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LOCAL KNOWLEDGE IN SPATIAL POLICIES: THE ROLE OF SPATIAL DATA PROCESSING TOOLS

PhD Thesis

Doctoral Program in Spatial Planning | Programa Doutoral em Planeamento do Território

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Abstract

Advances in geographic information and communication technology have democratized the production and access to spatial information, by offering communities and citizens easier access to spatial data processing tools. These tools are being used, at different levels of participation and community engagement, to solve problems, narrate local needs and conditions, secure places of belonging, and negotiate spatial policies. Simultaneously, local knowledge is highlighted being useful in preserving diversity, informing spatial policies, and highlighting planning concerns, development sites and environmental issues, thus constituting a strategic resource for good governance. It is also important to local communities beyond its scientific or broader societal merit, as it encompasses matters of social justice, sovereignty, autonomy and identity.

This work identifies a research gap that calls for a systematic analysis of how local knowledge is truly influencing policy-making. It seeks to answer the question of how local knowledge, harnessed and diffused through the use of spatial data processing tools, is being transferred into spatial policies and asserting community governance within the sphere of decision making. For that purpose, the study turns to community mapping processes, which gather local knowledge through the use of spatial data processing tools, and potentially disseminate the harnessed knowledge as a cartographic product.

The construction of a theoretical referential for the classification and categorization of the community mapping model is undertaken, followed by research focused on the exploration of multiple case studies. A mixed methodology is used, based on content analysis to which numerical and statistical methods are applied. Results are presented according to the different typologies and dimensions determined by the typological and conceptual frameworks, for the 230 cases and 961 corresponding initiatives under study.

The main contributions of this study are, firstly, the creation of the theoretical referential itself, comprising a typological and conceptual framework; secondly, the application of this referential to case studies, in order to clarify how local knowledge is harnessed by knowledge-holding communities using spatial data processing tools, and subsequently to determine how it is integrating decision-making processes and interacting with spatial policy; and thirdly, the analysis of patterns, strengths and weaknesses pertaining to those same cases, as a foundation for future recommendations and best practices regarding their potential for influencing spatial policies.

Keywords: Local knowledge, spatial policies, spatial data processing tools, community governance, community mapping.

Resumo

Avanços na tecnologia da informação geográfica e da comunicação democratizaram a produção e acesso à informação espacial, ao oferecer às comunidades e cidadãos acesso facilitado a ferramentas de processamento de dados espaciais. Estas ferramentas têm sido usadas, a níveis diferentes níveis de participação e envolvimento comunitário, para resolver problemas, narrar necessidades e condições locais, assegurar lugares de pertença, e negociar políticas espaciais. Em simultâneo, o conhecimento local é apontado como sendo útil para preservar diversidade, informar políticas espaciais, e evidenciar preocupações com o planeamento, áreas para desenvolvimento e questões ambientais, constituindo portanto um recurso estratégico para a boa governança. A sua importância para as comunidades locais estende-se também para lá do seu mérito científico ou social, pois inclui questões ligadas à justiça, soberania, autonomia e identidade.

Este trabalho identifica uma lacuna de investigação que exige uma análise sistemática de como o conhecimento local está verdadeiramente a influenciar a tomada de decisão nas políticas. Pretende responder à questão de como é que o conhecimento local, mobilizado e difundido através do uso de ferramentas de processamento de dados espaciais, está a ser transferida para as políticas espaciais e a afirmar a governança comunitária na esfera da tomada de decisão. Para este propósito, o estudo recorre a processos de mapeamento comunitário, que recolhem conhecimento local através de ferramentas de processamento de dados espaciais, e potencialmente disseminam o conhecimento compilado sob a forma de um produto cartográfico.

A construção de um referencial teórico para a classificação e categorização do modelo de mapeamento comunitário é empreendida, seguida da investigação focada na exploração dos múltiplos estudos de caso. É usada uma metodologia mista, baseada na análise de conteúdo à qual métodos numéricos e estatísticos são aplicados. Os resultados são apresentados de acordo com as diferentes tipologias e dimensões determinadas pelos referenciais tipológico e conceptual, para os 230 casos e 961 correspondentes iniciativas estudados.

As principais contribuições deste estudo são, em primeiro lugar, a criação do próprio referencial teórico, constituido por um enquadramento tipológico e outro conceptual; em segundo lugar, a aplicação deste referencial aos estudos de caso, de forma a clarificar como é que o conhecimento local é mobilizado, pelas comunidades que o detêm, usando ferramentas de processamento de dados espaciais, para subsequentemente determinar como é que está a ser integrado em processos de tomada de decisão e a interagir com as políticas espaciais; finalmente, a análise de padrões, pontos fortes e fracos relativamente esses mesmos casos, como fundação para futuras recomendações e boas práticas relativamente ao seu potencial para influenciar as políticas espaciais.

Palavras-chave: *Conhecimento local, políticas espaciais, ferramentas de processamento de dados espaciais, governança comunitária, mapeamento comunitário.*

TABLE OF CONTENTS

INTRODUCTION

"First he thought the historians kept their knowledge from the pueblos, then he thought the pueblos kept their knowledge from their own people. He accused; his teachers mildly denied. No, they said. You were taught that certain things were true, or necessary; and those things are true and necessary. They are the local knowledge of Tse. (…)

Local knowledge is not partial knowledge, they said. There are different ways of knowing. Each has its own qualities, penalties, rewards."

Ursula K. LeGuin, *A Man of the People* (1995), in *The Found and the Lost*

Presentation of the theme

This study discusses the harnessing and application of local knowledge, a place-based type of tacit knowledge, which is a basic component of the knowledge system of a territory and a key resource in development initiatives. More specifically, it focuses on how it can be harnessed through spatial data processing tools and later used to determine, inform or influence spatial policies. Therefore, local knowledge, its main applications, and the tools and methods to harness it are the object of this research, contextualized across multiple fields such as the social, the economic or the environmental.

Presently, there is a strong emerging body of literature about local knowledge and its applications, as well as about participatory means of harnessing it through spatial data processing tools. This growing interest highlights the important role that local knowledge can play in promoting social learning, capacity building, recognition, equity and justice, as well as adaptation to new social and economic changes. Emphasis has been given to how, in the context of different local communities, work can be done towards the building and improvement of complex knowledge systems, cooperation, communication, and sustainable development.

Literature on the effective impact that local knowledge has in spatial policy-making, however, is scarcer, even though such impact exists due to the participatory shift in governance. The most prominent works on the subject often take place in the fields of environmental management, disaster risk reduction and adaptation to climate change, through geoinformatics and case studies related to community-led governance, prominent amongst those the model of community mapping. Therefore, it urges to secure a more global characterization and analysis of the impact of local knowledge in spatial policies. This theme has been considered as a priority area of research by several authors, such as Karin Pfeffer, Isa Baud, Dianne Scott, Michael McCall, or Sarah Elwood, amongst others.

Seeing this theme through the prism of spatial data processing tools allows for a clear incision into the problem, since these are the primary means of harnessing the potential of local knowledge and transferring it to spatial policies. Such stance is condensed into the model of community mapping, which lies at the intersection of several important markers highlighted by this study: the need to harness local knowledge, the need for dialogue with or within the

knowledge-holding community in order for that to happen, and the use of spatial data processing tools during processes, translated into the production of cartographic and spatially oriented information.

This study turns first and foremost towards existing literature in order to build a strong contextual foundation. The first section of the literature review is dedicated to the characterization of local knowledge and its applications in a global context, starting from the multifaceted concept of knowledge, crossing several areas and disciplines, and rummaging through literature on knowledge communities, complex knowledge systems and the 'spatial turn' of different disciplinary fields. Due to the importance of studying local knowledge in the context of spatial policies, section two of the literature review has planning and governance theory as its foundation. It considers the scale of the use of local knowledge, its inclusion or exclusion from spatial policies, the complexity of harnessing it in order to inform policies, and several issues concerning management, development and intervention. Finally, section three focuses on the understanding of spatial data processing tools and their use across several domains of research.

The methodology chapter highlights how this work identifies a research gap, which calls for a systematic analysis of how local knowledge is truly influencing policy-making. It seeks to answer the question of how local knowledge, harnessed and diffused through the use of spatial data processing tools, is being transferred into spatial policies and asserting community governance within the sphere of decision making. For that purpose, the study turns to community mapping processes, which gather local knowledge through the use of spatial data processing tools, and potentially disseminate the harnessed knowledge as a cartographic product. A multiple case study research design is presented, as well as the methodological theory at its foundation.

The following chapter focuses on the construction of a theoretical referential for the classification and categorization of the community mapping model. It comprises a pre-determined typological framework based on existing literature classifications and semantic groups, and a conceptual framework based both on literature and on the emergent dimensions resulting from successive iterations of data collection and analysis. This referential is applied, in the empirical research chapters, to the exploration of the multiple case study. The empirical analysis is centred on 230 case studies comprising 961 initiatives of community mapping, to which quali-quantitative methods were applied according to the categorizations of the theoretical referential. Chapter 4 presents results based on typification and the five main dimensions - 'context', 'knowledge building', 'community engagement', 'spatial policies', and 'spatial data processing tools', - while Chapter 5 conducts an interpretation of results along critical themes and cross analysis.

This study has three main intentions, and consequent results: firstly, the creation of the theoretical referential itself; secondly, the application of this referential to case studies, in order to clarify how local knowledge is harnessed by knowledge-holding communities using spatial data processing tools, and subsequently to determine how it is integrating decision-making processes and interacting with spatial policy; and thirdly, the analysis of patterns, strengths and weaknesses pertaining to those same cases, as a foundation for recommendations and best practices regarding their potential for influencing spatial policies. It is hoped this thesis will constitute a significant contribution towards better adaptive governance practices, and spatial policies that are able to meet specific local needs and transformations.

Personal motivation

As I look at my bookshelves, I see the remnants of my days of writing the final dissertation to achieve my integrated master degree in Architecture, at the Faculty of Architecture of the University of Porto. Titles such as “Hungry City”, “Shadow Cities”, “Agropolis”, “CPULs - Continuous Productive Urban Landscapes”, “Converging World – Connecting Communities in Global Change”, “Communities, Councils & A Low-Carbon Future”, or “Social Movements” are scattered across the shelves. Some did not even make it to the references list of that dissertation.

It was the end of 2010, the theme was ‘urban agriculture’ in Porto, and after some remarkably uneventful five years at college, I was leaving with the feeling that I had just started down a new path. This feeling was reinforced by a new social and site development project I undertook at the volunteering association EpDAH, in collaboration with Fundação de Serralves and Porto Social, which dealt precisely with the impact of urban agriculture on communities. My work in architectural design ran in parallel to that kind of work and was not half as riveting. When the Doctoral Program in Spatial Planning opened for the first time, I already had a few ideas I knew I just had to pursue, and the description of the program looked like the perfect opportunity.

Inevitably, I made urban agriculture the object of my study, arriving at the interview for admission in the doctoral program with a stubborn proposal centred on it. But it was restrictive, something that Professor Isabel Breda Vázquez helped me see. I was not fascinated with the phenomenon of urban agriculture *per se*, rather with the extremely interesting subjects it brought to the fore: local economies, community networking, local management of resources, repurposing of urban spaces in a socially beneficial way, the capacity of local citizens for auto-mobilization, adaptation, self-improvement.

The true object of the study was there from the very beginning, however, and eventually it had to shine through. Urban farmers and other people bent on producing and managing resources within the built environment, such as those involved in the Transition Network, were moving worlds with their knowledge and skills. Yet something was lacking. I believed more could be done. The problem, I thought, was that knowledge was not circulating, it was not visible. With the information technology available nowadays, there was little excuse as I saw it. Why were people not organizing their efforts? Why were they not availing themselves of the existing user-friendly Digital Earth technologies that could so easily market their efforts and attract interested volunteers? The Portuguese Network of Urban and Peri-Urban Agriculture had the most rudimentary online map, simple pins on a Google Map. The Portuguese Transition Cities were a bit of a desert for anyone outside of the community.

Even disregarding the fact that one cannot force change, it was all very idealistic.

But, in that first proposal, there was a mention to the problem of having an interdisciplinary activity, one with a large capacity for mobilization of people and resources, seeing its potential diminished due to its difficulty in communicating with a significant part of the population. There was a tentative proposal that different scales, the local and the global, were not properly articulated, and that spatial data processing tools were in the whole still more adapted to the expert user than the lay one. It was necessary to employ or conceive tools that would bridge the local and global in order to inform initiatives and prevent bad practices, it read; but above all, it

was necessary to make information circulate for the sake of communities themselves, so that they could be their own agents of transformation.

Where is spatial planning in the middle of all of this? That came later, with my advisor patiently reminding me (and rightly so) that this doctoral program was, after all, on spatial planning – and the subsequent gruesome combing of existing literature for the larger picture. From that moment on, things started falling into place. Urban agriculture was dropped; the common denominator, the substance that was the basis for all manner of initiatives involving communities that acted over their own environment, in a given location, was local knowledge. Spatial data processing tools stayed, and provided the cohesive frame of mind under which the whole literature review was conducted. The review of the use of local knowledge and its contextualization in spatial policies pushed previously set boundaries, and opened the doors to the study of governance and decision making processes that were wider reaching and more impacting than anything I had studied before.

The articulation between a local community and institutional actors that are external to it, between community-based and institutional or governmental decisions, between the more incisive capacity of people for local action or their right to auto-determination and the wider vision of experts, these revealed themselves as the great hidden challenges. They were also, simultaneously, cropping up in other areas of my professional activity, such as the inevitable issues arising at my volunteering project, or the research project on "Ilhas do Porto" (forms of atypical housing) which I undertook as a member of CITTA.

Local knowledge, spatial policies, spatial data processing tools… community mapping processes emerged as the model that synthetized those three different vectors. I once wrote, on my thesis project report, that after that first port of call, which I hesitated to call a safe haven, it could only get more interesting. Famous last words. I had to take a long hard look at those concepts, dissect them, build a whole theoretical referential (much longer and more comprehensive I imagined it could be, because it turned out emergent categories were an important – essential – thing and they kept screaming at me!) to manage the systematic collection of case studies I was gathering. Community mapping is complex. This can be said of a great many things, in the context of spatial planning theory and participatory governance, but I cannot emphasize it enough. It is truly complex. It made the research design of this thesis an exercise in feral beast wrangling and expectation management.

The theme of this work is not only personally and professionally important to me. I also started by believing it could truly make a difference in the (dare I say it?) complex and changing world we live in, and still believe it. There was a research gap that had to be filled, even if that meant jumping bodily into it. Community mapping, that expression of the use of spatial data processing tools to harness local knowledge, is a form of transferring local knowledge to the sphere of decision-making, of asserting community governance within spatial policies. Contextualizing it, categorizing it, analysing its inner workings and successes but also its weaknesses, all of those are steps in understanding the fight of communities for, and against, spatial policies that directly affect them, and how decision-making institutions receive such dynamics.

1. LITERATURE REVIEW

1.1 LOCAL KNOWLEDGE

The use and harnessing of local knowledge is central to this work. Local knowledge is the object of the research, the substance that is captured in the processes and policies of section 1.2 and moulded through the tools of section 1.3 of the literature review. Therefore, this section is dedicated to the review of the concept of 'local knowledge' and its contextualization. At this point, the net is cast in the broadest sense, seeking recent journal articles and older reference works that focus exclusively on the subject, independently of their area of expertise.

The sources chosen are varied, presenting a range of action for local knowledge that spreads across social, environmental and economic fields. The contextualization of the concept is also conducted in a broad sense, drawing from epistemology and the contemporary position towards knowledge, from the concept of complexity, and also from the 'spatial turn', or the influence of spatial attributes in several fields. The section ends with a delimitation of the four main applications of local knowledge, again conducted in a way that is relatively independent from the disciplinary fields depicted. These four main applications are further examined in subsequent chapters.

1.1.1 THE CONCEPT OF LOCAL KNOWLEDGE

FAO (2004) identifies local knowledge, a place-based type of knowledge, as a basic component of the knowledge system of a territory and a key resource in development initiatives, which often seek to build human capacity and improve the resilience and sustainability of local communities. Local knowledge has been defined in contrasting ways, depending on the purpose of the definition. Broadly, it can be said that local knowledge is the human capital that people in a given community have developed, and continue to develop, in relation to their surroundings over time, in order to solve problems, achieve goals, and maintain or improve their livelihood. It comprises skills, experiences and insights related to the place they inhabit, acquired through constant efforts to seek information (FAO 2004). It derives mostly from memory, intuition, and the senses, resulting of a mix of experiential and transmitted knowledge, although it can also stem from structured data such as recorded measurements obtained by local people with formal training (Raymond et al. 2010). Transmitted local knowledge carries more legitimacy within the community as it has been culturally internalized, but often that also renders it invisible and of difficult access to external agents (Dekens 2007).

Therefore, local knowledge does not deviate from the understanding of knowledge as the ability to use information, which is structured data or information, to achieve objectives. The 'local' in local knowledge refers to a place, a region or a location, as well as to regular movements

between different points such as migrations and nomadic routes (Dekens 2007). Especially when compared with scientific knowledge, local knowledge is place-based, which means it is adapted to the local culture and environment (FAO 2004), and space-based, focusing on spatial relationships with nature. Because it emphasizes the relatedness between human and nonhuman aspects of ecological systems, spanning what would be classified by scientific knowledge as several fields of study, it is also interdisciplinary (Oliver et al. 2012).

Knowledge is dynamic, being lost and gained all the time, and local knowledge does not remain static either. It is embedded in individual and group action through local practices, which are "complex adaptive responses to external and internal changes that have evolved throughout the generations" (Dekens 2007, 24). Therefore, local knowledge has often been tested over time, through repeated use and trial and error, changing with the people and communities in whose practices, institutions, relationships and rituals it is embedded (FAO 2004), by experimentation and adaptation to environmental and socioeconomic changes (Dekens 2007). This means local knowledge is more meaningful within its own spatial and temporal contexts and to the members of the community where the holders of such knowledge live, as well as other local actors such as community-based organisations and private or administrative local entities. Its significance is the most visible in contexts where there is investment in survival, food production, shelter provision, and generally the need to act upon and change one's environment on a daily basis. This capacity to acquire information and build knowledge about their environment allows individuals to better control over their own lives (FAO 2004).

Depending on the source, there are other terms related to local knowledge that are used interchangeably, or partly overlap it. It is the case of traditional knowledge, rural knowledge (FAO 2004), indigenous knowledge (Bohensky and Maru 2011), folk knowledge, and even citizen science (Dekens 2007) or participatory spatial knowledge (Pfeffer et al. 2013). Local knowledge can be considered less restricted in contents or origin, as it includes several knowledge systems and types of communities, from rural to urban and settled to nomadic, as well as being developed both by original inhabitants and migrants (FAO 2004). The term 'local knowledge' can also be used to denote a stronger focus, by external agents, on the experiential and observational aspects of knowledge rather than the internalized, culturally bound aspects that are at the heart of traditional and indigenous knowledge (Sinclair and Walker 1999). However, even if the latter are not the focus, to understand local knowledge one has to understand people's practices and beliefs, perceptions, values, lifestyle, and behaviour, since these factors influence what they know (Dekens 2007).

More importantly, one has to account for people's ways of knowing: the acquisition of local knowledge, and the parts of the whole on which individuals focus, depend on factors such as "age, gender, occupation, labour division in the family, enterprise or community, socio-economic status, experience, environment, history" (FAO 2004, 3). Access to knowledge, and the power derived from it, is neither equal nor easy for all individuals of a community, some of them being more vulnerable than others. Inequality in distribution means who the local key players are depends on the subject at hand. The individual's level of knowledge also differs. It can range from common knowledge - widespread and held by the whole community - to shared knowledge - restricted to a smaller group of people with something in common - or specialist knowledge - specific and held by local experts (Dekens 2007).

The term ‘local knowledge’ is often used by opposition to scientific knowledge. However, according to Taylor and de Loë (2012), some researchers defend that well-defined boundaries between scientific and local knowledge do not exist, because the knowledge possessed by different people results of ‘knowledge encounters’ in which local and scientific perspectives get tangled. In some countries, people often regarded as holders of local knowledge, such as farmers, may receive formal academic training and learning, and record information objectively (Raymond et al. 2010). Another example is that of scientists and technicians working in local offices, who accumulate knowledge pertaining to their surroundings.

Recent use of the concept of ‘local knowledge’

Science-based attitudes towards local knowledge have shifted from denial to romanticizing, and lately to various degrees of acceptance. Local knowledge, and especially folk taxonomies, used to be systematically extracted, codified, and re-appropriated as scientific knowledge, usually without properly crediting its origins. The ‘rediscovery’ of local knowledge, through the stereotype of ‘primitive’ people in harmony with nature, took place in the mid-1960s. The hegemony of ‘western’ science and technology in problem-solving was being questioned due to its apparent remoteness and negative technological outcomes (Dekens 2007).

Since the 1970s, the importance of integrating local knowledge and practices into development and conservation projects has been increasingly highlighted. Its advocates slowly began to infiltrate mainstream thought, setting themselves against the tendency to see top-down approaches as the only way towards development. The importance of accounting for and integrating local knowledge into development projects, including decision-making processes, gained recognition among academia, international development and funding agencies: World Bank, UNESCO, FAO, IDRC and UNEP, non-governmental agencies (NGOs), policy-makers and governments (Dekens 2007). Various initiatives from the international community have recognised the role of indigenous knowledge in sustainable development, particularly in developing countries: ‘Our Common Future’ in 1987, the United Nations’ Earth Summit in 1992, ‘Agenda 21’, the World Conference on Science in 1999, the Johannesburg Plan of Implementation, the Millennium Development Goals, the Hyogo Framework for Action 2005–2015, etc. Several approaches and tools for integrating the knowledge of communities, especially those at risk, into decision-making processes have gained acceptance since the beginning of the 21st century. Methods of participatory research, such as participatory rural appraisal and rapid rural appraisal, were extensively deployed to analyse local knowledge and life conditions in fields such as anthropology and natural resource management (Peters-Guarin, McCall, and van Westen 2012), at the same time that geographic information and communication technology (geoICT) evolved and were used to support them.

Dekens (2007) explains that the rediscovery of local knowledge is concomitant with calls for flexible and adaptive management systems and the emphasis placed, in the development field, on bottom-up initiatives, citizen science and community-based or collaborative management, towards empowerment, self-reliance, devolution, and the decentralisation of decision-making. However, the current interest in local knowledge develops the same time that many local knowledge systems are at risk of becoming extinct, due to the transformation of natural environments and fast-paced economic, political, and cultural changes. Practices vanish, when

inappropriate or because they adapt too slowly, in the face of new challenges. Many practices also disappear due of the intrusion of foreign technologies or development concepts, that promise short-term gains or solutions to problems (FAO 2004).

1.1.2 CONTEXTUALIZATION

The growing interest in local knowledge should be understood in the context of governance issues and the movement towards participatory and emancipatory approaches in planning, development and resource management. Since the inception of the concept, paradigms have changed, from considering what people do to the cultural context in which knowledge is generated, from an interventionist external paradigm for development to an increasingly participatory one (Sinclair and Walker 1999), from the hegemony of scientific knowledge to complex knowledge systems with very different legitimate sources. A new ethos has emerged in favour of participatory and decentralised development, as well as (to some extent) the disengagement of the state in favour of the growing role of the NGO sector or even the communities themselves, provided they have access to the range of technological solutions necessary to generate solutions (Sinclair and Walker 1999, FAO 2004).

The themes above have implications to the positioning of local knowledge in theory concerning spatial policies, thus being further explored in chapter 1.2. However, there are other even broader trends at play, which show how the interest in local knowledge is not an isolated phenomenon.

First of all, it is necessary to look into the shift towards knowledge and innovation intensive, competitive economies and societies have evolved towards the end of the 20th century. Nowadays, knowledge and innovation are generic input factors of development endeavours, be it at the level of a small enterprise or a nation (Alaerts 2009). The creation of knowledge has been an activity connected to the harnessing of power and to human development throughout history, but has acquired new proportions nowadays.

But ‘knowledge’ is not the only crucial keyword when talking about local knowledge: the adjective ‘local’ also has a story to tell, because it encompasses a spatial dimension that started being valued in the wake of the so-called ‘spatial turn’. Due to the way it is processed by and influences human cognition, constituting a major format of abstract thought, space has been proposed as a primary dimension for organizing interdisciplinary knowledge (Celentano and Pittarello 2012, Mix, Smith, and Gasser 2010) with the objective of achieving better readability and connectivity between concepts and information. This position of perceptually grounded cognition accompanies not only a shift from the not so distant description of human thought in terms of logical propositions (Mix, Smith, and Gasser 2010), but also the growing support for the usefulness of local knowledge in assuring the quality of life, culture preservation, education, growth or even survival of the individual and the community.

Analysing these trends is the objective of this section, which focuses on three themes: knowledge as a foundation of human activity, complex knowledge systems and the ‘spatial turn’.

1.1.2.2 Knowledge as a foundation of current human activity

Knowledge has emerged, after a brief period of post-industrialization which saw the rise of the services sector, mass production, information society and network economy, as a new key attribute to several areas (Stehr 2001, 2010, David and Foray 2003). Knowledge-based activities have become prevalent all around us and are equated to positive attributes such as economic development, high skill employment, high wages and progress – even in cases where the market for high end knowledge-based workers is becoming saturated. This increased visibility and focus on knowledge and knowledge-based activities comes in the wake of an unprecedented increase and acceleration of the production and accumulation of knowledge, or knowledge-based activities (David and Foray 2003, Stehr 2001).

> *"Knowledge-based activities emerge when people, supported by information and communication technologies, interact in concerted efforts to co-produce (i.e. create and exchange) new knowledge. Typically, this involves three main processes: a significant number of a community's members combine to produce and reproduce new knowledge (diffuse sources of innovation); the community creates a 'public' space for exchanging and circulating the knowledge; new information and communication technologies are intensively used to codify and transmit the new knowledge." (David and Foray 2003, 27)*

The knowledge society

At the societal level, the 'knowledge society' or community, networking and knowledge dissemination, participation and citizenship are often discussed, the exercise of the latter being found to require "an increasing level of scientific literacy" (Stehr 2010, 24).

> *"A knowledge-intensive community is one wherein a large proportion of members is* involved in the production and reproduction of knowledge. Therefore, it is likely that such a community constitutes a public (or semi-public) space where codification and dissemination costs have been radically reduced by the pre-existence of commonly employed concepts and terminological conventions; the existence *of the latter further facilitates information and communication technologies to enhance the circulation of new knowledge." (David and Foray 2003, 28)*

It is not solely the acceleration of knowledge production, nor the increasing number of people currently involved in creating and working with knowledge, that make a knowledge society (Woodward, Goldblatt, and McFall 2004, 120). The defining factors of this type of society run deeper.

> *"… if knowledge is not just a constitutive feature of our modern economy but a basic organizational principle of the way we run our lives, then it is justifiable to talk about our living in a knowledge society. This means nothing more and nothing less than that we organize our social reality on the basis of our knowledge"(Stehr 2001, 89).*

a) The acceleration of knowledge production is due to knowledge-based teams and communities, both formal and informal. The first sign of this knowledge society is that the acceleration of knowledge production is partly due to knowledge-based communities, "networks of individuals striving, first and foremost, to produce and circulate new knowledge and working for different, even rival, organisations", especially "conventional organisations" (David and Foray 2003, 21).

This society is seeing the end of the hegemony of long-standing institutions such as the state, the church and the military, as skepticism grows concerning their capacity to predict and regulate social conditions, which have become increasingly complex (Stehr 2001). [In fact, one turning point in research is that is started being carried out mainly by teams]

b) Tangible capital is being surpassed, in economy, by intangible capital. Another sign of a knowledge society is the rise of intangible capital at macroeconomic level, which can be verified through its relative share of GDP. Intangible capital translates into investment either in production and dissemination of knowledge (training, education, research and development, information and coordination) or in the sustenance of the physical state of human capital (such as health care expenditures). One example of the increasing importance of intangible capital, according to David and Foray (2003), is the fact that at the end of the 1960s it surpassed the weight of tangible capital in the USA. According to these authors, post-industrial society in general started shifting to knowledge-intensive activities in the 1970s. At the end of the century, innovation started to become the dominant activity, due to increasing investment, leading to "the proliferation of new varieties of goods and services that (…) marked the trend towards 'mass customisation'" (David and Foray 2003, 21). Innovation is pointed as the main means for survival and prosperity in highly competitive and globalized economies, with companies and society in general spending more time and energy in the production of change and adjustment to it.

c) Agents and instruments for the creation and processing of knowledge have diversified, and not always through formal channels. The existence of a knowledge society also means a diversification in agents and instruments for the creation of knowledge. The rise of knowledge-based communities and the increasing number of knowledge professionals, together with the generalization of technologies for knowledge production and dissemination brought forth by the digital age - especially the world wide web, - have resulted in a paradigm change (David and Foray 2003). While formal research is still the main source of knowledge production in most areas, and virtually untouchable in the case of medical sciences, innovation and knowledge production have started coming from the public at large for the first time (David and Foray 2003). In fact, the largest contributions are often classified as 'citizen science', a concept mainly developed since the early 1990s to follow structured models, which may include "integration of explicit and tested protocols for collecting data, vetting of data (…), and inclusion of specific and measurable goals for public education" (Bonney et al. 2009, 978).

This situation is once more compounded by current digital technology, which enables remote access to an amount of information that would be unimaginable even in mid-20th century, when it started to be developed. It also supplies diverse tools to collect, calculate, analyze and process both raw data and the information available in global databases, as well as ways to share, explore, discuss and learn from findings. Collective research in large scale (or simply crowdsourcing of data) has not only been made possible but also simplified, and is currently conducted in fields as diverse as astronomy, oceanography, archaeology or ornithology (David and Foray 2003, 24, Bonney et al. 2009).

Associated to the concept of the knowledge society is the 'learning society', developed mainly in the context of educational philosophy (Hargreaves 2000). It proposes education as the key to a nation's economic development, and holds that education should extend beyond formal

learning in schools and universities into informal learning centers, to support a knowledge economy known as a 'world education culture' (Spring 2014). A learning society regards the actual process of learning as an activity that takes place outside of regular educational institutions, and is thus also decentralized and deregulated, a tenet of globalization theory. Learning societies are broader in context, drawing on elements of systems to facilitate the ability for lifelong learning in the individual. If lifelong learning is about the ability of the individual, then this is enabled through a Learning Society.

The knowledge economy

The economic level of the knowledge debate is related to concepts such as the 'knowledge economy', innovation, and knowledge as property. Due to the resources allocated to the activity of developing and creating knowledge, especially scientific knowledge, this is an area that receives much attention from research - "scientific knowledge constitutes one of the most important conditions of modernization in the sense of a persistent extension and enlargement of social and economic action that science, unlike any social system in modern society, generates." (Stehr 2010, 27). Stehr (2001, 89), for example, defines knowledge as the capacity for action or the potential to give start to something, thus encompassing all forms of knowledge and attributing the privileged status of scientific and technical knowledge not to their greater credibility, objectivity or indisputability, but to its greater capacity to create opportunities for action. However, for these opportunities to be seized, scientific knowledge must be worked first, 'enabled' (Stehr 2010, 19) – it has to come to conclusions, acquire practical meaning, allow for existing social constraints and conditions. It is the "ability to invent and innovate, that is, to create new knowledge and new ideas that are then embodied in products, processes and organisations" that has "served to fuel development" (David and Foray 2003, 20).

The initial foundation for the knowledge economy was introduced in 1966 in the book *The Effective Executive* by Peter Drucker and it was seen as the successor to the post-industrial, mass production structure of economy that started in the mid-1900s. At the economic level, according to Stehr (2001), knowledge-based work and professions tend to increase and the number of jobs that require low cognitive skills to decline, especially in areas such as the manufacture and distribution of material goods[1]. The situation is in fact more complex, with labor being increasingly relocated to the services sector, both into high skill and low skill jobs at both ends of the wage spectrum (thus generating a wage gap). [This is verifiable for at least sixteen European countries and the USA, find the source.] Countries considered to be further ahead in this process, present therefore a very strong services sector, at the same time that both their manufacturing and agricultural sectors also evolve in ways that make obsolete the traditional view of them being completely separate from the services sector. Service inputs, which include everything from logistics to advertising, and service roles, such as R&D engineering and office

[1] Manyika et al. (2012) finds that manufacturing continues to grow globally, currently accounting for approximately 16% of global gross domestic product (GDP) and 14% of employment. However, a country by country analysis reveals that manufacturing tends to decrease, along with its share of employment, once its share of GDP peaks (at 20 to 35% of GDP). One explanation given is that, as wages rise, consumers have more money to spend on services and that sector's growth accelerates, becoming more important than manufacturing for growth and employment.

support, constitute an increasing amount of these activities, with more than half of all employees dedicated to service roles in some manufacturing industries (David and Foray 2003). Additionally, in some manufacturing industries, there is both an increased automation of manual labor.

One concern at the economic level is the current 'digital divide', a recurring problem in intervention and development projects as well (further explored in chapter 1.3). On the one hand, "(…) it is widely assumed that the gradient of separation between the commands of specialized scientific knowledge and everyday knowledge has increased in modern societies and, hence, on the political plane, a growing authority and power rests with 'elite public policy specialists' (…). Elite policy specialists are no longer intellectually accountable to many segments of the public" (Stehr 2010, 15). On the other, the current wage gap and the definition of skill are based on digital knowledge even though "affluence and educational levels in the sense of capabilities are by no means uniform and equally distributed" (Stehr 2010, 6).

The first decade of the 21st century was the decade of knowledge, starting with the Lisbon Strategy of 2000 which advocated the concept of knowledge economy as the key to growth and employment in Europe. However, Stehr (2010) points out that the concept of knowledge economy is under revision, either because it cannot fit the frameworks created around it, meaning that policy-makers have not fully understood it, or because the core concepts of globalized economy are becoming obsolete, which would mean that the problem lies with the economy itself. A third option might be that the economy has not finished transitioning into a new post-industrial order. According to Lundvall (2008), the economic sector has retained its boundaries but become more transdisciplinary, and changed from a knowledge economy to a learning economy.

Knowledge politics

Today, science and technology innovations, like medical research, are judged by civil society, with their worldviews, values and beliefs. The shift of paradigm that brought laypeople and experts closer in value and standing has also led to concern about a gap between expertise and democratic governance, since it is believed that "the franchise of democratic governance should not be restricted and that the expert should be no more influential than the layperson" (Stehr 2010, 23). In an age of knowledge politics, it no longer makes sense to view the public as naively resistant to new capacities to act, but instead, it should be seen as cautious, uncertain and curious about the possible consequences of new information (Stehr and Meja 2005). The worldwide web provides for a drastic change, due to a better educated public, who has wide access to information (at least on the more connected side of the 'digital divide'), and selects it by itself instead of trusting media filters. But while "the crucial combination of a network society and media-politics provides new problems and tensions (…), characterized by the absence of consensus both on the relevant values and the necessary knowledge and information" (Veld 2010, 2), media-politics also destroy the original meaning of representation.

Paradoxically, Stehr (2010, 24) declares that "one of the other salient themes of recent criticisms of democracy refers to (…) the feasibility of representative democracy and effective citizen participation – the lack of civic competence or more disparagingly, the political ignorance of many citizens of democratic states." The recent decline of representative parliamentary

democracy goes hand in hand with the disappearance of individual ideologically-based positions. This is due to a fragmentation of values that leads to the recognition of individual uniqueness, but also to the impossibility of being represented in a general manner by a single actor, such as a member of parliament.

It would therefore seem that greater access to knowledge does not mean recognition of the knowledge that is relevant to better citizenship, even though the potential exists. Nevertheless, Veld (2010) defends that the knowledge democracy must be the current successor of what the author calls a ruined representative democracy. For better or worse, knowledge is an undeniable part of the current debate, for example, on democracy, education and the role of the academic at the political level.

1.1.2.1 Complex knowledge systems

A shift towards the acceptance of diversified sources and types of knowledge (Figure 1.1) is another occurrence that helps contextualize the focus on local knowledge, in particular its informal, often tacit dimension. The recognition of non-expert sources and systems, as those that provide local knowledge often are, is a relatively recent change of paradigm (FAO 2004), being met with growing recognition and interest by external researchers and decision-makers (Bohensky and Maru 2011). The debate over concepts such as 'citizen science' or 'crowdsourcing' of data collection is one of the many visible faces of this change of paradigm.

The fact that knowledge-based communities might be constituted by 'lay people', as opposed to 'experts' (David and Foray 2003, 23), and current access to digital technologies are two factors that make possible the collection of local data and the systematization of local knowledge in large scale. Lay people are now taking part in knowledge production and articulating with each other and existing institutions. And as "members of these [knowledge-based] communities develop their collective expertise, they become agents of change for the economy as a whole" (David and Foray 2003, 21). This is due to the aforementioned existence of an increased number of people with knowledge-based skills and widespread access to digital technology, to the recognition of diversified types of knowledge, especially those that differ from expert knowledge, and to the rise of public participation.

Types of knowledge	*Main actors*
Tacit knowledge	Individuals with experience (experts, communities and citizens)
Community knowledge	Community knowledge spread by social networks
Context-embedded knowledge: community based and social	
Sectoral knowledge	Professional knowledge belonging to sector professionals and political networks
Context-embedded knowledge: technical, economic and political	
Expert knowledge	Academically and professionally taught and diffused
Codified knowledge (analytical, regulatory, standards, etc.)	

Figure 1.1: Types of knowledge, from the most codified - expert knowledge - to the least codified - tacit knowledge (Pfeffer et al. 2013, 260).

But this situation also uncovers a change in the power of expert and scientific and lay knowledge in an uncertain and rapidly changing society. Hard decisions are being made hurriedly, with only soft evidence to support them. The role of expert and scientific knowledge in decision-making is challenged by citizens, revealing a need for 'socially acceptable science' in democratic governance. There is a growing unease and anxiety in society due to the failure of science and expert knowledge in addressing, by themselves, contemporary environmental and social problems (Pfeffer et al. 2013).

The problem is not merely a matter of swift response. It is found that, as scientific knowledge progresses, problems that were originally thought to respond to simple rules are reclassified as 'complex systems'. This does not only apply to natural phenomena. The aforementioned contemporary environmental and social problems and interactions are now often characterized as 'complex systems' as well - Henshaw (2013) points at 'human cultural systems' as an example, - and the theory of complex knowledge systems has been applied to any combination of natural, societal, political or economic matters.

Complex knowledge systems consist of diverse interrelated and interconnected components which try to solve problems by matching the increasing complexity of current reality with an increased complexity – and often unpredictability – of their own. They are of special interest to the topic at hand due to their integration of all types of knowledge, including local knowledge, and to the aforementioned change of paradigm that they represent. It is important to look into the theory behind complex knowledge systems before attempting to analyse certain tendencies and choices within current development strategies and policies. Such is the case of capacity building, adaptive management, and the concepts of complexity and uncertainty that underlie several other themes, to be reviewed in chapter 1.2.

Complex knowledge systems theory is rooted on the General Systems Theory proposed by Ludwig Von Bertalanffy in 1928, which proposed that each problem definition needs a different mode of explanation. While to this day there is not a unified body of theory, "'systems theory' has now become a foundation for most modern scientific disciplines, our methods of education, learning, business, financial and environmental management, as well as the basis of social policy as human ecology" (Henshaw 2013, N/A). There is nevertheless a recognizable divide between applications that require large computational power, programming and the creation of theoretical systems, and direct work in the context of natural sciences, environmental protection or community relations.

Not only are informal, lay-based and local types of knowledge expected to integrate and even help manage a complex knowledge system, it is also found that partnerships between people and institutions with different views of social and environmental problems, previously unsolvable by each agent individually, are able to build a common insight and address these problems cooperatively. By providing a framework that helps in identifying overlapping natural and social systems and discovering how to connect the options, systems theory becomes an evolving common language for a new kind of shared research, often using socially communicated learning tools (Henshaw 2013).

Since complex knowledge systems can be as unreliable and unpredictable as the subject to which they apply, since they exhibit properties that emerge from the interaction of their parts and cannot be predicted from the properties of the parts, it might be difficult to implement

them in certain contexts. Blokland et al. (2009) mention the difficulty in justifying the implementation of capacity building programs, based on complex knowledge systems theory, to official entities dependent on funds and needing a certain degree of assurance concerning possible outcomes. However, other options for predicting outcomes will often reveal themselves too rigid and simplistic.

This division between 'pre' and 'post complexity' is reinforced by Gibbons et al. (1994), who differentiated two processes of knowledge building based on different types of knowledge: Mode I, or the 'elitist model' (Bruckmeier and Tovey 2008), in which all knowledge enters a linear scientific process of experimentation, verification and codification; and Mode II, which distinguishes different types of knowledge, accepts different paradigms from different sources (Gibbons et al. 1994, Rip 2001), and could be the basis for a complex knowledge system. Mode I contemplates what is designated as formal or scientific knowledge, including expert and sectoral forms of knowledge. Mode II, on the other hand, may include both these and forms of informal knowledge. Informal knowledge, or non-expert knowledge, is lay-based and its forms range from a more personal nature – tacit, both implicit or explicit, - to "those that are embedded in and interact with cultural rules and norms" (Raymond et al. 2010, 1767), such as community knowledge (Pfeffer et al. 2013, 260, Figure 1.1). Tacit knowledge is considered particularly useful due to cross-cutting through other types of knowledge, but is often ignored in policy-making[2].

While it might not occur at all times, lay-based knowledge does not exclude scientific experimentation. It may indeed be generated through the formalised processes of research and scientific methods, as can be seen through models of project implementation of civic science, and be used to advance scientific knowledge (Raymond et al. 2010, Bonney et al. 2009). Still, in most cases the lack of methodological structure (hypothesis, proof and acceptance or rejection) is the main aspect in which lay-based knowledge differs from scientific knowledge. Another is its lack of an institutional or developmental framework equivalent to that of scientific knowledge; comparable procedures exist within some culturally defined communities, but never with the same capacity for education, review, debate, dissemination or experimentation, nor the same perspective of a need for universal truths beyond an observer's immediate surroundings. The lack of observational instruments, for example, means that level of accuracy attained by a farmer will normally be much lower than that attainable by a scientist (Sinclair and Walker 1999).

Ackerman (2004) defends that while informal (community-based or tacit) knowledge can be used locally, it must be upscaled and embedded in wider institutional processes to be more widely recognized and accepted, on par with scientific knowledge. The author argues that a legal framework for its mandatory inclusion could facilitate such upscaling. Other authors, writing from the perspective of spatial policy, disagree with the usefulness and even advisability of upscaling lay-based knowledge, especially when it is space-based. This debate will be further explored in chapter 1.2.

[2] Further examples of the differences between Mode I and Mode II can be found in the review of case studies, included in section 1.3.

1.1.2.2 The 'spatial turn'

'Spatial turns' and 'landscape turns' are mentioned throughout several academic disciplines, often in reference to GIS and the neogeography revolution around mapping. The spatial turn embodies an impulse to use new tools in reply to old questions.

Throughout time, according to (Guldi 2011b), the use of the term 'space', especially within the Humanities, has changed its significance. It began with spatial questions about nations and boundaries, states and surveillance, private property, and the perception of landscape. This was discussed and contested during the nineteenth century, from the 'social space' of sociologists studying the Paris Commune to the 'personal space' of midcentury psychologists. In the 1940s and 50s, modernist urban planners developed 'proxemics' in order to study and explain the relationship between human bodies and the built environment. In the 1960s, historians and sociologists were attracted to the logic of 'space' because of an emphasis on multiple scales and multiple agency. By 1968, Marxist geographers were using the 'Cartesian space' in association to the liberal government and the rule of capital. Later on, thinkers such as Georges Duby and Natalie Zemon Davis, together with the Cultural Turn of the 1980s, led to a 'spatial turn' in (or, as Guldi describes it, a new, space-centered way of looking back into) the description, experience and management of several disciplines and aspects of reality.

> *"In the spatial literature that followed, the slippage of the term 'space' from body to neighborhood to state (…). As nineteenth-century discussions of 'human geography' shifted to twentieth-century discussions of 'place' and 'space,' scholars in a range of disciplines played upon exactly this facility of landscape to bring the small and large under the same heading. (…) That easy synthesis of personal and political, of multiple scales and temporalities offered a radical alternative to the methods of hierarchical analysis, documentary history, and biographies of great men that dominated the traditional teaching of most disciplines" (Guldi 2011a, N/A).*

As the author emphasizes, "this spatial emergence (…) can help us understand (…) the direction that interdisciplinary collaboration may take in the spatial era of GIS" (Guldi 2011b, N/A). Today, for example, anthropologists defend that place-making is a way of constructing the past, social traditions, and personal and social identities, since place names register evidence of changes in the landscape even where there are no written traditions. Historians also refer to geographical names as an expression of different people, cultural areas, periods, and the line of development of each.

The layering of different types and areas of knowledge according to a geo-location, including metaphorical knowledge, and the most common and supported methodological approaches to both the structuring of such processes and their evaluation are activities better explained inside the domain of spatial cognition. Since they are relevant to the construction and use of tools and processes to harness local knowledge, they are further discussed in chapter 1.3.

In short, spatial cognition plays a central role in daily human activities and helps solve numerous problems, thus becoming an essential component of human experience in both routine and exceptional situations. It is a broad field that includes a range of disciplines from psychology, single cell biology and receptor physiology to geography and macro environmental planning (Foreman and Gillett 1998). Montello and Raubal (2012, 250) define spatial cognition as "the

area of research that studies activities centrally involving explicit mental representations of space (or at least potentially explicit)". There are also more detailed explanations:

> *"Hart and Moore (1971) define spatial cognition as the knowing of, internal or cognitive representation of the structure, entities, and relations of space; in other words, the internalized reflection and reconstruction of space in thought. Similarly Downs and Stea (1973) note that the process of cognitive mapping is a means of structuring, interpreting, and coping with complex sets of information that exist in different environments" Kim (2001, 2).*

The spatial turn and the recognition of the importance of space to human cognition have led to different types of spatial knowledge becoming strategic resources in planning and management – local knowledge, the focus of this work, is a type of spatial knowledge. Pfeffer et al. (2013) use the term 'participatory spatial knowledge' to refer to a complex knowledge system linked to one geographical locality and constructed by the contributions of several types of knowledge.

Spatial knowledge is increasingly visible due to the growing use of geographic methods (Cinnamon and Schuurman 2013) and concepts in sciences and humanities and the widespread use of geospatial technologies. In the wake of the 'spatial turn', it is now acknowledged as a resource essential for sustainable development and making good planning decisions (Wart, Tsai, and Parikh 2010, Paudyal, McDougall, and Apan 2011). Associated to it, there is the concept of 'spatial enablement', or the organization of activities of people and businesses, government actions, decisions and polices according to place and location (Williamson, Wallace, and Rajabifard 2006). Spatial enablement is part of e-Government and governmental ICT strategies. For it to occur, a spatial data infrastructure (SDI) must be established as support and it space needs to be regarded as core concept for all levels of society (Rajabifard 2012).

Spatial enablement can play a key role in the design of adaptation measures in regional adaptation strategies, as both the effects of climate change and adaptation measures have spatial impacts (Eikelboom and Janssen 2013). A considerable amount of the required information in risk and emergency management is geographical, and most of the information that is used by government to support social, environmental, economic and political decisions has a spatial component (Neuvel, Scholten, and van den Brink 2012, Paudyal, McDougall, and Apan 2011). At the local level, governmental activities with a spatial component include spatial planning, land management, taxation, and the issue of building and site permits (Sutanta, Rajabifard, and Aditya 2010).

1.1.3 CURRENT USE OF LOCAL KNOWLEDGE

1.1.3.1 Areas of application

Several disciplines, sectors and strategies value local knowledge, such as agriculture, animal husbandry, veterinary medicine and health care (especially concerning the properties of medicinal plants), sustainable use and management of natural resources, community development, poverty alleviation and survival strategies based on local resources (FAO 2004), maintenance of ecological diversity, humanitarian aid, disaster risk reduction and disaster management. Environmental, agricultural or ecological knowledge are the most intensively studied aspects of local knowledge. Much of the literature on local knowledge is dispersed throughout several fields, such as geography, anthropology, natural development, rural sociology, urban resource management, climate change response, planning, and engineering (Dekens 2007). In these fields of study, as well as others calling for an increase in community participation, local knowledge is an asset and a means to achieve better resource management, adaptation and capacity development strategies, recognizing local agents as the primary actors by default in their own lives and surroundings. According to the participatory discourse, taking local knowledge into consideration in terms of practices and contexts can also improve project performance and acceptance, ownership and sustainability. Understanding, accounting for and respecting local knowledge can contribute to cost-effectiveness in the long-term, both from a social and financial point of view (Dekens 2007).

This review includes journal articles published between 2010 and 2014 that refer to the use and production of local knowledge, or other interchangeable terms, in the context of spatial policies. The objective is to pinpoint within which themes and disciplines the concept was given more attention in recent years, and the support it has gathered. Since 'spatial policy' is a broad concept, the results range from topics connected to modes of knowledge production, research, assessment, and decision-making to planning, implementation, management and evaluation. Currently, governance, spatial planning (urban, environmental), environmental or natural resources management, and disaster risk prevention are the most frequently occurring contexts.

Starting with general literature concerning decision support in development policy, it is found that Barca, McCann, and Rodríguez-Pose (2012) defend place-based development policies, which build on the existing local knowledge, local values and sense of community, while remaining open to outside values. Harnessing local-level expert knowledge can also generate large quantities of data which ultimately inform the structure of Decision Support Systems (DSS) and risk-based tools, to determine practices likely to impact on environmental quality (Oliver et al. 2012). Since the local knowledge needed for development policies is often not readily available, it is necessary to involve local and external actors in a participatory process for its production (Barca 2012). Oliver et al. (2012) also advocate the need for integrated participation of stakeholders throughout the whole research process.

In the area of environmental planning and management, structured space-based approaches to data gathering are being increasingly used. It is the case of 'sense of place' mapping, which tries to describe values and meanings attributed by people to landscapes and their specific locations, human activities associated with these landscapes, and the variation of values and meanings

across different cultural and socio-demographic categories and different stakeholders; and local (ecological) knowledge mapping, used to find relationships between local ecological conditions and their variation to human activity in the same area (McLain et al. 2013, Fagerholm, Käyhkö, and Van Eetvelde 2013). Several fields of study, related to human activity and its surroundings, are thus layered on the spatial framework of local knowledge. Integration of local knowledge with scientific knowledge is usually sought, resulting for example in co-produced ecosystem services knowledge, through a process of collective and sometimes formal learning that takes place within the stakeholder community (Krueger et al. 2012, Raymond et al. 2010, Dühr and Müller 2012). Stakeholder participation and integration of local knowledge may lead a reduction of conflict in policy implementation and to better decision-making, enhanced reliability of information at the local scale and sense of ownership of the project (Krueger et al. 2012). It is also considered essential for essential for the credibility, relevance and legitimacy of knowledge systems (Dühr and Müller 2012). However, technical experts may show scepticism towards local knowledge (Krueger et al. 2012), while scientific knowledge might be met with low social acceptance by local actors in participatory processes (Scholz et al. 2011). Overcoming such issues can be a decisive factor for success of policy implementation, one possible solution being the clarification of correlations between local data with technical data (Krueger et al. 2012). Despite its perceived usefulness, however, local knowledge is still an underused resource in spatial analysis (Fagerholm, Käyhkö, and Van Eetvelde 2013).

In disaster risk assessment and reduction, including literature on climate change, there is recognition of the necessity to involve those affected by disasters in policy and actions towards disaster risk reduction (Gaillard and Mercer 2013) and to integrate their accumulated knowledge and perceptions in local risk management strategies (Peters-Guarin, McCall, and van Westen 2012, Eriksen and Brown 2011). Gaillard and Mercer (2013) warn that local people and communities, due to the knowledge they possess, are not helpless in facing natural hazards. According to these authors, the two areas of knowledge, local and scientific, need to converge; superiority should not be attributed to scientific knowledge in a given context by default, but, on the other hand, the suitability of local knowledge to a particularly strategy needs to be carefully assessed to avoid worsening vulnerabilities. In fact, building on local knowledge might not effectively lead to sustainable adaptation without addressing other principles at the same time, such as vulnerability and marginalization (Eriksen et al. 2011). Nevertheless, when properly integrated, local knowledge might help provide sustainable assessment and solutions to disaster risk (Gaillard and Mercer 2013). More specifically, it can improve practice at the municipal level by legitimising local coping strategies, providing better indicators, and developing understanding of recurrent threats (Peters-Guarin, McCall, and van Westen 2012).

In urban governance and spatial planning, there is a considerable body of literature centred on the methods, technologies and forms of assessment and validation to be applied to local data collection and integration, as well as local knowledge production through participatory processes. The position of local knowledge in current approaches is not secure. Data reliability of user-generated content, social exclusion due to dependence on technology, the interpretation and implications of digital maps, and which processes better generate effective knowledge from collected data are still major concerns (Pfeffer et al. 2013, McCall and Dunn 2012). The problems in the acceptance of local knowledge by experts and non-experts are once again stressed (Curry 2012). Van Assche and Djanibekov (2012), for example, state that while

local knowledge is desirable in policy integration and spatial decision making, it can be put to better use outside the formal planning system. However, other authors defend that making local embedded knowledge visible is useful to map priority problems and spatial conflicts, and direct urban governance towards more sustainable, resilient and inclusive development (Baud et al. 2011, Pfeffer et al. 2011, McCall and Dunn 2012). By helping democratize knowledge production, it can also inform local action and public policy, promote empowered public action and decision-making, and possibly counteract asymmetries in formal urban spatial governance processes (Pfeffer et al. 2013, Scott 2011), increasing of the potential for the actions of government agencies to better reflect people's needs as well as for the benefits to be more equitably distributed (McCall and Dunn 2012). A way to achieve this, according to Ellul, Francis, and Haklay (2011), is through community mapping. It provides a way to engage with local communities, which act as sensors in their local environment. The local knowledge added to these maps by communities highlights local issues, planning concerns, development sites and environmental issues. It is a strategic resource to which all stakeholders in urban governance processes can contribute, especially thought participatory processes (Baud et al. 2011). Information regarded as relevant by community groups is not necessarily identical to that provided by local government (Ellul, Francis, and Haklay 2011).

In recent spatial planning theory, (Albrechts 2013) agrees that local knowledge can improve planning in at least four dimensions: epistemology, procedural democracy, effectiveness and distributive justice. The author also mentions openness to local knowledge as a desirable trait of strategic governmental planning.

Concerning the production of knowledge itself, Dennehy, Fitzgibbon, and Carton (2013) explain that recognition of the significance of the 'place', and the way it promotes knowledge creation and sustained innovation, is needed in order to avoid erosion of knowledge as it moves across different cultural settings. This knowledge is essential in improving development aid performance, but not always valued in practice. Knowledge networks often fail in working both ways, which might prevent people from participating and contributing with the local knowledge needed for development. In O'Brien, Marzano, and White (2013), it is mentioned that calls for new models of knowledge production demand combinations of different research attributes. Participatory interdisciplinary approaches can quickly improve understanding and communication amongst both researchers and stakeholders involved in management.

Waas, Verbruggen, and Wright (2010) propose that multidisciplinary, interdisciplinary and participatory university research is an essential characteristic of academic research for sustainable development, requiring close collaboration between social and natural sciences and the harnessing of local knowledge. Yeager and Steiger (2013), in advocating for the use of mixed methods in order to reach understanding of the complex interactions occurring between society, environment and place, mention the increasing efforts to incorporate local, contextual, and other qualitative data into spatial research. In the context of applied geography, this allows overlooked groups to become active in the creation of knowledge pertaining to their environments, a better understanding of the meanings attributed by local populations to the landscape, and increased opportunities for awareness and input concerning local issues by stakeholders.

1.1.3.2 Main Applications

While local knowledge is not exclusive or sufficient for tackling the challenges people face today, it is nevertheless pointed as very useful resource in areas such as the preservation of cultural and biological biodiversity, informing spatial policies or the support of resilience views. Moreover, it is a part of global knowledge, which can be preserved, transferred, or adopted and adapted elsewhere, and thus has a value and relevance in itself (FAO 2004).

Finally, it is recognized that some forms of local knowledge, such as traditional knowledge, are important to local communities beyond scientific or broader societal merit: they encompass the concepts of social justice, sovereignty, autonomy and identity. This means local knowledge is strongly connected to power, local politics and the relationship between the local community and governmental entities, a connection played over the location of knowledge production and tools for communication. Understanding this connection is a key to studying conflict (Bohensky and Maru 2011).

Beyond these broader purposes of the harnessing, study, and use of local knowledge, there are four other recurrent ones, characterized for being more specific and pragmatic: managing complex knowledge systems, building cooperation, improving communication, response and resilience, and improving cost-effectiveness of projects.

Managing complex knowledge systems

Local knowledge has the potential of contributing invaluable information for science and resource management, quickly filling gaps and providing new perspectives in scientific understanding (Bohensky and Maru 2011). The combination of specific local knowledge and general scientific knowledge can be more powerful in informing policies than the use of either alone. At a minimum, local knowledge can provide a basis for preliminary formulation of hypotheses. If an explicit local process or model is already in place, it is also possible to take the process further by formally comparing it against both local practice and scientific knowledge, in order to identify constraints and opportunities for extending knowledge that is unavailable locally (Sinclair and Walker 1999).

Local knowledge is therefore an essential component in place-based knowledge systems and facilitates their construction, for the purpose of managing complexity. The integration of different knowledge systems, as well as different types and sources of information, is important to actors involved in research and development. This recognition of non-expert sources and systems, as those that provide local knowledge often are, is a relatively recent change of paradigm (FAO 2004), being met with growing recognition and interest by external researchers and decision-makers (Bohensky and Maru 2011). Considering the current knowledge driven development policies, this means that harnessing local knowledge and using it for future building and management complex knowledge systems is an end in it itself.

Building cooperation

Local knowledge is also significant to external actors who interact with the communities and places to which such knowledge pertains. These can be researchers, NGOs, donors, those

involved in private sector initiatives, governmental entities, and other development agents and policymakers (FAO 2004). In a context of cooperation between local and external actors, local knowledge has several roles.

Local actors confront and manage their environment in everyday life, developing their own coping mechanisms and an acute perception of the variation of conditions and risk over time. However, they are seldom in charge of developing large-scale decisions, studies or models related to that same environment. Without accessing local information and identifying the individuals or local identities that possess relevant knowledge, external actors involved in planning and risk management can find it difficult to understand how communities cope with and adapt to local specificities or hazards. This often results in local and external actors having very different perceptions of the same situation, which can lead to errors, failure, waste of time and mistrust (Peters-Guarin, McCall, and van Westen 2012).

Placing value on the sharing of information in cooperation, as well as valuing and recognizing local knowledge itself, guarantees that external actors are able to reach common ground when communicating and working with local actors and other members of local communities (FAO 2004). Therefore, it can encourage appropriate attitudes and actions by authorities and local communities, help build trust, improve project performance and ownership (Dekens 2007), and enhance opportunities for decision-making in partnership (Peters-Guarin, McCall, and van Westen 2012). This aspect is relevant in participatory development and/or governance, but even more so in disaster response and risk management due to the time constraints associated[3].

Access to local knowledge provides guidance in the joint development of adequate measures, practices and models for developing communities, decreasing their vulnerability, and avoiding or reducing risk (Peters-Guarin, McCall, and van Westen 2012). Models of development or intervention that seek change, when applied to a certain place, can be more successful if based on incremental transformation of existing practices and systems rather than pre-determined ones, even if the latter are theoretically sounder and technologically more complex. Therefore, local knowledge may help define the range of options available to external actors when designing better practices (Sinclair and Walker 1999) and provide different perspectives for evaluating the effectiveness of implemented practices (Peters-Guarin, McCall, and van Westen 2012).

Improving communication, response and resilience

Improved communication is already an aspect of building better cooperation through the use of local knowledge, but there is an aspect of communication that is often highlighted: that of direct communication in situations of crisis and disaster response.

[3] Example: research in Naga City revealed that understanding the threat embodied by flooding and typhoons requires not just determining physical aspects (such as water depth and duration or velocity of the water and winds as well as their spatial distribution), but it also involved comprehending the role played by existing knowledge at the community level, the awareness raised by official and community-based warning systems, and the efficacy of the coping strategies available at the household, ward and municipal level. These elements determine the range of options available to actors for 'managing' the flood threat (Peters-Guarin, McCall, and van Westen 2012).

Understanding local knowledge, practices, and contexts helps development and research organisations to adapt their communication strategies to local partners' necessities. It also enables them to act as intermediaries, translating governmental messages to communities in a way that is understandable and credible. A hazard map might not be understood if the community perceives the landscape differently from the mapmakers, in the same way that an official warning message using technical language might not properly depict the urgency of the situation (Dekens 2007)[4].

Therefore, integrating or combining different types of knowledge in a way that benefits both scientific and local communities, such as by incorporating local references in the communication tools for disaster preparedness, improves communication and response time (Dekens 2007, Bohensky and Maru 2011). In recent literature, the ultimate objective of this strategy is often to strengthen the preparedness and resilience of local communities, as well as avoid or decrease the disruption caused by natural events, in light of climate variability and other environmental changes (Alaerts 2009, Peters-Guarin, McCall, and van Westen 2012).

This objective is firmly planted inside the resilience discourse, related to "the ability of a social-ecological system to withstand disturbance without changing structure, function, feedbacks, and identity (…), and to remain flexible in response to changing environmental and social contexts" (Bohensky and Maru 2011, 2). The resilience view defends that the combination of different types of knowledge, co-management and collaboration can help manage complexity and uncertainty, as well as build up both social and ecological resilience.

Improving cost-effectiveness of projects

Dekens (2007) defends that local knowledge practices and contexts can help improve local planning, project performance, sustainability and disaster preparedness activities, especially in the context of participatory discourse.

From the financial point of view, different resources and scales have to be considered in economies of scale, as well as the performance of local people. However, in order to integrate cross-scale institutional linkages, "solutions in resource management, development, and disaster management need to go beyond the dichotomy between local versus state management levels" (Dekens 2007, 14). Understanding local knowledge and practices can help identify what is needed and acceptable locally and how people can participate collaboratively, strengthening local possibilities. Integrating local knowledge and practices, when relevant, can also decrease dependency on external aid, provide continuity and monitor the actions taken. Therefore, the understanding and integration of local knowledge contribute to financial and social cost-effectiveness.

[4] Example: "(…) a meteorological agency might release the following message to communities: 'the river is going to rise by one to two metres in the next 24 hours.' But is it enough? What does it mean to the locals? Government agencies often release information that is not understood at local level" (Dekens 2007, 14).

1.1.4 WRAP UP

In this section, a review of recent literature illustrates the current interest on local knowledge. The objective was to show what local knowledge is, and the way it is regarded and applied in several areas. Specific, direct applications of local knowledge are summarized, unconstrained by a specific disciplinary context, while at the same time highlighting how harnessing local knowledge can be profitable and desirable for the purpose of improving "the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say" – in short, governance (Graham, Amos, and Plumptre 2003, ii).

In following section, however, the theme of local knowledge is subordinated to spatial policies. This is important at two levels. Firstly, if local knowledge is to be used, the scale of its use is influenced by its inclusion in (or exclusion from) spatial policies, which means it is relevant to have a clear picture of the issues and difficulties involved. Secondly, harnessing local knowledge in order to inform spatial policies is, after all, a complex task that needs investment of resources, and it is reasonable to expect it will not be as readily promoted if it is not somewhat aligned with the processes and desired outcomes of spatial policies for management, development and intervention.

1.2 LOCAL KNOWLEDGE IN SPATIAL POLICIES

Local knowledge, as a type of spatial knowledge, is of marked important to activities that are subordinated to space and place. To understand the role of local knowledge in spatial policies, it is first necessary to understand the current context of spatial policy making, as well as its paradigms and metanarratives, through a literature review of planning and governance theory.

There are arguments for an increasing inclusion and legitimization of local knowledge in spatial policies, as well as criticism of such inclusion or the way it is conducted. But there is also a wider set of trends implying that such inclusion has been inevitable for some time, since it has a strong connection to some policies and themes that have been on the rise. This means that, in current policy making, it is important to recognize and learn how to work alongside local knowledge, independently of whether one might champion its cause.

In what concerns the literature review of the role of local knowledge in spatial policies, this situation translates into local knowledge either being purposefully mentioned in policies or contexts that consider the outcomes of its harnessing and use desirable (although previously that might not have been the common practice), or appearing as a by-product of certain contexts and being regarded as inevitability. It should be mentioned that planning and governance theory seldom address local knowledge specifically. Therefore, beyond the concept of local knowledge itself, other associated themes were sought in the literature review, such as mentions to community engagement, participatory practices, and Mode II of knowledge production[5].

