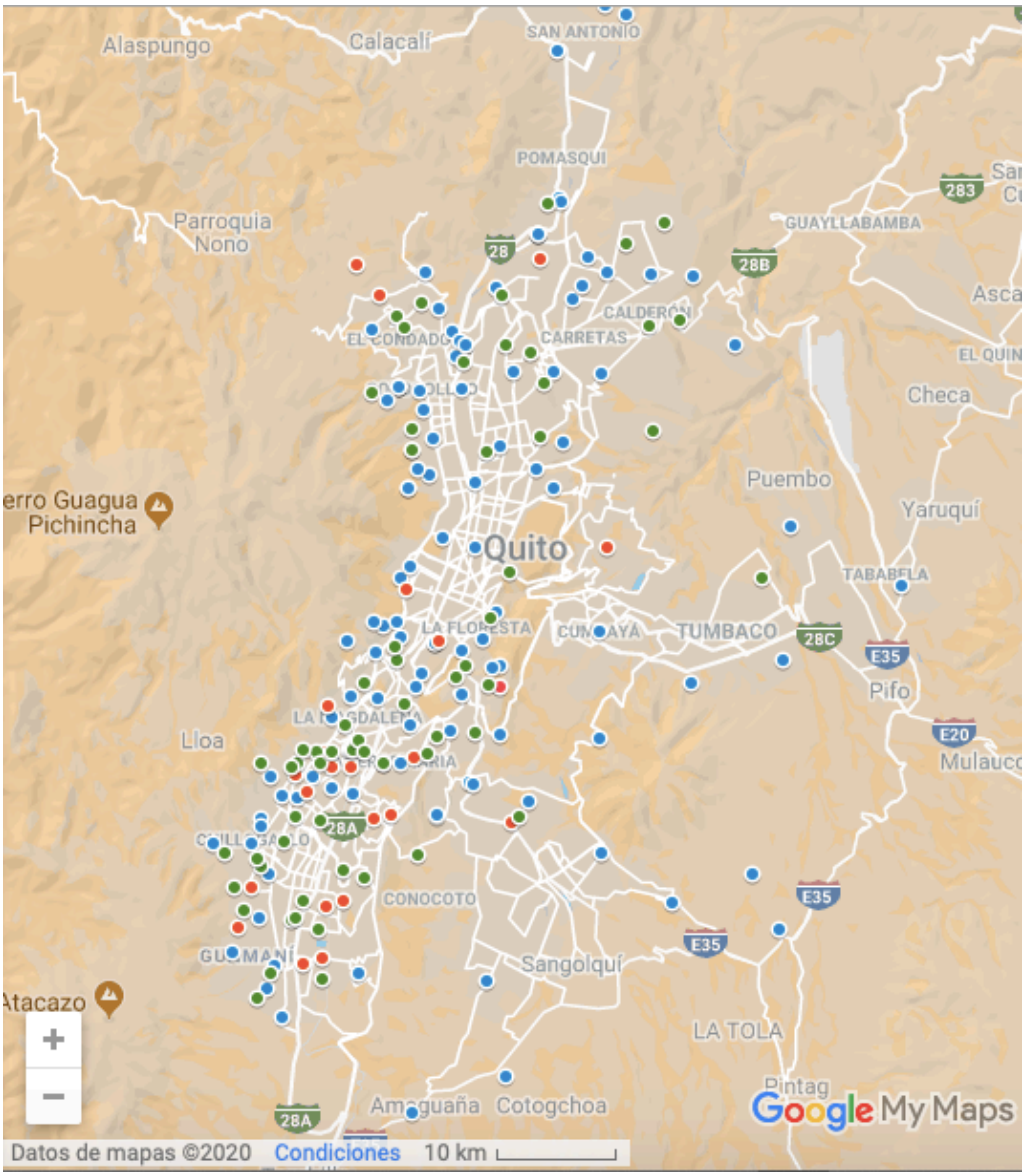


Figure 7.5. Network of neighbourhood leagues' pitches in Quito. Note leagues affiliated to the federation in blue, to the association in red, and to the union in green (adapted from Google Maps).

This section has focused on the role that clubs and leagues play in the emergence and maintenance of pitches in informal settlements. By doing so, this section has extended our understanding of the governance scheme in which IGIs develop. The next section turns its attention to the benefits that pitches produce, as perceived by players and their local communities.

7.3. Pitches as infrastructure: Benefits to informal settlement dwellers

In this section, I address the perceived benefits that pitches provide to residents in informal settlements. Football and *ecuavoley* pitches are both

infrastructures and green networks that facilitate a range of agencies beyond conventional ways of using them to informal settlement dwellers. Nevertheless, pitches constitute also a form of privatised public space, since they are often fenced and discriminatory in terms of access for those without membership affiliation to the clubs. This aspect will be further developed in section 4 of this chapter. For those with access, though, in particular male residents from adolescence onwards, they find in the pitches solutions that address their needs from the most elementary to the more complex aspirations. For instance, pitches facilitate arousal opportunities among the younger residents of informal settlements.

> "…What male player would not enjoy ladies admiring him and his football abilities…?" (Football player in *Guamani*, personal interview, 2nd December 2016).

In general, though, pitches facilitate a system to operate and support practices that are desirable for a large share of their neighbours. Moreover, across informal settlements, football pitches are perhaps the only places that may claim to be capable of assembling neighbours every weekend. Neighbours go to pitches to play sports, provide support to their teams, appreciate the performance of players, exchange knowledge, get drunk, make money, or simply breathe in an open environment. From this perspective, pitches are infrastructures. They are part of a network through which players, spectators, vendors, ideas, money, and knowledge circulate, as discussed in 2.2.2. It is likewise, a spatial configuration that support human practices that pattern the place experience, and the uniqueness and identity of the neighbourhood (McFarlane, 2008a; McFarlane & Vasudevan, 2014).

7.3.1. Pitches as platforms for income generation

Beyond pitches being intended for generating income as argued on 7.2.3, the betting practice embedded in the most popular sports in Quito allows the observation of a mechanism of informal economy configuration that provides a living for many. Pitches act as infrastructures on which to articulate processes of informal economy through at least two mechanisms: first, by providing a market place for "right of pitch" (5 – 25 USD per match), for informal vendors of drinks, ice balls, sweets, football accessories, cigarettes and local food, and for referees; and second, by providing a platform for bets. Informal vending, on the one hand, is a very sensitive issue in Quito. The municipality estimates that there are about 30 thousand informal

vendors in the public spaces of Quito, of whom some 3 thousand are foreign immigrants. Most informal vendors concentrate in the HC, including parks and landmarks around the historic centre. However, informal vendors often demonstrate their own mechanisms of territorial control when spaces on which to perform vending are limited. Pitches provide a market place within informal settlements, which although minor, is somewhat convenient for vendors in that it escapes the scope of control by municipal police and informal mechanisms of territorial control of vendors.

On the other hand, despite the fact that competitions hosted on the pitches of informal settlements are in essence amateur, an entrenched betting system adds rigour to the rules of the games. Bets engage players and audiences equally in guarding the rules of fairness, and give sports in informal settlements a sense of formality. Thus, across neighbourhoods, especially the most popular, it is normal to find inhabitants who bet on the matches of their local football league every weekend, and on the *ecuavoley* pitches daily. Figure 7.6 shows an *ecuavoley* match in *Ciudadela del Ejército*.

> "…*Ecuavoley* is not just a sport nor a distraction; instead, it became a profession. Many people visit pitches throughout the city every day hoping to play as means of making a living…" (*Ecuavoley* player in park *El Ejido*, personal interview, 27th November 2016).

Figure 7.6. Ecuavoley match in *Ciudadela del Ejército* (author's photo).

The betting culture is more obvious in the *ecuavoley* environment. *Ecuavoley* is played every day, beginning mid-afternoon. The minimum bet per player in most

popular *ecuavoley* courts throughout the city is 30 USD. Elementary *ecuavoley* pitches in informal settlements often attract about 20 players at a time. In most cases, players know each other well, so they aim to arrange their teams to be evenly strong so that bets remain motivating. When dealing with above-average players in terms of skill, they set limitations to offset their advantages and aim for teams to be equally competitive. For example, the most skilful players are often restricted during a given match to "use always the two hands" or "use only the left hand". After teams are sorted, the team leaders negotiate the terms of the bet.

> Team 1: "…How much shall we bet?"
> Team 2: "…Let's do 20 USD each…"
> Team 1: "…No way, I don't play for 20 USD, if you want to play bet at least 30 USD …"
> (Fieldnote, *ecuavoley* playing in *Ciudadela del Ejército*, 9th December 2017).

Bet money does not always come from players. Instead, sponsors that fund bets are usual among spectators, and share both losses and profits with their funded players. The practice of funding bets engages spectators in the game actively. Moreover, although there are no official records, bets can go from 60 to 1500 USD per player at the pitches where the most skilful players congregate. That is the case, for instance, in neighbourhood *Chimbacalle* in the south, and parks *El Ejido, La Carolina*, and *La Alameda* in the HC. One of the players interviewed in *Ciudadela del Ejército* revealed having bet 700 USD in one occasion. The referee would usually make between 5 USD and 5% of the betting pool. Occasionally, though, agreement on the bet amount is not achieved. In such cases the match is simply suspended, and another set of teams take the chance to use the pitch. When there is agreement, on the other hand, team leaders collect the bets from their teammates and pass the money on to the referee.

> Team leaders: "…there are 90 USD from my side…" – 30 USD each player
> Referee: "…there are 180 USD in the match, referee charges 5 USD, net and ball 5 USD, agree?"
> (Fieldnote, *ecuavoley* playing in *Ciudadela del Ejército*, 19th December 2017).

Following agreement on bets and price for referee, right of pitch, and amenities, the referee tosses a coin to determine which team starts the game, and reminds players

about the rules. These involve usual prohibitions such as insulting and kicking the ball, and additional rules set in certain circumstances, such as in the example above about dealing with above-average players. Inaccurate refereeing is often a source of conflict, sometimes violent, basically due to the money at risk of loss. Thus, referees and spectators engage in complying with the different rules set for each match.

7.3.2. Pursuing a career

Similar to UCAs, football pitches are forms of IGI that enhance the agency of informal settlements' residents, both youths and adults, in pursuing a career. Through the leagues, the younger residents of informal settlements have achieved engagement in the professional football league, and adults in higher political representation both at municipal and national levels. For children, the pitch embodies the channel to follow the path of role models who demonstrate that becoming a football star is achievable for an individual living in the informal settlements. On the pitch, children build an identity, often attempting to emulate their favourite football stars. In the league of *El Rocio* in *Guamani*, the names of big football stars *Messi, Ronaldo,* and *Neymar* are typical nicknames on the pitches.

> "…Coaches of clubs that play in the professional league come often to see the matches of the local league. *Neymar* was tested in the school of *Club Deportivo El Nacional* (football team of the professional league). I hope they recruit the child, although the football school is far away…" (Spectator of the neighbourhood's league in *Guamaní*, personal interview, 2nd February 2017).

Examples of local football stars that commenced their sports career in the neighbourhood leagues are anything but rare. Franklin Salas "the magician", for example, began his career in the league of *San Miguel de los Banco*s and later managed to play for the Ecuadorian National Football Selection, and internationally in Red Star Belgrade from Serbia, and for a trial period in PSV Eindhoven of the Netherlands.

It is equally common to find leaders of the local football leagues venturing into political careers nationwide, such as for instance congressman René Caza, who is a former leader of neighbourhood league *Los Libertadores* in the south of Quito, and later became president of the association of leagues. Furthermore, there are also cases of referees who began performing in the neighbourhood and then pursued a prosperous career in the professional league. Such is the case of Byron Moreno, who

was controversial worldwide as he refereed in the 2002 FIFA World Cup the match in which Italy was eliminated to co-host South Korea. Through the dynamics of the neighbourhood leagues, therefore, residents of informal settlements not only have left their condition of poverty but have indeed achieved a dream of many.

> "… Those days kids would begin their sports activity in whichever space they would have at hand. There, in the streets and improvised pitches, new talents emerged, some of which moved later into the professional football league. Now things are different because there are specialised football schools. But before it was like this: whenever a new kid moved in the neighbourhood, the first thing he would be asked was if he knew how to play football" (Salgado, 2014, p. 61).

Also, it is usual that players and referees reappear in the neighbourhood leagues after their prosperous careers as players in professional football leagues both nationally and abroad, occasionally as sponsors, and sometimes just as another player. This latter practice has been effective in raising the enthusiasm of younger residents of informal settlements and their parents, as it aids the construction of a dream in terms of seeing the children wearing the shirt of their favourite football team, and ultimately exiting poverty. Most importantly, this post-professional engagement of football stars has been helpful to make marginalised communities visible and link their football clubs with local business, and the politicial community.

These dynamics suggest that the neighbourhood leagues, rather than being spontaneous instances of professional footballers and social leaders' emergence, actually constitute a practice of professional football and political career-building for residents of informal settlements, and a way to gain access to the city. Thus, football pitches are embedded in the practice of pursuing a career – e.g. professional football player, referee, politician – that has already changed the life of residents – most of them men – of informal settlements. This explains partially the eagerness of those involved in the local leagues to mobilise resources for continuous reconfiguration of the pitches and the neighbourhood. This resonates with the discussion of incrementalism in 2.5.3. Thus, around the football pitches, an apparatus of governance has been given shape, which on one hand controls the dynamics in the local space where football is played, and on the other has achieved a blending with the political structures to articulate fundamental neighbourhood demands, such as land tenure security and access to water, electricity, and sanitation. Further details on how pitches connect to community infrastructure achievements are presented next.

7.3.3. Community development

Pitches in informal settlements have enhanced collective agency towards local development. This has been done by providing a platform from which to articulate the implementation of elementary infrastructure and solutions to issues that are inherent to informal occupation of land. At the core of the football social networks of the city are the neighbourhood leagues. Leagues interweave with citywide institutions and mobilise resources within a discursive framework that blends social assistance with healthy recreation for youths and adults. For instance, historical records of league *La Floresta* provide elements to appreciate their neighbourhood's process of transformation and infrastructure supply, which was articulated from the pitches and the leadership of the league. The experience in *La Floresta* was later reproduced – although not as successfully – in several peripheral communities of Quito.

League *La Floresta* was created in 1957. By 1972, in line with 4.4, the city mayor Sixto Durán (former President of Ecuador, 1992-1996) executed the filling of ravine Anglo-French to create the space where the pitch of *La Floresta* is sitting today. Years later, the head of Pichincha prefecture Fabián Alarcón (also former President of Ecuador, 1997-1998) promoted the construction of a multi-sport complex in the same space. Following that, former minister of education Camilo Gallegos promoted the allocation of a nursery for the league with two teachers, which were funded with the ministry's budget. Similarly, the National Congress authorised a one-time monetary contribution to advance the league infrastructure. Also, a community police station was allocated to the league premises in 1996, and most recently, mayor Mauricio Rodas executed enhancement works on the pitch, which included replacing the surface with synthetic grass. Today the league features a football stadium with lighting, grandstands, toilets, food court, two cemented *ecuavoley* pitches, the nursery with a playground and green space, seminar rooms, and an auditorium (La Floresta, 2012).

Although *La Floresta* is an exceptional case, not the norm throughout neighbourhoods in Quito, it provides an illustration of the neighbourhood evolution achieved through the networking abilities of the football league as social organisation, and the pitch as its core space. It also gives some account for the clientelist relationships whereby league leaders engage with politicians. In this regard, the pitch performed as infrastructure to articulate community development demands with governmental agencies. See also, for example, a fragment of mayor Mauricio Rodas'

speech in the re-launch of park *Curiquingue* in *La Roldós* – from the renewed football pitches – referring to community enhancement investment.

> "…We have launched two brand-new pitches with synthetic grass that comply with FIFA regulations. Until recently, these pitches were covered with dust and mud, which affected the health of players… alongside we are launching the renewed park, 38 paved streets and sidewalks, and a municipal nursery … and equipping the neighbourhood with rubbish containers…" (Fieldnote, Speech of mayor Mauricio Rodas*:* re-launch of park *Curiquingue* in *La Roldós*, 19th December 2017).

The use of the football pitch as physical space to articulate the engagement of informal settlements with government in development projects is not a new practice. Quito provides plenty of evidence that supports this. Thus, football pitches in informal settlements are multifunctional infrastructures, which facilitate the continuum of formalisation or integration of these spaces in the institutional frameworks country-wide. Another example (below) is the speech of former mayor Augusto Barrera in the pitch of *Calderon* league, during the launch of a ministry of electricity project to supply energy distribution infrastructure in informal settlements of *Calderon* in the north of Quito.

> "…We are very happy to be here today… we are demonstrating to the sceptic that we can and have to work together. We spent too much time unhappy with each other, between the community and authorities. Today things have changed for good. We have a country in which the majority of its citizens are coming together as a fist to build a homeland of equality…" (DMQ, 2010).

Furthermore, according to a former head of National Housing Bank – *Banco Ecuatoriano de la Vivienda* – interviewed during the fieldwork, leading local construction companies and real estate developers also engaged with leaders of league *La Floresta* to push for further public investments in urban infrastructure, and subsequently create value for the contiguous land. This practice of informal association shaped part of the urban form of Quito in the past. In the contemporary context of informal settlements, likewise, recent supply of public infrastructure from municipality and central government are manifestly linked to the football pitch and the engagements of the local leagues.

Regarding the rationale and discourse through which the leagues mobilise resources from government budgets, in the contemporary context of informal settlements, the healthy recreation approach used by local leaders is evident in the

local infrastructure launch speeches of politicians, as well as in the records of municipal ordinances that favoured the development of pitches and sports facilities in marginalised neighbourhoods despite regulatory issues of land tenancy.

> Speech of vice minister of sports José Moncayo during the launching of *Colinas del Norte* league championship 2017 in the north-west of Quito: "This Ministry will continue to support the neighbourhood leagues… this is a celebration of yours… do not let enthusiasm for sports decline… say no to sedentary lifestyle, drug addiction, and alcoholism, because neighbourhood sport is the basis for the country's development" (Secretaría del Deporte, 2017).

In addition, league leaders have mastered the ability to navigate across transitory governments and insert their agendas regardless of the ruling political regimes. For instance, following the adoption of the current Constitution of Ecuador in 2008, the right to spare time was legitimised as a feature of social inclusion and equality, especially for children (Republic of Ecuador, 2008, p. 106). Drawing from this, league leaders have achieved the allocation of public budget funds from various ministerial agendas to address their development aims. An example is the organisation of football tournaments for children and women sponsored by the Ministry of Sports. This helped leagues in obtaining equipment for the pitches, as well as improving the surroundings in the neighbourhoods. For the central government, the rationale for supporting the neighbourhood leagues lies in the constitutional mandate of giving sports to the masses.

> Art. 381 of the Constitution of the Republic of Ecuador: The State … promotes massive access to sports … and foments the participation of citizens with disabilities. The State guarantees the resources and infrastructure necessary for such activities.
>
> Art. 73 of the Code of Childhood and Adolescence: Children and adolescents have the right to play and participate in sports, cultural and recreational activities, which allow for occupying their spare time fruitfully and contribute to their integral development.

Furthermore, the incremental trajectory of neighbourhood pitches involves also gains in the ability of their host informal settlements to demand and articulate the provision of resources from both central and municipal governments. Pitches enabled, for instance, the construction of new pitches – or upgrading of existing ones, community headquarters, health centres, public lighting, and police stations, to

mention a few examples. Thus, pitches provide a platform that brings together authorities and politicians with everyday people from the informal settlements to articulate their demands, and exert pressure to have what they want delivered.