Several reasons justify this choice of keywords. Firstly, while spatial data collection and codification for further use are demanding activities in themselves, the difficulty is increased tenfold by the fact that the only people who possess local knowledge are local people, and accessing it is impossible without them. Therefore, participatory practices are indivisible from activities for harnessing local knowledge. Secondly, and reinforcing this, any work towards community engagement implies recognition of the impact that a community can have on its own quality of life, worldview, and the spaces it inhabits. As stated before, local knowledge is a primary vehicle, intrinsically connected to cultural practices, for an individual or a community to act over their own environment and improve their quality of life; encouraging the contributions of a community implies an acceptance that local knowledge will be involved in the process. Finally, subjects and processes related to Mode II of knowledge production indicate some degree of acceptance of alternative, non-expert sources, types of knowledge and actors, signalling a discourse that might be favourable to local knowledge.

This section is divided in two parts. In the first, present-day policy making is contextualized according to four different themes (‘structural realities’, ‘the shift towards governance’, ‘justice and desirable outcomes’ and ‘new challenges’), through a combination of recent history and prominent concepts currently in use. At the end of each theme, a subsection labelled ‘local communities’ focuses on one specific concept, belonging to spatial planning or governance

[5] Mode II of knowledge production involves the acceptance of sources and types of knowledge beyond scientific sources, as described in section 1.1.

theory, which was considered especially relevant to working with local knowledge or the related keywords enunciated in the previous paragraph.

The second part of this section answers to the same four themes as the first one, now under the specific role of local knowledge in spatial policies - the issues presented are directly related to either the concept of local knowledge or one of the other three keywords. While the first part tries to provide the big picture surrounding the use of local knowledge in spatial policies, the second part pinpoints its specifics issues and uses.

1.2.1 CONTEXTUALIZING PRESENT-DAY POLICY MAKING

Böhme (2002, 12) defines spatial policies as "comprising all policies aiming at influencing locational and land-use decisions, or the distribution of activities, at any geographical scale". Policies are "the response of policy actors to particular issues that are constructed and debated within the limits established by paradigms and philosophies" (Allmendinger and Haughton 2013, 19).

Spatial planning, according to Böhme (2002), is currently largely responsible for defining and implementing spatial policy at any geographical scale. It is hoped that it will help accomplish a more rational territorial organization of land uses, balance environmental and development demands, and achieve a series of social and economic objectives. However, it is also a stage for competing objectives and aspirations regarding future land use, where reconciliation of interests is attempted, sometimes unsuccessfully, and where there are winners and losers (Allmendinger and Haughton 2012, 89). These authors defend that planning evolves in parallel to changes in governments and societal priorities, as it is the main mechanism through which the state manages land use changes. Such shifting consensus challenges the position that planning should pursue a normative agenda that transcends political and ideological shifts, and create visionary planning processes based on firmly established core values. Instead, the discourse of a given epistemic community might come to the fore of practice not (only) due to its relevance, but also because it is needed in order to legitimate and present the ideas of those in power, as well as to provide a new, clearer paradigm that will replace the previous one.

Paradoxically, Allmendinger and Haughton (2012, 89) consider that one of the main roles of planning is "to acknowledge and address some of the power inequalities in society, to ensure that a general 'public interest' is taken into account in this mediation between different and competing interests". Spatial planning and governance theory provide an extensive picture of the dominant (and alternative) paradigms and philosophies that "allow policy actors to interpret situations within common 'frames', defining the problems to be solved and the methods to solve them" (Allmendinger and Haughton 2013, 19). These philosophies are the roots of the mediation process pictured above - between ideals and the constant conflict and input of distinct interests, - made visible through the implementation of spatial policies.

Contemporary trends and discourses behind spatial policies are diversified and difficult to pinpoint. The same can be said of the current normative context of planning schools of thought. In this section, a summary of the main concepts pertaining to current spatial policy is presented, drawing from recent literature in the areas of spatial planning and governance. These trends,

grouped here according to overarching themes, reflect nonetheless the coexistence of differing interests, agents, frameworks and paradigms. On one side, there are structural realities that dominate most of policy making: the institutions responsible for decision-making (governmental bodies, organizations) and the main forces that shape them (economy, politics, changes in dynamics and scale). On the other side, or, optimistically, alongside, we have citizen movements and the recognition of complex inputs that have largely bolstered dynamization of and participation in governance. Underneath them all, strong normative and civilizational values such as justice, equity and identity, pressuring policy setters to take 'the right path' when facing challenges and to induce change. And finally, the challenges themselves, or at least the main new challenges of our day: climate change, risk, uncertainty, complexity and fast demographic growth, amongst others.

1.2.1.1 Structural realities

In order to contextualize current spatial policy making, it is necessary to understand the global processes, political-economic meta-narratives and major trends influencing planning practices and the organization of the entities responsible for decision making and implementation of policies (Allmendinger and Haughton 2013). It is also pertinent to look into how these entities, which have the power to set policy, handle that power in confrontation with alternatives and deviant narratives. This section is therefore dedicated to a top-down perspective of spatial planning, drawing from its context, intentions, outcomes, rhetoric and reality.

Large-scale trends

One of the greatest stressors of current spatial policy making is globalization. At a broad level, globalization can be defined as "the growing interconnectedness and interrelatedness of all aspects of society" (Jones 2010, 4) in the post WWII / mid-20th century world. Globalization processes imply a "transcultural diffusion, integration and transformation of a broad variety of means of social cohesion, ranging from goods to language, to belief systems and political institutions" (Renn 2012, 29), as well as "global standards, rules and policy instruments" (Renn 2012, 401). These processes are characterized by an intersection of several layers, such as the spread of technologies occurring at the same time as the migration of populations in a given area.

The existence of significantly different philosophical perspectives, and disciplinary positions, engaged in the debate over the concept of globalization means that it is problematic to consensually narrow down these definitions. Jones (2010) explains there are three main difficulties in this debate. One of them is the difference in the focus of the different disciplines that seek to define globalization, each giving preference to different aspects of it. Another is the question of whether globalization can even be considered a singular, identifiable phenomenon, relevant and applicable to its commonly associated transformations - while, according to the author, Anthony Giddens links globalization to modernity and every dimension of contemporary life, authors such as Thomas Friedman, Martin Wolf and Naomi Klein only speak of globalization as a political-economic phenomenon.

The final aspect is the major contrast between two epistemological approaches: on one side, a group ranging from 'modern' and structuralist to social scientific approaches, derived from social and economic classical theories, defends that "coherent systems, processes and structures can be used as units for analysing the social world"; on the other side, the group of 'postmodern' and poststructuralist approaches doubts of the existence of such entities and "focuses its theoretical attention on flows, networks, relations and interactions" (Jones 2010, 4). This epistemological division is of special interest for this work. Echoes of it can be heard in many other themes, such as the different approaches to knowledge and its agents, the issues of complexity and uncertainty, or the debate around governance and the networked society.

Current debate about the consequences of globalization processes also points to a dichotomy between homogenization (or universalization) and reinforcement of complexity, according to Renn (2012). While these views may seem contradictory, the dynamics of globalization cannot be encapsulated by either; rather, they meet in the middle, and often overlap.

> *"(…) the economic power of globally organized transnational corporations increasingly translates into a standardization of mass culture and universal tendencies of wasteful consumption of natural resources. Contrastingly, due to the unequal distribution of wealth, among other factors, the same pressures of homogenization provoke an increasingly diverse spectrum of strategies to cope with these pressures, which leads to an increasingly complex patchwork of social relations. National and regional institutions and traditions in fact play an often neglected mediatory role in filtering and transforming the effects of globalization." (Renn 2012, 28)*

The fact that the institutions responsible for policy making and implementation assume the role of mediators is an aspect of power and structural realities to be discussed further below, namely under the topics that pertains to the role of planning in consensus-based politics. It is important to keep in mind that, despite the importance of globalization to spatial policies, it only provides context, with a scope of responses and outcomes in different situations continuing to be possible. In other words, "the globalization of planning ideas and practices can still lead to different outcomes" (Stead 2013, 22).

The second concept to exert great influence on spatial policy is neoliberalism. Neoliberalism, often classified as a metanarrative [6] by social sciences, has swept the so-called 'western' countries and led to the 'neoliberalization of planning'. The term is widely used, sometimes in a misleading way, to designate "fast evolving, multi-faceted and spatially variable practices and policies to support a market-enabling approach" (Allmendinger and Haughton 2013, 8), for which the label 'processes of neoliberalization' would be more accurate. To clarify, the author deploys David Harvey's summary of neoliberalism as a process based on:

> *"(…) [the] theory of political economic practices which proposes that human well-being can best be advanced by the maximization of entrepreneurial freedoms within an institutional framework characterized by private property rights, individual liberty, free markets and free*

[6] 'Metanarrative' is a concept used in critical theory, and particularly in postmodernism. It refers to an overarching narrative or grandiose rhetoric about events, experiences and phenomena of historical meaning, or rather, the story beyond the story. This grand narrative offers a totalizing view of events, appealing to universal truths or values in order to legitimize power, authority and social customs as part of a universal master idea. Examples of metanarratives include neoliberalism, marxism, religious doctrines, or the model of scientific rationalism, amongst others (Lyotard 1984, Jones 2003).

> *trade. The role of the state is to create and preserve an institutional framework appropriate to such practices... State interventions in markets (once created) must be kept to a bare minimum because the state cannot possibly possess enough information to second-guess market signals (prices) and because powerful interests will inevitably distort and bias state interventions (particularly in democracies) for their own benefit". (Harvey 2006, 145, in Allmendinger and Haughton 2013)*

There has been an increasing marketization of the public domain, with previously public responsibilities being increasingly taken up by private (or jointly by public and private) providers, and public organizations being relegated to the role of enablers (Stead 2013). However, processes of neoliberalization, like all discourses and policies, are not simply imposed from above nor applied in pure form. Instead, it is filtered through various levels of governance, which leads to a multi-directional process of negotiation, contestation and reformulation. Neoliberalism is, in fact, a series of interconnected but distinct neoliberalisms, according to (Allmendinger and Haughton 2013).

Some aspects of neoliberal thinking, and their effects on spatial planning practices, are criticized. One of them is the emphasis on "individuals making decisions as self-interested individualistic consumers rather than as citizens undertaking collective forms of action" (Allmendinger and Haughton 2012, 96). Additionally, neoliberal governance depoliticizes emancipatory concepts such as empowerment and participation, at the same time that it politicizes socially charged decisions traditionally considered mundane and technical.

Parallel to globalization and neoliberalism, there are strong trends in politics that also affect spatial policy, namely the 'post-political condition' and consensus-based politics. Implied is the characterization of the 'political' as a space of power, conflict and antagonism, derived from the ontological concern with how society is instituted. It is distinct from the concept of 'politics', the set of practices and institutions that guarantee the creation of an order and the organization of human coexistence in spite of 'political' conflict (Allmendinger and Haughton 2012, 91).

The 'post-political condition', or 'post-politics', is a term used in the social sciences to contextualize certain characteristics (dialogue, deliberation, participation and consensus, for example) of policies that take place in a broader political consensus, typical in Europe and 'western' countries. This political landscape emerged from a conjuncture that included the rise of liberal democracy, economic globalization, political and administrative devolution, and proliferation of diverse lifestyles. Post-politics replaced class-based politics after World War II, and sought to work with the continuously changing personal and collective identities of people, growing individualism and acknowledgment of individual differences. It is closely tied to the concept of consensus and participation, seeking it through dialogue and challenging the dominant model of 'aggregative democracy' [7] with the model of 'deliberative democracy' (Allmendinger and Haughton 2012, 91).

> *"Work on deliberative democracy (Guttman and Thompson 1996; Habermas 1984; Rawls 1971) provided an alternative model for engaging with political disagreement and conflict, with its emphasis on normative rationality and the value of deliberative approaches to*

[7] Aggregative democracy is the aggregation of preferences through political parties. It considers "popular participation as likely to be dysfunctional or destabilising for the system, relying instead on compromise and trade-offs between interests" (Allmendinger and Haughton 2012, 91).

consensus-building, serving as part critique and part antidote to the aggregative model (Mouffe 2000)." (Allmendinger and Haughton 2012, 91)

Consensus-based approaches seek to achieve agreement between diverse actors through consensus-building work, a concept pushed forward mainly by communicative planning theory, in the context of public participation and institutional governance. It is based on the notion that making spatial policies work involves mediating between conflicting, sometimes irreconcilable interests (Allmendinger and Haughton 2012, 89). Communicative or collaborative planning, sometimes also qualified as 'argumentative' or 'deliberative', comes from the 'communicative turn', a change of paradigm which emerged during the post-war period and has dominated theoretical discourse since the early 1980s (Healey 1996, Allmendinger and Tewdwr-Jones 2002). It could be categorized as a change of interest from ontological to epistemological matters, embracing social sciences and the enlargement and empowerment of democratic processes, and adapting Habermas' critical theory concepts to spatial planning theory. Its proponents defend that public government embedded in representative democracy has failed to deliver social justice and environmental sustainability, and that government has compromised the development of a democratic attitude as well (Bengs 2005). Collaborative planning focuses on issues of context, including nature, places and systems of governance, structure and institutional organisation. In addition, it attends to issues of power, in order to develop more democratic planning practices. The concept of community, within the collaborative planning framework, is both a spatially-based and a stake-based concept, related to diversity. The emphasis of this model is on the deliberative or collaborative process, on the construction of policy through participation, and on 'deliberative strategy' (Allmendinger and Tewdwr-Jones 2002).

The post-political condition is criticized for being premised on an over-optimistic view of liberal democracy and not taking into account the downsides of political consensus, with the consequence of foreclosing "all but narrow debate and contestation around a neoliberal growth agenda" (Allmendinger and Haughton 2012, 91). And while consensus-based approaches have the potential to strengthen accountability and community engagement in planning, it is argued that the concept has also been used to justify questionable reforms and undermine challenges to the main paradigm: "there will always be those who do not agree and even if they are in the minority, the important point is how they are regarded in the development process in its broadest sense" (Allmendinger and Haughton 2012, 100). Instead of empowerment and debate of a wide range of societal options for future development, consensus-based approaches can mask "carefully stage-managed processes with subtly but clearly defined parameters of what is open for debate. This system gives the superficial appearance of engagement and legitimacy, whilst focusing on delivering growth" (Allmendinger and Haughton 2012, 90).

This focus is central in planning literature, with development and economic growth being presented as (or assumed to be) fundamental to planning. Planning practices change regularly in order to accommodate and address contradictions in different approaches that promote economic competitiveness. An economic system centred on neoliberal capitalism is seen as inevitable, with the post-political condition providing the necessary 'consensus tools' to legitimize choices (and offer minimalistic concessions) at the same time that they tackle conflict

regarding objectives[8]. This is visible when planning practices strive to offer something to each of the interests involved in policy making and promote progressive issues such as citizen participation, social justice, sustainable development and quality of life – all the while keeping economic growth at its core. Consensus based politics assure that the growth agenda is not compromised by existing challenges, at the same time that issues are incorporated insofar as they do not conflict with it (Allmendinger and Haughton 2012).

In this context, there seems to be a predominance of outcome-based, or objective-focused, planning practices, policies, and projects. This focus on the delivery of results, on which funding is often dependent, is mentioned by several authors (Crowley, Balaram, and Lee 2012, Othengrafen 2012, Day 2008). Performance measurements have also become a widespread practice in neoliberal countries, being used in all kinds of professional areas, including planning (Gunn and Hillier 2013). In a series of interviews conducted by Christensen (2015), for example, it is found that even when recognizing the importance of the process in planning, 95% of the interviewed planners in the study admitted to being goal oriented, thus attending to outcomes. The situation is compounded by the economic recession that started affecting several 'western' countries at the end of the 2000s, the support for public austerity measures (Allmendinger and Haughton 2013, Crowley, Balaram, and Lee 2012), and risk-averse professionals and practices, influenced by a context of uncertainty (Gunn and Hillier 2013).

Changes in institutional frameworks

Recent history is characterized by the reformulation of whole nation systems of planning and state rescaling, first of all by redefining the role of the nation-state (Stead 2013). Decision-making has been partly relegated to supranational bodies, such as the European Union, thus mudding sovereignty to some extent and introducing common policies and initiatives, while ethnical or regional specificities have placed stronger pressure on the state from the inside (Stead 2013, Allmendinger and Haughton 2012).

Spatial planning systems in Europe, in particular, are being shaped by forces of convergence and divergence (Stead 2013) [9] . One of the forces for convergence is globalization, but 'europeanization', 'policy transfer' and 'lesson-drawing' also play a role. This convergence is visible in "state rescaling, the internalization of planning education and practice, and the increasing competition between cities and regions" (Stead 2013, 22).

Europeanization is used to refer to processes of "consensus building, network establishment and maintenance, elite bargaining and knowledge construction, transnational socialization and learning processes" that have and are still contributing to the building of the EU and the creation of a European identity[10] (Faludi 2014, 156). At the institutional level, europeanization is both a

[8] The replacement of debate and dissent with a way of governing based on consensus and technocratic management, with experts expected to resolve conflicts while the political status-quo remains unchallenged, is even referred to, at some point, as 'neoliberal governmentality' (Allmendinger and Haughton 2012, 91).

[9] However, the principles and concepts involved in Stead's description of convergence and divergence can also be found beyond European countries, according to the author.

[10] Faludi (2014) warns that europeanization is often used both to refer to countries belonging to the EU and countries in Europe that are not members. This causes some confusion, because it conflates processes related to EU policy setting and the European integration narrative.

top-down and a bottom-up process – for the European Union to influence national discourses, first there has to be an agreement on which issues the EU can address. The result are 'uploading', 'downloading' and horizontal processes of policy 'crossloading' (Stead 2013, Faludi 2014) in policy transfer. While spatial planning is not one of the competences of the EU, the supranational body has played a key role in promoting a European spatial planning agenda, with shared normative concepts and planning ideas (Stead 2013).

Policy transfer is a concept that means "the transference of policy ideas, institutions, models and programs between government authorities (national, regional, and local)" (Stead 2013, 23), a practice whose validity is questioned but which happens nonetheless. There is a great variety of institutional frameworks and socioeconomic situations from country to country, and the transfer of policies between them has not been widely investigated in detail yet - especially when it comes to central and eastern Europe, according to Stead (2013). Policy transfer is complex and not a simple matter of emulation, since it also involves learning and adaptation processes. It also has to consider the unique features of countries when importing tools and methods, since they might only be applicable with some degree of customization, or not at all. Additionally (and branching out from the topic of convergence), the practice of policy transfer amongst national entities, at different scales, raises the issues of policy diffusion, the focus of spatial planning on multi-scalar coordination and integration, and multilevel governance, whose many fragments spatial planning is supposed to knit together (Allmendinger and Haughton 2012). Multilevel governance processes, about which there is still much to be known, highlight the role of a new set of countries with the capacity to influence the EU territorial policies, by means of socioeconomic, political or cultural factors, rooted in in various realities, both regional and national (Servillo 2011). Inevitably, many spatial policies today are cross-sectoral (Allmendinger and Haughton 2012), with cross-scale effects (Beilin and Wilkinson 2015).

Returning to the topic of convergence and divergence, the main forces of divergence presented by (Stead 2013) are the existence of planning cultures, families of nations and social models, as well as path dependence and path shaping.

A planning culture, according to Faludi (Stead 2013), is the collective ethos, or dominant attitude, of planning professionals in what concerns the appropriate role, and influence, of the state, market forces and civil society over social outcomes, taking into consideration the attitudes, beliefs, emotions and societal values pertaining to a specific decision-making system. Differences between planning cultures are visible in the professional ethos of each, but also in the planning instruments and practices used (Othengrafen 2012, Stead 2013). This can introduce significant variation in the discipline and practice of planning. Examples given are the reliance of German, English or Dutch planning cultures on social sciences, Spanish and Italian on the profession of architecture, and some of the post-communist ones on economics.

Not only does Stead defend that there is a strong correspondence between type of planning system and model of society, he also points out the theory that proposes the existence of clustering according to 'families of nations'. The theory is that "policy goals and implementation preferences in specific regions are not random but rather tend to cluster into favoured sets of ideas and instruments which are used over a wide range of policy-making contexts" (Stead 2013, 25). Each 'family' shares geographical, linguistic, cultural and historical attributes as a result of their inherited common ideas, customs and institutions, with the most commonly 'families'

being Western Europe, Anglo-Saxon Europe, Southern Europe, Central and Eastern Europe, and the Nordic region. The existence of families of nations is pointed as one of the possible causes of the differences, in the way Europeanization impacts different countries. Other causes might be the distance between spatial planning and regional development policies, which varies from country to country, and the dependence of any given territory on European financial support for regional development.

Finally, path dependence refers to the national contextualization of processes at the foundation of current institutions. It is defended that "the historical experiences and developments that (…) countries have been through have shaped institutional patterns, legal structures, cultural values, public preferences, and professional organizations" (Stead 2013, 25). Also, path dependence might mean a preference for well-known past policy decisions that have been more or less successful. Having in mind this concept is especially important when facing new challenges and promoting new forms of governance, since it tells us that present decisions are conditioned by the persistence of certain ideas and institutions, through a negotiation between formal and informal rules, and that institutional change tends to be incremental and kept to a minimum. Nevertheless, this resistance to change can be countered, in the path shaping perspective. While path dependency looks at the past, path shaping considers the future, seeing the incremental changes that are possible, within the inherited constraints, as the key to open up future possibilities. According to it, an actor working within a path dependent institution or system still has a range of possible choices, no matter how conditioned they might be.

These forces of divergence are connected to another trend, which is the increasing recognition and acceptance of diversity and asymmetry. Acceptance of the diversity is present in political, professional, and administrative cultures or structures, in social models, and in welfare systems (Stead 2013), and contextualized by an increasingly globalized, interconnected, saturated and mobile society. It is now seen as essential for a more equal society, as it means that a more diverse range of people can participate in civic discourse, thus meeting the principles of communicative planning and justice advocates at the same time. Furthermore, it is doubly important for social-ecological resilience advocates, who consider diversity important for recovery from shocks to the system. Nevertheless, Beilin and Wilkinson (2015, 1210) issue a cautionary reminder that diversity is not considered a positive attribute universally; instead, it can be argued that "less diversity – fewer local governments and more concentration of wealth – is better for the current economic system to flourish". They do point out that the current economic model has promoted harmful policies for the future of humanity, and that the outcomes considered suitable to it might not match the aspirations of societies. Regardless of these problems, diversity is still a subjective concept that requires further interrogation, as its meaning is dependent on the wider context in which it is used.

We have seen the impact of global and international trends in spatial policy, as well as the influence national systems have over each other and the ways in which they differ or converge. But policy diffusion goes all the way down to the local level, and both local and regional governments have their own peculiarities, especially in present day spatial policy making and in the light of diversity acceptance. In fact, recent years have seen many instances of strengthening of the lower levels of self-government. This leads to a sense of local empowerment, as well as a differentiation between the path followed locally and nationally in spatial policy (Stead 2013). Two main trends exist at the heart of this process: devolution and localism.

According to Lyotard (1984), there is a postmodern distrust of all-encompassing metanarratives (such as neoliberalism), in favour of local 'little' narratives from a multiplicity of theoretical standpoints. Interestingly, this discourse has now surfaced in planning and decision-making. Allmendinger and Haughton (2012, 101) reveal that post-politic stances are moving towards 'local-area politics' in certain contexts[11]. Local-area politics still make use of consensus-building and public engagement while seeking new ways to align planning and democracy. However, the concept is also connected to further marginalization of positions that oppose the mainstream growth-led strategies. Moreover, it is based on the concepts of pluralism and localism, according to which local communities take on a greater role in identifying and addressing local needs. In the same way, devolution, or the scaling down of planning and decision-making to the lower forms of government, promotes local empowerment and more effectiveness in response and implementation. It could be considered "a practical and moral response to the limitations of existing governance systems in light of continued declines to biodiversity, inattention to social justice and an increasingly informed citizenry as education standards have improved" (Leys and Vanclay 2011, 576).

Allmendinger and Haughton (2013) also point out that incentivizing a plurality of localist interventions might be a way to greatly reduce the role of the state, which can be taken as a way of emancipation, when human capacity for such exist, or a way for governmental entities to shirk their responsibilities and cut back on spending, thus aggravating social problems. They also defend that there is no guarantee of a better flow of resources to local government through the practice of rescaling. In the same way, Beilin and Wilkinson (2015, 1206) explain that a common political justification for devolution is to remit "responsibility to individuals and ambiguously defined communities, underpinned by an assumption that citizens inherently have the power to act and overcome emergencies". All of this has the potential of undermining effective policies and the resistance to ineffective ones (Allmendinger and Haughton 2012, 89).

Local communities and spaces of democratic informality

Another side of the localism, self-governance and emancipatory trend is a marginalization of alternatives, especially in the context of consensus politics. There is a constant, dissimulated conflict between the mainstream or dominant philosophy and 'deviant' alternatives. Since voices of dissent are seen as prejudicial to the group, they become effectively marginalised from networks of governance, with the system rewarding only those willing to work with the mainstream parameters it has set. Those who present alternatives are often characterized as problematic, troublesome, counterproductive, or as having vested interests (Allmendinger and

[11] In the UK, for example, 'open source planning' been presented as a new planning paradigm in 2010, drawing from the localism and devolution discourse. It is similar to "open source software development, which draws on the 'wisdom of the crowds' and public spirited individuals and communities of interest rather than simply adopting a dominant corporate or governmental blueprint"; furthermore, it is presented as "a shift in the emphasis from a 'one size fits all', top-down target-driven model to a more fragmented, locally determined, incentive driven approach" (Allmendinger and Haughton 2013, 6). This approach seeks to shift part of the responsibility of identifying and addressing local needs from the state to local communities, by encouraging a plurality of localist interventions. Open source planning is circumscribed to specific contexts, since no matter what plans communities come up with, they still must conform to national standards such as the precedence of sustainable development, and be able to coordinate with existing local plans and development frameworks.

Haughton 2012, 94), and might end up creating spaces of resistance, which is a concept important to this work and the use of local knowledge.

> *"A key additional feature [of neoliberal democracies] is the attempted normalization of neoliberal thinking through its discursive representation by proponents as a form of natural order (often citing 'the invisible hand of the market') and an associated portrayal of alternatives of deviant."(Allmendinger and Haughton 2013, 8)*

However, spaces of resistance are not only born out of the fight against the marginalization of alternatives. Scalar changes of decision-making frameworks such as devolution can create grey areas in developed regions, and pre-existing informal urban spaces (slums and other informal, unplanned settlements, for example) also constitute grey areas (Allmendinger and Haughton 2013, Roy 2005). Often called 'soft spaces', in what concerns policy making and implementation, these grey areas are then filled in by manifestations of informal governance. Allmendinger and Haughton (2013) defend that the fuzzy boundaries between formal and informal spaces and scales of planning are an overlooked dimension of neoliberalism. In short, spaces of democratic informality or informal governance can occur spontaneously, due to movements of resistance or the mismatch between the rigid aspects of formal governance and more functional spaces that do not fall into well-defined categories (such as the boundary between urban and rural); but they can also be purposefully created to supplement and even usurp formal processes, in order to, for example, overcome resistance to growth.

As Van Assche, Beunen, and Duineveld (2014, 661) explain, "many states do not function according to their own stated principles, and free market, democratic representation, and rule of law are usually imperfect." In a complex and imperfect democratic government, spaces of informal governance can be created when private interests hide behind public ones, deviate from proper procedures and fill in gaps. These practices "are experimental and push the boundaries of existing statutory requirements in an inventive way. Rather than replacing formal or statutory approaches, however, they tend to mirror or complement them" (Allmendinger and Haughton 2013, 23). In this situation, 'metarules' – informal rules that can act upon formal ones - allow for competition over both private and public goods (Van Assche, Beunen, and Duineveld 2014).

1.2.1.2 The shift towards governance

In the last two decades, there has been an ongoing shift from government to governance in several 'western' states (Trudeau 2012). Governance can be regarded as the sum of "the interactions among structures, processes and traditions that determine how power and responsibilities are exercised, how decisions are taken, and how citizens or other stakeholders have their say" (Graham, Amos, and Plumptre 2003, ii). Governance principles focus both on how power is exercised (processes) and its results (outcomes).

Proposed by different authors, there are different and equally valid sets of proposed principles to characterize what constitutes 'good governance', based on directives set by the United Nations Development Program. Graham, Amos, and Plumptre (2003) elect the principles of 'legitimacy and voice', 'direction', 'performance', 'accountability' and 'fairness', for example (Figure 1.2). Griffith, Davidson, and Lockwood (2009) propose a more comprehensive list, which

includes 'legitimacy', 'accountability', 'transparency', 'inclusiveness', 'fairness', 'integration', 'capability' and 'adaptability'. As illustrated by such principles, the shift towards governance has raised questions about the role of local communities in social regulation and integration (Trudeau 2012).

The Five Good Governance Principles	The UNDP Principles on which they are based
1. Legitimacy and Voice	▪ Participation ▪ Consensus orientation
2. Direction	▪ Strategic vision, including human development and historical, cultural and social complexities
3. Performance	▪ Responsiveness of institutions and processes to stakeholders ▪ Effectiveness and efficiency
4. Accountability	▪ Accountability to the public and to institutional stakeholders ▪ Transparency
5. Fairness	▪ Equity ▪ Rule of Law

Figure 1.2: five key principles of good governance for Protected Areas (a designation set by the World Conservation Union), proposed by Graham, Amos, and Plumptre (2003, ii).

Additionally, an increasingly networked society has potentiated another paradigm shift, towards more networked forms of governance, which has been accompanied by the debate over the dynamization of citizenship.

> *"I refer to civil society not in the traditional sense as a political society or a state, but as the public arena of active citizens interposed in the space between the state and intimate forms of life. (…) At the heart of civil society is agency. Agency is the ability of citizens to set goals, develop commitments, pursue values, and succeed in realizing them. Valuing agency is at the heart of subsidiary or self-government." (Stehr 2010, 19)*

At the same time, the 'emancipatory concepts' of 'empowerment' and 'participation' have gained traction in planning and governance theory (Allmendinger and Haughton 2012). The emancipatory trend includes important debates and initiatives concerning participation, collaboration and social learning.

This section is therefore dedicated to the participation, recognition and engagement of civil society in spatial policy, which was one of the great factors in the emergence of local knowledge as a valid contribution to diverse areas. The focus is mainly on community engagement and its recognition as a partner in decision-making, which can be overshadowed by the manipulation of soft spaces (as seen in section 1.2.1.1). However, grassroots governance – and its implications for citizen engagement, transparency and accountability – is also mentioned as the other side of democratic informality, thus completing this theme.

Civil society as a partner in decision-making

The concept of participation, based on theories of deliberative democracy (O'Brien, Marzano, and White 2013), has the objective of establishing, through participatory processes, institutional structures that prevent the exclusion of sections of society from debate and dialogue, and at the same time guarantee these are conducted fairly, according to predetermined rules. Participation

can also imply the "empowerment of participants through social learning, more effective management through the capture of multiple perspectives; and improved implementation of recommendation" (O'Brien, Marzano, and White 2013, 52). It is considered that participatory processes have the potential to create change. They can lead to collaboration, the attaining of a broader perspective through sharing of information and viewpoints, learning and conflict resolution (O'Brien, Marzano, and White 2013, 56-58).

S.R. Arstein was the first to categorize citizen involvement, by proposing an eight-step ladder for citizen participation (Figure 1.3) in her work *A ladder of citizen participation* (1969). According to Luyet et al. (2012, 215), Arstein "structured the degrees of participation into three main groups: Nonparticipation (manipulation and therapy), Tokenism (informing, consultation, placation) and Citizen Power (partnership, delegated power and citizen control)". In the 'Tokenism' steps, citizens can hear and be heard, but lack the power to enforce their views in any way; participation is thus geared towards providing input to spatial policies. In the 'Citizen Power' steps, on the other hand, citizens can engage the government in negotiations and trade-offs, possessing decision-making majority or full management power. Arnstein's interpretation of participation is closely related to power, which is assured for the citizen at the higher steps of the ladder. The lowest the step, the less power is transferred to the public, and the most manipulation of public opinion occurs (Niedziałkowski, Paavola, and Jędrzejewska 2012).

There are other views of how participation can be achieved. If participation is seen as a deliberative exercise, a view which is based on Habermas' rules of rational discourse, it takes the form of a consensus-building process divorced from power. As seen previously, under the topic of consensus politics, avoiding the topic of power does not mean it is not present, nor that manoeuvring towards a hidden goal is not happening. In fact, deliberative processes in planning theory have been criticized by justice-based theorists for their avoidance of power and its ramifications. The deliberative view of participation shies away from categorization of citizen involvement and instead works towards a consensus or compromise by setting up a participatory deliberative process. The process, meant to be fluid and adapt to different situations, combines technical expertise and rational decision-making with the varied values and preferences of the public (Niedziałkowski, Paavola, and Jędrzejewska 2012).

One last approach to the categorization of participation sees the government as a delegator of tasks, and categorizes different forms of participation according to how much of the management of policies is delegated to the public. It is a mirror of the Arstein's approach, which categorizes how much control the public takes for its own instead. Each category is deployed as needed, after an analysis of the issue in question, the political situation, time available, level of concern expressed by stakeholders, available resources, etc. (Niedziałkowski, Paavola, and Jędrzejewska 2012). From least citizen participation to full control of the decisions, Shand and Arnberg (1996) identify five types of public involvement: 'Information' (disseminating facts about a policy to the public or educating the public), 'Consultation' (giving input to the public and engaging in debate, while retaining the power to make decisions), 'Partnership' (co-production, co-regulation, co-management or community-based management), 'Delegation' (policy development is delegated to community representatives, with a pre-established decision-making framework) and 'Control' (the public makes decisions directly, for example through referenda).

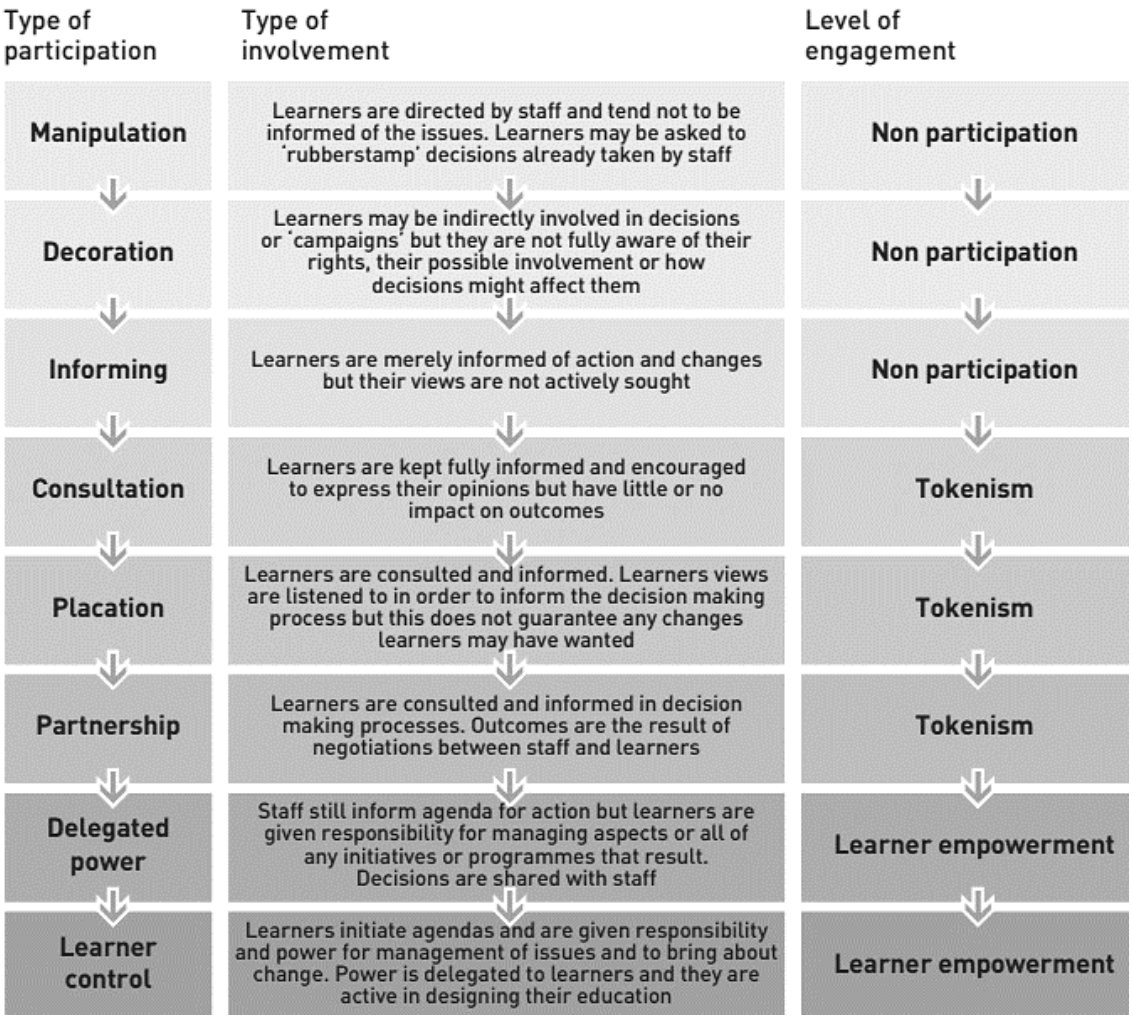

Figure 1.3: The ladder of participation, by Rudd, Colligan, and Naik (2006), based on two important systematizations of citizen participation: Arnstein's 'ladder of participation' and R. Hart's work *Children participation: from tokenism to citizenship* (1992).

There are several reasons why governments, within the paradigm shift that is the recognition of civil society as a part of decision-making, might choose to include citizens. In 'nominal participation', powerful actors use the public to legitimate policies or development plans, but without any intention of achieving change. In 'instrumental participation', the involvement of citizens is seen as a means towards an end, each presence being considered a resource whose skills and knowledge can be utilized. In 'representative participation', communities are given an effective voice, and thus power, in the process because it is considered that their engagement can increase the sustainability of interventions. Finally, in 'transformative participation', there is an intention to involve citizens with their empowerment in mind, with a possible subsequent alteration of the structures and institutions responsible for marginalization and exclusion. In each of these forms of participation, top stakeholders (more powerful) and grassroots stakeholders (less powerful) have different perceptions and interests (White 2011).

Transformative participation, in particular, must be understood in the context of processes geared towards empowerment and emancipation, which defend that citizens and communities are capable of learning and being engaged to the point of auto-organization and motivation, and thus of bettering their quality of life and power over their own circumstances and environment. Empowerment is mostly an agenda 'from below', because outsiders can only facilitate it, not

cause it. It can be achieved, especially in multi-stakeholder complex processes, through cooperative management, social learning and capacity building, which are discussed further ahead. Interestingly, people who are disadvantaged usually do not recognise by themselves the need for empowerment (White 2011).

What is the real weight of public or stakeholder participation to spatial policies nowadays? Most of the material on the subject presents decision-making processes (on projects and their implementation, budgets, codes, objectives, etc.) as the main opportunities for participation. The general public or particular stakeholders are to be included, but their presence might not be continuous - as noted by O'Brien, Marzano, and White (2013, 52), participatory processes are institutional, and thus it is usually institutions that are the constant presence, and continuously produce the necessary work for the development of these processes. Public or stakeholder participation might translate into "meetings, choice experiments and interviews" in which stakeholders are expected to contribute to decisions (O'Brien, Marzano, and White 2013, 55) and might occur at one or more different stages of the process. These authors, for example, analyse stakeholder participation in the research framing stage, in order to "improve understanding of objectives and delivery of relevant outputs" (O'Brien, Marzano, and White 2013, 58).

Problems in participatory processes include the difficulty in obtaining input from all participants, the tendency to try to identify the impacts of the process too early, and the lack of enough understanding of the situation (O'Brien, Marzano, and White 2013, 58). There is also a danger that people-centred, participatory processes will be used as a cover to legitimize institutionally-led proposals, while actually having no power to change them; and that power imbalances within the participatory processes (between institutions and citizens, but also between different citizen groups) will disproportionately shift power away from the most vulnerable stakeholders (Fainstein 2015). It must not be forgotten that governance is, after all, indivisible from "power, relationships and accountability: who has influence, who decides, and how decision-makers are held accountable" (Graham, Amos, and Plumptre 2003, ii).

Finally, there is also a permanent sense of discomfort with (and risk of rejection of) participatory processes by some institutions, which is similar to the situation arising from the clash between modes of knowledge production and the acceptance of informal ones, discussed in section 1.2.2.1. As Metzger (2011, 191) puts it, "it is a matter of debate whether planning has ever been truly comfortable with the idea of more direct democratic involvement, control and steering." Part of this discomfort might be related to the fact that people-centred governance and participatory processes do not necessarily guarantee desirable outcomes. Bafarasat (2015) defends that community governance, and other people-centred place making projects, are vulnerable to disruption in the middle of the chain that leads towards social and spatial innovation. Such disruption can, and has, led to places segregated by class and ethnicity, an undesirable outcome when diversity is seen as a condition for a lively community. Inclusive strategy making is, according to the author, often challenged in what concerns its feasibility, effectiveness and transformative capacity. Whether the supposed benefits of involving the general public and promoting citizenship and emancipation trump the uncertainty of the process and the risk of undesirable outcomes is a subject further developed in section 1.2.1.3.

Local communities and grassroots governance

Grassroots governance is the 'bottom-up' expression of democratic informality, in which citizens take up projects and initiatives and carry on cooperative management and capacity building tasks, often with some kind of institutional training or help. It is also an inversion of the responsibilities and worldviews in decision making: instead of, for instance, citizens being 'given' responsibility or 'delegated' power (see the 'Learner control' stage of Figure 1.3), grassroots governance is seen from the perspective of the citizens at the centre of it, who seek to acquire greater autonomy over the affairs of the community.

Grassroots participation is described, by Bafarasat (2015), as desirable and empowering, through a bottom-up consensus building effect. According to the author, grassroots participation is achievable through community-led governance, which brings forth the effect of network power in consensus building regarding politically weaker stakeholders, helps negotiate social and economic priorities with institutions and brings grassroots input to decision makers, in a 'scale-jumping' effect. It also provides a regeneration effect, by aligning local services with the real needs of a community, improving response, efficiency and therefore quality of life in a geographically limited area (Hoelzel and Akinsete 2015). All of these effects "boost the prospects of genuine consensus under narrower influence differentials" (Bafarasat 2015, 11), thus possibly staving off token consensus. In Zhu (2015), Hoelzel and Akinsete (2015), community-led governance and neighbourhood management are themselves characterized as grassroots governance approaches and cover a vast array of activities: "from the work of estate wardens, caretakers and housing managers, to strategic planning and local governance, addressing issues including resident satisfaction and involvement, education, health, security, housing and employment" (Hoelzel and Akinsete 2015, 32).

Therefore, the theme of grassroots governance is one to which community engagement is most pertinent. Community engagement is highlighted by Zhu (2015) as a critical component of sustainable community development, one which has been encouraged in planning, particularly within the New Urbanism discourse, through neighbourhood design. The participation and engagement of local people in community affairs is conditioned by both the existing social cohesion and social relationships, and the physical environment. The existence of communal space, in particular, can enable the development of space-based neighbourhood attachment, develop a sense of place, and create social capital. Sense of place and attachment, acquired for example through a longer history of residence, local roots and home ownership, as well as employment, are presented as good indicators to predict individual engagement in community-led governance (Zhu 2015).

A problem related to this discussion is that much of what is described as grassroots governance is informal institutional governance. This can lead to a questioning of its legitimacy, as worded by Harley (2009, 301) regarding traditional environmental groups: they "are often charged with speaking *for* grassroots activist rather than working *with* them". Roy (2005), writing about community-based programs and the ambiguity between informal governance and grassroots governance, also mentions that what is seen as grassroots activities can in fact be a top-down policy effort, led by experts in order to enact grassroots change.

However, the two concepts are not always easily separated. In both, the same difficulty in providing accountability exists, due to a lack of identification of who is directly responsible when

there are multiple projects occurring and actors involved (Allmendinger and Haughton 2012). The term 'grassroots' is, itself, indivisible from informality, and the presence of informality in some processes meant to encourage grassroots' input can discourage institutions that organize such processes. It might also happen that a citizen-led organization, originally created as an informal method of institutional control, can actually become a strong grassroots form of participation and source of autonomy for a local community (Zhu 2015). Therefore, the boundary presents itself as fluid.

Other concerns regarding grassroots action are in truth common arguments against citizen participation in general: that meetings with more disputing parties (especially lay ones) become lengthier, costlier and more frustrating, or that power imbalances can exist amidst citizens and local communities themselves, such as in the case of "special interest groups intimidating the average citizen with elaborate charts and expert advice" (Bafarasat 2015, 9). Often, grassroots engagement in project debates – which this author presents as the basic apparatus for grassroots empowerment at the strategy-making level - is limited by relegating decisions on strategy to the more complicated and technically advanced phase of policy making, in which the grassroots participants can then be justifiably excluded due to their low technical knowledge, confusion and lack of resources.

1.2.1.3 Justice and desirable outcomes

One of the concerns of this work is the future distribution of resources that possess quantifiable limits and are necessary to achieve an acceptable quality of life, especially when depletion is a concern. This corresponds to a vague definition of the concept of sustainability, such as the one proposed by IUCN/UNEP/WWF (1991, 10): "sustainability is improving the quality of human life while living within the carrying capacity of supporting eco-systems". The definitions of sustainability and sustainable development are at the centre of their own debate, given their complexity and reach.

Before focusing on it, however, it is necessary to answer a broader question: why the importance attributed to the fair distribution of resources, and why should we aim that future generations are not deprived of those same resources? One way to contextualize the problem is through the theory of justice, and more specifically distributive justice.

Social, environmental and spatial justice

Justice is a philosophical and ethical concept centered on the notions of rightness or correctness and debated in the context of political philosophy, moral philosophy and normative ethics. The concept of justice steadily evolved through debates around the role of the state, equity, and freedom of the individual, as well as through the clash between supporters and critics of utilitarianism, hedonism, equality, morality, punishment, the role of religion, anarchism, communism, individualism, rationality, entitlement and status (Raphael 2001). A significant part of the theory written during the second half of the twentieth century, according to Hinman (2012, 224), is centered on distributive justice, more specifically on "the distribution of scarce goods and the distribution of inequalities". A few authors have developed their own theories,

most notably John Rawls, but there are also more general theories such as the egalitarian, welfare, and libertarian or market-based approaches (Hinman 2012).

Distributive justice, also known as economic justice, is directed at allocating a sufficient share of resources available, as well as rights, benefits and liberties (Jenkins 2011, 10), to each member of society. In a dispute, it could be defined in terms of whether the parties get what they deserve (Rawls 1971). While there is not a consensus over what is considered sufficient or deserved, equity, equality and need are often used as allocation criteria (Maiese 2003). Distributive justice is considered important to the stability of a society, for "when issues of distributive justice are inadequately addressed and the item to be distributed is highly valued, intractable conflicts frequently result" (Maiese 2003, N/A). As a consequence, conflict and the norms that regulate it are central themes to this type of justice (Forsyth 2009).

Rawls tried to solve the problem of distributive justice, or the socially just distribution of goods in a society (Hinman 2012). He argued that any person would reject a utilitarian theory of justice due to the risk that they might turn out to be someone whose own good is sacrificed for greater benefits for others. Since he distinguishes between the importance of liberties and that of social and economic goods, Rawls proposes a liberty principle and an average utility principle: each person is to have an equal right to the most extensive system of equal basic liberties compatible with a similar system of liberty for all; social and economic inequalities are to be arranged so that they are both to the greatest benefit of the least advantaged, consistent with the just savings principle, and attached to offices and positions open to all under conditions of fair equality of opportunity.

The Indian economist and philosopher Amartya Sen, on the other hand, focuses on individual freedom, and even more specifically freedom of judgment, as the basis for the application of distributive justice (Sen 1990). He builds his argument with the global economic context in mind, and more specifically the dynamics of deprivation and disparity between highly industrialized and affluent nations and the poverty of developing nations (Hinman 2012). Practicality is a concern: "a theory of justice that can serve as the basis of practical reasoning must include ways of judging how to reduce injustice and advance justice, rather than aiming only at the characterization of perfectly just societies" (Sen 2009, ix).

Theories of distributive justice have been often criticized, such as in the American philosopher and political theorist Iris Marion Young's work *Justice and the Politics of Difference* (2011), originally published in 1990. Young presents a different view of justice, not as a matter of distribution but in terms of the overcoming, by groups, of oppression and domination, which manifest as exploitation, marginalization, powerlessness, cultural imperialism and violence. For her, justice belongs mostly to the social domain, which most major theorists in this area approach and to which some dedicate themselves entirely. Other authors simply criticize clear-cut theories. Nancy Fraser, for example, argues that justice is a complex concept with three key dimensions: distribution (of resources), recognition (of the varying contributions of different groups), and (linguistic) representation (Fraser 2003). Although she considers the influence of economic factors in her works, providing in fact a theory of justice from multiple perspectives in the context of global capitalism and cultural pluralism, the authors writes mainly within the domain of social theory.

The social movements of the 20th century took to the concept of social justice, which evolved in tandem with that of environmental justice. Social justice has its own distinct background from the many other manifestations of justice. It involves finding a balance between the joint responsibilities of the society to which a person belongs and their own individual responsibilities, towards an outcome that is as just as possible. However, the point of balance is not consensual (Ho 2011). The history of social justice parallels that of justice as a broader concept, centering on the individual instead of resources, and on moral choices made by the individual instead of more impersonal catalysts such as economy, distribution, or retribution.

Even more interesting is a newer iteration of the justice movements which is based both on social justice and the 'spatial turn', currently designated as 'spatial justice'. Space is the most prominent finite resource that conditions human activity and quality of life. Most other resources are dependent on it, or can at least be correlated to a certain geography. It is also in a given space that a society interacts and creates public value and social friction. Therefore, Soja (2010, 2) proposes that "whatever your interests may be, they can be significantly advanced by adopting a critical spatial perspective." The author describes spatial thinking as essential to gain insight into more effective means of achieving greater justice and democracy, a view which is adopted by several disciplines due to the recognition of the impact of geography on human activity (the 'spatial turn').

According to the author, three principles structure critical spatial thinking: there is an 'ontological spatiality of being', since people are spatial, temporal and social; space has a social production and can be changed socially as well; and there is a dialogue between the social and the spatial, for each can change the other in equal measure. This last principle, related to the impossibility of dissociation between the spatial and the social, is central to the debate of spatial justice. "In the broadest sense, spatial (in)justice refers to an intentional and focused emphasis on the spatial or geographical aspects of justice and injustice" (Soja 2009, 2).

According to Brawley (2009, 5), recent social-spatial transformations reveal that "the urban scale is a central spatial register within which and through which the responsibilization and democratization of citizens takes place", for several of the key processes of what Brawley considers de-democratization are centered on the spatial. For instance, the author mentions the 'deplanning' process studied by Peter Marcuse, which points a shift 'from urban planning to urban mega-projects' as a cause for lessening of 'democratic accountability'. The 'quartered city' and the increased 'securitization' are other themes of relevance. However, less complex examples of spaces as product of an ideology are also given, such as 'the alarm rigged-house, the gated community'.

The author warns that spatial justice should not concern itself solely with public space, as seems to be the tendency. He considers that, instead, its usefulness lies in "forging democracy out of the core structures that regulate and finance collective urban life" (Brawley 2009, 11), also proposing the notion that each ideology has a corresponding landscape, or spatial manifestation. Without knowing the form it takes, questions will continue to be asked about the best methodologies to disrupt or improve on it. In the end, the author argues that spatial justice must cultivate citizens, and re-establish the duality of spatial and social that is associated to the concept of social justice.

Local communities and desirable outcomes

The themes of justice and equity, which translate into fairness in the distribution of resources, provide a contextualization for the debate over the desirable outcomes of spatial policies. This debate seems to be central to planning practice, since "spatial planning embraces measures to co-ordinate the spatial impacts of other sectoral policies, to achieve a more even distribution of economic development between regions", "to balance demands for development with the need to protect the environment, and to achieve social and economic objectives" (EC 1997, 24, in Böhme 2002, 12). 'Just' and 'equitable' might well be the best descriptors available for a situation in which the 'greater good' is enacted, or a public interest is safeguarded. After all, following such ideals means trying to guarantee that every member of society is equal and can access their fair share of resources and opportunities, in proportion to their need.

Beyond justice and equity, there are other values that often appear as desirable outcomes, such as diversity, sustainability, resilience, or economic development/growth. The sets of five and eight good principles of governance presented in section 1.2.1.2 illustrate how different authors and decision-makers might place certain values above all others – after all, it might not possible to attend to everything deemed 'good' and achieve a workable, focused policy without losing momentum. Determining which outcomes are desirable for a given situation is difficult, because some of these values and aspirations can and have conflicted with each other even amongst the planning profession (Baker, Marston, and McClure 2013). Different theories, planning cultures and disciplinary approaches have different assumptions about desirable outcomes, which impacts decision-making in different ways. For example, the aspiration to 'diversity' can both be seen as essential to a more equal society and detrimental to economic growth, as seen before (Beilin and Wilkinson 2015). Bureaucratic modes of decision might produce desirable outcomes (Fainstein 2000), but they might also hinder public participation and representation.

Is the purpose of planning, delivered through spatial policies, aligned with this normative context? Allmendinger and Haughton (2012) declare that the idealistic expectations for planning practice have consistently fallen short; recently, the market supportive, post-political and consensus-building stance of spatial planning seems to take the blame. At the same time, the authors also mention that planning has a need to address power inequalities in society, to take account the public interest through mediation between competing interests, and to provide greater accountability and scrutiny in decisions concerning the allocation of resources. Tying into the previous section on the shift towards governance, the authors present factors such as the professional responsibility of planners, and public involvement in the preparation of plans and strategies, as determinant for accountability.

This clash between idealized practice and reality is not only important to planning practice, but also to planning theory. A planning school of thought that focuses on just outcomes emerged precisely to counter the dominance of communicative planning theory, for its apparent neglect of structural issues as well as the over-emphasis placed on the capacity of individual and the importance of consensus building processes. The adaptation of Habermas' critical theory was accused of hampering the understanding of how power shapes planning, and communicative approaches have been known to fail in situations of economic and social inequality (Allmendinger and Tewdwr-Jones 2002). A background of equal respect and opportunity of speech would have to be created in order for them to work, but communicative theory does not clarify how this can be achieved under neo-liberalism. Susan Fainstein's *The Just City* (2011)

stands out in recent literature, challenging the prioritization of market efficiency as a normative criterion to guide urban policy, and placing greater emphasis on justice (Song 2014).

In contrast to Fainstein's 'just city' approach, scholars exploring questions of progressive change and social justice, from the perspective of American Pragmatism, have emphasized provisional and contextual inquiry and praxis. American Pragmatism, as a philosophical and epistemological tradition, rejects abstract categorizations and absolute truths to instead emphasize human creativity and situational adjustment to current social problems (Song 2014). In informing a co-constructed, generative, and negotiated planning practice, critical pragmatism attends to both processes and outcomes, utilizes multiple, contingent, and evolving forms of knowledge.

The theoretical dance around processes and outcomes, recurrent in planning theory, does not mean they are antagonistic. Achieving justice and equity in a given context are desirable outcomes; however, providing for the exercise of citizenship during participatory processes, for example, can also bring forth a sense of justice, because recognition and representation are dimensions of justice as previously mentioned. As such, the fact that a well-conducted participatory decision process was, in a given situation, able to take place might be regarded as an outcome in itself. The planning process and its outcomes are two variables in a complex activity, to be taken into consideration together. In fact, Christensen (2015) defends that it is possible for planners to reconcile the debate, using processes to achieve valued outcomes. Baker, Marston, and McClure (2013, 875) go even further by declaring that "value conflicts do not need to be well defined and distinct", as long as there is awareness of value differences and of the conflict they might cause.

Bafarasat (2014) reveals that a usual counter to the criticism directed towards participatory governance is to recommend it in situations of either paralyzing conflict or cohesive environments, extremes which bring have the capacity of bringing to the fore the added value of network power. A more informed design of collaborative procedures can include, for example, "early inclusion or front-loading (…), information sharing (…), and raising immediate and concrete issues in strategy making to give voice, confidence, and legitimacy to grassroots for presence among established players" (Bafarasat 2015, 10). Therefore, even if the intention is to stay on the safe side, there are opportunities for community engagement in planning and governance.

1.2.1.4 New challenges

Davoudi et al. (2012, 299) describe the present-day situation at length: "we live in challenging times with a heightened sense of uncertainty and constant reminders of the unpredictability of what might be lurking around the corner; be it catastrophic climate events, terrorist attacks, credit crunch, youth riots, or mass redundancies." Uncertainty around economic systems and their long term sustainability, territorial and political instability, political unrest, armed conflict and mass displacement of populations, social inequality and exclusion, all of these are ongoing problems for which there are many proposals and theories but no definite solutions.

Planning is being redefined by these challenges and several new discourses, such as climate change or territorial cohesion, which now compete with the discourse of neoliberal spatial governance. Moreover, planning is also being transformed by its own new responsibilities and

attempts to increase its societal relevance (Allmendinger and Haughton 2012, 2013, Stead 2013), a process amplified by the internationalization of planning education and practice. As Stead (2013, 21) puts it, "(…) spatial planning is being recast as a way of managing the increasing interdependencies of actors involved in territorial development, which provides spatial planning a new rationale for and presents a new opportunity to demonstrate the contemporary relevance of planning". After all, planning has the potential of changing mindsets, value systems and methodological approaches.

The urbanization of populations is a good example of the unique challenges presented to spatial planning, placing urban planning in a privileged position to improve human quality of life by working towards the sustainability and viability of human settlements. The world population, an ever-present ghost in the context of finite resources and looming thresholds, overcame the 7 billion mark in 2011 and is expected to number between 9 and 11 billion in 2050, depending on the projections chosen. Demographic growth, despite its rate having peaked in the late 1960s, is expected to stabilize only in the 2060s (United Nations 2014). According to the United Nations, global urban population is also expected to increase, from 3.6 billion in 2011 to 6.3 billion in 2050. Almost 90% of this difference will occur in developing countries, which, in part due to a massive rural exodus in search of better quality of life, are expected to accommodate more than the 80% of the global urban population by 2050 (Coutard et al. 2014).

While related to this work, it is not possible, here, to treat themes such as political instability and economic crisis with the attention they deserve. Even demographic growth receives no more than a cursory glance, although it should be considered an additional stressor in all situations described below. This section focuses, instead, on the contemporary challenges most relevant to the theme of local knowledge, in the context of spatial policies and spatial planning: the idea that certainty and stability are not the dominant settings or outcomes anymore, the 'ideals' of sustainability and resilience, and the position of new forms of governance such as adaptive governance.

Disturbing the balance

Nowadays, it is necessary to work with concepts that challenge the idea of the world as stable and predictable, as well as with the idea that there are planetary thresholds behind which an even greater dose of uncertainty lurks. These concepts allow a better understanding of more complex ones, such as those of sustainability and resilience, described further below.

First of all, there should be a mention of 'risk' and 'uncertainty'. Uncertainty and risk appear in the clash between knowledge systems and competing paradigms, such as dominant economic models reaching their ecological limits (Baker, Marston, and McClure 2013). There are also associated to the controversy and diversification of participation in governance, the difficulty in engaging local communities, the changeability of the environment we live in, and the complexity of social relationships. The two concepts often appear together, despite being distinct entities with different implications for governance. Risk, according to Gunn and Hillier (2013, 62), "is 'a well-identified danger associated with a perfectly describable event or series of events'", while uncertainty, on the other hand, "is a social construct relating to circumstances of not knowing, in which it is impossible to describe or explain one's situation completely or predict the feature". While risk is calculable, observable and measurable, uncertainty is non-measurable.

Risks are considered social constructs by Gunn and Hillier (2013), since they can be either objective or subjective and tend to downplay or highlight certain aspects of a situation. They can be overestimated in situations that are unfamiliar, stressful or characterized by information overload (an interesting occurrence in the era of knowledge), with the possibility of later provoking fear of failure and resistance to change. Uncertainty, on the other hand, is associated to anxiety about the unknown. Baker, Marston, and McClure (2013) suggest that, in order to address uncertainty, it is necessary to promote "more deliberative planning processes and more radical policy solutions, which can not only tackle the social equity and justice issues but also improve energy performance, land-use planning and reduce reliance on carbon based energy consumption". On the other hand, more flexible planning approaches that seek to respond to uncertainty and local particularities can, in truth, generate anxiety over possible failure and increase actual risk of failure. The problem, as explained by Gunn and Hillier (2013), is that there is a danger of regulatory procedures being contaminated by risk mentality, or what the author also calls the 'risk management of everything', and of treating uncertainty as risk, in this way sabotaging the capacity of such procedures for action.

Thirdly, there is the concept of 'complexity'. As previously mentioned, scientific views have been going through a complexity shift: "rather than seeing the world as orderly, mechanical and reasonably predictable, they [scientists] see it as chaotic, complex, uncertain, and unpredictable" (Davoudi et al. 2012, 302). This complexity shift was previously presented in section 1.1, through complex knowledge systems. Complexity theory and concepts that build upon it, such as socio-ecological resilience, maintain that the future cannot be predicted in a way that would dissipate uncertainty (Beilin and Wilkinson 2015); instead, they embrace non-linearity, diversity and instability, challenge reductionism, accept a 'tangle' of causes for a given occurrence, and refuse to accept claims to predictability and controllability (Wilkinson 2012).

Complexity is nowadays accepted as a part of governance, due to its (complex) processes and the (complex) nature of the areas over which it is necessary to make decisions, especially in what concerns the 'participatory' and the 'urban' (Fagence 2014, MacKinnon and Derickson 2013). It is also present in planning theories "that share in some respect a non-linear or relational conceptualization of the dynamics of change" (Wilkinson 2012, 152), in post-structuralism and in political economy. Complexity theory is not, however, a new arrival to planning, as it has been used in planning research as a frame for analysis of urban systems dynamics since the 1970s, resulting in a series of concepts such as "generated dissipative cities, synergetic cities, fractal cities, agent-based cities, cellular automata cities, sandpile cities and network cities" (Wilkinson 2012, 159). As the author explains, the patterns of behaviour present in cities are similar to complex adaptive systems; the parts and agents that compose urban systems are themselves complex adaptive systems, presenting cognitive capabilities such as learning, thinking and decision-making.

In terms of problems related to this concept, the simplistic importation of ecological thinking into social disciplines is warned against, for it implies that social processes should mimic those of nature. Moreover, the abstract language used in systems and complexity theory can be appropriated to objectify and depoliticize governance, "normalizing the emphasis on adaptation to prevailing environmental and economic conditions and foreclosing wider sociopolitical questions of power and representation" (MacKinnon and Derickson 2013, 258). There is also the problem of the dynamics between planning, policies and programs not being completely

understood, something which, associated to other problems such as the clash between socio-economic models, complex knowledge systems and finite resources, makes it difficult to work with complexity towards desirable outcomes. Nevertheless, planning theorist have been encouraged to find new and better ways of dealing with complexity (Wilkinson 2012).

Finally, there is also the concept of 'vulnerability', which appears predominantly under the forms of social vulnerability and climate vulnerability (the latter as part of climate change and disaster risk reduction literature). In resilience and social sustainability, there is often a preoccupation with the reduction of vulnerability of social and cultural systems, while maintaining their capacity and ability to withstand shocks (Ciegis, Ramanauskiene, and Martinkus 2015). Vulnerability is not simply being harmed when exposed to danger, as it also includes potential risk, ability to cope with transformations and access support, adaptive capacity (MacCallum, Byrne, and Steele 2014), the vulnerability of the community's location itself (Coutard et al. 2014), and other factors exogenous to the community (Baker, Marston, and McClure 2013). There is also a recognition of the role of power: the 'vulnerability paradigm' asserts that "disasters primarily affect those who are marginalized in everyday life and who lack access to resources and means of protection which are available to others with more power"; unlike the 'hazard paradigm' which defends that "disasters result from extreme and rare natural hazards, and that affected people fail to 'adjust' because their perception of risk associated to these natural events is insufficient" (Gaillard and Mercer 2013, 93).

To tackle vulnerability, intervention from people at the top, who hold most of the power, is a priority. But action at the community level, under the forms of social learning, social inclusion and self-organization, can also help while at the same time enabling the community to participate in, for example, climate change adaptation responses (MacCallum, Byrne, and Steele 2014, Baker, Marston, and McClure 2013) – although Beilin and Wilkinson (2015) provide a reminder that society is always vulnerable to some degree, and that recognition of that fact is not necessarily a bad thing. Moreover, Hutter and Kuhlicke (2013) warns against illusions of 'invulnerability' and the fantasy of thinking that initiatives to reduce vulnerability will always lead to desirable outcomes.

Sustainability and resilience

As seen in previous sections, there are currently several discourses geared towards building human capacity, promote social learning and support initiatives that put an emphasis on collaboration as a way to achieve social justice and equity. However, entering what has been called the Anthropocene (Griggs et al. 2013) – an epoch in which humankind holds the power to transform ecological systems and set off tipping points – has been met by two strategies inter-related that are of special interest to this work. The first was sustainable development, while the second, more recent, one is the rise of policies focusing on socio-ecological resilience as a path towards sustainability.

Sustainability is many things at once: a measure of future consumption, the ability to maintain economic productivity, or a purely political act, for example (Ciegis, Ramanauskiene, and Martinkus 2015, Blewitt 2015). But it can simply correspond to the current idea "that the future should be a better, healthier, place than the present and the past" (Blewitt 2015, 1), in the context of a world in which the natural and the social are not only connected, but indivisible.

Cornell et al. (2013, 62) even present a vision of sustainability as "an open-ended process of social learning in which a new balance is continually being sought between multiple social, economic and environmental challenges and goals", instead of being solely defined by limits, boundaries and thresholds. The fact is that, more often than not, sustainability is defined in relation to something else, such as development, growth or consumption (Ciegis, Ramanauskiene, and Martinkus 2015). Therefore, the definition of sustainable development is the one that has gained prominence.

The years leading up to the present-day definition of sustainable development, especially the 1960s, 1970s and 1980s in Europe and Northern America, saw several debates around environmental justice, consumerism, ecology and conservation, and the capacity of natural systems. There was also a debate around the meanings of 'development' and 'growth', culminating in the differentiation of the two by the Brandt Commission Report in 1980, which rejected growth as the prime objective of development. Instead, self-fulfilment and full, creative use of production means and human potential were presented as ideals to achieve, in a warning against ever expanding economic growth or GDP.

The Brundtland Report of 1987 eventually presented the well-known, and still relevant, definition of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Blewitt 2015, 9). It also recognized the variability of the concept of 'needs' and the priority of the needs of disadvantaged peoples, since 'need' meant different things to the industrialized North, concerned with the environmental impacts of production, and a South contending with issues of "poverty, health, income, agricultural sustainability, food security, educational opportunity and achievement, shelter, sanitation, desertification and armed conflict" (Blewitt 2015, 9). The foundations for equity and justice in the concept of sustainable development were therefore early established; notwithstanding, its definition is criticized for being based on the assumption that industrialized development is central and essential to the future of the planet.

From that point forward, several concepts slowly emerged around sustainable development, such as the 'green economy', ecological modernization, low carbon economy or eco-efficiency. There were also many subsequent opportunities to discuss sustainable development, which often did not live up to high expectations. In the most recent large-scale international conference on the theme, the United Nations Conference on Sustainable Development of 2012 (also known as Rio +20), the concept of 'resilience' took a central role, possibly due to the context of economic downturn. But attention was also given to the fact that "no single assessment matrix for sustainable development had been previously devised and accepted" (Blewitt 2015, 14), leading to the devising of sustainable development goals which, for all purposes, substituted the Millennium Development Goals and were integrated in the UN's post-2015 development agenda.

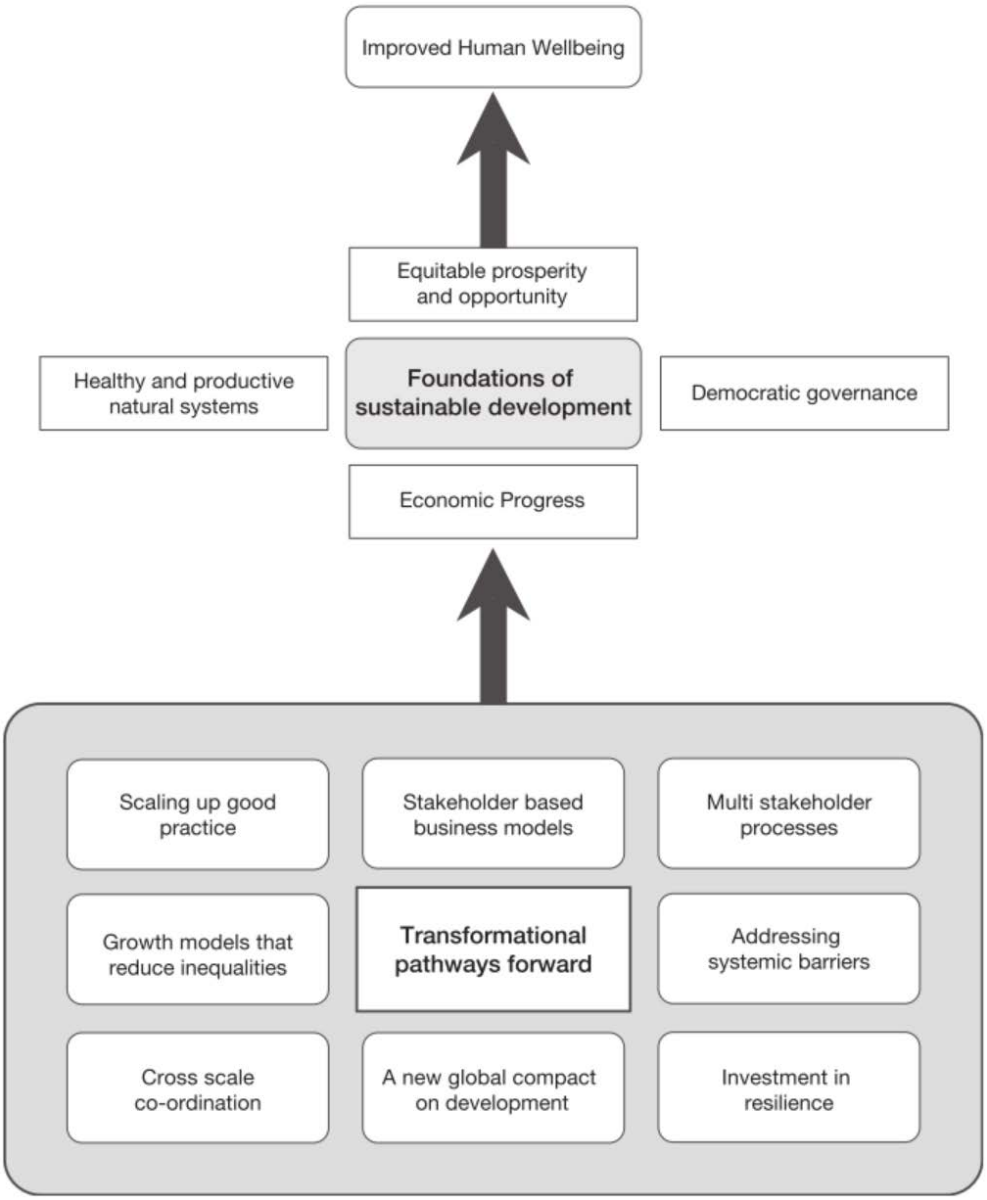

Figure 1.4: Foundations for the post-2015 sustainable development process (Blewitt 2015, 15).

Current tenets of sustainable development include equitable prosperity and opportunity, democratic governance, economic progress and healthy and productive natural systems, as systematized in Figure 1.4. A revised definition of sustainable development is presented by Ciegis, Ramanauskiene, and Martinkus (2015, 29), in a way that is perhaps more relevant to contemporary use: sustainable development is "the improvement in the population's quality of life while taking into consideration the ecosystem's regenerating capacity that can be described as the maximal continuous load on the environment (…), and the carrying capacity – the greatest number of population that can survive in the presence of ecological balance". It is also important to note the present role of concepts such as uncertainty and complexity when working towards sustainable development, with Blewitt (2015, 2) warning against the imposing of conceptual frameworks disconnected from reality just because they are comfortable or accessible; the author promotes, instead, "an attitude of mind that welcomes change, difference, creativity, risk, uncertainty, a sense of wonder, and a desire and capacity to learn", and a recognition of

the fact that sustainable policy makers cannot understand everything and should rather take the world as it is, in all its complexity.

Now focusing on resilience, which at its Latin root means 'to spring back', this is a term that was first used to express the stability of materials and their resistance to external shocks. In the 1960s, with the rise of systems thinking, it entered the field of ecology (Davoudi et al. 2012). Since then, diverse meanings of the concept have emerged, often ambiguous and politically exploitable – a situation analogous to that of the 'sustainability' concept. Engineering resilience is "the ability of a system to return to an equilibrium or steady-state after a disturbance", while ecological resilience is defined as "the magnitude of the disturbance that can be absorbed before the system changes its structure" (Davoudi et al. 2012, 301), thus attributing importance to the critical thresholds of the system and rejecting the existence of a single stable equilibrium. A type of equilibrium and a 'bounce-back' ability are nevertheless central to both definitions, which has led to the concepts being primarily used in post-disaster emergency planning and adaptation strategies geared towards large and turbulent events. These types of resilience have been absorbed by the neoliberal discourse in a way that supports the status quo, presenting the attribute of 'resilience' as a counter to risk in a purely technical and scientific perspective, that is, through the preservation of a (imaginary) stable state and engineered responses to threats or shocks to the system. Resilience can be used as an argument in positions, in the context of devolution and localism debates, which assume that the power to act and overcome emergencies is inherent to individual, and thus responsibilities belonging to the state should be entrusted to local communities (Beilin and Wilkinson 2015).

Governmental entities have supported the specific discourse of engineering resilience, due to the societal preoccupation with risk and the demand for its control and quantifying, as well as the need to make the future predictable, actionable and governable. Even so, this perspective is not all there is to resilience (Beilin and Wilkinson 2015). Another type of resilience, evolutionary resilience (also known socio-ecological resilience), rejects the idea of an equilibrium and a return to 'normalcy', being defined as "the ability of complex socio-ecological systems to change, adapt, and, crucially, transform in response to stresses and strains", with or without external disturbances (Davoudi et al. 2012, 302). Beilin and Wilkinson (2015, 2) also present it as "the ability of a community to withstand external shocks and stresses without significant upheaval", accepting instability and uncertainty as part of the system while maintaining an optimistic outlook.

Both sustainability and resilience are, in essence, characteristics of systems. They can be used in such a broad sense that it makes susceptible to misuse as concepts, in particular for deflection, and changeable depending on the worldview of the user. Fainstein (2015, 166) presents one of the risks: "the apparent scientific precision of risk analysis, and the glamour of complexity theory allow conversations that fail to confront the real issue of which groups of the population will actually benefit from the expenditure of public resources." Public expenditure in vulnerable, low-income areas and groups is avoided, due to its low return; as the deployment of concepts such as sustainability and resilience in a strategy present the image of it being used to equally benefit all, there can be little thought given by the public to the reality and distribution of the outcomes of such policies, with vulnerable people being increasingly excluded.

It is difficult to act in all fronts at once, and the claim that it happened through a given policy might fold under scrutiny. For instance, consensus-based and 'win-win-win' approaches (without losses against the triple objectives of social, economic and environmental improvement) were pointed by Allmendinger and Haughton (2012) as characteristic of the new attitude towards the new challenges of spatial planning, particularly within the sustainable development trend. These intended to tackle the apparent irreconcilable nature of economic growth improvement and environmental conservation / climate change mitigation. However, presenting positive results in these three areas might be a result of policies with a genuine concern for such improvements, or a *trompe d'oeil* from crunched numbers that play up improvement in the social and environmental areas while guaranteeing economic development.

A profound apathy, lack of concern or inadequacy in dealing with the social and environmental consequences of failing to consider these areas properly can also hide behind the brandishing of sustainability concepts. For example, according to Baker, Marston, and McClure (2013, 871), even though there is "a strong scientific consensus that climate change is happening, that it is the result of human activity, that it is global, cumulative and destructive of human and environmental well-being, (…) this scientific consensus has not led to any meaningful coherence between economic and social policy, planning laws and climate change policy in developed countries (…)". According to Fainstein (2015), in order for policies to remain just and equitable when facing new environmental, social and economic challenges, it is necessary to clearly present the stakes in development processes and policies, and to insist on transparency in what concerns outcomes.

Local communities and adaptive governance

A careful reflection over of the previous themes – concepts that express imbalance or destabilization, or the ideals of sustainability and resilience – is part of wider trends towards environmentally mindful, low carbon policies which seek to respect planetary boundaries (Steffen et al. 2015). One such trend is adaptive governance, suggested as an alternative to traditional governance for providing answers to complex problems, such as natural resources management, disaster risk reduction and the construction of resilient systems. The dissemination of the concept of adaptive governance is a sign of rapidly changing times, in which dynamism and self-organisation in socio-ecological systems have become widely accepted. On the other side of the debate stand the rigid structures and stable, fixed processes of 'traditional' governance, more appropriate for times of slow change or stability (Griffith, Davidson, and Lockwood 2009), but also efficient and predictable in the right context.

Adaptive governance is "a form of governance that recognises the importance of (...) engagement and interaction with change, complexity and uncertainty. (...) This type of governance system must enable the capacity to cope and adapt, the conservation of sources of innovation and renewal and ultimately resilience" (Griffith, Davidson, and Lockwood 2009, 12). Another definition simplifies it down to a pattern of practices that "include the adaptation of policy decisions to real people" (Brunner et al. 2005, 19). The concept has evolved from that of adaptive management, which defends iterative learning, regards management actions as experiments ('learning by doing'), and seeks the implementation of a multi-stakeholder cycle which includes objective definition, planning, action, monitoring of and reflection over

outcomes, learning, and renewed action (Cundill et al. 2012, 14). It is interesting to note that, within adaptive governance, the resilience of systems is seen a critical factor for their sustainability.

Adaptive governance tries to integrate knowledge, decision-making and policy (see Figure 1.5) in a way that counters the difficulties of overly bureaucratic or centralized, expert-led governance structures in planning for failure, learning from experimentation and adapting to change (Wyborn 2015, 57). Similarly to adaptive management, there are several components that must be attended to in order to guarantee the quality of the 'adaptive cycle' of adaptive governance, such as the use of the best available knowledge, community engagement, determination of scale, collaboration, risk management, monitoring and evaluation, and information management (Griffith, Davidson, and Lockwood 2009, 9). In adaptive governance, participation is seen as necessary to build trust, deliberation "leads to shared understanding needed to mobilise and self-organise", polycentric, multi-layered institutions "improve the fit between knowledge, action and social-ecological contexts in ways that allow societies to respond more adaptively", and accountable authorities "pursue just distributions of benefits and involuntary risks" in order to "enhance adaptive capacity of vulnerable groups and society as a whole" (Lebel et al. 2006 16).

Part of the support for adaptive governance comes from those who seek to bring the debate of governing for change into the public sphere, defending that, in this way, complex problems will be adequately represented in policy and decision making. This is pointed as preferable to try to control change (Griffith, Davidson, and Lockwood 2009). Spatial planning is seen as essential to adaptation, since it can provide the necessary instrumental framework, operate as a mechanism to achieve it, and simultaneously serve as a forum for the negotiation of priorities. For example, Baker, Marston, and McClure (2013) defend the efficiency of spatial planning in the case of settlements affected by climate change.

Criticisms to the adaptive governance stance focus on the fact that current relationships between knowledge, science, governance and action are not clear, or that adaptive governance discussions prefer to focus on abstract design principles and institutional arrangements instead of the practical ways (such as co-production) in which science, policy and practice can co-evolve. The normative influences that shape those relationships are also paid insufficient attention (Wyborn 2015, 56). Additionally, Griffith, Davidson, and Lockwood (2009) also stress that adaptive thinking is just one potential component of good governance, and that principles such as transparency, inclusiveness and fairness should treated on par with it instead of being relegated to mere characteristics of the more adaptive principles. After all, according to the authors, any of the attributes that "allow human societies to respond to and shape change and build resilience (…) may be a weakness when it comes to transformation", if their presence is too strong (Griffith, Davidson, and Lockwood 2009, 8).

Figure 1.5: The relationship between resilience, the capacity to act and governance as critical factors for sustainability (Lebel et al. 2006 5).

1.2.2 THE DIVERSE ROLES OF LOCAL KNOWLEDGE IN SPATIAL POLICIES

Local knowledge possesses especial relevance to any policies and strategies related not only to sustainability, but also to the concepts of 'vulnerability', 'capacity' and 'resilience', and to the areas of adaptive, environmental and resources management, risk assessment and disaster response (as seen in section 1.1). It can also be a relevant factor in the debate about civil rights, social, environmental and spatial justice, recognition and identity politics - especially in urban settings, - power dynamics, equality and distribution of resources. Its most direct uses are informing spatial planning and decision-making as part of complex knowledge systems, and helping the implementation of policies, cooperation building and the coordination between local and external actors, playing an important role in participatory governance processes.

The objective of this section is to connect the concepts related to the actuality of spatial planning and governance to the main applications and areas of use of local knowledge, in order to evidence intersections and highlight the different ways in which local knowledge is of importance to spatial policy making. It must be pointed out that, even though these issues are compartmentalized in the same four sections as before (structural realities, shift towards governance, justice and desirable outcomes, and new challenges), they are nevertheless interconnected. This compartmentalization, although simplistic, is meant for ease of reading.

1.2.2.1 The connection to structural realities

In discourses connected to structural realities, there are five main themes for which local knowledge is an important concept: the role of local knowledge, and participation itself, in top-down processes (especially within process-based planning theory); the clash between modes of knowledge production; the problematic of scale, particularly upscaling and glocalization; and the improvement of transparency and accountability. It is also a part of the debate on tools and methods of implementation, the only theme that is excluded from this section in favour of section 1.3.

Local knowledge and participation in top-down processes

Harnessing local knowledge has been promoted in the context of communicative planning, through citizen participation, and process-based planning in general. However, it is also important to outcome-based schools of thought due to the way it evidences power conflicts. Therefore, there are two important parts in this section: the importance of local knowledge in process-based planning theory and the problem of uncertain outcomes.

'Joint fact-finding' (Innes and Booher 2010) has been advocated as a central component of collaboration and emphasizes the importance of using the knowledge of local actors closest to an issue, especially in environmental planning and management decisions (Taylor and de Loë 2012). It follows that collaborative theory can be receptive to the integration of local knowledge into decision-making, in a broader context of collaborative processes. It is thought that it can help local actors feel empowered and more likely to view all process and its outcomes as legitimate and fair, since there is a sharing of power and responsibility among state and non-state actors in decision-making (Carlsson and Berkes 2005).

In the context of critical pragmatist planning, Albrechts' (2013) reframing of strategic spatial planning from a coproduction perspective also calls for active civil society involvement in the contextual, contentious, creative, and continuous process of agenda setting, in problem formulation, and in the shaping and implementation of policy, plans, and projects. In this way, it not only seeks to counter power, material interests and narrow thinking in urban governance, but also tries to build engaged, strong, resilient, mutually supportive communities, capable of meeting their own needs (Song 2014). By emphasizing the human characteristics of space and place, both natural and urban, this model implies an activist mode of planning, open to local knowledge and all citizens, using coproduction as a political strategy for planners working in or out of the system. In strategic planning, conceived as a co-production process, citizens are looked upon by the state, planners and fellow citizens as valuable agents in joint learning, invention, and problem solving (Albrechts 2013).

Pfeffer et al. (2011) enumerate several examples of how spatial knowledge (local knowledge being necessarily included in this category) can be included in policy making and governance: through mapping, community-based or institutionally-led; through transect walks and discussion groups; and through the use of geoICT. They defend that inclusion and production of spatial knowledge is tied to processes of participation and negotiation, and "depends particularly on the extent to which urban local governance has made the turn to more participatory processes" (Pfeffer et al. 2011, 237).

Other schools of thought have different views. According to the 'Just City' model, for example, institutionalized citizen participation increases the information available to policy makers by providing local knowledge, and allows decision-making to become democratic and open. However, it is not necessarily more equitable; it can lead to parochialism and corruption; it is rarely transformative, but it provides a training ground for developing leadership skills and a path of upward political mobility (Fainstein 2011). Therefore, local knowledge is accepted as part of participation, but authors defend that its presence will not necessarily guarantee a positive outcome, leading instead towards an uncertain one – in the just city model, outcomes trump communicative norms should the two conflict (Fainstein 2009).

This attempt at mitigation of uncertain outcomes seems at odds with the body of theory that, in planning for new challenges, embraces complexity and uncertainty in today's world. However, if lack of good implementation can undermine types of governance that promote participation and power sharing, it is understandable that attempting to control outcomes is presented as a safer position. This subject is furthered below, in the context of power relations and just outcomes.

The clash between modes of knowledge production

There are still several challenges when working with and towards local knowledge, as shown previously in section 1.1.2.1. Now in the context of spatial policies, one of the most important is the reluctance of scientists, government officials and other professionals to consider local sources of knowledge in different environmental governance contexts. Local knowledge held by community groups is often mistrusted by professionals, who not only tend to favour positivist knowledge over local knowledge, and scientific expertise over common sense, but who also stand outside the community and have trouble grasping its views (Curry 2012). In fact, there is

still disagreement in academia over which forms of knowledge, including local knowledge, are valid, despite the support demonstrated for complex knowledge systems. Moreover, the views of local actors regarding their own knowledge and participation are unclear, except for sporadic examples in which research aimed at clarifying their position (Taylor and de Loë 2012).

This is mainly due to the critical relationship between knowledge and power in collaborative processes, which leads to 'epistemological anxiety'(Innes and Booher 2010) and the rejection of local knowledge by professionals. This rejection is connected to four main complaints of professionals concerning community action: firstly, that it is not necessary, as public services are provided through democratic processes; secondly, that the community is not qualified to take appropriate decisions about complex issues; thirdly, that it is impracticable to consider the views of all members of the community; and finally, that the predominant values of the public may vary in meaning. Professionals are often apprehensive about citizen involvement, perceiving community participation as time-consuming, costly, unmanageable and unproductive (Curry 2012). To compound the situation, the digital divide – the differing access to technology and information depending on the geographic area and economic situation of the user – presents policy makers with uneven support depending on the location of implementation, increasing uncertainty.

Finally, epistemological anxiety might also be related to scientific knowledge having lost part of its cognitive authority in recent years, as seen previously. There is some amount of tension in the effort to connect science with policy and practice, despite contemporary efforts to include diversified knowledge across all scales. As Wyborn (2015, 59) explains, "science, while fundamental (…), represents rather than mirrors reality, making scientific knowledge a space for contested claims of truth and power".

Due to all of this, various authors have made an effort to show that the possession, manipulation and use of knowledge by communities allows them to make an informed contribution to spatial policies, influence the quality of their decisions and the official process of decision making, and bring about change (Curry 2012). These positive points are highlighted while keeping in mind the reservations about and pitfalls of the process, expressed throughout this work. To overcome epistemological anxiety, the encouragement of open dialogue and sharing of knowledge and expertise between all actors involved in the implementation of both top-down and bottom-up actions is recommended (Gaillard and Mercer 2013). After all, as Curry (2012) defends, knowledge that is negotiated between lay people and professionals might be superior to scientific knowledge when it comes to finding solutions adapted to local circumstances.

The problematic of scale

Coenen, Benneworth, and Truffer (2012) defines a geographical scale as a territorial level at which significant relationships, with a distinct dynamic resulting from repeated interactions, exist between actors. As previously stated, many spatial policies are currently cross-sectoral and cross-scalar. In particular, the scaling down of planning, decision-making and forms of government is a recent tendency, as well as the formation of grey areas of governance due to the scalar changes of decision-making frameworks. The use of local knowledge might be seen as being in line with calls for devolution and localism; however, the influence it can have at a larger scale is actually a more discussed topic concerning the role of local knowledge in spatial policies.

Therefore, there are two main issues at hand: firstly, the capacity of the local to influence the global; and secondly, the difficulty in 'scaling up' local knowledge.

A decade ago, Roy (2005) claimed that globalization was being regarded as disempowering, and communities were being considered as a force for change instead. The author saw a false dichotomy between global and local scales, defending that they were not mutually exclusive and that decision-making had the possibility of engaging in 'scale jumping'. This 'glocal' perspective is a consequence of geographical reality being increasingly interconnected. According to it, understanding global networks and local nodes can clarify how governance unfolds, which stakeholders are involved and how much control they have over their own decisions. This idea is explored by Coenen, Benneworth, and Truffer (2012, 972), who write that "characteristics of the locality have different impacts on the processes at all scales, so even processes operating at a global geographical scale are influenced by differences in localities".

Citizens are increasingly aware of their ability to contribute to decision-making processes, and cooperation between institutions and citizens is increasingly sought, recognition of local knowledge included. In fact, projects for harnessing local knowledge and seek change at community level have taken off worldwide. But the use of local knowledge in spatial policies is conditioned by issues of scale dynamics and by its own specificity and diversity: local knowledge is not only itself produced at different scale levels, it also lacks the same coherence at all scales[12] (Pfeffer et al. 2013, Beilin and Wilkinson 2015), and local practices can be both context and time specific (Dekens 2007).

Nevertheless, Gaillard and Mercer (2013) defend that using both local and scientific knowledge is the only way to achieve large-scale results in spatial policies, particularly in those related to risk reduction - as Dekens (2007) explains, risks are multi-scale, so spatial policies should avoid managing each scale level in isolation and employ cross-scale analysis instead. It should also be pointed out that time is a factor that goes hand in hand with scale, and that there is often a need to combine immediate and longer term measures. Scalar and temporal mismatches can both undermine policy implementation.

Opportunities for scaling up results are limited because good practices regarding complex knowledge systems have not yet been institutionalized worldwide (Gaillard and Mercer 2013). Pfeffer et al. (2013, 265) agree, stating that initiatives to harness local knowledge "remain local and lack the upscaling to either city level or national level, which could make them comparable and possibly provide consistency across scale levels". The best way to achieve a wide integration of local knowledge would thus be through governmental mandates and legal frameworks. According to both sources, NGOs and community volunteers are important in supporting such initiatives, but changes in national policies can have a much greater impact. Coenen, Benneworth, and Truffer (2012, 977) also insist that "trans-local and trans-national network relations and institutional interdependencies need be acknowledged by policy-makers and 'transition managers' even though they may extend beyond their sphere of influence."

[12] An example of the problems posed by the different scales of local knowledge and scale is provided by Beilin and Wilkinson (2015, 1213): "mapping the peri-urban is a challenge for planners and other stakeholders as there is a sense out in the paddocks and small towns that the map boundaries are always out of date and institutionalising a past imaginary rather than the dynamic realities of the current activities."

> *"It is clear that there are potential tools to linking communities with associated stakeholders or clear, practical frameworks to integrate both sets of knowledge. However, without the incorporation of such tools and approaches within national development policy, thereby simultaneously reaffirming the role of the state and giving voice to those most at risk, we are in danger of under-utilizing the wealth of local knowledge available and engaging in unproductive DRR strategies which contribute to enhancing vulnerability rather than reducing it" (Gaillard and Mercer 2013, 106).*

Pfeffer et al. (2013) are more cautious, stating that it is unclear how initiatives at community level can be scaled up and supported at city level – and especially, how the knowledge acquired can be used to change outcomes and influence decision-making. Digital tools, usually pointed out as facilitators for the integration of local knowledge, are not available worldwide to all citizens and there are institutional gaps in access to digital resources, factors that pose problems at larger scales. It is also difficult to promote cross-scale analysis and the use of complex knowledge systems due to their higher data requirements and variability in the theory applicable to each level (Dekens 2007). But this author warns that the problem is not always a lack of resources, rather a problem of "entitlements such as access, control, and management of assets" (Dekens 2007, 36).

Accountability and transparency

As previously seen, the harnessing of local knowledge has the potential to inform spatial policies, raise awareness of local issues, enhance a sense of citizenship, and contribute to transparency in governance. However, positive outcomes depend on good implementation, and unexpected or undesirable outcomes might appear when taking an informal, ill-informed or not properly defined strategic path. For instance, Beilin and Wilkinson (2015) describe how guidelines that pursue 'good' governance, under the form of inclusiveness, flexibility or other ideals, may maximize vulnerability. Processes that harness local knowledge are deeply embedded in this debate of unintended (or worse, intended) consequences.

A lack of acceptance of local knowledge can thus express a variety of concerns that have little to do with local knowledge itself, such as apprehension over power inequalities, accentuated by the digital divide, and clashes between modes of knowledge production. But criticism might also reflect concerns with the negative impact of assuming that upscaling and implementation are possible at all times, and especially with lack of accountability and transparency. There is a paradox at work: mechanisms to harness local knowledge and include it in spatial policies have the potential to open up dialogue between institutions and citizens, as well as promote wider acceptance of a policy by the people directly affected by it (White, Kingston, and Barker 2010) and, in this way, promote transparency and what Wilkinson (2012) calls 'downward accountability' (policy-makers being made accountable to local communities); however, the reverse is also true, as the co-existence of a great diversity of actors and projects muddies the attribution of responsibility and the perception of what is really happening (Allmendinger and Haughton 2012).

This same concern has been expressed about public participation in general, which can suffer from 'NIMBYism', lack of accountability regarding community representatives and also susceptibility to demagoguery (Fainstein 1999). Therefore, the situation can only be

characterized as complex. There is, at the same time, the presence of successful case studies revolving around community mapping and participatory governance projects that promote transparency in governance (see the review of case studies in section 1.3), and a feeling that new forms of spatial governance are resulting in limited transparency as well as questionable democratic accountability, explained in depth below:

> *"The building of such semi-formal or informal networks are celebrated by many practitioners and some academics as potent methods of circumscribing and avoiding 'administrative clutter' and a way of really 'getting things done' (…). Still, if someone wishes to challenge decisions made within these networks, what court of appeal can she turn to, when it is sometimes even difficult to figure out who are responsible for the decision, or if any decision formally even has been made or if some loose consensus to 'go ahead in a certain direction' just appears to have taken form and taken on a life of its own, within this emerging truly Kafkaesque landscape of planning and spatial policy development?" (Metzger 2011, 192).*

It can be inferred that collaborative, informal and grassroots governance, the incorporation of 'alternative', lay-based knowledge in decision making, and participatory processes in general, all lend themselves to working around unwieldy processes and acting in proximity with the needs of local communities. At the same time, networks and collaborations that seek to solve public problems in governance and implement public policy, often in 'soft spaces', have an almost chaotic character, "driven by the interplay of collaboration processes and structures, the tensions or paradoxes embedded in collaborations, and an external environment of shifting politics, policy fields and institutional relationships" (Cornforth and Brown 2014, 12). They often rely on indirect democratic links and consultative processes instead of democratic politics to achieve legitimacy (Allmendinger and Haughton 2012).

A previously stated criticism, that the use local knowledge and the promotion of community governance or emancipation need to be institutionalized in order to have full effect, resonates with this argument. It might be possible for a community project, with a well-defined strategy and boundaries, to easily succeed in promoting transparency and accountability in governance even if it is a grassroots-only endeavour, as its geographical limitations confer to it a certain degree of formality. The same might not be true for complex and commonplace informal governance processes that seek to respond to immediate needs and problems. Brokering informal agreements around soft spaces and informal governance processes is easier, but those agreements also dissolve easily under stress. These agreements might also survive with an unexpected tenacity, making their way into formal plans, possibly at other scales, while lacking further scrutiny (Allmendinger and Haughton 2012).

The building of accountability within collaborative settings is considered the domain of collaborative planning and adaptive governance (Wyborn 2015), and each has mechanisms to ensure and evaluate accountability. For example, Graham, Amos, and Plumptre (2003), in Figure 1.6, make an in-depth description of what constitutes proper accountability in governance. Proactive accountability mechanisms, usually seen as the role of the institution that is intervening in a given setting, are essential to planning and governance theories, as they build trust, excellence and legitimacy; on the other hand, lack of supervision, clear direction and proper management can lead to corruptive practices (Blokland et al. 2009). Therefore, any work directed at harnessing local knowledge and engaging with local communities can take advantage of these already existing mechanisms to ensure accountability.

ACCOUNTABILITY

- **Clarity –** Clarity in the assignment of responsibilities and the authority to act is critical in being able to answer the question "who is accountable to whom for what?"
- **Coherence and Breadth** – the degree to which broader concepts of accountability to the global community, future generations and nature are integrated with more traditional concepts of political accountability
- **Role of Political leaders –** Appropriateness of responsibilities assigned to political leaders as opposed to non-elected officials or semi-independent bodies and the absence of corruption
- **Public Institutions of Accountability** – Effective public institutions of accountability, including access to information, capacity to analyze and report, ability to get action, comprehensiveness of mandates
- **Civil Society and the Media –** Effectiveness of civil society and the media in mobilizing demand for accountability
- **Transparency** – The capacity of citizens, civil society and the media to access information relevant to the performance of PA management and to its use of regulatory, spending and other powers

Figure 1.6: Characterization of the concept of accountability in governance (Graham 2003, vi).

1.2.2.2 The contribution to grassroots governance

When talking about grassroots governance, community engagement is usually a component of already undergoing processes, and local knowledge is strongly connected to the themes of community governance, social learning, capacity building, and the construction of citizenship in general – in other words, processes that lead towards self-organization and emancipation. On one hand, it is seen as a way to make communities and minorities heard, to help them achieve a stronger degree of engagement. On the other, it is associated to resistance and confrontation, grassroots movements, and a way for communities to take the power of decision and control for themselves, away from top-down processes.

Even though the focus of this section is on grassroots governance, collaborative governance with a strong grassroots presence is not excluded; it should be kept in mind that what is being mentioned are bottom up processes in general. It should also be noted that, despite all the sources available related to participation, capacity building in governance is a theme which nowadays has close associations to climate change, resilience, and emergency planning in general. Therefore, it is of importance to several themes and disciplines beyond bottom-up action, in particular in what concerns the answers of planning and governance to new challenges.

Community governance

Community governance has been previously defined, under the topic of grassroots governance, but it becomes relevant once more when looking at it through the lenses of local knowledge. At the base of community focused or community-led participation and governance with a strong grassroots component, there is a disenchantment with formal, institutional development programs, which are accused of yielding limited benefits. There is also a belief that development can be built with local knowledge and direct participation as bases, occurring (mostly) outside the sphere of the state (Harley 2009).

A lot can happen within community governance, regarding the use of local knowledge. For example, grassroots groups can develop (and have done so in the past) their own spatial data resources, thus also taking a place as stakeholders in local spatial data development (Elwood 2008). Therefore, it is possible for communities themselves to harness existing local knowledge, but also to produce data that can contribute towards the evolution of such knowledge. This points towards a degree of capacity for autonomy, especially in contexts in which government data and support are not readily available. Local knowledge is, likewise, at the heart of governance issues directly related to space, such as spatial claims and disputes, which must be mediated between a range of actors, including grassroots ones. And, in a more collaborative perspective, the deployment of strategic projects as part of community governance can integrate issues of memory, identity and other aspects related to local knowledge and community engagement, all the while keeping in mind wider interests (Bafarasat 2015).

Capacity building

Another aspect in which local knowledge is relevant to grassroots governance is in its role to help build capacity. Capacity building is a development concept that takes the definition of capacity, "the ability to do something" (applicable to individual, collective and systemic competencies), and seeks to extend and broaden it so that a given entity can endure change and perform over time. Although a lot of its application was born from organizational environments, training for capacity building can be deployed hand in hand with community engagement by institutional stakeholders, in order to encourage greater resilience and reduce vulnerability; it can also be championed by grassroots entities. Either way, it is a way of strengthening communities and institutions useful to them, a way which draws from ideals of empowerment, identity, collective action and self-organization (Baser 2009). It is also, first and foremost, a process of creation of public value and change which seeks to help people avoid disruptions to their lives. And as it is based on complex systems thinking, it has, once more, local knowledge at its centre (Sinclair and Walker 1999, Baser 2009).

Originally, initiatives geared towards capacity building focused on training, skill development and technical assistance, but it was soon verified that capacity is seldom improved by measures such the injection of supply-driven training programs or technical assistance alone. Acting over a complex reality is difficult, and capacity building initiatives must take into account the complex systems within countries and organizations, demand-side pressures and the political economy of reform while at the same time taking into account. Blokland et al. (2009, 343) add that "the international development community has consistently overestimated its ability to build capacity in the absence of national commitment, local ownership and reasonably good governance." Nowadays, capacity building has become a multi-faceted process that acts over the enabling environment and the norms and values affecting behaviours. Improved institutions, laws, incentives, transparency and leadership are also expected to elevate performance and governance to a higher level (Blokland et al. 2009). At the community level, there is greater engagement of key stakeholders and a strengthening of the ownership of activities (Baser 2009).

In capacity building, knowledge, understanding and skills are acquired and developed through education and training. Tacit knowledge, of which local knowledge is part, is considered the most important type of knowledge for shaping skills and attitudes, and "can best be transferred

[in a capacity building process] through one-on-one interaction between junior and senior, apprentice and teacher" (Blokland et al. 2009, 18). Networks also play an important role in improving existing knowledge and capacity, which means that information technology can be a powerful support.

Social learning

Social learning, one more concept which relies on complex knowledge systems and also on local knowledge specifically, is a theme found in participation and adaptation research. Social learning in groups is currently "central to debates on tensions between sustainable development, democracy and free market ideology" (Leys and Vanclay 2011, 574). Its relevance stems from the inclusion of complexity, uncertainty and diversification of agents and sources of knowledge in debates related to participation, as well as the recognition that in some cases there is "little existing agreement on either the nature of the situation or the response" (Collins and Ison 2009, 359). This translates into an erosion of the more conventional policy approaches (including participatory ones), mediated in terms of power. Therefore, the roles, responsibilities and purposes of actors involved in adaptive processes are being re-conceptualized, and more 'traditional' forms of participation supplanted by processes of social learning.

The concept of social learning "has arisen in response to a growing recognition that our understanding of learning has moved away from an educational emphasis, with its focus on individual learning, to one where learning occurs through some kind of situated and collective engagement with others" (Collins and Ison 2009, 364). Social learning seeks an understanding of the nature of an issue, and of how it might be processed. It is also a central tenet of adaptive governance, which promotes collaborative learning and forms of concerted action, such as collaborative co-management. Although the concept of social learning does not have a completely established definition, its main characteristics include: a convergence of goals, criteria and knowledge that builds awareness of mutual expectations and relational capital; a process of collaborative creation of knowledge, conducted with the objective of learning the nature of a situation and possible ways of transforming it through concerted action; a change of human behaviour and action, achieved by understanding the nature of the issue through action, which also leads to concerted action; and finally, the overarching capability to transform a situation (Wyborn 2015, Collins and Ison 2009).

Ultimately, processes of social learning seek to build normative deliberations on local socio-environmental issues through the members of local communities (Ipiranga et al. 2014). More than making use of existing local knowledge, these processes integrate local and scientific knowledge and build on such integration, while at the same time fostering attitudinal, behavioural and normative changes within society (Leys and Vanclay 2011). These last authors nevertheless issue a warning against the same power imbalances and issues of representation that can occur in participatory processes, as well as in the access to local knowledge itself. It is also important to keep in mind that the implementation of a social learning process requires funding, long term monitoring, and an understanding of learning strategies and the different needs of participants, in order to successfully promote community engagement and learning, reduce power differentials, and avoid bias and the manipulation of agendas.

Resistance and confrontation

Resistance and confrontation is a theme that primarily draws from grassroots attitudes against official and formal entities, thus differing from the previous ones. Its interest for this work stems from the fact that contextualizes a very specific form of harnessing local knowledge, namely counter-mapping. There are many instances in which local knowledge is a cause or a tool of attitudes of resistance, which appear either in the context of grey areas, of informal governance, or in the outright clash between different interests, stakeholders and levels of governance.

A disinterest in or trivialization of local knowledge by formal entities, for instance, can be seen as a power play by local communities, since knowledge and power are intricately connected. In such cases, the conflict might render all science-based knowledge hostile at the eyes of a community, since it is used to inform policies that do not represent local interests and understandings of place (Van Assche et al. 2011). This attitude on the part of governmental and other formal entities is taken as a sign of ill will, especially when considering that local knowledge, despite its multiple and competing perspectives, can be and has been incorporated in spatial policies, such as in the case of land reforms (Kwaku Kyem 2004).

The reverse of the coin is that local knowledge holds power, and it has been used to defend the rights and identity of communities against governmental entities. Counter-mapping is one of the approaches to achieve this at the grassroots level, as further described in section 1.3. Another, more dissimulated means of contestation is simply a concerted effort on the part of community to substitute services that should be provided by formal entities, either due to the failure or inadequacy of those services. As Blokland et al. (2009) explain, making better use of local knowledge and capacity can be compelling when official assistance decreases; however, when such use is proposed by official entities, public scrutiny should ensure that it is the best option available, not merely a shirking of responsibilities on the part of the state.

Processes geared towards awareness raising and learning, such as social learning, can also have the transforming consequence of creating practices that question norms, policies and objectives (Collins and Ison 2009), a questioning for which the superior local knowledge of the local community is an asset. Should that questioning prove unwelcome, however, it is the rigidity of formal entities that will determine the magnitude of the clash.

Finally, one last issue in processes for harnessing of local knowledge that might place communities and government at odds is ‘intellectual robbery’, the taking of local knowledge without providing a benefit to the community in return. The direct consequence of this is a loss of trust, on the part of the community, in the engagement process. The issue can be kept at bay through a constant evaluation of whether the objectives and outputs of the process reflect the needs of the participants (Raymond et al. 2010).

1.2.2.3 Promoting recognition, equity and justice

According to justice theory, local knowledge and regional awareness can encourage larger-scale perspectives, linking local movements not only to state and federal levels, but to the global justice movement and the revival of struggles over the right to the city (Soja 2010). There is also a ‘glocal’ perspective expressing that, through all the local inputs of knowledge, it might be

possible to achieve a more equitable global equilibrium, at economic, political, and cultural levels, and build a support framework for policy implementation.

Another viewpoint is that of the potential of traditional or indigenous types of local knowledge to integrate policies concerning environmental conservation and biodiversity preservation. This potential not only helps in verifying the state of local resources, filling knowledge gaps and environmental monitoring, it also promotes recognition of knowledge holders and the legitimization of their identity and places of existence. Local people are pointed as the ones both better positioned to carry out these tasks, provided they have proper training, and as having the most to lose due to negative outcomes.

Local knowledge, in the context of promoting recognition, equity and justice within spatial policies, is also presented under three specific dimensions in literature: the debate around 'just outcomes', power and equity dynamics, and the theme of identity.

Just outcomes

As pointed out in section 1.1, local knowledge is a means of control and response to one's own environment and surroundings. It is thus often implied that, with the right tools and support, local communities can take it one step further and obtain access, when it is lacking, to the resources they need, while at the same time achieving recognition in the process. Just outcomes are desirable, but the processes by themselves are valuable, independently of whether the process is a grassroots one or collaborative. However, processes and outcomes, as well as communicative and normative theory, can complement each other, as shown by examples provided by Pfeffer et al. (2011): spatial knowledge, acquired through participatory processes, has been used to represent the distribution of deprivation and spatial inequality, and local knowledge, specifically (in this case referred to as civic science and lay knowledge), has provided forms of pressuring state and capital towards a better quality of life.

Involving local knowledge and local communities in adaptive governance can also be a way of working towards a better management of common landscapes, spaces and heritage. Devolution, delegation of responsibilities aside, would ideally return the land to 'its' people for a more just distribution of resources and goods and a more conscious form of management – possibly meeting both the egalitarian redistributive claims and recognition claims of social justice, as described by Nancy Fraser (Harley 2009). In reality, planning is likely to resort to tokenism – through token public participation or the indiscriminate deployment of the concepts of sustainability and resilience, for example, - and answer to economic concerns and growth policies, instead of placing justice at the forefront of concerns. Susan Fainstein (Centre for Liveable Cities 2013) defends that participatory processes for the harnessing of local knowledge do not necessarily promote more equitable or just outcomes, since such processes can be dominated by the most articulate and educated, and suffer from deterioration due to routine, corruption, lack of engagement and an interest in maintaining (or at least lack of interest in changing) the *status quo*.

Assuming that one is not resorting to 'tokenism', but actually interested in just outcomes instead, it is therefore necessary to be mindful of power relationships within (and around) processes, decisions and policies that work with local knowledge. According to Fainstein (2015, 166), "planners can contribute to a more just city by using the information at their disposal to show

clearly what are the stakes in any particular decision regarding environmental protection or economic development and advocate for policies that are more equitable."

Power and equity

Local knowledge plays a role in power politics and inequality dynamics, something which ends up being more important than its role in participation for the normative planning theory school (Fainstein 2011). In general, themes to which local knowledge is strongly associated can often be more relevant to normative planning theory than critical planning theory because they address matters of power and conflict, while providing frames of reference for problem-setting and problem-solving; such is the case of social-ecological resilience (Beilin and Wilkinson 2015).

Any theme related to adaptive governance, such as social learning and collaborative co-management, involves "power-sharing between local communities and government to provide community benefits through decentralized decision-making" (Wyborn 2015, 57). Processes for harnessing local knowledge, when occurring within these contexts, allow for the same type of power sharing, as do other contexts related to cultures of resistance and the negotiation of formal and informal rules within governance. On the other hand, a more equitable distribution of power can be hindered due to the specificity and hierarchy of knowledge holding within a community (as seen in section 1.1)[13].

Political and social theorists have identified an inseparability between what one knows and how one chooses to act in the world, and thus knowledge is indivisible from power. At the same time, the power of knowledge is embedded – while knowledge can be harnessed and yielded, the same is not true for power, because information does not create power on its own. According to McCall and Dunn (2012), the potential of harnessed knowledge, at the institutional level, for influencing existing power relations is still unclear. Such a process might have both valuable and detrimental consequences, for both institutions and local communities, especially in controversial cases such as converting vague boundaries on the ground into clear ones on a map.

It is important to stress that, when using the term 'power politics' or 'power inequality', institutional stakeholders are often the strongest players. As mentioned by Wyborn (2015, 58), "institutions exist in a constant state of flux, shaped by power relations and conflicting interests". According to the author, deploying a model of governance implies an understanding of power, negotiation and contestation across all scales, as well as a certain disillusionment with the possibility of institutions emerging from their context and reforming themselves for the better. Perhaps for that reason, McCall and Dunn (2012) refer specifically to 'equity in community control and accountability' as a central principle of good governance, and to the specificities of equity amongst 'governed' and 'governing'. Mapping socio-environmental equity and power, particularly when exposing hazards for people living near pollution sources and representing

[13] Dekens (2007, 33) provides some good examples of how local knowledge can reflect local power – or, in other words, how dominant groups can use local knowledge to gain the upper hand within their own communities. In a case study in Northern Bangladesh, "the local elite influenced NGOs' decisions to locate flood shelters and control access to the shelters. As a result the shelters were not placed in the best locations either for vulnerable people or in terms of hazard risk (…)." In another case study in the 'char' lands of Bangladesh, it was reported that "attitudes to preparedness are often influenced by religious leaders, some of whom advocate prayer as the only appropriate and necessary measure."

local conceptualizations of inequalities, is an example of an activity that can promote equity and to which local knowledge can be important.

One last topic pertains to the choice of tools and methods for harnessing local knowledge, particularly if these demand digital literacy. The matter of the 'digital divide' can influence participatory processes for decision-making and is further discussed in section 1.3, in the context of tools themselves.

Place, memory and identity

Local knowledge, by definition, pertains both to a physical 'space' and a social 'place', while at the same time it is a repository of collective memory (Dekens 2007). Therefore, it is strongly associated to the recognition claims within the social justice movement, particularly those pertaining to ethnic minorities. Recognition of local knowledge is one step towards the recognition of the distinctive characteristics of communities whose culture has, up until now, been devalued in relation to mainstream culture (Harley 2009, 78).

Memory can be a part of the social imaginary, subject to shifts, recalibrations and idealizations concerning past experiences, but it is also useful to spatial policy-making in that it is essential to transfer local knowledge to a map, in this way legitimizing a landscape or habitat. It is the mapping process that "provides 'certainty' to the developers that boundaries exist and that they can depend on government to maintain agreements as realised from the maps" (Beilin and Wilkinson 2015, 1211).

The distribution of local knowledge within a community can also denote specific cultural traditions, pertaining to a people's identity. In Blewitt (2015), amongst other examples, it is explained that Inuit women of Northern Canada hold a better understanding of weather conditions than their male counterparts, because the responsibility of evaluating conditions for hunting has traditionally been theirs. Recognition of hierarchy, as well as occupational, age and gender divisions in the access to local knowledge might not only inform spatial policies, but also provide a better understanding of such communities by decision-makers, as well as reinforce social justice movements.

1.2.2.1 Adapting to new challenges

Local knowledge is often presented an important element of capacity building and risk mitigation, as seen previously, but it is also of importance to adaptive governance, mainly through complex knowledge systems and complex thinking. These are major approaches, in the context of sustainable development and resilience thinking, to the new challenges faced in governance and planning. Since capacity building, and the role of local knowledge in it, have already been presented in section 1.2.2.2, this section focuses instead solely on the themes of resilience, risk mitigation and adaptive governance.

Risk mitigation

Several of the approaches described previously, such as community governance, capacity building and social learning, have a dual importance to communities: the improvement of quality

of life and social cohesion, on one hand, and the strengthening against stressors by pursuing adaptation to change. This last effect is directly related to resilience thinking and risk mitigation, which means local knowledge often appears in sustainable development, climate change, and hazard and adaptation literature.

Disaster risk reduction is, per definition, a conceptual framework that encompasses elements considered to have "the possibilities to minimise vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development" (Dekens 2007, ix). Natural hazards are just one type of the many stresses communities face, with mundane issues often being perceived as more pressing threats, such as those related to livelihood insecurity. Dekens (2007) presents, as an example, the existence of settlements in steep slopes, risking infrequent landslide hazards, in a trade-off for reserving flat land for cultivation. There is also often more local knowledge associated to recurrent shocks that lead to gradually increased vulnerability, than local knowledge pertaining to exceptional hazards which need exceptional coping strategies and external support. While it cannot be assumed that scientific or local knowledge, on their own, will be able to provide answers to community development challenges (Gaillard and Mercer 2013), the incorporation of both local knowledge and the catalytic force of memory it brings forth can assist efforts to enact change (Beilin and Wilkinson 2015).

The central point to understanding the role of local knowledge in risk mitigation (one previously presented, but again relevant) is recognising that "local people are the primary actors by default when a disaster strikes", as they accumulate considerable experience due to living in disaster-prone areas and have a good understanding of perceived risk variation over time (Dekens 2007). Therefore, the coping mechanisms that local people establish can help create adequate measures for reducing risk and decreasing vulnerability (Peters-Guarin, McCall, and van Westen 2012). Of course, bridge institutions need to understand these coping mechanisms nevertheless, because communities see disasters and hazards through a cultural lens and there is the risk that, during disaster responses, there might be different perceptions and ways of communicate the same concepts at play, a situation which creates obstacles to the collaboration between the community and external entities (Dekens 2007).

Practitioners have long been advocating for increased involvement of affected communities in spatial policies geared towards risk reduction. For that inclusion to happen, governmental entities first need to recognize the value of local knowledge as a resource and the fact that local communities are not helpless when facing natural hazards. In this context, in the last two decades, concepts such as community-based disaster risk reduction, participatory hazard mapping, and community-based hazard identification and mitigation have gained traction (Gaillard and Mercer 2013, Dekens 2007). However, there is still a strong lack of integration between local and scientific knowledge in many parts of the world. Gaillard and Mercer (2013) claims that the field of disaster risk reduction is a 'battlefield' of knowledge and action, which often increases the vulnerability of disadvantaged communities. The local and the global are still largely disconnected, a situation which is evidenced by "the dominant top-down, homogenizing DRR strategies utilizing global scientific knowledge on hazards and vulnerability, on the one hand, and the context-specific nature of local knowledge and community-based actions on the other hand" (Gaillard and Mercer 2013, 94).

This situation is worrisome as authors defend that there has been an increase in the incidence of disasters and the toll they take, due, firstly, to shifts in the allocation of resources between different demographics; and, secondly, to the undertaking of development processes that force displaced people to settle in risk-prone areas, lack development themselves (Dekens 2007). It is accepted that scientific knowledge saves lives, and Gaillard and Mercer (2013) add that the same has been demonstrated by local knowledge. It is therefore important that different types of knowledge are integrated, presenting in this way the possibility of a particular context always being able to access the most beneficial forms of knowledge in a given moment and situation. Besides, the authors argue that local knowledge can provide improvements in disaster risk mitigation (Figure 1.7) in a manner that is cost-effective, participatory and sustainable. Tragically, in some cases, constantly imposing scientific knowledge in a way that is not necessarily appropriate to the context has led to a local rejection of local knowledge and to its permanent loss, as it came to be seen as 'inferior' by local communities although that might not be the case.

Figure 1.7: Integration of knowledge, actions and stakeholders in disaster risk reduction approaches (Gaillard Mercer 2013, p.95), with local knowledge as one of the main concepts.

Adaptive governance

Adaptive governance is extremely relevant to this work because it includes, and values, a series of concepts that are relevant when working with local knowledge. Since it has been previously described at length, this section focuses solely on its features that relate to local knowledge. The first of such features is that it is centred on the diversification of knowledge and agents, as it is a multi-disciplinary, multi-scalar and decentralized form of governance that relies primarily on collaborative mechanisms, and has social learning and co-management as foundations. It also focuses strongly on networking people, ideas and knowledge, and provides opportunities for

actors to interact. In fact, drawing otherwise isolated people into partnerships is important to resilience thinking (Wyborn 2015).

Adaptive governance draws from collaborative planning in that it recognizes the importance of incorporating voices other than expert ones and diversified knowledge. But, most importantly, it uses knowledge focused on system dynamics, instead of detailed knowledge about parts of the system (or linear understandings of cause and effect); in other words, it employs complex knowledge systems, of which local knowledge is part (Wyborn 2015). This can be explained by the fact that, in many situations, local governance and monitoring are better capable of matching the diverse social and ecological contexts and dynamics of different locations, as local knowledge can inform place-specific action in a way that centralized systems cannot (Lebel et al. 2006).

1.2.3 WRAP UP

Characterizing the current state of planning and governance is not an easy endeavour, much less pinpointing the myriad of roles local knowledge can have in spatial policies. First of all, there is a certain degree of obscurity to it, which no one describes better than Allmendinger and Haughton (2012, 90): "planning theory has evolved over the past 30 years, growing into a major academic enterprise (…), albeit one that to the professional planner looks mostly impenetrable, written by a 'small tribe of experts speaking to each other in strange tongues'". This is not, however, the greatest problem pertaining to a contextualization of local knowledge. Instead, the diversity and interdisciplinary of the themes associated to it – in particular participation, community engagement, complexity theory or the fast changes in society and the world during the past few decades - present themselves as the great culprits. And if the contextualization of local knowledge in spatial policies is complex, what to say about its harnessing and use? It is to be expected that the tools and methods to achieve that purpose would have to be complex, flexible, and able to cover a wide array of situations. Existing case studies would also, necessarily, pertain to several domains of research, sometimes more than one at the same time.

Throughout this section, several applications of local knowledge and community engagement are presents, along with their advantages and problems. Proponents of local knowledge are usually positioned within certain normative approaches, such as communicative planning, or reliant on frameworks such as complex adaptive systems. But, whether arguments are for or against, the use of local knowledge is already undertaken on a daily basis by policies that seek and value the involvement of local communities. In this work, such involvement is not only seen as necessary and inevitable, but also as something should be encouraged as a form of building autonomy, social cohesion and quality of life, and also, if possible, improved on.

Improvement, however, needs research as its base, and such research also needs to focus on the most crucial point yet: the way local knowledge is traded between communities and institutions, directly applied, included in spatial policies, or simply used to secure a better life. For this, tools and methodologies for their deployment are needed. Therefore, section 1.3 focuses on such tools – spatial data processing tools, - in search of an understanding of their use through literature review.

1.3 HARNESSING LOCAL KNOWLEDGE THROUGH SPATIAL DATA PROCESSING TOOLS

Spatial data processing tools is a designation that conglomerates different but interrelated types of technology, and even traditional methods. The third section of the literature review focuses on the clarification of this concept, its contextualization, and the issues associated to the use of spatial data processing tools for harnessing local knowledge. The last part is dedicated to the review of case studies that reflect such use, in an effort to provide concrete examples of the tools, processes and methodologies involved.

1.3.1 SPATIAL DATA PROCESSING TOOLS

The integration of geographically referenced information into the conceptual frameworks and its applied uses has been an ongoing process over the past few centuries in different fields of study. It gained momentum in recent decades with the advances in technologies for computation and visualization and with the arrival of new data sources (Goodchild and Janelle 2010). The use of geographic information and cartographic representations for communication (demonstration, contextualization, motivation, supporting the construction of mental models, etc.), as well as the collection of spatial information to inform policies and build knowledge systems, are currently vital to spatial planning (Hennig and Vogler 2011).

The term 'spatial data processing tools' is not widely used, with geographic information systems (GIS), participatory geographic information systems (PGIS) or geographic information and communication technology (geoICT) being the most popular choices when referring to technology that handles spatial data. GIS, for example, are information systems[14] that handle geographic data through the combination of several types of spatial data processing tools, namely data collection and management systems, tools for manipulation and visualization of outputs, and geo-processing technology (Stephenne, Burnley, and Ehrlich 2009). These tools might be used separately or as part of other types of systems, with the term 'spatial data processing tools' applying to each of them, separately, and to the systems they help build. It can also apply to tools that do not georeference data despite the fact that they help in its handling, or that serve purposes other than processing spatial data specifically, such as spreadsheets and databases. Therefore, spatial data processing tools are simply aspects of information and communication technology (ICT) used for manipulating data sets characterized by their spatial dimension, with the objective of achieving results relevant to that same spatial dimension.

Generally, ICT is a given when talking about spatial data processing tools – as an amalgamation of concepts born of computer engineering, it is reasonable to assume that there is at least some computing power behind the tool in question. However, as GIS started being used in collaborative work by communities and community-based organizations, it is difficult to take

[14] An information system is "a computer-based set of software modules that interact with a database. The system processes and transforms digital data into information that is meaningful to a set of users" (Stephenne, Burnley, and Ehrlich 2009, 503).

paper out of the equation. Traditional tools for spatial representation, such as paper, pens, printed cartography and cardboard models, are useful and easily assimilated by communities that face disadvantages when required to use ICT in general, as explained later in this chapter (Ramasubramanian 2010). For this reason, the term 'spatial data processing tools' will be hereby deployed with some leeway given to traditional tools when these are coupled with some form of digital processing, even though analogical spatial representation methods are not the focus of this work.

Evolution of spatial data processing tools

In the 1960s, the Department of Defense of the USA created the forerunner to present-day Internet through its ARPANET program. In the early 1970s, after a decade of innovations driven by military defense goals, the first personal computers appeared and the first Graphical User Interfaces (GUIs) were developed. The focus was on efficiency and accuracy, by finding ways to make computers perform better than humans. The first Geographic Information System (GIS) was the Canadian Geographic Information System, developed by Roger Tomlinson. In the 1980s, although personal computers still served an elite market, users were able to acquire them and use spreadsheets, relational database systems, and word-processing applications to serve everyday needs. GIS evolved, adapting to other emergent technologies such as the use of remotely sensed data (Ramasubramanian 2010).

The processing, analysis and visualization of cartographic data was carried out using GIS as desktop software, installed on a single computer, from the 1960s to the 1990s. Each process for the collection of information was distinct (Colás 2013). However, this approach changed due to advances in the technological infrastructures available and the pressures created by population growth and urbanization processes, environmental degradation, water scarcity and climate change, which require governments to have and share much more accurate and comprehensive information than before (Williamson, Wallace, and Rajabifard 2006). The notion of using GIS to support urban planning and management issues gradually emerged as the adoption and use of GIS among local governments began to spread (Ramasubramanian 2010).

Beyond the traditional, self-contained governmental use of GIS, and accompanying the growing emphasis on 'collaborative' and 'participatory' approaches to spatial planning and decision-making, participatory, 'bottom-up' geoICT started being developed in the 1990s (McCall and Dunn 2012, Rotondo and Selicato 2011). By 1995, for example, USA communities applying to funding had to demonstrate their need to the US Department of Housing and Urban Development, which they started doing by mapping census data and cross-referencing it with other city and county sources in order to develop a social-spatial narrative of neighbourhoods in need. This is referred to by Ramasubramanian (2010) as the 'mapping of misery', with the objective of delimitating with precision the areas suffering the most from crime or socioeconomic deprivation. These community-focused GIS activities often secured the funding needed, but they also had a larger impact by creating a culture of data-driven analysis of social issues which facilitated data gathering and integration.

In 1997, in some parts of the world, participatory GIS was being used by community-based organizations "for a variety of social applications, including emergency dispatch, finding funding to build low-cost housing, tracking drug activity, and managing urban sprawl"

(Ramasubramanian 2010). Cities and neighbourhoods sought to better understand the dynamics of neighbourhood change and solve social problems, using the data collected to encourage physical interventions that were thought to address such problems[15]. Its use quickly spread to non-profit organizations and universities as well.

With the 2000s approaching, internet-based data delivery services were also becoming possible. Governmental agencies, which were integrating digital maps and geospatial databases in shared workflows in land management, urban planning and transportation in decision-making, both at national and city levels, and creating Spatial Data Infrastructures (SDIs) (Tao 2013, Acharya 2009), started providing and disseminating spatial data online, in an effort to democratize access to information, promote public debate, and report or track civic progress (Ramasubramanian 2010). Governments across the globe started investing in e-Government models as well, including online mapping facilities and geoportals, for which the SDIs were essential (Kingston 2007).

The reach of 'Public Participation GIS' (PPGIS), which includes the traditional geospatial layers of GIS as well as visual and multimedia information such as photographs, videos and sketches, was expanded significantly in 2005, with the launch of Google Earth and other 'digital earth' mapping platforms (Atzmanstorfer and Blaschke 2013, Wart, Tsai, and Parikh 2010). Another phenomenon occurred at the same time: mapping functionalities entered the computers of all internet users, who adhered to them enthusiastically, giving birth to the term 'volunteered geographic information' or 'VGI' and opening up the domain of spatial data collection and processing to the crowdsourcing phenomenon. The development of the social web and the miniaturization of sensors have also created new opportunities for citizen participation in planning and monitoring (Gouveia and Fonseca 2008).

Today, there is a wide diffusion of ever-innovative electronic devices and open-source mapping tools that allows lay users to produce, consume, display and query geo-referenced information. GeoICT and other tools capable of spatial data processing are used in a variety of grassroots and collaborative initiatives, much different from the military and governmental projects that constitute the origins of geoICT. The concept of 'spatial data processing tools' nowadays includes, to name the most relevant, desktop-based or mobile GIS and PGIS, web-based and/or open-source mapping services such as OpenStreetMap, ModestMaps or Open Layers, digital earth technology such as Google Earth, public APIs such as the Google Maps API and the W3C Geolocation API, very high resolution (VHR) earth observation sensors, GPS, and participatory three-dimensional modelling and visualisation (McCall and Dunn 2012, Zook et al. 2010, Al-Khudhairy 2010).

Accessing spatial knowledge

How do spatial data processing tools tap into spatial knowledge that is tacit and context-specific, namely local knowledge? The basis for their use can be found in spatial cognition theory, and is not dependent on the use of technology. Since local knowledge is a type of spatial knowledge, accessing it mean tapping into activities that require mental representations of space.

[15] Example: trying to reduce crimes related to arson or drugs by eliminating abandoned or boarded up houses (Ramasubramanian 2010).

These activities might imply movement or simply states of being, such as contemplating or sleeping. The study of spatial cognition in cognitive sciences focuses primarily on high-level tasks, such as reasoning, communication, imagination, symbolic representation or interpretation, in which internally represented spatial knowledge is thought to be accessed explicitly. It excludes tasks that involve perception-action coordination, even though they include psychological processing of spatial information. To clarify the types of tasks that are considered relevant, Table 1.8 has been adapted and expanded based on the work of Montello and Raubal (2012).

The most acknowledged result of spatial cognition processes is the cognitive map (Kim 2001, Montello and Raubal 2012), which establishes a correlation between the spatial configuration in the real world and its cognitive constructs. This is possibly the underlying reason that the outcome of many of the collaborative processes seeking to harness local knowledge is the production of a map by the local community. In fact, 'community mapping' is one of the recurring designations of such processes in literature that features them.

At the methodological level, there are several approaches to the study of spatial cognition. Within cognitive sciences themselves, the one most relevant to local knowledge and the use of spatial data processing tools is possibly the neurobehavioral approach, which focuses on the underlying spatial processes to these tasks and their physiological implications (Foreman and Gillett 1998). The results of the study of spatial cognition are applied in the development of location-based services, especially digital navigation, spatial information technologies such as Geographic Information Systems (GIS), iconic information display, such as a simple cartographic map, and architecture and planning. Configurational aspects of the surrounding environment have significant cognitive consequences for humans. However, there is also a physical interaction: the configuration of these environments might be changed to influence human behavior, or they might be changed by human behaviour as a consequence of the cognitive processes the environments themselves trigger – something that is especially visible in regards to the built environment (Kim 2001). The technologies developed as a result of spatial cognition studies further this interaction.