> "…In *La Roldós,* before the central government attended their demands and integrated them in the national agenda, various NGOs had been established here for a long time. The prominent ones are *Dar la vida*, *Cedeal*, Children International, and *Sembrando paz*. In addition, there have been organisations that emerged locally to assist their own communities, such as African culture groups, women groups, drugs rehabilitation groups, etc. These organisations occupied spaces that were often small and sporadic. Now that the central government has more presence in the territory, obstacles for people to access health, education, and sports have reduced sharply. These, by the way, are universal rights guaranteed in the Constitution… …They use the pitches to address the community. (Former) President Correa used the pitch in one of his weekly reports in 2012. These spaces are big enough to host a good part of the community…" (Employee of the municipality and resident of *La Roldós*, personal interview, 6th November 2016).

Finally, as informal settlements grow in size and population, demands for neighbourhood municipal recognition and land tenancy rights intensify. Regularisation (of occupied land) implies formal recognition of informal settlements as being part of the urban system and provision of secure tenure to their households – this regularisation does not include compliance with building regulations. In this regard, pitches benefit informal settlements by adding to the green space stock required to demand regularisation. The municipal platform for geographic information of Quito classifies the pitches of regularised informal settlements as green space, which adds to the green space per capita figure – according to INEC, Quito features 21.66 m^2 per capita of green space, although the study of Alvarez-Mendoza, Vilches, and Teodoro (2017) claim that this figure is only 6.08 m^2 per capita.

> "… In most cases, following land tenancy regularisation and formal recognition of the neighbourhood, leagues negotiate with the municipality for a concession agreement of pitch spaces. Normally, this entitles leagues to administer the space and mobilise resources for maintenance and enhancement. The support of influential politicians is often essential in having these concessions authorised in favour of leagues…" (Municipal employee, personal interview, 2nd February 2017).

Despite the fact that regularisation lays bare an issue of ownership and land tenancy about the land where pitches are established, this mechanism turns out to be convenient for the football leagues. Regularisation grants the leagues the privilege to

charge fees for the use of the pitch – usually 25 USD per hour of use to practice and 0.50 to 1 USD per ticket to see the official matches. Income is used in part to maintain the league organisation and the pitches. In the end, pitches are IGIs that support informal settlements in entering spaces of formality.

This section has shown how pitches deliver benefits to informal settlements at community level. The evidence presented here somewhat resonates with the discussion on entrepreneurialism in informal settlements presented in 2.4.3. Pitches support entrepreneurialism by presenting informal settlements as entrepreneurial and investment subjects. Likewise, in line with Mell's (2013) claim about the exploitation of the GI concept to guide investments, as discussed in 2.3, this section has shown how pitches are IGIs that guide allocation of public funds in informal settlements. The ability of IGIs to attract funds intended for community development was not equally evident in the cases of UCAs and footpaths. As stated in 5.3, actors from outside informal settlements mobilise resources to begin the UCAs, but there is no evidence that these resources target the enhancement of areas beyond the UCAs' communities and spaces. Footpaths, as described in 6.4, can attract investments for the allocation and maintenance of bridges. However, despite the conceivable impact of bridges in the lives of informal settlements' dwellers, pertinent investments are less likely to happen than in the pitches. The ability to attract funds is a distinctive contribution of this chapter to the aim of conceptualising IGIs. To provide some contrast to the benefits investigated above, the next section shifts the attention onto the adverse effects of pitches in informal settlements.

7.4. Inequalities in access and violence

Sadly, not all interests of residents in informal settlements are represented in the leagues and the pitches. Building upon the discussion in 2.2 about the perception of infrastructure's value being different across users, this section addresses the negative aspects of pitches as reported by informal settlement dwellers. Sports in informal settlements are entangled with issues of segregation, which is often embodied in inequalities of gender and age in accessing and experiencing the pitches. This section shows that the leagues' practice of regulating and controlling the pitch space in informal settlements reproduces a dynamic of privatisation of public space, similar to what Lopes de Souza (2006) criticises, as reviewed in 2.4.3.1, which is in part linked to episodes of intra-neighbourhood and intra-family violence.

> "…The pitches are almost exclusive for adult men. Children and women play football in the tournaments, but that's only during weekends… …when you see children in the *ecuavoley* pitch, however, it is because they are cheering their father, or they are just neighbours hanging around, but they never get to play. And the worst part is that children witness the adults drinking, betting, cursing, and sometimes fighting… …further, when they lose money in the pitches and go home drunk, the ones to blame are often the wives and children" (Resident of *Guamani*, personal interview, 13th January 2017).

The pitches contribute to the social construction of fear and insecurity in the households of informal settlements, and consequently, play a role in the distinctive organisation of everyday practices of residents. These differences are particularly noticeable between men and women, and between children and adults. For men, the organisation of each day often considers the wish to play sports, make extra (or spend) income, produce and experience collective excitement, manage their social network, and ultimately assure their presence in the commons.

> "… I play *ecuavoley* Tuesdays and Saturdays in the neighbourhood. We begin at 3pm. Some housewives in the neighbourhood don't like their partners to play because it often involves drinking alcohol and spending money … …usually we drink beer "just for the thirst", but then there is always one that brings *"un fuerte"* – strong alcoholic drink – and that is how we pass from sports to drunk…" (*Ecuavoley* player in *Ciudadela del Ejército*, personal interview, 21st December 2017).

Conversely, for women, the pitches often represent distress and spaces of avoidance, for which they plan around the odds of losing household money and having to face aggressive behaviours. Thus, the practices that sustain sports fields in informal settlements are associated with episodes of violence in public spaces and within households, which often affect women the most.

> "…Besides the consumption and trading of drugs in the form of micro-trafficking, alcohol drinking is the main trigger of violence in the neighbourhoods. Among the few cases of intra-family violence in which victims had the courage to denunciate and use the opportunity to intervene, nine in every ten occasions we found that it was a drunken husband that attacked his partner and children. And very often, they had been drinking at the pitches. However, we don't get to intervene as much as needed because victims tend not to report abusive behaviour. People drink too much in the leagues during the weekends as well as in the *ecuavoley*..." (Police officer of *Guamaní*, personal interview, 2nd February 2017).

Violence on the pitches and their surroundings is an adverse factor to the action of the neighbourhood leagues of Quito. Violent episodes often begin in the pitches, during the matches, against the referee for failing in the enforcement of arbitration, and between players and spectators for disagreeing on their perspectives of fairness in the playing realm.

> "…It is normal that referees make mistakes, and that players and viewers question the referee's actions during a match; but being attacked because of those mistakes, and sometimes being hit is unacceptable. There are matches that one can foresee that will be problematic, particularly when there is conflicting rivalry between teams. Bets and alcohol further exacerbate such aggressive behaviour. For referees, there is no guarantee to go home safe from the pitches…" (Referee in football league of *Guamani*, personal interview, 14th January 2017).

Actors involved in the neighbourhood leagues, including league leaders, players, neighbours, police, and municipal authorities, maintain that alcohol consumption is the trigger of aggressive behaviour in the pitches, which extends after matches into the households and shapes intra-family violence. As a result, the matches of the league have gained the stigma of being events of exaggerated alcohol consumption. From this, municipal and security-related policies attempting to address violence in informal settlements are significantly framed in aims of eradication of alcoholism.

> "…Although an agreement to address alcoholism was reached with the municipality, we recognise that nothing seems sufficient to eradicate violence in the pitches of the neighbourhood leagues. For many, consumption of alcoholic beverages, including beer, is the trigger of violence. However, I believe violence is a social problem. We need to reflect and recognise that a state policy is crucial. The neighbourhood leagues should be a movement that tightens family cohesion. That is what we are working towards with the central and municipal governments. We want the pitches to become centres of family gathering…" (Sebastián Palacios, President of association of leagues, radio interview of Pichincha Universal radio, 95.3 FM, Quito, 15th December 2016).

In an attempt to address intra-family violence, the Prefecture of *Pichincha* launched the programme SOS *Mujeres* – SOS Women – in 2017, which uses pitches of informal settlements as its platform. The programme consists of workshops led by the football teams' beauty queens, in which women from informal settlements could share their experience of violence in a relaxed environment. Among other things,

women were advised about legal and psychological assistance programmes available free of charge and designed for them. As of today, the outcome of this programme in terms of reducing violent episodes within households has not yet been disclosed. However, a Prefectural employee involved explained that a social network emerged in which women developed the ability of mutual support. This is another mechanism by which pitches become infrastructure by supporting the articulation of public policy.

> "…Pitches can be both cause and solution for gender violence problems in informal settlements…" (Prefectures' employee, Skype interview, 9th March 2018).

However, although high levels of alcohol consumption are undeniable in the pitches during league matches, a local researcher on urban sociology interviewed for this research maintains that the pitches alone are not the causes of alcoholism and violence, nor are the leagues. Instead, pitches are merely the venues that gather those who regularly consume alcohol and are more prone to presenting violent behaviour. Such violent behaviour is in part exacerbated by discriminatory access to the pitches and the poor coordination between the clubs and the community in utilising the pitches.

In the pitches of *Guamani* and *La Roldós,* however, from the information produced during the residents' discussions in focus groups, it is perceived that privatisation of the playing space, which includes a fee for the right to use the pitch, segregates neighbours, and produces inequalities in access to open space and thus exclusionary joy, which in the end reproduces constraints on inclusive development in the territory (Ranieri & Almeida-Ramos, 2013). Moreover, these inequalities in access to the pitches may be responsible in part for deteriorating social cohesion in informal settlements (Kolev, 2017). Contrariwise, the temporal occupation of public and accessible space for cultural manifestations is better accepted among residents.

> "…Our mission is to promote social cohesion through the practice of cultural manifestations. Unfortunately, the space is limited, but we manage to accommodate ourselves in the public spaces, we occupy the streets… They do music; urban hip-hop is the most common; and Indigenous and Afro-Ecuadorian dances… Contrary to what happens with sports practices in the neighbourhoods, which are perceived as sources of violence, particularly for women, culture and arts are appreciated for being peace-making and inclusionary practices…" (Culture promoter in *La Roldós*, personal interview, 2nd November 2016).

For those involved in the leagues, including club leaders and players, fencing and discriminating over access are absolutely necessary to maintain the space. They maintain that if access were not restricted, pitch preservation would be problematic because of rubbish littering, dog poop on the pitch, just as in cases of wasteland, open spaces, and abandoned parks in the neighbourhoods. This latter resonates with the study by Jorgensen and Anthopoulou (2007) identified in 2.3.4, about presence of miscreants and criminal activity being a limitation on GI development in informal settlements. Figure 7.7 shows two pitches in *La Roldós*, one fenced and the other one of open access.

Figure 7.7. Open versus fenced pitches in *La Roldós.* Note rubbish on the open pitch (author's photo).

> "…There are open spaces in the neighbourhood, but they are dirty, no one cares for them, dogs go there to poop, the drunks waste their glass bottles there, on the ground. On Sundays, we prefer to travel to (parks) *Las Cuadras* or *La Carolina* to spend the day. In the local greenspaces, it is absolutely upsetting to spend time, the odours are terrible, it is frustrating, and scary… …Some neighbours put their solid waste in the open spaces, wastelands, and uninhabited plots. Many street dogs gather there, shred the rubbish bags, drag the bags to the sidewalks, and spread the rubbish everywhere in the neighbourhood… a few days ago about ten dogs attacked a girl on her way to school in the morning, they almost killed her. Luckily, the neighbours confronted the dogs with sticks and stones…" (Residents in *Guamani*, focus group, 13th January 2017).

Thus, the privatisation of the playing space, the pitches in this case, is a common practice intended to preserve IGIs, which leads to episodes of violence. Moreover, according to an interviewee of this study from a local health centre in *Guamani*, violence is the most pressing public health issue in the neighbourhood and is linked to the social dynamics deployed on the pitches.

Furthermore, beyond violence, another adverse outcome for those without access relates to behavioural and physical disorders for children. About this, although the role of access to green space in child development has been addressed broadly in the relevant literature (Marcus & Francis, 1997; Wolch, Byrne, & Newell, 2014), a knowledge gap remains in terms of health outcomes arising from restricted access to green playing space, for which this study contributes some evidence.

> "…Here in the neighbourhood we have issues of children with low size, and it is believed that it is because they stay indoors most of the time. That is what doctors from the health centre always say. Most of the residents here are tenants rather than owners. Landlords are strict to families with children, as they demand extra care for the windows not to break and walls to remain painted, so the children hardly play and have no choice but watch television. Thus, children have limited contact with nature, they have no access to touch plants or play with soil, and because of that they develop fears. Normally children here are afraid of bugs and small animals…" (Instructor of infant centre in *Guamani*, personal interview, 13th January 2017).

The case of the pitches has provided a lens to observe social outcomes of exclusionary practices in the use of IGIs, such as violence and disorder in child development. In the view of the local researcher mentioned above, "a management model for informal settlements needs to emerge in which barriers to inclusive development are identified and properly addressed". Therefore, supplementary perspectives to further identify exclusionary practices deployed in the isolation of

informal settlements would likely be beneficial to enrich the sources of social innovation and the capacity to make better targeted decisions for livelihood enhancement of their communities.

7.5. Conclusion

This chapter has described the emergence of football and *ecuavoley* pitches in the informal settlements of Quito, the practices that enable them to transform and be sustained over time, and the benefits/detriments they deliver to informal settlement dwellers. Pitches, particularly football, are IGIs that are as primitive as the footpaths investigated in Chapter 6, in that both emerged in parallel with the occupation of land. Pitches are assembled on open green landscapes within informal settlements from a combination of resources available at hand. During their lives, pitches transform in incremental steps to continuously provide themselves with multiple infrastructural functions. This progress is most often achieved from the resource mobilisation efforts of their users and their temporary relationships with vote-seeking politicians.

The investigation of pitches in informal settlements has made several contributions that further assist in the conceptualisation of IGIs: first, pitches allowed exploration of the (apparent) dualism between formality and informality. In line with Roy (2005), as reviewed in 2.4, pitches present informality as a process of urbanisation. That is, spaces that although emerging spontaneously and (in many cases) remaining "branded" as informal, become networked at city level and function for the articulation of public policies. Second, the investigation provided a window into how a space becomes infrastructure. As for this, pitches not only constitute playing spaces, but also develop into platforms from which to launch careers and social and spatial interventions, and to create sources of income. Third and finally, this chapter has challenged Western views on how GI is created and maintained by presenting how the network of clubs and leagues create an increasing demand for pitches' functionalities, whereby they become these IGI's development-supporting system.

Chapter 8
Conclusion

8.1. Introduction

This thesis set out to conceptualise IGI as a theoretical resource to understand the making, transformation, and unmaking of green infrastructures in informal settlements. Following the empirical analysis, I conclude that IGIs are interdependent green political spaces in informal settlements that are embedded in multiple urban networked systems, in which formal and informal practices intertwine to produce social and material assets, and through which circulate people, fauna, knowledge, and resources.

IGI offers a consistent concept for research and practice in at least three respects: 1) it can inform environmental intervention design in cities with a prevalence of informal settlements. In this regard, the concept of IGI, as pointed out in 2.2.3 and as Mell (2013) and Young et al. (2014) would argue, addresses a gap in understanding GI in terms of its persistence across settings. This is done by identifying how urban processes fuel the transformation of IGIs. 2) It sheds light on how urban processes fuel resource mobilisation to produce and transform informal infrastructures. Resource mobilisation for GI was a recurrent theme in the literature review, yet 5.2.2, 6.4, and 7.3.3 describe what it entails in the context of informal settlements. Finally, 3) it provides a window to explore how informality alters land cover and urban forms.

In addition, this dissertation has offered a lens through which to register practices in informal settlements that have not been reported in previous works. In this regard, IGI not only provides a useful way to explain how GI is seen and experienced in informal settlements, but also forms a perspective from which to examine urban informality. Therefore, the concept of IGI can help to anticipate, for instance, environmental problems and urban transformations. The insights gained from this study can be of assistance when looking to reconfigure the city's policy framework to address access to green space and promote development within contemporary paradigms of sustainability. These problems are relevant in fields such as urban geography, urban planning, and environmental management.

In terms of methodology, this work has brought together two bodies of scholarship that have emerged and moved forward in parallel: green infrastructure (GI) and informal infrastructure. This is perhaps the first attempt to examine GI

through the lens of everyday infrastructural practices in informal settlements. This research has involved six months of fieldwork at seven informal settlements in Quito, Ecuador where a mix of qualitative techniques allowed for rich insights into the everyday lives and practices that involve the use of IGIs and allow their maintenance and development.

The empirical chapters – four to seven – have shown that the endowment and maintenance of green space in Quito is not the exclusive domain of state-centric top-down mechanisms. Instead, IGIs are green spaces that their users produce and maintain autonomously, with no formal planning. This is crucial knowledge when attempting to effect greener urban areas in restricted circumstances of funding and resources. The remainder of this chapter is organised as follows: section 2 explains how the concept of IGI developed from the empirical analysis; section 3 highlights the thesis's most significant findings and contributions; section 4 identifies the strengths and limitations faced in conducting this research; and section 5 discusses the implications of this study for future research.

8.2. Towards a concept of informal green infrastructure (IGI)

This section recaps some of the central insights of the preceding chapters that led to the conceptualisation of IGI. This thesis began by challenging the relevance of mainstream views on GI to examine the making, transformation, and unmaking of GI in informal settlements. GI has been conceptualised mainly in the Global North and thematically biased toward ecosystem services research (Lindley et al., 2018). This suggests that mainstream conceptualisations on GI are unlikely to embrace nuances of everyday life in informal settlements, and thereby are of little value to plan for sustainable green space supply in this context.

The informal settlements context, as seen in Chapter 4, features vulnerabilities, both physical and social, while the feasibility for attempting conventional urban infrastructure in these spaces is limited. To develop a contextually relevant concept of GI, I borrowed the thoughts of Star and Ruhleder (1996) and Star (1999) on infrastructure being a relational concept and a community of practice. Then, I used theories of informal settlements' infrastructures (i.e. assemblage, entrepreneurialism, and informal infrastructures), as reviewed in 2.4.1., to inform the research design. Anchored in this relational thought, the thesis traced factors that cause the emergence, transformation, and disappearance of IGIs. This implied

mapping the interrelations of a multiplicity of materials, actors, networks, practices, and circumstances and then fitting them together in one concept.

IGIs emerge to cope with limitations of informal settlements. They result from groups of residents organising politically to take control of neighbouring unbuilt spaces and make them functional to accomplish their everyday needs and escalate their capabilities. This is when IGIs become political spaces. In the case of UCAs, as explained in 5.4.3., women's organisations often arise from local social networks to form and take control of the farming space. From there, they engage in trading networks that allow them to escalate political power. Similarly, 7.2.3. has described how football teams form leagues that exercise power over the pitch spaces. Pitches become platforms to demand and articulate government action and insert league leaders in political careers. About footpaths, although a form of local political organisation that sustains them is less obvious, they rely on entrenched mechanisms of collective labour to emerge and thereby allow everyday mobility to residents. Mobility is a leading source of political tensions in the city.

Also, IGIs are infrastructures embedded in networked systems. As reviewed in 2.2.2. and 2.5.2., infrastructures in informal settlements are networked systems that produce continuity in the city. 5.2.2. has shown that UCAs emerge from the interaction of NGOs, local actors, and institutions, which mobilise knowledge, labour, and technical and financial resources. Then, as UCAs develop, they embed in the city's food networks and provide a space for pertinent people to circulate and exchange produce, knowledge, and resources. Likewise, as shown in 6.4., footpaths become networked by connecting informal settlements among themselves, and with the core city's public transport stops, pavements, bridges, and main roads, thus facilitating mobility of people and goods. Equally, 7.3. has argued that pitches are nodes of a network in which mobile players, spectators, vendors, and money connect. For all types of IGIs, the networks they embed themselves into become their supporting backbones and main drivers of transformation.

Furthermore, IGIs produce social and material resources for those engaged in related practices. 5.4. has described how UCAs maintain and extend the social networks of farmers, which is functional to support their household food security, income generation, and mutual assistance in daily chores. Equally, while empowering mobility, as discussed in 6.3., footpaths enable the younger residents to go to school, and the other residents to reach their daily spaces of income generation in the city. Likewise, as shown in 7.2, pitches are embedded in the informal economy of the city,

and thereby facilitate income generation for players, vendors, referees, and league leaders. Lastly, it is the ability of IGIs to facilitate access to resources what makes them significant and worthy of preservation by their hosting communities.

Additionally, IGIs allow the exploration of the dualism between formality and informality. As Roy (2005) has argued, informality is a mode of urbanisation, while the relationship between formality and informality is not a dichotomy but a continuum. On this matter, 5.6. has shown that although UCAs emerge informally, meaning aside institutional means, they become key players of the organic food supply network of the city. Similarly, concerning footpaths, 6.3. has argued that while they emerge spontaneously, footpaths eventually blend with the city's mobility infrastructure and thereby become part of the mobility network citywide. Likewise, 7.5. has shown that informal settlements' pitches not only provide a space for the informal economy to operate, but also a platform for the articulation of public policies. Therefore, IGIs make possible the convergence and collaboration between formal and informal practices.

So far, this section has focused on the similarities that allow the development of a single unifying concept of IGI, as presented in the beginning of this chapter. However, there are some contrasts among IGIs as well, which are worthy of note. I will refer to the three that stands out in the empirical analysis. First, in terms of users, 5.4. has shown that UCAs are, in most cases, spaces of women, while, as 7.2.1. has argued, pitches are spaces of men. These differences are less obvious in footpaths, which access is open, although contested. Second, regarding scales, as seen in 5.3. and 5.5., an estimate of 1,100 allotments of different sizes (making about 29 ha.) would operate in Quito and involve 15 thousand families. Footpaths, to the best of my knowledge, have not been previously mapped, for which it is difficult to estimate the land area they use. However, as seen in 3.3., the near 800 informal settlements hosting half of Quito population give an indication of their significance for mobility. Regarding pitches, as indicated in 7.2.3., the 269 thousand players registered in the football leagues use about 420 pitches (making roughly 170 ha.[26]). Therefore, in terms of number of people involved, footpaths are by far the most significant IGIs, while in terms of size, football pitches are the most substantial. Finally, the preservation for the three IGIs are threatened in different ways. While access to water is equally the most pressing resource for maintaining UCAs and pitches, as indicated in 5.2.2. and 7.2.1.,

[26] Approximately 420 pitches times the minimum size of a football pitch (90m x 45m).

the lands supporting UCAs, as opposed to pitches, tend to be disputed as they were initially meant for housing constructions. Thus, continuous access to space is less challenging for pitches than it is for UCAs. Concerning footpaths, 6.4.1. has shown that the occupation and pollution of neighbouring lands prompt them to disappear. Therefore, IGIs are, in general, susceptible to water access, environmental pollution, and land-use changes.

8.3. Contributions and implications

This section discusses the empirical contribution and implications for theory, practice, and methodology of this research. First, to my knowledge, the present study is the only empirical investigation into describing how informality produces GIs and how these infrastructures support the reproduction of informality. This is relevant to understanding and anticipating the effects of intensifying urbanisation and informality. Surprisingly, despite the sustainable development concept having been prominent on a global scale at least since the Earth Summit in Rio de Janeiro in 1992, few studies have investigated GIs in informal settlements in any systematic way. Thus, the mechanisms and urban dynamics that facilitate informal settlement dwellers' engagement in producing and securing GIs is a considerable omission in the literature that this study hopes to address.

8.3.1. Key empirical contributions

This section highlights a set of empirical contributions of this dissertation. The results presented in the previous three chapters can be useful for scholars and practitioners involved in urban policy debates in developing countries, with particular reference to GI planning and issues of informal urbanisation. As I have argued in 2.3 and 2.4.1, GI research has produced limited empirical evidence from informal settlements in the Global South which informs policy making intended to motivate production and preservation of greenspaces in this context. The key empirical contributions are summarised below:

- *Informality produces urban transformation in still-green ways*

The notion that urban informality produces urban transformation is well established (Kamalipour & Dovey, 2017; Roy, 2004, 2016a). What was not evident was the actual relationship between informality and the production of GI. This study has presented three types of IGI that have emerged and developed alongside processes

of informal occupation of land. These IGIs emerged without formal codes from the city in terms of land tenure/use, urban planning, design, and materials (Kamalipour & Dovey, 2017). Instead, they arose from the mobilisation of local resources, which include land, labour, materials available at hand, and knowledge. Moreover, footpaths and pitches, as discussed in Chapters 6 and 7, emerged to support practices already long since present inside the communities, so practices created IGIs. Footpaths (*chaquiñan*) were used on the Andean landscape from pre-colonial times, as explained in 6.3.2, while football and *ecuavoley* have been for decades the most popular sports in the city and constituents of the informal economy, as explained in 7.3.1.

These motivations behind the production of IGIs indicate that, unlike conventional views on GI, IGIs are oftentimes not intended for environmental ends. Instead, these constitute mediums for informal settlement dwellers to access urban features and enhance agency in everyday life. Besides, IGIs change not only because their components often do not correspond with conventional views of infrastructure, but also because urban and environmental processes constantly challenge their intended functionalities. This led me to the assumption that informality triggers continuous urban transformation also in still-green ways. This argument challenges us to rethink mainstream conceptualisations on both GI and informality: on GI, by adding a relational dimension of these spaces with wider urban processes and long-standing practices; and on informality, by dismantling presumed associations with deprivation and environmental damage.

- *IGI is a parallel dimension of GI, which their users develop and maintain*

This is a key aspect in addressing the challenge of making cities greener under classic conditions of restricted public funds for GI development and maintenance. What is at stake here is that IGIs emerge from within informal settlements to transform inhabitants' everyday practices, so the emergence and development of IGIs are not contingent on public budget allocation. This is clear in the UCAs, which, as discussed in 5.2.1, are developed, and maintained by membership-based local organisations. As UCAs grow, they engage in exchange and retailing networks with other UCAs, recyclers, suppliers, and marketplaces in the city, which builds up the platform that supports their maintenance and development.

The exploration of footpaths also provides experimental evidence supporting the claim that users develop and maintain IGIs. The production and use of footpaths is a local response to the mobility challenge. Footpaths allow for gains in the ability to

commute, and although precarious and hazardous, as discussed in 6.4, form shortcuts that save time and money, and frequently constitute the only way to access the city. The footpaths' production and course of transformation often relies on collective labour and material input of residents. However, footpaths' ability to empower mobility is somewhat mediated by the environmental conditions of their surrounding landscapes.

Lastly, football and *ecuavoley* pitches offer further support to this empirical claim. Allocating space for pitches is a practice embedded in the formation process of informal settlements. This is why in 7.2 I argued that pitches are spontaneously shaped, sustained and enhanced, not only because these are functional for leisure, but also because new settlers tend to be aware of the functionality of pitches in other informal settlements. Again, long standing practices enthuse the creation of IGIs. Pitches are perceived as local assets that function as platforms to pursue career dreams, be it as players, referees, or politicians, without having to disturb or be disturbed by formal practices of income generation in the city, as discussed in 2.4.1.4. Thus, assembling pitches is embedded in the practice of informal occupation of land. Furthermore, for some informal settlement dwellers, pitches allow them to make a living and support their families.

- *IGIs are green nodes inserted into heterogeneous networked systems*

IGIs are embedded in networks in which heterogeneous infrastructures made of elements that can be formal, informal, green or grey intertwine. By and large, it is the ability to become part of urban networks that holds the relevance of IGIs. This is a key contribution in that there is not consistent evidence that top-down in-situ interventions are effective in addressing green space shortages in informal settlements. Instead, urban policies that intervene in the trans-local linkages of IGIs, as Hannerz (2003) would suggest and as discussed in 3.3, may instead be a better approach to supporting the production, reproduction, and maintenance of IGIs. The exploration of UCAs in Chapter 5 provided strong evidence that IGIs subsist in terms of their coexistence with other systems. As discussed in 5.2.1, UCAs remain in place and experience incremental development in harmony with other UCAs through the exchange of seeds, materials, and produce. This resembles the argument of Gonzalez de la Rocha (2007) about producing credits for social exchange, as reviewed in 2.6.1. Similarly, UCAs remain relevant while interconnected with food retailing networks in the city.

Also, the examination of footpaths revealed a clear connection between their production, transformation, and their ability to link dwellers to larger scale and formal mobility infrastructures, as discussed in 6.3. Further, 6.3.1.2 showed that footpaths remain in place and develop as long as they connect to neighbouring communities, bridges, main roads, and public transport hubs. Contrariwise, as described in 6.4.1, dynamics of sprawl and space privatisation reduce dwellers' directness of access to destinations and prompt footpaths to disappear or deterritorialise.

The exploration of football and *ecuavoley* pitches likewise illustrates the networked nature of IGIs. In the first place, as discussed in 7.2.2, through the pitches circulate players, referees, spectators, vendors, ideas, knowledge, and money. As in the cases of UCAs, pitches develop in synchrony with other pitches, regardless of their location being formal or informal, as long as the communities that use them remain engaged in sporting competitive relationships and take part in associations at citywide level. Therefore, through the need to stay in competition combined with the clientelist practices discussed in 7.3.2, pitches simultaneously are inserted in different networks through which their maintenance and incremental transformation are articulated.

- *IGIs' utility to users dictates their value, preservation, and incrementalism*

Consistent with the assemblage notion (Deleuze & Parnet, 1987), the production, preservation, and incrementalism of IGIs are also dictated by their ability to enhance agency, transform everyday practices in informal settlements, and ease access to the city. Informal settlement dwellers produce, preserve, and transform IGIs because they support a wide range of agencies. 5.3 described the practices through which UCAs enhance food supply to informal settlement households, create channels of additional income generation, and help women to achieve everyday chores relevant to their entrenched householding roles. Moreover, as explained in 5.3.3, UCAs enhance women's ability to access and feel rightful with reference to the city's amenities, since the dynamics involved in producing and trading food prompt a multiplicity of "things to do" in the city.

Footpaths, likewise, are significant enablers of access to the city since these facilitate mobility for dwellers in informal settlements, while also supporting mobility-related savings with respect to the cumulative cost of multi-modal undersupplied means of transportation required to access the city's core. This is achieved by enhancing directness of access to everyday destinations and acting as

shortcuts, as discussed in 6.3.3. Similarly, as described in 7.3.1, pitches support income generation for different actors within informal settlements, including players, referees, vendors, and gamblers. Hence, pitches are platforms that support the pursuit of individual goals of sports and political careers and facilitate dwellers in navigating spaces of formality.

Lastly, the preservation and transformation of IGIs is also contingent on the ability of informal settlement dwellers to claim these spaces as their own. This is more obvious in the case of pitches, as indicated in 7.3.3, where local leagues negotiate concession agreements with the municipality to operate and enhance the pitches. This constitutes a different way of understanding "the right to the city" as referred in 5.4.3 and goes in line with Pieterse's (2013) ideas on radical democracy, as reviewed in 2.5.3, when suggesting that empowering marginalised communities would produce radical – as opposed to prudent – incrementalism.

- *IGI differs from the conventional Western characterisation of GI.*

In the Global North, GI is conceived as a space that interconnects with networks of green spaces for the purpose of preserving natural ecosystem values. Instead, in line with theories of informal infrastructure, as reviewed in 2.4.1, this study shows that IGI is a kind of informal land occupation through the mobilisation of the community, intended to produce continuity in the city (Simone, 2010) to support inhabitants in achieving their everyday routines. Taking for instance UCAs, the Western literature on GI has often addressed these spaces as an approach to green space planning for tackling social challenges in urban vacated spaces. Moreover, they are assumed to emerge from the mobilisation of neighbouring households' resources, as discussed in 5.1. In studies focused on the Global South, the literature on community allotments has developed in a context of rural poverty instead, and has addressed issues of malnutrition, unemployment and women's empowerment, as suggested in 2.6.1. However, UCAs in informal settlements, which is of particular relevance to the Global South, have been rarely examined and their distinctive features have thus been overlooked.

Similarly, footpaths as IGIs have a different connotation from that of the conventional view of GI in the Global North. As reviewed in 2.2, the term GI was first used to refer to greenways as an alternative to established practices of urban mobility. In practice, as examined in 2.3.2, the functionality of footpaths has been understood in a context of health and well-being and is suggested most often for

exercising and for contemplating nature. In informal settlements, footpaths are instead used for utilitarian walking, and rather than being meant for pleasant walking, are conceived as the inexpensive though life-threatening alternative, if not the only option, to achieve mobility. This mis-conceptualisation of footpaths in informal settlements has overlooked walking as a viable mean of transport in Quito.

Likewise, football pitches are viewed in the GI literature as platforms provided for recreation, often within narratives of well-being, as examined in 2.2.3. From the climate change adaptation standpoint, as discussed in 2.3.1, the contribution of urban pitches to runoff control has been acknowledged. However, similar to findings in UCAs, the social organisation over which pitches are laid as well as the forms of access to the city that pitches enable are specific to the context of the Global South and are overlooked in the GI literature. These features are important to take into account when planning for green space allocation in informal settlements.

8.3.2. Theoretical implications

Findings in this dissertation have significant implications for understanding how GIs in informal settlements are made, transformed, and unmade. By introducing the concept of IGI, this study has provided insights for the relationship among GIs, informality and infrastructure shortage in the face of growing urbanisation in the Global South, as represented in Figure 8.1. In this regard, as discussed in 2.2.2 and as Star and Ruhleder (1996) would suggest, IGI adds a relational dimension to understanding both GI and informal infrastructure, which has been little explored in previous research. Thus, the theoretical implication in this thesis lies in the demonstration that, in the growing cities of the Global South, urban processes, and approaches to formal infrastructural development in the core city fuel the production, reproduction and transformation of IGIs. This challenges conventional wisdom on GI.

As argued in 2.3, securing the provision of GI has been reduced to an issue of public funds, whereby their preservation is often vulnerable to the dynamics and tensions behind budget allocation. The concept of IGI, on the other hand, even while it may share similarities with GI in terms of physical features and the overall purpose they are meant to serve, differs fundamentally from that of GI in the causal dynamics that produces and sustains it in place. Then, while GI creation and transformation depend on top-down and articulated inputs, which may be expected in well-institutionalised settings, IGI emerges and transforms through spontaneous adaptations that depend conditionally on processes occurring in the core city.

Therefore, in line with the discussion in 2.4, IGI transcends the territorial dimension of informality. That is, IGIs are not only defined in terms of the settings in which they emerge, but more importantly in terms of the practices around their existence.

In brief, conceptualising UCAs as IGIs has brought to light elements and dynamics that prompt their emergence, their transformation in terms of both the farming space and the everyday practices of inhabitants involved, and their links with exchange networks of food and material supply in the city, as explained in 5.1. Likewise, the IGI concept allows for the understanding of footpaths as a spontaneous response to spatial isolation and inadequate mobility infrastructure, as explained in 6.3.1, to connect informal settlement dwellers with the city. Footpaths are made, unmade, and transformed in harmony with changes in the transport networks and land use policies and practices. Lastly, regarding pitches, these emerge from practices of mobilising local labour and resources to cope with shortages of spaces for leisure. Pitches capitalise on the network of teams and leagues city-wide to sustain and induce transformation. For all cases examined, IGIs are raised on informally occupied lands in the form of green or at least permeable surfaces, and are configured and often reconfigured to secure everyday functionalities and access to the city for their users, as discussed in 7.5.

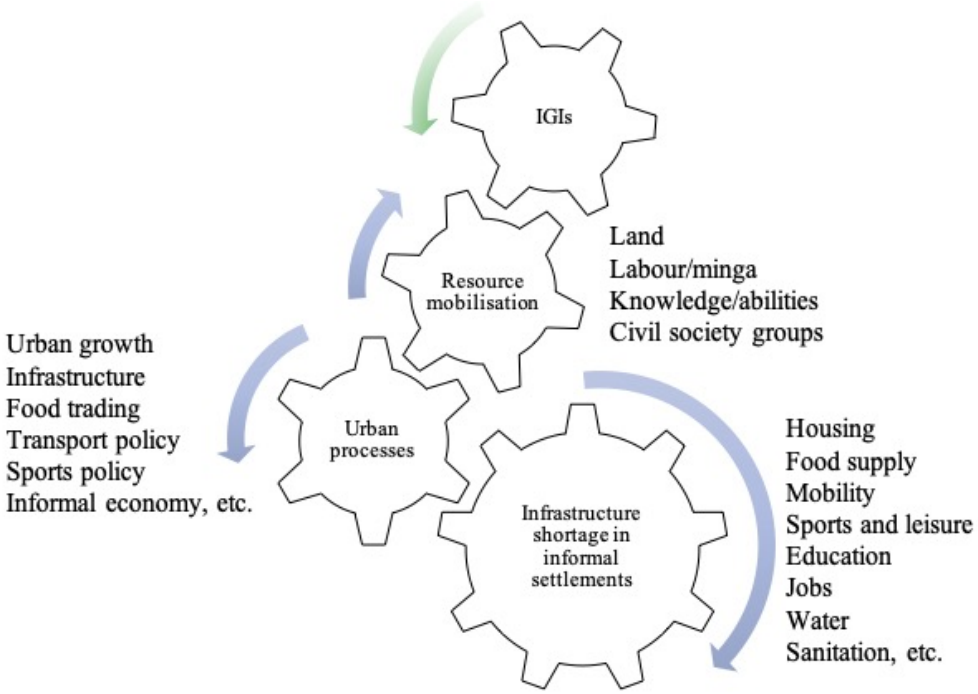


Figure 8.1. Theoretical implication of IGI.

Specifically, the concept of IGI brings value and originality to the urban geography and planning literature concerned with both GI and informality in at least three respects: 1) the emergence course of IGIs defies the entrenched view from the Global North that achieving GI, as suggested by Diehl (2018) and discussed in 2.3.2, is at large a problem of financial resource mobilisation through conventional instruments of the financial markets. Instead, IGIs emerge and develop in harmony with existing practices in place, from mobilising local labour, most frequently in form of *mingas* as explained in 5.3, 6.4 and 7.2.1, along with material and epistemic resources. 2) In line with Roy (2005) and McFarlane (2012), as discussed in 2.4, IGIs obscure the oft-assumed separation between formality and informality. Instead, by laying bare the networks that lie behind, IGIs shed light on the tangled relations between institutions and everyday lives in the peripheries. IGIs show informality as an urban process and continuum rather than a single isolated phenomenon. Finally, 3) IGI provides support for the proposed politics of radical democracy as a condition for radical incrementalism (McFarlane & Vasudevan, 2014; Pieterse, 2013) as discussed in 2.5.3. The position of providing means and securing freedoms for peripheral communities to take responsibility of their own development resonates with when, for instance, the sports leagues demand the endorsement of concession agreements from the municipality to maintain and enhance the pitch space, as discussed in 7.3.3.