Other approaches have been developed in the area of environmental design, such as the syntactic approach. The use of space syntax was proposed by Bill Hillier, Julienne Hanson, and their colleagues at University College London in 1984, in order to capture spatial patterns of settlements using a connected graph of axial lines (Dara-Abrams et al. 2010). It defends that spaces can be broken down into components, in order to be analyzed as networks of choices and later represented as maps and graphs. This process mirrors current collaborative mapping initiatives and seeks to achieve a description of the relative connectivity and integration of those spaces.

Kim (2001) considers that both cognitive and syntactic approaches are insufficient, if used in isolation, to the in-depth study of spatial cognition, and that only an integrated approach will yield accurate results. Nowadays, there are several different models and measurements for characterizing different types of spaces and objects in the built environment. Computer sciences, particularly in the area of robotics, and geographic information sciences have developed other computational approaches parallel to the models of space syntax (Dara-Abrams et al. 2010).

Table 1.8: Six categories of spatial-cognitive tasks, adapted from Montello and Raubal (2012, 251-253).

1. Wayfinding as part of navigation
Includes tasks such as: - creating and choosing routes - establishing and maintaining orientation with respect to one's starting location or with respect to external features or places - recognizing how landmarks spatially relate to other landmarks or other aspects of the environment, judging distances - remembering sequences of turns - remembering the locations of objects and events
2. Acquiring and using spatial knowledge from direct experience
Different scales: - at the figural scale, mostly through the sensori-motor systems of vision and haptics - at the vista-scale, through vision, and head and eye movements - at the environmental scale, though body locomotion and thus visual and proprioceptive senses Different focus: - locations of prominent features (landmarks), path network structures that connect places, and spatial relationships among places at the environmental scale - geometrically-based spatial properties, including connections, containments, sequences, distances, directions, shapes, configurations, at all scales
3. Using spatially iconic symbolic representations
Different media: - two-dimensional/graphical symbolic representations (maps, graphs, drawings and diagrams, photographs, movies, spatializations*) - three-dimensional/volumetric symbolic representations (physical models and globes) Different focus, often distorting the types of information that are secondary to it - measurable information such as distance: - relationships such as connectivity and sequence - metaphors for non-spatial information **multivariate representations of very large data sets that use landscape depictions to represent nonspatial information metaphorically*
4. Using Spatial Language
Important for interpreting linguistic expressions, independently of whether its semantic content is spatial or not (as in the case of spatializations): - Johnson (1987) proposes the theory of image schemata, according to which language is interpreted via the metaphorical extension of a few basic iconic mental representations to capture all semantics.

- Gattis (2001), Gentner and Medina (1998) discuss the role of spatial thinking in temporal thinking and in the spatial alignment of conceptual structures during analogical reasoning more generally

- According to the geometric theory of conceptual spaces, concepts are mentally represented as iconic representations whose geometric properties express relational meaning (Gärdenfors, 2000)

5. Imagining places/reasoning about them with mental models

Mental models are constructed:

- as part of interpreting narratives in language
- from non-linguistic sources, through direct experience with entities at figural, vista or environmental scales
- through imagination, sometimes representing fictional entities

6. Location allocation

Finding optimal or adequate locations, and thus reducing relative cost functions, for certain resources or entities in an adaptive manner is an intensive task that incorporates a great deal of spatial thinking. At institutional level, this task is currently handled non-cognitively, by algorithmic and heuristic computer routines that do not mimic human cognition.

1.3.2 CURRENT USE OF SPATIAL DATA PROCESSING TOOLS

Advances in geoICT have democratized the production and access to spatial information by offering communities and citizens access to spatial data processing tools. These tools are being used, on a grassroots or collaborative basis, to solve problems, narrate local needs and conditions, secure their space and negotiate spatial policies. Community mapping projects gather the potential of local knowledge, localized social relations and place-specific conditions, and aim to build capacity and spaces of engagement. They also provide a way for external agents to engage with local communities and connect multiple actors, both local and external, public and private, through networks of association.

The main issues concerning current use of spatial data processing tools are related to two main themes. The first is the nature and technical issues of geoICT itself, and what these mean to collaborative local processes. The second is related to their implementation, especially in what concerns matters of power, empowerment and engagement of local communities.

Technical issues

The nature of geographical applications requires seamless integration and sharing of spatial data from a variety of providers. There has been great progress in this area during the last decade. However, different GIS desktop applications and online mapping services from different providers cannot often interoperate or communicate with one another (Stoimenov, Stanimirovic, and Djordjevic-Kajan 2005). The development of a unique global framework seems utopic. Instead, interoperability is being promoted through, i.e., Service Oriented Architecture (with components being reused depending on the framework and resources available), cloud

computing (for storage and use of large amounts of data), and application development over existing web mapping tools (Anumba et al. 2006). It is important to invest on coordination and solutions that promote interoperability, especially at institutional level (Nedovic-Budic and Pinto 2001, Stoimenov and Djordjević-Kajan 2005). The semantic level can be especially tricky, since language is still a barrier and metadata is not always preserved and read properly, despite OpenGIS efforts.

In what concerns collaborative action, usability of software is one of the most important issues (Jones and Weber 2012). Good usability allows users to achieve goals with effectiveness, efficiency and satisfaction. Hennig and Vogler (2011) comment that software developers sometimes forget that they are not typical users, and that cooperation between the intended users and developers can be essential for project success. In their article, the authors describe the development of a geographic online application by an interdisciplinary work group that includes the target groups of the application. This emphasis on collaboration at the earliest stage of the mapping process – such as tool design/selection – as a precondition for success is also found in one of the case studies reviewed in this work (Gearheard et al. 2011), and is in agreement with the principles of communicative planning theory.

The diversity of sources and tools may also pose several problems related to the relevance, credibility, representativeness and quality of the geographic information. The data submitted by users and participants is not always reliable and must be validated - the implementation of parameters and rules that automatically evaluate the quality of the information is still a problem. Moreover, its coverage is often not homogeneous (Mooney et al. 2012, Goodchild and Li 2012, Fraternali et al. 2012). Security and privacy are also complicated parts of collaborative networks, due to the number of participants and the need for information exchange and interaction in general. The rights over shared information and how to control the extent of the sharing are issues over which theory is still unclear (Fraternali et al. 2012, Leszczynski 2012).

Implementation

While the collection and dissemination of geographic information has, until recently, been the prerogative of national mapping agencies (Mac Gillavry 2006), non-professional users are consistently seeking more accurate and highly detailed information on spatial and temporal dimensions (Acharya 2009). With current geoICT and location-aware mobile devices, for example, anyone has the potentially to be a mapmaker and provide complementary and alternative geographic information. This is presented as helpful regarding education and spatial citizenship, such as in reflective and participatory practice. These tools can also amplify the voice of ordinary citizens, allow them to participate in knowledge production instead of remaining passive consumers, improve citizens' capacity to directly influence public service delivery, and hold local government accountable (Georgiadou et al. 2011, Ramasubramanian 2010). However, whether empowerment is guaranteed to derive from the use of geoICT tools is an open question, with more enthusiastic support than concrete results. Technological developments of knowledge production have not yet fully addressed important issues related to social inclusion, accountability, empowerment, control and use of knowledge (Pfeffer et al. 2013). It is also difficult to find data concerning outcomes and spillover effects, especially concerning the kind of processes reviewed in this work.

Empowerment is a complex process that depends on bureaucratic organizations being transformed into flexible institutions, able to address the concerns of marginalized groups in society (Kwaku Kyem 2001). Such a process involves shifts in power relations during which intervening organizations confront embedded structures and vested political interests. Opposition from local leaders, unfamiliar customs and rituals, lack of infrastructure and of trained personnel that is able to meet the local community halfway may prevent successful participation. Reliance on external sources of funding and expertise for participatory mapping projects can also limit their long-term sustainability; ultimately, empowerment involves mutual transfers of knowledge, capabilities and power among all of the local stakeholders, which can't simply be given to the community by external agents (Tsai et al. 2013).

Nevertheless, it is argued that both individual and communities can use spatial data processing tools successfully in a grassroots, participatory or collaborative setting, even when facing 'digital divides' and the effects of marginalization, by addressing the insufficiencies within their own communities (Ramasubramanian 2010). Spatial tools have been used to maintain cultural specificities, communicate, archive knowledge, empower their communities, develop skills and generate income, in accordance with their particular needs and the opportunities available (Singleton et al. 2009).

In the area of governance, geoICT tools can help improve the inclusiveness of decision-making processes and reduce urban inequalities, by incorporating tacit knowledge and citizens' preferences (Pfeffer et al. 2011). One of the main questions is which methods and geoICT-based approaches can be used to make local knowledge visible. The outcome of any process can depend greatly on the nature of input maps, the situated knowledge of workshop participants, map literacy, and the chosen methodological approach. For instance, one author argues that the discourse and practices of collaboration can often lead to a problematic depoliticization of geoICT tools, normalizing uneven power dynamics and marginalizing alternative and oppositional perspectives (Ramsey 2008). Furthermore, it is explained that recent research has focused on enabling the representation of different opinions, while ignoring actual debates among stakeholders and the clash of inconsistent perspectives in these processes. At the same time, another article found that participatory mapping processes contributed positively, though not comprehensively, to good governance (McCall and Minang 2005). This was achieved by improving dialogue, redistributing resource access and control rights, though not always equitably, legitimizing and using local knowledge, exposing local stakeholders to geospatial analysis, and creating empowerment through training. It was also important to support of community members' participation in decision-making and actions, and enablement of planning decisions beyond the community itself.

Disaster response and risk prevention are two more areas in which the harnessing of local knowledge through geoICT tools and the measure of power derived from the process are strong topics of debate. GeoICT tools can offer insights into the possibilities for preparedness and emergency response during disasters such as floods or earthquakes. Not only can vulnerable housing areas be adapted or 'safe havens' for shelter created, but individuals can also make a tangible difference during the emergency itself by contributing to the work of relief and aid agencies, sometimes without being physically present (Neuvel 2009, Zook et al. 2010). Proponents of emergency and preparedness mapping are however cautioned to take into

consideration local spatial planning practices, since local governments may not feel responsible for the reduction of potential disaster consequences and boycott or alter proposed programmes.

There is some attention given, in the literature, to the capacity of local people to lead themselves to safety, through mobile technology and specific protocols, and serve as distributed active sources of information. Despite this growing awareness of the untapped potential of the affected population in a disaster situation, their inclusion in a disaster management is still limited (Gunawan et al. 2012). Currently, communities often lack strategies to cope with disasters and especially unsafe housing. It is suggested that linking community participation with modern techniques to analyse risk can empower and mobilise communities to address very specific vulnerabilities (Krishnamurthy, Fisher, and Johnson 2011), although it can also be seen as a rejection of responsibilities that pertain to the state.

It should once again be emphasized that democratization of knowledge and open access to information are not equally guaranteed in all places. Firstly, the 'digital divide' means that there is a significant gap between those who have access to digital technology and those that do not. Moreover, in many areas (especially in the 'Global South') GIS databases are still under construction, and the capacity for managing and maintaining them is limited. The sole reliance on GIS-based technical knowledge can also be problematic because the system only shows its inputs, and these, being quantifiable, are regarded as 'the truth'. For example, certain areas and people may be erased by the process of digitization, such as during the construction of digital cadastres, or may not even 'exist' because they have never been included in the database (Pfeffer et al. 2013). In cases such as these, local knowledge can and has been able to fill the knowledge gaps quickly, one of the main applications mentioned in chapter 1.1.

But caution should be exercised, as local knowledge production is also linked to power and control over place and space. One has to account for people's ways of knowing: the acquisition of knowledge, and the parts of the whole on which individuals focus, depend on factors such as "age, gender, occupation, labour division in the family, enterprise or community, socio-economic status, experience, environment, history" (FAO 2004, 3). Access to knowledge, and the power derived from it, is neither equal nor easy for all individuals of a community, some of them being more vulnerable than others. Inequality in distribution of knowledge, as mentioned in chapter 1.1, means that who the local key players are depends on the subject at hand (Dekens 2007).

Local networks already contain structural inequities, hierarchical dominance and fluctuating resources. Since spatial information can be a commodity or a source of power for those who control it, it is subject to local power dynamics at different scales. Therefore, certain agents, depending on the context, often occupy a key dominant position in community mapping projects. The relationship between them plays a crucial role in shaping processes and outcomes, enhancing some aspects of the experience and constricting others.

Community mapping, when undertaken in countries on the disadvantaged side of the 'data divide', might also rely too heavily on geoICT. The use of such technologies can be "marginalising and disempowering for community members, particularly those from disadvantaged communities or those with poor computer literacy skills" (Grant-Smith and Johnson 2012, 11). Those who have prior knowledge of the situation, some experience of spatial data analysis, or are in positions of power can dominate the discussion and alter the results of a collaborative

project. Internet availability is also not global and could in fact be considered a tool for exclusion, in the sense that communities that do not have a strong online representation are diminished before the more digitally present society, which is usually also the most economically and socially privileged group (Ramasubramanian 2010).

There is another, and far stronger, type of power imbalance that affects local communities: the one between the community and the (usually) governmental organization that is working with it. This imbalance is present even in projects that are citizen-driven (through a citizen association or local non-governmental organization), as the problems under scrutiny often belong to the public or social domain, having been caused by a lack of governmental capacity to step in or outright confrontation. It is the case, for example, of projects in which the community is trying to gain leverage over the state by counter mapping.

Technology is, as (Ramasubramanian 2010, 8) states, "the intermediary (…) to facilitate our conversations". There are many kinds of analogical, simple spatial representation methods – from drawing on paper to building cardboard models – that are sufficient, easily assimilated and useful to communities. However, digital and especially online-based tools, where it is possible to have access to them, have the advantage of being a two-way street. The data they collect and transform can be made available globally and used to extrapolate from other cases. It is thus useful not only locally, but in a much wider context.

1.3.3 POINTERS ON THE USE OF GEOICT THROUGH CONCRETE INITIATIVES

This section is comprised of a review of a preliminary review of concrete initiatives that employ spatial data processing tools, in the context of the literature review conducted thus far. For that reason, only initiatives described in journal articles were selected, prioritizing those published since 2010 which contain a combination of keywords also suggested by this literature review: 'local knowledge', 'geoICT', 'GIS', 'PGIS', 'collaborative GIS', 'collaborative' or 'participatory' or 'community' or 'lay-based' mapping, 'mapping for change', 'spatial policies', 'just outcomes', 'communicative planning'. From the 222 results retrieved, 11 articles and a total of 13 initiatives were selected in order to deepen the analysis of available literature.

Since the focus of this work is the harnessing of local knowledge with the help of spatial data processing tools, in participatory, collaborative or grassroots settings, there were three criteria for the selection of projects. The first was the use of spatial data processing tools at some point during the process. The second was the involvement of a community or group of citizens, belonging to the location to which the process pertained and in dialogue with each other and with external agents, and the third was a focus on local knowledge. It was considered that any process of mapping or spatial data collection that did not involve local agents would not be able to fully access local knowledge, since it is contained in living people from the community and only occasionally on records made by them, as aforementioned. In other words, it was understood, through the literature review, that if the recording of spatial knowledge or its use to obtain other data (data mining) are tasks that can only be performed efficiently by or with the aid of local 'experts', we are in the presence of local knowledge. These criteria eliminated, for example, most VGI-based participatory processes (often within the domain of crowdsourcing), which, although useful for collecting spatial data in large amounts or short

periods of time, were conducted by external volunteers and as such are not concerned with unique local knowledge. For an insight into the uses of externally-sourced VGI, especially in the field of emergency response, reading of the case study presented in Zook et al. (2010) is recommended. It should also be noted that the selected criteria, employed at the stage of general literature review, are a prototype of the criteria or markers used in the selection of case studies for empirical research, later on.

Table 1.12 compiles information on the initiatives selected and is divided in five columns. The first three columns, 'case and location', 'key agents' and 'description', present the project. The fourth column sheds light on how the process for harnessing local knowledge is constructed. The fifth column explains the tools and methods used.

In the analysis of the characteristics of the process, presented in the fourth column of Table 1.12, a classification of the type of local knowledge accessed is included, based on the summary provided by Baud et al. (2011) of spatial knowledge types (Figure 1.9, which is an alternate version of Figure 1.1). While local knowledge mainly falls into the tacit and community-based categories of spatial knowledge, other types of spatial knowledge can be present in the same process due to the participation of multiple actors in different roles. At the same time, a single member of a community might also possess different types of spatial knowledge about their surroundings, from tacit to codified, depending on the person's background and training.

		Contextual-embedded knowledge:			Codified knowledge
	Tacit	**technical, economic**	**community-based, social**	**political and network levels**	**(analytical, regulatory, standards, etc.)**
Main actors	Individuals with experience	Professional knowledge belonging to sector professionals	Community knowledge spread by social networks	Political knowledge within political and social networks	Academically and professionally taught and diffused

Figure 1.9: Types of knowledge (Baud et al. 2011).

Figure 1.10: The modes of knowledge production proposed by Gibbons et al. (1994), currently very prevalent in sustainability science (Martens 2006).

	One-way communication	Two-way communication			
	Inform	Consult	Involve	Collaborate	Empower
Objectives	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/ or solutions.	To obtain public feedback on analysis, alternatives and/ or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Techniques	• Fact sheets • Open houses	• Public comment • Surveys • Public meetings	• Workshops • Deliberative polling	• Citizen advisory commmittees • Consensus-building • Participatory decision-making	• Citizen juries • Ballots • Delegated decison
ICT Example	• (Basic) Web sites	• On-line polls	• On-line discussion forums	• On-line services, forms & documents in electronic form	• On-line decision making support systems

Figure 1.11: "Spectrum and technics of public participation", in Hennig and Vogler (2011, 80).

In the same column of Table 1.12, there is a classification of the knowledge-building process that occurs. The analytical division into Mode I and Mode II (Figure 1.10), previously presented in section 1.1, was chosen to integrate the description of the projects and the systematization of types of knowledge and knowledge-building processes. Not only does it reflect the paradigm change concerning the validity of sources and types of knowledge other that scientific/expert knowledge, but it also provides, at first glance, an idea of how processes are conducted and whether they might lean towards a top-down approach or a collaborative approach. Mode I, or the 'elitist model', is related to scientific codified knowledge, built through linear processes of experimentation, verification and codification. It relies on expert and scientific knowledge systems and dominates government-private sector relations. Mode II accepts the different types of knowledge categorized in Figure 1.9 and recognizes knowledge-building as a social process. It is especially relevant when actors from many different backgrounds cross paths, as it tends to happen in urban areas.

Finally, the fourth and fifth columns of Table 1.12, in a further bid to summarize the characteristics of the process as well as the tools and methods used, also present the answers to two questions for each case: whether there was any input of the local community in the workflow of the process, namely in choosing the objectives of the project, the method of implementation or its schedule; and whether there was also any input in the design or choice of tools to be used. Not every article describes all the details of the respective project, but the questions are general enough that it has been possible to glean the answer in all cases. These two questions, combined with the mode of knowledge acquisition, look into the level of communication, engagement and participation that is happening during the process itself. Is the local community being simply consulted? Or are they partners in deciding the agenda? Who exactly has the power in each project, and what roles are institutions and communities taking for themselves? Hennig and Vogler (2011) summarize these possible interactions in Figure 1.11, which presents the spectrum of public participation through ICT.

Table 1.12: Description and systematization of some published examples regarding the use of spatial data processing tools for the harnessing of spatial (local) knowledge.

Initiative and location	Key agents	Description	Process for harnessing local knowledge	Tools and methods
01 (Pfeffer et al. 2013): South Durban valley, Durban; South Africa	South Durban Community Environmental Alliance – SDCEA (civic organization), community	Experiential knowledge of respiratory illnesses and cancer, experienced by population due to air pollution from heavy industry, was not accepted as valid in deliberative forums. Structuring of information as civic science was needed to represent the population.	*Input of local community in workflow / objectives definition*: no *Types of spatial knowledge accessed:* tacit knowledge (experiential narratives), that is read on the GIS as 'civic science' *Modes of knowledge acquisition:* I and II	community GIS that displays the distribution of community complaints, sources of problems and incidents *Input of local community in tool design/choice*: no
02 (Pfeffer et al. 2013): Jardim São Luis: neighbourhood, São Paulo; Brazil	Instituto Lidas and Associação Casa dos Meninos (local NGOs), community	The NGOs aimed at making information about the neighbourhood (especially social indicators) available to ordinary citizens and community leaders, educate and inform individuals so that they can make a difference in their neighbourhood, and demand greater accountability from local officials.	*Input of local community in workflow / objectives definition*: no *Types of spatial knowledge accessed:* Tacit and community-based knowledge *Modes of knowledge acquisition:* I and II	Community mapping, GIS, GPS *Input of local community in tool design/choice*: no
03 (Pfeffer et al. 2013): Chennai; India	Centre for Development Finance (non-profit action research think-tank), community	Transparent Chennai is an interactive web-mapping initiative that seeks to provide useful and easy-to-understand information about Chennai which can improve government accountability and empower residents to take action.	*Input of local community in workflow / objectives definition*: no *Types of spatial knowledge accessed:* codified knowledge; in some areas, the community is engaged in data mining through GPS according to formal methods; the only use of tacit knowledge seems to be the mapping of familiar bus routes and the validation of information *Modes of knowledge acquisition:* I (II slightly represented in data collection, might be expanded in the future with the addition of user photos, opinions and other elements)	Web-mapping GIS organized by thematic layers, remote sensing GPS *Input of local community in tool design/choice*: no; GIS set up by experts (Google.org)

Table 1.12: Description and systematization of some published examples regarding the use of spatial data processing tools for the harnessing of spatial (local) knowledge (cont.).

Initiative and location	Key agents	Description	Process for harnessing local knowledge	Tools and methods
04 (Gearheard et al. 2011): *Igliniit* of the Inuit Territory and Kangiqtugaapik (Clyde River), Nunavut; Arctic	Nammautaq HTO (local Hunters and Trappers Organization) and University of Calgary	The goal of the Igliniit Project was to develop, test and evaluate a new approach and technology that can be used by Inuit hunters to map their trails (*igliniit*) and their observations and activities on the land and ice as they travel.	*Input of local community in workflow / objectives definition*: yes *Types of spatial knowledge accessed:* tacit knowledge of hunters *Modes of knowledge acquisition:* II	Igliniit, a personal data assistant outfitted with a GPS and a Kestrel 4000 weather meter. Geo-referenced data is logged in during travels and later transferred onto maps. *Input of local community in tool design/choice*: yes, the design and development of Igliniit was collaborative, as well as the initiative to design it; the map construction, however, was conducted by experts, with community input
05 (Ellul, Francis, and Haklay 2011): Royal Docks, London; UK	Mapping for Change (social enterprise – partnership between University College London and the London 21 sustainability network), local residents	Mapping for change provides participatory mapping services and communication tools to communities, voluntary sector organizations, local authorities and developers in order to engage and empower communities to make positive transformations to their localities.	*Input of local community in workflow / objectives definition*: yes *Types of spatial knowledge accessed:* tacit and community-based knowledge *Modes of knowledge acquisition:* II	Royal Docks user-centred minisite, which allows georeferenced points to be added to a map according to theme. *Input of local community in tool design/choice*: no, but the administrator of the site can create new themes without programming skills.
06 (Grant-Smith and Johnson 2012): Goodna and Gailes suburbs, southeast Queensland; Australia	Goodna Communities Moving Forward Forum (citizen working group), residents, social service providers (networks), Griffith University's Urban Research Program	For decades, the residents of Goodna and Gailes identified poor public transport infrastructure that impacted the development of the already disadvantaged communities. This resulted in a collaborative research project for transport service and infrastructure improvements that included community mapping.	*Input of local community in workflow / objectives definition*: no *Types of spatial knowledge accessed:* tacit and community-based knowledge *Modes of knowledge acquisition:* II	Photo diary; mapping with digital cadastral database, abandoned in favour of hand-drawn conceptual base map, since former option was not considered sufficiently user-friendly *Input of local community in tool design/choice*: yes
07 (Kwaku Kyem 2004):, Kofiase, Mampong, Ashanti; Ghana	A team that included the researcher and local loggers; local community (representatives of the pro-logging group and of the pro-conservation group)	This case concerns the mediation of a dispute over logging the Aboma Forest Reserve, already damaged by wildfire. The dispute opposed inhabitants of Kofiase, which either defended logging (creation of jobs) or conservation.	*Input of local community in workflow / objectives definition*: no *Types of spatial knowledge accessed:* tacit and community-based knowledge *Modes of knowledge acquisition:* I and II (while knowledge from different sources is accepted, the process is linear and every procedure is codified)	The whole handling of spatial information is the responsibility of the researcher; relevant criteria that defined each party's demands identified and combined through a weighted linear combination method; suitability maps for two different solutions (logging and preservation) created by the researcher using an MCE module in the Idrisi for Windows GIS; use of a multi-objective land-allocation procedure (MOLA) to resolve conflicting cells after the input of the final two maps *Input of local community in tool design/choice*: no

Table 1.12: Description and systematization of some published examples regarding the use of spatial data processing tools for the harnessing of spatial (local) knowledge (cont.).

Initiative and location	Key agents	Description	Process for harnessing local knowledge	Tools and methods
08 (Atzmanstorfer et al. 2014): neighbourhoods in the vicinity of the Ilaló Mountain, Quito suburbs; Ecuador	Secretaría de Territorio, Habitat y Viviend (government-tal) of Quito and residents of five neighbour-hoods, seven communities and three suburban municipalities	A participatory land-zoning process which doubles as a pilot-study for addressing spatial planning deficits and making planning more transparent and citizen oriented through the use of geoICT.	*Input of local community in workflow / objectives definition*: yes, on specific objectives and milestones *Types of spatial knowledge accessed:* tacit and community-based knowledge; codified (expert) knowledge *Modes of knowledge acquisition:* I and II	GeoCitizen, a platform that merges geo-web technologies and social media; uses the jQuery mbile web-framework, the Google Map API, a Post/Gres GIS database as web-application framework, and the ArcGIS for Server JavaScript API for integrating spatial background layers to the platform *Input of local community in tool design/choice*: no
09 (Ramirez-Gomez, Brown, and Fat 2013): five villages belonging to the Trio and Wayana people in southern Suriname; Suriname	Conservation International Suriname (CIS), research team, village communities	The aim of the project was to identify the location of ecosystem services that sustain indigenous peoples, as well as their needs and activities, in order to inform the creation of a Southern Suriname Conservation Corridor with 2 million hectares. Community leaders added to it the purpose of facilitating land rights negotiations with the government.	*Input of local community in workflow / objectives definition*: partial *Types of spatial knowledge accessed:* tacit and community-based knowledge (to be used only with the permission of the villages in each circumstance) *Modes of knowledge acquisition:* I and II	Location of ecosystem services mapped individually by each participant on a printed base map (DEM of 90 m resolution from the Shuttle Radar Topography Mission, reclassified for two elevations to evidence landmarks); data digitized into ESRI ArcGIS v10 and processed by researchers *Input of local community in tool design/choice*: no
10 (Smith et al. 2012): Huasteca Potosina (nine villages), eastern San Luis Potosí, and Sierra Juárez, Oaxaca; Mexico	The Bowman Expedition (team of researchers), village communities	The indigenous regions of Mexico often have a wealth of places, perspectives and cultural specificities that are not represented in conventional cartography, which is therefore of little relevance to indigenous communities. Through participatory research mapping, the research team documented 'hybrid geographies' and created maps relevant to the struggles and aspirations of local people.	*Input of local community in workflow / objectives definition*: partial *Types of spatial knowledge accessed:* tacit and community-based knowledge, codified (governmental) knowledge *Modes of knowledge acquisition:* I and II	Communities sketched on printed maps, helped by trained local 'experts'; acquisition of coordinates for places on the maps using GPS and compilation of the data in a GIS database were conducted by researchers *Input of local community in tool design/choice*: no
11 (Kienberger 2014): Munamicua, Búzi; Mozambique	research team, local disaster risk committees, community	A community mapping project that updates information at the local level in order to mitigate disaster risk and flood hazards. The major aim is to provide communities with a decision support and awareness tools to identify and reduce vulnerabilities.	*Input of local community in workflow / objectives definition*: partial *Types of spatial knowledge accessed:* tacit and community-based knowledge; codified knowledge (derived from National Spatial Data Infrastructures and other sources) *Modes of knowledge acquisition:* I and II	Participatory mapping as a tool of Participatory Rural Appraisal (PRA); high resolution satellite imagery (Quickbird, i.e. ~0.7m) as base (photo mapping); printed base to be marked by community with coloured pens; data integrated into ESRI ArcGIS 9.3 by researchers and enhanced through spatial analysis *Input of local community in tool design/choice*: no

Table 1.12: Description and systematization of some published examples regarding the use of spatial data processing tools for the harnessing of spatial (local) knowledge (cont.).

Initiative and location	Key agents	Description	Process for harnessing local knowledge	Tools and methods
12 (Cinnamon and Schuurman 2013): Groote Schuur Hospital, Cape Town. South Africa.	research team, local emergency medical service (EMS) at the Groote Schuur Hospital	Project of injury surveillance that aims to better understand the social and environmental factors associated with injury in Cape Town.	*Input of local community in workflow / objectives definition*: no *Types of spatial knowledge accessed:* tacit knowledge (data mining) *Modes of knowledge acquisition:* I	Tablet computer with web interface that records geo-referenced injury 'hotspots' and transmits them to a database, to be used by the participant group *Input of local community in tool design/choice*: no
13 (Martínez-Verduzco, Galeana-Pizaña, and Cruz-Bello 2012): Chiapas highlands, Cacahoatan; Mexico	research team, local communities (Agustín de Iturbide and Toquián de las Nubes), Comisariado Ejidal (local authority, facilitator)	Discriminating between shade coffee plantations and natural vegetation of the Chiapa highlands using Remote Sensing is particularly difficult in zones where both coverages have almost the same mix of species, therefore supervised classification was combined with a community mapping initiative to distinguish them.	*Input of local community in workflow / objectives definition*: no *Types of spatial knowledge accessed:* tacit knowledge of local people with geographical expertise about the area (data mining); codified knowledge (governmental) *Modes of knowledge acquisition:* I	Land-cover map generated from SPOT 5 satellite images as base; use of (printed) confidence maps for training; delimitation of areas on printed maps during local workshops; digitization and processing of these maps done by the research team *Input of local community in tool design/choice*: no

It should be noted that there are deeper dimensions to each example, which are only briefly framed by this synthesis, or not at all. Examples of this are a possible classification of the level of participation and engagement (hinted at through the two questions on community input and the mode of knowledge acquisition); the power dynamics between the communities or local agents and the institutions portrayed (which, for the most part, were the ones to promote mapping processes); the validation of data collection; and, finally, the evaluation of desired outcomes versus initial objectives. There is also very little, in the article themselves, on long-term results, such as capacity building, community development and the connection to spatial policies.

Baud et al. (2011) present a comprehensive analysis of the specificities related to these questions in Figure 1.13, of which the most interesting feature is the inclusion of a question about people's capability to participate. This question is not answerable through a preliminary review of case studies, but it is certainly a path for future research since it ties in with capacity building and the concept of emancipation. It is also relevant to highlight the assertions related to complexity and power relations in each critique, such as those concerning the assumption that communities are simple and homogeneous or that institutions might have 'hidden agendas', particularly those standing at the top of power hierarchies.

Theme	Emerging perspectives
Computer-based information system (CBIS) used as information system?	1. CBIS used by urban planners mainly for planning choices and implementation 2. Alternative community-based information produced by communities, translated by professionals for use in urban decision-making (only in experimental situations) 3. CBIS not generally used as strategic planning tool; city government staff not equipped; private sector consultants do so according to the criteria set by institutions contracting them. To what extent are universities recognized as partners in the process? By whom? Critique: CBIS not generally accessible due to technical capabilities required; requires synthesizing several types of 'questions', types of information to produce integrated sets of knowledge for participatory decision-making
Who defines the participation agenda?	1. Largely externally driven; people (end-beneficiaries) not involved in design/ implementation; not owned by people; development programmes unsuccessful. 2. Peoples' participation increasingly practiced; often occupies center stage in development approaches. 3. Need to move from participation towards empowerment of people. Critique: Hidden agendas of governments; development agencies usurp power while appearing to promote participation to allocate resources.
What is the capability of the people to participate?	1. Shaped by sociopolitical context; constricted by limited domain knowledge; language barriers and illiteracy. 2. Latent capabilities can find expression through facilitation by sympathetic external agency; empowerment through democratization and recognition of both instrumental and constitutive roles of participation also enhance this capacity. Critique: 'community' assumed to be a monolithic, unproblematic entity; public discussions may inhibit people from expressing opinions frankly; 'local' networks of relationship and power, often invisible to outsiders, deeply modulate what individuals contribute during participatory meetings; 'time-table' approach counterproductive; recourse to participatory action research suggested.
What is the role of institutional and social structures?	1. Change from central control to more decentralized systems of authority and governance. 2. Human agency expressed as participation has the potential to modify present institutional/bureaucratic structures rooted in historical contexts that hinder participation or to even create new structures. Critique: Western "blueprint;" political technology.

Figure 1.13: "Issues from literature on participation in development", with a focus on the use of computer-based science (Baud et al. 2011, 14).

Some broad guidelines are possible from this descriptive breakdown of published initiatives, and seem to be transversal to these initiatives and rest of the literature review. They are summarized by the five following points, deeply connected to the context in which processes take place, key agents and the mode of knowledge acquisition in use.

1. People must be at the centre of technology. User-centred tool development is the first guarantee of engagement and usability (Ellul, Francis, and Haklay 2011), something which is seen in initiatives 04 and 05. Atzmanstorfer et al. (2014) explain that usability issues can be a major limitation amongst users with low ICT skills and spatial literacy. Tool design should thus take into consideration user feedback when redesigning and recalibrating.

2. People are more important than technology. Community mapping, when undertaken in countries on the disadvantaged side of the 'data divide', might rely too heavily on geoICT. The use of such technologies can be "marginalising and disempowering for community members, particularly those from disadvantaged communities or those with poor computer literacy skills" (Grant-Smith and Johnson 2012, 11). Additionally, it should not be forgotten that the application of GIS occurs within existing power structures, in which those who have prior knowledge of the situation, some experience of spatial data analysis, or to positions of power would dominate the discussion and alter the results (Kwaku Kyem 2004).

The author that presented initiative 06 declares that it is necessary to find the most appropriate tools for the process at hand, but that this choice cannot dictate the process. The choice of technology, if any, should instead be shaped by the needs of the process and participants, and banned altogether if necessary. In several case studies, community members are engaged by drawings on printed maps or even from scratch (Wart, Tsai, and Parikh 2010), and the digitization tasks are left to be dealt with by the research team. In other cases, lay users are comfortable enough using geoICT and even propose and collaborate in its development. Introduction of specific geoICT tools should be preceded by a reflexion on what they can add to the process, and the fact that they are being widely used does not lessen the need for a critical analysis of their use and effectiveness (Grant-Smith and Johnson 2012). Thus, there is a case to be made for the study of all types of spatial data processing tools, and not only those included within geoICT.

3. Approaches need to be flexible, and conventional maps might not be enough. In initiative 04, the authors highlight that the power of the technology that was developed resides in its flexibility, which allows different (perhaps new) forms of engagement with the environment, while "conventional maps are often difficult to use when trying to represent multiple realities and the different perspectives and knowledge that comes with different ages, livelihoods and genders" (Gearheard et al. 2011, 54). Those involved in the development of Igliniit wanted maps that, beyond delineating the territory, could also reveal the relationships between people and the territory and enhance local human relationships. Initiative 05, whose authors declare that flexibility is the key', reiterates this position (Ellul, Francis, and Haklay 2011).

4. Researchers must be mindful of the key agents' different expectations concerning data codification and the clash between modes of knowledge acquisition. In initiative 09, Ramirez-Gomez, Brown, and Fat (2013) notes that while education, empowerment and social action can be objectives of the process, codification of the results is essential to ensure credibility. The conundrum is that the systematic and rigorous standards of research must not clash with the often more simplified language of implementation. Perhaps this is why Mode I and II are often deployed together, as if the phase of community participation and that of data codification were two completely different stages. It must be noted that initiatives such as 06 assert their confidence in the validity of the process, while maintaining a Mode II of knowledge acquisition.

5. Maps might be incorrect. Therefore, according to initiative 11, the possibility of feedback loops should be ensured. In other words, the process should not end when the map is finished, since geographical representation is just a (more or less grainy) snapshot of the community at a moment in time and will have to be updated eventually (Kienberger 2014).

1.3.4 WRAP UP

Ramasubramanian (2010, 16) poses several essential questions concerning the use of technology in collaborative governance and planning processes: “Will the use of digital technologies in planning make decision-making processes more transparent and accountable? Will the use of these tools subordinate common sense, further alienating the general public? Will digital technologies support or hinder participatory planning activities? Are digitally enabled participatory planning activities sustainable in the long run?”

It is interesting that the use of technology, and indeed maps themselves, can serve to widen or narrow inequalities. In the case of Ecuador, a platform was created so that communities could share spatial information. Its practical aim was to aid a land-zoning process, but the broader aim that its creators had in mind was to address spatial planning deficits and make planning more transparent and citizen oriented (Atzmanstorfer et al. 2014). The community mapping project in Suriname also had the effect of both helping the government to identify the location of ecosystem services that sustain indigenous peoples, as well as their needs and activities, and allowing said indigenous participants to negotiate land rights and protection. Demonstrating that they knew the place, that places of enough value to be named in their own language were located there, gave indigenous people legitimacy over those places (Ramirez-Gomez, Brown, and Fat 2013).

On the other hand, the disadvantage many communities have experienced with digital mapping mean that often their input is recorded on paper and later digitized and processed by experts. Their difficulty can be used as an argument to keep them away from broader participation, such as the definition of objectives and the validation of results, and thus results in a lesser sense of proactivity. It must be noted, however, that collaborative paper-based mapping processes have been implemented in with success, so this difficulty does not need to serve as a deterrent (Grant-Smith and Johnson 2012).

Maps were historically used to govern the territory, to support colonial and army operations and to maintain the superior position of those with power (Panek 2014). The spatial concept of ‘territory’ itself is “intrinsically linked to ‘power’ and ‘sovereignty’ within a political community enclosed by ‘borders’ (…). This construction refers to our identity and to the difference between ‘us’ and the ‘others’ (Schack 2000) (Stephenne, Burnley, and Ehrlich 2009, 504). Participatory mapping and community empowerment are new trends in the development and policy-making discourse that allow local communities to become part of and influence the existing power structures. Ultimately, geoICT tools can empower individuals and communities to participate in planning their own environments and develop civic responsibility, a core element of democratic societies, if they reach a high enough level of usability and user-orientation (Hennig and Vogler 2011). Spatial-oriented education can also be a crucial factor in the success of such initiatives (Kanwischer and Quennet 2012).

2. METHODOLOGY

2.1. RESEARCH METHODOLOGY

The literature review presented in the previous chapters is meant to contextualize the research project, constituting the starting point for formulating a main research question. Both research and theoretical literature are relevant to the topic and the question. By maintaining an appropriate critical focus, first on the content ('local knowledge'), then on the context of practice ('spatial policies'), and finally on the tools ('spatial data processing tools'), it is possible to search, screen, summarize, organize and write in a way conducive to the selection of exploration paths that lead towards evaluative criteria, later used for assessing empirical research.

The choice of formulating the research methodology – including the main research question – after the literature review is deliberate. While the general characteristics of a budding problematic have been present since the very beginning, as presented during the Introduction section and further expanded in the following section, the interdisciplinary crisscrossing of the themes relevant to the issue at hand required a careful reflection and handling. The capacity of local knowledge to actively transform and influence spatial policy, and the use of spatial data processing tools as its vehicle, is a complex issue. Through the literature review, it was possible to conclude, for instance, that debate and communication with the knowledge-holding community is essential to access and properly interpret local knowledge, thus placing the process at the centre of the stage; that spatial data processing tools can widely vary in complexity and their analogue and simple forms are valid, thus countering a discourse often focused on their digital aspects and again centring the discussion on the process; and that the affirmation of local knowledge at the planning and public policy level can be seen also as an affirmation of the voices of the knowledge-holding community, or in other words, a form of local and community-based governance. All of these realizations are central to the subsequent definition of the research methodology.

In this second chapter, the design of the study is introduced. Firstly, the methodological choices are presented, namely a multiple case study research with a mixed methods approach. Secondly, the elements of the research process are described, such as the literature review, devising research questions, objectives and hypothesis, sampling, data collection and data analysis. The context of the case studies will also be presented. Finally, this chapter focuses on the researcher's views regarding the relationship between theory and research, and their implications for the research itself.

2.1.1 THE PROBLEM

Nowadays, the local use of spatial data processing tools is quickly spreading in consonance with the realization that, in an increasingly complex and competitive world, information matters. This study looks into processes of local knowledge construction and harnessing enacted by the respective knowledge-holding communities and agents related to them. These are processes purported to be conducted in a satisfactory manner for all participants involved, to enact desirable values in the context of spatial dynamics, planning processes and governance in general - such as greater inclusion, emancipation and capacity for self-organization, minimization of errors, transparency, adaptation and resilience, - and to generate improvements and desirable outcomes for both the local communities involved and the wider context of spatial policies, following the principle of mutual transaction.

Nevertheless, the concrete reality of these concepts - which are mostly subjective and long-term, - within the context being studied lacks both the support of an encompassing theoretical referential and the backing of systematic data collection and analysis. The systematization of reality through its typification and conceptual categorization, the creation of a theoretical referential meant to be applied to all case studies pertaining to the use of spatial data processing tools by local knowledge-holding communities, the closing of the research gap regarding how local knowledge is truly being harnessed by communities and influencing policy-making, and the analysis of patterns, strengths and weaknesses pertaining to harnessing processes, as a foundation for recommendations and best practices, are therefore the proposals of this study.

2.1.2 THE MAIN RESEARCH QUESTION

Empirical research needs to demonstrate both conceptual clarity and a good fit between its questions and its methods. A research question provides an explicit statement of what the researcher wants to know, organizing and delimiting the project, providing a framework, and pointing to which data will be necessary to answer it (Bryman 2008). Denscombe (2010) proposes six types of research questions: (1) predicting an outcome; (2) explaining causes and consequences; (3) evaluating a phenomenon; (4) describing a phenomenon; (5) developing good practice; (6) empowerment of those participating in the research. In sum, the main research question should bring into focus the key concepts being used to support the topic.

With this in mind, the main research question of this work is:

> **How is local knowledge, harnessed and diffused through the use of spatial data processing tools, being transferred into spatial policies and asserting community governance within the sphere of decision making?**

This question demands an analysis within the specific context of the use of spatial data processing tools, in processes of local knowledge construction, intersecting spatial planning, particularly its participation-supportive theory branch and the processes related to community governance and adaptive governance, with cognitive sciences and geoinformatics. It is devised to cover a specific problem: although previous chapters have highlighted several instances of analysis and reflection, in existing literature, on the necessity of incorporating local knowledge

into policy, through more or less sophisticated means, tools and processes, there is a research gap that calls for a systematic analysis of how local knowledge is truly being harnessed and influencing policy-making.

2.1.3 THE HYPOTHESES

A hypothesis is a predicted answer to a research question; being "typically chosen when the literature past research provides some indications about the predicted relationship among the variables" (Creswell and Clark 2011, 161). The literature review presented in the previous chapter, along with the definition of the main research question and the objectives, leads to the following hypotheses:

> **General hypothesis:** local communities' harnessing of local knowledge through spatial data processing tools is able to affect and transform decision-making processes and spatial policy, thus becoming an expression of community governance.
>
> **Hypothesis 1:** it is possible to create a typological and conceptual referential to analyse and understand community processes for harnessing local knowledge using spatial data processing tools.
>
> **Hypothesis 2:** using this referential, it is possible to clarify how local knowledge is harnessed by communities using spatial data processing tools, and subsequently to determine how it is integrating decision-making processes and interacting with spatial policy.
>
> **Hypothesis 3:** using this referential, it is possible to analyse patterns, strengths and weaknesses pertaining to local knowledge harnessing processes using spatial data processing tools by communities, as a foundation for recommendations and best practices regarding their potential for influencing spatial policies.

2.1.4 THE OBJECTIVES

The **general objective** of this work is to analyse the transference of local knowledge to the sphere of formal decision making in what pertains to spatial policy, thus assessing the potential of community mapping processes – initiatives in which knowledge holding communities harness their local knowledge through the means of spatial data processing tools – to assert community governance at formal levels.

As **specific objectives**, aimed at clarifying existing issues in available literature and emergent patterns derived from data collection, this work proposes to:

- **Obj.1.** Create a typological framework capable of providing a clear systematization of the reality of the community mapping model, by integrating the predominant categories of concepts highlighted by existing literature as well as emergent categories (Hypothesis 1).

- **Obj.2.** Create a conceptual framework to characterize, define boundaries, analyse and identify patterns within the community mapping model (Hypothesis 1).
- **Obj.3.** Provide a data-backed and systemic overview of the complexities of community mapping processes worldwide, including their context, knowledge building and community engagement dynamics, and use of spatial data processing tools (Hypothesis 2).
- **Obj.4.** Analyse the degree of integration of local knowledge into spatial policy achieved by community mapping initiatives (Hypothesis 2).
- **Obj.5.** Determine the concrete influence that local knowledge harnessed by community mapping initiatives is able to exert on the wider context of spatial policies and governance (Hypothesis 2).
- **Obj.6.** Verify the impact of use of different spatial data processing tools for local knowledge diffusion, by communities, at the decision making and spatial policy level (Hypothesis 2).
- **Obj.7.** Identify the most relevant patterns, strengths and weaknesses of the community mapping model in relation to its capacity for knowledge transfer and potential for influencing spatial policies (Hypothesis 3).

2.1.5 RESEARCH METHODOLOGIES AND PARADIGMS

The purpose of this scientific research is to find answers to research questions. Scientific procedures are part of an intrinsically unfinished and permanent process. It is a complex activity, linking theory and practice, in order to respond to the problems raised (Bryman 2008; Denscombe 2010).

Methods of inquiry are based on assumptions about the nature of the reality that is being studied, about what knowledge is, and about the right methods to build knowledge of that reality. These assumptions constitute the basic idea of what is meant by 'paradigm' in research methodology (Punch 2006, 2005). The three main dimensions of paradigms that should be considered in research are: (1) what reality is like (ontology); (2) the relationship between the researcher and reality (epistemology); (3) and what methods can be used to study reality (methodology). The fact that methods derive from paradigms led to a major qualitative-quantitative debate, in the 1960s, challenging the traditional dominance of quantitative methods (Hammersley 2007).

Most research methodologies used in natural sciences have positivism as their underlying paradigm, so they tend to be largely quantitative in nature and to generate quantitative data. According to this paradigm, a function of science is to develop explanations in the form of universal laws. Likewise, the objective of scientific inquiry is to build explanatory theories about data (Punch 2011). When complex social processes are present, though, a more qualitative approach is usually used (Flick 2009). It gives preference to both 'interpretivism' - the way people understand their world and the meaning they place on situations - and 'constructivism' - the way both the researcher and the participants construct knowledge, - while taking into

consideration the context of the study. Stake (2000, 1995) refers to three main differences between qualitative and quantitative approaches: the distinction between explanation and understanding, personal and impersonal role of the investigator, and discovered and built knowledge.

For a long time, an opposition between qualitative and quantitative methodologies supporters dominated the discussion on research methods, raising some questions and doubts about qualitative research:

> *"How is a worldview determined or constructed? What methodologies are used to learn about the world? What approaches serve as a theoretical basis for research? It is essential to be aware that there is no 'right' way to think about qualitative research. This is a way of knowing and a way of doing"* (Lichtman 2013, 15).

In what concerns methodology, it is possible to avoid a polarized stance by choosing a research position in the middle of this *continuum*. This can be achieved through a pragmatic approach that is aligned with the nature of the study, such as by using mixed methods research (Tashakkori and Teddlie 2010). Thus, specific knowledge about qualitative and quantitative methodology is essential to ensure a better methodological adequacy to the object of study and the research design. Some authors consider that, from a methodological point of view, there is no contradiction between quantitative and qualitative research, since they are different in nature. Therefore, despite having different perspectives, they can be used together in a case study research (Bryman 2008, Creswell and Clark 2011, Günther 2006).

Qualitative methods have the advantage of being consistent at the internal validity level, because they focus on the particularities of the study, facilitating the characterization of natural contexts. In-depth observation and analysis can lead researchers to close in on the essence of the problem and the perceptions of those who participate in the study. But qualitative methods also have some disadvantages concerning external validity, because they are weak in terms of representativeness and the possibility of generalizing the results. In contrast, quantitative methods have the advantage of being strong on the external validity level, as a representative sample ensures the possibility of generalization of the results. It is possible to replicate quantitative research, reasons for findings and hypotheses. However, they present the disadvantage of being weak at the level of internal validation, since the researcher does not always know the context in depth.

With all of this in mind, this study makes use of mixed methodology to interpret a primarily qualitative method (case study research, as explained in the following section), allowing the research to consider the main characteristics of the problem while remaining unattached to either the quantitative or the qualitative method. Thus, this case study uses qualitative and quantitative instruments for data collection and treatment, subject to descriptive, categorical and statistical analysis. From this viewpoint, the two approaches, even though considered antagonistic *a priori*, can enhance the results of the research when used simultaneously (Günther 2006).

2.1.5.1 Case study research

Case study research is a research method focusing on a temporally and spatially limited social phenomenon, within the unity and totality of a system (Stake 1995). A case can be defined as a phenomenon of some sort occurring in a circumscribed context.

Although case study research is considered a part of qualitative research, it also goes beyond it "by using a mix of qualitative and quantitative evidence" (Yin 2009, 19). This research approach allows the in-depth analysis of a situation or problem, in response to the research questions 'why' and 'how'. It involves systematic investigation of human behaviour, in natural settings, relying on verbal and visual communication, so as to answer the research questions. It facilitates the understanding of social phenomena, through the analysis of its context (Yin 2009).

> *"The basic idea is that one case (...) will be studied in detail, using whatever methods and data seem appropriate. While there may be a variety of specific purposes and research questions, the general objective is to develop as full an understanding of this case as possible. We may be interested only in this case, or we may have in mind not just this case we are studying, but others like it" (Punch 2011, 119).*

The following can be considered distinctive characteristics of case study research (Yin 2009, 2011). First of all, the case should be complete, by respecting the boundaries of the case, namely the distinction between the phenomenon and its context, and the comprehensive analysis of evidence, unconditioned by time or resource limits. Secondly, alternative perspectives should be used - or rather, the researcher should look for explanations other than those adopted in the literature review, by applying a critical vision to the case study. Finally, the evidence must be conclusive and disclosed in appealing writing, in order to attract the reader.

There are different types of case study. Yin (2009) notes three categories: 'exploratory', if the purpose is to obtain preliminary information about the object of study, serving as a point of interest to the researcher; 'descriptive', when the goal set by the researcher is to describe the data as they occur; or analytical, whenever they lead to a new theory and its comparison with existing ones. All categories assume that reality will be interpreted by the researcher.

Stake (1995) also distinguishes three main types of case studies: the intrinsic case study, in which the study is undertaken because the researcher wants a better understanding of a particular case; the instrumental case study, where a particular case is examined to give insight into an issue, or to refine a theory; and the collective case study, where the instrumental case study is extended to cover several cases, to learn more about a social phenomenon. The first two are single case studies, where the focus is within the case, either intrinsic or instrumental. The third one is a multiple case study or a comparative case study, involving a number of cases that are related in some way (Ashley 2012, Punch 2011).

The capacity for generalization is a weak point in a case study approach, as they do not typically allow for their results to be applied to similar subjects, situations or places. For this reason, the utility of case studies is sometimes derided (Yin 2009, Bell 2010, Sousa 2009, Stake 2000). However, there are more subtle forms of generalization, such as analysing what can be considered general to unique cases, or highlighting important and defining circumstances. Furthermore, it is important to note that instrumental and collective case studies may open the door to some generalizing conclusions, if applied to a large enough population (Ashley 2012,

Punch 2011). There is one more type of generalization possible through case studies, namely an analytical generalization, sometimes designated as 'transferability' instead; it derives from the problems and questions that arise during case study research, leading to logical extrapolations used to reinforce the study's theoretical framework (Yin 2009, Coutinho 2008).

2.1.5.2 Dimensions of concepts and referential construction

Concepts constitute the building blocks of theory, and measuring them is a necessity in research. Measurements highlight fine differences and variations, offer a consistent device or scale to gauge those differences, and provide a foundation for more precise estimates of the degree of relationship between concepts, i.e. through correlation analysis. Developing a measure of a concept, or in other words a form to quantify a concept, is essential to research (Bryman 2012, 163).

One major form of looking at concepts is to consider that each concept might comprise different dimensions. In order to determine these dimensions, different aspects or components of the concept must be considered, drawn from both theory and research associated to that same concept. While not all research needs more than a single indicator for each core concept, often multiple-indicator measures of concepts come to the fore. More important, however, is that each measure of concept can prove its reliability and especially stability - the characteristic of being stable and consistent over time, in multiple applications through different occasions (Bryman 2012, 169).

Although the measurement of concepts pertains primarily to quantitative research, the determination and characterization of concepts is also extremely relevant to qualitative research. This conceptual work is often malleable throughout a research project: research often starts by being conducted within a grounded theory framework; nevertheless, there is a phase of conceptual and theoretical work that runs parallel to the phase pertaining to the collection of relevant data, with each influencing the other – and sometimes unearthing new concepts or dimensions of concepts in the aftermath. Furthermore, this dynamic might elicit the collection of further data and the revision of the conceptual work, until no further work is deemed necessary. According to Bryman (2012, 386), "there can be an interplay between interpretation and theorizing, on the one hand, and data collection, on the other", a "strategy (…) frequently referred to as an iterative one". This interplay is also an aspect of the analytical generalization proposed by Yin (2009).

The emergent dimensions arising from data collection mesh with the dimensions of the initial theory framework, in what eventually becomes a finalized referential for qualitative analysis and quantitative measurement. This finalized referential becomes not only an important tool, but also an expression of the duty of the researcher to look for explanations other than those adopted in the literature review, as described by Yin (2009, 2011).

Due to this work's focus on a collective case study research design with the possibility of cross-case analysis, it was important to invest heavily in preparing a theoretical framework capable of integrating existing concerns and categorizations, emergent dimensions and patterns, and the complex nature of community mapping cases which, despite being homogeneous in what pertains their requisite selection markers, still present a large amount of variety. It was also

important that the typological and conceptual frameworks that integrate this theoretical referential are able to interact with each other, for cross analysis. This referential, developed in Chapter 3, not only provides the means for data collection to answer the central problem, hypotheses and objectives of this thesis, it is also used to characterize the essential aspects and boundaries of the case studies themselves, as will be seen in Chapter 4.

2.1.5.3 Triangulation of results

Triangulation was originally identified by Denzin in the 1970s, who determined that the triangulation of method, researcher, theory and data was the most solid research strategy (Denzin 2012, 19). Denzin explained it using a metaphor of looking through a crystal, in order to perceive all the facets or viewpoints of data. Triangulation can be defined as "the use of more than one method or source of data in the study of a social phenomenon so that findings may be cross-checked" (Bryman 2008, 717). One can "achieve in-depth understanding of cases through the triangulation of methods and sources, to confirm emerging findings and to point to contradictions and tensions (…) that may highlight areas for analysis and help draw insights and interpretations" (Ashley 2012, 103).

Therefore, by using multiple perspectives and sources, bias is minimised while the meaning inherent to data can be more safely extrapolated (Yin 2009, Bryman 2008). This is especially important in matters of qualitative research, in case study research, in the determination of the dimensions of concepts, and in the subsequent interpretation of data, due to the researcher's inherent biases, values and ideologies when necessarily making use of their best judgement for the completion of these tasks (Fusch, Fusch and Ness 2018, Gerring 2011). In case studies, this can be accomplished using sources of multiple evidence (Yin 2009), or, in other words, combining different methods, strategies and instruments - qualitative and quantitative.

Accordingly, in this study, triangulation contemplates two interdependent levels, namely theoretical triangulation and methodological triangulation.

The theoretical triangulation relies on the literature review and previous understandings of the dimensions of concepts related to the case studies of interest; these were used as the starting point for the construction of a theoretical referential, comprising a typological framework and a conceptual framework, and the selection of defined categories *a priori* (Yin 2009). The methodological triangulation, on the other hand, is present through to the comparison of multiple case studies and the combination of emerging dimensions and categories. When conducting this comparison, the same dimensions and categories were applied to all cases, combining qualitative and quantitative sources and data. Relying on triangulation, on the constant feedback loop between established theory and emergent dimensions, between the starting referential and collected data, between the case studies themselves, enhances the strength and validity of research findings (Fusch, Fusch and Ness 2018).

2.2. A MULTIPLE-CASE RESEARCH DESIGN

In terms of methodological design, and taking into account the interconnection between theory and practice, the research anchors in multiple case studies. Qualitative analysis provided the definition of emerging categories with the respective subcategories, which were then typified and quantified. In this way, different procedures were applied, which involved content analysis, systematization, quantification, interpretation and discussion of the data collected, according to the nature of the empirical study.

2.2.1 SELECTION OF CASE STUDIES: THE 'COMMUNITY MAPPING' MODEL

Considering the research gap identified when determining the main research question – that there is a need for a systematic analysis of how local knowledge is truly being harnessed and influencing policy-making, – the collective or multiple case study approach, conducted in a large and systematic scale, was deemed relevant. Cross-case analysis, through the application of a typological and conceptual framework to all case studies, is also of importance. This means casting a wider net for a large number of case studies. However, having opted for a multiple or collective case study research design, it is important to determine which case studies, or which model of case study, better answers the problem being studied, even if not every case study comprises all the desired characteristics (Stake 2009). It is also necessary to determine which type of case study research is most useful in meeting the demands of the thesis.

According to Gerring (2011), "the logic of cross-case analysis is premised on some degree of cross-unit comparability", or similarity. Therefore, in order to understand the problem and the causal relationships being studied through this research method, there should be some homogeneity between cases. If the cases available are too heterogeneous, according to the author, it would be like comparing 'apples and oranges'; relative homogeneity on a large scale, on the other hand, strengthens the methodological argument for cross-case analysis, with each additional case study potentially providing useful information and reinforcing any empirical pattern that can be found.

All of this implies narrowing down the desired characteristics for case studies, and thus determining very specific markers for their selection. Therefore, in view of the central problem of this thesis and the three main themes approached in the literature review chapters, three markers were selected:

i. Activity connected to local knowledge

> Local knowledge is the first central aspect of this study. Thus, in each case study, local knowledge should be present as a requisite aspect. It might be that existing local knowledge is being harnessed by its holding community for a specific purpose; or perhaps new spatial information is being discovered by community members, and thus, even if the actions undertaken for that purpose are not specifically focused on that outcome, it is building up the future knowledge of the community. Either way, through

the community's work – on its own or in cooperation with related external agents, - a contribution is being made towards the improvement, harnessing and/or clarification of local knowledge.

ii. Dialogue with or within the knowledge-holding community

The previous literature review has reflected on how local knowledge can be complex, and its interpretation might rely heavily on the ontologies, codes and meanings specific to each community. The more dialogue and bridging between different agents involved, the more likely that a specific piece of local knowledge can be accurately interpreted and verified. Conversely, the inexistence of some form of dialogue (i.e. instances in which aspects of local knowledge are reported directly to a platform by local knowledge holders) implies that there are less opportunities for interpretation and validation, and thus only simple aspects of local knowledge can be safely collected.

Therefore, this requisite for dialogue is meant to ensure, firstly, that the knowledge-holding community is involved by default and that actions undertaken in the context of a case study contribute towards building up local knowledge per se, and not just collecting spatial data. Secondly, it increases the likelihood of harnessing complex local knowledge, instead of simpler aspects of local knowledge. These are important points pertaining not only to the concept of local knowledge that is of interest to this study, but especially to the connection between local knowledge and spatial policy. Community engagement is important when analysing case studies from the contextual viewpoint of participatory spatial planning; furthermore, the capacity of local knowledge to interact with and transform spatial policy and influence decision making depends on its capacity to provide answers and illustrate crucial local circumstances. Complexity and opportunity for interpretation are key.

The case studies selected do include use of platforms that are traditionally employed collective mapping – in which participants report their knowledge to the centralized platform or to the receiver of the information, with seemingly no discussion of that same knowledge. However, only in cases in which the members of the community responsible for the mapping are known to each other and able to meet in order to discuss their findings and reports was this model considered.

iii. Production of a cartographic result

This study focuses on local knowledge for its spatial, local, and specialized characteristics, which can be useful to spatial planning, especially in the context of adaptive and participatory forms of governance as previously described. But the harnessing and dissemination of local knowledge into the decision making sphere relies on tools able to capture, represent and compile that knowledge – which this study designates as spatial data processing tools. Tool use is not always described in activities related to the harnessing of local knowledge, but there is proof of their use in the final product of such activities; at the same time, this product often provides clues pertaining to tool use during the process. The product is often a map, from hand-drawn to online and interactive; but there are other manifestations of the knowledge-harnessing process, such as 3D models; there are even, if fact, forms of cartographic and spatial data representation that do not represent maps at all, which is the main reason why we

hesitate to automatically select the 'map' as the pinnacle of community mapping. Nevertheless, the production of some form of cartographic result was selected as an obligatory marker in the selection of case studies, as the most visible product and proof of use of spatial data processing tools.

Cases centred on the production of cartography by or in dialogue with a specific community, usually harnessing their unique local knowledge, typically correspond to community mapping or participatory mapping initiatives. Although these terms are often used interchangeably, this study distinguishes between the two and opts for 'community mapping' as the most relevant and applicable one; the main reasons for this differentiation are explained in Chapter 3. It is not possible to study all manner of cases that make use of local knowledge. At the same time, in a collective case study research, there are some advantages to keeping to a single model, in order to facilitate analysis and categorization.

All case studies selected for this work thus constitute community mapping initiatives of varying characteristics, selected by answering the three requisite markers proposed above. There were 230 case studies identified with characteristics matching the desired markers. The identification and data analysis is conducted through the investigation of what we call their 'media footprint', which is the collected available evidence of a case study – a community mapping initiative or a set of community mapping initiatives – having existed.

Community mapping initiatives are social and/or participatory processes, involving multiple agents and local communities, and as such often leave an extensive media footprint. This study acknowledges the importance of all types of media supports and platforms for the organization, implementation and diffusion of such initiatives, including "user-created content and communication" (Bruns and Burgess 2013, 206), and makes use of them for the purpose of analysis. As McCulloch (2013, 214) explains, "it is helpful to combine different kinds of documents to develop a fuller and more comprehensive account of specific themes. Archival documents can support research on many topics, and the scope for such research has been greatly enhanced by the online revolution of the early twenty-first century". The media footprint of any case study included in this work might include: formal publications such as books, atlas, reports and journal articles; news and magazine articles; interviews of involved agents published online; promotional videos and documentaries of activities; documental photos; testimonies, commentaries, dialogue and announcements of activities, in news outlets, video channels, personal blogs and social media; and any and every product that formalizes and condenses the local and spatial knowledge harnessed during initiatives, such as formal or hand-drawn maps, geographic platform contributions, art, collages, schematics, animations, and many others.

The context of a case study establishes its boundaries, contributing to the understanding of reality. However, given the number of case studies analysed, a decision was made to not perform this analysis individually. While it is acknowledged that, in a case study research design, case study context definition and analysis is priority and of the upmost importance (Yin 2009, Yin 2011), it is argued that this analysis happens nevertheless, albeit in a non-traditional manner: the characteristics of case studies are assessed by a theoretical referential – collectively and in bulk. In other words, in this multiple case study, we chose not to focus on each context individually, but instead reserved a dimension of the conceptual framework, proposed in the following chapter, for that specific purpose, with the advantage of integrating the context into

the meta-analysis. In this way, the context of case studies serves a double function: it characterizes, but it also serves to analyse information about a phenomenon that was extensively studied (Bryman, 2008).

For the sake of obtaining a more accurate view of reality, the whole numerical analysis relies not on the number of case studies, but on the number of different implemented initiatives. This option provides a more weighted distribution of the various dimensions being researched, as while one case study might refer to one project implemented in a single neighbourhood, another might include 120 different community mapping initiatives in 120 different remote villages – all using the same methodologies and dialogue construction types, but still representing a very different 'share' or 'slice' of reality regarding the first one. It was felt that such differences in scope (1 or 120) should not be attributed the same weight. The 230 case studies under study thus correspond to 961 community mapping initiatives.