8.3.3. Implications for practice

This dissertation derives some practical implications. The most obvious is that anticipation of the making, transformation, and unmaking of IGIs is useful and desirable for greenspace planning and delivery in cities of the Global South. In this regard, in line with Mell (2013) and Wright (2011), 2.3 discussed the point that despite a plethora of guiding principles, challenges remain on how GI should be planned worldwide. Notwithstanding, findings in this study imply that intervening in policies of food commercialisation, including food quality and storage/retailing infrastructure, may impact the production and reproduction of UCAs, and consequently the shares of green-covered land in informal settlements. Likewise, public transport policy may be reshaped to integrate footpaths in the mobility networks and impact the scope of utility walking as a mainstream element of mobility in the city. Similarly, intervening in sports policy to facilitate and promote participation in competitive encounters can influence the spatial scope and features of

pitches. Therefore, stakeholders of policy change pertinent to urban food, public transport, and sports are crucial, yet overlooked, actors of green space policy making.

A second practical implication is that the concept of IGI can support policy-making relevant to food security, mobility, and career development in informal settlements. On these matters, 5.4.1., 6.3.4., and 7.3.2. have shown how promoting the development of UCAs, restoring ecological functionalities of ravines and slopes, and stimulating sports in informal settlements can help respectively to secure food, enhance mobility, and pursue a career. This is important knowledge for urban planners and policy stakeholders to consider when designing the development path of the city.

Third, attempts to restore the ecological functions of the landscapes where informal settlements exist can support the production and preservation of IGIs. In this regard, 4.5.1 argued that restoring and protecting the hydrological functionalities of the ravines enhance access to water, and subsequently facilitate the production and maintenance of UCAs and pitches. About this, 5.5.1 indicated that UCAs and pitches compete for water in informal settlements. Moreover, the rejuvenation of ravines was proven to be beneficial also for mobility since it fuels production, preservation, and transformation of footpaths, which support utilitarian walking for informal settlement dwellers. Therefore, IGIs can help environmental planners, natural resources managers, and development economists in designing policies that simultaneously address environmental, social, and economic challenges in informal settlements.

The possibility of integrating informality in the management of urban transformation constitutes a fourth practical implication of this research. As shown in 4.3.1 and 4.4.1, informality exists in a parallel institutionalisation with analogous functionalities to those of the formal city. Citizens who rely on informal practices resolve their everyday lives with actors and organisations that are strangers to the conventional, and fuel processes of urban transformation in this process. Findings in this study imply that liaising with organisations that govern informality can support the production, reproduction, and transformation of IGIs. This is more obvious in the case of pitches, as discussed in 7.3.3, where politicians engage with local leagues in clientelist relationships to exchange votes and active support with pitch enhancement and community development projects. Thus, social organisations that govern informal practices are perhaps the most appropriate channels to induce spatial transformation. This is useful knowledge for those involved in innovation in urban development.

Lastly, this dissertation also has practical implications for sustainable development, as framed in the United Nations' SDGs 2030 agenda. Findings in this dissertation imply that intervening in favour of IGIs preservation and reproduction can help urban planners and those involved in sustainable development policy to address the following targets as shown in Table 8.1:

Table 8.1. Practical implications for Sustainable Development Goals (SDG) and targets (UN, 2015)

SDG	Target	
2	4	Ensure resilient agricultural practices
5	5	Ensure women's opportunities in economic and public life
9	a	Facilitate sustainable and resilient infrastructure development
11	2	Access to sustainable and affordable transport systems
11	3	Enhance sustainable human settlement planning and management
11	6	Reduce adverse environmental impacts of cities
11	7	Access to green–inclusive spaces
13	3	Improve capacity for climate change mitigation and adaptation
15	3	Restore degraded land and soil

The practical implications discussed above have a direct reference to the Quito's Plan for Development and Territorial Management 2015 – 2025 introduced in 4.2.1. In this regard, this thesis has provided further knowledge and tools that are beneficial for a more suitable implementation of actions aimed at tackling sustainable development, which is a core principle of the plan. Specifically, the relational aspect of the concept of IGI can facilitate policy processes that enable the production, effective use, and management of infrastructure in informal settlements. It can likewise help in harnessing economic activity of the periphery with the city's core. And, lastly, it can aid planners and environmental intervention designers in adopting more effective and budget-efficient approaches to the preservation of ravines and the green landscape neighbouring informal settlements.

8.3.4. Implications for methodology

This dissertation holds some methodological implications. Nevertheless, it should be pointed out that the methodology and methods used herein are not new. The informal practices standpoint has produced a wide range of theoretical understandings

and a rich literature base to draw from and address informal settlements in cities in developing countries. As reviewed in 2.4, prominent stances include practices relevant to housing, mobility, sanitation, water, and electricity. This thesis adds to this growing body of research by focusing on the struggles of inhabitants to secure GI. So, the most obvious methodological implication is that this research has offered a fresh perspective from which to explore both GIs and informal settlements, which can be useful when designing and implementing urban policies for green spaces' preservation and expansion.

To my knowledge, GIs in informal settlements had not previously been tested in terms of their ability to enable agencies of everyday life. Similarly, past research has omitted some important issues such as how GIs are produced and transformed in this context, which are essential for debates on sustainable development and contemporary urban planning. Moreover, conventional approaches to studying GIs, as discussed in 2.3, are not likely to yield theoretical insights that advance our understanding of how GIs in informal settlements are made, remade, and unmade. Hence, the selection of methods in this research was intended to reflect on how, despite the shortage of governmental input, informal settlement dwellers engage in ensuring that some GIs remain in place.

The use of qualitative techniques with focus on everyday practices was proven appropriate and convenient to lay bare causal relationships that induce the production of IGIs and subsequent mechanisms of transformation. In this study, I selected Quito city as my case study for experimentation of existing practices that rely on IGIs. This research has drawn on a mix of interviews, focus groups, participatory observations, background investigation of communities, transect walks, and analyses of newspaper articles and social media. The reasons for using this mix of methods are manifold. In the first place, doing so allowed me to obtain different perspectives from diverse actors on the same subject in participants' own words. Then, it also allowed me to explore contradictions, particularly between interviewees in government and actual everyday practices experienced in IGIs. Lastly, it allowed me to examine and re-examine findings by comparing them against each other.

Specifically, this approach allowed identification of key elements that enable UCA creation and the networks of suppliers, customers, and cooperating peers in which they are embedded, and which shape their transformation. For example, 5.2 and 5.3 described how civil society groups mobilise knowledge, resources, local labour, and space to produce UCAs, and how these pull inhabitants, particularly women, into

the city food retail networks and other spaces of formality. Similarly, as shown in 6.3.1, this approach allowed the tracing of roads, bridges, and transport hubs that footpaths connect, and the stories behind their current shape and features. In terms of pitches, 7.2.2 explained how following the creation of the local league, pitches are inserted into a network of circulation for players, politicians, vendors, and individuals involved in other leagues, which impact their incremental transformation. The ability to thrust players and league leaders into the city's sports dynamics embodies the pitches' production of continuity in the city. Also, this approach permitted the identification of tensions between UCAs and pitches in their demands for water, and how involvement of leagues with local politicians generates priority for them.

Furthermore, this approach allowed the introduction of new areas of controversy in informal settlements that have not been addressed. For instance, the exploration of UCAs in 5.3 revealed factors that restrain women from racing for job opportunities in the city and perpetuate gender inequalities. Also, it disentangled actors and dynamics in the territorial food system that shape nutrition practices in these spaces. Moreover, examining footpaths exposed how forms of urban growth, both formal and informal, put dwellers in a dynamic of progressive spatial isolation, as seen in 6.4.1. Likewise, 7.4.1 showed how practices of privatisation of the playing space, while convenient for maintaining the space and endorsing sense of ownership, also contribute to perceptions of fear and insecurity within informal settlements. These are all new findings and causal relations that this study has produced, and which have not been reported.

Finally, other methodological implications of this dissertation include some guidance to investigate: 1) gender relations and inequalities in informal settlements. The exploration of IGIs exposed a set of disadvantages for women in generating household income and accessing conventional urban amenities. 2) Food access for the urban poor. Chapter 5 identified actors and practices that shape food intake norms in informal settlements. 3) Choices for everyday mobility in informal settlements. Finally, 4) informal mechanisms of resource mobilisation. These are all concerns in sustainable development and urban planning research.

8.4. Strengths and limitations

This section discusses the strengths and limitations of this research. A key strength of the present study lies in the comparison of the three GI typologies – UCAs, footpaths, and football/*ecuavoley* pitches – used in the process of developing

the concept of IGI. The multiple sources of evidence and the multiplicity of actors involved, which are independently relevant to each of the three typologies, represent a comprehensive and cross-referenced examination of: 1) the production process of IGIs; 2) the ways IGIs support the everyday life of inhabitants of informal settlements; and 3) the dynamics that allow for IGIs' maintenance and transformation. This establishes the basis for the theoretical validity of my findings. Besides, data were collected from the voices of the participants and from the researcher's direct observation and own experience of the phenomena, which allowed for rich insights into everyday lives and the practices that rely on IGIs.

In terms of limitations, first, this research has focused on established and stable informal settlements in Quito. This study did not explore emerging informal settlements among its sources of evidence. This is meaningful because, in line with Allen and Cochrane (2007) and as discussed in 2.5.3.1, informal settlements are differently susceptible to urban dynamics at different stages of their development. This raises a note of caution regarding the applicability of the findings to informal settlements in more precarious and incipient conditions.

Second, the diversity of sources of evidence, including spaces beyond UCAs, footpaths, and football/*ecuavoley* pitches distributed across seven informal settlements, implies that this dissertation does not report all of the realities for each of the topics and types of IGI addressed. Instead, although it involved empirical engagement with everyday practices in the spaces examined, the analytical phase focused on exploring commonalities and consistencies across territories and actors investigated that would relate to the concept suggested here. This constitutes a limitation in that there are spaces that may arguably be GIs of informal settlements, but which were not considered in this study as a potential fit for the IGI concept. This might contribute to an atmosphere of contestation. This is the case, for example, for greenspaces and playgrounds that are seldom maintained, and which inhabitants seldom use because they are perceived as peculiarly unsafe, as referred to in 2.3.4. Nevertheless, while this may be a limitation, the approach used here is still useful to develop an understanding of how GI is seen in the informal context.

Third, the absence of reliable maps with which to navigate the informal settlements of Quito was a crucial limitation at the beginning of the fieldwork. This is clear, for instance, in the significant disparity between the municipality figures for allotments and that of the NGOs, as discussed in 5.4. To cope with this limitation, the sampling protocols relied on a mix of guided walks and online satellite images,

whereby some potential forms of IGI might have been overlooked. Summing up, this study offers an empirical demonstration of the applicability of IGI as conceptual tool from which to understand GI in informal settlements. In doing so, IGI has sought to map out a new research agenda that addresses questions that are key to sustainable development in the context of the cities of the Global South.

8.5. Directions for future research

The following lines propose three priorities for future research that can both, advance the delivery of greenspace in cities of the Global South, and anticipate the transformation of the built environment in informal settlements.

First, there is a need to translate IGI data into policy-relevant information. This thesis has shown that IGIs emerge spontaneously to make spaces functional for everyday practices in informal settlements and transform in harmony with formal urban processes. Therefore, both public and private initiatives that alter land use in the city can drive greenspace stock in informal settlements. However, questions remain on how these relationships inform policy making. To extend the benefit of IGI as a conceptual tool, future work should look into building scenarios that incorporate the interests of the diverse actors involved in IGI's production and transformation (e.g. land price and environmental protection), and projections of relevant populations and demand growth. Such understanding of interrelations can contribute to debates in both urban economic theory and environmental management.

Second, it is important to register how IGIs emerge, transform, and disappear in other cities and regions with a significant presence of informal settlements. On this matter, future research should develop a comprehensive set of case studies for comparative analysis, to determine the relative effects of cultural, economic, and environmental factors on IGIs values. A substantial number of new case studies will provide nuances to the broad understanding of IGI and can contribute to debates on ecological systems theory.

Third, to advance urban sustainable development in the Global South, it is necessary that informal practices become greener (e.g. housing, mobility, and access to food, water, energy, and sanitation). However, translating research into practice in the informal realm is distinctively challenging as it might involve bypassing conventional processes of policy making. This is important because, while associated with lower carbon footprint, the practices that informal settlements' residents adopt to fulfil the inadequate access to basic services are often blamed for environmental

degradation. On this matter, this thesis has identified a set of informal practices and how these are organised, sustained, and governed. Future research should look into the organisation of informality, in such a way that attempts to adopt greener practices incorporate the interests and visions of all. This can contribute to the literature on both social practice and urban planning.

Finally, the applicability of IGI can be extended into multidisciplinary research agendas. Understanding how IGIs emerge and transform can yield, for instance, theories that integrate informality in policies relevant to disaster risk reduction, social inclusion, and cultural and natural heritage protection.

References

Adegun, O. B. (2017). Green infrastructure in relation to informal urban settlements. *Journal of Architecture and Urbanism, 41*(1), 22-33.

Adegun, O. B. (2018). When green is grievous: Downsides in human-nature interactions in informal urban settlements. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability, 11*(3), 347-361.

Adelekan, I. O. (2012). Vulnerability to wind hazards in the traditional city of Ibadan, Nigeria. *Journal of Environment and Urbanization, 24*(2), 597-617.

Adger, W. N. (2010). Social capital, collective action, and adaptation to climate change. In V. M (Ed.), *Der klimawandel* (pp. 327-345): Springer.

Ahern, J. (1995). Greenways as a planning strategy. *Journal of Landscape and Urban Planning, 33*(1-3), 131-155.

Ahern, J. (2007). *Green infrastructure for cities: The spatial dimension.* Paper presented at the Proceedings of the Conference on Cities of the Future: Towards Integrated Sustainable Water and Landscape Management.

Ahlers, R., Cleaver, F., Rusca, M., & Schwartz, K. (2014). Informal space in the urban waterscape: Disaggregation and co-production of water services. *Journal of Water Alternatives, 7*(1), 1-14.

Akbar, H. D., Minnery, J. R., van Horen, B., & Smith, P. (2007). Community water supply for the urban poor in developing countries: The case of Dhaka, Bangladesh. *Journal of Habitat International, 31*(1), 24-35.

Alarcón, I. (2016, April 8th, 2016). 32 lugares son el paraíso de los productos agroecológicos [32 places are the paradise of agroecological products]. *El Comercio*. Retrieved from http://www.elcomercio.com/actualidad/lugares-paraiso-productos-agroecologicos-quito.html

Alarcón, I. (2017a, March 9th, 2017). Rescatan a joven de 17 años que cayó por una quebrada de 15 metros en Llano Chico [A 17 year-old male was rescued from a fall on a 15-metre-deep ravine in Llano Chico]. *El Comercio*. Retrieved from http://www.elcomercio.com/actualidad/joven-cayo-quebrada-llanochico-quito.html

Alarcón, I. (2017b, May 1st, 2017). Una joven fue rescatada tras caer 20 metros por una quebrada [Young female was rescued from slipping 20 metres down a ravine]. *El Comercio*. Retrieved from http://www.elcomercio.com/actualidad/rescate-quebrada-quito-coem-bomberos.html

Alexandri, E., & Jones, P. (2008). Temperature decreases in an urban canyon due to green walls and green roofs in diverse climates. *Journal of Building and Environment, 43*(4), 480-493.

Allen, A., Dávila, J. D., & Hofmann, P. (2006). *Governance of water and sanitation services for the peri-urban poor: A framework for understanding and action in metropolitan regions*: The Development Planning Unit, University College London.

Allen, J., & Cochrane, A. (2007). Beyond the territorial fix: Regional assemblages, politics and power. *Journal of Regional Studies, 41*(9), 1161-1175.

Altmann, J. (1974). Observational study of behavior: Sampling methods. *Journal of Behaviour, 49*(3), 227-266.

Alvarez-Mendoza, C. I., Vilches, R., & Teodoro, A. C. (2017). Evaluation of urban green spaces with UAV-based photography in Quito, Ecuador: Small Unmanned Aerial Systems for Environmental Research.

Álvarez-Rivadulla, M. J., & Bocarejo, D. (2014). Beautifying the slum: Cable car fetishism in Cazucá, Colombia. *International Journal of Urban and Regional Research, 38*(6), 2025-2041.

Alvear, J., Bahamonde, M. C., Bonilla, D., Díaz, V., Gutiérrez, V., Knust, T., . . . Darquea, A. (2016). *Atlas ambiental Quito sostenible [Environmental Atlas sustainable Quito]*. Distrito Metropolitano de Quito: Secretaría de Ambiente del DM Quito Retrieved from http://www.quitoambiente.gob.ec/ambiente/index.php/descarga-de-menu.

Anil, B., Tonts, M., & Siddique, K. H. (2015). Strengthening the performance of farming system groups: Perspectives from a Communities of Practice framework application. *International Journal of Sustainable Development & World Ecology, 22*(3), 219-230.

Aradau, C. (2010). Security that matters: Critical infrastructure and objects of protection. *Journal of Security Dialogue, 41*(5), 491-514.

Armijos-Burneo, M. T. (2012). *Negotiating citizenship through communal water management in highland Ecuador.* University of Sussex.

Armson, D., Stringer, P., & Ennos, A. (2013). The effect of street trees and amenity grass on urban surface water runoff in Manchester, UK. *Journal of Urban Forestry & Urban Greening, 12*(3), 282-286.

Asoligas. (2012). Reglamento de inscripción y transferencia de jugadores [Regulation of registration and transfer of players]. Quito, Ecuador: Asociación de ligas deportivas barriales de Pichincha.

Auyero, J. (2000). The hyper-shantytown: Neo-liberal violence(s) in the Argentine slum. *Journal of Ethnography, 1*(1), 93-116.

Avilés-Pino, E. (2014). Enciclopedia del Ecuador: Huasipungo [Encyclopedia of Ecuador: Huasipungo]. Retrieved on January 18th, 2017 from http://www.enciclopediadelecuador.com/historia-del-ecuador/huasipungo/

Baeza, D. C. (2006). *Metas del milenio y tugurios: Una metodología utilizando datos censales [Millennium goals and slums: A methodology using census data]* (Vol. 63): United Nations Publications.

Bagstad, K. J., Semmens, D. J., Waage, S., & Winthrop, R. (2013). A comparative assessment of decision-support tools for ecosystem services quantification and valuation. *Journal of Ecosystem Services, 5*(2013), e27-e39.

Baker, T., & McGuirk, P. (2017). Assemblage thinking as methodology: Commitments and practices for critical policy research. *Journal of Territory, Politics, Governance, 5*(4), 425-442.

Balatti, J., Black, S., & Falk, I. (2006). Reframing adult literacy and numeracy course outcomes: A social capital perspective: Australian Government or NCVER.

Bankoff, G. (2015). "Lahat para sa lahat" (Everything to everybody): Consensual leadership, social capital and disaster risk reduction in a Filipino community. *Journal of Disaster Prevention and Management, 24*(4), 430-447.

Barlow, D., Burrill, G., & Nolfi, J. (1977). Research report on developing a community level natural resource inventory system: Center for Studies in Food Self-Sufficiency: 1977.

Barreto-Vaquero, R. (1994). Manejo ambiental y prevención de desastres naturales con participación comunitaria: El caso de los barrios populares del noroccidente de Quito [Environmental management and prevention of natural disasters with community participation: The case of the popular neighbourhoods of the north-west of Quito]. *Viviendo en riesgo: Comunidades vulnerables y prevención de desastres en América Latina* (pp. 297-316): Red de Estudios Sociales en Prevención de Desastres en América Latina; Facultad Latinoamericana de Ciencias Sociales, FLACSO sede Ecuador; Centro de

Coordinación para la Prevención de los Desastres Naturales en América Central.
Barthel, S., & Isendahl, C. (2013). Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities. *Journal of Ecological Economics, 86*(2013), 224-234.
Barthel, S., Parker, J., & Ernstson, H. (2015). Food and green space in cities: A resilience lens on gardens and urban environmental movements. *Journal of Urban Studies, 52*(7), 1321-1338.
Battersby, J. (2011). Urban food insecurity in Cape Town, South Africa: An alternative approach to food access. *Journal of Development Southern Africa, 28*(4), 545-561.
Beatley, T. (2012). *Green urbanism: Learning from European cities*: Island Press.
Bélanger, P. (2015). Is landscape infrastructure? In G. Doherty & C. Waldheim (Eds.), *Is Landscape...? Essays on the identity of landscape* (pp. 204-241). London: Routledge.
Bell, S. B. (2018). Drainage. *Urban water sustainability* (Vol. 106, pp. 106-130): Routledge in association with GSE Research.
Bennett, B. T. (2018). *Understanding, assessing, and responding to terrorism: Protecting critical infrastructure and personnel*: John Wiley & Sons.
Bennett, E. M., Peterson, G. D., & Gordon, L. J. (2009). Understanding relationships among multiple ecosystem services. *Journal of Ecology Letters, 12*(12), 1394-1404.
Bhattacharyya, S. C. (2014). Business issues for mini-grid-based electrification in developing countries. *Mini-grids for rural electrification of developing countries* (pp. 145-164): Springer.
Biagi, S. (2012). *Media impact: An introduction to mass media*: Cengage Learning.
Booth, B., & Bellouin, N. (2015). Climate change: Black carbon and atmospheric feedbacks. *Journal of Nature, 519*(7542), 167.
Borelli, S., Chen, Y., Conigliaro, M., & Salbitano, F. (2015). *Green infrastructure: A new paradigm for developing cities.* Paper presented at the Proceedings of the XIV World Forestry Congress, Durban, South Africa.
Bottema, M. J., & Bush, S. R. (2012). The durability of private sector-led marine conservation: A case study of two entrepreneurial marine protected areas in Indonesia. *Journal of Ocean & Coastal Management, 61*(2012), 38-48.
Brakke, A. (2019). *Shaping the periphery: Emergent architectures in Latin America.* Paper presented at the Proceedings of the Conference on Architectural Research Centers Consortium.
Brandão, M., Levasseur, A., Kirschbaum, M. U., Weidema, B. P., Cowie, A. L., Jørgensen, S. V., . . . Chomkhamsri, K. (2013). Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. *The International Journal of Life Cycle Assessment, 18*(1), 230-240.
Brantley, H. L., Hagler, G. S., Deshmukh, P. J., & Baldauf, R. W. (2014). Field assessment of the effects of roadside vegetation on near-road black carbon and particulate matter. *Journal of Science of the Total Environment, 468*(2014), 120-129.
Brenner, N., & Schmid, C. (2014). The "urban age" in question. *International Journal of Urban and Regional Research, 38*(3), 731-755.
Bucklin, R., Jacob, J., Mather, F., Leary, J., & Naas, I. (2009). Tunnel ventilation of broiler houses. *Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida PS-46*.

Butchart, A., Kruger, J., & Lekoba, R. (2000). Perceptions of injury causes and solutions in a Johannesburg township: Implications for prevention. *Journal of Social Science & Medicine, 50*(3), 331-344.
Buzby, K. (2013). Farming the slums: Using eminent domain and urban agriculture to rebuild Baltimore's blighted neighborhoods. *William & Mary Law School Scholarship Repository, 38*, 479-506.
Cameron, R. W., Blanuša, T., Taylor, J. E., Salisbury, A., Halstead, A. J., Henricot, B., & Thompson, K. (2012). The domestic garden: Its contribution to urban green infrastructure. *Journal of Urban Forestry & Urban Greening, 11*(2), 129-137.
Carpinetti, L. C., Gerolamo, M. C., & Galdámez, E. V. (2007). Continuous innovation and performance management of SME clusters. *Journal of Creativity and Innovation Management, 16*(4), 376-385.
Carrión, D., Vásconez, J., & Bermudez, N. (2003). Urban slums reports: The case of Quito, Ecuador: Understanding slums: Case studies for the global report on human settlements. University College London World Reports.
Carrión, F. (2006). Escenarios del fútbol: De la calle, por el barrio, al estadio [Football stages: From the street, through the neighbourhood, to the stadium]. *El jugador número 12: Fútbol y sociedad*: FLACSO sede Ecuador, Municipio Metropolitano de Quito, EPMAAP-Q, Diario El Comercio.
Carrión, F., & Vallejo, R. (1994). La planificación de Quito. Del plan director a la ciudad democrática [The planning of Quito. From the master plan to the democratic city]. In F. Carrión Mena (Ed.), *Ciudades y políticas urbanas en América Latina* (pp. 143-168): CODEL.
Carvajal, V. (2005). Lista preliminar de artrópodos del bosque protector Pichincha y sus alrededores [Preliminary list of arthropods of the protected forest Pichincha and its surroundings] (Vol. 26, pp. 141-160): Escuela Politécnica Nacional.
Cass, N., Schwanen, T., & Shove, E. (2018). Infrastructures, intersections and societal transformations. *Journal of Technological Forecasting and Social Change, 137*(2018), 160-167.
Cass, N., Shove, E., & Urry, J. (2005). Social exclusion, mobility and access. *Journal of The Sociological Review, 53*(3), 539-555.
CBD. (1993). UN Convention on Biological Diversity. *United Nations.* Retrieved on July 5th, 2018 from https://www.cbd.int/
CBD. (n.d.). Convention on Biological Diversity: Terms of use. *United Nations.* Retrieved on May 21th, 2018 from https://www.cbd.int/terms/
CEDATOS. (2016). Los principales problemas de las ciudades del Ecuador [The main problems of the cities of Ecuador]. Retrieved on December 5th, 2016 from http://www.cedatos.com.ec/detalles_noticia.php?Id=257
CEDEAL. (2017). Talleres de formación de defensoras de derechos humanos [Training workshops for human rights defenders]. Retrieved on March 3rd, 2017 from http://www.cedeal.org/content/inicio.php
Children International. (2017). Sponsor a child in Ecuador. Retrieved on February 2nd, 2017 from https://www.children.org/see-the-impact/where-we-work/south-america-ecuador
Cieza, R., Davies, L., & Gómez, S. (2003). Las mujeres en la agricultura urbana: Un estudio de caso en Argentina [Women in urban agriculture: A case study of Argentina]. *LEISA Revista de Agroecología, 18*(4), 25-27.
Cilliers, S., Cilliers, J., Lubbe, R., & Siebert, S. (2013). Ecosystem services of urban green spaces in African countries: Perspectives and challenges. *Journal of Urban Ecosystems, 16*(4), 681-702.

Clavijo-Palacios, C., & Cuvi, N. (2017). La sustentabilidad de las huertas urbanas y periurbanas con base agroecológica: El caso de Quito [The sustainability of urban and periurban vegetable gardens with an agro-ecological base: The case of Quito]. *Letras Verdes: Revista Lationamericana de Estudios Socioambientales. FLACSO sede Ecuador, 21*, 68-91.

Corburn, J. (2017). Urban place and health equity: Critical issues and practices. *International Journal of Environmental Research and Public Health, 14*(2), 117.

Coutard, O., & Rutherford, J. (2015). *Beyond the networked city: Infrastructure reconfigurations and urban change in the North and South*: Routledge.

Cresswell, T. (2006). *On the move: Mobility in the modern western world*: Taylor & Francis.

Cresswell, T. (2010). Towards a politics of mobility. *Journal of Environment and Planning D: Society and Space, 28*(1), 17-31.

Crow, B., & Odaba, E. (2010). Access to water in a Nairobi slum: Women's work and institutional learning. *Journal of Water International, 35*(6), 733-747.

Crush, J., Hovorka, A., & Tevera, D. (2011). Food security in Southern African cities: The place of urban agriculture. *Journal of Progress in Development Studies, 11*(4), 285-305.

Currie-Alder, B. (2003). Why participation? Enhancing our understanding of participatory approaches to natural resource management: Living document for the MINGA Program Initiative. International Development Research Centre: Ottawa, ON, Canada.

D'Ercole, R., & Metzger, P. (2004). *Vulnerabilidad del Distrito Metropolitano de Quito. Metodología de investigación [Vulnerability of the Metropolitan District of Quito. Research methodology]* (Vol. 23): Cooperación IRD y Municipio de Quito.

Daily, G. C. (1997). Valuing and safeguarding Earth's life support systems. *Natures Services: Societal Dependence on Natural Ecosystems. Island Press, Washington, DC*, 365-374.

Das, A. K., & Takahashi, L. M. (2009). Evolving institutional arrangements, scaling up, and sustainability: Emerging issues in participatory slum upgrading in Ahmedabad, India. *Journal of Planning Education and Research, 29*(2), 213-232.

Davies, C., MacFarlane, R., McGloin, C., & Roe, M. (2006). Green infrastructure planning guide. *Project: Final Report*.

Davis, M. (2006). Planet of slums. *Journal New Perspectives Quarterly, 23*(2), 6-11.

Davoren, E. (2009). *Plant diversity patterns of a settlement in the North-West Province, South Africa.* North-West University, Potchefstroom Campus.

De la Rocha, M. G. (1988). Economic crisis, domestic reorganisation and women's work in Guadalajara, Mexico. *Bulletin of Latin American Research, 7*(2), 207-223.

De Soto, H. (2000). *The mystery of capital: Why capitalism triumphs in the West and fails everywhere else*: Basic Civitas Books.

de Souza Briggs, X. (1998). Brown kids in white suburbs: Housing mobility and the many faces of social capital. *Journal of Housing Policy Debate, 9*(1), 177-221.

Deci, E. L., & Ryan, R. M. (1995). Human autonomy. *Efficacy, agency, and self-esteem* (pp. 31-49): Springer.

Dekker, P., & Uslaner, E. M. (2003). *Social capital and participation in everyday life*: Routledge.

Deleuze, G., & Parnet, C. (1987). *Dialogues*. New York: Columbia University Press.

Demoraes, F. (2015). *Movilidad, elementos esenciales y riesgos en el Distrito Metropolitano de Quito [Mobility, essential elements, and risks in the Metropolitan District of Quito]*: Colección Quito Metropolitano.

Demuzere, M., Orru, K., Heidrich, O., Olazabal, E., Geneletti, D., Orru, H., . . . Faehnle, M. (2014). Mitigating and adapting to climate change: Multi-functional and multi-scale assessment of green urban infrastructure. *Journal of Environmental Management, 146*(2014), 107-115.

Dessai, S., & Hulme, M. (2007). Assessing the robustness of adaptation decisions to climate change uncertainties: A case study on water resources management in the East of England. *Journal of Global Environmental Change, 17*(1), 59-72.

Diehl, J. (2018). *Stormwater and resiliency.* Paper presented at the Proceedings of the Conference on Urban Green Infrastructure: Science, Operation and Finance. New Heaven, CT.

Djellal, F., & Gallouj, F. (2016). Service innovation for sustainability: Paths for greening through service innovation. *Service Innovation* (pp. 187-215): Springer.

Djémin, J. É., Kouamé, J. K., Deh, K. S., Abinan, A. T., & Jourda, J. P. (2016). Contribution of the sensitivity analysis in groundwater vulnerability assessing using the DRASTIC method: Application to groundwater in Dabou region. *Journal of Environmental Protection, 7*(1), 129-143.

DMQ. (2010, August 24th, 2010). Con una inversión de 13 millones de dólares, 80 mil usuarios se beneficiarán de Fondo de Electrificación Rural [With an investment of 13 million USD, 80 thousand users will benefit from Fondo de Electrificación Rural]. *Prensa Quito*. Retrieved from http://tiny.cc/im7tcz.

DMQ. (2012). *Resolución de declaratoria de patrimonio natural, histórico, cultural y paisajístico al sistema de quebradas del Distrito Metropolitano de Quito [Resolution of declaration of natural patrimony, historical, cultural, and landscape to the system of streams of the Metropolitan District of Quito]*. Municipio del Distrito Metropolitano de Quito. Retrieved from http://www7.quito.gob.ec/mdmq_ordenanzas/Resoluciones de Concejo/Año 2012/RC-2012-350 - SISTEMA DE QUEBRADAS - DECLARATORIA PATRIMONIO CULTURAL.pdf.

DMQ. (2014). *Diagnóstico de la movilidad en el Distrito Metropolitano de Quito para el Plan Metropolitano de Desarrollo Territorial (PMOT) [Diagnosis of mobility in the Metropolitan District of Quito for the Metropolitan Territorial Development Plan (PMOT)]*. Municipio del Distrito Metropolitano de Quito.

DMQ. (2016). *Mi quebrada recuperada [My recovered ravine]*. Municipio del Distrito Metropolitano de Quito Retrieved from http://www.fondoambientalquito.gob.ec/sites/default/files/2016-08/Mi Quebrada Recuperada - Propuesta.pdf.

DMQ. (2017). *Ordenanza Metropolitana No. 0194 [Municipal Ordinance No. 0194]*. Municipio del Distrito Metropolitano de Quito Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwiM2oaVnpvjAhXzSBUIHQRMDtQQFjAAegQIAhAC&url=http%3A%2F%2Fwww.amt.gob.ec%2Ffiles%2Flotaip2018%2Fdocs%2FORDMbicicletaPublica.pdf&usg=AOvVaw2djpKvIXN42iElOGSEWFPs.

Douglas, I. (2012). Urban ecology and urban ecosystems: Understanding the links to human health and well-being. *Journal of Current Opinion in Environmental Sustainability, 4*(4), 385-392.

Douglas, I. (2016). The challenge of urban poverty for the use of green infrastructure on floodplains and wetlands to reduce flood impacts in intertropical Africa. *Journal of Landscape and Urban Planning, 180*(2016), 262-272.
Dovey, K. (2012). Informal urbanism and complex adaptive assemblage. *Journal of International Development Planning Review, 34*(4), 349-368.
Dubbeling, M. (2011). Integrating urban agriculture in the urban landscape. *Urban Agriculture Magazine, 25*(2011), 43-46.
Dunnett, N., Swanwick, C., & Woolley, H. (2002). *Improving urban parks, play areas and green spaces*: Department for Transport, Local Government and the Regions London.
Ecuador en vivo. (2013). Los Quiteños pierden 5 años de su vida en el tráfico, y el alcalde dice que todo funciona de maravilla, según Rodas [Quitenians waste 5 years of their life in the traffic while the city mayor says that everything works wonderfully, according to Rodas]. Retrieved on December 11th, 2016 from http://www.ecuadorenvivo.com/politica/83-videos/6920-los-quitenos-pierden-5-anos-de-su-vida-en-el-trafico-y-el-alcalde-dice-que-todo-funciona-de-maravilla-segun-rodas.html - .Wf4dKkycaT8
Edmunds, D. S., & Wollenberg, E. K. (2013). *Local forest management: The impacts of devolution policies*: Routledge.
El Comercio. (2011, June 22th, 2011). Así se vive sin servicios básicos en dos barrios [This is living without basic services in two neighbourhoods]. *El Comercio*. Retrieved from https://www.elcomercio.com/actualidad/quito/se-vive-servicios-basicos-barrios.html
El Comercio. (2014, June 21st, 2014). El Camino del Inca, obra maestra de América, ingresa al Patrimonio de la Humanidad [The Inca pathway, masterpiece of America, enters the World Heritage]. *El Comercio*. Retrieved from https://www.elcomercio.com/tendencias/camino-inca-obra-maestra-patrimonio.html
El Telégrafo. (2012, June 9th, 2012). Servidores fueron ayer al trabajo "en bici" [Government employees went to work yesterday "by bike"]. *El Telégrafo*. Retrieved from http://www.eltelegrafo.com.ec/noticias/quito/11/servidores-publicos-fueron-ayer-al-trabajo-en-bici
El Telégrafo. (2014, December 3rd, 2014). El deporte barrial en Quito agrupa a 7600 clubes y 350 ligas [The neighbourhood sport in Quito groups 7600 clubs and 350 leagues]. *El Telégrafo*. Retrieved from http://www.eltelegrafo.com.ec/noticias/quito/11/el-deporte-barrial-en-quito-agrupa-a-7-600-clubes-y-350-ligas-infografia
El Telégrafo. (2015, December 31st, 2015). El cambio climático incrementa el riesgo de deslizamientos [Climate change increases the risk of landslides]. *El Telégrafo*. Retrieved from https://www.eltelegrafo.com.ec/noticias/quito/1/el-cambio-climatico-incrementa-el-riesgo-de-deslizamientos-en-quito
El Telégrafo. (2016, August 26th, 2016). Los vecinos de Bolaños obligados a caminar [The residents of Bolaños forced to walk]. *El Telégrafo*. Retrieved from http://www.eltelegrafo.com.ec/noticias/quito/11/los-vecinos-de-bolanos-obligados-a-caminar
El Telégrafo. (2017, July 29th, 2017). Los barrios convierten las quebradas en áreas verdes [The neighbourhoods transform the ravines into green areas]. *El Telégrafo*. Retrieved from https://www.eltelegrafo.com.ec/noticias/179/11/los-barrios-convierten-las-quebradas-en-areas-verdes
EPMAPS. (2017). Sistema de Distribución [Distribution systems]. Retrieved on December 5th, 2017 from https://www.aguaquito.gob.ec/?page_id=1392

Epule, E. T., Peng, C., Lepage, L., & Chen, Z. (2014). Enabling conditions for successful greening of public spaces: The case of Touroua, Cameroon based on perceptions. *Journal of Small-scale Forestry, 2*(13), 143-161.

Erasmus, C. J. (1956). Culture structure and process: The occurrence and disappearance of reciprocal farm labor. *Southwestern Journal of Anthropology, 12*(4), 444-469.

Escobedo, F. J., Kroeger, T., & Wagner, J. E. (2011). Urban forests and pollution mitigation: Analyzing ecosystem services and disservices. *Journal of Environmental Pollution, 159*(8-9), 2078-2087.

Evans, J. (2011). Resilience, ecology and adaptation in the experimental city. *Journal of Transactions of the Institute of British Geographers, 36*(2), 223-237.

Evans, J., O'Brien, J., & Ch Ng, B. (2018). Towards a geography of informal transport: Mobility, infrastructure and urban sustainability from the back of a motorbike. *Journal of Transactions of the Institute of British Geographers, 43*(2018), 674-688.

Faas, A. (2015). Disaster resettlement organizations and the culture of cooperative Labor in the Ecuadorian Andes. In M. Companion (Ed.), *Disaster's Impact on Livelihood and Cultural Survival: Losses, Opportunities, and Mitigation* (pp. 51-62).