2.2.2 QUALI-QUANTI METHODS OF ANALYSIS

As previously discussed, Cresswell and Clark (2011), Lichtman (2013), and Punch (2011) state that the discussion on the effectiveness of quantitative versus qualitative methodology is artificial, given that both are not correct or incorrect, compatible or incompatible. What matters is whether the methodology is adequate to the problem being investigated, its starting point, the objectives, and the context of application. This means that both methodologies can be applied in the same study - the research can be mixed, combining the subjectivity of qualitative research (semantic discourse analysis and categorical analysis) and the objectivity of quantitative research (numerical and statistical analysis). This is a very relevant idea to a case study research design that relies on the qualitative interpretation of data (an intrinsic characteristic of case studies) but simultaneously aims for its numerical analysis, which is one of the main reasons for the selection of a multiple model with a large number of cases. It is a choice based on a particular "way of knowing and (…) way of doing" (Lichtman 2013, 15).

In qualitative research, the focus should be on understanding the social phenomena under analysis, using document analysis and content analysis in order to deepen the knowledge of subjects and contexts. This study took into account the inherent subjectivity in the collection and interpretation of data, from the identification of concepts, themes and categories to the phase of systematization and triangulation of acquired data, with the latter having a second origin point in the previously carried out typification and categorical analysis. Therefore, in the qualitative aspect of the case study, it was possible to combine the subjectivity of processes and categories, defined through the literature review and even other emerging categories, with the researcher's perspective (Coe 2012, 7).

In contrast, and in order to enrich the study and avoid possible distortion of results given the number and complexity of the cases, quantitative analysis was also used, based on the quantification and systematization of numerical results, treated statistically. Collected data was analysed in a more objective way, allowing for the interpretation of relationships, similarities and contrasts between cases, as well as the verification of the previously constructed hypotheses (Creswell and Clark 2011).

Content analysis was one of the main focus and the foundation of the empirical research, relying on typologies, semantic groups, keywords and themes. Content analysis is currently one of the most common research techniques in Human and Social Sciences (Morgado 2012). According to Bardin (2009, 40; 2011, 44), content analysis "consists of a set of techniques for analysing communications, which uses systematic and objective procedures to describe the content of messages". It is realized, above all, by the "inference of knowledge related to the conditions of production (or, possibly, reception), an inference that uses indicators (quantitative or not)". Also according to this author (Bardin 2009, 43), content analysis seeks to establish "a correspondence between semantic or linguistic structures and psychological or sociological structures". It has, as a disadvantage, the subjectivity in the treatment of data due to possible different meanings, which creates difficulties in interpreting and organizing, something which does not happen with data of a purely quantitative nature (Sousa 2009).

When inquiring about the object of study, in conjunction with a system of theoretical-analytical concepts, the researcher formulates inferences, triggering the semantic (meaning) and interpretive dimension of content analysis (Bardin 2009). In this type of analysis, the categories are the centrality of the analysis, carried out by the researcher, which groups the segments (concepts, keywords) into previously defined categories (usually selected in the literature review) or emerging ones (Flick 2009, Stake 2012). Also, Bardin (2009) affirms the importance of categories, which can be pre or post established, for better simplification, systematization and understanding of data.

The set of content analysis techniques quantifies words and phrases in documents and messages, going beyond the linear reading of the text (Stake 2012). This analysis makes it possible to obtain quantitative results, starting from textual data (Bardin 2009). Thus, it is up to the researcher to look for units of analysis with the same meaning, concepts and symbols (Flick 2005), which can be organized into "conceptual categories, and these categories can represent aspects of a theory that is intended to be tested" (Coutinho 2013, 217).
The pre-analysis, the exploration of the material and the treatment of the results, inference and interpretation of the same, summarize three sequential moments of content analysis (Bardin 2009; Coutinho 2013), all three essential in this work:

1. Pre-analysis. Four steps for organizing and selecting the data: (i) initial reading; (ii) selection of documents; (iii) definition of the research objectives; (iv) development and organization of indicators/descriptors/markers.

2. Exploration of the material. Four steps for in-depth study of the data or selected corpus: (i) clipping or coding, enumeration and categorization; (ii) definition of categories, using semantic criteria (meanings) necessary for interpretation and understanding (literal or inferential); (iiI) registration of frequencies or occurrences; (iv) gathering common elements, which can result in the establishment of typologies.

3. Treatment of results, inference and interpretation. After the distribution of the data by categories (and subcategories, if necessary), the analysis and critical reading of the data is carried out, under the responsibility of the researcher, based on a theoretical framework of reference, previously defined. This analysis can be descriptive and inferential, or even include the counting of occurrences or frequencies, thus having a

quantitative support, which facilitates the analysis and classification, especially in more complex case studies, involving a greater amount of data.

Additionally, the content analysis undertaken in this study included categorical analysis by levels, namely:

- by degrees of occurrence, considering initiatives classified by types - a value is given to those that have more than one overlapping type;
- by weight, assigning different weights to different types, and using them to make weighted averages, in order to determine the value of a category.

A crossover between categories of analysis was also carried out, focusing 1) on typification, as the types of the typological framework, in particular, draw from several different dimensions and categories, 2) on description, including descriptive types and categories, and 3) on interpretation, as the interpretation of results required considering more than one category simultaneously.

The following analytic methods (Cresswell and Clark 2011, 213-214) summarize the strategies that prepared collected data for the extraction of the results presented in Chapters 4 and 5:

- Typology development – analysing one data type so that it yields a typology or categories, in order to be used as a framework (particularly useful in the development of a conceptual framework);
- Data transformation – transforming qualitative data into quantitative data (i.e., quantifying qualitative data);
- Data consolidation – combining both data types to create new or consolidated variables or data sets;
- Data comparison – comparing data from different sources;
- Data integration – integrating all data into a coherent whole.

Thus, the methodological strategy combined descriptive and content analysis with statistical analysis, in order to enable data triangulation, so that the data collected and analysed is accurate and reliable (Coe 2012, Coutinho 2013). Moreover, the researcher's view underlies all methodological design. In a case study research this perception is important, contributing to the richness of a multifaceted analysis of the entire research process.

The analysis and discussion of the results was conducted according to a methodological pluralism (Morgado 2012), as a guarantee of a more reliable analysis and understanding of the phenomena (Coutinho 2013). A multifaceted vision is essential in order to not limit the answer(s) to the main research question, which guided the study design.

3. Building a theoretical referential

This work is geared towards understanding how local knowledge disseminates and interacts with spatial policies, for the purpose of attaining more sustainable, adaptive and just governance practices that have the potential to also benefit communities at the local level. Community mapping initiatives have been chosen as case studies, due their fulfillment of the three requisite markers for the selection of case studies (as described in Chapter 2), which positions them at the intersection of local knowledge, knowledge-holding community engagement, and production of media with a cartographical component, using spatial data processing tools.

In order to fully comprehend and analyze the reality and outcomes of community mapping initiatives, first it is necessary to understand the nature of this form of community engagement that has been chosen as a case study model, a task which was undertaken through a review of the relevant literature and keyword and thematic research. Secondly, it is essential to build upon that nature in order to create a working referential able to categorize, typify and accurately describe and quantify the different dimensions of community mapping processes and their interactions with reality.

This section is dedicated to the untangling of the many definitions and conceptualizations of community mapping, followed by the construction of both a typological framework and a conceptual framework which comprise the theoretical referential, for the subsequent empirical analysis of case studies. This working referential is based on a keyword and thematic search, and subsequent discussion of results, on the literature review of retrieved references and prominent cited cases, and on emergent dimensions and categories necessary to the case study research design, informed by that very same research. The working referential proposed is thus double-sided, as it includes a typological and conceptual framework meant to articulate with each other during the analysis of case studies, so that the application of the first can be refined through the lens of the second.

The typological framework categorizes and typifies community mapping initiatives based on the most common classifying terms and designations found in related literature. Five categories comprising different types are proposed. Some of them are organized along axis (such as the types of community engagement), while others correspond to thematic groups of the same weight (i.e., aim of the initiative). Representative cases of each type are provided.

The conceptual framework focuses on basic dimensions of community mapping initiatives which are important to empirical research, such as the context of initiatives (i.e., geographical distribution or temporal evolution) or the characteristics of the community engagement process that occurred (for example, on which types of actors participated, or how the dialogue construction took place). The different categories within each dimension focus more on the characterization and description of reality, and less on articulating with each other; however, together they contribute to the triangulation of theory and to a clearer picture of what occurs within a dimension of analysis.

3.1. COMMUNITY MAPPING: DEFINITION AND CHARACTERIZATION

Community mapping is an activity deployed in the context of community engagement and empowerment. It is also an instrument of collaborative planning, as it inverts “the usual plan making process of plan-consult to consult-plan” and brings “to the forefront the knowledge of the local residents”, representing a “significant deviation from the usual issue driven planning approaches to a highly consultative local problem solving and local strategy development approach” (Grant-Smith 2012, 9-10).

Martinez-Verduzco (2012) defines community mapping simply as local expert knowledge being used to produce cartography. A more complete definition presents community mapping as “a map-making process that is undertaken at the local level. It often produces a map showing the relationship between a community and the space in which it exists" (Corbett 2006). It is a process for “inventorying the resources or assets available to a specified neighbourhood or community", but also for establishing “a common knowledge base among a group of diverse persons concerned with improving or changing the outcomes for communities and their residents” (Melcher et al. 1998). Lydon (2007) elaborates:

> *"Community mapping is a graphic learning, development, and planning tool that connects people to one another and their home places. We are all mapmakers and any community can make maps. Community maps are the collective representations of geography and landscape, and community mapping is the process to create such representations. Community mapping also tells the stories of what is happening right now and what may happen in the future. Every community has stories, recently or long buried in the lives and landscapes of our common ground. Community mapping connects geography to the history of our lives and the world around us."*

Although such definitions seem straightforward, it is possible to pinpoint several issues in need of clarification when reviewing the literature on the subject. Competing and overlapping applicable terms and designations, as well as incomplete and confusing classifications, are the most urgent.

3.1.1 MAKING SENSE OF TERMS AND DESIGNATIONS

This section focuses on explaining various aspects of the ‘community mapping’ concept, towards a better understanding of what literature actually means when referring to this kind of process and its related terms. The review focuses on five aspects: identifying the most common terms primarily used to refer to ‘community mapping’ in research literature, which are condensed in Table x; the conflation of community mapping with PGIS and PPGIS; the interchangeability between ‘community mapping’, ‘participatory mapping’ and ‘social mapping’; the overlap between community mapping and other types of mapping with the potential to harness local-knowledge; and association of ‘community mapping’ to other related terms, mainly used as sub-types.

A keyword search of several sources acquired during the theoretical literature review for the terms that accompany 'mapping' or 'mapeo' or 'mapeamento' has retrieved a comprehensive list of terms, from a total of 66 sources.[16] This list is presented in Table 3.1. In most cases, more than one designation was found per document.

3.1.1.1 Results of the keyword search

Primary terms in community mapping literature

These designations can be semantically grouped as follows (see also Table 3.1):

- 'Community mapping' (49 occurrences), including 'mapeo participativo comunitario', 'community-based mapping', 'proyeto comunitario de mapeo', 'community-engaged mapping', 'community-based GIS mapping', 'mapeo de la comunidad', 'mapping in a community', 'map of communities', and 'mapa de actividades comunitarias'.
- 'Participatory mapping' (47 occurrences), including 'mapeo participativo comunitario', 'participatory hazard mapping', 'participatory research mapping', 'participatory spatial knowledge production', 'participatory social mapping'.
- 'Participatory GIS' (16 occurrences), including 'PPGIS'.
- 'Social mapping' (8 occurrences), including 'participatory social mapping'.
- 'Counter-mapping' (7 occurrences).
- Mapping at the 'locality' or 'neighbourhood' level (4 occurrences).
- Collaborative mapping (4 occurrences), including GIS-based 'collaborative governance activities' and 'mapeamento cultural colaborativo'.
- 'Collective mapping' or 'mapeo colectivo' (3 occurrences).
- Land rights mapping (3 occurrences), such as 'tenure mapping' or 'land use and occupancy mapping'.
- 'Indigenous' or 'aboriginal mapping' (3 occurrences).
- 'Grassroots mapping' (3 occurrences), including 'auto-mapping' ('automapeo').
- Cultural mapping (3 occurrences), including 'mapeamento cultural colaborativo'.
- Traditional land-use and territory mapping (2 occurrences).
- Civic mapping (1 occurrence).

Secondary terms used in the characterization of community mapping initiatives

As an additional topic of interest when reflecting on the practices of community mapping and common stances in literature, it should be mentioned that community mapping projects are often adjectivized and characterized according to their focus. Therefore, a quick query of

[16] In addition to guideline/manual sources listed in Table 3.4, the following were retrieved: Atzmanstorfer et al. (2014), Baud et al. (2011), Bohensky and Maru (2011), Rouse, Bergeron and Harris (2007), Cinderby (2010), Cinderby et al. (2008), Dekens (2007), Colás (2013), Elwood (2008), Fagerholm et al. (2013), Gaillard and Mercer (2013), Gearheard et al. (2011), Ghose (2003), Gouveia and Fonseca (2008), Grant-Smith and Johnson (2012), International Fund for Agricultural Development (2011), Kanwischer and Quennet (2012), Kienberger (2014), Kwaku Kyem (2004), Luyet (2012), Martínez-Verduzco (2012), McCall (2003), Panek (2014), Peters-Guarin et al. (2012), Pfeffer et al. (2013), Pfeffer et al. (2011), Ramirez-Gomez et al. (2013), Scott (2011), Sieber (2006), Sillitoe (1998), Sinclair and Walker (1999), Smith et al. (2012).

published research on the subject will retrieve a most colourful list of community mapping sub-types, as presented in Table 3.2.

Table 3.1: Total number of occurrences retrieved.

DESIGNATION	Nr	DESIGNATION	Nr
'participatory mapping' / 'participative mapping' / 'P-mapping' / 'mapeo participativo'	35	'alternative mapping'	1
'community mapping' / 'community maps' / 'mapeo comunitario' / 'mapeamento comunitário'	34	'mapeo territorial'	1
'PGIS' / 'participatory GIS' / 'PGIS mapping' / 'sistemas participativos de informação geográfica'	12	'land use and occupancy mapping'	1
'counter-mapping'	7	'mapeamento de territorios tradicionais'	1
'social mapping / 'mapeo social' / 'cartografia social'	7	'civic mapping'	1
'mapeo participativo comunitario' / 'mapas participativos comunitários'	6	'collaborative governance activities' which involve GIS use	1
'PPGIS'	4	'aboriginal mapping'	1
'mapeo colectivo' / 'mapeamento colectivo'	3	'traditional use mapping'	1
'participatory (resource/hazard/asset) mapping'	3	'proyeto comunitario de mapeo'	1
'collaborative mapping'	2	'community-engaged mapping'	1
'tenure mapping'	2	'community-based GIS mapping'	1
'indigenous mapping'	2	'mapeo de la comunidad'	1
'community-based mapping'	2	'mapping in a community'	1
'locality mapping' / 'mapas de la localidad'	2	'map of communities'	1
'cultural mapping'	2	'neighbourhood mapping'	1
'participatory research mapping'	1	'neighbourhood level asset mapping'	1
'participatory spatial knowledge production'	1	'local-level mapping'	1
A/E 'participatory social mapping'	1	'local-level GIS'	1
'grassroots GIS mapping' / 'grassroots mapping'	2	'mapa de actividades comunitarias'	1
'automapeo'	1	'mapeamento cultural colaborativo'	1

Table 3.2: Some community mapping sub-types, grouped according to the focus of the initiative.

Focus	Terms
instru-ment or platform	'PGIS mapping', 'PPGIS mapping', 'computer mapping', 'web-mapping', 'webmapping', 'web-based mapping', 'wiki-mapping', 'digital mapping', 'online mapping', 'on-street mapping', 'GeoWeb mapping', 'three-dimensional mapping', 'interactive mapping', 'photo mapping', 'traditional sketch mapping', 'paper mapping', 'mobile mapping'
area of interest	'slum mapping', 'tenure mapping', 'village mapping', 'parish mapping', 'mapping of community space', 'mapping indigenous lands', 'neighborhood mapping'
object of interest	'stakeholder mapping', 'community asset mapping', 'cultural asset mapping', 'mapping of health assets', 'mapping cultural resources', 'mapping of institutions'
theme of interest	'poverty mapping', 'deprivation mapping', 'mapping urban poverty', 'assessment mapping', 'resource mapping', 'vulnerability mapping', 'historical mapping', 'oral history mapping', 'environmental mapping', 'crisis mapping', 'noise mapping', 'outcome mapping', 'human-ecological mapping', 'mapping community knowledge', 'mapping social values', 'mapping landscape values', 'community planning mapping', 'local economy mapping', 'equity mapping', 'disaster mapping', 'hazard mapping', 'flood hazard mapping', 'land use mapping', 'mapping deforestation', 'green mapping'
metho-dology	'conceptual mapping', 'cognitive mapping', 'metaphoric mapping', 'behavioral mapping', 'cognitive spatial mapping', 'thematic mapping', 'asset mapping', 'school-project mapping', 'dream mapping'
resis-tance	'colonial mapping', 'working against traditional mapping agencies', 'remapping', 'unmapping the imperium', 'conflict mapping'

3.1.1.2 Discussion of results: most prominent overlaps between terms and concepts

In order to make sense of the many designations and terms surrounding community mapping initiatives, it is necessary to look at several overlaps between these same terms, and the fact that they are often used interchangeably. Language – semantics, and the choices made when opting for one term or the other, - is of paramount importance for the correct characterization of the object of study, especially when said object involves many different agents and worldviews.

Overlap with the participatory and social characteristics of mapping initiatives

In the Methodology section, a conceptual justification for choosing 'community mapping' over 'participatory mapping' in this work has already been presented, due to the perceived conflict that seeped through the general state of the art and literature review. This overlap was confirmed through the keyword search now conducted: the terms 'participatory mapping' or 'P-mapping' are used interchangeably with community mapping (also in Table 1).

This interchangeability has deep roots, as in some sources local knowledge itself is described as 'participatory spatial knowledge', and community mapping as a form of "participatory spatial knowledge production" (Pfeffer et al. 2013, 264). Participatory mapping is defined by Riesen et al. (2012) as:

> *"(…) A process of recording the knowledge that the inhabitants of a community have about their territory. This important instrument of participation does not necessarily have to result in the production of maps, as illustrations, definition of trails in the landscape, reports, tales are considered forms of Participatory Mapping. Various actors, methodologies and scales can be used to implement Participatory Mapping (...), in order to better prepare the discussion on the management of the territory in question. Based on cartographic documentation and other types of knowledge records, as well as technologies such as GPS, community members have solid means of opposition and resistance (…). Participatory Mappings can also assist in the preparation of management plans and in the application of public policies that are more appropriate to the region's reality."*

Considering the definition of participatory mapping, community mapping could be seen as subset of participatory mapping. That not all participatory mapping is community mapping is no surprise; there are some examples of collective mapping listed further below which can be classified as participatory mapping, but are in no way community mapping, as they do not involve a community, not even the sense of it. However, if we look into a different meaning of the word 'participatory', it can also be argued that not all community mapping is participatory mapping.

This is a finicky subject, as many authors include participation as a cornerstone of the definition of community mapping. Current approaches emphasize the participatory aspect of these processes, with organizations that invest in mapping processes defending that community mapping "is about participation, and not just about data collection. It's also about giving people a chance to show what's happening in their neighbourhood from their point of view, in this case

through the medium of a map, and about their own use of the information later" (Hagen 2012). However, as previously mentioned in the Methodology section, from the lens of spatial planning and governance (indeed, any project-based or institutional perspective instead of a social movements one, as explained by Tufte and Mefalopulos, 2009, 4), participation could also be seen as the engagement with entities with 'official' status, the 'drafting' of the community into a project that is not theirs (even if it benefits them). In a broader context, Albrechts (2013, 50-51) also questions the pervasiveness of the term 'participation' in spatial planning, especially when referring to modes of grassroots co-production and self-management.

We argue that, while many community mapping initiatives can be considered participatory in their mode of engagement of the community, participatory mapping is not a parent category to community mapping, merely a different group with which it usually overlaps. Also, the fact that community mapping must include dialogue amidst community members, at the very least, is not enough to call it participatory, although it can be argued that processes occur in a participatory manner. Some mapping manuals adopt this idea: for instance, Kienberger (2008, 2, free translation) sets as a primary objective of community mapping that the process should be conducted "according to the necessities of the members of the community, in a participatory manner"; further in the manual, in page 6, the author presents an exercise of community mapping which is described as being "closely linked to participatory mapping". Also, ACT Brasil (2008, free translation) defends that their mapping methodology is not participatory:

> *"It is a collaborative methodology, more than a participatory one, because those who lead the mapping process are the communities themselves, their leaders and representative institutions, according to their customs and traditions. It is collaborative because it is implemented at the interface between conventional cartography and traditional geographic knowledge. Community and technical team make up a "team". (…) In this methodology, traditional peoples are the protagonists in the process of building cultural maps; they are seen as subjects of knowledge on an equal footing with Western technicians, their collaborators."*

This is mostly a theoretical distinction, but one that is useful for typification. It provides a clear separation, for instance, between processes which are commonly designated in the literature as 'participatory', and others which are designated as 'grassroots' or 'collaborative' – processes which are differentiated from participatory ones by the authors who describe them. It is also a distinction borne out of a need to clarify the power dynamics and level of community engagement in mapping processes, which will be explained further ahead.

The frequent use of the term 'social mapping' is also related to the subject at hand. It occurs mainly in Brazilian literature and designates cases which, due to their characteristics, would be classified in the present work as community mapping processes. Social mapping aims towards including, in cartography, the "daily life of a community. Localities, rivers, lakes, cemeteries, houses, streams, caves are placed on the map - regardless of their size or condition. Social mobilizations are also mapped, describing and georeferencing them based on what is considered relevant by the communities studied" (Gorayeb 2014, 4, free translation). In this instance, perhaps the overlap is more complete, as it would be hard to argue that there is any form of community mapping that does not also constitute social mapping; even the most

impersonal cases of community-based mapping for the purpose of local-based research, presented further ahead, build up the social component throughout the process. Not all cases of social mapping are community mapping, for it is possible to have external agents mapping the social and cultural assets of a community, as seen further below under the heading "Mapping of a community by an external team"; but social mapping is largely a parent category to community mapping. In a fewer number of sources, the designation 'cultural mapping' is used in similar manner (ACT Brasil 2008).

Conflation between process-related terms and tool-related terms

As seen in Table 1, there is also a great amount of overlap between 'community mapping' and related terms, in particular 'PGIS' and 'PPGIS'. Baud (2011, 12) refers to community mapping as commonly interchangeable with PGIS, PPGIS, or other designations for "participatory methods employing GIS technology", but later portrays to community mapping as a specific form of PGIS which focuses "on the production of knowledge to empower communities, to make their voice heard and to reach the hard-to-reach", but also on the creation of "a database for social mobilization" (Pfeffer 2013). In this approach to the concept, there is no clear distinction between tool/platform (PGIS) and process (participatory mapping, community mapping); instead community mapping is set apart from other PGIS-based processes due to its social potential.

Cinderby (2008), however, mentions community mapping as an exercise that can be implemented to "produce spatial representations of local knowledge" through PGIS, thus distinguishing between process and tool. This distinction is reinforced by Gouveia (2008, 189), who explains that the exploration of Google Earth, which is a participatory tool and can, as such, be considered a Public Participation GIS, "augments citizen empowerment in similar ways to community mapping through GIS"; although the tools used in both situations can be considered PGIS or PPGIS, there is a distinction between the process of collaborative and remote exploration of Google Earth, and community mapping processes. Furthermore, when referring back to the definition of community mapping proposed by Corbett et al. (2006), we find that community mapping is also described as a process. In fact, some authors insist that community mapping can only be accurately described as a process, exercise, activity, approach or project (Grant-Smith 2012, Cinderby 2008), instead of a platform or a tool as is the case of PGIS. Thus, there is a case to be made for clearly separating the term 'community mapping', which refers to a process, from terms which pertain to tools and platforms, such as 'PGIS'. It can be acknowledged, however, that PGIS-based mapping processes can often be simultaneously classified as community mapping processes and vice-versa.

Overlap with other processes for harnessing local knowledge

At a broader level, community mapping processes can also overlap with other mapping processes, some of which are able to harness local knowledge as well. This overlap between concepts makes it necessary to understand the differences between them. For this purpose, a list of such processes was compiled, based on available literature and actual case examples.

Table 3.3: Examples of online services and platforms that can be used for collective and crowdsourced mapping, but also for community mapping.

Platform name	Founder	URL
CIVICS	Vivero de Iniciativas Ciudadanas	viveroiniciativasciudadanas.net/civics/iniciativas
Community Maps	Mapping for Change	communitymaps.org.uk/welcome
Crowdmap | Ushahidi	Crowdmap	crowdmap.com/maps/ | ushahidi.com
Google Maps	Google Inc.	maps.google.com/maps
Landmark – Global Platform of Indigenous and Community Lands	LandMark	landmarkmap.org
Map Your World	Map Your World	mapyourworld.org/#/maps
MapMe	MapMe	mapme.com
Mapping for Rights	Rainforest Foundation	map.mappingforrights.org
Missing Maps Project	Missing Maps	missingmaps.org
OpenStreetMap	OpenStreetMap Foundation	openstreetmap.org
Story Maps	ESRI's ArcGIS	storymaps.arcgis.com/en

i. Collective mapping. In collective mapping processes, agents from various backgrounds come together, in face-to-face meetings or through a PGIS platform (see Table 3.3), for the purpose of acquiring, harnessing or building up geographical information and their own spatial knowledge, with the objective of creating a map or a georeferenced dataset. 'PGIS' sometimes is also used as a synonym of collective mapping (for instance, in Pfeffer 2013). A typical example of collective mapping would be the platform Ciudadanos Activos, created so that the citizens of Cali, Colombia, could map all sorts of problems and make proposals about their city to the local authorities (Atzmanstorfer 2014, 249).

Any type of crowdsourced mapping that involves some measure of interchange between agents can be considered collective mapping, but so can community mapping. In fact, community mapping initiatives which temporarily bring together members of the community who did not know each other beforehand, drawing them into debating and building up their own local knowledge, tend to be called 'collective mapping'; the Iconoclasistas (Risler and Ares 2013), for example, are well-known for their creative mapping initiatives which they choose to call collective mapping, some of which could also be classified as community mapping – see, for instance, the mapping workshops with the Movimiento Popular la Dignidad (Czernikier, Ithuralde and Panal 2018).

The Iconoclasistas define collective mapping as a "playful and creative tool which facilitates the construction of collective story about a territory. This information is socialized within a horizontal meeting space that aims to elaborate knowledge and condense it into a common support (the map). It is intended as an instance of collective construction and open participation, allowing for critical knowledge of various realities, from everyday memory and non-specialized knowledge" (Iconoclasistas 2014, free translation). Due to this nature as a snapshot of territory,

collective maps can be rather open-ended and focus on a variety of issues. Nevertheless, when the agents who are tasked with mapping belong to a tight-knit community or are working with one, and there is debate or other forms of knowledge interchange amongst agents during the process, 'community mapping' (or the interchangeable terms that have been discussed before, such as 'participatory mapping', 'PGIS mapping' or 'social mapping') seems to be the go-to designation.

ii. Crowdsourced mapping / VGI. Crowdsourced mapping is characterized by the fact that users voluntarily pool their spatial knowledge or build up geographical information into an online platform – it is this mosaic-like nature, of the small contributes of many coming together to form a larger picture, that is evoked when using the term. In more detail, "crowdsourcing is the collective generation of media, ideas, and data undertaken voluntarily by many people. (…) In the virtual realm, a crowd can be drawn together across a widely distributed set of actors for little cost in order to tackle very large challenges (for example, mapping whole countries). (…) given many thousands of participants, the task can be subdivided and solved. Crowdsourcing then is premised on mass participation, with distributed voluntary effort, and a degree of coordination; it harnesses the 'wealth of networks'" (Dodge 2013, 19-20). Crowdsourcing is also "about more than volunteers and amateurs. It is about creating fluidity in data sharing and collaboration by breaking down barriers in access to technology and participation through the web, open standards, and simplified interfaces" (Zook 2010, 23). The designation 'Volunteered Geographic Information' (VGI), the object of interest of such processes, is sometimes used to refer to the mapping process itself, in much the same way that 'PGIS' is used to refer to 'community mapping'. VGI, "a term and concept popularized by Michael Goodchild (….) describes geographic data that are created by diverse users via novel protocols and technologies on a voluntary basis" (Schuurman 2011, 4).

One example of crowdsourced mapping (or spatial/geographic information being volunteered) is the Portuguese platform Mapping Our Tiles, created so that citizens can reporting geo-referenced for the purpose of building a database of traditional ceramic tiles. Another is the platform Deliktum (Atzmanstorfer 2014, 249), created so that citizens could report and map crimes in the city of Quito, Ecuador. In these examples, users do not need to establish contact with each other in order to volunteer information, and it could be said that crowdsourced mapping can be distant and impersonal for its agents. Nevertheless, there is a sub-type of crowdsourced mapping - crowdsourced community mapping - that can be quite gregarious.

Crowdsourced mapping tends to focus on a theme, as seen in the examples above, and it does not necessarily require local knowledge, although there are instances in which it became the object of the process. Nevertheless, the impersonality and lack of debate typical of crowdsourced mapping comes associated to the most visible and generalist (see Chalmers and Fabricius 2007) forms of local knowledge. For instance, in Portugal, a platform for alerting the authorities on the existence of Asian wasp nests was created at a certain point, allowing users to report them all over the country. Even though the awareness of the existence of most wasp nests is within the domain of local knowledge, since one usually needs to know the area and have access to private property to possess it, this is a type of knowledge that does not require expertise – the presence of the nests would be reported by anyone living in the area, no matter for how long, and the possibility of it being Asian wasps can be easily confirmed by an expert.

Occasionally, a specific crowdsourced mapping project might require users/volunteers to conduct extremely fast-paced remote mapping events or mass data creation workshops in response to catastrophes, a process known as 'crisis mapping' (Meier 2012). There are several examples, such as Haiti's (Zook 2010, Meier 2012) or Nepal's – the latter of which, interestingly enough, later evolved in the direction of community mapping. Due to the extension of the affected territories and the several communities being assisted, the remote teams and mappers often coordinate with reports from people on the ground, which means knowledge interchange was occurring.

iii. Crowdsourced community mapping. Crowdsourced community mapping occurs when several external and local users centre their efforts on a municipality, village or neighbourhood – see, for instance, the Missing Maps Project (Feinmann 2014). This can occur without any interaction between mapping agents, beyond correcting each other's mistakes and improving on their fellow volunteers' work. However, the mapping agents might also come together at a 'mapping party' (Botello 2012, 4), a term coined by OpenStreetMap users to designate a collective mapping event centred on a specific place whose purpose is to draft new volunteer mappers at their places of origin, cover a large area of ground in a short period of time regarding the mapping of basic infrastructures and landmarks, and hopefully provide inspiration for engagement to be sustained afterwards (the success rate of such initiatives is discussed by Hristova 2013).

In mapping parties, the participants often physically meet, tour the place they will be mapping and exchange their impressions about the whole process; considering this interchange and the fact that many of them are local agents, the process undoubtedly crosses the bridge into community mapping territory (or social mapping, as Hristova et al. prefer to call it); this also means that local knowledge of a more complex and expert nature thus has the opportunity to make its way into the map. Examples include the mapping parties of Calheta and of Bangalore.

Another example in which crowdsourced community mapping can also be considered community mapping proper (in other words, as presented at the beginning of this section), albeit for different reasons, is the Anti-Eviction Mapping Project (Maharawal and McElroy 2018, a crowdsourced project which goes to great lengths to display the personal narratives of the mapping agents involved in their online platform, and also creates an online space for the sharing of experiences and debate – thus allowing for knowledge interchange amongst the different agents to occur online.

iv. Mapping in the context of citizen/civic science. In 'citizen science' or 'civic science' processes, public participation in scientific research is encouraged for both scientific and educational outcomes (Booney 2009, 978). According to Pfeffer et al. (2013), "'civic science' is a form of knowledge production used by communities in the 'struggle over facts and science'. (…) Civic science is defined here as knowledge production by civil society which claims to be valid and reliable scientific knowledge. Civil society organizations, therefore, use scientific technologies to formalize and spatialize the tacit knowledge of residents." Lay participants are expected to follow the scientific method and specific protocols to acquire reliable information. Sometimes, mapping is used to structure that information, in which case it might overlap with any other of the designations enumerated in this work – the term 'civic science' denotes a primary focus on

the scientific method, but does not exclude other classifications. For that reason, citizen science projects that include mapping can include examples of crowdsourced mapping, collective mapping, etc. – data can be gather at initiatives of several scales, from school projects to widespread inputs into online platforms (Booney 2009).

When a citizen science mapping initiative is carried out by members of a community in relation to their surroundings, it helps build local knowledge and overlaps with community mapping. An example is presented by Scott (2011), in which local knowledge and community engagement were used to research industrial pollution in Durban, South Africa. Another example is the PhD research described by Rafael Chiaravalotti at the UCL's Extreme Citizen Science Blog.

v. Mapping of a community by a sole (local) agent. In a given community, there might be a lack of people with the necessary technological skill and info-literacy to conduct its mapping. However, due to the multitude of tools and platforms available nowadays, it has become easier for a single person to tackle the problem by themselves: "technological trends favoured the emergence of Web 2.0 practices that allow different types of users to create and explore multimedia data through easy-to-use geo-referenced tools", enabling the common citizen to perform "operations that were previously restricted to professional GIS experts" (Gouveia 2008, 189). One example of this practice is the Mapa de Frutales, a fruit tree map of Montevideo designed created as a web intervention project by artist María Noel Silvera (Ghierra Intendente 2015, 47).

These single-agent mapping processes are often expedient, but the resulting map may not be very reliable in what concerns local knowledge as it depends on the perspective of a single person, thus lacking checks and balances. Additionally, if the local knowledge that is woven into the maps is of a complex and/or hidden nature, it will be hard to verify and there is potential for errors and misuse. As Zook (2010, 12) explains, only "with enough people working together, any errors by one individual can be easily corrected by another. Indeed, this crosschecking by many can be used as an argument for the superiority of peer-produced mapping over more traditional means."

vi. Mapping of a community by an external team. Although the age of anthropological surveys and ethnographic maps such as Aleš Hrdlička's "Anthropological survey in Alaska" (1930) seems long past, similar initiatives persisted for a while longer (see, for instance, the ethnographic 1965 map of Jerrila). This kind of mapping differs from crowdsourced community mapping in that it lacks scattered users coming together due to similar aims; instead, it includes a team or researcher that observes the community context and practices with the purpose of carrying out the mapping themselves. These mapping processes depend on being physically close to the community, as we can read in the account of a researcher who mapped land tenure in Satupaitea, Samoa, and was the village's guest for two and a half years for that purpose (Crocombe 1987, 74).

Although there is the danger of complex information being 'lost in translation', this kind of initiative can overlap with community mapping when the team or the researcher actively reaches out and involves the community, either by conducting interviews with several of its members, or by creating participation opportunities such as meetings and workshops. Nevertheless, nowadays it is much more difficult to find an outsider looking into the practices

of an 'other' who is not wanted as part of the mapping process, and examples from the past few decades are hard to come by. Instead, routine governmental-led mapping surveys, which include a degree of community engagement while also contemplating social and cultural aspects in the mapping, have become norm for initiatives with the enunciated characteristics.

3.1.2 IDENTIFYING THE BASIC COMPONENTS OF COMMUNITY MAPPING

Based on the previous review, one might ask what community mapping is, after all. Indeed, between tangled concepts and mapping processes that are as diverse as their contexts, it is hard to settle on a definition. When looking at existing examples of community mapping processes, the constants seem to be the undertaking of a process which integrates dialogue and the mapping of place-based aspects related to a community, by the community (and related agents), through the use of spatial data processing tools, in order to build, harness or explore their own local, spatial knowledge. This process eventually crystallizes into a map, or other visual/cartographic product, meant to help fulfil the specific need or purpose which led to the process being implemented in the first place.

Therefore, in order to better characterize community mapping, this work suggests that we also look at it from the perspective of a basic set of components. For this, a look into the more process-oriented literature related to community mapping is needed, namely manuals and resources which include guidelines for community mapping processes. The first step was to list such resources, which resulted in the table presented below (Table 3.4). Afterwards, a thematic search of their content was employed.

Table 3.4: manuals and resources which include guidelines for community mapping processes.

Authors	Year	Title
Valderrama, R., Limón D.	2010	*Memoria del proyecto de Innovación docente en el marco del I Plan Propio de Docencia de la Universidad de Sevilla. El mapeo social como herramienta educativa en el trabajo por proyectos: aprendizaje autónomo, activo e inductivo en la comunidad educativa.*
IIED	2006	*Mapping for change: practice, technologies and communication*
Rotary	2008	*Community Assessment Tools. A resource for Rotary Projects*
Orozco et al.	2015	*Mapeo Participativo Comunitario –MPC–*
Rainforest Foundation UK	2015	*THE Mapping for Rights Methodology; A new approach to participatory mapping in the Congo basin*
Gonda, Noémi, Pommier, Denis	2004	*Manual práctico de mapeo comunitario y uso del GPS para organizaciones locales de desarrollo*
Burns, Paul, Paz	2012	*Participatory asset mapping; a community research lab toolkit*
Virginia Roaf	2005	*Community mapping; a tool for community organising (Guidelines for WaterAid Programmes and Partners)*
ETTERN/IPPUR/UFRJ (Rio de Janeiro)	2013	*Guia para Experiências de Mapeamento Comunitário. Versão livremente adaptada para o português de CTA. 2010. Training Kit on Participatory Spatial Information Management and Communication. CTA, Países Baixos*
Otto Callejas	2012	*Guía de estudio semipresencial; Taller 1: Inserción Comunitaria y Mapeo Social*

Table 3.4 (cont.): manuals and resources which include guidelines for community mapping processes.

Authors	Year	Title
Aide au Développement Gembloux (ADG)	2012	*Módulo III "El Mapeo Comunitario"; Guia Metodológica del Facilitador*
IFAD	2009	*Good practices in participatory mapping*
Rodríguez, Efrén	2011	*Los mapas participativos-comunitarios en la planificación del desarrollo local*
Mejía, Mario Ardón	1998	*Serie de Cuadernos Metodológicos de Investigación Participativa*
Knapp, Freyja L. (International Rivers)	2007	*Making Maps that Make A Difference; A Citizens' Guide to Making and Using Maps for Advocacy Work*
Risler, Julia and Pablo Ares (Iconoclasistas)	2013	*Manual de Mapeo Colectivo; Recursos cartográficos críticos para procesos territoriales de creación colaborativa*
Dillon, Leonellha Barreto (SSWM)	2013	*Mapas Participativos Comunitarios*
CEGP-TI - TURMA 32, Fundação Carlos Alberto Vanzolini da Poli/USP	2007	*Um guia para o mapeamento de recursos comunitários*
Botello et al.	2012	*Metodología para el mapeo de activos de salud en una comunidad. Gac Sanit. 2013;27(2):180–183.*
Iconoclasistas	2014	*Mapeo Colectivo; Profundizando la mirada sobre el territorio*
Zuber, Robert E.; Wendy Brawer	2003	*Mapeo Verde*
World Bank	1996	*The World Bank Participation Sourcebook*
Tipula T., Pedro (Instituto del Bien Comun)	2008	*Metodologia de Mapeo Territorial; Comunidades nativas Cacataibo*
Avizhar, Amy Lipmn, and Sami Backleh (Friends of the Earth Middle East)	2013	*Good Water Neighbors; Resource Guide for Environmental Educators*
MSP	2010	*Multi-Stakeholder Process – Locality Mapping*
Lydon, Maeve	2007	*Mapping our Common Ground; a community and green mapping resource guide*
Wahono, Francis X.	2012	*Pancur Kasih Empowerment Movement*
Kienberger, Stefan	2008	*Manual. Mapeamento da vulnerabilidade das comunidades. Exemplo de Búzi, Moçambique.*
Tobias, Terry	2000	*Chief Kerry's Moose - a guidebook to land use and occupancy mapping, research design and data collection*
ACT Brasil	2008	*Metodologia de Mapeamento Cultural Colaborativo*
CEDINS	2011	*Tierra y derechos en aguas turbulentas. Aportes para la construcción de cartografías sociales*
Broadmoor Improvement Association (BIA)	2006	*Community Mapping Project: A Guidebook for Neighborhood Associations and CDCs*
Riesen et al.	2012	*Mapeamentos Participativos e elaboração de Planos de Uso. Uma experiência nas comunidades de Anã, Arimum, Atodi e Vila Amazonas nas margens do Rio Arapiuns*
Humara Bachpan	2015	*Children Led Planning on Safe and Healthy Living Conditions for Family and Children in Urban Neighbourhood - Training Pack*
Gorayeb, Adryane	2014	*Cartografia Social e Populações Vulneráveis. Oficina do Eixo Erradicação da Miséria*

3.1.2.1 Discussion of results: main components of community mapping

Based on the previous search and on the literature review conducted so far, it is proposed that community mapping has seven main components: the community as essential agents of the process, the mapping process itself (in which dialogue and mapping activities figure prominently), the physical space and place subjected to the mapping process, the spatial data processing tools used during the process, the forms of local spatial knowledge which the process is harnessing, the map produced by the community as the physical representation of the harnessed knowledge, and the objective or purpose that led to the implementation of the process. Each of these components is applied/defined in varied ways. The range of forms each of these components assume should, therefore, be the object of clarification, as should the specific debates related to them.

i. Aim or purpose. The purpose is what galvanises the participating agents into action, often led by external agents. It is something specific to the community or the space to which they are related, and usually something which can be advanced through the production of a map and the harnessing of local knowledge, which is typically condensed on a map. There is a wide variety of aims that spur the implementation of community mapping projects.

For instance, Lydon (2007, 1.2) presents, as the three main purposes or advantages of community mapping, the creation of a sense of place, the facilitation of dialogue, and the transformation of reality: “citizens locate and affirm the historical, physical, social, cultural, and even spiritual attributes of their home place. Through the process of naming their realities through the creation of maps, communities are better equipped to proactively plan their own lives and communities.” IFAD (2009, 9-12), referring to the slightly wider context of participatory mapping, enumerates six main purposes for initiating a project: “to help communities articulate and communicate spatial knowledge to external agencies”; “to allow communities to record and archive local knowledge”, especially to protect their culture and traditions; “to assist communities in land-use planning and resource management”; “to enable communities to advocate for change”, something which is presented as the domain of counter-mapping, particularly regarding the demarcation of ownership over costumary land; “to increase the capacity within the communities” and “contribute to building community cohesion”, often by sustaining a sense of place and identity or by assisting with the recognition of assets and problems within the community; and "to address resource-related conflict”, especially in land claims against outsiders. Kwaku Kyem (2004, 39) adds that counter-mapping initiatives, specifically, aim to “represent the viewpoints of particular underprivileged groups”, “demarcate and protect indigenous land rights”, “record and appraise local knowledge”, and “assess local and neighbourhood needs”.

ii. Community and related agents. The size and nature of a community, and indeed what can be called a community, varies wildly in literature, from a group of people who occupy a relatively well-defined, relatively short unit of geographical space, to a group that establishes social and cultural ties between its members, to those who share a common history and heritage, to a combination of these aspects. Lydon (2007, 1.1) provides a very thorough explanation of communities being defined by “where and with whom one identifies with and/or feels that one belongs. A community can be geographic (e.g. local, school, neighbourhood, regional, national), socio-cultural (e.g. ethnic, women, men, gay, youth and children), sectoral (e.g. education,

recreation, government, police, health), ecological (e.g. bioregional, plant, animal, biosphere) or special interest (e.g. church, punk, soccer, birdwatchers)."

In fact, the only constant reasons for calling a group of people a community seem to be that they either see themselves as one, or that people external to the group identify it as such for some reason - due to them possessing common characteristics, a common goal, physical proximity, etc. Therefore, a group of people living in the same street or neighbourhood might be called a community. But a set of villages kilometres apart but whose residents belong to the same ethnicity might also be a community; specifically in the case of indigenous groups, 'community' is often related to a group with a specific ethnic and/or cultural identity, and thus the community might comprise all the members of that group, no matter how large their number or what their geographical distribution is. Case studies are often left to speak for themselves, and any 'community' presented is accepted as such. There are school communities - comprised of the pupils and staff of a given school, - neighbourhood communities, city-wide communities, and so on.

It should also be noted that the mapping community might be only one of the stakeholders involved, and sometimes not even the leading one. When talking about the agents involved, it is important to distinguish between 1) local and external agents, and 2) between the community mapping agents (the people within the community who are assigned the actual task and work of translating their local knowledge into the physical shape of a map) and the initiative promoting agents (who might or might not be the same as the former), as the differences might be very telling about engagement dynamics. This distinction is important for the purposes of typification, as will be seen in the next section.

iii. The process. The mapping process can be organised in many different ways to reach its immediate objective, which is the creation of a map by the community. Sometimes, such organisation is completely spontaneous; at other times, the agents conducting the process might be following existing guidelines or even a methodology that they themselves developed, something which happens when an entity focused on community mapping starts implementing a string of processes. The Mapping for Change initiative (2008), or the project Nova Cartografia Social da Amazônia (CEDINS 2011) are examples of this.

There are several manuals and guidelines specific to community mapping processes – which, as has been discussed, borrow heavily from participatory methodology, - although guidelines from participatory processes, social research and other types of collective mapping can also be useful. A quick glance through the manuals, guidelines and recommendations available (Table 3.4), many of which downloadable for free from the websites of several organisations, tells us that there is a large diversity of methods, which translate into a large diversity of processes. A very basic process structure (as anything more detailed would not be very encompassing) would include a preparatory phase, in which the necessary research about the context is conducted, contacts between agents are established and materials and activities are readied; an implementation stage, strongly based on dialogue and interchange between the mapping agents; and, ideally, a phase for evaluation and receiving feedback. Two comprehensive reference guides are IFAD (2009) and Maeve (2007), but it is also important to take into account Tufte and Mefalopulos's "Stages of a participatory development project" (2009, 5-6).

Dialogue is essential to community mapping, for several reasons. Firstly, because it is impossible to harness local knowledge without dialogue unless one single person is undertaking the mapping – something which, as previously explained, not only cannot be classified as community mapping, but also makes it impossible to perform balances and checks on the information collected. Secondly, because it is the main way for external agents, if involved, to facilitate the process and gain the trust and consent of the community which has to undertake the mapping (see the sections "Ensuring good facilitation" and "Ensuring that the M&E process is inclusive" in IFAD 2011, 9-11). Dialogue does not need to occur face-to-face, however, as successful cases exist in which dialogue-facilitating online forums and platforms were used (i.e. the Anti-Eviction Mapping Project).

iv. Space and place, or the territory. At first glance, a community mapping process seems to be related either to a physical space or to the mental construct of it that constitutes a place. However, it could be said that community mapping always act upon a place and not just a space - for even if the focus was on a space at first external and/or unknown to the community, going through the process itself would have created the mental constructs for the community to see it as a place. Much like local knowledge, being place-based means that these processes interact with the local culture and environment (FAO 2004), and being space-based means that they focus on spatial relationships with the physical and natural environment (Oliver et al. 2012).

Beyond this distinction, it is important to mention that the characteristics of the space itself vary wildly:

- in dimension, from neighbourhood centred-projects to demarcations of large traditional territories;
- in type, such as urban or rural;
- in access to resources, from slums to asset-rich urban areas;
- in type of features that are of interest, such as sacred places, natural resources, or health assets.

v. (Spatial data processing) tools. Community mapping can make use of a variety of spatial data processing tools, such as "sketch maps, participatory 3-dimensional models, aerial photographs, satellite imagery and tools such as global positioning systems and Geographic Information Systems to compile virtual or physical 2 or 3-dimensional maps" (Martinez-Verduzco 2012, 1). It can also employ analogue tools, such as iconographies, pictograms, and printed graphical and cartographical elements (Risler and Ares 2013, 14). Printed material, sketch maps, and models built by hand can be as useful as technological tools such as GPS devices and PGIS, especially in low-tech environments. In fact, while such technologies facilitate community mapping and the transmission of knowledge, Grant-Smith (2012, 2, 11) warns that there is also a "potential for them to create conflicts, or more accurately, bring latent dormant conflicts into the open", as they can be "marginalising and disempowering for community members". As these authors explain, the tools must adapt to the context of their implementation. For instance, printed orthophotos can be of easier use to communities as "they alleviate people's distrust of computer technology and their lack of cartographic literacy; these tools are also less expensive than other related inputs, such as high-resolution satellite images" (Martinez-Verduzco 2012, 1).

It is the use of all these predominantly visual tools that allows for local knowledge to be harnessed, visualised and built upon, eventually culminating in the form of the map. Working

with visual resources, according to Risler and Ares (2013, 14 - free translation), has the potential of allowing the mapping workshop to "territorialize collective creation and plural participation, and to give visibility to a horizon of critical and transforming sense of inquiry."

vi. Local knowledge. Some of the things mapped by communities cannot be mapped by anyone else, which is one of the reasons why community mapping is so interesting – and, ultimately, so relevant to complex knowledge systems and the modes of governance that build upon them, such as adaptive governance (Wyborn 2015). FAO (2004) identifies local knowledge, a place-based type of knowledge, as the human capital that people in a given community have developed, and continue to develop, in relation to their surroundings over time, in order to solve problems, achieve goals, and maintain or improve their livelihood. It comprises skills, experiences and insights related to the place they inhabit, acquired through their efforts to seek information, and includes several knowledge systems and types of communities, from rural to urban and settled to nomadic, original inhabitants as well as migrants.

This definition is by no means consensual. The term 'local knowledge', especially in recent years, has been used to denote a stronger focus, by external agents, on the experiential and observational aspects of knowledge rather than the internalized, culturally bound aspects that are at the heart of traditional and indigenous knowledge (Sinclair and Walker 1999). This evolution towards non-expert forms of place-based knowledge, without the depth that FAO's definition implies, is further explained below.

It is recognized that the concept of local knowledge is tied down to that of traditional and indigenous knowledge. It relates to knowledge of the environment, to knowledge that is acquired through a practice specific to a place, to knowledge that depends on a place and could not be exactly the same somewhere else: Hayek's "knowledge of the particular circumstances of time and place." However, it is often portrayed in the context of remote, rural, indigenous, or otherwise non-urban/non-mainstream cultures. This is apparent when searching for community mapping projects that make use of local knowledge, with many taking place specifically in such contexts. In fact, some of the earliest (contemporary) examples of community mapping are indigenous mapping initiatives, such as the tenure mapping initiatives of the 70s in the Arctic Quebec (Poole 2006, 42), or the West Kalimatan counter-mapping projects of the 90s (Peluso 1995, 395). In the list of terms related to local knowledge that are used interchangeably with it, or partly overlap it, 'traditional knowledge' and 'rural knowledge' (FAO 2004) are ever-present, along with 'indigenous knowledge' (Bohensky and Maru 2011), 'folk knowledge', and even 'citizen science' (Dekens 2007) and tacit and community-based forms of 'participatory spatial knowledge' (Pfeffer et al. 2013).

There is little doubt that local knowledge, and community mapping, is useful in these traditional contexts. But, recently, local knowledge is also being presented as relevant to urban, culturally-mainstream areas as well. In participatory urban planning initiatives, residents are sought out for their "perceptions and images of the city", built "in a more intuitive way, from their daily routine practices in the city" (Fenster 2005). Local knowledge does not have to be about the distribution of culturally important sites, the location of rare plants, or which species are better adapted to local cultivation - sometimes, it is the knowledge held by a group of children regarding the littered state of their local park, because they cross it every day on their way to

school (Mapping for Change 2008). In some cases, the type of local knowledge found in urban settings can even be tantamount to that of rural knowledge - a study in Finland, for example, has identified the existence of local ecological knowledge amidst the residents of the Helsinki metropolitan area (Yli-Pelkonen, Vesa and Kohl 2005). According to Eversole (2014, 96), “local knowledge is not defined by its 'traditionalness' (...) nor is it defined by a tendency to be more or less 'scientific' in orientation”, but “by its location in particular physical and social settings”.

This emphasis in the fact that local knowledge does not need to be exotic, - that it can in fact be rather mundane, - is important when placing, on the same table, projects aimed at engaging schoolchildren and projects on which the survival of a remote community depends. Even though the 'what' (local knowledge) is important to this particular work - otherwise all types of spatial knowledge could be considered, - the focus is on 'how' to work with it, and 'to what end'.

In the wake of all that has been explained above, some authors now distinguish between generalist (circumstantial, simple, easily visible) local knowledge and expert (deep, complex, hidden) local knowledge (see, for instance, Chalmers and Fabricius 2007). Dekens (2007) goes even further and suggests a tripartite gradient of local knowledge, which can range from common knowledge - widespread and held by the whole community - to shared knowledge - restricted to a smaller group of people with something in common - or specialist knowledge - specific and held by local experts. Community mapping processes are the ones in which the most access to expert local knowledge is expected, as it requires more involvement on the part of the community and more dialogue for the purpose of verification: to understand local knowledge, and deep, specialist or expert local knowledge in particular, one has to understand the context of the community, since it influences what the knowledge holders know (Dekens 2007). Crowdsourced mapping and other collective mapping processes which only tangentially involve local groups only have reliable access usually to visible forms of local knowledge. Furthermore, they do not always focus on local knowledge, while community mapping, on the other hand, always involves harnessing local knowledge - either by collecting and structuring it, by building up on it, or by using it to facilitate interactions. This is another of the main reasons why this work chooses to focus on community mapping processes.

vii. The map, or an equivalent cartographic product. Community mapping processes are implemented due to various objectives, as previously seen, and can have many different short and longer-term outcomes. Nevertheless, the most immediate outcome of a community mapping process, and the only one which remains a constant, is the production of a map or equivalent visual item (such as a model), because it is an ideal way of organising, studying and presenting spatial knowledge and, by extension, local knowledge. This map can assume a range of different expressions, from the Iconoclasistas’ highly conceptual and artistic maps (Iconoclasistas 2014) to detailed 3D representation of the vital sites of the indigenous community in the Philippines.

A cognitive map establishes a correlation between the spatial configuration in the real world and its cognitive constructs, such as local knowledge (Kim 2001, Montello and Raubal 2012). Therefore, one of the most sought after and useful outcomes of processes seeking to harness local knowledge is the production of a map by the local community, which acts as a well-tuned sensor of its immediate surroundings. According to IFAD (2011, 17), the use of maps has several

key advantages, such as: allowing for collective visualization and analysis of the issues at hand, as well as making it possible for groups to reflect over them on their own terms; depicting change over time and the reach of initiatives in an easily understandable way; supporting an overlap of several variables; and enhancing a sense of ownership to their community-generated content.

Nevertheless, it is necessary to keep in mind that maps might be incorrect, and that the possibility of feedback loops should be ensured. In other words, the process should not end when the map is finished, since geographical representation is just a (more or less grainy) snapshot of the community at a moment in time and will have to be updated eventually (Kienberger 2014).

3.2. TOWARDS A TYPOLOGICAL FRAMEWORK

As previously seen when searching for prevalent terms and designations, many authors choose to typify and adjectivize community mapping initiatives according to their focus, or simply typify them according to their prevalent designations. For instance, Rodríguez (2011, free translation) divides 'participatory community maps' into 'historical maps', 'school-project maps', 'risk maps', 'geographic maps in urban and rural environments', 'community planning maps' and 'estate planning maps'. Others, such as Pfeffer (2013), present all the prevalent types of participatory and collective methods of data collection without categorizing them, with community mapping appearing along, for instance, counter-mapping, PPGIS or VGI.

This work proposes something different. It has been noted that community mapping initiatives can be very different from each other, apart from their basic components. Nevertheless, we defend that is possible to group some of their characteristics together, preferably while integrating the most popular and primary terms used to designate community mapping in the literature.

More importantly, we defend that while some of the primary keywords ('indigenous', 'local-level') might correspond to initiative types of the same weight, others ('participatory', 'counter', 'grassroots', 'collaborative', 'indigenous', 'local-level', etc.) simply cannot be presented that way. Rather, they move along different axis; and since an axis has two directions, we are often too blindsided by the most popular terms to remember their foils. What is the opposite of counter-mapping? What is the opposite of grassroots mapping? In order to achieve a working categorization of community mapping initiatives, and one geared toward the research of their effectiveness and place in planning and governance, it is important to clarify these questions.

Therefore, this part explores five different categories, for which practical examples are later provided. The categories chosen were the ones both more relevant according to existing literature and necessary to the research context of this work. In some of them, types are organized along axis; in others, types correspond to thematic groups of the same weight.

3.2.1 PROPOSED CATEGORIES AND TYPES

Category: community engagement

The first axis to which the literature pays attention is undoubtedly the level of community engagement, as demonstrated by the frequent use of the term 'participatory'. As aforementioned, a community mapping project might be described, for instance, as grassroots instead of participatory, especially if participation is seen from an institutional, project-based perspective in which the community group is participating in the initiative of an external group, the latter usually with 'official' status or at least influence over development initiatives. So how to classify the different levels of engagement of a community in a mapping process?

First of all, it is necessary to remember the ladder of participation, and its distinction between passive or tokenized participation and active participation. In this model and many of its derivations, not all interactions between institutions and a community are made the same, nor desirable at all times – at the bottom is consultation and tokenism, at the top collaboration and devolution.

It is also necessary to differentiate between local agents and external agents. Local agents might come from within the community or be the community itself, including institutions organizations, radios or newspapers run by the members of that community. External agents, on the other hand, originate from outside of the community; there are those that do not directly influence decision making (although they might have enough clout to apply pressure), such as NGOs, charities, funds, or advocacy groups, and those that directly influence decision making - governmental institutions, political parties, institutions with financial or public opinion leverage (banks, TV channels with wide coverage, etc.); depending on the situation, the academia and researchers in general might or might not be considered 'influencers'. After these distinctions have been made, it is then necessary to find out if the group of community mapping agents (the people of the community who hold/seek local knowledge and who will be primarily responsible for making it visible to those who do not possess it), along with their local allies, coincide with the initiative promoting agents – the 'kickstarters' and promoters of the initiative, so to speak.

Power imbalances are something to guard against in mapping processes, even amidst the community itself - mainly due to the uneven distribution of knowledge amidst the community (Dekens 2007), but also due to the 'differential empowerment' that is attained in the wake of a community mapping process. The aforementioned distinctions between types of agents and their roles have the potential to clarify not only power differentials between local and external agents, but also to allow us to gauge the extent to which a community is committed to an initiative. Authors such as Gorayeb (2014, 6) defend that the identification of actors is essential to this purpose, especially in what concerns determining and/or protecting the autonomy of the community.

Levels of community engagement and levels of participation are quite the similar thing unless one is trying to nit-pick and hammer a series of disjointed popular designations together; therefore, participation literature is where we found our answer to the first paragraph's question. Tufte and Mefalopulos's (2009, 6) "Typology of Participation" has the potential to easily help us incorporate the most common terms in community mapping literature regarding community engagement. The authors divide participation in four types: 'passive participation', in which there is minimal feedback from the participants and does not quite apply to the mapping processes at hand; and other three quite useful types, namely 'participation by consultation', which would correspond to participatory community mapping, 'participation by collaboration', in which collaborative community mapping would be included, and 'participation by empowerment', which is similar to the dynamics found in grassroots community mapping.[17]

[17] Needless to say, this type of approach requires a large amount of database sleuthing in order to ascertain to primary motivations and roles of each of the agents involved. A worthy endeavour, considering that the relationships between agents are of primary importance in these processes. Nevertheless, readers are free to consider the three proposed types, 'grassroots', 'participatory' and 'collaborative', from a social movement perspective, and thus regard them all as participatory.

These authors are not the only ones, of course, to propose ways to categorize participation that are simultaneously more complex than slotting all types of community engagement and action under the umbrella of 'participation', but also simpler than Arnstein's 'ladder of participation'. An example is Hennig and Vogler's (2011, 80) "Spectrum and technics of public participation", although the types they propose are perhaps the most straightforward.

Participation by consultation is described by Tufte and Mefalopulos (2009, 6) as "an extractive process, whereby stakeholders provide answers to questions posed by outside researchers or experts". It can be equated to community mapping processes simply described as 'participatory'. Participatory community mapping would occur every time the local community mapping agents are invited to participate in an initiative devised and promoted by external agents, even if it primarily benefits the local agents.

Participation by collaboration is described as "a joint collaborative effort. Even if initially dependent on outside facilitators and experts, with time collaborative participation has the potential to evolve into an independent form of participation" Tufte and Mefalopulos (2009, 7). This fits in with ACT Brasil's (2008) description and emphasis on the distinction between participatory and collaborative mapping processes, which are deemed to occur on more equal footing. In the collaborative mapping type, however, we have also included cases in which local and external agents are equal partners, which is in line with the latter reference but not the former (Tufte and Mefalopulos prefer to include this instance in the 'empowerment participation' type).

Empowerment participation "is where primary stakeholders are capable and willing to initiate the process and take part in the analysis." Tufte and Mefalopulos (2009, 7). When grassroots community mapping processes are mentioned, this is the kind of experience being described, as the examples in the following section demonstrate. Grassroots community mapping would occur when the local community mapping agents, or local entities with close ties to them, are the main creators and promoters of the initiative, even though external agents are invited to participate. Although the authors mentioned in this paragraph do not include the possibility, as it is after all a work on participation, in some of the cases the process can be entirely undertaken without the presence of external agents.

Category: connection to spatial policies

Another axis can be introduced by the term 'counter-mapping', which refers to something completely different – namely, the way the project is connecting with official spatial policy (or lack thereof). Although the term does not total a very high count in the previous keyword search, it is recurrent in some of the most prominent literature related to community mapping. Counter-mapping comes frequently associated to terms such as indigenous mapping, and it could be mistaken for a reference to the level of participation and engagement as well; in fact, it is anything but. Counter-mapping initiatives range across all levels of participation, from grassroots to participatory to collaborative.

This is perhaps the most relevant axis for the work at hand, as it deals precisely with the interaction and influence of such initiatives over spatial policy. The interesting part comes from

the fact that such interactions are usually only ever mentioned and classified when they are negative, in the presence of what IFAD (2009, 22) calls a 'disabling environment' of alienating government decisions or government-driven development that shut out the people most negatively impacted. Mapping projects started by governmental entities for surveying or consulting purposes with expected beneficial outcomes will hardly ever be designated as 'pro-mapping'. In order to create a category that reflects the connection of initiatives to spatial policies, it is therefore necessary to name the opposite of counter-mapping processes.

Therefore, in this category, we include 'counter' processes, which are instigated by external actions that are provoking an adverse effect on the community and seek to overturn disabling environments; they contest, challenge and/or reject an existing spatial policy ('the current state of things'), and often existing power structures. On the other side of the axis, we find initiatives that are undertaken primarily out of a sense of betterment, capacity building, policy creation and adjustment, and transformation of the surroundings of the community for a better future; while perceived lack (of infrastructures or resources) or existing problems can be a factor in initiating the process, they are not the galvanizing factor. In this spirit, two types of mapping initiatives can be systematized: 'instructive' processes, which provide the foundation for building, improving or rectifying a spatial policy, in the present or the future; and 'pioneer' processes, which push for the creation of spatial policies that do not yet exist, or attempt to set structures in place that will act as substitutes, due to insufficient interest or access to resources by the state.

What, it may be asked, is the use of categorizing community mapping initiatives in this way? Let us use, again, the example of counter processes. Counter-mapping is "any effort that fundamentally questions the assumptions or biases of cartographic conventions, that challenges predominant power effects of mapping, or that engages in mapping in ways that upset power relations" (Harris and Dazen 2005, 115); although counter-mapping is not usually named as a type of community mapping (i.e. Pfeffer 2013), the initiatives described in the literature are undertaken by community mappers and involve harnessing their local knowledge (see, for instance, Hodgson 2002), which means we choose to see it as a such. It would be useful to know more about this type of mapping: what is its success rate in overturning official spatial policies? Under which conditions? What are its long-term outcomes? How do those differ from those of a community mapping process created to instruct official policy, or to compensate for its absence? All of these are questions that require urgent answers, especially when one takes into consideration the contemporary popularity of community mapping processes, both in the research world and in the wake of increasing public involvement in decision making (Kwaku Kyem 2004, 38; Wynne-Jones 2015, 1; Cinderby 2008, 310).

When typifying processes within this category, it is also necessary to take into consideration that many mapping projects are not started with official spatial policies in mind; they might not even quite know what a spatial policy is. Therefore, we must take into account the present and future use of the knowledge harnessed during the mapping process. Are the participants securing land pre-emptively against future logging attempts, even though logging concessions have yet to affect their territory? Is the community trying to empower itself by creating a community asset map, which might be later used to instruct local policies? Is the community trying to pioneer

services and infrastructures in a 'policy desert', with their actions having the potential of one day becoming official policy?