Farrugia, S., Hudson, M. D., & McCulloch, L. (2013). An evaluation of flood control and urban cooling ecosystem services delivered by urban green infrastructure. *International Journal of Biodiversity Science, Ecosystem Services & Management, 9*(2), 136-145.

Finewood, M. H. (2016). Green infrastructure, grey epistemologies, and the urban political ecology of Pittsburgh's water governance. *Journal of Antipode, 48*(4), 1000-1021.

Fletcher, T. D., Shuster, W., Hunt, W. F., Ashley, R., Butler, D., Arthur, S., . . . Bertrand-Krajewski, J.-L. (2015). SUDS, LID, BMPs, WSUD and more: The evolution and application of terminology surrounding urban drainage. *Urban Water Journal, 12*(7), 525-542.

Flusty, S. (2001). The banality of interdiction: Surveillance, control and the displacement of diversity. *International Journal of Urban and Regional Research, 25*(3), 658-664.

Foster, J., Lowe, A., & Winkelman, S. (2011). The value of green infrastructure for urban climate adaptation. *Center for Clean Air Policy, 750*, 1-52.

Frank, S. (1980). Los señores étnicos de Quito en la época de los Incas [The ethnic lords of Quito in the time of the Incas]: Otavalo, Ed. Gallocapitan.

Frantzeskaki, N., & Loorbach, D. (2010). Towards governing infrasystem transitions: Reinforcing lock-in or facilitating change? *Journal of Technological Forecasting and Social Change, 77*(8), 1292-1301.

Freudenburg, W. R., Frickel, S., & Gramling, R. (1995). Beyond the nature/society divide: Learning to think about a mountain. *Journal of Sociological Forum, 10*(3), 361-392.

Frischmann, B. M. (2008). Environmental infrastructure. *Journal of Ecology Law Quarterly, 35*(2008), 151-178.

Gaffikin, F., & Perry, D. C. (2012). The contemporary urban condition: Understanding the globalizing city as informal, contested, and anchored. *Journal of Urban Affairs Review, 48*(5), 701-730.

Gallaher, C. M., Mwaniki, D., Njenga, M., Karanja, N. K., & WinklerPrins, A. M. (2013). Real or perceived: The environmental health risks of urban sack gardening in Kibera slums of Nairobi, Kenya. *Journal of EcoHealth, 10*(1), 9-20.

Ganapati, S. (2017). Urban studies & planning program. Retrieved on October 22nd, 2017 from http://www.csun.edu/~sg61795/350/definitions.html
García, A. (2017, June 8th, 2017). Municipio construye una red de abastecimiento de agua potable para barrios del noroccidente de Quito [Municipality builds a potable water supply network for neighbourhoods in the north-west of Quito]. *El Comercio*. Retrieved from http://www.elcomercio.com/actualidad/quito-noroccidente-aguapotable-construccion-mauriciorodas.html
García, J. (1985). *Las organizaciones barriales de Quito [Social organisations of Quito]*: Ildis.
Gardner, J. A. (2014). *Living with herbs: A treasury of useful plants for the home and garden*: The Countryman Press.
Gibbs, L. (2014). Freshwater geographies? Place, matter, practice, hope. *Journal of New Zealand Geographer, 70*(1), 56-60.
Gibson-Brydon, T. R. (2016). *The moral mapping of Victorian and Edwardian London: Charles Booth, Christian Charity, and the poor-but-respectable*: McGill-Queen's Press-MQUP.
Gill, S. E., Handley, J. F., Ennos, A. R., & Pauleit, S. (2007). Adapting cities for climate change: The role of the green infrastructure. *Journal of Built Environment, 33*(1), 115-133.
Givens, J. E. (2015). Urbanization, slums, and the carbon intensity of well-being: Implications for sustainable development. *Journal of Human Ecology Review, 22*(1), 107-128.
Glover, L. (2011). *Public transport as a common pool resource.* Paper presented at the Proceedings of the 34th Australasian Transport Research Forum, Adelaide, Australia.
Glover, T. D. (2004). Social capital in the lived experiences of community gardeners. *Journal of Leisure Sciences, 26*(2), 143-162.
Glynn, L. (1984). Quinchuqui: A case study on rural poverty in Ecuador. *Journal of Transformation, 1*(2), 13-15.
Godard, H. R. (2015). *Quito, Guayaquil: Evolución y consolidación en ocho barrios populares [Quito, Guayaquil: Evolution and consolidation in eight popular neighbourhoods]*: Institut Français D'études Andines.
Gonzalez de la Rocha, M. (2007). The construction of the myth of survival. *Journal of Development and Change, 38*(1), 45-66.
Google (Cartographer). (n.d.). Passage from allotment in La Argelia to bioferia in market La Floresta. Retrieved from https://urlzs.com/B5Dqb
Goonetilleke, A., Yigitcanlar, T., Ayoko, G. A., & Egodawatta, P. (2014). *Sustainable urban water environment: Climate, pollution and adaptation*: Edward Elgar Publishing.
Graham, S., & McFarlane, C. (2014). *Infrastructural lives: Urban infrastructure in context*: Routledge.
Grieco, M. (2009). Living infrastructure: Replacing children's labour as a source of sanitation services in Ghana. *Journal of Desalination, 248*(1-3), 485-493.
Griggs, D., Nilsson, M., Stevance, A., & McCollum, D. (2017). *A guide to SDG interactions: From science to implementation*: International Council for Science, Paris.
Gruebner, O., Khan, M. H., Lautenbach, S., Müller, D., Krämer, A., Lakes, T., . . . Galea, S. (2014). The spatial epidemiology of mental well-being in Dhaka's slums. *Spatial Analysis in Health Geography* (pp. 139-160): Ashgate Publishing, Ltd.

Guardiola, J., & García-Quero, F. (2014). Buen Vivir (living well) in Ecuador: Community and environmental satisfaction without household material prosperity? *Journal of Ecological Economics, 107*, 177-184.
Gudeman, S. (2013). *The demise of a rural economy: From subsistence to capitalism in a Latin American village*: Routledge.
Güneralp, B., McDonald, R. I., Fragkias, M., Goodness, J., Marcotullio, P. J., & Seto, K. C. (2013). Urbanization forecasts, effects on land use, biodiversity, and ecosystem services *Urbanization, biodiversity and ecosystem services: Challenges and opportunities* (pp. 437-452): Springer.
Guy, S., Marvin, S., & Medd, W. (2011). *Shaping urban infrastructures: Intermediaries and the governance of socio-technical networks*: Routledge.
Habermas, J. (1973). What does a crisis mean today? Legitimation problems in late capitalism. *Journal of Social Research, 40*(4), 643-667.
Hall, P., & Pfeiffer, U. (2000). Urban future 21: A global agenda for twenty-first century cities: Spon.
Hannerz, U. (2003). Being there... and there... and there! Reflections on multi-site ethnography. *Journal of Ethnography, 4*(2), 201-216.
Hansen, R., & Pauleit, S. (2014). From multifunctionality to multiple ecosystem services? A conceptual framework for multifunctionality in green infrastructure planning for urban areas. *AMBIO: A Journal of the Human Environment, 43*(4), 516-529.
Hartje, V., Klaphake, A., & Schliep, R. (2003). *The international debate on the ecosystem approach: Critical review, international actors, obstacles and challenges*: Bundesamt fur Naturschutz (BfN).
Harvey, D. (1989). From managerialism to entrepreneurialism: The transformation in urban governance in late capitalism. *Journal of Geografiska Annaler: Series B, Human Geography, 71*(1), 3-17.
Harvey, D. (2004). The "new" imperialism: Accumulation by dispossession. *Journal of Socialist Register, 40*, 63-87.
Harvey, D. (2008). The right to the city. In R. T. LeGates & F. Stout (Eds.), *The City Reader* (Vol. 6, pp. 23-40).
Harvey, P., Jensen, C. B., & Morita, A. (2016). *Infrastructures and social complexity: A companion*: Taylor & Francis.
Hasan, A. (2006). Orangi Pilot Project: The expansion of work beyond Orangi and the mapping of informal settlements and infrastructure. *Journal of Environment and Urbanization, 18*(2), 451-480.
Hernández, S. Y., Franco, C., & Angelica, N. (2010). *La aplicabilidad del procedimiento de legalización para los asentamientos informales para la seguridad juridica de las familias de escasos recursos económicos, en función del interes social [The applicability of the legalisation procedure for informal settlements for the legal security of families with limited economic resources, according to the social interest].* Universidad de El Salvador.
Hernández-Garcia, J. (2012). Open spaces in informal settlements in Bogotá: Expressions of attachment and identity. *The Role of Place Identity in the Perception, Understanding, and Design of Built Environments* (pp. 92-106): Bentham Science Publishers.
Heron, T. (2008). Globalization, neoliberalism and the exercise of human agency. *International Journal of Politics, Culture, and Society, 20*(1-4), 85-101.
Herrera-Aráuz, F. (2001). *Los golpes del poder al aire: El 21 de enero a través de la radio [The blows of power to the air: January 21 through the radio]*: Editorial Abya Yala.

Högenauer, A.-L. (2014). Formal rules and informal cooperation: Inter-governmental relations in domestic european policy making in comparative perspective. *Journal of Regional & Federal Studies, 24*(3), 321-340.
Holcim. (2016). Memoria de sostenibilidad 2016 [2016 sustainability report]. Retrieved on December 20th, 2017 from http://memoria.holcimecuador.com/categorias/participación-y-desarrollo-comunitario
Huchzermeyer, M. (1999). *The exploration of appropriate informal settlement intervention in South Africa: Contributions from a comparison with Brazil.* University of Cape Town.
Hughes, C. (2016). *A method for near real-time surveillance of hepatitis A and E cases in Ahmedabad, India.* McGill University Libraries.
Hungerford, H., & Moussa, Y. (2016). Seeing the (urban) forest through the trees: Governance and household trees in Niamey, Niger. *Journal of African Geographical Review, 36*(3), 286-304.
INEC. (2017). *Encuesta nacional de salud, salud reproductiva, y nutrición (ENSANUT) [National survey on health, reproductive health, and nutrition (ENSANUT)]*. Quito, Ecuador: Instituto Nacional de Estadísticas y Censos. Retrieved from http://www.ecuadorencifras.gob.ec/category/ensanut/.
Iweka, A. C., & Adebayo, A. K. (2010). Improving housing durability in deprived settlements of Lagos megacity through ingenuous use of sustainable indigenous materials. *International Journal of Sustainable Construction Engineering and Technology, 1*(1), 99-112.
Jacobson, C. R. (2011). Identification and quantification of the hydrological impacts of imperviousness in urban catchments: A review. *Journal of Environmental Management, 92*(6), 1438-1448.
Jácome, E. (2015a, July 14th, 2015). En Quito hay un promedio de siete atropellados por día [Quito features an average of seven run-overs per day]. *El Comercio*. Retrieved from http://www.elcomercio.com/actualidad/quito-atropellados-accidentes-muerto-victimas.html
Jácome, E. (2015b, March 16th, 2015). En Quito hay una explosión de gas cada 82 horas [There is a gas explosion every 82 hours in Quito]. *El Comercio*. Retrieved from https://www.elcomercio.com/actualidad/quito-explosion-gas-vivienda-ecuador.html
Jácome, E. (2017, January 8th, 2017). El 60% de las edificaciones son informales en el Distrito Metropolitano de Quito [60% of the buildings are informal in the Metropolitan District of Quito]. *El Comercio*. Retrieved from http://www.elcomercio.com/actualidad/municipio-quito-regulacion-viviendas-informales.html.
Jain, M., Knieling, J., & Taubenböck, H. (2015). Urban transformation in the National Capital Territory of Delhi, India: The emergence and growth of slums? *Journal of Habitat International, 48*, 87-96.
Jamison, M. S. (1985). The joys of gardening: Collectivist and bureaucratic cultures in conflict. *Journal of The Sociological Quarterly, 26*(4), 473-490.
Jenkins, B. (2017). Avon-Ōtākaro network vision for regeneration of the Avon-Ōtākaro corridor red zone. *Landscape Review, 17*(2), 56-66.
Jessop, B. (1993). Towards a Schumpeterian workfare state? Preliminary remarks on post-Fordist political economy. *Journal of Studies in Political Economy, 40*(1), 7-39.
Jiboye, A. D. (2011). Sustainable urbanization: Issues and challenges for effective urban governance in Nigeria. *Journal of Sustainable Development, 4*(6), 211.

Jonas, A. E., McCann, E., & Thomas, M. (2015). *Urban geography: A critical introduction*: John Wiley & Sons.
Jorgensen, A., & Anthopoulou, A. (2007). Enjoyment and fear in urban woodlands. Does age make a difference? *Journal of Urban Forestry & Urban Greening, 6*(4), 267-278.
Joyce, P. (2003). *The rule of freedom: Liberalism and the modern city*: Verso.
Juárez, D. (2018, Agoust 31st, 2018). ¿Xenofobia o tema conveniente? El trato a los venezolanos en Ecuador [Xenophobia or convenient topic? The treatment of Venezuelans in Ecuador]. *Russia Today*. Retrieved from https://actualidad.rt.com/actualidad/287154-ecuador-migracion-venezolana-xenofobia-analisis
Kaika, M., & Swyngedouw, E. (2000). Fetishizing the modern city: The phantasmagoria of urban technological networks. *International Journal of Urban and Regional Research, 24*(1), 120-138.
Kamalipour, H., & Dovey, K. (2017). Incremental Urbanisms. In K. Dovey, E. Pafka, & M. Ristic (Eds.), *Mapping Urbanities* (pp. 249-267): Routledge.
Kaoma, H., & Shackleton, C. M. (2014). Collection of urban tree products by households in poorer residential areas of three South African towns. *Journal of Urban Forestry & Urban Greening, 13*(2), 244-252.
Karimzadegan, H., Rahmatian, M., Dehghani, S., Jalali, R., & Shahkarami, A. (2007). Valuing forests and rangelands-ecosystem services. *International Journal of Environmental Research and Public Health, 1*(4), 368-377.
Kingman-Garcés, E. (2006). *La ciudad y los otros. Quito 1860-1940: Higienismo, ornato y policía [The city and the others. Quito 1860-1940: Hygienism, ornate, and police]*: FLACSO sede Ecuador.
Kitha, J., & Lyth, A. (2011). Urban wildscapes and green spaces in Mombasa and their potential contribution to climate change adaptation and mitigation. *Journal of Environment and Urbanization, 23*(1), 251-265.
Klaufus, C. (2010). The two ABCs of aided self-help housing in Ecuador. *Journal of Habitat International, 34*(3), 351-358.
Kolev, A. (2017). Enhancing social cohesion as a means of sustainable poverty eradication: Background paper prepared for the expert group meeting on "Strategies for eradicating poverty to achieve sustainable development for all", UN Headquarters, New York.
Krasny, M. E., & Tidball, K. G. (2009). Applying a resilience systems framework to urban environmental education. *Journal of Environmental Education Research, 15*(4), 465-482.
Kumar, S., & Phrommathed, P. (2005). *Research methodology*: Springer.
Kusno, A. (2011). The green governmentality in an Indonesian metropolis. *Singapore Journal of Tropical Geography, 32*(3), 314-331.
La Floresta. (2012). History of league La Floresta. Retrieved on November 20th, 2017 from http://ligalafloresta.com/historia.php
Lab Quebradas. (2014). Deriva 6 Atucucho [Drift 6 Atucucho]. Laboratorio Quebradas. Retrieved on December 19th, 2017 from http://labquebradas.blogspot.co.uk/2014/12/deriva-6-atucucho.html
Lagarde, M. (2012). La soledad y la desolación [Loneliness and desolation]. *Revista de Consciencia y Diálogo, 3*(3), 198-200.
LahiriDutt, K., & Gopa, S. (2006). Constructing social capital: Self-help groups and rural women's development in India. *Journal of Geographical Research, 44*(3), 285-295.

Lancione, M., & McFarlane, C. (2016). Infrastructural becoming: Sanitation and the (un)making of life at the margins. *Urban Cosmopolitics: Agencements, assemblies, atmospheres* (pp. 45-62): Routledge.
Landman, R. H. (1993). *Creating community in the city*: Bergin & Garvey.
Landscape Institute. (2013). Green infrastructure: An integrated approach to land use. Retrieved on May 26th, 2017 from http://tiny.cc/nnbi9y
Larkin, B. (2013). The politics and poetics of infrastructure. *Journal of Annual Review of Anthropology, 42*, 327-343.
Lemieux, C. J., & Scott, D. J. (2005). Climate change, biodiversity conservation and protected area planning in Canada. *Journal of the Canadian Geographer - Le Géographe canadien, 49*(4), 384-397.
Lennon, M., & Scott, M. (2014). Delivering ecosystems services via spatial planning: Reviewing the possibilities and implications of a green infrastructure approach. *Journal of Town Planning Review, 85*(5), 563-587.
Lind, A. C. (2018). Power, gender, and development: Popular women's organizations and the politics of needs in Ecuador. In A. Escobar & S. Alvarez (Eds.), *The making of social movements in Latin America* (pp. 134-149): Routledge.
Lindell, I. (2010). Between exit and voice: Informality and the spaces of popular agency. *African Studies Quarterly: The Online Journal of African Studies, 11*(2-3), 1-124.
Lindley, S., Pauleit, S., Yeshitela, K., Cilliers, S., & Shackleton, C. (2018). Rethinking urban green infrastructure and ecosystem services from the perspective of sub-Saharan African cities. *Journal of Landscape and Urban Planning, 180*, 328-338.
Linn, K. (1999). Reclaiming the sacred commons. *Journal of New Village, 1*(1), 42-49.
Little, C. E. (1990). *Greenways for America: Creating the North American landscape.* Baltimore, Maryland, USA: The Johns Hopkins University Press.
Lopes de Souza, M. (2006). Cidades, globalização e determinismo econômico [Cities, globalisation, and economic determinism]. *Revista Cidades, 3*(5), 123-142.
Lovell, S. A. (2009). Social capital: The panacea for community? *Journal of Geography Compass, 3*(2), 781-796.
Lovell, S. T., & Taylor, J. R. (2013). Supplying urban ecosystem services through multifunctional green infrastructure in the United States. *Journal of Landscape Ecology, 28*(8), 1447-1463.
Lyytimäki, J., Petersen, L. K., Normander, B., & Bezák, P. (2008). Nature as a nuisance? Ecosystem services and disservices to urban lifestyle. *Journal of Environmental Sciences, 5*(3), 161-172.
Lyytimäki, J., & Sipilä, M. (2009). Hopping on one leg: The challenge of ecosystem disservices for urban green management. *Journal of Urban Forestry & Urban Greening, 8*(4), 309-315.
MacLeod, G. (2002). From urban entrepreneurialism to a "revanchist city"? On the spatial injustices of Glasgow's renaissance. *Journal of Antipode, 34*(3), 602-624.
Madon, S., & Sahay, S. (2017). Urbanisation and megacities in developing countries: The management challenge. In C. Avgerou & G. Walsham (Eds.), *Information technology in context: Studies from the perspective of developing countries* (pp. 220-233): Ashgate Publishing.
MAFRE. (2017). Madres educadoras brindan espacios de desarrollo infantil en los barrios de Pisullí y La Roldós [Educational mothers provide spaces for child development in the neighbourhoods of Pisullí and La Roldós] [Press release]. Retrieved from

https://www.fundacionmapfre.org/fundacion/es_es/programas/cooperacion-internacional/ecuador/madres-educadoras-desarrollo-infantil-quito.jsp
Maiguashca, J. (1996). *Ecuadorian cocoa production and trade 1840–1925*: Palgrave Macmillan, London.
Malakoff, D., Wigginton, N., Fahrenkamp-Uppenbrink, J., & Wible, B. (2016). Rise of the urban planet. Retrieved on August 6th, 2019 from https://www.sciencemag.org/news/2016/05/use-our-infographics-explore-rise-urban-planet
Maltby, E. (2000). *Ecosystem approach: From principle to practice.* Paper presented at the Proceedings of the International Conference on Ecosystem Service and Sustainable Watershed Management in North China.
Marcus, C. C., & Francis, C. (1997). *People places: Design guidelines for urban open space*: John Wiley & Sons.
Marcuse, P. (2012). Whose right(s) to what city? In N. Brenner, P. Marcuse, & M. Mayer (Eds.), *Cities for people, not for profit* (pp. 36-53): Routledge.
Martin, G., Clift, R., Christie, I., & Druckman, A. (2014). *The sustainability contributions of urban agriculture: Exploring a community garden and a community farm.* Paper presented at the Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector.
Massey, D. (2011). A counterhegemonic relationality of place. In E. McCann & K. Ward (Eds.), *Mobile Urbanism: Cities and Policymaking in the Global Age* (Vol. 17, pp. 1-15): University of Minnesota Press.
McCann, E. (2011). Veritable inventions: Cities, policies and assemblage. *Journal of Area, 43*(2), 143-147.
McFarlane, C. (2006). Knowledge, learning and development: A post-rationalist approach. *Journal of Progress in Development Studies, 6*(4), 287-305.
McFarlane, C. (2008a). Governing the contaminated city: Infrastructure and sanitation in colonial and post-colonial Bombay. *International Journal of Urban and Regional Research, 32*(2), 415-435.
McFarlane, C. (2008b). Sanitation in Mumbai's informal settlements: State, "slum", and infrastructure. *Journal of Environment and Planning A, 40*(1), 88-107.
McFarlane, C. (2011). The city as assemblage: Dwelling and urban space. *Journal of Environment and Planning D: Society and Space, 29*(4), 649-671.
McFarlane, C. (2012). The entrepreneurial slum: Civil society, mobility and the co-production of urban development. *Journal of Urban Studies, 49*(13), 2795-2816.
McFarlane, C., & Silver, J. (2017). Navigating the city: Dialectics of everyday urbanism. *Journal of Transactions of the Institute of British Geographers, 42*(3), 458-471.
McFarlane, C., & Vasudevan, A. (2014). Informal infrastructures. In P. Adey, D. Bissell, K. Hannam, P. Merriman, & M. Shelle (Eds.), *The Routledge handbook of mobilities* (pp. 256-264): Routledge.
McHarg, I. L. (1971). *Design with nature: Published for the American Museum of Natural History*: Doubleday.
Mell, I. (2015). Green infrastructure planning: Policy and objectives. In D. Sinnett, N. Smith, & S. Burgess (Eds.), *Handbook on green infrastructure: Planning, Design and Implementation* (pp. 105-123): Edward Elgar Publishing.
Mell, I. C. (2008). *Green infrastructure: Concepts and planning.* Paper presented at the Proceedings of the FORUM eJournal.
Mell, I. C. (2013). Can you tell a green field from a cold steel rail? Examining the "green" of green infrastructure development. *Journal of Local Environment, 18*(2), 152-166.

Mena-Segura, A. P. (2010). *Regularización de los asentamientos informales en Quito: Análisis de las políticas públicas [Regularization of informal settlements in Quito: Analysis of public policies].* FLACSO sede Ecuador.

Merriam, S. B., Johnson-Bailey, J., Lee, M.-Y., Kee, Y., Ntseane, G., & Muhamad, M. (2001). Power and positionality: Negotiating insider/outsider status within and across cultures. *International Journal of Lifelong Education, 20*(5), 405-416.

Meyboom, A. (2009). Infrastructure as practice. *Journal of Architectural Education, 62*(4), 72-81.

Mezzetti, M., Orsini, F., Fecondini, M., Michelon, N., & Gianquinto, G. (2009). *Women and simplified hydroponics: Community gardening as a way of emancipation in Trujillo, Peru.* Paper presented at the Proceedings of the International Conference on Landscape and Urban Horticulture.

MIDUVI. (2013). Programa INTI: Intervención nutricional territorial integral [INTI programme: Integral territorial nutrition intervention]. Retrieved on December 19th, 2017 from http://www.habitatyvivienda.gob.ec/programa-inti/

MIDUVI. (2015a). El MIDUVI fortalece la organización barrial en Quito [The MIDUVI strengthens the neighbourhood organisation in Quito] [Press release]. Retrieved from http://www.habitatyvivienda.gob.ec/el-miduvi-fortalece-la-organizacion-barrial-en-quito/

MIDUVI. (2015b). "Yo, Mi Barrio, Mi Ciudad", una oportunidad para mejorar las viviendas de Atucucho ["Myself, My Neighbourhood, My City", an opportunity to improve the homes of Atucucho] [Press release]. Retrieved from http://www.habitatyvivienda.gob.ec/yo-mi-barrio-mi-ciudad-una-oportunidad-para-mejorar-las-viviendas-de-atucucho/

MIES. (2017). Bono de desarrollo humano [Human development bonus]. Retrieved on November 7th, 2017 from http://www.inclusion.gob.ec/bono-de-desarrollo-humano1/

Minuchin, L. (2016). The politics of construction: Towards a theory of material articulations. *Journal of Environment and Planning D: Society and Space, 34*(5), 895-913.

Miranda, B. (2018). Ecuador "legalizes" gangs and slashes murder rate. Retrieved on December 4th, 2018 from https://www.insightcrime.org/news/analysis/ecuador-legalizes-gangs-slashes-murder-rates/

Mishra, A. P., Sen, A., & Kumar, A. (2017). Exploring potentials and challenges in making smart cities in India: A case study of Allahabad city, Uttar Pradesh. In P. Sharma & S. Rajput (Eds.), *Sustainable smart cities in India* (pp. 123-142): Springer.

Mitullah, W. V., & Opiyo, R. (2017). Non-motorized transport infrastructure provision on selected roads in Nairobi. In W. V. Mitullah, M. Vanderschuren, & M. Khayesi (Eds.), *Non-Motorized Transport Integration Into Urban Transport Planning in Africa* (pp. 27-39): Routledge.

Monstadt, J. (2009). Conceptualizing the political ecology of urban infrastructures: Insights from technology and urban studies. *Journal of Environment and Planning A, 41*(8), 1924-1942.

Montero, L. H. (2002). *La ciudad del migrante la representacion de Quito en relatos de migrantes indegenas [The city of the migrant the representation of Quito in stories of migrants]*: Editorial Abya Yala.

Moore, R. (2017). The end of parklife as we know it? The battle for Britain's green spaces *The Guardian.* Retrieved on November 11th, 2018 from

https://www.theguardian.com/uk-news/2017/jul/09/the-end-of-park-life-as-we-know-it-the-battle-for-britains-green-spaces-rowan-moore
Morgan, S. L. (2011). Social learning among organic farmers and the application of the communities of practice framework. *Journal of Agricultural Education and Extension, 17*(1), 99-112.
Morocho, Y., & Ramiro, P. (2012). *Historia de la comunidad" Runa Kawsay": Un pueblo indígena urbano en Quito [History of the "Runa Kawsay" community: An urban indigenous territory in Quito]*. FLACSO sede Ecuador.
Moscoso-Rosero, R. (2013). Dinámicas socio-espaciales urbanas. Una exploración desde las lotizadores irregulares de Quito, negociantes de la pobreza [Urban socio-spatial dynamics. An exploration from the irregular lotizadores of Quito, poverty traders]. *Revista de Cuadernos de Vivienda y Urbanismo*.
Moser, C. (2009). *Ordinary families, extraordinary lives: Assets and poverty reduction in Guayaquil, 1978-2004*: Brookings Institution Press.
Moser, S. C., & Ekstrom, J. A. (2010). *A framework to diagnose barriers to climate change adaptation.* Paper presented at the Proceedings of the National Academy of Sciences.
Motzny, A. (2015). *Prioritizing vacant properties for green infrastructure: A landscape analysis in spatial planning, and design approach for siting green infrastructure in moderately to highly vacant urban neighborhoods.* University of Michigan.
Mukhija, V., & Loukaitou-Sideris, A. (2014). *The informal American city: Beyond taco trucks and day labor*: MIT Press.
Müller, M., & Schurr, C. (2016). Assemblage thinking and actor-network theory: Conjunctions, disjunctions, cross-fertilisations. *Journal of Transactions of the Institute of British Geographers, 41*(3), 217-229.
Myers, P., & Nelson, T. (2010). Considering social capital in the context of social entrepreneurship. *Handbook of Research on Social Entrepreneurship*, 271-285.
NABU Project. (2016). Awareness creation, nursery establishment, plantation development and agroforestry management practices. Berlin, Germany: Nature And Biodiversity Conservation Union (NABU).
Nagendra, H., Sudhira, H., Katti, M., & Schewenius, M. (2013). Sub-regional assessment of India: Effects of urbanization on land use, biodiversity and ecosystem services. In T. Elmqvist, M. Fragkias, J. Goodness, B. Güneralp, P. J. Marcotullio, R. I. McDonald, S. Parnell, M. Schewenius, M. Sendstad, K. C. Seto, & C. Wilkinson (Eds.), *Urbanization, biodiversity and ecosystem services: Challenges and opportunities* (pp. 65-74): Springer.
Naidoo, R., Balmford, A., Costanza, R., Fisher, B., Green, R. E., Lehner, B., . . . Ricketts, T. H. (2008). Global mapping of ecosystem services and conservation priorities: The National Academy of Sciences of the USA.
Narayan, D., & Kapoor, S. (2005). *Beyond ideologies: Creating wealth for the poor.* Paper presented at the Proceedings of the Arusha Conference on New Frontiers of Social Policy.
Naumann, S., Davis, M., Kaphengst, T., Pieterse, M., & Rayment, M. (2011). Design, implementation and cost elements of Green Infrastructure projects. *Final report, European Commission, Brussels, 138*.
Nayebare, S. R. (2012). *Evaluation of the short- and long-term drinking water sustainability programs for point water sources and public water supplies (PWS) in developing countries. Case study of Uganda*: State University of New York at Albany.

Nelson, S. H. (2015). Beyond the limits to growth: Ecology and the neoliberal counterrevolution. *Journal of Antipode, 47*(2), 461-480.
Nieves, I. (1979). Household arrangements and multiple jobs in San Salvador. *Signs: Journal of Women in Culture and Society, 5*(1), 134-142.
Nijman, J. (2010). A study of space in Mumbai's slums. *Tijdschrift Voor Economische en Sociale Geografie, 101*(1), 4-17.
NOVUM. (2014). Plan de intervención ambiental integral en las quebradas de Quito [Comprehensive environmental intervention plan in the quebradas of Quito]. Retrieved on May 26th, 2016 from http://www.quitoambiente.gob.ec/ambiente/images/Secretaria_Ambiente/Documentos/patrimonio_natural/quebradas/plan_de intervencion.pdf
NSF. (2012). *Greening of cities. International Workshop on Green Urban Infrastructure* Auckland, New Zealand:
Nwaka, G. I. (2005). The urban informal sector in Nigeria: Towards economic development, environmental health, and social harmony. *Global Urban Development Magazine, 1*(1), 1-11.
Nzengya, D. M. (2018). Improving water service to the urban poor through delegated management: Lessons from the city of Kisumu, Kenya. *Journal of Development Policy Review, 36*(2), 190-202.
O'Farrell, P. J., Anderson, P. M., Le Maitre, D. C., & Holmes, P. M. (2012). Insights and opportunities offered by a rapid ecosystem service assessment in promoting a conservation agenda in an urban biodiversity hotspot. *Journal of Ecology and Society, 17*(3), 27.
Ohnmacht, T., Maksim, H., & Bergman, M. M. (2009). *Mobilities and inequality*: Ashgate Publishing, Ltd.
Oldfield, S. (2010). *Botanic gardens: Modern-day arks*: The MIT Press.
Oleas-Mogollón, D., & Albornoz-Barriga, M. B. (2016). La bicicleta y la transformación del espacio público en Quito (2003-2014) [The bicycle and the transformation of Quito's public space (2003-2014)]. *Letras Verdes. Revista Latinoamericana de Estudios Socioambientales*(19), 24-44.
Oluwafeyikemi, A., & Julie, G. (2015). Evaluating the impact of vertical greening systems on thermal comfort in low income residences in Lagos, Nigeria. *Journal of Procedia Engineering, 118*, 420-433.
Onyx, J., & Bullen, P. (2001). The different faces of social capital in NSW Australia. In P. Dekker & E. M. Uslaner (Eds.), *Social capital and participation in everyday life* (pp. 45-58): Routledge.
OPP. (n.d.). Orangi Pilot Project. Retrieved on July 14th, 2018 from http://www.opp.org.pk/
Orquera, L. (2011, January 26th, 2011). Invasión destruida [Destroyed invasion]. *Últimas Noticias*. Retrieved from http://www.ultimasnoticias.ec/noticias/1690-invasion-destruida.html
Pacheco, M. (2015, April 26th, 2015). Dos empresas interesadas en los Quitocables [Two companies interested in the Quitocables]. *El Comercio*. Retrieved from https://www.elcomercio.com/actualidad/empresas-inversion-quitocables-mauriciorodas-transporte.html
Pank, T. E. (2013). Apparatus to separate light fluids, heavy fluids, and/or sediment from a fluid stream: Google Patents.
Paustian, K. (2014). Carbon sequestration in soil and vegetation and greenhouse gases emissions reduction. In B. Freedman (Ed.), *Global environmental change* (pp. 399-406): Springer.

Peloso, M., & Morinville, C. (2014). "Chasing for water": Everyday practices of water access in peri-urban Ashaiman, Ghana. *Journal of Water Alternatives, 7*(1), 121-139.
Peltre, P. (1989). Quebradas y riesgos naturales en Quito, período 1900-1988 [Ravines and natural risks in Quito between 1900-1988]. *Estudios de Geografía, 2*, 45-91.
Petersen, L. K. (2013). The materiality of everyday practices in urban greenspace. *Journal of Environmental Policy & Planning, 15*(3), 353-370.
Phukan, D. K. (2014). Levels of some basic amenities in the slums and their impacts on ecology: A case study of Jorhat City, Assam. *International Journal of Science and Research, 3*(1), 71-74.
Pickerill, J., & Chatterton, P. (2006). Notes towards autonomous geographies: Creation, resistance and self-management as survival tactics. *Journal of Progress in Human Geography, 30*(6), 730-746.
Pieterse, D. E. (2013). *City futures: Confronting the crisis of urban development*: Zed Books Ltd.
Pradhan, P., Costa, L., Rybski, D., Lucht, W., & Kropp, J. P. (2017). A systematic study of Sustainable Development Goal (SDG) interactions. *Journal of Earth's Future, 5*(11), 1169-1179.
Preston, J., & Rajé, F. (2007). Accessibility, mobility and transport-related social exclusion. *Journal of Transport Geography, 15*(3), 151-160.
Prothero, A., & Fitchett, J. A. (2000). Greening capitalism: Opportunities for a green commodity. *Journal of Macromarketing, 20*(1), 46-55.
Puderbaugh, A. (2016). Seeds of hope. Retrieved on January 19th, 2017 from https://www.children.org/stories/2016/feb/seeds-of-hope
Puren, K., & Roos, V. (2016). Using the Mmogo-method to explore important places and their meaning in two communities: The importance of context. In V. Roos (Ed.), *Understanding relational and group experiences through the Mmogo-Method®* (pp. 195-212): Springer.
Putnam, R. D. (2000). Bowling alone: America's declining social capital. *Culture and politics* (pp. 223-234): Springer.
Putnam, R. D., Leonardi, R., & Nanetti, R. Y. (1994). *Making democracy work: Civic traditions in modern Italy*: Princeton University Press.
Rahier, J. M. (1999). Mami, que será lo que quiere el negro? Representaciones racistas en la revista Vistazo [Mommy, what will the black want? Racist representations in the magazine Vistazo]. *Ecuador racista: Imágenes e identidades. FLACSO sede Ecuador*.
Ramírez-Tarapuez, E. (2004). *Fútbol barrial: Identidad, ritual y su relación cotidiana en los barrios de Quito [Neighbourhood football: Identity, ritual and their daily relationship in the neighborhoods of Quito]*. Universidad Andina Simón Bolívar, Sede Ecuador.
Ranieri, R., & Almeida-Ramos, R. (2013). Inclusive growth: Building up a concept: Working Paper No 104, International Policy Centre for Inclusive Growth (IPC-IG).
Rankin, W. J. (2009). *Infrastructure and the international governance of economic development, 1950–1965.* Paper presented at the Proceedings of the 12th Annual International Conference on the Economics of Infrastructures.
Rashid, H., Hunt, L. M., & Haider, W. (2007). Urban flood problems in Dhaka, Bangladesh: Slum residents' choices for relocation to flood-free areas. *Journal of Environmental Management, 40*(1), 95-104.

Rashid, S. F. (2009). Strategies to reduce exclusion among populations living in urban slum settlements in Bangladesh. *Journal of Health, Population, and Nutrition, 27*(4), 574-586.
Reed, H., & Lansley, S. (2016). Universal basic income: An idea whose time has come? : Compass London.
Register, R. (2006). *Ecocities: Rebuilding cities in balance with nature*: New Society Publishers.
Reis, R. B., Ribeiro, G. S., Felzemburgh, R. D., Santana, F. S., Mohr, S., Melendez, A. X., . . . Tassinari, W. S. (2008). Impact of environment and social gradient on Leptospira infection in urban slums. *Journal of PLoS Neglected Tropical Diseases, 2*(4), e228.
Rekow, L. (2017). Urban agriculture in the Manguinhos favela of Rio de Janeiro: Laying the groundwork for a greener future. *Sustainable Economic Development* (pp. 155-185): Springer.
Republic of Ecuador. (2008). Constitution of the Republic of Ecuador (Vol. 340, pp. 106).
Reyes, R. R. (2002). Gendering responses to El Niño in rural Peru. *Journal of Gender & Development, 10*(2), 60-69.
Reynolds, H., Brandt, L., Widhalm, M., Fei, S., Fischer, B., Hardiman, B., . . . Dukes, J. (2018). *Maintaining Indiana's Urban Green Spaces: A Report from the Indiana Climate Change Impacts Assessment*
Richards, R., O'Leary, B., & Mutsonziwa, K. (2007). Measuring quality of life in informal settlements in South Africa. *Journal of Social Indicators Research, 81*(2), 375-388.
Rietbergen, S., Bishop, J., & Mainka, S. (2002). Ecosystem conservation: A neglected tool for poverty reduction: International Institute for Environment and Development in collaboration with the Regional and International Networking Group.
Roberts, E., Andrei, S., Huq, S., & Flint, L. (2015). Resilience synergies in the post-2015 development agenda. *Journal of Nature Climate Change, 5*(12), 1024-1025.
Robinson, J., & Roy, A. (2016). Debate on global urbanisms and the nature of urban theory. *International Journal of Urban and Regional Research, 40*(1), 181-186.
Rodrigue, J.-P., Comtois, C., & Slack, B. (2016). *The geography of transport systems*: Taylor & Francis.
Rodriguez, A., & Proaño, I. (2016). Quito Siembra: Agricultura urbana [Quito Siembra: Urban agriculture]: CONQUITO, Agrupar y Alcaldía de Quito.
Rodríguez-Pava, D. (2017). *Agricultura urbana en Bogotá: Aporte para el cambio cultural [Urban agriculture in Bogota: Contribution to cultural change]*. Instituto de Estudios Ambientales. Universidad Nacional de Colombia.
Romero, D. (2018a, July 28th, 2018). 47 accidentes con ciclistas hubo entre enero y junio [47 accidents with cyclists occurred between January and June]. *El Comercio*. Retrieved from https://www.elcomercio.com/actualidad/accidentes-ciclistas-quito-investigaciones-ciclovias.html
Romero, D. (2018b, March 12th, 2018). La ciudad de Quito tiene solo una asociación de peatones [Quito city has only one pedestrian association]. *El Comercio*. Retrieved from https://www.elcomercio.com/actualidad/quito-asociacion-peatones-movilidad-normativa.html
Rostworowski, M. (2015). *Historia del Tahuantinsuyu [Tahuantinsuyu history]*: Instituto de Estudios Peruanos.