The concept of 'spatial policies' is used here in its broadest sense – not only as public policies that establish relationships between resources or services and spatial location (Lim 1988), but also as the possibility of such relationships being established in the future. If a community mapping project is intent on recording indigenous hunting trails at the behest of the community itself, even though there is no current link to a given spatial policy, we accept that the compiled knowledge might still inform a future policy, such as the allocation of lands for environmental conservation.

We do, admittedly, hold a hopeful view of a future in which indigenous, societal and human rights will continue to improve, as a long path has already been treaded, from the first tenure mapping initiatives of the 70s (Poole 2006) to the United Nations's 2007 Declaration on the Rights of Indigenous Peoples. Therefore, we tend to see present policy-unaffiliated local-knowledge-gathering initiatives as having the potential to be used in instructive ways, in the future. It is, however, entirely possible that such initiatives will have to be used for counter-mapping purposes. It is also important to remember that maps have power, that they can and have been used deliberately by governmental entities to the detriment of communities, and that "documenting sensitive information using the community mapping process might also serve to make that information more vulnerable to exploitation; this is particularly the case when maps draw attention to valuable natural resources or archaeological sites" (IFAD 2009, 12). All of this means that a community mapping process classified as instructive in the present might later contribute towards a disabling environment, and even double as the foundation of a counter-mapping process.

Category: knowledge-holding community

The community which holds the local knowledge – without whom it does not exist – and which is the audience and target of community mapping initiatives is largely an emergent category. Although the type of community might be imagined to be determinant for the type of community mapping implemented, there are generally no primary terms that focus on specific types of community with one notable exception, as seen in Table 3.1: indigenous (or aboriginal) mapping. Commonly associated to land tenure, traditional and customary land use, and mapping of cultural heritage, indigenous mapping is at the centre of many implemented initiatives and dedicated publications, such as Chapin, Lamb and Threlkeld's "Mapping Indigenous Lands" (2005). It is also the focus of publications focusing on tenure mapping (Poole 2006). The indigenous communities involved in community mapping share other common characteristics beyond their belonging to an ethno-linguistic group distinct from their territory's majority or colonizer groups: they are invariably non-urban, and often located in remote areas.

For the inclusion of an indigenous community mapping type, other types of communities were grouped according to their defining contexts. The urban/non-urban division informed the formation of types, as well as their social and economic context particularities.

Category: aim of the initiative

The literature tells us that community mapping projects are initiated for a variety of reasons, as seen in the previous section. Apart from the commonly highlighted aim of facilitating communication between local and external agents, which is not seen in case studies as a motivator by itself but rather in conjunction with other factors, all other aims can be gathered into four loose groups. These are based on the aims that can be found in mapping manuals, but also on practical cases, examples of which can be found in Table 5. It is important to try to understand which types of aim/motivation are working in tandem with which other categories, i.e., types of community engagement – and which combinations are leading towards favourable outcomes.

In this category, the first group, or type, would be external recognition and the handling of resource or tenure-related conflict, as seen in countless examples of counter-mapping, indigenous mapping and tenure mapping, mainly for the purpose of costumary claims and to fight appropriation. Secondly, we have the many forms of community cohesion, empowerment and capacity-building, which include recording cultural aspects and memories, promoting community learning, promoting community self-awareness and cooperation, and working towards self-protection. Thirdly, there are mapping initiatives to secure funds, infrastructures, better public spaces or services, sometimes by taking advantage of existing funding programs. And, finally, there are initiatives concerned with local research, the only type not centred on the community itself, choosing instead to use community mapping for the purpose of researching a particular aspect of science in the physical space to which the community belongs – a space which later, if it did not happen before, will be appropriated to some extent into a place by the community who built their local knowledge of it during the initiative.

Category: use of spatial data processing tools

Choice of tools and complexity of use is but a small subset of the varied methodologies and decisions applied during the mapping processes themselves; still, it is one which is simple and useful to gauge in comparison to other aspects. Creating a category regarding the use of spatial data processing tools will also, during the empirical research phase, facilitate the analysis of a possible link between the most complex tools (often GIS and network based, and chosen mostly based on skill level) and knowledge dissemination and influence over spatial policy, the focus of this work. The specificities of tool use are made doubly relevant by the frequency with which they appear on the minds of researchers, as demonstrated by the keyword search, in which PGIS is commonly used as a designation for community mapping.

Researchers, especially in development-oriented fields, are interested specifically in digital spatial data processing tools, due to their higher capacity to process and transmit information. In some of the literature, analogue tools are described as inferior. “For FIDA (…), the georeferenced cartographic product differs from maps drawn on the ground or a sketch, as these are ephemeral, present difficulties in being recorded due to their size or volume, or might be destroyed with time. Therefore, the scaled map represents a more credible and durable element for its users to manage the territory in a more autonomous way” (Araújo and Nascimento 2012, 54; free translation). MSP (2010) also defends that “sketch maps represent

how people see a physical area or a particular issue and its importance, and are, therefore, not as precise or scale accurate as formal maps."

However, as seen in previous sections, tools must adapt to the context of their implementation. This means that sometimes the community agents and the process itself must be prioritized over tool choice. Grant-Smith and Johnson (2012) defend that that it is necessary to find the most appropriate tools for the process at hand, but that this choice cannot dictate the process. The choice of technology should instead be shaped by the needs of the process and participants, and banned altogether if necessary. In many cases, the choice of tool will correspond directly to the skills of the knowledge-holding community. It should be pointed out that there are shades of grey in this debate, sometimes rendering the point moot. For instance, if the local community mappers are not able to digitize the maps by themselves, someone else might do it for them (see, for instance, the case described by Smith 2012, or Wart, Tsai, and Parikh 2010). Analogue spatial data processing tools are not always easy to use, either; some community mapping manuals propose creative forms of mapping that, albeit extremely interesting, can be considered complex and might require guided use.

Three skill-based or difficulty-based types were included in this category – 'elementary', 'guided', and 'complex' use – in order to allow for a later analysis of the success of such processes in different contexts, in combination with other categories (in particular, the categories of the 'spatial data processing tools' dimension of the conceptual framework, to be presented in the next part). 'Elementary' use includes cases in which the community handles very simple and intuitive tools, often analogical (such as printed maps and hand-made drawings) or GPS positioning devices; they rely on external agents to translate and codify the information recorded into paper cartography (in older processes) or through GIS or other digital spatial data processing tools (in newer processes); there might be a short training period beforehand. In 'guided' use, there is an externally-guided process in which relatively complex spatial data processing tools are employed, often including a learning period and a discussion of their use; these complex tools are almost always digital, except for the most creative processes, in which case a designer might have to intercede at the end to create a 'clean' version of the map. In processes with 'complex' tool use, the community uses complex tools on its own, with the least proficient community members sometimes being taught by the most proficient ones. For the purpose of classification, the distinction between simple and complex tools is made by asking whether formal expertise and a long period of training would be required to handle them.

3.2.2 A NEW TYPOLOGICAL FRAMEWORK FOR COMMUNITY MAPPING

Based on the examples and references presented in the previous section, the following referential is thus proposed for classifying community mapping cases according to overarching categories and types, for the purpose of further research. While the categories and types of this referential are strongly influenced by the analysis of existing literature, their descriptions also include emergent information derived from data collection, following the process of content analysis explained in Chapter 2.

Table 3.5: Proposed typological framework for classifying the community mapping model.

Category	Type	Description
C1. AIM OF THE INITIATIVE	EXTERNAL RECOGNITION	Associated to land rights and ownership, resolving conflicts over resources, asserting the community's identity when unrecognized, and achieving formal recognition by the state.
	COMMUNITY CAPACITATION	Includes recording cultural heritage, memories and traditions, promoting community learning, self-awareness, cooperation and capacity-building, strengthening the community's identity, and working towards self-protection.
	RESOURCE ATTRACTION	Related to using maps to acquire funds, infrastructures, better public spaces and/or services, sometimes by taking advantage of existing funding programs.
	LOCAL-BASED RESEARCH	The only type that is not centred on the community itself, instead using community mapping to research a particular aspect/area of science in the area to which the community belongs.
C2. KNOWLEDGE-HOLDING COMMUNITY	INDIGENOUS	Non-urban communities defined by their indigenous identity, which sets them apart from the rest of their territory's population and often their government's policies; often living in remote areas.
	NON-URBAN	Other non-urban communities, living in rural, traditional or remote contexts.
	URBAN1	Urban communities living in contexts in need of structural improvement, often associated to deprivation, informal settlements, and emergent urbanity.
	URBAN2	Urban communities living in consolidated contexts that adequately meet their basic needs, and thus seek a higher level of development as well as social, cultural and scientific improvement.
C3. COMMUNITY ENGAGEMENT	GRASSROOTS	The main agents – responsible for proposing, leading and/or managing the initiative – are locally based, belonging to the knowledge-holding community or originating from the same specific geographic boundaries; they may or may not invite external agents to participate in their initiative.
	PARTICIPATORY	The main agents – responsible for proposing, leading and/or managing the initiative – are not locally based; they invite the community to participate in an initiative that requires their pre-existing local knowledge and/or involves the territory where the community is based.
	COLLABORATIVE	Of the main agents – responsible for proposing, leading and/or managing the initiative, – some are locally based, and some are external to the community and its territory; both types of agents have equal standing in the initiative.

Table 3.5 (cont.): Proposed typological framework for classifying the community mapping model.

Category	Type	Description
C4. CONNECTION TO SPATIAL POLICIES CONNECTION TO SPATIAL POLICIES	PIONEERING	Pushes for the creation of a spatial policy that does not yet exist, or attempts to set a structure in place that will act as a substitute, due to insufficient interest or access to resources by the state; usually occurs within a 'policy desert'.
	INSTRUCTIVE	Provides the foundation for building, improving or rectifying a spatial policy, in the present or the future.
	COUNTER	Contests, challenges and/or rejects an existing spatial policy, or the lack of one, as well as existing power structures; might try to forcefully create, change or replace a spatial policy against the will of decision-makers; unlike the 'pioneering' or 'instructive' type, it is instigated by external actions that are provoking a disabling environment and an adverse effect on the community.
C5. USE OF SPATIAL DATA PROCESSING TOOLS	ELEMENTARY	The community uses very simple and intuitive tools, such as manual drawing implements or GPS positioning devices; they rely entirely on external agents to formalize and codify the information recorded; the methodologies used by the community are simple as well.
	GUIDED	There is an externally-guided use of spatial data processing tools that are relatively complex; the tools are often digital, except for the most creative processes, which rely on manual albeit artistic material that nevertheless requires a certain level of expertise; there is more methodological involvement, often with several phases very different from each other.
	COMPLEX	The community uses complex tools on its own; external technical expertise might still be necessary for the most complicated aspects, especially if the project is ambitious, but the community would be able to fulfil their aims without it if it were necessary; there is usually a very involved methodological process, with the community devising ideas to best meet their aims and following through with them.

3.3. REALITY THROUGH THE LENS OF A CONCEPTUAL FRAMEWORK

The conceptual framework proposed explored in this part is a working tool, to be applied to case studies in conjunction with the typological framework, in order to decipher their minutiae and clarify their many aspects. The previously presented typological framework, although informed by the necessities of this research project, still claims a broader application to all community mapping processes, and the subjacent arguments – such as the community engagement vs. participation debate – might also know some applicability to other similar processes. The conceptual framework, on the other hand, is mostly dependent on paths formulated by the research objectives of this thesis. It aims firstly to understand the chosen case studies – community mapping processes – in their entirety, and secondly to build on that understanding in order to ask more complex, context-dependent questions during the empirical research phase.

The extensive literature review, the comprehensive keyword and thematic searches needed to build the first part of the working referential, and the concrete examples sought to characterize the previously proposed community mapping types have, by this point, provided several different avenues for exploration in a conceptual framework. Thus, this framework explores the theory previously presented when building the typological framework, and the emergent realities of the case studies.

The framework comprises three different levels: dimensions, categories and types, the latter only when applicable. Beyond their emergent realities, all of these are directly informed by the case study research design necessities, especially at the dimension level. 'Context', for instance, is an essential dimension for the characterization of case studies, as explained in the Methodology chapter; while the other four dimensions are determined by the research question – "How is local knowledge, harnessed and diffused through the use of spatial data processing tools, being transferred into spatial policies and asserting community governance within the sphere of decision making?" – and resulting keywords, as well as the three markers considered essential for the selection of case studies (Chapter 2). The 'Knowledge building' dimension corresponds to this study's main keyword 'local knowledge', and to the marker "i. Activity connected to local knowledge". The 'community engagement' dimension is an answer to the marker "ii. Dialogue with or within the knowledge-holding community", since to properly characterize the harnessing of local knowledge one must focus on the community and its involvement in the process. The 'Spatial policies' and the 'Spatial data processing tools' dimensions are direct matches with another two main keywords of this study, with the latter also corresponding to the marker iii. Production of a cartographic result.[18]

[18] The keyword 'community governance' is considered a different matter; it is partly represented both by 'Community engagement' and 'Spatial policies', and requires a more complex analysis that involves more than one dimension. More on this matter in Table 3.6 and Chapter 5.

3.3.1 EMERGENT REALITIES: FIVE DIMENSIONS

Dimension: Context

Characterizing the context of any case study is necessary to its analysis, as explained in Chapter 2. In a comprehensive multiple case study research, this dimension gains extra relevance through the possibility of gaining insight into existing trends. This includes the geographic distribution of existing community mapping cases, their evolution through time, common or differing groups of characteristics between the communities involved in the processes, or recurring themes from amongst the reasons presented for initiating a community mapping process and engaging or mobilizing the respective community.

Characteristics of the knowledge holding community

Descriptive keywords:

- community-led;
- creative/artistic;
- economically deprived;
- remote;
- rural/agro-extractive;
- youth-centred;
- youth-led;
- non-specific.

Necessity of the initiative

Focus keywords:

- citizen science;
- environmental concerns;
- gentrification;
- heritage;
- home evictions;
- informal settlements;
- land tenure;
- poverty;
- risk mitigation;
- school project;
- social housing;
- territorial conflict;
- territorial management;
- traditional/customary land use.

Thematic aggregator statements:

- mediate conflicts;
- reduce risk and vulnerability;
- document territorial presences, features or landmarks;
- document land tenure;

- defend/negotiate land tenure and land rights;
- reorganize territorial boundaries;
- adjust territorial management;
- create groundwork where there is none;
- create groundwork to negotiate claims;
- create groundwork to guide decisions;
- petition for infrastructures;
- navigate the decision-making sphere to obtain resources;
- seek partnerships for investment;
- validate the community's position regarding existing external threats;
- mobilize against external threats;
- increase community awareness on issues and threats;
- promote community cohesion and identity;
- capacitate the community for self-management;
- empower the community for self-advocacy/leadership;
- promote community engagement and capacitation;
- create/provide learning opportunities;
- preserve local heritage/knowledge;
- document local heritage;
- protect and negotiate the tenure/management of heritage/sacred sites;
- document traditional practices and costumary land use;
- share local knowledge;
- collect information on local issues;
- document the local context;
- document/identify local issues;
- document territorial transformations;
- validate local issues and concerns;
- reflect on the local context;
- create bridges between communities and formal entities.

Dimension: Knowledge building

The process of knowledge building within a community mapping initiative is multi-faceted. This dimension aggregates many different queries that aim to achieve a better understanding of it.

Role of local knowledge

It is important to ascertain the role of local knowledge within the process, and in relation to the knowledge-holding community. Three types of roles were determined:

- ‘Object of interest’ – the process aims to harness existing local knowledge amidst the knowledge-holding community;
- ‘Object of discovery’ – the process builds up or complements local knowledge amidst the (potential) knowledge-holding community;
- ‘Facilitator’ – the process uses the exploration of familiar physical surroundings to promote capacitation or to foster a sense of belonging, with the harnessing or building up of local knowledge as a by-product.

Background knowledge

This category questions whether the actors engaged have previous experience with similar processes, the process itself is informed by previous attempts or other cases, or the methodology follows existing community mapping guidelines.

Evaluation of the initiative

This category question whether there are short and long term evaluation processes associated to the initiative through content research. Short term evaluation includes determining if the initiative's objectives were accomplished, while long-term evaluation includes evaluation cycles, reports, reflection on the outcomes of the initiative, and discussion of a shared vision for the future.

Contributions

Two main types of contributions derived from community mapping initiatives are considered. The first is a contribution to a wider body of knowledge, through the production of guidelines and recommendations, or intention to replicate the initiative. The second is to community capacitation and empowerment, as per the involved agent's own perceptions.

Dimension: Community engagement

The relationships between the many different agents involved, and their different functions, are crucial for the understanding of community engagement in community mapping, and as a consequence for the understanding of community mapping itself.

Mapping agents

The following descriptors are used to provide a characterization of the agents involved in the mapping itself - the members of the knowledge-holding community, - through their relationship to the territory and to each other:

- people of the region;
- residents of the city/municipality;
- residents of areas with similar characteristics;
- residents of a circumscribed area;
- community leaders;
- community experts;
- local group or collectivity;
- community collectivities;
- stakeholders of the area;
- distinct ethno-linguistic/identitary groups.

Most descriptors roughly relay the amount of territory to which the mapping agents belong. Some, such as 'community leaders' or 'stakeholders of the area', express the relations of power and degrees of interest or knowledge about the territory that sets some agents apart.

The 'distinct ethno-linguistic/identitary groups' label, specifically, implies a more profound separation, at the identity level. This label is not applied to all instances in which the knowledge-

holding community is indigenous, as that characteristic, very common in community mapping initiatives, has already been typified and represented under the second category of the typological framework. Rather, it is necessary when the indigenous, other specific ethno-linguistic, or other minority/non-mainstream identities of the community undertaking the mapping are a factor in its coming together to harness local knowledge, or are used to differentiate between it and other communities in the implementation of initiatives.

Leaders of the initiative

Like the rest of this dimension, 'leaders of the initiative' classifies the agents that take the lead and start the process of implementation of a community mapping initiative regarding their positioning relatively to the knowledge-holding community.

- 'Local intra-community ' - the agents or entities taking initiative are part of or include members of the knowledge-holding community undertaking the mapping.
- 'Local non-community' - the agents or entities taking initiative are not part of the knowledge-holding community undertaking the mapping, but they are based on the same geographical area. They might have close ties to the community itself or might be relative strangers; either way, they have a strong understanding of the socioeconomic and geographical context in which the community lives
- 'Regional' - the agents or entities taking initiative are based on the wider geographical context of the initiative. They might have ties to community members, to other local agents or entities, or be unrelated to any of these; either way, the social, economic and geographical context in which the community lives is familiar to them.
- 'External' - the agents or entities taking initiative come from a geographical context that is external to that of the knowledge-holding community; they are either foreign, or based in the same country but not close enough to the community to be considered 'regional'.

Actor network

Looking into involvement in community mapping initiatives provides an overview of the types of agents engaged in ensuring that local knowledge is harnessed, but also into what these agents – together – can offer community mapping processes: namely, the polyvalence (degree of accumulation of different types of actors) of prevalent actor networks, or their resource, funding, and action weight.

It must be noted that 'engaged actors' is not automatically equivalent to 'knowledge-holding actors', 'mapping actors' or 'community'. While the agents that constitute the actor network might be directly involved in mapping activities and local knowledge harnessing, the actor network is a series of connections concerned with supporting the initiative itself. The sole exception is the 'governmental, antagonistic' type of agent; it is included in this section for the purpose of providing a clearer picture of human and institutional connections in initiatives that often have a component of territorial conflict. Governmental actors connected to the process in an antagonistic capacity are not considered contributors to the community mapping initiative per se, and thus fully part of the actor network of the initiative under the conception that is employed here.

- ‘Governmental, direct supportive role’;
- ‘Governmental, secondary role’;
- ‘Governmental, antagonistic’;
- ‘Supra-national/foreign’;
- ‘Governance, indigenous/traditional’;
- ‘Governance, other regional/local’;
- ‘Non-gov. intervention-oriented, global reach’;
- ‘Non-gov. intervention-oriented, national to local’;
- ‘Non-gov. research-oriented, global reach’;
- ‘Non-gov. research-oriented, multinational to local’;
- ‘Other collectivities, regional to local’.

Basis for dialogue construction

The basis for dialogue construction is a form of classifying the debate and information flow happening within a community mapping initiative, with the community itself as the reference point.

- ‘Locals’ - several local people or collectives, who either did not know each other beforehand or were acquainted but might not have chosen to meet spontaneously, come together temporarily (i.e. in a workshop). It can be said a sense of belonging emerges during the mapping initiative. This type of interaction appears in processes located at the boundary between collective mapping and community mapping.
- ‘Nexus’ - an external, local but not intra-community, or intra-community (each of these three might elicit different debates) trained team interviews community members one at a time to create the product of the mapping process. Within this type, leadership matters, because the agents taking initiative are also the nexus of the dialogue and their views of reality condition the knowledge harnessed; i.e., the simpler the interviews, the simpler the map.
- ‘Researchers’ - a small team (local but not necessarily intra-community) or small part of the community to whom the land is familiar gathers together and decides, or is trained, to go around, observe, take measurements, georeference places, use spatial data processing tools, and/or build up the local knowledge of an area to which they at least partially belong, in order to create or update cartographic information.
- ‘Group’ - a small, cohesive, externally trained or self-made, intra-community or local group or collective already in existence which knows the area (well or not so well) creates the cartographic product.
- ‘Teams’ - the community organizes or is organized into smaller units and each contributes to a part of the map (condition: each part is not complete on its own, otherwise each deployment of a ‘team’ would be a process in itself); one of the teams within the community, or all of them, might have been capacitated to help conduct the project.
- ‘Local experts’ - a small group of members, who are identified as the most knowledgeable regarding the issue at hand, come together in a workshop to create the map (guided or not).

- ‘Community’ - the whole community, or at least a significant percentage of people and community groups willing to meet (i.e. during a workshop or activity) is involved in the harnessing of local knowledge. A team (external or within the community) or the whole community might have been capacitated to help conduct the project.
- ‘Delegation’ - representatives of different communities come together to discuss the matter at hand and undertake the necessary work; the representatives might have been capacitated to help conduct the project.
- ‘Coalition’ - several different communities come together in the same workshop or event to discuss the matter at hand and undertake the necessary work; a team within the communities, or the whole communities, might have been capacitated to help conduct the project.

Process management

Regarding the management of the process, it was deemed pertinent to ascertain what the community’s level of agency was in determining its specificities, regarding process flow, tools, or objectives. Three types were used:

- ‘Pre-determined’ by agents external to the community;
- ‘Self-determined’ by the community;
- ‘Collaborative’ between all involved agents.

Dimension: Spatial policies

The fourth dimension pertains to the connection (or lack of it) between initiatives and the formal decision-making sphere, looking into several details.

Actors’ aspirations to exert influence over spatial policies

Not all community mapping initiatives are connected to existing spatial policy, although they have the potential to form that connection and to inform policies that do not yet exist. A category was created specifically determine which initiatives have a connection, at the time of their implementation, to actual policies and decisions, these having been directly referenced by the agents involved in the initiative. This is an important category, as it allows for the distinction, in the cross analysis, between these initiatives and those which do not have a connection to actual policy, or to those that are succeeding in being assimilated into policy (as aspirations are different from success).

Integration into existing spatial policies

This category aims to typify processes that are close to being assimilated or have been assimilated into official spatial policy and decision making, as follows:

- ‘Unrelated’ to any existing spatial policies
    - theoretically, a connection might be imagined between the initiative and current policies or hypothetical future policies;
    - however, in the present, there is no solid link to any current spatial policy, such as an expressed belied by an involved agent that the initiative will serve to

influence spatial policy, or mention of a possible connection in published documents.

- 'Potential' contribution to official policy
  - a result of non-governmental instructive – groundwork or research-oriented – processes, counter mapping, or pioneering processes;
  - in these processes, led by non-governmental entities, the main actors either express a belief that the process has the potential to inform future policies that focus on the same area, propose policy adjustments, or draft policy proposals and management plans;
  - although nothing points towards the process having been integrated into a formal framework, sometimes it is mentioned or implied that governmental entities are receptive.
- 'Integrated' into official policy
  - a result of non-governmental instructive processes, counter-mapping processes, or pioneering processes;
  - in these processes, led by non-governmental entities, the results of the process reach the decision-making sector and stand in for formal phases of policy-making;
  - this can be a form of countering and adjusting harmful policies, or the lack of effective policies regarding basic rights and services;
  - in pioneering cases, governmental entities might have been informed about the existence of the process all along and tacitly regarded it as if part of official policy, due to lack of knowledge or resources to achieve the same results; these are instances in which there is a legal/policy void or grey area, such as large informal settlements or the first processes for attribution of indigenous land titles.
- 'Formal', or governmental, and thus already part of official policy
  - a result of instructive processes.

<u>Phases of policy-making facilitated or substituted by the initiative</u>

Community mapping processes can serve different functions, in what concerns policy making. These include:

- 'Documenting' – "What exists here?"
  - actors are trying to understand a given context and acquire basic and often previously inexistent information;
  - there might or might not be an intervention in mind.
- 'Diagnosing' – "What exactly are the problems?"
  - actors recognise there is a problem or need for intervention regarding a given context;
  - mapping is used to monitor the situation that requires an intervention, determine which problems exist from the onset, identify opportunities, or test possible methodologies.
- 'Consulting' – "What is the community's opinion on what should be done?"

- there is a policy or intervention in mind and basic information about the place has already been acquired
- either the opinion of the community is sought regarding the intervention, even if they are not going to participate in decision-making; or a policy is being pushed forward, and local communities are being legally consulted through community mapping processes;
- also occurs during viability studies or to iron out the specificities of the place;
- this stage is skipped when the intention is to let the community collaborate in defining the intervention (or when there is no intention of letting them decide anything).

⌖ 'Drafting' – "How are we going to intervene?"
- the policy or intervention strategy is being redacted;
- local communities carry out community mapping processes to iron out the specificities of the intervention, or sketch over previously concluded maps.

⌖ 'Intervening' – "Can we use mapping to facilitate the intervention and achieve change?"
- the mapping process is part of an intervention strategy;
- common in initiatives working towards reducing poverty/uncertainty, promoting community engagement, and affirming local identities.

⌖ 'Adjusting' – "Should we change this policy/regulation?"
- employed when adjustments to an existing spatial policy - resource allocation, land-use regulations, etc. are needed.

Dimension: Spatial Data Processing Tools

The fifth dimension focuses on the use of the aforementioned tools by the mapping agents of the knowledge-holding community, and their cartographic products.

Tools used during the initiative

The identification of tools used during the initiative by the mapping, knowledge-holding community members includes several forms of manual tools, digital tools, and devices:

- stationery/drawing material;
- physical markers/stickers;
- modelling material;
- projections/presentation of information (hand-drawn, printed, or through laptops and other devices);
- community documents (legal documents such as those pertaining to land tenure and property, or documents related to heritage, tradition, and customs, such as old photos);
- geographic data (data used to inform the mapping, i.e. elevation values to construct a 3D model);
- printed surveys (blank);
- printed base maps;
- printed aerial/satellite images;
- base 3D model;
- photographic cameras;
- sound recorders;

- video cameras ;
- aerial devices;
- GPS devices;
- phones/tablets/apps;
- computers;
- GIS software;
- online geographic platforms.

Products of spatial data compilation accessible after the initiative

Four types of cartographic products are considered:

- 'Visual' elements - photos, drawings, sensory/mind/conceptual maps, hand-drawn maps, handmade 3D models, mood boards, collages, artistic presentations and products, videos, animations;
- 'Data' elements - tables with georeferenced data points, textual descriptions of space-related activities, reports, atlas;
- 'Cartographic' visual elements (per se) - accurate (digital) cartography and 3D models;
- 'Interactive' cartographic elements - cartography available for edition, new geo-referenced platforms, contributions to Geographic Information Systems.

Additionally, data is queried on whether the community had the help of a technical team to formalize the information collected into a final cartographic product.

3.3.2 A CONCEPTUAL FRAMEWORK FOR THE ANALYSIS OF COMMUNITY MAPPING PROCESSES

The condensed conceptual framework is presented in Table 3.6. Along with its dimensions and categories, the forms of analysis sought through its organization are described. All respective results, unless otherwise stated, are presented in Chapter 4.2.

Table 3.6: Proposed conceptual framework for community mapping processes.

Dimension	Category	Description: analysis sought, types, themes
D1. CONTEXT	**I.** GEOGRAPHIC DISTRIBUTION	➢ Analysis of the initiative's country of origin.
	II. TEMPORAL EVOLUTION	➢ Analysis of the initiative's starting and ending date (in years).
	III. CHARACTERISTICS OF THE KNOWLEDGE-HOLDING COMMUNITY	➢ Demographic description of the knowledge-holding community(ies), when available, through thematic analysis. Keywords: o community-led o creative/artistic o economically deprived o remote o rural/agro-extractive o youth-centred o youth-led o non-specific
	IV. NECESSITY OF THE INITIATIVE	➢ Justification for initiating the process and engaging the community. Keywords: o citizen science o environmental concerns o gentrification o heritage o home evictions o informal settlements o land tenure o poverty o risk mitigation o school project o social housing o territorial conflict o territorial management o traditional/customary land use ➢ Thematic grouping of the primary necessity of the initiative, through the use of thematic aggregator statements.
D2. KNOWLEDGE BUILDING	**I.** ROLE OF LOCAL KNOWLEDGE	➢ Analysis of the role of local knowledge within the process and in relation to the knowledge-holding community. Types: ⌖ FACILITATOR ⌖ OBJECT OF DISCOVERY ⌖ OBJECT OF INTEREST
	II. BACKGROUND KNOWLEDGE	➢ Determination and analysis of whether the actors engaged have previous experience with similar processes, the process itself is informed by previous attempts or other cases, or the methodology follows existing community mapping guidelines.
	III. EVALUATION OF THE INITIATIVE	➢ Analysis of short and long term evaluation processes associated to the initiative through content research.
	IV. CONTRIBUTIONS	➢ Determination and analysis of contributions to a wider body of knowledge: production of guidelines and recommendations, or intention to replicate the initiative. ➢ Determination and analysis of contributions to community capacitation and empowerment, through the involved agent's own perceptions.

Table 3.6 (cont.): Proposed conceptual framework for community mapping processes.

Dimension	Category	Description: analysis sought, types, themes
D3. COMMUNITY ENGAGEMENT	**I.** MAPPING AGENTS	➢ Characterization and analysis according to descriptors: o people of the region o residents of the city/municipality o residents of areas with similar characteristics o residents of a circumscribed area o community leaders o community experts o local group or collectivity o community collectivities o stakeholders of the area o distinct ethno-linguistic/identitary groups
	II. LEADERS OF THE INITIATIVE	➢ Characterization and analysis according to types. ⌖ LOCAL INTRA-COMMUNITY AGENTS ⌖ LOCAL NON-COMMUNITY AGENTS ⌖ EXTERNAL AGENTS
	III. ACTOR NETWORK	➢ Characterization and analysis according to types. ⌖ GOVERNMENTAL, DIRECT SUPPORTIVE ROLE ⌖ GOVERNMENTAL, SECONDARY ROLE ⌖ GOVERNMENTAL, ANTAGONISTIC ⌖ GOVERNMENTAL, SUPRA-NATIONAL/FOREIGN ⌖ GOVERNANCE, INDIGENOUS/TRADITIONAL ⌖ GOVERNANCE, OTHER REGIONAL/LOCAL ⌖ NON-GOV. INTERVENTION-ORIENTED, GLOBAL REACH ⌖ NON-GOV. INTERVENTION-ORIENTED, NATIONAL TO LOCAL ⌖ NON-GOV. RESEARCH-ORIENTED, GLOBAL REACH ⌖ NON-GOV. RESEARCH-ORIENTED, MULTINATIONAL TO LOCAL ⌖ OTHER COLLECTIVITIES, REGIONAL TO LOCAL ➢ Determination of average capacity of actor networks for mobilization of resources, funding and action, using weighted averages for the different types of agents.
	IV. BASIS FOR DIALOGUE CONSTRUCTION	➢ Characterization and analysis according to types: ⌖ LOCALS ⌖ NEXUS ⌖ RESEARCHERS ⌖ GROUP ⌖ TEAMS ⌖ LOCAL EXPERTS ⌖ COMMUNITY ⌖ DELEGATION ⌖ COALITION
	V. PROCESS MANAGEMENT	➢ Characterization and analysis according to types. ⌖ PRE-DETERMINED ⌖ SELF-DETERMINED ⌖ COLLABORATIVE
	VI. THE AGENTS FIGHTING (FOR) SPATIAL POLICIES	**Complex query (chapter 5.2):** **D4.I.** ACTORS'S ASPIRATIONS TO EXERT INFLUENCE OVER SPATIAL POLICIES **D4.II.** INTEGRATION INTO EXISTING SPATIAL POLICY + **D3.II** LEADERS OF THE INITIATIVE **D3.III** ACTOR NETWORK **D2.II** BACKGROUND KNOWLEDGE

Table 3.6 (cont.): Proposed conceptual framework for community mapping processes.

Dimension	Category	Description: analysis sought, types, themes
D4. SPATIAL POLICIES	**I.** ACTORS'S ASPIRATIONS TO EXERT INFLUENCE OVER SPATIAL POLICIES	➢ Determination of whether actors involved in community mapping express a desire to influence or promote present-day policies and decisions that affect them and the territory they occupy.
	II. INTEGRATION INTO EXISTING SPATIAL POLICY	➢ Characterization according to types. Success of initiatives in challenging/serving policy making: ⌖ POTENTIAL ⌖ INTEGRATED ⌖ FORMAL
	III. PHASES OF POLICY-MAKING FACILITATED OR SUBSTITUTED BY THE INITIATIVE	➢ Characterization according to types. Degree of substitution of initiatives to other processes and institutional actors in policy-making: ⌖ DOCUMENTING – "What exists here?" ⌖ DIAGNOSING – "What exactly are the problems?" ⌖ CONSULTING – "What is the community's opinion on what should be done?" ⌖ DRAFTING – "How are we going to intervene?" ⌖ INTERVENING – "Can we use mapping to facilitate the intervention and achieve change?" ⌖ ADJUSTING – "Should we change this policy/regulation?"
	IV. CONCRETE INFLUENCE OF COMMUNITY MAPPING INITIATIVES OVER SPATIAL POLICIES	**Cross analysis (chapter 5, introduction):** analysis of success in the assimilation of community mapping into spatial policies and the formal sphere of decision making. Includes: **D4.I.** ACTORS'S ASPIRATIONS TO EXERT INFLUENCE OVER SPATIAL POLICIES + **D4.II.** INTEGRATION INTO EXISTING SPATIAL POLICY
	V. PERCEPTIONS OF SATISFACTORY PROCESSES AND DESIRED OUTCOMES	**Cross analysis (chapter 5.3):** analysis of involved agents' perceptions regarding satisfactory processes and desired outcomes. Includes: **D4.I.** ACTORS'S ASPIRATIONS TO EXERT INFLUENCE OVER SPATIAL POLICIES **D4.II.** INTEGRATION INTO EXISTING SPATIAL POLICY + **D4.I.** ACTORS'S ASPIRATIONS TO EXERT INFLUENCE OVER SPATIAL POLICIES: PERCEPTIONS **D2.IV** CONTRIBUTIONS: TO CAPACITATION AND EMPOWERMENT

Table 3.6 (cont.): Proposed conceptual framework for community mapping processes.

Dimension	Category	Description: analysis sought, types, themes
D5. SPATIAL DATA PROCESSING TOOLS	**I.** TOOLS USED DURING THE INITIATIVE	➢ Description, characterization and analysis of the several different tools used by mapping and knowledge-holding members of the community. ➢ Analysis of the transference potential of the tool set used by the community, through the use of weighted averages.
	II. PRODUCTS OF SPATIAL DATA COMPILATION ACCESSIBLE AFTER THE INITIATIVE	➢ Characterization and analysis according to types: ⌖ VISUAL ⌖ DATA ⌖ CARTOGRAPHIC ⌖ INTERACTIVE ➢ Identification and analysis of the technical help received to formalize the cartographic product.
	III. CAPACITY OF SPATIAL DATA PROCESSING TOOLS FOR DISSEMINATING LOCAL KNOWLEDGE	**Cross analysis (chapter 5.1):** analysis of the concrete capacity of spatial data processing tools for disseminating local knowledge in spatial policies and within the formal decision-making sphere. Includes: **D4.I.** ACTORS'S ASPIRATIONS TO EXERT INFLUENCE OVER SPATIAL POLICIES **D4.II.** INTEGRATION INTO EXISTING SPATIAL POLICY + **D5.I.** TOOLS USED DURING THE INITIATIVE **D5.II.** PRODUCTS OF SPATIAL DATA COMPILATION ACCESSIBLE AFTER THE INITIATIVE

4. Case study research

In this Chapter, the theoretical referential previously constructed is applied to the analysis of community mapping case studies. This case study research presents the characteristics described in the methodology chapter: it is a collective or multiple case study research, employs mixed methods based on a qualitative comparative analysis, and makes use of case studies selected according to three markers: i. Activity connected to local knowledge; ii. Dialogue with or within the knowledge-holding community; iii. Production of a cartographic result.

Each case study was pieced together from diverse testimonies, from published literature to social and local media. It was verified that each of these occurrences often groups several different initiatives, usually because they were implemented at the same time, with similar methods and results. Therefore, all results obtained from the analysis of cases studies are presented taking into account not the case studies themselves, but the number of initiatives included in them, in order to present a more accurate, weighted view of reality. With this in mind, this study always refers to a total number of 961 initiatives. This large number is one important factor in making possible the quantitative methods that can be used associated to a comparative qualitative research, and lends credence to the validation of results in the comparison between concepts. The use of initiatives, instead of cases, as the basic unit for analysis also corrects a bias found early on, pertaining to the disparity, in terms of dimension and impact, between single implementation cases and multiple implementation cases.

Table 4.1: Total number of occurrences and initiatives analysed.

Total nr. of cases	230
Total nr. of initiatives	961

The search for case studies was conducted in a systematic manner, with the intention of gathering enough examples to provide a clear view of the state of community mapping worldwide. One bias that could not be corrected, however, concerns the language barrier in research. As the search and collection of suitable source materials relied on keywords, the analysis favors a limited set of languages, namely English, Spanish and Portuguese. It is hoped, however, that the use of English as a global language helps to offset the disparity between cases found and the distribution of existing cases.

The first part of this chapter (section 4.1) focuses on the application of the typological framework to case studies, according to its different categories. The results per category are presented, as well as compound results that combine the different types of the typological framework and reflect on their prevalence. The second part, more extensive, provides the application of the conceptual framework to case studies, also according to its different dimensions and categories, but with the particularity of filtering it through the typological framework. In each section, absolute values are provided for each category and then explored according to the different categories proposed by the typological framework; the different conceptual categories of the same dimension are also intersected for data extraction.

4.1. COMMUNITY MAPPING INITIATIVES: A TYPOLOGICAL PERSPECTIVE

A typological classification using the typological framework previously presented does not provide many details – which, instead, are meant to be collected through an analysis using the conceptual framework. The typological framework is a tool designed to fulfil two important purposes: first, to condense the essence of community mapping cases being implemented, allowing the researcher, decision-maker or community leader to conduct a quick appraisal of their specific needs or to evaluate an already implemented process; secondly, it is the lens that filters all the specific information acquired by means of the conceptual framework, an analysis which is presented in section 4.2.

This section focuses solely on the application of the typological framework to all case studies, providing an analysis per number of initiatives and comments regarding key results. The case studies were analysed in Microsoft Excel, using pivot tables. In table 4.2, for each type within each category, the total number and frequency relative to the total number of initiatives collected was determined. Then, for each case, a string key comprised of a concatenation of its five different type classifications was assembled; the total number, and frequency relative to the total number of initiatives collected, was determined, and ordered from the largest number of occurrences to the smallest (Table 4.3). Afterwards, the same string key was used to determine, for each type of each category, the most prevalent combination of types within the rest of the categories were determined (Tables 4.4 to 4.8).

Analysis per category and type: some considerations

In what concerns the aim of the initiative, we can see that external recognition, community capacitation and resource attraction lead in detriment of local-based research, a type associated to citizen science and forms of data collection more focused on the physical and less on the ethnographic. In fact, if we look to Table 4.2 and consider that the combined type 'external recognition; community capacitation' is also very representative, these two keywords become the most important.

Regarding the types of knowledge-holding community, it is also visible that the 'urban2' type - associated to well-established urban contexts, which adequately meet the basic needs of the community, and in which mapping initiatives typically seek a higher level of development as well as social, cultural and scientific improvement - is the least common one. Both non-urban types of community - the more general type and the indigenous type, - and the 'urban1' type - communities living in contexts in need of structural improvement, - on the other hand, are rather prevalent. These are communities that seek: infrastructures, recognition, and skills with which to defend themselves; and although not all are associated to contexts of deprivation, many deal with matters of justice and identity. As an example, the most representative type combinations shown in Table 4.5 for indigenous knowledge-holding communities all feature external recognition and counter mapping in what concerns their aim and their connection to spatial policies. While for the rest motivations are not as apparent, the analysis derived from the

first dimension of the conceptual framework ('Context') delves into stimuli and necessity of initiatives in more detail.

In the category of community engagement, the representativity of different types is balanced, and expected. As seen before, a large part of community mapping initiatives is also defined as participatory, devised by many different institutional agents to engage local communities. The instances in which there is a fuller partnership (collaboration) between agents from the local community and external agents are fewer; while the number of initiatives that can claim grassroots status, which occur when local agents take the lead and can be considered the primary managers of the process, are fewer still - possibly due to the greater difficulties that local agents feel in mobilizing resources on their own. Nevertheless, there is no large gap between these three levels or types.

The same cannot be said for the types of connections to spatial policies, but it should be remarked that the pioneering type is, in itself, an exceptional status per its own definition. It is uncommon to find cases which involve a 'planning desert' so comprehensive that the population and local collectivities feel the need to take matters into their own hands, in terms of action and even methodology. Even counter-mapping processes react to something which exists; it might be a disabling environment, and policy which is not in the best interest of the residents and people of the region, but it exists. The two types other than pioneering - instructive and counter - have almost equal representation amongst initiatives.

Finally, we find a gradation in complexity of tool use, which is also not surprising. Considering that many processes have been implemented amongst communities with no expertise on these tools, and sometimes not even on most devices that can be used for mapping, it is expected that a large majority of initiatives depends on an elementary use of spatial data processing tools. What is surprising is that the complexity of tool use varies significantly from one type of community to the other, as can be seen in table 4.8. Complex tool use can be found in indigenous grassroots processes as well as urban2 collaborative ones, for instance. This is further explored through the conceptual framework, but a summarized explanation involves the fact that the agents with most expertise of the actor network involved in the mapping initiative, which might or might not be counted amongst the mapping agents, often determine the flow of the process, including which tools are used; the agents with undertake the mapping are typically provided with training in order to be able to use the tools and methodologies selected.

Table 4.2: Distribution of occurrences per type.

Category	Type	Nr. initia-tives	% of Total
C1 Aim of the initiative	external recognition	289	30.07%
	resource attraction	220	22.89%
	community capacitation	207	21.54%
	external recognition; community capacitation	196	20.40%
	community capacitation; local-based research	17	1.77%
	local-based research	13	1.35%
	community capacitation; resource attraction	10	1.04%
	external recognition; local-based research	5	0.52%
	external recognition; resource attraction	4	0.42%
	Total	**961**	**100.00%**
C2 Knowledge-holding community	indigenous	486	50.57%
	urban1	225	23.41%
	non-urban	173	18.00%
	urban2	77	8.01%
	Total	**961**	**100.00%**
C3 Community engagement	participatory	445	46.31%
	collaborative	305	31.74%
	grassroots	211	21.96%
	Total	**961**	**100.00%**
C4 Connection to spatial policies	counter	431	44.85%
	instructive	392	40.79%
	pioneering	138	14.36%
	Total	**961**	**100.00%**
C5 Use of spatial data processing tools	elementary	520	54.11%
	guided	298	31.01%
	complex	143	14.88%
	Total	**961**	**100.00%**

Table 4.3: Combinations of types of community mapping initiatives, ordered by prevalence of occurrences.

Category: **C1** **Aim of the initiative**	Category: **C2** **Knowledge-holding community**	Category: **C3** **Community engagement**	Category:**C4** **Connection to spatial policies**	Category:**C5** **Use of spatial data processing tools**	**Nr. initia-tives**	**% of total**
external recognition; community capacitation	indigenous	grassroots	counter	complex	120	12.49%
resource attraction	urban1	participatory	pioneering	elementary	114	11.86%
external recognition	non-urban	participatory	counter	elementary	67	6.97%
resource attraction	urban1	collaborative	instructive	guided	61	6.35%
external recognition	indigenous	participatory	counter	elementary	45	4.68%
external recognition	indigenous	grassroots	counter	guided	42	4.37%
external recognition	indigenous	participatory	instructive	elementary	34	3.54%
external recognition	indigenous	collaborative	counter	elementary	32	3.33%
community capacitation	non-urban	participatory	instructive	guided	32	3.33%
resource attraction	indigenous	participatory	instructive	elementary	29	3.02%
community capacitation	indigenous	collaborative	instructive	elementary	24	2.50%
external recognition	indigenous	collaborative	instructive	elementary	22	2.29%
community capacitation	urban2	grassroots	instructive	guided	22	2.29%
community capacitation	indigenous	collaborative	instructive	guided	21	2.19%
community capacitation	non-urban	participatory	instructive	elementary	18	1.87%
external recognition; community capacitation	indigenous	participatory	instructive	guided	17	1.77%
community capacitation	indigenous	collaborative	counter	elementary	14	1.46%
external recognition; community capacitation	non-urban	collaborative	counter	elementary	14	1.46%
external recognition	urban1	collaborative	pioneering	elementary	13	1.35%
community capacit.; local-based research	indigenous	participatory	counter	guided	12	1.25%
community capacitation	urban2	participatory	instructive	guided	11	1.14%
external recognition	non-urban	collaborative	counter	elementary	10	1.04%
external recognition; community capacitation	indigenous	collaborative	counter	elementary	10	1.04%
external recognition; community capacitation	non-urban	collaborative	counter	guided	10	1.04%
external recognition	indigenous	participatory	counter	guided	9	0.94%
community capacitation	urban2	collaborative	instructive	guided	9	0.94%
community capacitation	urban2	participatory	instructive	elementary	7	0.73%
Other combinations					142	15.78%
Total					**961**	**100.00%**

Table 4.4: For each type of the category 'Aim of the initiative', most prevalent combinations of characteristics (other types) of community mapping initiatives.

Category: **C1 Aim of the initiative**	Category: **C2 Knowledge-holding community**	Category: **C3 Community engagement**	Category: **C4 Connection to spatial policies**	Category: **C5 Use of spatial data processing tools**	**Nr. initia-tives**	**% of total**
Type: **External recognition**	non-urban	participatory	counter	elementary	67	7.0%
	indigenous	participatory	counter	elementary	45	4.7%
	indigenous	grassroots	counter	guided	42	4.4%
	Other combinations				135	14.0%
	Partial total				**289**	**30.1%**
Type: **Resource attraction**	urban1	participatory	pioneering	elementary	114	11.9%
	urban1	collaborative	instructive	guided	61	6.3%
	indigenous	participatory	instructive	elementary	29	3.0%
	Other Combinations				16	1.7%
	Partial total				**220**	**22.9%**
Type: **Community capacitation**	non-urban	participatory	instructive	guided	32	3.3%
	indigenous	collaborative	instructive	elementary	24	2.5%
	urban2	grassroots	instructive	guided	22	2.3%
	Other Combinations				129	13.4%
	Partial total				**207**	**21.5%**
Type: **External recognition; community capacitation**	indigenous	grassroots	counter	complex	120	12.5%
	indigenous	participatory	instructive	guided	17	1.8%
	non-urban	collaborative	counter	elementary	14	1.5%
	Other Combinations				45	4.7%
	Partial total				**196**	**20.4%**
Type: **Community capacitation; local-based research**	indigenous	participatory	counter	guided	12	1.2%
	urban2	participatory	instructive	elementary	4	0.4%
	indigenous	collaborative	instructive	elementary	1	0.1%
	Partial total				**17**	**1.8%**
Type: **Local-based research**	indigenous	collaborative	instructive	complex	5	0.5%
	non-urban	participatory	instructive	guided	2	0.2%
	urban2	participatory	instructive	guided	2	0.2%
	Other Combinations				4	0.4%
	Partial total				**13**	**1.4%**
Type: **Community capacitation; resource attraction**	urban1	grassroots	pioneering	elementary	4	0.4%
	urban1	collaborative	instructive	guided	2	0.2%
	urban2	grassroots	instructive	elementary	1	0.1%
	Other Combinations				3	0.3%
	Partial total				**10**	**1.0%**
Type: **External recogn.; local-based research**	indigenous	participatory	counter	elementary	5	0.5%
	Partial total				**5**	**0.5%**
Type: **External recognition; resource attraction**	urban1	participatory	pioneering	guided	3	0.3%
	non-urban	collaborative	counter	elementary	1	0.1%
	Partial total				**4**	**0.4%**
Total					**961**	**100.00%**

Table 4.5: For each type of the category 'Knowledge-holding community', most prevalent combinations of characteristics (other types) of community mapping initiatives.

Category: **C2 Knowledge-holding community**	Category: **C1 Aim of the initiative**	Category: **C3 Community engagement**	Category: **C4 Connection to spatial policies**	Category: **C5 Use of spatial data processing tools**	**Nr. initia-tives**	**% of total**
Type: **Indigenous**	external recogn.; community capacitation	grassroots	counter	complex	120	12.5%
	external recognition	participatory	counter	elementary	45	4.7%
	external recognition	grassroots	counter	guided	42	4.4%
	Other combinations				279	29.0%
	Partial total				**486**	**50.6%**
Type: **Urban1**	resource attraction	participatory	pioneering	elementary	114	11.9%
	resource attraction	collaborative	instructive	guided	61	6.3%
	external recognition	collaborative	pioneering	elementary	13	1.4%
	Other combinations				37	3.8%
	Partial total				**225**	**23.4%**
Type: **Non-urban**	external recognition	participatory	counter	elementary	67	7.0%
	community capacitation	participatory	instructive	guided	32	3.3%
	community capacitation	participatory	instructive	elementary	18	1.9%
	Other combinations				56	5.8%
	Partial total				**173**	**18.0%**
Type: **Urban2**	community capacitation	grassroots	instructive	guided	22	2.3%
	community capacitation	participatory	instructive	guided	11	1.1%
	community capacitation	collaborative	instructive	guided	9	0.9%
	Other combinations				35	3.7%
	Partial total				**77**	**8.0%**
Total					**961**	**100%**

Table 4.6: For each type of the category 'Community engagement', most prevalent combinations of characteristics (other types) of community mapping initiatives.

Category: **C3 Community engagement**	Category: **C1 Aim of the initiative**	Category: **C2 Knowledge-holding community**	Category: **C4 Connection to spatial policies**	Category: **C5 Use of spatial data processing tools**	**Nr. initia-tives**	**% of total**
Type: **Participatory**	resource attraction	urban1	pioneering	elementary	114	11.9%
	external recognition	non-urban	counter	elementary	67	7.0%
	external recognition	indigenous	counter	elementary	45	4.7%
	Other combinations				219	22.7%
	Partial total				**445**	**46.3%**
Type: **Collaborative**	resource attraction	urban1	instructive	guided	61	6.3%
	external recognition	indigenous	counter	elementary	32	3.3%
	community capacit.	indigenous	instructive	elementary	24	2.5%
	Other combinations				188	19.6%
	Partial total				**305**	**31.7%**
Type: **Grassroots**	external recogn.; community capacit.	indigenous	counter	complex	120	12.5%
	external recognition	indigenous	counter	guided	42	4.4%
	community capacit.	urban2	instructive	guided	22	2.3%
	Other combinations				27	2.8%
	Partial total				**211**	**22.0%**
Total					**961**	**100%**

Table 4.7: For each type of the category 'Connection to spatial policies', most prevalent combinations of characteristics (other types) of community mapping initiatives.

Category: **C4 Connection to spatial policies**	Category: **C1 Aim of the initiative**	Category: **C2 Knowledge-holding community**	Category: **C3 Community engagement**	Category: **C5 Use of spatial data processing tools**	**Nr. initia-tives**	**% of total**
Type: **Counter**	external recognition; community capacit.	indigenous	grassroots	complex	120	12.5%
	external recognition	non-urban	participatory	elementary	67	7.0%
	external recognition	indigenous	participatory	elementary	45	4.7%
	Other combinations				199	20.7%
	Partial total				**431**	**44.8%**
Type: **Instructive**	resource attraction	urban1	collaborative	guided	61	6.3%
	external recognition	indigenous	participatory	elementary	34	3.5%
	community capacit.	non-urban	participatory	guided	32	3.3%
	Other combinations				265	27.7%
	Partial total				**392**	**40.8%**
Type: **Pioneering**	resource attraction	urban1	participatory	elementary	114	11.9%
	external recognition	urban1	collaborative	elementary	13	1.4%
	community capacit.; resource attraction	urban1	grassroots	elementary	4	0.4%
	Other combinations				7	0.7%
	Partial total				**138**	**14.4%**
Total					**961**	**100%**

Table 4.8: For each type of the category 'Use of spatial data processing tools, most prevalent combinations of characteristics (other types) of community mapping initiatives.

Category: **C5 Use of spatial data processing tools**	Category: **C1 Aim of the initiative**	Category: **C2 Knowledge-holding community**	Category: **C3 Community engagement**	Category: **C4 Connection to spatial policies**	**Nr. initia-tives**	**% of total**
Type: **Elementary**	resource attraction	urban1	participatory	pioneering	114	11.9%
	external recognition	non-urban	participatory	counter	67	7.0%
	external recognition	indigenous	participatory	counter	45	4.7%
	Other combinations				294	30.6%
	Partial total				**520**	**54.1%**
Type: **Guided**	resource attraction	urban1	collaborative	instructive	61	6.3%
	external recognition	indigenous	grassroots	counter	42	4.4%
	community capacitation	non-urban	participatory	instructive	32	3.3%
	Other combinations				163	17.0%
	Partial total				**298**	**31.0%**
Type: **Complex**	external recognition; community capacitation	indigenous	grassroots	counter	120	12.5%
	local-based research	indigenous	collaborative	instructive	5	0.5%
	community capacitation	urban2	collaborative	instructive	3	0.3%
	Other combinations				15	1.6%
	Partial total				**143**	**14.9%**
Total					**961**	**100%**

4.2. THE CONCEPTUAL DIMENSIONS OF COMMUNITY MAPPING

Due to its use of a collective case study research design involving a large number of cases, this study foregoes the common practice of characterizing the context of each case study individually, as explained in Chapter 2. Instead, the case studies are characterized collectively, using the dimensions and categories of the conceptual framework proposed in Chapter 3. This conceptual framework, which incorporates the emergent dimensions and categories that occur in the analysis itself, in an interplay between theoretical and empirical work, is detailed enough to provide a characterization and analysis of the intricacies of community mapping cases, while at the same time pointing out their similarities and thus allowing for the comparative analysis between qualitative aspects and concepts.

Thus, this section focuses on the application of each dimension of the conceptual framework to all case studies, providing an analysis per number of initiatives, further filtered through the lens of the typological framework, and comments regarding key results. For ease of reading, categories and types pertaining to the typological framework are prefixed with the designation 'tf', while dimensions, categories, types and descriptors that belong to the conceptual framework use the prefix 'cf'.

4.2.1 THE CONTEXT OF COMMUNITY MAPPING INITIATIVES

Presenting the context of community mapping initiatives through collective means requires a detailed analysis of their general characteristics and boundaries. For this reason, the 'cf.D1.Context' dimension of the conceptual framework is divided into four different categories: geographic distribution, temporal evolution, characteristics of the knowledge-holding community, and necessity of the initiative.

4.2.1.1 Context: geographic distribution

Although there is a large number of countries – fifty-five – represented in this study, that representation is dominated by the topmost of the list: Indonesia, India, Brazil, Tanzania, and Democratic Republic of Congo (Figure 4.9). This is not a coincidence, in the sense that it just does not simply happen that many different communities and entities spontaneously, and separately, decide to conduct community mapping processes in these specific countries. Rather, it is not uncommon that giant 'community mapping machines' establish themselves, through opportunity and circumstance, and move into uncharted territory fearlessly, each success enabling the next initiative. There are many factors leading to this, such as NGOs with international reach, funding, and tried and tested community mapping methodologies taking an interest, or communities with pressing aims and needs hearing of nearby successes, or unjust legislation spurring nation-wide action. Some of these factors will be further explored throughout this section's conceptual analysis.

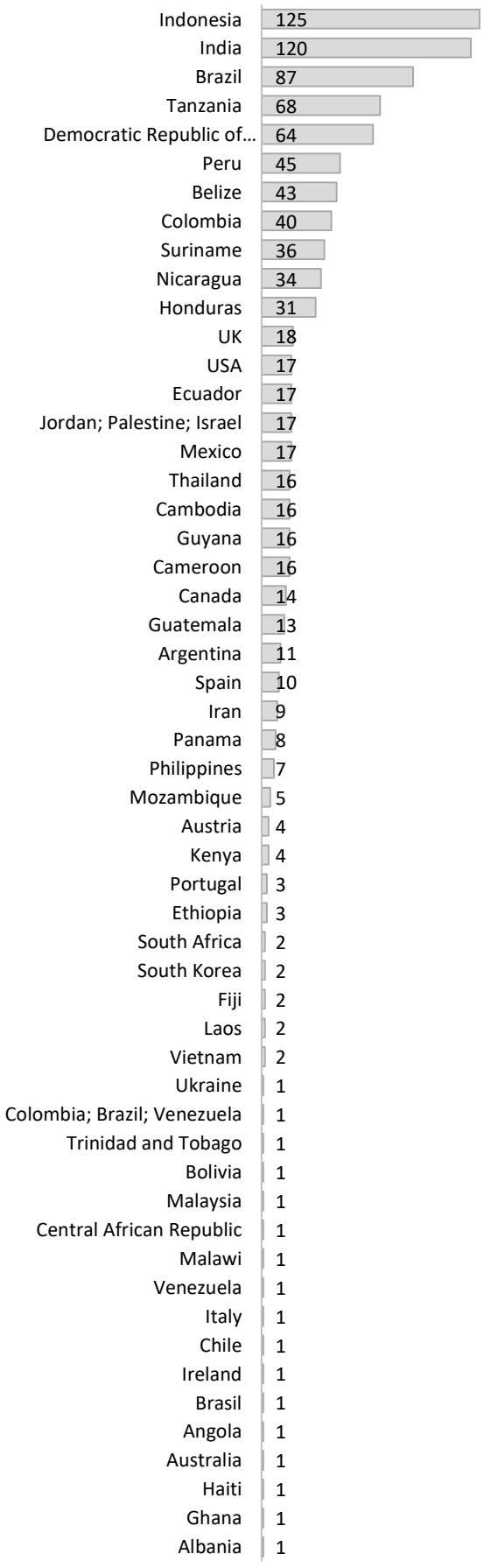

Figure 4.9: Geographic distribution of all cases of community mapping under analysis.

'Indigenous' and 'external recognition' types (per the typological framework') of community mapping, which are often associated to each other, top the distribution tables through Indonesia and Brazil (Tables 4.10 to 4.14). The non-urban (rural and remote, but not classified as indigenous) communities of Brazil and the Democratic Republic of Congo also seek external recognition, often through similar processes and for similar reasons to the previous ones. Interesting, also, processes from Indonesia are mainly grassroots, which means the knowledge-holding community itself is taking initiative and procuring the resources and/or help to initiate the process; and involve complex tool use. This scenario is created by a strong involvement of NGOs and other institutions external to the community, albeit assuredly not many governmental agents, as Indonesian processes are of the counter-mapping type.

Community mapping from India, on the other hand, focuses on something different: resource attraction, for 'urban1'-type areas: areas which lack infrastructure and are often associated to informal settlements and deprivation. These processes taking place in India comprise the bulk of the 'pioneering' type, which pushes for the creation of a spatial policy that does not yet exist, or attempts to set a structure in place that will act as a substitute, due to insufficient interest or access to resources by the state. The agents taking action choose to keep tool use by the community simple, at 'elementary' level, focusing instead on engaging as many members of the community and covering as much ground as possible.

Table 4.10 to 4.14: Breaking down the geographic distribution of community mapping initiatives, per each type of the typological framework's five categories.

Category: **tf.C1 Aim of the initiative**	Country	Nr. initia-tives
Type: **External recognition**	D. R. Congo	64
	Belize	42
	Peru	40
	Other	143
	Part. total	**289**
Type: **Community capacitat.**	Brazil	31
	Jordan; Palestine; Israel	17
	Thailand	16
	Other	143
	Part. total	**207**
Type: **Resource attraction**	India	116
	Tanzania	66
	Nicaragua	29
	Other	9
	Part. total	**220**
Type: **Local-based research**	Canada	3
	USA	3
	Mexico	3
	Other	4
	Part. total	**13**
Type: **External recognition; community capacitat.**	Indonesia	122
	Brazil	30
	Suriname	14
	Other	30
	Part. total	**196**
Type: **Ext. recognition; resource attraction**	Kenya	3
	Brazil	1
	Part. total	**4**
Type: **Ext. recogn.; L.B. research**	Cameroon	5
	Part. total	**5**
Type: **Community capacitat.; resource attraction**	India	4
	Philippines	2
	UK	1
	Other	3
	Part. total	**10**
Type: **Community capacitat.; local-based research**	Mexico	12
	Ecuador	4
	Suriname	1
	Part. total	**17**
Total		**961**

Category: **tf.C2 Knowledge-holding community**	Country	Nr. initia-tives
Type: **Indigenous**	Indonesia	125
	Brazil	49
	Peru	45
	Other	267
	Part. total	**486**
Type: **Non-urban**	D. R. Congo	64
	Brazil	34
	Jordan; Palestine; Israel	17
	Other	60
	Part. total	**175**
Type: **Urban2**	UK	16
	Spain	9
	Argentina	9
	Other	43
	Part. total	**77**
Type: **Urban1**	India	120
	Tanzania	68
	Cambodia	16
	Other	21
	Part. total	**225**
Total		**961**

Category: **tf.C3 Community engagement**	Country	Nr. initia-tives
Type: **Collabora-tive**	Brazil	79
	Tanzania	63
	Colombia	34
	Other	129
	Part. total	**305**
Type: **Participa-tory**	India	114
	D. R. Congo	64
	Peru	44
	Other	223
	Part. total	**445**
Type: **Grassroots**	Indonesia	121
	Belize	42
	Spain	8
	Other	40
	Part. total	**211**
Total		**961**

Category: **tf.C4 Connection to spatial policies**	Country	Nr. initia-tives
Type: **Pioneering**	India	120
	Cambodia	13
	Kenya	3
	Brazil	2
	Part. total	**138**
Type: **Instructive**	Tanzania	68
	Brazil	34
	Nicaragua	33
	Other	257
	Part. total	**392**
Type: **Counter**	Indonesia	122
	D. R. Congo	64
	Brazil	51
	Other	194
	Part. total	**431**
Total		**961**

Category: **tf.C5 Use of spatial data processing tools**	Country	Nr. initia-tives
Type: **Complex**	Indonesia	120
	USA	7
	UK	4
	Other	12
	Part. total	**143**
Type: **Guided**	Tanzania	63
	Belize	43
	Jordan; Palestine; Israel	17
	Other	175
	Part. total	**298**
Type: **Elementary**	India	120
	Brazil	72
	D. R. Congo	64
	Other	264
	Part. total	**520**
Total		**961**

4.2.1.2 Context: temporal evolution

Plotting the temporal evolution of community mapping initiatives was achieved through a simple occurrence count per year; when the initiative(s) within a case lasted more than a year, the number of initiatives for that same case was divided by its total duration, in years, even if that meant obtaining partial values. It should be noted that the diminishing number of initiatives recorded after 2015 can mostly be attributed to the lag between implementation and publication of proceedings. Also, the cut-off line for this study means that most cases were collected before 2018, with only a cursory search being conducted after that date.

After the first mapping experiments of the 1970s, there is a lull in mentions to community processes in available literature and testimonies, only broken twenty years later. The rapid growth in number of initiatives throughout the 1990s confirms the influence of the participatory turn in governance, the increasing availability of spatial data processing tools, and perhaps the increasing ease of communication within even remote areas. It was a period for large community mapping initiatives conducted at the behest of indigenous communities, concerned with defending land tenure and their indigenous territories in court ('external recognition'); these communities were aided by a variety of local, regional and external agents, as environmental concerns asserted themselves over the destruction wrought by concessions to external companies (or even illegal activities) for the exploration of natural resources. Then, another push towards the 2010s makes itself known, now with different characteristics: the 'community capacitation' and 'resource attraction' types of process gains ground, and the number of initiatives taking place in communities other than indigenous ones also increases in popularity. These two changes go hand in hand; for instance, 'urban1' processes – community mapping processes taking place in urban contexts which need structural improvement and are often associated to deprivation and informality – are understandably concerned with mapping for the purpose of presenting their situation and attracting resources.

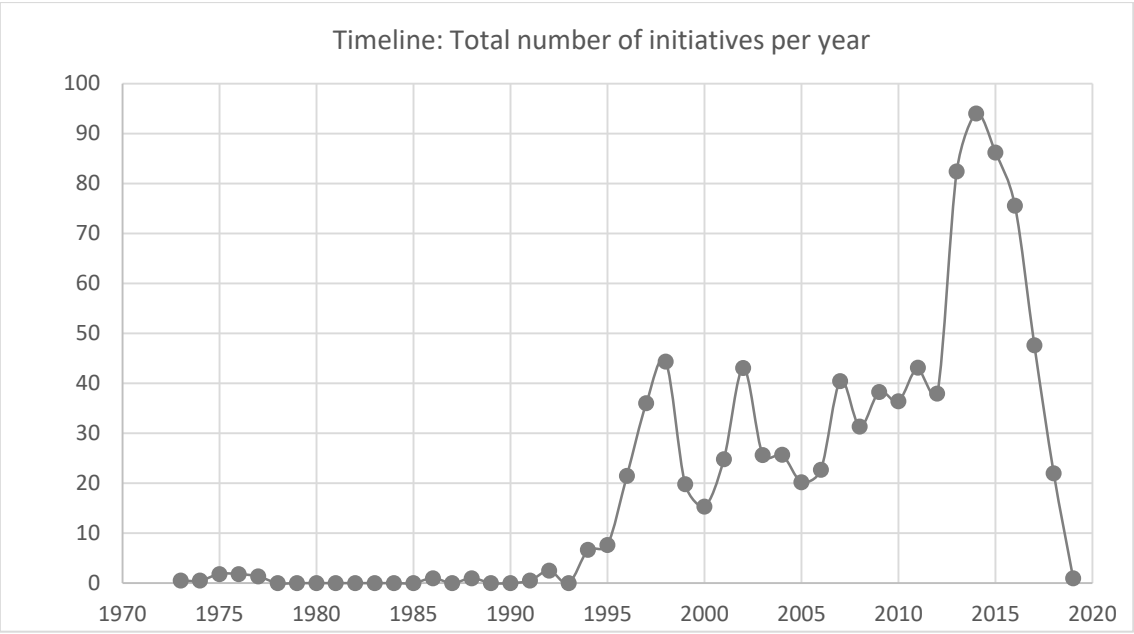

Figure 4.15: Temporal evolution of the implementation of all community mapping initiatives under study.

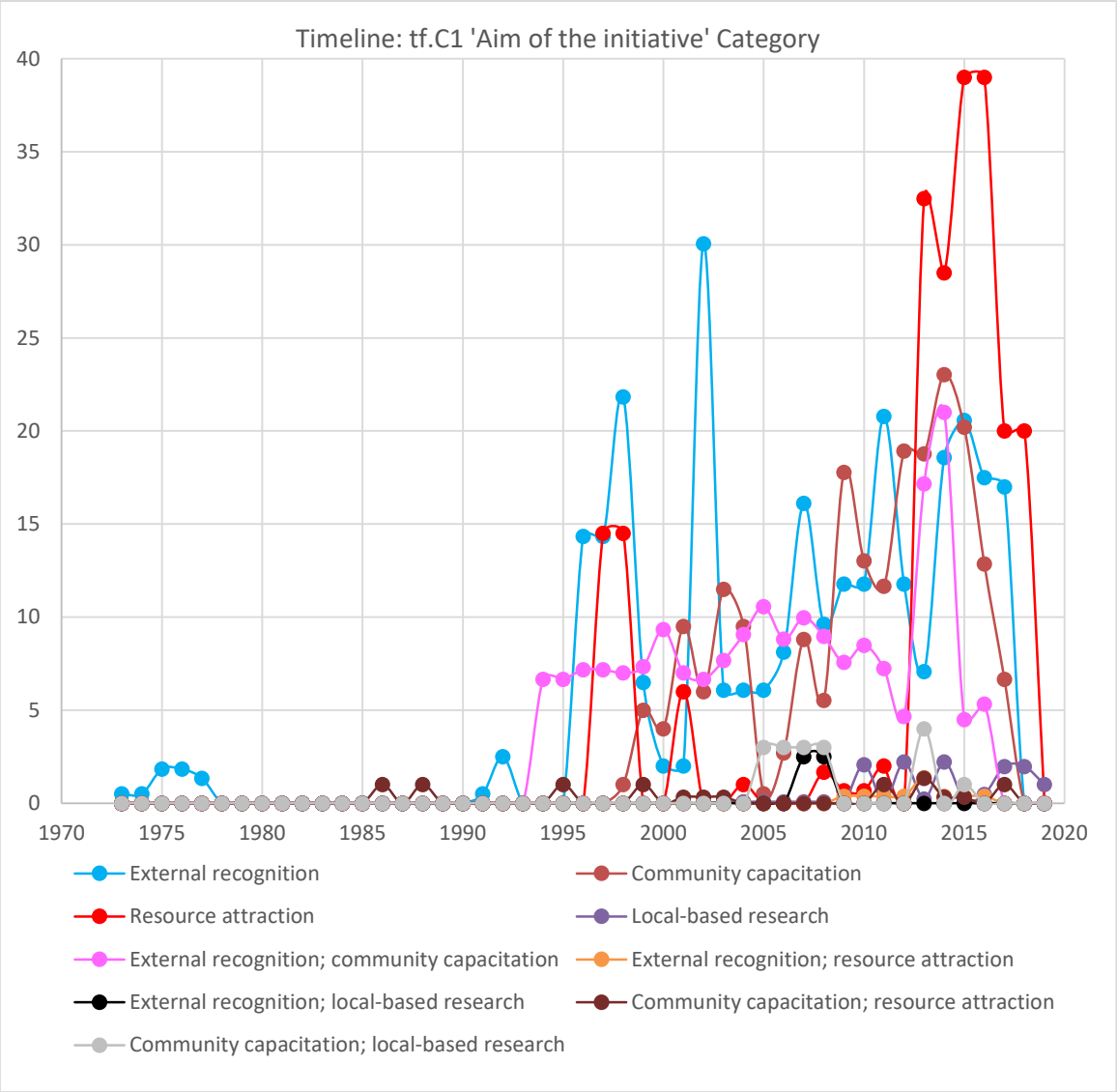

Figure 4.16: Temporal evolution of the implementation of community mapping initiatives, distributed according to the types of the category 'Aim of the initiative' presented in the typological framework.

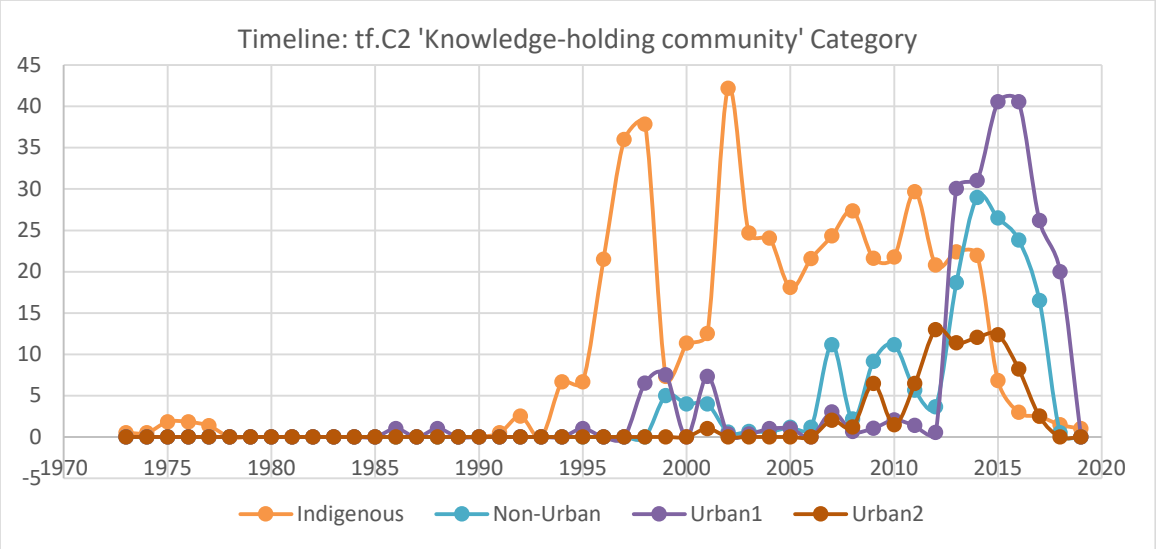

Figure 4.17: Temporal evolution of the implementation of community mapping initiatives, distributed according to the types of the category 'Knowledge-holding community' presented in the typological framework.

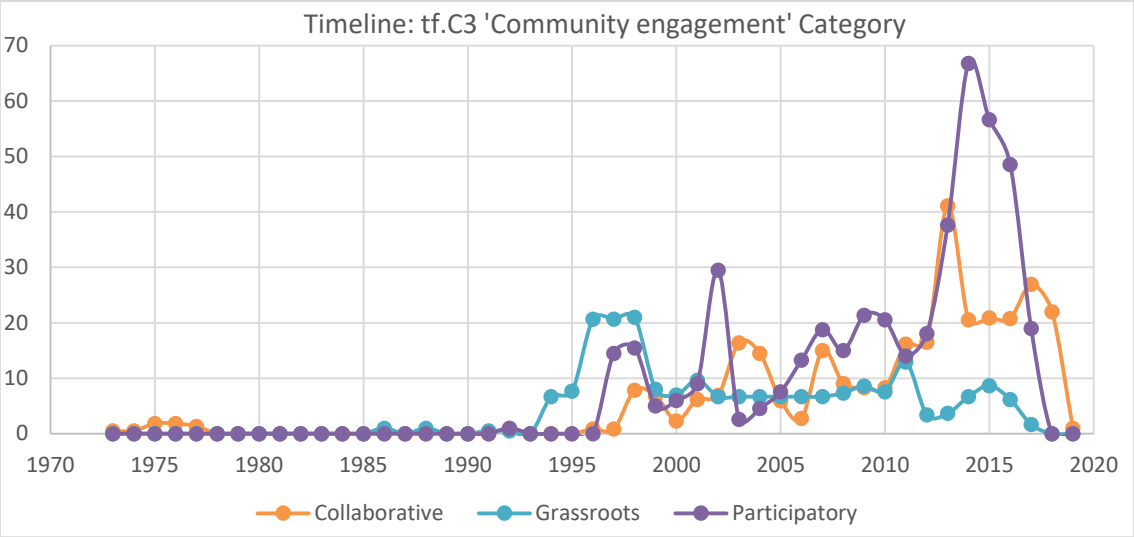

Figure 4.18: Temporal evolution of the implementation of community mapping initiatives, distributed according to the types of the category 'Community engagement' presented in the typological framework.

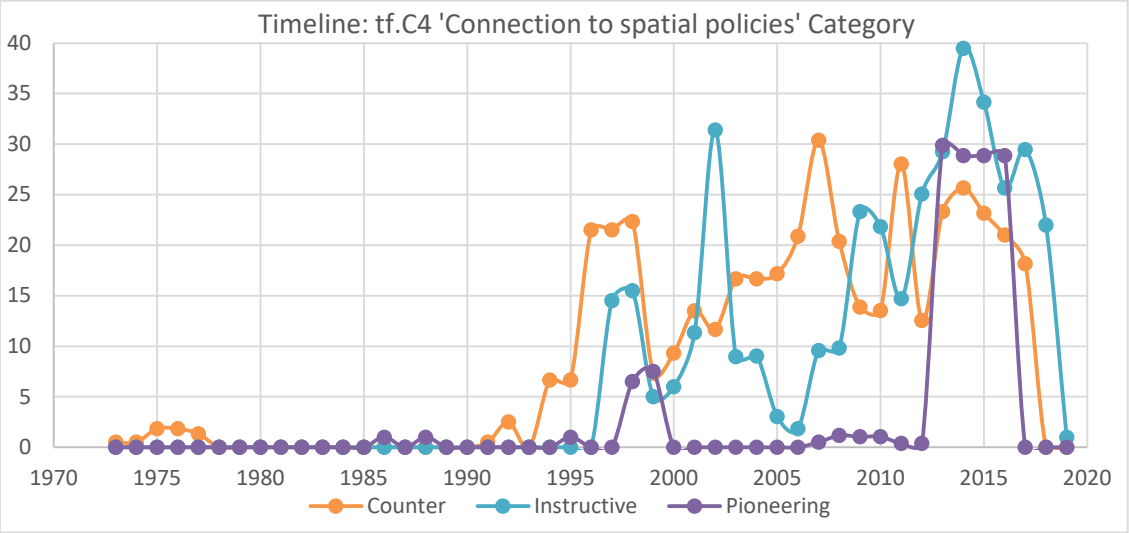

Figure 4.19: Temporal evolution of the implementation of community mapping initiatives, distributed according to the types of the category 'Connection to spatial policies' presented in the typological framework.

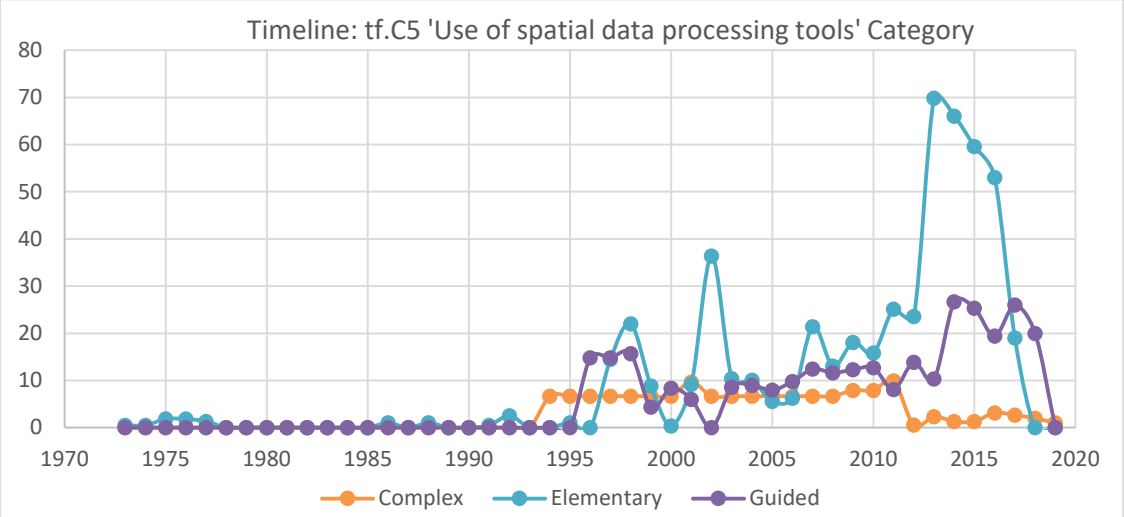

Figure 4.20: Temporal evolution of the implementation of community mapping initiatives, distributed according to the types of the category 'Use of spatial data processing tools' presented in the typological framework.

4.2.1.3 Context: characteristics of the knowledge-holding community

The community forms the core of the agents engaged in each initiative and is partly responsible for determining the physical boundaries of implementation, as one cannot map where the community is not available or cannot reach; it is already typified, in broad strokes, by the types of the typological framework category 'tf.C2. Knowledge-holding community', as seen previously. However, in order to obtain more accuracy in its characterization, a keyword analysis was conducted. The results retrieved the following predominant results, semantically aggregated: 'community-led', 'creative/artistic', 'economically deprived', 'remote', 'rural/agro-extractive', 'youth-centred', 'youth-led'. For initiatives which do not present specific keywords beyond what is already typified by tf.C2, 'non-specific' is used.

In Table 4.21, we can observe the distribution of the predominant keywords for the total of initiatives and per type of the typological framework; whereas in Table 4.22, the keywords are grouped together with the tf.C2 types and used as an extension of these (as if they were sub-types) in order to provide the most common typological combinations for each. In both tables, keywords are stackable, meaning that they can simultaneously for the same initiative. For that reason, the total sum of keyword occurrences for a type of initiative is higher than the total of initiatives of that type.

This avenue of analysis provides further insight especially into the 'tf.C2 Knowledge-holding community' types, and as such it is interesting to observe that category in Table 4.21. We can see, for instance, that the indigenous non-urban type of community mapping is not frequently associated to other community keywords. In collecting data, it can be observed that 'indigenous' is not only commonly used as a type - hence its selection for the typological framework – but also as a very strong identitary keyword. Saying that an initiative is indigenous has a series of implications – not only that it is located in a non-urban, and often remote context, but also that it pertains to a distinct ethno-linguistic group that is set apart from other (majority) groups, and that systems of management, governance, and use of the land other the mainstream ones are in place. Furthermore, 'indigenous' also highlights the presence of indigenous and traditional local knowledge.

Other types do not have such a straightforward relationship with keywords. A non-urban (and non-indigenous) type of community mapping will receive frequent references to the fact that the community is remote and is based on a rural/agro-extractivist economy – something which also happens in indigenous communities, but is not mentioned as often because it is implied. 'Urban1' types – urban communities based on structurally under-developed areas, often characterized by lack of infrastructures and informal settlements, - present a strong correlation with deprivation and poverty, which is expected, but also a lot of youth-centred dynamics. These dynamics are also present in the 'urban2' type, which makes them a feature of urban community mapping initiatives in general; additionally, urban2 communities are shown to implement a significant number of creative and artistic initiatives – the only type of community, in fact, in which the 'creative/artistic' keyword has significant weight. It should be noted that poverty, deprivation, and lack of infrastructures are not themes that appear outside urban communities and contexts. A rural community might very well be extremely deprived, but its way of life, proximity to means of production, land tenure, and positioning in relation to the average socio-economic status of the region might mean that those words are not used to describe it at all.

Table 4.21: Total number and frequency of initiatives pertaining to each of the isolated keywords that characterize the knowledge-holding community context; global results and results per type of the typological framework.

		cf.D1.III Keywords: knowledge holding community															
		non-specific		community-led		creative/artistic		economically deprived		remote		rural/agro-extractive		youth-centred		youth-led	
		Nr	%	Nr	%	Nr	%	Nr	%	Nr	%	Nr	%	Nr	%	Nr	%
Total of initiatives		**520**	**54.1%**	**4**	**0.4%**	**27**	**2.8%**	**223**	**23.2%**	**89**	**9.3%**	**63**	**6.6%**	**163**	**17.0%**	**2**	**0.2%**
tf.C1	community capacitation	102	**10.6%**	2	0.2%	27	2.8%	9	0.9%	9	0.9%	26	2.7%	41	**4.3%**	1	0.1%
	community capacit.; local-based research	17	**1.8%**	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	community capacit.; resource attraction	1	0.1%	0	0.0%	0	0.0%	8	**0.8%**	0	0.0%	0	0.0%	2	0.2%	0	0.0%
	external recognition	184	**19.1%**	0	0.0%	0	0.0%	18	1.9%	72	7.5%	14	1.5%	0	0.0%	0	0.0%
	external recognition; community capacit.	172	**17.9%**	0	0.0%	0	0.0%	2	0.2%	5	0.5%	17	1.8%	1	0.1%	1	0.1%
	external recognition; local-based research	5	**0.5%**	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	external recognition; resource attraction	0	0.0%	0	0.0%	0	0.0%	3	0.3%	0	0.0%	1	0.1%	3	**0.3%**	0	0.0%
	local-based research	8	**0.8%**	0	0.0%	0	0.0%	0	0.0%	3	0.3%	1	0.1%	1	0.1%	0	0.0%
	resource attraction	31	3.2%	2	0.2%	0	0.0%	183	**19.0%**	0	0.0%	4	0.4%	115	**12.0%**	0	0.0%
tf.C2	indigenous	453	**47.1%**	1	0.1%	0	0.0%	6	0.6%	13	1.4%	13	1.4%	2	0.2%	1	0.1%
	non-urban	30	3.1%	1	0.1%	0	0.0%	0	0.0%	76	**7.9%**	50	**5.2%**	18	1.9%	0	0.0%
	urban1	7	0.7%	0	0.0%	0	0.0%	213	**22.2%**	0	0.0%	0	0.0%	119	**12.4%**	0	0.0%
	urban2	30	**3.1%**	2	0.2%	27	**2.8%**	4	0.4%	0	0.0%	0	0.0%	24	**2.5%**	1	0.1%
tf.C3	collaborative	156	**16.2%**	1	0.1%	11	1.1%	86	**8.9%**	13	1.4%	36	3.7%	5	0.5%	1	0.1%
	grassroots	175	**18.2%**	3	0.3%	14	1.5%	7	0.7%	2	0.2%	0	0.0%	16	1.7%	1	0.1%
	participatory	189	**19.7%**	0	0.0%	2	0.2%	130	**13.5%**	74	7.7%	27	2.8%	142	**14.8%**	0	0.0%
tf.C4	counter	306	**31.8%**	1	0.1%	1	0.1%	8	0.8%	79	8.2%	35	3.6%	3	0.3%	1	0.1%
	instructive	214	**22.3%**	3	0.3%	26	2.7%	79	**8.2%**	9	0.9%	27	2.8%	43	4.5%	1	0.1%
	pioneering	0	0.0%	0	0.0%	0	0.0%	136	**14.2%**	1	0.1%	1	0.1%	117	**12.2%**	0	0.0%
tf.C5	complex	132	**13.7%**	2	0.2%	0	0.0%	3	0.3%	2	0.2%	1	0.1%	3	0.3%	1	0.1%
	elementary	238	**24.8%**	0	0.0%	6	0.6%	141	**14.7%**	84	8.7%	51	5.3%	116	**12.1%**	0	0.0%
	guided	150	**15.6%**	2	0.2%	21	2.2%	79	**8.2%**	3	0.3%	11	1.1%	44	4.6%	1	0.1%

Table 4.22: For each type of the category tf.C2 Knowledge-holding community, and matching knowledge-holding community context keywords, most prevalent combinations of typological framework types.

tf. C2	cf.D1.III Keywords	tf.C1 Aim of the initiative	tf.C3 Community engagement	tf.C4 Connection to spat. policies	tf.C5 Use of spat. data proc. tools	Nr. initia-tives	% of total
INDIGENOUS	community-led	community capacit.	collaborative	instructive	guided	1	0.10%
	economically deprived	external recognition	collaborative	counter	guided	4	0.42%
		external recognition; community capacit.	collaborative	instructive	guided	1	0.10%
		external recognition	collaborative	counter	elementary	1	0.10%
	remote	external recognition	collaborative	counter	elementary	3	0.31%
		external recognition	collaborative	counter	guided	1	0.10%
		external recognition	collaborative	pioneering	elementary	1	0.10%
		Other combinations				8	0.83%
	rural/agro-extractive	community capacit.	collaborative	instructive	elementary	3	0.31%
		community capacit.	participatory	counter	guided	2	0.21%
		external recognition; community capacit.	participatory	instructive	guided	2	0.21%
		Other combinations				6	0.62%
	youth-centred	external recognition; community capacit.	participatory	instructive	guided	1	0.10%
		community capacit.	collaborative	instructive	guided	1	0.10%
	youth-led	external recognition; community capacit.	collaborative	counter	guided	1	0.10%
NON-URBAN	community-led	resource attraction	grassroots	instructive	complex	1	0.10%
	remote	external recognition	participatory	counter	elementary	64	6.66%
		community capacit.	participatory	counter	elementary	5	0.52%
		community capacit.	participatory	instructive	elementary	2	0.21%
		Other combinations				5	0.52%
	rural/agro-extractive	community capacit.	participatory	instructive	elementary	15	1.56%
		external recognition; community capacit.	collaborative	counter	elementary	11	1.14%
		external recognition	collaborative	counter	elementary	10	1.04%
		Other combinations				14	1.46%
	youth-centred	community capacit.	participatory	instructive	guided	17	1.77%
		community capacit.	participatory	counter	guided	1	0.10%
URBAN1	economically deprived	resource attraction	participatory	pioneering	elementary	114	11.86%
		resource attraction	collaborative	instructive	guided	61	6.35%
		external recognition	collaborative	pioneering	elementary	13	1.35%
		Other combinations				25	2.60%
	youth-centred	resource attraction	participatory	pioneering	elementary	114	11.86%
		external recognition; resource attraction	participatory	pioneering	guided	3	0.31%
		community capacit.	collaborative	instructive	guided	1	0.10%
		community capacit.; resource attraction	collaborative	counter	complex	1	0.10%
URBAN2	community-led	community capacit.	grassroots	instructive	guided	1	0.10%
		resource attraction	grassroots	counter	complex	1	0.10%
	creative/ artistic	community capacit.	grassroots	instructive	guided	11	1.14%
		community capacit.	collaborative	instructive	guided	8	0.83%
		community capacit.	collaborative	instructive	elementary	3	0.31%
		Other combinations				5	0.52%
	econ. deprived	community capacit.	participatory	instructive	guided	4	0.42%
	youth-centred	community capacit.	grassroots	instructive	guided	13	1.35%
		community capacit.	participatory	instructive	guided	5	0.52%
		community capacit.	collaborative	instructive	elementary	1	0.10%
		Other combinations				5	0.52%
	youth-led	community capacit.	grassroots	instructive	complex	1	0.10%

4.2.1.4 Context: necessity of the initiative

The 'tf.C1 Aim of the initiative' previously analysed provides an overview of the objectives community mapping agents have in mind when implementing an initiative. However, to further characterize the context of the multiple case study research, further fields of analysis – more descriptive, more qualitative – were sought by the conceptual framework. Two avenues were used.

The first focuses on isolating keywords and concepts that are important to the agents involved in the community mapping initiatives, per their own words. The following keywords were considered, whenever the whole expression or its main concepts and synonyms were present: 'citizen science', 'environmental concerns', 'gentrification', 'heritage', 'home evictions', 'informal settlements', 'land tenure', 'poverty', 'risk mitigation', 'school project', 'social housing', 'territorial conflict', 'territorial management', and 'traditional/customary land use'. These are presented for each type of community mapping initiative in Table 4.23, in a more fluid format due to their extensive presence. As in the previous section, these keywords are stackable, as more than one can be present for the same initiative. In front of each keyword, the number of initiatives that provided matching concepts is noted. The total number of initiatives per type is presented for comparison.

The second avenue involved identifying a primary 'necessity' amongst the objectives of each community mapping initiative and bringing them together in semantic groups, worded as statements. 33 such groups were created from a multitude of different descriptive texts, thus condensing 230 entries and 961 initiatives. These groups are presented in Table 4.24, under the heading 'cf.D1.IV Necessity of the initiative', and for each of them the associated context keywords are also provided. By 'necessity', the analysis does not mean to imply that the respective community mapping initiatives were inevitably implemented for those specific purposes, although that it is a possibility; instead, the entries might refer to the desired impact of the local knowledge being harnessed during the mapping process, or to further actions made possible by the community engagement achieved, for instance. In other words, the 'necessity of the initiative' is meant to summarize the most urgent or more important desires of involved agents, identified from amongst the initiative's media footprint, regarding the positive outcomes of the community mapping initiative in which they are involved.

As both these avenues of analysis provide more insight especially into the 'tf.C1 Aim of the Initiative' types, it is particularly interesting to observe that category in Table 4.23. The table can be used as a consulting tool to gauge the 'composition' of each type of community mapping: i.e., it becomes apparent that the type 'local-based research', in its non-juxtaposed form, is strongly associated to environmental concerns and environmental research. We can also see the distribution of a specific keyword: for instance, 'land tenure' and 'traditional/customary land use' are associated to almost all types, as proving occupancy and guaranteeing rights over the land is not only a common worry, but also an objective that can be plotted into many different types of processes.

It is important to highlight that certain keywords function as an umbrella for several dynamics. One such case is 'territorial conflict', which pertains to conflict in land use, especially between undocumented customary land use (i.e. by indigenous people) and concessions to extractivist companies that move into these territories to access existing resources. The conflict might

involve some form of illegal resource extraction (logging, mining, etc.). It might also pertain to existing tensions between groups occupying adjacent territories, whose boundaries are not well defined. It is also common for the mention of conflict to encompass governmental entities, due to the concessions made or lack of adequate spatial policies put in place to protect local communities. Spatial policies pertaining to territorial management that fail to include customary land use might also cause conflict, as they might outlaw traditional community activities within certain areas (i.e. CS.073).

Another example is 'territorial management', strongly connected to the keywords such as 'environmental concerns' and 'traditional/costumary land use'. It appears primarily in contexts that seek the recognition of traditional and indigenous practices in managing their own territory, and the collaborative elaboration of environmental, resource and/or biodiversity co-management plans; in some cases, plan elaboration is led by the community, in grassroots-type processes, and later integrated into formal policy. This descriptor is also used for contexts in which governmental entities use participatory consultation processes to ascertain the reality of these territories and the best way to proceed, even if the management plan sought is not collaborative. There are forms of territorial management, to which this descriptor applies, that are supported by the action of NGOs and do not depend on formal action by governmental entities.

Table 4.23: For each type of the typological framework, context keywords associated to the community mapping initiatives and number of initiatives in which they occur.

Typological framework types (respective nr. initiatives)		**cf.D1.IV Context keywords (respective nr. initiatives)**
tf.C1 Aim of the initiative	community capacitation (207)	environmental concerns (84); traditional/customary land use (63); territorial management (60); risk mitigation (37); school project (33); N/A (32); land tenure (18); territorial conflict (13); gentrification (9); heritage (7); poverty (6); informal settlements (3); home evictions (2); social housing (2); citizen science (1)
	community capacit.; l.b. research (17)	land tenure (17); traditional/customary land use (1)
	community capacit.; resource attraction (10)	poverty (8); informal settlements (6); home evictions (5); N/A (2); environmental concerns (1); heritage (1); risk mitigation (1); school project (1)
	external recognition (289)	land tenure (184); territorial conflict (176); traditional/customary land use (129); territorial management (96); environmental concerns (71); poverty (18); home evictions (15); informal settlements (15); heritage (5); risk mitigation (1)
	external recognition; community capacit. (196)	territorial conflict (135); traditional/customary land use (66); land tenure (48); environmental concerns (37); territorial management (22); heritage (17); risk mitigation (9); poverty (2); informal settlements (1)
	external recognition; l.b. research (5)	environmental concerns (5); land tenure (5); territorial conflict (5); territorial management (5); traditional/customary land use (5)
	external recognition; resource attraction (4)	informal settlements (3); poverty (3); environmental concerns (1); traditional/customary land use (1)
	local-based research (13)	N/A (2); citizen science (1); environmental concerns (11); heritage (1); school project (1); territorial management (1); traditional/customary land use (1)
	resource attraction (220)	poverty (182); informal settlements (180); environmental concerns (71); risk mitigation (62); territorial conflict (31); land tenure (29); traditional/customary land use (4); territorial management (3); N/A (2); citizen science (2); home evictions (2)

Table 4.23 (cont.): For each type of the typological framework, context keywords associated to the community mapping initiatives and number of initiatives in which they occur.

Typological framework types (respective nr. initiatives)		**cf.D1.IV Context keywords (respective nr. initiatives)**
tf.C2 Knowledge-holding community	indigenous (486)	territorial conflict (265); land tenure (212); traditional/customary land use (161); environmental concerns (138); territorial management (102); heritage (26); risk mitigation (10); poverty (6); N/A (3)
	non-urban (173)	traditional/customary land use (108); territorial conflict (91); land tenure (85); territorial management (79); environmental concerns (63); risk mitigation (31); school project (18); N/A (4); citizen science (3); heritage (2)
	urban1 (225)	poverty (212); informal settlements (208); risk mitigation (68); environmental concerns (67); home evictions (24); N/A (3); school project (2); territorial conflict (2); heritage (1); territorial management (1); traditional/customary land use (1)
	urban2 (77)	N/A (28); school project (15); environmental concerns (13); gentrification (9); territorial management (5); land tenure (4); heritage (2); social housing (2); territorial conflict (2); citizen science (1); poverty (1); risk mitigation (1)
tf.C3 Community engagement	collaborative (305)	traditional/customary land use (161); environmental concerns (153); land tenure (90); poverty (85); informal settlements (77); risk mitigation (66); territorial management (57); territorial conflict (42); home evictions (15); heritage (12); N/A (10); gentrification (5); school project (4)
	grassroots (211)	territorial conflict (167); land tenure (57); N/A (16); environmental concerns (9); school project (8); home evictions (7); poverty (7); heritage (6); gentrification (4); informal settlements (4); territorial management (4); citizen science (2); traditional/customary land use (2); risk mitigation (1)
	participatory (445)	land tenure (154); territorial conflict (151); informal settlements (127); poverty (127); territorial management (126); environmental concerns (119); traditional/customary land use (107); risk mitigation (43); school project (23); heritage (13); N/A (12); citizen science (2); home evictions (2); social housing (2)
tf.C4 Connection to spat. policies	counter (431)	territorial conflict (319); land tenure (190); traditional/customary land use (161); territorial management (116); environmental concerns (112); heritage (12); poverty (8); home evictions (4); N/A (2); informal settlements (2); school project (2); citizen science (1); gentrification (1); risk mitigation (1)
	instructive (392)	environmental concerns (168); land tenure (111); risk mitigation (108); traditional/customary land use (107); poverty (75); informal settlements (72); territorial management (71); territorial conflict (40); N/A (36); school project (33); heritage (19); gentrification (8); citizen science (3); social housing (2); home evictions (1)
	pioneering (138)	poverty (136); informal settlements (134); home evictions (19); traditional/customary land use (2); environmental concerns (1); risk mitigation (1); territorial conflict (1)
tf.C5 Use of spat. data proc. tools	complex (143)	territorial conflict (122); environmental concerns (13); land tenure (13); N/A (5); poverty (3); citizen science (2); home evictions (2); school project (2); heritage (1); informal settlements (1); risk mitigation (1); territorial management (1); traditional/customary land use (1)
	elementary (520)	land tenure (213); traditional/customary land use (208); territorial conflict (179); poverty (140); informal settlements (138); environmental concerns (130); territorial management (118); home evictions (20); N/A (14); risk mitigation (14); heritage (6); gentrification (1); school project (1)
	guided (298)	environmental concerns (138); risk mitigation (95); poverty (76); land tenure (75); informal settlements (69); territorial management (68); traditional/customary land use (61); territorial conflict (59); school project (32); heritage (24); N/A (19); gentrification (8); citizen science (2); home evictions (2); social housing (2)

Table 4.24: For each statement pertaining to the necessity of the community mapping initiative, context keywords associated to the statement; number of initiatives in which both statements and keywords occur.

cf.D1.IV Necessity of the initiative (respective nr. initiatives)	cf.D1.IV Context keywords (respective nr. initiatives)
validate the community's position regarding existing external threats (180)	environmental concerns (57); heritage (3); land tenure (19); territorial conflict (173); territorial management (4); traditional/customary land use (17)
defend/negotiate land tenure and land rights (171)	environmental concerns (13); heritage (2); land tenure (157); poverty (5); territorial conflict (120); territorial management (74); traditional/customary land use (98)
create groundwork where there is none (118)	environmental concerns (1); home evictions (3); informal settlements (115); poverty (117); territorial conflict (1); traditional/customary land use (1)
document land tenure (67)	environmental concerns (8); land tenure (67); territorial management (5); traditional/customary land use (39)
collect information on local issues (53)	environmental concerns (46); heritage (2); informal settlements (41); poverty (42); risk mitigation (40); school project (2); social housing (1); territorial management (1); traditional/customary land use (2)
document traditional practices and customary land use (42)	environmental concerns (11); heritage (2); land tenure (6); poverty (1); territorial management (27); traditional/customary land use (34)
seek partnerships for investment (29)	land tenure (29); territorial conflict (29)
create/provide learning opportunities (28)	environmental concerns (18); poverty (2); risk mitigation (18); school project (26)
reduce risk and vulnerability (27)	environmental concerns (21); informal settlements (21); poverty (21); risk mitigation (27); traditional/customary land use (1)
adjust territorial management (26)	environmental concerns (22); heritage (1); land tenure (6); school project (1); territorial conflict (6); territorial management (19); traditional/customary land use (18)
mobilize against external threats (25)	environmental concerns (25); land tenure (1); risk mitigation (9); territorial conflict (2); territorial management (23); traditional/customary land use (24)
create groundwork to negotiate claims (24)	environmental concerns (2); heritage (2); home evictions (19); informal settlements (19); land tenure (2); poverty (17); territorial management (2); traditional/customary land use (5)
empower the community for self-advocacy/ leadership (18)	environmental concerns (1); informal settlements (3); land tenure (3); poverty (3); school project (1); territorial conflict (2); traditional/customary land use (11)
create bridges between communities and formal entities (17)	environmental concerns (13); territorial management (17)
create groundwork to guide decisions (15)	risk mitigation (13); school project (1)
document the local context (14)	environmental concerns (3); territorial conflict (1)
validate local issues and concerns (14)	citizen science (2); environmental concerns (13); gentrification (1); risk mitigation (1); territorial conflict (10); territorial management (1)

Table 4.24 (cont.): For each statement pertaining to the necessity of the community mapping initiative, context keywords associated to the statement; number of initiatives in which both statements and keywords occur.

cf.D1.IV Necessity of the initiative (respective nr. initiatives)	cf.D1.IV Context keywords (respective nr. initiatives)
validate local issues and concerns (14)	citizen science (2); environmental concerns (13); gentrification (1); risk mitigation (1); territorial conflict (10); territorial management (1)
document/identify local issues (10)	environmental concerns (3); home evictions (2); poverty (2); territorial conflict (3)
promote community engagement and capacitation (9)	gentrification (1); poverty (1); school project (4)
document local heritage (8)	environmental concerns (4); heritage (7); territorial management (2); traditional/customary land use (5)
promote community cohesion and identity (8)	citizen science (1); environmental concerns (1); informal settlements (1); poverty (1); social housing (1); traditional/customary land use (1)
reflect on the local context (8)	environmental concerns (1); gentrification (5)
reorganize territorial boundaries (8)	land tenure (6); territorial conflict (4); territorial management (2); traditional/customary land use (2)
document territorial presences, features or landmarks (5)	environmental concerns (2); heritage (1); territorial management (1); traditional/customary land use (1)
document territorial transformations (5)	environmental concerns (2); heritage (1); informal settlements (1); poverty (1); risk mitigation (1); territorial conflict (3); territorial management (1); traditional/customary land use (3)
navigate the decision-making sphere to obtain resources (5)	environmental concerns (5); informal settlements (5); poverty (5)
protect and negotiate the tenure/management of heritage/sacred sites (5)	environmental concerns (2); heritage (5); land tenure (1); territorial conflict (1); territorial management (4); traditional/customary land use (2)
capacitate the community for self-management (4)	environmental concerns (2); heritage (1); territorial management (1); traditional/customary land use (3)
increase community awareness on issues and threats (4)	environmental concerns (2); gentrification (1); informal settlements (1); territorial conflict (1)
mediate conflicts (4)	environmental concerns (2); land tenure (2); poverty (1); territorial conflict (4); territorial management (3); traditional/customary land use (1)
preserve local heritage/knowledge (4)	heritage (3); informal settlements (1); land tenure (2); traditional/customary land use (2)
share local knowledge (4)	citizen science (1); environmental concerns (1); gentrification (1); heritage (1); risk mitigation (1)
petition for infrastructures (2)	N/A

4.2.2 KNOWLEDGE BUILDING IN COMMUNITY MAPPING INITIATIVES

The process of knowledge building within a community mapping process has many facets. In order to understand how it occurs, and provide the necessary analysis of its different aspects, the 'cf.D2.Knowledge building' dimension looks into four categories: the role of local knowledge in the mapping process, the use of background knowledge, the existence of an evaluation cycle and vision for the future, and the contributions made, as a consequence of the community mapping initiative, both to a wider body of knowledge and to the capacitation of the mapping community.

4.2.2.1 Knowledge building: the role of local knowledge

Community mapping initiatives focus on harnessing – usually, this means 'mapping' – existing local knowledge, but not solely, and not always. Harnessing might also mean 'to build up', or in other words, to engage the local community in mapping activities that, as a consequence, contribute to each knowledge-holder's trove of knowledge. Harnessing local knowledge might also be a by-product of a process whose primary focus is something else altogether; for instance, the act of exploring the territory and/or depicting what is known can contribute to community capacitation and learning, for a variety of purposes.

In Table 4.25, the three emergent types of roles pertaining to the category 'cf.D2.I Role of local knowledge' - 'object of interest', 'object of discovery', and 'facilitator' – are depicted, taking into consideration simultaneous occurrences. The classification was obtained through the qualitative analysis of the media footprint for each case study entry. In 'object of interest', the local community formalizes, takes measurements of features of, and depicts their local knowledge for a specific purpose; in 'object of discovery', the initiative focuses on previously unknown/unfamiliar features of the territory or community, or known only to very few members, and thus it contributes to build up the local knowledge held by the community; and in 'facilitator', the initiative's primary focus is not local knowledge itself, but in the process of harnessing it.

A mapping community might regard local knowledge as object of interest and object of discovery simultaneously. As explained before, in Chapter 1, knowledge is not distributed equally amongst all members of a community, and sometimes that distribution is very uneven. It is possible that some knowledge is only held by community experts, and the identity of these experts varies depending on the issue at hand. Community mapping initiatives help the community pool their knowledge together. For instance, in CS.117, the aim was to collectively pool the knowledge on the village - by drawing on a large sheet of paper the rivers where they fish, the land they hunt, the areas where they may grow crops or harvest the forest for its bounty, - and superimposing this new information on survey maps, so that it can be presented to the local government, to board directors and shareholders of mining companies.

As an example of local knowledge being used in the role of facilitator, we have CS.080, in which the process itself was meant to capture the needs and aspirations of participating children and using them in the creation of their ideal neighbourhoods. Although findings were meant to influence city master plans and zonal developments plans, the process had the double aim of encouraging children to make decisions, become more independent, and develop their self-esteem.

Table 4.25: Types of roles of local knowledge, and combinations of roles, within community mapping processes.

		cf.D2.I Role of local knowledge									
		Object of Interest	Object of Discovery	Facilitator	one role %	Object of Interest; Object of Discovery	Object of Discovery; Facilitator	Object of Interest; Facilitator	two simultaneous roles %	Object of Interest; Object of Discovery; Facilitator	three simultaneous roles %
All types of initiatives		**28**	**495**	**28**	**57.34%**	**15**	**373**	**9**	**41.31%**	**13**	**1.35%**
tf.C1	community capacitation	27	88	28	14.88%	13	41	7	6.35%	3	0.31%
	community capacit.; local-based research	0	17	0	1.77%	0	0	0	0.00%	0	0.00%
	community capacit.; resource attraction	0	4	0	0.42%	0	5	1	0.62%	0	0.00%
	external recognition	0	235	0	24.45%	1	52	0	5.52%	1	0.10%
	external recognition; community capacit.	0	38	0	3.95%	1	148	0	15.50%	9	0.94%
	external recognition; local-based research	0	5	0	0.52%	0	0	0	0.00%	0	0.00%
	external recognition; resource attraction	0	3	0	0.31%	0	1	0	0.10%	0	0.00%
	local-based research	1	10	0	1.14%	0	1	1	0.21%	0	0.00%
	resource attraction	0	95	0	9.89%	0	125	0	13.01%	0	0.00%
tf.C2	indigenous	0	281	0	29.24%	3	192	0	20.29%	10	1.04%
	non-urban	17	102	13	13.74%	0	39	1	4.16%	1	0.10%
	urban1	0	92	0	9.57%	1	129	3	13.84%	0	0.00%
	urban2	11	20	15	4.79%	11	13	5	3.02%	2	0.21%
tf.C3	collaborative	4	241	5	26.01%	5	47	1	5.52%	2	0.21%
	grassroots	7	55	7	7.18%	7	130	3	14.57%	2	0.21%
	participatory	17	199	16	24.14%	3	196	5	21.23%	9	0.94%
tf.C4	counter	1	229	1	24.04%	3	197	0	20.81%	0	0.00%
	instructive	27	250	27	31.63%	12	56	9	8.01%	11	1.14%
	pioneering	0	16	0	1.66%	0	120	0	12.49%	2	0.21%
tf.C5	complex	3	13	1	1.77%	1	125	0	13.11%	0	0.00%
	elementary	1	289	7	30.91%	2	219	1	23.10%	1	0.10%
	guided	24	193	20	24.66%	12	29	8	5.10%	12	1.25%

4.2.2.2 Knowledge building: background knowledge

Another important aspect in knowledge building are the antecedents of the process. In order to determine whether an initiative is making use of existing know-how on community mapping, the data collected was queried regarding several aspects: whether an initiative follows specific pre-existing guidelines, methodologies or platforms; whether agents consider that the implementation was informed by previous attempts (such as pilot projects) or other similar cases; and whether at least one of the agents involved in the initiative's actor network states extensive previous experience in community mapping. A positive answer to at least one of these parameters translates into a positive answer to the category 'cf.D2.II Background knowledge', which can be observed in Table 4.26.

It is interesting to note than not only the prevalence of background knowledge informing community mapping initiatives is extremely high, which means that previous work is being disseminated and reaching new projects, it also happens at a rate of 100% for several types of initiatives. This happens, for instance, in pioneering community mapping, which is a demanding type in terms of organisation, mobilization and resources, and implies a context that cannot be taken lightly.

4.2.2.3 Knowledge building: evaluation of the initiative

The third aspect of knowledge building focuses on the evaluation of the initiative. An evaluation cycle allows for a reflection over the strengths and weaknesses of the process that was conducted, in order to consolidate it and reinforce its positive characteristics in the future, while trying to avoid anything that might have not been as successful – procedures, methodologies, tools, situations, etc. By looking into whether the proposed short-term objectives were achieved, conducting an evaluation cycle, and appraising its long term outcomes, and initiative is also a step closer towards a significant contribution towards a wider body of knowledge.

Much of the media footprint of community mapping cases is produced during these two moments – when presenting the fulfilment of short-term objectives to the community itself and the wider world, and when conducting longer term appraisals and reports. Unfortunately, this also points towards a bias in data collection: any unsuccessful initiatives, by the standards of the agents involved, are more likely to not reach any of the evaluation stages and thus not have a media footprint at all. Therefore, the results presented in Table 4.27 will naturally tend towards extremely high rates of positive primary evaluations ('short-term objectives achieved'). It is interesting, however, to compare these rates with the lower ones of the longer-term evaluations ('evaluation cycle or appraisal of outcomes').

Table 4.26: Number and percentage of initiatives that include some form of background knowledge regarding community mapping.

		Follows specific guidelines, methodologies or platforms			Informed by previous attempts or other cases			One of the agents involved has previous mapping experience			**cf.D2.II Background knowledge**		
		No	**Yes**	**% Yes**	**No**	**Yes**	**% Yes**	**No**	**Yes**	**% Yes**	**No**	**Yes**	**% Yes**
All types of initiatives		**340**	**621**	**64.6%**	**290**	**671**	**69.8%**	**172**	**789**	**82.1%**	**86**	**875**	**91.1%**
tf. C1	community capacitation	77	130	62.8%	105	102	49.3%	102	105	50.7%	46	161	77.8%
	community capacit.; local-based research	12	5	29.4%	12	5	29.4%	4	13	76.5%	0	17	100.0%
	community capacit.; resource attraction	4	6	60.0%	5	5	50.0%	4	6	60.0%	3	7	70.0%
	external recognition	170	119	41.2%	94	195	67.5%	23	266	92.0%	17	272	94.1%
	external recognition; community capacit.	32	164	83.7%	29	167	85.2%	21	175	89.3%	15	181	92.3%
	external recognition; local-based research	5	0	0.0%	0	5	100.0%	0	5	100.0%	0	5	100.0%
	external recognition; resource attraction	0	4	100.0%	0	4	100.0%	0	4	100.0%	0	4	100.0%
	local-based research	3	10	76.9%	12	1	7.7%	13	0	0.0%	3	10	76.9%
	resource attraction	37	183	83.2%	33	187	85.0%	5	215	97.7%	2	218	99.1%
tf. C2	indigenous	243	243	50.0%	176	310	63.8%	55	431	88.7%	37	449	92.4%
	non-urban	42	131	75.7%	68	105	60.7%	65	108	62.4%	29	144	83.2%
	urban1	35	190	84.4%	18	207	92.0%	16	209	92.9%	12	213	94.7%
	urban2	20	57	74.0%	28	49	63.6%	36	41	53.2%	8	69	89.6%
tf. C3	collaborative	85	220	72.1%	70	235	77.0%	34	271	88.9%	15	290	95.1%
	grassroots	58	153	72.5%	76	135	64.0%	32	179	84.8%	12	199	94.3%
	participatory	197	248	55.7%	144	301	67.6%	106	339	76.2%	59	386	86.7%
tf. C4	counter	153	278	64.5%	111	320	74.2%	30	401	93.0%	16	415	96.3%
	instructive	173	219	55.9%	175	217	55.4%	140	252	64.3%	70	322	82.1%
	pioneering	14	124	89.9%	4	134	97.1%	2	136	98.6%	0	138	100.0%
tf. C5	complex	9	134	93.7%	16	127	88.8%	15	128	89.5%	6	137	95.8%
	elementary	178	342	65.8%	102	418	80.4%	62	458	88.1%	26	494	95.0%
	guided	153	145	48.7%	172	126	42.3%	95	203	68.1%	54	244	81.9%

Table 4.27: Number and percentage of initiatives that include some form of evaluation or appraisal, in the short and long term.

		cf.D2.III. Evaluation of the initiative								
		Short-term objectives achieved					Evaluation cycle or appraisal of outcomes			
		No information	Unfinished/ ongoing	No	Yes	% Yes	No information	Unfinished/ ongoing	Yes	% Yes
All types of initiatives		**49**	**54**	**2**	**856**	**99.8%**	**282**	**52**	**627**	**65.2%**
tf.C1	community capacitation	17	2	0	188	**90.8%**	119	1	87	**42.0%**
	community capacit.; local-based research	0	0	0	17	**100.0%**	0	0	17	**100.0%**
	community capacit.; resource attraction	1	1	0	8	**80.0%**	2	1	7	**70.0%**
	external recognition	30	3	1	255	**88.2%**	100	3	186	**64.4%**
	external recognition; community capacit.	1	1	1	193	**98.5%**	48	1	147	**75.0%**
	external recognition; local-based research	0	0	0	5	**100.0%**	0	0	5	**100.0%**
	external recognition; resource attraction	0	0	0	4	**100.0%**	1	0	3	**75.0%**
	local-based research	0	7	0	6	**46.2%**	5	6	2	**15.4%**
	resource attraction	0	40	0	180	**81.8%**	7	40	173	**78.6%**
tf.C2	indigenous	31	7	2	446	**91.8%**	83	6	397	**81.7%**
	non-urban	6	2	0	165	**95.4%**	129	2	42	**24.3%**
	urban1	3	44	0	178	**79.1%**	16	43	166	**73.8%**
	urban2	9	1	0	67	**87.0%**	54	1	22	**28.6%**
tf.C3	collaborative	4	48	0	253	**83.0%**	72	47	186	**61.0%**
	grassroots	3	1	1	206	**97.6%**	28	0	183	**86.7%**
	participatory	42	5	1	397	**89.2%**	182	5	258	**58.0%**
tf.C4	counter	9	3	1	418	**97.0%**	111	2	318	**73.8%**
	instructive	40	51	1	300	**76.5%**	167	50	175	**44.6%**
	pioneering	0	0	0	138	**100.0%**	4	0	134	**97.1%**
tf.C5	complex	0	7	0	136	**95.1%**	10	5	128	**89.5%**
	elementary	41	1	1	477	**91.7%**	180	1	339	**65.2%**
	guided	8	46	1	243	**81.5%**	92	46	160	**53.7%**

4.2.2.4 Knowledge building: contributions

The final aspect of knowledge building in community mapping initiatives is the contribution of the initiative itself – through the knowledge harnessed, and the products, cartographic and otherwise, created during the process. This might mean a contribution to a wider body of knowledge, or a contribution that loops back into the mapping community and its own skills, perceptions, and capacity.

For the first form of contribution, the data collected was queried regarding two aspects: whether the initiative resulted in guidelines or recommendations for future initiatives, or whether the agents involved manifested the intention to replicate the initiative, informed by their present attempt. A positive answer in one of these aspects translates into a positive answer to the category 'cf.D2.IV Contributions to wider body of knowledge', visible in Table 4.28. As for the

second form of contribution, also present in the same table, data was combed for instances in which involved agents expressed an intangible gain through the community mapping project, at a personal level or at the level of the mapping community, especially in what concerns acquisition of skills, autonomy, capacity, self-confidence and empowerment.

The results that present a positive answer for the first of contribution are high – above 80% for the total of initiatives, although this can be attributed in part to the method of analysis, which joins two separate queries. The positive perceptions regarding community mapping contributions to community capacitation, however, are high on their own. The analysis confirms that there is a sense of satisfaction and empowerment associated to community mapping initiatives. This positivity is strongly associated to initiatives with higher levels of engagement and devolution (grassroots and collaborative types).

Table 4.28: Number and percentage of initiatives that imply some form of contribution, either to a wider body of knowledge, or to community capacitation perceptions.

		Resulted in guidelines or recommendations			Intention to replicate			**D2.IV Contributions to wider body of knowledge**			**D2.IV Contributions to community capacitation (perceptions)**		
		No	**Yes**	**% Yes**	**No**	**Yes**	**% Yes**	**No**	**Yes**	**% Yes**	**No**	**Yes**	**% Yes**
All types of initiatives		**316**	**645**	**67.1%**	**311**	**650**	**67.6%**	**174**	**787**	**81.9%**	**217**	**744**	**77.4%**
tf.C1	community capacitation	60	147	71.0%	73	134	64.7%	26	181	87.4%	42	165	79.7%
	community capacit.; local-based research	16	1	5.9%	4	13	76.5%	4	13	76.5%	0	17	100.0%
	community capacit.; resource attraction	5	5	50.0%	4	6	60.0%	4	6	60.0%	3	7	70.0%
	external recognition	156	133	46.0%	159	130	45.0%	79	210	72.7%	123	166	57.4%
	external recognition; community capacit.	16	180	91.8%	17	179	91.3%	9	187	95.4%	7	189	96.4%
	external recognition; local-based research	5	0	0.0%	0	5	100.0%	0	5	100.0%	0	5	100.0%
	external recognition; resource attraction	3	1	25.0%	0	4	100.0%	0	4	100.0%	0	4	100.0%
	local-based research	9	4	30.8%	9	4	30.8%	7	6	46.2%	11	2	15.4%
	resource attraction	46	174	79.1%	45	175	79.5%	45	175	79.5%	31	189	85.9%
tf.C2	indigenous	123	363	74.7%	182	304	62.6%	83	403	82.9%	89	397	81.7%
	non-urban	89	84	48.6%	48	125	72.3%	16	157	90.8%	85	88	50.9%
	urban1	60	165	73.3%	52	173	76.9%	48	177	78.7%	7	218	96.9%
	urban2	44	33	42.9%	29	48	62.3%	27	50	64.9%	36	41	53.2%
tf.C3	collaborative	105	200	65.6%	106	199	65.2%	84	221	72.5%	39	266	87.2%
	grassroots	30	181	85.8%	64	147	69.7%	22	189	89.6%	18	193	91.5%
	participatory	181	264	59.3%	141	304	68.3%	68	377	84.7%	160	285	64.0%
tf.C4	counter	180	251	58.2%	129	302	70.1%	76	355	82.4%	96	335	77.7%
	instructive	130	262	66.8%	180	212	54.1%	96	296	75.5%	121	271	69.1%
	pioneering	6	132	95.7%	2	136	98.6%	2	136	98.6%	0	138	100.0%
tf.C5	complex	20	123	86.0%	11	132	92.3%	11	132	92.3%	9	134	93.7%
	elementary	184	336	64.6%	151	369	71.0%	96	424	81.5%	165	355	68.3%
	guided	112	186	62.4%	149	149	50.0%	67	231	77.5%	43	255	85.6%

4.2.3 COMMUNITY ENGAGEMENT IN COMMUNITY MAPPING INITIATIVES

Community mapping initiatives rely on the people of a community – as per their name. The relationships between the many different agents involved, and their different functions, are crucial for the understanding of community engagement in community mapping, and as a consequence for the understanding of community mapping itself. In this section, five aspects or categories of community engagement are considered: the characterization of mapping agents within the knowledge-holding community; agents that take the lead in initiatives, and how they relate to the community; actor networks in their differing weights for varying purposes; the organizational basis for dialogue construction; and determination and choice, on the part of the mapping community, regarding process management.

4.2.3.1 Community engagement: mapping agents

The category 'cf.D3.I Mapping agents' refers to the members of the knowledge-holding community that directly conduct the mapping and the harnessing of local knowledge within a community mapping initiative. This excludes, for instance, external technicians and facilitators that are nevertheless involved in the initiative, and part of its actor network. The reality of mapping agents associated to an initiative is not easy to characterize, but it is a necessary endeavour, as it affects the interpretation of data pertaining to the other categories of the conceptual framework's community engagement dimension. From a community engagement perspective, the characterization and analysis of all the agents involved in a community mapping initiative, as well as the ebb and flow of dialogue and management within a process, must refer back to the community. What is the relationship between the leading agents and the community? How close or distanced is each of the agents in the community mapping initiative's actor network in relation to the community, and how does than affect their contributions? How is dialogue with the community being conducted? How much does the community influence the process flow and decision-making within the process? In sum, what is a community, that concept which is sometimes vague and difficult to explain? All of these questions require knowing who the community is, in the first place.

This analysis relies on qualitative data collection, which differs from entry to entry, to which more universal descriptors were subsequently applied, relying on the interpretation of the data. Such descriptors took into consideration the territory of action of these agents, their relationship with it, and even their relationship with each other, in order to reflect different positions, identities, and power differentials. With this in mind, ten descriptors were used, with the possibility of overlap: 'people of the region', 'residents of areas with similar characteristics', 'residents of the city/municipality', 'residents of a circumscribed area', 'community leaders', 'community experts', 'local group or collectivity', community collectivities', 'stakeholders of the area', and 'distinct ethno-linguistic/identitary groups'. The first four are predominantly territorial, while the rest refer to different forms of social positioning – from the importance and role that mapping agents assume within the community, to their association in distinct groups.

Table 4.29: For each type of the typological framework, descriptors associated to the mapping agents and number of initiatives in which they occur.

Typological framework types (respective nr. initiatives)		**cf.D1.IV Mapping agents: descriptors (respective nr. initiatives)**
tf.C1 Aim of the initiative	community capacitation (207)	residents of a circumscribed area (77); people of the region (65); distinct ethno-linguistic/identitary groups (52); local group or collectivity (37); community collectivities (24); community experts (17); residents of areas with similar characteristics (13); residents of the city/municipality (11); stakeholders of the area (5); community leaders (4)
	community capacit.; l.b. research (17)	residents of a circumscribed area (16); distinct ethno-linguistic/identitary groups (12); stakeholders of the area (4); community experts (1)
	community capacit.; resource attraction (10)	residents of a circumscribed area (5); residents of the city/municipality (2); local group or collectivity (2); residents of areas with similar characteristics (1); community experts (1)
	external recognition (289)	people of the region (172); distinct ethno-linguistic/identitary groups (114); residents of a circumscribed area (85); residents of areas with similar characteristics (26); community experts (9); residents of the city/municipality (2); community leaders (1)
	external recognition; community capacit. (196)	distinct ethno-linguistic/identitary groups (166); residents of a circumscribed area (152); people of the region (29); community experts (21); community collectivities (10); local group or collectivity (7); residents of areas with similar characteristics (1); community leaders (1)
	external recognition; l.b. research (5)	residents of areas with similar characteristics (5)
	external recognition; resource attract. (4)	residents of a circumscribed area (3); community collectivities (3); local group or collectivity (1)
	local-based research (13)	people of the region (8); community experts (8); local group or collectivity (8); residents of the city/municipality (1)
	resource attraction (220)	people of the region (33); local group or collectivity (116); residents of the city/municipality (63); community experts (63); distinct ethno-linguistic/identitary groups (30); residents of areas with similar characteristics (5); residents of a circumscribed area (5)
tf.C2 Knowledge-holding community	indigenous (486)	distinct ethno-linguistic/identitary groups (357); residents of a circumscribed area (245); people of the region (210); community experts (43); residents of areas with similar characteristics (14); community collectivities (10); local group or collectivity (9); community leaders (3)
	non-urban (173)	people of the region (95); residents of a circumscribed area (38); local group or collectivity (26); residents of areas with similar characteristics (17); distinct ethno-linguistic/identitary groups (11); community experts (4); residents of the city/municipality (1); community leaders (1); community collectivities (1); stakeholders of the area (1)
	urban1 (225)	local group or collectivity (117); community experts (66); residents of the city/municipality (65); residents of a circumscribed area (22); residents of areas with similar characteristics (20); community collectivities (7); distinct ethno-linguistic/identitary groups (3); people of the region (2); community leaders (2)
	urban2 (77)	residents of a circumscribed area (38); local group or collectivity (19); community collectivities (19); residents of the city/municipality (13); stakeholders of the area (8); community experts (7); distinct ethno-linguistic/identitary groups (3)

Table 4.29 (cont.): For each type of the typological framework, descriptors associated to the mapping agents and number of initiatives in which they occur.

Typological framework types (respective nr. initiatives)		**cf.D1.IV Mapping agents: descriptors (respective nr. initiatives)**
tf.C3 Community engagement	collaborative (305)	people of the region (122); distinct ethno-linguistic/identitary groups (96); community experts (85); residents of a circumscribed area (74); residents of the city/municipality (70); residents of areas with similar characteristics (34); local group or collectivity (18); community collectivities (8); community leaders (4)
	grassroots (211)	residents of a circumscribed area (182); distinct ethno-linguistic/identitary groups (169); community collectivities (11); local group or collectivity (10); community experts (9); residents of the city/municipality (6); people of the region (3); residents of areas with similar characteristics (1)
	participatory (445)	people of the region (182); local group or collectivity (143); distinct ethno-linguistic/identitary groups (109); residents of a circumscribed area (87); community experts (26); community collectivities (18); residents of areas with similar characteristics (16); stakeholders of the area (9); residents of the city/municipality (3); community leaders (2)
tf.C4 Connection to spat. policies	counter (431)	distinct ethno-linguistic/identitary groups (245); residents of a circumscribed area (209); people of the region (188); residents of areas with similar characteristics (23); community experts (12); local group or collectivity (10); residents of the city/municipality (5); community collectivities (2); community leaders (1)
	instructive (392)	distinct ethno-linguistic/identitary groups (128); residents of a circumscribed area (126); people of the region (118); community experts (108); residents of the city/municipality (74); local group or collectivity (46); community collectivities (32); residents of areas with similar characteristics (14); stakeholders of the area (9); community leaders (5)
	pioneering (138)	local group or collectivity (115); residents of areas with similar characteristics (14); residents of a circumscribed area (8); community collectivities (3); people of the region (1); distinct ethno-linguistic/identitary groups (1)
tf.C5 Use of spat. data proc. tools	complex (143)	residents of a circumscribed area (131); distinct ethno-linguistic/identitary groups (121); community experts (8); local group or collectivity (8); people of the region (7); residents of the city/municipality (3); community collectivities (2)
	elementary (520)	people of the region (238); distinct ethno-linguistic/identitary groups (144); local group or collectivity (125); residents of a circumscribed area (102); residents of areas with similar characteristics (46); community collectivities (8); stakeholders of the area (8); community experts (7); residents of the city/municipality (2); community leaders (2)
	guided (298)	residents of a circumscribed area (110); distinct ethno-linguistic/identitary groups (109); community experts (105); residents of the city/municipality (74); people of the region (62); local group or collectivity (38); community collectivities (27); residents of areas with similar characteristics (5); community leaders (4); stakeholders of the area (1)

Table 4.29 presents the mapping agents descriptors associated to each type of community mapping as they occur, without accounting for overlap; for that reason, the total number of initiatives per type is also provided, for comparison. Tables 4.30 to 4.34 describe the most

common descriptor combinations for each type of the typological framework, in order to more accurately represent reality.

Amongst the territorial descriptors, ‘residents of a circumscribed area’ – a village, a neighbourhood, a city parish, etc. – is the most representative, which underlines the local application and delimitation of most community mapping initiatives. ‘People of the region’, on the other hand, is often associated to large scale project implementations, in which interventions are designed with a whole region and its people in mind, even if such interventions are later divided into many different community mapping initiatives; for that reason, it is strongly associated to the external recognition type (and to counter-mapping). ‘Residents of areas with similar characteristics’ and ‘residents of the city/municipality’ have the same implications as ‘people of the region’. It should be noted that ‘municipality’ is used here in the sense of administrate division – smaller than a region, larger than a circumscribed area such as a village or a neighbourhood, - and thus also applies to rural areas.