Rotondo, F. (2011). OUR city cohesion policies: Practices of Ontologies for Urban Regeneration (OUR). The case of the Puglia region. *Ontologies in Urban Development Projects* (pp. 179-187): Springer.
Roy, A. (2004). Transnational trespassings: The geopolitics of urban informality. In A. Roy & N. AlSayyad (Eds.), *Urban Informality: Transnational Perspectives from the Middle East, Latin America, and South Asia* (pp. 289-317).
Roy, A. (2005). Urban informality: Toward an epistemology of planning. *Journal of the American Planning Association, 71*(2), 147-158.
Roy, A. (2009). Why India cannot plan its cities: Informality, insurgence and the idiom of urbanization. *Journal of Planning Theory, 8*(1), 76-87.
Roy, A. (2011). Slumdog cities: Rethinking subaltern urbanism. *International Journal of Urban and Regional Research, 35*(2), 223-238.
Roy, A. (2016a). Informality and the politics of planning. *The Ashgate Research Companion to Planning Theory* (pp. 105-126): Routledge.
Roy, R. P. (2016b). *Infrastructural unevenness in Bangladesh: A "privatised world of technological improvisation".* Paper presented at the Refereed Proceedings of the TASA 2016 Conference.
Rubio, A. G., Bordi, I. V., Ortíz, H. T., & Muro, P. G. (2017). Empoderamiento y feminismo comunitario en la conservación del maíz en México [Empowerment and community feminism in the conservation of corn in Mexico]. *Revista de Estudios Feministas, 25*(3), 1073-1092.
Rufai, T. (2017). *Malaria and typhoid fever co-infection: A study among patients presenting with febrile illnesses in the Ga West Municipal Hospital, Amasaman.* University of Ghana.
Ruhl, J. (2010). Climate change adaptation and the structural transformation of environmental law. *Journal of Environmental Law, 40*, 363-436.
Saelens, B. E., & Handy, S. L. (2008). Built environment correlates of walking: A review. *Journal of Medicine and Science in Sports and Exercise, 40*(7 Suppl), S550-S566.
Saelens, B. E., Sallis, J. F., & Frank, L. D. (2003). Environmental correlates of walking and cycling: Findings from the transportation, urban design, and planning literatures. *Journal of Annals of Behavioral Medicine, 25*(2), 80-91.
Salazar, A. (2015). *La historia ambiental de los asentamientos informales de Quito (1980-2014) [The environmental history of the informal settlements of Quito (1980-2014)].* FLACSO Sede Ecuador.
Salazar, A., & Cuvi, N. (2016). Asentamientos informales y medio ambiente en Quito [Informal settlements and the environment in Quito]. *Areas: Revista Internacional de Ciencias Sociales*(35), 101-119.
Salgado, S. (2003). Migrations: The work of Sebastiao Salgado. *Townsend Center for the Humanities*.
Salgado, V. (2014). *Chimbacalle con alma de ferrocarril [Chimbacalle with railroad soul]*. Quito, Ecuador: Ecográficas.
Salon, D., & Gulyani, S. (2010). Mobility, poverty, and gender: Travel "choices" of slum residents in Nairobi, Kenya. *Journal of Transport Reviews, 30*(5), 641-657.
Santos, R. V. (2015). Barrio afrodescendiente en Quito: Identidades, representaciones y multiterritorialidades [Afro-descendant neighborhood in Quito: Identities, representations and multiterritorialities]. *Universitas Humanística*(80).
Schlegelmilch, B. B., Bohlen, G. M., & Diamantopoulos, A. (1996). The link between green purchasing decisions and measures of environmental consciousness. *European Journal of Marketing, 30*(5), 35-55.

Schuurman, D., De Marez, L., & Ballon, P. (2013). Open innovation processes in living lab innovation systems: Insights from the LeYLab. *Journal of Technology Innovation Management Review, 3*(11), 28.
Schwab, E. (2017). Equity and empowerment in Medellín's informal settlements. *Journal of Built Environment, 43*(2), 236-255.
Schwartz, G., Costa, R., & Fleck, A. (2013). How does football influence the political system and juridify social movements? Brazil, June 2013. *Oñati Socio-legal Series, 6*(3), 857-876.
Scott, J. (1999). Geographies of trust, geographies of hierarchy. *Journal of Democracy and Trust*, 273-289.
Secretaría del Deporte. (2017). Liga barrial inauguró torneo de fútbol [Neighbourhood leagues inaugurated football tournament] [Press release]. Retrieved from http://www.deporte.gob.ec/liga-barrial-inauguro-torneo-de-futbol/
SEMBRAR. (2017). Fundación Sembrar [Sembrar ONG]. Retrieved on July 18th, 2017 from http://www.fundacionsembrar.ec/
SENATEL. (2014). *Servicio móvil avanzado: Boletín estadístico del sector de telecomunicaciones [Advanced mobile service: Statistical bulletin of the telecommunications sector]*. Quito: Ministerio de Telecomunicaciones y Sociedad de la Información. Retrieved from http://www.arcotel.gob.ec/wp-content/uploads/downloads/2014/12/BOLETIN-No.1-SMA.pdf.
Seneviratne, S. I. (2012). Climate science: Historical drought trends revisited. *Journal of Nature, 491*(7424), 338.
Sengers, F., & Raven, R. (2014). Metering motorbike mobility: Informal transport in transition? *Journal of Technology Analysis & Strategic Management, 26*(4), 453-468.
SEPS. (2018). Consulta de organizaciones [Organisations enquiry]. Retrieved on October 23rd, 2017 from https://servicios.seps.gob.ec/gosnf-internet/paginas/consultarOrganizaciones.jsf
Seto, K. C., Güneralp, B., & Hutyra, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proceedings of the National Academy of Sciences, 109*(40), 16083-16088.
Shafiquea, M., & Kima, R. (2017). Green stormwater infrastructure with low impact development concept: A review of current research. *Journal of Desalination Water Treat, 83*, 16-29.
Sheweka, S. M., & Mohamed, N. M. (2012). Green facades as a new sustainable approach towards climate change. *Journal of Energy Procedia, 18*, 507-520.
Silver, J. (2014). Incremental infrastructures: Material improvisation and social collaboration across post-colonial Accra. *Journal of Urban Geography, 35*(6), 788-804.
Silver, J. (2017). The energy geographies of incremental infrastructures in Ga Mashie, Accra. *The Routledge Research Companion to Energy Geographies*, 295.
Simon, D. (2016). *Rethinking sustainable cities: Accessible, green and fair*: Policy Press.
Simone, A. (2004a). *For the city yet to come: Changing African life in four cities*: Duke University Press.
Simone, A. (2004b). People as infrastructure: Intersecting fragments in Johannesburg. *Journal of Public Culture, 16*(3), 407-429.
Simone, A. (2008). Emergency democracy and the "governing composite". *Journal of Social Text, 26*(2 95), 13-33.
Simone, A. (2010). *City life from Jakarta to Dakar: Movements at the crossroads*: Routledge.

Simone, A. (2016). Passing things along: (In)completing infrastructure. *Journal of New Diversities, 17*(2), 151-162.
Smets, P. (2006). Small is beautiful, but big is often the practice: Housing microfinance in discussion. *Journal of Habitat International, 30*(3), 595-613.
Smith, E. A. (2017). *Evolutionary ecology and human behavior*: Routledge.
Soruco, X., Piani, G., & Rossi, M. (2008). What emigration leaves behind: The situation of emigrants and their families in Ecuador. *Inter-American Development Bank*.
Stacey, P., & Lund, C. (2016). In a state of slum: Governance in an informal urban settlement in Ghana. *The Journal of Modern African Studies, 54*(4), 591-615.
Star, S. L. (1999). The ethnography of infrastructure. *Journal of American Behavioral Scientist, 43*(3), 377-391.
Star, S. L., & Ruhleder, K. (1996). Steps toward an ecology of infrastructure: Design and access for large information spaces. *Journal of Information Systems Research, 7*(1), 111-134.
Starkoff, P. C., & Ortíz, S. C. (2012). Lotización irregular en Quito: Impunidad y conflictividad social [Irregular lotization in Quito: Impunity and social conflict]. *Dimensiones del Hábitat Popular Latinoamericano, 2*, 465.
Stein, A. (2001). Participation and sustainability in social projects: The experience of the Local Development Programme (PRODEL) in Nicaragua. *Journal of Environment and Urbanization, 13*(1), 11-35.
Stein, A., & Castillo, L. (2005). Innovative financing for low-income housing improvement: Lessons from programmes in Central America. *Journal of Environment and Urbanization, 17*(1), 47-66.
Strauss, C. L. (1962). *Savage mind*: University of Chicago.
Sullivan, S. (2013). Banking nature? The spectacular financialisation of environmental conservation. *Journal of Antipode, 45*(1), 198-217.
Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., . . . Weber, E. (2009). Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges. A report by the American Psychological Association's task force on the interface between psychology and global climate change. *Journal of American Psychological Association*.
Tamba, X. (2017, June 25th, 2017). Ecuavoley, historia en boca de quien creó el reglamento [Ecuavoley, story in mouth of who created the regulation]. *El Telégrafo*. Retrieved from http://www.eltelegrafo.com.ec/noticias/otros-deportes/26/ecuavoley-historia-en-boca-de-quien-creo-el-reglamento
Taylor, B., & de Loë, R. C. (2012). Conceptualizations of local knowledge in collaborative environmental governance. *Journal of Geoforum, 43*(6), 1207-1217.
TEEB. (2007). The initiative. Retrieved on March 2nd, 2018 from http://www.teebweb.org/
Terán-Fierro, N. A. (2015). *Análisis de la interacción social en la liga deportiva barrial "Chaupicruz" [Analysis of social interaction in the neighborhood sports league "Chaupicruz"].* Pontificia Universidad Católica del Ecuador.
Thorne, C. R., Lawson, E., Ozawa, C., Hamlin, S., & Smith, L. A. (2018). Overcoming uncertainty and barriers to adoption of Blue-Green Infrastructure for urban flood risk management. *Journal of Flood Risk Management, 11*, S960-S972.
Tiwari, M., & Ibrahim, S. (2012). Sustainable human development at the grass roots: Different contexts, similar ingredients? *Journal of Oxford Development Studies, 40*(1), 69-85.

Tomlinson, R. (2015). Introduction "best practice" in development planning: Products, processes and networks: Liverpool University Press.
Torrance, M. (2009). Reconceptualizing urban governance through a new paradigm for urban infrastructure networks. *Journal of Economic Geography, 9*(6), 805-822.
Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kaźmierczak, A., Niemela, J., & James, P. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. *Journal of Landscape and Urban Planning, 81*(3), 167-178.
Últimas Noticias. (2013). Improvisan un puente [Improvising a bridge]. Retrieved on September 25th, 2017 from https://www.ultimasnoticias.ec/noticias/15369-improvisan-un-puente.html
UN. (2015). Sustainable development goals. Retrieved on April 3rd, 2017 from https://sustainabledevelopment.un.org/?menu=1300
UN. (2016). *Habitat 3 Conference*. Paper presented at the United Nations Conference on Housing and Sustainable Urban Development, Quito. http://habitat3.org/the-conference/programme/all/
UN. (2018). 68% of the world population projected to live in urban areas by 2050, says UN. Retrieved on August 10th, 2019 from https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html
UN-Habitat. (2013a). The atlas of urban expansion. Retrieved on September 11th, 2017 from http://www.atlasofurbanexpansion.org/cities/view/Quito
UN-Habitat. (2013b). *Water and sanitation in the world's cities: Local action for global goals*: Routledge.
UN-Habitat. (2016a). *New urban agenda.* Paper presented at the United Nations Conference on Housing and Sustainable Urban Development, Quito, EC.
UN-Habitat. (2016b). Slum almanac 2015-2016: Tracking improvement in the lives of slum dwellers: Participatory Slum Upgrading Programme in Nairobi, Kenya.
UNCTAD. (2017). Development and globalization. Facts and figures 2016. Retrieved on July 8th, 2019 from https://stats.unctad.org/Dgff2016/annexes/populationnote.html
USEPA. (2013). Greening EPA Glossary. Retrieved on January 19th, 2019 from https://www.epa.gov/greeningepa - g
Uteng, T. (2009). Gender, ethnicity, and constrained mobility: Insights into the resultant social exclusion. *Journal of Environment and Planning A, 41*(5), 1055-1071.
Valdivia, G. (2008). Governing relations between people and things: Citizenship, territory, and the political economy of petroleum in Ecuador. *Journal of Political Geography, 27*(4), 456-477.
Vallejo, R. (2008). Quito: Capitalidad y centralidades [Quito: Capital status and centralities]. *Centro-h, Revista de la Organización Latinoamericana y del Caribe de Centros Históricos*(2), 47-54.
Van Averbeke, W. (2007). Urban farming in the informal settlements of Atteridgeville, Pretoria, South Africa. *Journal of Water SA, 33*(3).
Van Gelder, J.-L., Cravino, M. C., & Ostuni, F. (2016). Housing informality in Buenos Aires: Past, present and future? *Journal of Urban Studies, 53*(9), 1958-1975.
Vasudevan, A. (2015). The makeshift city: Towards a global geography of squatting. *Journal of Progress in Human Geography, 39*(3), 338-359.

Velasco, E., & Roth, M. (2010). Cities as net sources of CO2: Review of atmospheric CO2 exchange in urban environments measured by eddy covariance technique. *Journal of Geography Compass, 4*(9), 1238-1259.
Venn, S., Schulman, H., Törrönen, S., Salla, A., Pajunen, T., Kerppola, S., . . . Karjalainen, S. (2015). Helsinki. *Vertebrates and invertebrates of European cities: Selected non-avian fauna* (pp. 323-377). New York: Springer.
Ventura, F., Rossi Pisa, P., & Vicari, A. (2004). Effect of land use on soil erosion in a small watershed of Emilia-Romagna region. *Italian Journal of Agronomy, 8*(1), 29-36.
Vickery, C. (1977). The time-poor: A new look at poverty. *Journal of Human Resources, 12*(1), 27-48.
Vilar, K., & Cartes, I. (2016). Urban design and social capital in slums. Case study: Moravia's neighborhood, Medellin, 2004-2014. *Procedia-Social and Behavioral Sciences, 216*, 56-67.
Villa, F., Bagstad, K. J., Voigt, B., Johnson, G. W., Portela, R., Honzák, M., & Batker, D. (2014). A methodology for adaptable and robust ecosystem services assessment. *Journal of PloS one, 9*(3), e91001.
Vollmer, D., & Grêt-Regamey, A. (2013). Rivers as municipal infrastructure: Demand for environmental services in informal settlements along an Indonesian river. *Journal of Global Environmental Change, 23*(6), 1542-1555.
von Döhren, P., & Haase, D. (2015). Ecosystem disservices research: A review of the state of the art with a focus on cities. *Journal of Ecological Indicators, 52*, 490-497.
Wade, I. (1987). Community food production in cities of the developing nations. *Food and Nutrition Bulletin, 9*(2), 29-36.
Weick, K. E. (2007). The generative properties of richness. *The Academy of Management Journal, 50*(1), 14-19.
Wellman, B. (2018). *Networks in the global village: Life in contemporary communities*: Routledge.
Wellman, B., & Wortley, S. (1990). Different strokes from different folks: Community ties and social support. *American Journal of Sociology, 96*(3), 558-588.
Wilbanks, T., Kane, S. M., Leiby, P. N., Perlack, R. D., Settle, C., Shogren, J., & Smith, J. B. (2003). Integrating mitigation and adaptation-possible responses to global climate change. *Journal of Environment, 45*(5), 28-38.
Wilcox, A., Randhawa, G., Embi, P., Cao, H., & Kuperman, G. J. (2014). Sustainability considerations for health research and analytic data infrastructures. *Journal of eGEMs, 2*(2).
Wise, J. M., & Stivale, C. J. (2005). *Gilles Deleuze: Key concepts*: Routledge.
Wisner, B., Gaillard, J. C., & Kelman, I. (2012). *Handbook of hazards and disaster risk reduction and management*: Routledge.
Wolch, J. R., Byrne, J., & Newell, J. P. (2014). Urban green space, public health, and environmental justice: The challenge of making cities "just green enough". *Journal of Landscape and Urban Planning, 125*, 234-244.
Wright, H. (2011). Understanding green infrastructure: The development of a contested concept in England. *Journal of Local Environment, 16*(10), 1003-1019.
Wutich, A., Beresford, M., & Carvajal, C. (2016). Can informal water vendors deliver on the promise of a human right to water? Results from Cochabamba, Bolivia. *Journal of World Development, 79*, 14-24.

Wynn, T., Henderson, M., & Vaughan, D. (2008). Changes in streambank erodibility and critical shear stress due to subaerial processes along a headwater stream, southwestern Virginia, USA. *Journal of Geomorphology, 97*(3), 260-273.

Yamashita, S., Watanabe, R., & Shimatani, Y. (2015). Smart adaptation to flooding in urban areas. *Journal of Procedia Engineering, 118*, 1096-1103.

Yin, R. K. (2009). *Case study research: Design and methods (4th Ed.)*: Thousand Oaks, CA: Sage.

Young, R., Zanders, J., Lieberknecht, K., & Fassman-Beck, E. (2014). A comprehensive typology for mainstreaming urban green infrastructure. *Journal of Hydrology, 519*, 2571-2583.

Young, R. F. (2011). Planting the living city: Best practices in planning green infrastructure. Results from major US cities. *Journal of the American Planning Association, 77*(4), 368-381.

Yu, C., & Hien, W. N. (2006). Thermal benefits of city parks. *Journal of Energy and Buildings, 38*(2), 105-120.

Zafra, M. (2014, July 3rd, 2014). El camino del Inca: Principales enclaves incas en los Andes [The Inca pathway: Main Inca enclaves in the Andes]. *El País*. Retrieved from https://elpais.com/elpais/2014/07/03/media/1404413359_254423.html

Zevallos, O. (2002). Ocupación de laderas e incremento del riesgo de desastres en el Distrito Metropolitano de Quito [Hillside occupation and increased risk of disasters in the Metropolitan District of Quito]. *Memorias del Seminario: Gestión de riesgos y prevención de desastres* (pp. 106-117).

Zinkernagel, R., Evans, J., & Neij, L. (2018). Applying the SDGs to cities: Business as usual or a new dawn? *Journal of Sustainability, 10*(9), 1-18.