As explained before, the 'distinct ethno-linguistic/identitary groups' descriptor is not applied to all instances in which the knowledge-holding community is indigenous, but rather when the indigenous, other specific ethno-linguistic, or other minority/non-mainstream identities of the community undertaking the mapping are a factor in its coming together to harness local knowledge, or are used to differentiate between it and other communities in the implementation of initiatives. Examples include instances when the community guards indigenous/traditional knowledge that it wants to harness, specific to that group and none of the others that inhabit the territory; when one of the aims of the initiative focuses on reinforcing the unique identity of the community; when initiatives are divided between the different ethno-linguistic groups, without mixing them together; or when the initiative derives from conflicts between an indigenous or minority identitary group and external agents. In spite of this disclaimer, it is still strongly associated to the indigenous type, as can be observed.

Another highlight is the importance of local, often small-scale collectivities for urban communities. Often, these are well established as members of the local community and engaging in the mapping itself. In some mapping initiatives, only one such entity is involved (‘local group or collectivity’), while other initiatives encompass all the groups acting in a certain area. This includes local associations, artistic collectives, schools, worker groups, and a myriad of other forms of association, formal or informal, which coexist within the urban territory.

Table 4.30: For 'tf.C1 Aim of the initiative', most common combinations of descriptors associated to the mapping agents and number of initiatives in which they occur.

tf.C1 Aim of the initiative	cf.D3.I Mapping agents: descriptor combinations	Nr initia-tives	% total
community capacitation	residents of a circumscribed area	44	4.58%
	people of the region; distinct ethno-linguistic/identitary groups	38	3.95%
	local group or collectivity	30	3.12%
	people of the region	22	2.29%
	Other combinations	73	7.60%
	Partial total	**207**	**21.54%**
community capacitation; local-based research	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	12	1.25%
	residents of a circumscribed area; stakeholders of the area	4	0.42%
	community experts	1	0.10%
	Partial total	**17**	**1.77%**
community capacitation; resource attraction	residents of a circumscribed area	5	0.52%
	local group or collectivity	2	0.21%
	residents of the city/municipality	1	0.10%
	residents of the city/municipality; community experts	1	0.10%
	residents of areas with similar characteristics	1	0.10%
	Partial total	**10**	**1.04%**
external recognition	people of the region	127	13.22%
	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	73	7.60%
	people of the region; distinct ethno-linguistic/identitary groups	37	3.85%
	residents of areas with similar characteristics	25	2.60%
	Other combinations	27	2.81%
	Partial total	**289**	**30.07%**
external recognition; community capacitation	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	129	13.42%
	residents of a circumscribed area	18	1.87%
	people of the region; distinct ethno-linguistic/identitary groups	16	1.66%
	community experts; community collectivities; distinct ethno-linguistic/identitary groups	9	0.94%
	Other combinations	18	1.87%
	Partial total	**196**	**20.40%**
external recognition; local-based research	residents of areas with similar characteristics	5	0.52%
	Partial total	5	0.52%
external recognition; resource attraction	residents of a circumscribed area; community collectivities	3	0.31%
	local group or collectivity	1	0.10%
	Partial total	**4**	**0.42%**
local-based research	people of the region; community experts; local group or collectivity	6	0.62%
	community experts	2	0.21%
	local group or collectivity	2	0.21%
	people of the region	2	0.21%
	residents of the city/municipality	1	0.10%
	Partial total	**13**	**1.35%**
resource attraction	local group or collectivity	114	11.86%
	residents of the city/municipality; community experts	61	6.35%
	people of the region; distinct ethno-linguistic/identitary groups	30	3.12%
	residents of areas with similar characteristics	5	0.52%
	Other combinations	10	1.04%
	Partial total	**220**	**22.89%**
Total		961	100.00%

Table 4.30: For 'tf.C2 Knowledge-holding community', the most common combinations of descriptors associated to the mapping agents and number of initiatives in which they occur.

tf.C2 Knowledge-holding community	cf.D3.I Mapping agents: descriptor combinations	Nr initia-tives	% total
indigenous	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	213	22.16%
	people of the region; distinct ethno-linguistic/identitary groups	113	11.76%
	people of the region	72	7.49%
	residents of a circumscribed area	23	2.39%
	Other combinations	65	6.76%
	Partial total	**486**	**50.57%**
non-urban	people of the region	84	8.74%
	residents of a circumscribed area	30	3.12%
	local group or collectivity	19	1.98%
	residents of areas with similar characteristics	17	1.77%
	Other combinations	23	2.39%
	Partial total	**173**	**18.00%**
urban1	local group or collectivity	115	11.97%
	residents of the city/municipality; community experts	62	6.45%
	residents of areas with similar characteristics	19	1.98%
	residents of a circumscribed area	11	1.14%
	Other combinations	18	1.87%
	Partial total	**225**	**23.41%**
urban2	residents of a circumscribed area	18	1.87%
	local group or collectivity	15	1.56%
	residents of the city/municipality	9	0.94%
	residents of a circumscribed area; community collectivities	9	0.94%
	Other combinations	26	2.71%
	Partial total	**77**	**8.01%**
Total		961	100.00%

Table 4.30: For 'tf.C3 Community engagement', the most common combinations of descriptors associated to the mapping agents and number of initiatives in which they occur.

tf.C3 Community engagement	cf.D3.I Mapping agents: descriptor combinations	Nr initia-tives	% total
collaborative	people of the region; distinct ethno-linguistic/identitary groups	76	7.91%
	residents of the city/municipality; community experts	62	6.45%
	residents of a circumscribed area	41	4.27%
	people of the region	33	3.43%
	Other combinations	93	9.68%
	Partial total	**305**	**31.74%**
grassroots	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	162	16.86%
	residents of a circumscribed area	16	1.66%
	local group or collectivity	10	1.04%
	residents of a circumscribed area; community collectivities	4	0.42%
	Other combinations	19	1.98%
	Partial total	**211**	**21.96%**
participatory	local group or collectivity	136	14.15%
	people of the region	123	12.80%
	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	47	4.89%
	people of the region; distinct ethno-linguistic/identitary groups	44	4.58%
	Other combinations	95	9.89%
	Partial total	**445**	**46.31%**
Total		961	100.00%

Table 4.30: For 'tf.C4 Connection to spatial policies', the most common combinations of descriptors associated to the mapping agents and number of initiatives in which they occur.

tf.C4 Connection to spatial policies	cf.D3.I Mapping agents: descriptor combinations	Nr initia-tives	% total
counter	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	181	18.83%
	people of the region	120	12.49%
	people of the region; distinct ethno-linguistic/identitary groups	54	5.62%
	residents of a circumscribed area	22	2.29%
	Other combinations	54	5.62%
	Partial total	**431**	**44.85%**
instructive	people of the region; distinct ethno-linguistic/identitary groups	66	6.87%
	residents of the city/municipality; community experts	62	6.45%
	residents of a circumscribed area	55	5.72%
	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	39	4.06%
	Other combinations	170	17.69%
	Partial total	**392**	**40.79%**
pioneering	local group or collectivity	115	11.97%
	residents of areas with similar characteristics	14	1.46%
	residents of a circumscribed area	5	0.52%
	residents of a circumscribed area; community collectivities	3	0.31%
	people of the region; distinct ethno-linguistic/identitary groups	1	0.10%
	Partial total	**138**	**14.36%**
Total		961	100.00%

Table 4.30: For 'tf.C1 Aim of the initiative', the most common combinations of descriptors associated to the mapping agents and number of initiatives in which they occur.

tf.C5 Use of spatial data processing tools	cf.D3.I Mapping agents: descriptor combinations	Nr initia-tives	% total
complex	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	120	12.49%
	residents of a circumscribed area	8	0.83%
	people of the region; community experts; local group or collectivity	6	0.62%
	residents of the city/municipality	3	0.31%
	Other combinations	6	0.62%
	Partial total	**143**	**14.88%**
elementary	people of the region	139	14.46%
	local group or collectivity	118	12.28%
	people of the region; distinct ethno-linguistic/identitary groups	97	10.09%
	residents of a circumscribed area	46	4.79%
	Other combinations	120	12.49%
	Partial total	**520**	**54.11%**
guided	residents of the city/municipality; community experts	62	6.45%
	residents of a circumscribed area; distinct ethno-linguistic/identitary groups	60	6.24%
	local group or collectivity	30	3.12%
	residents of a circumscribed area	28	2.91%
	Other combinations	118	12.28%
	Partial total	**298**	**31.01%**
Total		961	100.00%

Table 4.31: Number of initiatives, and their representativity in percentages, for the four types of leaders in a community mapping initiative.

		D3.II.Leaders of the initiative								
		Total nr. initia-tives	LOCAL INTRA-COMMUNITY		LOCAL NON-COMMUNITY		REGIONAL		EXTERNAL	
			Nr	%	Nr	%	Nr	%	Nr	%
All types of initiatives		**961**	**372**	**38.7%**	**337**	**35.1%**	**151**	**15.7%**	**703**	**73.2%**
tf. C1	community capacitation	207	91	9.5%	67	7.0%	24	2.5%	152	15.8%
	community capacitation; local-based research	17	1	0.1%	0	0.0%	16	1.7%	13	1.4%
	community capacitation; resource attraction	10	4	0.4%	9	0.9%	1	0.1%	4	0.4%
	external recognition	289	94	9.8%	62	6.5%	92	9.6%	236	24.6%
	external recognition; community capacitation	196	170	17.7%	125	13.0%	9	0.9%	72	7.5%
	external recognition; local-based research	5	0	0.0%	0	0.0%	0	0.0%	5	0.5%
	external recognition; resource attraction	4	1	0.1%	3	0.3%	0	0.0%	1	0.1%
	local-based research	13	3	0.3%	6	0.6%	7	0.7%	6	0.6%
	resource attraction	220	8	0.8%	65	6.8%	2	0.2%	214	22.3%
tf. C2	indigenous	486	281	29.2%	187	19.5%	56	5.8%	305	31.7%
	non-urban	173	43	4.5%	20	2.1%	82	8.5%	155	16.1%
	urban1	225	7	0.7%	100	10.4%	5	0.5%	207	21.5%
	urban2	77	41	4.3%	30	3.1%	8	0.8%	36	3.7%
tf. C3	**collaborative**	305	172	**17.9%**	120	**12.5%**	42	**4.4%**	286	**29.8%**
	grassroots	211	199	**20.7%**	185	**19.3%**	4	**0.4%**	0	**0.0%**
	participatory	445	1	**0.1%**	32	**3.3%**	105	**10.9%**	417	**43.4%**
tf. C4	counter	431	254	26.4%	175	18.2%	104	10.8%	250	26.0%
	instructive	392	113	11.8%	140	14.6%	46	4.8%	324	33.7%
	pioneering	138	5	0.5%	22	2.3%	1	0.1%	129	13.4%
tf. C5	complex	143	130	13.5%	135	14.0%	8	0.8%	6	0.6%
	elementary	520	139	14.5%	33	3.4%	100	10.4%	492	51.2%
	guided	298	103	10.7%	169	17.6%	43	4.5%	205	21.3%

4.2.3.2 Community engagement: leaders of the initiative

As explained before, the different categories of the 'cf.D3.Community engagement' all position themselves in relation to the mapping members of the knowledge-holding community, identified and quantified in the previous section. As such, when identifying and quantifying the agents that lead to the implementation of the community mapping initiative, it is important to transform the data collective from the multiple case studies into types which accurate depict that relationship: 'local intra-community', 'local non-community', 'regional', 'external'.

It is particularly interesting to look into the 'tf.C3.Knowledge-holding community' types. Per the criteria defined in the typological framework, in the grassroots community mapping type the main agents are local agents, within the community or originating from it, and may or may not invite external agents to participate in their initiative. In Table 4.31, it can be verified that the connection of the agents taking the lead to the knowledge-holding community is a strong predictor, and a confirmation, of the grassroots type – there are no external agents taking the

lead in grassroots community mapping initiatives, and only a few agents classified as regional. It should be noted that, once more, there can be more than one agent/group in the lead, and thus more than one type represented for each initiative. As the local connection is considered more relevant than the juxtaposition, this table does not focus on it.

Likewise, the definitions previously proposed for the participatory and collaborative types have a strong correlation with the connection of leading agents to the local community. For the collaborative type, percentages are evenly distributed between the two different types of local agents and the external agents, while for the participatory type, the agents taking the lead are much more noticeably external to the community.

4.2.3.3 Community engagement: actor networks

In what concerns actor networks, two forms of analysis are provided. Firstly, the number of different initiatives with institutional and collective actors of each type, as well as each degree of simultaneously occurring types of actors; total values are provided, as well as an intersection with the categories and types of the typological framework. Secondly, there is an analysis of the actor networks involved as a whole, using weighted averages to characterize them. The analysis is provided in Tables 4.33 to 4.35.

Table 4.32: Interpretation and analysis key for types of institutional/collective actors – codes, prevalent functions and weight of each agent type.

		cf.D3.Community engagement: III. Actor networks **INTERPRETATION AND ANALYSIS KEY**						
		Functions				**Weight of agent type**		
Code	**Type of institutional/collective actors**	Direct action	Funding/support	Directives/guidance	Research/development	Resource weight	Funding weight	Action weight
GV.A	**Governmental, direct supportive role**	✓	✓	✓	✓	2	1	1
GV.B	**Governmental, secondary role**		✓	✓	✓	2	1	0
GV.X	**Governmental, antagonistic**	-	-	-	-	-	-	-
GV.S	**Governmental, supra-national/foreign**		✓	✓	✓	3	2	0
GNC.I	**Governance, indigenous/traditional**	✓		✓		1	0	2
GNC.O	**Governance, other regional/local**	✓		✓		1	0	2
NG.I.A	**Non-gov. intervention-oriented, global reach**	✓	✓	✓	✓	3	2	1
NG.I.B	**Non-gov. intervention-oriented, national to local**	✓	✓	✓	✓	2	1	1
NG.R.A	**Non-gov. research-oriented, global reach**	✓	✓	✓	✓	3	2	1
NG.R.B	**Non-gov. research-oriented, multinational to local**	✓	✓	✓	✓	2	1	1
COL	**Other collectivities, regional to local**	✓				1	0	2

For the sake of clarity, a code is attributed to each type of actor previously described in the conceptual framework, as can be seen in Table 4.32. This table also provides an interpretation and analysis key for types of institutional/collective actors, including their respective codes, prevalent functions, and the weight of each agent type. Applying each assigned weight to the respective type of actor is done, in the analysis of the network, for the purpose of ascertaining the strength of the actor network as a whole; this is achieved by assigning a numerical value to each type of actor, counting the number of actors of each type engaged in the initiative, and obtaining the weighted sum of values for all actors, for the same initiative. These weighted analysis are then portrayed here according to three different vectors: general capacity for providing resources (funding, personnel, equipment, support, information, etc.), funding capacity only, and aptitude for taking action.

These are simplifications – not all governmental agents will have a resource weight of '2', nor will all collectivities present a funding weight of '0'; as a working tool to be applied to all initiatives and provide generalized results, a degree of simplicity was required, both in terms of the scale used, and in considering only the average characteristics of each type of actor. There are three levels for each vector (1-3 in resource capacity, and 0-2 in funding and action capacity), informed by the data collection itself and the prevalent emergent attributes of each type of agent that resulted from it. The predominant and recurring functions of each type, as well as their common dimension and reach, played a part in the attribution of these values.

It should be noted that type GV.X – 'Governmental, antagonistic' is displayed in the interpretation key and in the first analysis table to better complete the overview of juxtaposed actors, but it is not considered a part of actor networks and is not used for the rest of the analysis. Governmental actors connected to the process in an antagonistic capacity are not considered contributors to the community mapping initiative per se, as explained in Chapter 3, but including them provides a clearer picture of human and institutional connections in initiatives that often have a component of territorial conflict.

4.2.3.4 Community engagement: basis for dialogue construction

The 'basis for dialogue construction' category aims to provide an overview of the debate and information flow happening within a community mapping initiative, with the community itself as the reference point. These different types of flow, previously presented in the conceptual framework section, are roughly organized here – roughly, as the relationships established between mapping agents are not linear nor directly scalable from one type to the next - from the least engaging/cohesive to the most engaging/cohesive/far reaching.

Results presented here are, once again, stackable. There are cases in which more than one form of dialogue construction occurs – either because there are different phases within the initiative, or because different members of the community are assigned different tasks. For instance, in a participatory community mapping case, the whole community might have been invited to participate in a workshop, but the material used in that workshop might already contain some of the local knowledge harnessed by some members of the community in a previous moment. Above one fifth of all community mapping cases have more than one type of dialogue construction occurring simultaneously (Table 4.36).

Table 4.33: Number of initiatives in which each type of institutional/collective actor was engaged – total count and count per category and type of the typological framework.

		cf.D3.Community engagement: III. Actor networks INTERSECTION OF D3.III TYPES WITH THE TYPOLOGICAL FRAMEWORK											
		Nr. initiatives/tf. type for comparison	Occurrences of institutional/collective actors types										
			GV.A	GV.B	GV.X	GV.S	GNC.I	GNC.O	NG.I.A	NG.I.B	NG.R.A	NG.R.B	COL
			Nr. of initiatives in which each type of actor was present										
All types of initiatives		**961**	**170**	**325**	**404**	**101**	**402**	**83**	**668**	**563**	**250**	**225**	**248**
tf.C1	community capacitation	207	70	20	47	57	35	141	85	59	71	65	56
	community capacitat.; local-based research	17	0	12	12	13	0	17	4	17	16	0	4
	community capacitat.; resource attraction	10	5	1	1	0	3	6	10	0	4	3	4
	external recognition	289	85	198	17	150	23	243	139	120	23	15	17
	ext. recogn.; community capacitat.	196	37	161	18	176	17	39	131	22	30	4	17
	external recognition; local-based research	5	0	5	5	0	0	5	5	0	0	0	0
	external recognition; resource attraction	4	1	1	0	0	1	3	3	0	4	3	0
	local-based research	13	6	0	1	4	0	2	2	2	10	2	5
	resource attraction	220	121	6	0	2	4	212	184	30	67	156	67
tf.C2	indigenous	486	49	289	28	387	2	285	227	211	55	9	41
	non-urban	173	125	103	57	14	46	140	83	28	58	2	34
	urban1	224	131	6	16	0	18	211	204	4	78	182	77
	urban2	78	20	6	0	1	17	32	49	7	34	55	18
tf.C3	collaborative	305	93	66	30	156	53	227	127	101	142	84	101
	grassroots	239	25	174	2	169	11	62	192	42	8	31	3
	participatory	417	207	164	69	77	19	379	244	107	75	133	66
tf.C4	counter	431	129	381	34	299	31	258	277	108	68	11	9
	instructive	392	76	22	53	102	37	275	162	142	152	105	161
	pioneering	138	120	1	14	1	15	135	124	0	5	132	0
tf.C5	complex	143	18	126	0	125	2	4	132	0	12	11	2
	elementary	520	242	179	35	172	57	421	240	149	84	148	53
	guided	298	65	99	66	105	24	243	191	101	129	89	115

Table 4.34: Degree of juxtaposition of types of institutional/collective actors – simultaneous occurrences of more than one type, and weighted average of different types of actors per type of initiative.

		cf.D3.Community engagement: III. Actor networks **INTERSECTION OF D3.III NETWORKS WITH THE TYPOLOGICAL FRAMEWORK**							
		Nr. total initiatives per tf. type for comparison	**Degree of actor juxtaposition: simultaneous occurring institutional or collective actor types for the same initiative** *0 – zero types; to 6 – six simultaneously occuring types of institutional/collective actors for the same initiative*						
			1	**2**	**3**	**4**	**5**	**6**	
			Nr. initiatives						Juxtaposition : average
All types of initiatives		**961**	**48**	**268**	**255**	**269**	**116**	**5**	**3.16**
tf.C1	community capacitation	207	15	29	82	42	35	4	3.31
	community capacitat.; local-based research	17			1		16		4.88
	community capacitat.; resource attraction	10		1	4	3	2		3.60
	external recognition	289	31	71	100	76	11		2.88
	ext. recogn.; community capacitat.	196		132	43	8	12	1	2.51
	external recognition; local-based research	5			5				3.00
	external recognition; resource attraction	4			1	3			3.75
	local-based research	13	1	4	7	1			2.62
	resource attraction	220	1	31	12	136	40		3.83
tf.C2	indigenous	486	31	233	111	93	16	2	2.66
	non-urban	173	2	10	114	13	33	1	3.39
	urban1	224	1	9	8	156	48	2	4.10
	urban2	78	14	16	22	7	19		3.01
tf.C3	collaborative	305	7	21	117	89	68	3	3.65
	grassroots	239	38	130	17	46	8		2.40
	participatory	417	3	117	121	134	40	2	3.23
tf.C4	counter	431	2	191	146	58	34		2.84
	instructive	392	46	74	107	79	82	4	3.23
	pioneering	138		3	2	132		1	3.96
tf.C5	complex	143	3	125	8	6	1		2.14
	elementary	520	32	103	201	161	22	1	3.08
	guided	298	13	40	46	102	93	4	3.79

Table 4.35: Characterization of the average value and capacity of actor networks for different types of initiatives.

		cf.D3.Community engagement: III. Actor networks **INTERSECTION OF D3.III NETWORKS WITH THE TYPOLOGICAL FRAMEWORK**				
		Actor juxtaposition		**Actor network capacity**		
		Number of institutional/ collective actors per initiative	Simultaneous institutional/ collective actor **types** per initiative	resource capacity	funding capacity	action capacity
		Average	Average	Weighted average using assigned weights of Table 4.32		
All types of initiatives		**5.39**	**3.16**	**11.52**	**6.13**	**6.02**
tf.C1	community capacitation	5.81	3.31	11.74	5.94	6.76
	community capacitat.; local-based research	5.88	4.88	14.00	8.12	5.94
	community capacitat.; resource attraction	6.50	3.60	13.90	7.40	6.50
	external recognition	4.70	2.88	10.42	5.72	5.45
	ext. recogn.; community capacitat.	3.40	2.51	6.14	2.74	4.25
	external recognition; local-based research	4.00	3.00	11.00	7.00	3.00
	external recognition; resource attraction	4.75	3.75	9.25	4.50	5.25
	local-based research	3.62	2.62	7.15	3.54	3.08
	resource attraction	7.73	3.83	17.55	9.81	7.91
tf.C2	indigenous	3.78	2.66	8.11	4.33	4.67
	non-urban	5.88	3.39	13.10	7.23	5.23
	urban1	8.20	4.10	18.16	9.99	8.47
	urban2	6.26	3.01	10.08	3.74	9.18
tf.C3	collaborative	7.49	3.65	16.52	9.03	8.26
	grassroots	3.81	2.40	7.80	3.48	6.09
	participatory	4.76	3.23	9.85	5.40	4.46
tf.C4	counter	4.31	2.84	8.99	4.68	5.01
	instructive	6.74	3.23	14.89	8.15	7.49
	pioneering	4.92	3.96	9.86	4.94	5.01
tf.C5	complex	2.41	2.14	3.82	1.41	3.24
	elementary	4.63	3.08	9.82	5.19	4.99
	guided	8.15	3.79	18.18	10.03	9.16

It should also be noted that, for a few case studies, it was not possible to determine the basis of dialogue construction at all, beyond a generic assertion of the engagement of the community in mapping; the representativity of these cases, expressed by the number of initiatives included in them, is presented along the different types of dialogue construction.

Table 4.36: Simultaneous type occurrences, represented by number of initiatives.

cf.D3.IV Basis for dialogue construction: simultaneous type occurrences		
Total	Total initiatives	% total
>1 type simultaneously	217	22.6%
only 1 type	744	77.4%
TOTAL	**961**	**100.0%**

In Table 4.37, which shows the number of initiatives for each type of dialogue organization, we can see that the most common types are 'community' and 'researchers', followed by 'teams'. These three types are prevalent enough that they set the tone for most community mapping initiatives: mapping by the knowledge-holding community is happening by 1) having a majority of the community (as defined and characterized in section 4.2.3.1) engaged in the mapping and harnessing of local knowledge, often in joint activities or sessions; 2) by having a few previously non-organized members of the community acquire adequate training, and conduct the mapping and the dialogue necessary within the community; 3) by having the community divided into teams and set to different tasks or parts of the territory.

4.2.3.5 Community engagement: process management

The process management category pertains to the role of the community in determining the flow of the process itself: its objectives, tasks, partnerships, places of meeting, timeline, use of spatial data processing tools, and methodology, amongst other aspects. There are three emergent types within this category: 'pre-determined', 'self-determined', and 'collaborative', all of them having the knowledge-holding community as their reference point. In gathering the media footprint of a case, the reasoning underlying the methodological decisions and choices for process implementation is not always reflected upon; it is more common to have these methodological choices presented as a consummated fact. Such choices are made relevant mostly when they are negotiated between the local community and external agents, in which case they are highlighted as part of a fully collaborative process. Even so, in three fourths of the cases it was possible to ascertain what the positioning of the knowledge community regarding the management of the process itself.

This category is entirely separate from the category that concerns the leading agents of the initiative; in other words, it is entirely possible for local intra-community agents to take the initiative and push for the implementation of a community mapping process, and the process management be nevertheless determined by agents external to the community, who were involved in the meanwhile. Considering that, as seen before, community mapping initiatives tend to have not only varied actor networks but also to involve, at a certain point, agents with knowledge and background in community mapping – who are relied upon to provide training and guidance, - it was not seen as surprising that most processes are pre-determined, by agents other than the knowledge-holding and mapping community.

Table 4.37: Types of dialogue construction within community mapping, and corresponding number of initiatives.

		cf.D3.IV Basis for dialogue construction: types										
		Total	N/A		Locals		Nexus		Researchers		Group	
		Nr	Nr	%	Nr	%	Nr	%	Nr	%	Nr	%
All types of initiatives		**961**	**20**	**2.1%**	**14**	**1.5%**	**47**	**4.9%**	**269**	**28.0%**	**19**	**2.0%**
tf.C1	community capacitation	207	16	1.7%	14	1.5%	20	2.1%	78	8.1%	10	1.0%
	community capacit.; local-based research	17	0	0.0%	0	0.0%	0	0.0%	13	1.4%	0	0.0%
	community capacit.; resource attraction	10	0	0.0%	0	0.0%	6	0.6%	1	0.1%	1	0.1%
	external recognition	289	2	0.2%	0	0.0%	8	0.8%	79	8.2%	1	0.1%
	external recognition; community capacit.	196	1	0.1%	0	0.0%	6	0.6%	20	2.1%	2	0.2%
	external recognition; local-based research	5	0	0.0%	0	0.0%	0	0.0%	5	0.5%	0	0.0%
	external recognition; resource attraction	4	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.1%
	local-based research	13	0	0.0%	0	0.0%	7	0.7%	6	0.6%	1	0.1%
	resource attraction	220	1	0.1%	0	0.0%	0	0.0%	67	7.0%	3	0.3%
tf.C2	indigenous	486	3	0.3%	0	0.0%	20	2.1%	142	14.8%	2	0.2%
	non-urban	173	1	0.1%	0	0.0%	2	0.2%	31	3.2%	5	0.5%
	urban1	225	3	0.3%	0	0.0%	11	1.1%	85	8.8%	0	0.0%
	urban2	77	13	1.4%	14	1.5%	14	1.5%	11	1.1%	12	1.2%
tf.C3	collaborative	305	5	0.5%	8	0.8%	22	2.3%	206	21.4%	6	0.6%
	grassroots	211	9	0.9%	2	0.2%	14	1.5%	8	0.8%	7	0.7%
	participatory	445	6	0.6%	4	0.4%	11	1.1%	55	5.7%	6	0.6%
tf.C4	counter	431	3	0.3%	1	0.1%	12	1.2%	89	9.3%	7	0.7%
	instructive	392	17	1.8%	13	1.4%	31	3.2%	166	17.3%	12	1.2%
	pioneering	138	0	0.0%	0	0.0%	4	0.4%	14	1.5%	0	0.0%
tf.C5	complex	143	6	0.6%	0	0.0%	11	1.1%	8	0.8%	2	0.2%
	elementary	520	5	0.5%	6	0.6%	19	2.0%	114	11.9%	7	0.7%
	guided	298	9	0.9%	8	0.8%	17	1.8%	147	15.3%	10	1.0%

		Total	Teams		Local experts		Community		Delegation		Coalition	
		Nr	Nr	%	Nr	%	Nr	%	Nr	%	Nr	%
All types of initiatives		**961**	**166**	**17.3%**	**19**	**2.0%**	**581**	**60.5%**	**8**	**0.8%**	**58**	**6.0%**
tf.C1	community capacitation	207	21	2.2%	13	1.4%	101	10.5%	1	0.1%	5	0.5%
	community capacit.; local-based research	17	0	0.0%	0	0.0%	13	1.4%	4	0.4%	0	0.0%
	community capacit.; resource attraction	10	2	0.2%	0	0.0%	5	0.5%	0	0.0%	0	0.0%
	external recognition	289	0	0.0%	2	0.2%	227	23.6%	0	0.0%	52	5.4%
	external recognition; community capacit.	196	3	0.3%	2	0.2%	178	18.5%	3	0.3%	1	0.1%
	external recognition; local-based research	5	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	external recognition; resource attraction	4	3	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	local-based research	13	0	0.0%	2	0.2%	3	0.3%	0	0.0%	0	0.0%
	resource attraction	220	137	14.3%	0	0.0%	54	5.6%	0	0.0%	0	0.0%
tf.C2	indigenous	486	5	0.5%	3	0.3%	414	43.1%	3	0.3%	43	4.5%
	non-urban	173	18	1.9%	15	1.6%	116	12.1%	1	0.1%	15	1.6%
	urban1	225	142	14.8%	1	0.1%	33	3.4%	0	0.0%	0	0.0%
	urban2	77	1	0.1%	0	0.0%	18	1.9%	4	0.4%	0	0.0%
tf.C3	collaborative	305	25	2.6%	3	0.3%	174	18.1%	1	0.1%	11	1.1%
	grassroots	211	3	0.3%	0	0.0%	175	18.2%	0	0.0%	42	4.4%
	participatory	445	138	14.4%	16	1.7%	232	24.1%	7	0.7%	5	0.5%
tf.C4	counter	431	5	0.5%	1	0.1%	359	37.4%	1	0.1%	58	6.0%
	instructive	392	42	4.4%	18	1.9%	217	22.6%	7	0.7%	0	0.0%
	pioneering	138	119	12.4%	0	0.0%	5	0.5%	0	0.0%	0	0.0%
tf.C5	complex	143	0	0.0%	0	0.0%	122	12.7%	0	0.0%	0	0.0%
	elementary	520	125	13.0%	16	1.7%	297	30.9%	5	0.5%	15	1.6%
	guided	298	41	4.3%	3	0.3%	162	16.9%	3	0.3%	43	4.5%

Table 4.38: Types of process management within community mapping, in what concerns the knowledge-holding community, and corresponding number of initiatives.

		D3.V.Process management									
		N/A		Pre-determined		Self-determined		Collaborative		Totals	
		Nr	%	Nr	%	Nr	%	Nr	%	Nr	%
All types of initiatives		**245**	**25.5%**	**618**	**64.3%**	**13**	**1.4%**	**84**	**8.7%**	**961**	**100.0%**
tf. C1	community capacitation	75	7.8%	102	10.6%	5	0.5%	25	2.6%	207	21.5%
	community capacit.; local-based research	0	0.0%	13	1.4%	0	0.0%	4	0.4%	17	1.8%
	community capacit.; resource attraction	3	0.3%	4	0.4%	3	0.3%	0	0.0%	10	1.0%
	external recognition	33	3.4%	210	21.9%	0	0.0%	46	4.8%	289	30.1%
	external recognition; community capacitation	126	13.1%	64	6.7%	2	0.2%	4	0.4%	196	20.4%
	external recognition; local-based research	0	0.0%	5	0.5%	0	0.0%	0	0.0%	5	0.5%
	external recognition; resource attraction	0	0.0%	1	0.1%	0	0.0%	3	0.3%	4	0.4%
	local-based research	7	0.7%	5	0.5%	0	0.0%	1	0.1%	13	1.4%
	resource attraction	1	0.1%	214	22.3%	3	0.3%	1	0.1%	220	22.9%
tf. C2	indigenous	158	16.4%	275	28.6%	2	0.2%	51	5.3%	486	50.6%
	non-urban	37	3.9%	131	13.6%	0	0.0%	4	0.4%	173	18.0%
	urban1	23	2.4%	193	20.1%	5	0.5%	4	0.4%	225	23.4%
	urban2	27	2.8%	19	2.0%	6	0.6%	25	2.6%	77	8.0%
tf. C3	collaborative	66	6.9%	219	22.8%	1	0.1%	19	2.0%	305	31.7%
	grassroots	144	15.0%	3	0.3%	12	1.2%	51	5.3%	211	22.0%
	participatory	35	3.6%	396	41.2%	0	0.0%	14	1.5%	445	46.3%
tf. C4	counter	152	15.8%	227	23.6%	4	0.4%	48	5.0%	431	44.8%
	instructive	79	8.2%	273	28.4%	6	0.6%	33	3.4%	392	40.8%
	pioneering	14	1.5%	118	12.3%	3	0.3%	3	0.3%	138	14.4%
tf. C5	complex	133	13.8%	3	0.3%	6	0.6%	0	0.0%	143	14.9%
	elementary	44	4.6%	457	47.6%	5	0.5%	14	1.5%	520	54.1%
	guided	68	7.1%	158	16.4%	2	0.2%	70	7.3%	298	31.0%

4.2.4 COMMUNITY MAPPING INITIATIVES AND SPATIAL POLICIES

To understand the 'cf.D4.Spatial policies' dimension, this work has proposed three categories for direct analysis: actors' aspirations to exert influence over spatial policies, integration of initiatives into existing spatial policy, and phases of policy making facilitated or substituted. These categories are combined in Chapter 5 in order to obtain a more nuanced depiction of reality.

4.2.4.1 Spatial policies: actors' aspirations to exert influence over spatial policies

Actors' aspirations to exert influence over spatial policies are determined through express statements concerning spatial policies and formal decisions at the time of the community mapping initiative implementation; these statements must be directly related to the initiative at hand. While the agents involved in community mapping might not actually believe that they will affect existing policy or institutional decisions when making these statements, they do often (87.6% of times, in fact) indicate a desire for a change in their present reality. Their involvement in a community mapping initiative, which has the potential to transfer knowledge into the sphere of decision-making, might be considered as taking action and fighting for that change.

Table 4.39: Actors' aspirations to exert influence over spatial policies: positive answers.

		Total nr. of initiatives		cf.D4.I. Actors' aspirations to exert influence over spatial policies			
				Positive		Not mentioned	
		Nr	%	Nr	%	Nr	%
All types of initiatives		**961**	**100.0%**	**842**	**87.6%**	**119**	**12.4%**
tf.C1	community capacitation	207	21.5%	141	14.7%	66	6.9%
	community capacitation; local-based research	17	1.8%	16	1.7%	1	0.1%
	community capacitation; resource attraction	10	1.0%	9	0.9%	1	0.1%
	external recognition	289	30.1%	245	25.5%	44	4.6%
	external recognition; community capacitation	196	20.4%	196	20.4%	0	0.0%
	external recognition; local-based research	5	0.5%	5	0.5%	0	0.0%
	external recognition; resource attraction	4	0.4%	4	0.4%	0	0.0%
	local-based research	13	1.4%	6	0.6%	7	0.7%
	resource attraction	220	22.9%	220	22.9%	0	0.0%
tf.C2	indigenous	486	50.6%	418	43.5%	68	7.1%
	non-urban	173	18.0%	167	17.4%	6	0.6%
	urban1	225	23.4%	222	23.1%	3	0.3%
	urban2	77	8.0%	35	3.6%	42	4.4%
tf.C3	collaborative	305	31.7%	249	25.9%	56	5.8%
	grassroots	211	22.0%	194	20.2%	17	1.8%
	participatory	445	46.3%	399	41.5%	46	4.8%
tf.C4	counter	431	44.8%	431	44.8%	0	0.0%
	instructive	392	40.8%	273	28.4%	119	12.4%
	pioneering	138	14.4%	138	14.4%	0	0.0%
tf.C5	complex	143	14.9%	131	13.6%	12	1.2%
	elementary	520	54.1%	445	46.3%	75	7.8%
	guided	298	31.0%	266	27.7%	32	3.3%

As explained before, not all community mapping initiatives are connected to existing spatial policy, although they have the potential to form that connection and to inform policies that do not yet exist. Therefore, it is important to emphasize that this section pertains to actual policies and decisions, which have been directly referenced by the agents involved in the initiative.

The data collected was also queried to ascertain whether involved actors think that community mapping is relevant to spatial planning, territorial development, governance, and decision-making, in more general terms (not necessarily in their specific case). Positive perceptions regarding community mapping correspond to a weight of 698 initiatives, or 72.6% of the total. It is interesting to note that there is a high rate of awareness of their positioning in regard to planning and policy in the first place, and of what these two concepts mean.

4.2.4.2 Spatial policies: integration of initiatives into existing spatial policy

Having looked into actors' aspirations to exert influence over policy and decision making, we now look into cases in which such was achieved, or nearly so. This section looks into three types of integration – 'formal', 'integrated' and 'potential', as proposed by the conceptual framework of Chapter 3, – of community mapping processes into existing spatial policy. The 'potential' type is applied to initiatives which, due to their characteristics, products and/or aims, are expected to integrate policy or influence decision making in their near future, per the involved agents perceptions. The three types are exclusionary, as belonging to one excludes an initiative from belonging to the others.

Additionally, sum values for the formal and integrated types are provided, for these two types are both the expression of processes that have transferred local knowledge into the decision-making sphere, despite their different paths to achieve that end. Total values are provided, as well as their intersection with the categories and types, and type combinations, of the typological framework.

Table 4.40: Type of integration of initiatives challenging or serving policy making; total number of initiatives.

cf.D4.Spatial Policies: I. Integration into existing spatial policy **OVERVIEW OF D4.I TYPES**		
Type of initiative integration *Is the process part of existing spatial policy, or very likely to be?*	Nr. initiatives	% of total
FORMAL initiative, conducted by governmental agents/institutions, and thus already part of official policy and decision-making processes	71	7,39%
INTEGRATED into official policy and decision-making processes	174	18,11%
POTENTIAL contribution to official policy, with involved agents expressing a desire for integration	336	34,96%
Not applicable; the initative is not expected to affect any current spatial policy or influence decisions, although it might inform future policies	380	39,54%
Total	**961**	**100,00%**
FORMAL+INTEGRATED	245	25,5%

Table 4.41: Type of integration of initiatives challenging or serving policy making – distribution per category and type of the typological framework ('tf').

		cf.D4.Spatial Policies: I. Integration into existing spatial policy **INTERSECTION OF D4.I TYPES WITH THE TYPOLOGICAL FRAMEWORK**									
		cf.D4.I.Type of initiative integration									
		FORMAL+ INTEGRATED		FORMAL		INTEGRATED		POTENTIAL		UNRELATED	
Typological framework types		Nr. initia-tives	% of Total	Nr. initia-tives	% of Total	Nr. initia-tives	% of Total	Nr. initia-tives	% of Total	Nr. initia-tives	% of Total
tf.C1 Aim of the initiative	community capacitation	47	4,89%	41	4,27%	6	0,62%	38	3,95%	122	12,70%
	community capacitat.; local-based research	4	0,42%	4	0,42%	0	0,00%	0	0,00%	13	1,35%
	community capacitat.; resource attraction	8	0,83%	2	0,21%	6	0,62%	0	0,00%	2	0,21%
	external recognition	53	5,52%	2	0,21%	51	5,31%	18	1,87%	218	22,68%
	ext. recogn.; community capacitat.	33	3,43%	14	1,46%	19	1,98%	150	15,61%	13	1,35%
	external recognition; local-based research	0	0,00%	0	0,00%	0	0,00%	5	0,52%	0	0,00%
	external recognition; resource attraction	0	0,00%	0	0,00%	0	0,00%	1	0,10%	3	0,31%
	local-based research	2	0,21%	2	0,21%	0	0,00%	3	0,31%	8	0,83%
	resource attraction	98	10,20%	6	0,62%	92	9,57%	121	12,59%	1	0,10%
	Total	**245**	**25,49%**	**71**	**7,39%**	**174**	**18,11%**	**336**	**34,96%**	**380**	**39,54%**
tf.C2 Knowledge-holding community	indigenous	99	10,30%	21	2,19%	78	8,12%	173	18,00%	214	22,27%
	non-urban	40	4,16%	29	3,02%	11	1,14%	39	4,06%	94	9,78%
	urban1	92	9,57%	11	1,14%	81	8,43%	123	12,80%	10	1.04%
	urban2	14	1,46%	10	1,04%	4	0,42%	1	0,10%	62	6.45%
	Total	**245**	**25,49%**	**71**	**7,39%**	**174**	**18,11%**	**336**	**34,96%**	**380**	**39,54%**
tf.C3 Community engagement	collaborative	119	12,38%	15	1,56%	104	10,82%	92	9,57%	94	9,78%
	grassroots	27	2,81%	3	0,31%	24	2,50%	111	11,55%	73	7.60%
	participatory	99	10,30%	53	5,52%	46	4,79%	133	13,84%	213	22.16%
	Total	**245**	**25,49%**	**71**	**7,39%**	**174**	**18,11%**	**336**	**34,96%**	**380**	**39,54%**
tf.C4 Connection to spt. policies	counter	54	5,62%	1	0,10%	53	5,52%	185	19,25%	192	19,98%
	instructive	174	18,11%	70	7,28%	104	10,82%	34	3,54%	184	19,15%
	pioneering	17	1,77%		0,00%	17	1,77%	117	12,17%	4	0,42%
	Total	**245**	**25,49%**	**71**	**7,39%**	**174**	**18,11%**	**336**	**34,96%**	**380**	**39,54%**
tf.C5 Use of s.d.p tools	complex	20	2,08%	2	0,21%	18	1,87%	109	11,34%	14	1,46%
	elementary	112	11,65%	32	3,33%	80	8,32%	202	21,02%	206	21,44%
	guided	113	11,76%	37	3,85%	76	7,91%	25	2,60%	160	16,65%
	Total	**245**	**25,49%**	**71**	**7,39%**	**174**	**18,11%**	**336**	**34,96%**	**380**	**39,54%**

Table 4.42: Integration of initiatives challenging or serving policy making – distribution per most common type combinations of the typological framework ('tf').

cf.D4.Spatial Policies: I. Integration into existing spatial policy **INTERSECTION OF D4.I TYPES WITH THE TYPOLOGICAL FRAMEWORK**							
cf.D4.I.Type of initiative integration	**Typological framework combinations of types per category**						
	tf.C1 Aim of the initiative	tf.C2 Knowledge-holding community	tf.C3 Community engagement	tf.C4 Connection to spatial policies	tf.C5 Use of spatial data processing tools	Nr. initia-tives	% of total
FORMAL	community capacitation	non-urban	participatory	instructive	elementary	15	1,6%
	community capacitation	non-urban	participatory	instructive	guided	13	1,4%
	external recognition; community capacit.	indigenous	participatory	instructive	guided	6	0,6%
	community capacitation	indigenous	collaborative	instructive	guided	5	0,5%
	resource attraction	urban1	participatory	instructive	elementary	5	0,5%
	community capacit.; local-based research	urban2	participatory	instructive	elementary	4	0,4%
	Other combinations					48	5,0%
	TOTAL					**71**	**7,4%**
INTEGRATED	resource attraction	urban1	collaborative	instructive	guided	61	6,3%
	resource attraction	indigenous	participatory	instructive	elementary	29	3,0%
	external recognition	urban1	collaborative	pioneering	elementary	13	1,4%
	external recognition; community capacit.	indigenous	grassroots	counter	complex	13	1,4%
	external recognition	non-urban	collaborative	counter	elementary	10	1,0%
	external recognition	indigenous	collaborative	counter	elementary	10	1,0%
	Other combinations					136	14,2%
	TOTAL					**174**	**18,1%**
POTENTIAL	resource attraction	urban1	participatory	pioneering	elementary	114	11,9%
	external recognition; community capacit.	indigenous	grassroots	counter	complex	107	11,1%
	community capacitation	indigenous	collaborative	counter	elementary	14	1,5%
	external recognition; community capacit.	non-urban	collaborative	counter	elementary	14	1,5%
	external recognition	indigenous	collaborative	counter	elementary	10	1,0%
	external recognition; community capacit.	non-urban	collaborative	counter	guided	10	1,0%
	Other combinations					269	28,0%
	TOTAL					**336**	**35,0%**

4.2.4.3 Spatial policies: phases of policy making facilitated or substituted

Community mapping processes can serve different functions, in what concerns policy making. In the case of initiatives implemented by formal and governmental entities, the implementation might already be devised to achieve certain ends necessary to decision-making, such as documenting the local context or diagnosing its problems. In the case of processes that start outside the formal sphere (or 'counter' to it) but nevertheless succeed in changing policy and affecting decision-making, the community mapping initiative functions as a substitute of certain tasks as well. Table 4.43 and Figure 4.44 depict this reality, especially for integrated and formal processes.

Table 4.43: Phases of policy-making facilitated or substituted by the initiative, focusing on the number of initiatives per type and degree of substitution of community mapping processes to decision-making phases.

		cf.D4.Spatial Policies: II. Phases of policy making facilitated or substituted **OVERVIEW OF D4.II PHASES**											
		Phases of policy-making facilitated or substituted by the initiative: types						**Degree of substitution: number of simultaneous occurring types for the same initiative**					
								1 – one phase; to 5 – five simultaneously occuring phases for the same initiative					
		DOCUMENTING	DIAGNOSING	CONSULTING	DRAFTING	INTERVENING	ADJUSTING	**1**	**2**	**3**	**4**	**5**	
cf.D4.I.Type of initiative integration	Nr. initiatives	Nr. initiatives						Nr. initiatives					Weighted average
FORMAL	71	46	32	38	41	36	1	20	8	19	19	5	2,7
INTEGRATED	174	131	58	19	21	3	65	95	58	1	17	3	1,7
POTENTIAL	336	334	260	117	120	116	23	58	152	10	2	114	2,9
Total	**581**	**511**	**350**	**174**	**182**	**155**	**89**	**173**	**218**	**30**	**38**	**122**	**-**
FORMAL+ INTEGRATED	245	177	90	57	62	39	66	115	66	20	36	8	2,0

Figure 4.44: Number of initiatives which present each of combination of phases of policy-making being facilitated or substituted.

4.2.5 SPATIAL DATA PROCESSING TOOLS IN COMMUNITY MAPPING INITIATIVES

In this section, pertaining to the 'cf.D5. Spatial data processing tools' dimension, this study aims to characterize and analyse the use of the aforementioned tools by the mapping agents of the knowledge-holding community. Two categories were determined in order to achieve this; the first focuses on the concrete types of tools used, and the second on the products of local knowledge harnessing and compilation achieved through their use.

4.2.5.1 Spatial data processing tools: tools used during the initiative

As with the description of the process management determination, tool use is something which is not described in all cases; it is not uncommon for the use of spatial data processing tools to be implied by the existence of their product – a map, a drawing, etc. – instead of expressly stated. Even so, it was possible to collect information regarding the types of tools used, if not always the specific tools themselves, for all but 10.8% of initiatives. The missing information is expressed by type 'T.01 N/A' and represented in Table 4.46 along with other types. Unlike the others, however, T.01 is exclusionary, as only that type is present for those initiatives; for all other types, there is the possibility of juxtaposition, and almost always more than one type of tool is used in the same initiative.

Rather than represent these juxtapositions between types, the analysis veered towards depicting the potential of the tools used to transfer the local knowledge harnessed, as a more manageable and immediate way of perceiving the representativity of the set of tools used in each initiative. For that purpose, a weighted average of all tools was calculated, in a similar way to the method used to represent the different weights of actor networks. Each tool was previously assigned a different 'transference weight' value, according to the scale presented in Table 4.45. The minimum transference potential of a set of tools used is zero, and the maximum obtained from amongst all initiatives was 21; the weighted averages are shown in Table 4.47.

Table 4.45: Interpretation and analysis key for types of tools used by community mapping agents.

Code	D5.I.Types of tools used by the knowledge-holder community	Manual tools	Devices/digital tools	Transference weight
T.01	**N/A**	-	-	**-**
T.02	**stationery/drawing material**	✓	✓	**0**
T.03	**physical markers/stickers**	✓	-	**0**
T.04	**modelling material**	✓	✓	**0**
T.05	**projections/presentation**	-	-	**0**
T.06	**community documents**	✓	-	**1**
T.07	**geographic data**	✓	-	**1**
T.08	**printed surveys**	✓	-	**1**
T.09	**printed base maps**	✓	-	**1**
T.10	**printed aerial/satellite images**	✓	-	**1**
T.11	**base 3D model**	✓	-	**1**
T.12	**photographic cameras**	-	✓	**2**
T.13	**sound recorders**	-	✓	**2**
T.14	**video cameras**	-	✓	**3**
T.15	**aerial devices**	-	✓	**3**
T.16	**GPS devices**	-	✓	**3**
T.17	**phones/tablets/apps**	-	✓	**3**
T.18	**computers**	-	✓	**3**
T.19	**GIS software**	-	✓	**4**
T.20	**online geographic platforms**	-	✓	**4**

Table 4.46: Number of initiatives in which each of the different types of tools used by community mapping agents is employed.

Typological framework types	Total nr. initiatives	cf.D5.I Different types of tools used by the knowledge-holding community																			
		T. 01	T. 02	T. 03	T. 04	T. 05	T. 06	T. 07	T. 08	T. 09	T. 10	T. 11	T. 12	T. 13	T. 14	T. 15	T. 16	T. 17	T. 18	T. 19	T. 20
community capacitation	207	42	128	74	4	18	2	3	19	94	40	1	4	1	8	4	18	17	55	32	25
com. capacit.; l.b. research	17	0	13	1	0	0	0	0	0	13	0	0	0	0	0	0	0	0	4	0	4
com. capacit.; resource att.	10	1	9	0	0	2	0	0	5	2	1	0	0	0	1	1	0	3	1	0	1
external recognition	289	16	209	40	1	72	0	0	44	125	0	0	0	42	40	0	78	67	0	0	0
ext. recogn.; com. capacit.	196	14	178	18	122	5	1	120	2	179	6	0	2	7	5	0	31	0	6	4	1
ext. recogn.; l.b. research	5	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
ext. recogn.; resource att.	4	0	4	0	0	0	0	0	0	4	3	0	3	0	0	0	4	0	3	0	3
local-based research	13	1	4	0	0	0	0	0	0	4	4	0	0	0	0	0	0	8	8	1	8
resource attraction	220	30	148	1	0	0	0	0	5	26	0	0	1	0	0	22	4	2	41	42	42
All tf.C1 initiatives	**961**	**104**	**698**	**134**	**127**	**102**	**3**	**123**	**75**	**447**	**54**	**1**	**10**	**50**	**54**	**27**	**140**	**97**	**118**	**79**	**84**
indigenous	486	70	405	87	127	85	1	123	44	332	5	0	2	49	45	0	100	9	17	4	7
non-urban	173	14	78	17	0	15	2	0	18	55	37	1	1	0	0	1	33	65	21	19	4
urban1	225	1	179	5	0	2	0	0	13	33	9	0	3	0	3	24	6	9	54	50	49
urban2	77	19	36	25	0	0	0	0	0	27	3	0	4	1	6	2	1	14	26	6	24
All tf.C2 initiatives	**961**	**104**	**698**	**134**	**127**	**102**	**3**	**123**	**75**	**447**	**54**	**1**	**10**	**50**	**54**	**27**	**140**	**97**	**118**	**79**	**84**
collaborative	305	29	226	104	4	8	0	0	2	188	4	0	0	5	8	24	74	15	64	48	56
grassroots	211	7	185	10	120	43	1	121	46	177	1	0	4	45	4	2	1	10	18	8	16
participatory	445	68	287	20	3	51	2	2	27	82	49	1	6	0	42	1	65	72	36	23	12
All tf.C3 initiatives	**961**	**104**	**698**	**134**	**127**	**102**	**3**	**123**	**75**	**447**	**54**	**1**	**10**	**50**	**54**	**27**	**140**	**97**	**118**	**79**	**84**
counter	431	18	347	50	123	51	1	123	47	269	1	0	0	44	43	0	106	68	7	4	5
instructive	392	86	213	84	4	50	2	0	24	173	49	1	7	6	11	27	29	27	108	75	76
pioneering	138	0	138	0	0	1	0	0	4	5	4	0	3	0	0	0	5	2	3	0	3
All tf.C4 initiatives	**961**	**104**	**698**	**134**	**127**	**102**	**3**	**123**	**75**	**447**	**54**	**1**	**10**	**50**	**54**	**27**	**140**	**97**	**118**	**79**	**84**
complex	143	4	126	2	120	1	0	120	1	124	2	0	2	2	4	2	1	9	17	9	16
elementary	520	47	388	93	1	49	2	1	10	178	18	1	0	0	43	0	110	71	7	3	7
guided	298	53	184	39	6	52	1	2	64	145	34	0	8	48	7	25	29	17	94	67	61
All tf.C5 initiatives	**961**	**104**	**698**	**134**	**127**	**102**	**3**	**123**	**75**	**447**	**54**	**1**	**10**	**50**	**54**	**27**	**140**	**97**	**118**	**79**	**84**

Table 4.47: Average potential of each community mapping initiative's tool set in what concerns local knowledge transference.

		cf.D5.I Tools: Average transference potential
tf.C1	community capacitation	4.26
	community capacitation; local-based research	2.41
	community capacitation; resource attraction	3.33
	external recognition	2.96
	external recognition; community capacitation	2.59
	external recognition; local-based research	3.00
	external recognition; resource attraction	11.50
	local-based research	7.67
	resource attraction	3.03
	All tf.C1 initiatives	**3.25**
tf.C2	indigenous	2.80
	non-urban	3.57
	urban1	3.33
	urban2	5.29
	All tf.C2 initiatives	**3.25**
tf.C3	collaborative	4.25
	grassroots	3.16
	participatory	2.55
	All tf.C3 initiatives	**3.25**
tf.C4	counter	3.00
	instructive	4.85
	pioneering	0.44
	All tf.C4 initiatives	**3.25**
tf.C5	complex	3.27
	elementary	1.99
	guided	5.66
	All tf.C5 initiatives	**3.25**

4.2.5.2 Spatial data processing tools: products of the initiative

Community mapping initiatives intend to map, and thus almost invariably result in the production of a cartographic product, typically accurate (digital) cartography and 3D models. However, this is not the only possible product that conveys local knowledge, nor the only one occurring at the same time. Three other main types of products appear: 'visual' elements, which have been found to include photos (of the material produced during the initiative, the territory, the community and even the process itself), drawings, sensory/mind/conceptual maps, hand-drawn maps, handmade 3D models, mood boards, collages, artistic presentations and products, videos, and animations; 'data' elements, such as georeferenced data points, textual descriptions of place-related activities and experiences, reports, and even published atlas; and 'interactive' cartographic elements, which include cartography widely available for edition, the creation of new geo-referenced platforms or actualizations within them, and contributions to Geographic Information Systems.

It is very common for two or three types of products to be present. As it is important to provide an idea of the reach local knowledge can receive through community mapping processes, in what concerns decision making and diffusion through formal spheres, a 'diffusion weight' was assigned to the different types of products and used to calculate the weight of the set of

products of each initiative; visual and data products were assigned a value of 1, while cartographic and interactive products were assigned a value of 2, with results ranging from 1 to 5. The average diffusion potential of community mapping initiative's products is presented in Table 4.48, for each type of the typological framework.

Table 4.48: Intervention of technical team, and average potential of each community mapping initiative's product set in what concerns local knowledge diffusion.

		Total nr. initiatives	cf.D5.II Product: help of technical team		cf.D5.II Product: average diffusion potential
			Yes: nr	Yes: %	
tf.C1	community capacitation	207	167	80.7%	2.71
	community capacitation; local-based research	17	17	100.0%	2.76
	community capacitation; resource attraction	10	9	90.0%	2.20
	external recognition	289	286	99.0%	3.02
	external recognition; community capacitation	196	193	98.5%	3.15
	external recognition; local-based research	5	5	100.0%	3.00
	external recognition; resource attraction	4	4	100.0%	4.75
	local-based research	13	5	38.5%	2.77
	resource attraction	220	218	99.1%	1.73
	All tf.C1 initiatives	**961**	**904**	**94.1%**	**2.68**
tf.C2	indigenous	486	474	97.5%	2.87
	non-urban	173	169	97.7%	3.44
	urban1	225	219	97.3%	1.82
	urban2	77	42	54.5%	2.25
	All tf.C2 initiatives	**961**	**904**	**94.1%**	**2.68**
tf.C3	collaborative	305	280	91.8%	2.98
	grassroots	211	189	89.6%	2.72
	participatory	445	435	97.8%	2.45
	All tf.C3 initiatives	**961**	**904**	**94.1%**	**2.68**
tf.C4	counter	431	419	97.2%	3.08
	instructive	392	347	88.5%	2.73
	pioneering	138	138	100.0%	1.28
	All tf.C4 initiatives	**961**	**904**	**94.1%**	**2.68**
tf.C5	complex	143	124	86.7%	3.03
	elementary	520	503	96.7%	2.57
	guided	298	277	93.0%	2.70
	All tf.C5 initiatives	**961**	**904**	**94.1%**	**2.68**

The averages obtained are high. Above 1, one has to consider that something more than drawings was probably produced, a combination of visual and data products at the very least; above 2, initiatives are producing accurate cartographic elements. Keeping in mind that it has been found that 41,1% of all knowledge-holding communities employ devices or digital tools during these processes – which means that a large percentage does not, and is relying exclusively on manual tools, – someone else has to be formalizing the elements collected during community mapping into cartography. Indeed, the analysis of cases studies has corroborated that, in most instances, technical expertise is requested, as shown in Table 4.48. This technical expertise is not equivalent to the previously presented results for involved agents with background knowledge on community mapping – while the two might overlap, the technical team in charge of formalizing the mapping is sometimes hired for that specific purpose, and their experience lies in cartography instead of community mapping per se.

Even grassroots community mapping projects, known for being more 'hands off' in what concerns formal technical expertise, will seek technical assistance; the same can be said for complex processes - in which the community chooses and uses advanced tools and methodologies on its own, - most of which choose to seek assistance as well at some point of the cartographic formalization process. All in all, the frequency with which technical help is employed alludes to the availability of resources needed to make community mapping initiatives productive. The most marked exception seems to be the 'urban2' type of community mapping: only in 54.5% of initiatives was a technical team involved. However, this value is deceptive; of the 24 initiatives to which the query was considered 'not applicable' (Table 4.49), 22 occur in 'urban2' contexts. These are initiatives that choose to invest in the most elaborate of visual products - such as intricate collage and mental maps - in a context of artistic creation, and thus are not as interested in pure cartographic work.

Table 4.49: Intervention of technical team in the final, cartographic product of the community mapping initiative: global values.

Total nr. initiatives	cf.D5.II Product: help of technical team							
	Yes		No		Not applicable		No information	
	Nr. initiatives	%	Nr. initiatives	%	Nr. initiatives	%	Nr. initiatives	%
961	904	**94.1%**	27	**2.8%**	24	**2.5%**	6	**0.6%**

4.3. WRAP UP

The empirical research conducted in this chapter is the direct application of the theoretical referential developed in Chapter 3. Section 4.1 focuses on the application of the typological framework to case studies, according to its different categories, while section 4.2 follows the conceptual framework's structure, according to its different dimensions and categories, filtering results through the typological framework.

This thesis proposed to understand how local knowledge can reach the sphere of decision-making and affect spatial policy, through the use of spatial data processing tools by knowledge-holding communities. This chapter methodically picked apart and sought to understand, dimension by dimension and category by category, the reality of such processes – community mapping processes. It has been demonstrated that the typological classifications devised from the semantic leanings of existing literature are indeed applicable to all initiatives, and lead to results that we can interpret and make sense of. It has also been demonstrated, throughout section 4.2, that such typological classifications are able to mesh with the emergent conceptual categories and, again, lead to results representative of reality.

5. Exploration and discussion of results

In Chapter 4, each section hermetically respected the previously determined theoretical referential. It was important to keep a methodical separation between each different conceptual category, as that was seen as the best way to represent and analyze reality. In this chapter, however, we look into a few complex queries that involve more than one conceptual category, choosing some parameters that proved promising from the analysis conducted earlier.

In this exploration of results, which still involves a component of empirical analysis, the foundation lies in the concrete influence of community mapping over spatial policies. It is thus necessary to juxtapose three realities: 1) the global number of initiatives, some of which are known to bear no connection to specific spatial policies or territorial decisions at the time of implementation, as explained previously; 2) the results pertaining to initiatives in which involved actors express an aspiration to exert influence over spatial policies that are in place and affect them (category cf.D4.I.); 3) the results pertaining to initiatives close to integration into a spatial policy that existed at the time of their implementation (category cf.D4.II, 'potential' type), and to initiatives that are effectively part of official policy either through integration or by belonging to formal processes (category cf.D4.II, 'integrated'/'formal' types).

Are community mapping initiatives thus able to influence decision making and spatial policy? What is their concrete weight at these three different levels? Table 5.1 aggregates these different categories to provide an overview. We can see that, in 87.6% of initiatives, actors are working on change and transformation; that 35% of all initiatives are close to achieving change and enter the formal sphere, and that 25.5% of all initiatives analysed (in practice, 29% of those who want change) do effectively affect decision-making. Once more, it is highlighted that the 'potential' type is only applied in cases in which involved agents mention a clear and justified belief that the outcome of their community mapping initiative meets all the condition to fight (for) spatial policies.

Therefore, of the 842 initiatives expressing desire for policy change, adjustment, and/or intervention, 69% are potentially in a position to make a difference. We must take into account a certain level of survivor bias here, of course - as explained before, in the section pertaining to knowledge building, initiatives that failed so completely that they did not even meet their short-term objectives are not likely to leave a media footprint, and thus proof of their existence, - but even so these numbers are nothing to scoff at (certainly more than a coin toss). They do validate existing literature, presented in the literature review chapter, which proposes local knowledge and community engagement, in fact participatory processes in general, as capable of contributing significantly to spatial planning and governance.

Having established this foundation, this study now looks at a few themes that require a cross analysis between conceptual categories. These themes are an exploration of some salient points that were highlighted when conducting this thesis' main literature review, and include: the actual capacity of spatial data processing tools for disseminating local knowledge in spatial policy, the contribution of certain parameters of background knowledge and actor involvement to success, and the perception of involved agents regarding satisfactory processes and desired

outcomes. For all themes, the analysis hinges on the different and increasing levels of influence that initiatives possess over spatial policies, as established in Table 5.1.

To ensure a correct readability of the following tables, it must be noted that the analysis of actors' aspirations to exert influence over spatial policies is completely separate from that of the integration of initiatives into existing spatial policy. Thus, the results within each are presented as a percentage of the total number of initiatives, instead of 'integration' being a percentage of 'aspirations'. The types within 'integration' (potential, integrated, formal) are also exclusionary amongst themselves, which means that each initiative can only belong to one of these types when there is a connection to this category at all.

Table 5.1: Concrete influence of community mapping initiatives over spatial policy and decision making: all initiatives, actor's aspirations, and actual integration.

		Total nr. of initatives		cf.D4.I. Actors' aspirations to exert influence over spatial policies		cf.D4.II. Integration into existing spatial policy			
				Positive		POTENTIAL		INTEGRATED + FORMAL	
		Nr	%	Nr	%	Nr	%	Nr	%
All types of initiatives		**961**	**100.0%**	**842**	**87.6%**	**336**	**35.0%**	**245**	**25.5%**
tf.C1	community capacitation	207	21.5%	141	14.7%	38	4.0%	47	4.9%
	community capacitation; local-based research	17	1.8%	16	1.7%	0	0.0%	4	0.4%
	community capacitation; resource attraction	10	1.0%	9	0.9%	0	0.0%	8	0.8%
	external recognition	289	30.1%	245	25.5%	18	1.9%	53	5.5%
	external recognition; community capacitation	196	20.4%	196	20.4%	150	15.6%	33	3.4%
	external recognition; local-based research	5	0.5%	5	0.5%	5	0.5%	0	0.0%
	external recognition; resource attraction	4	0.4%	4	0.4%	1	0.1%	0	0.0%
	local-based research	13	1.4%	6	0.6%	3	0.3%	2	0.2%
	resource attraction	220	22.9%	220	22.9%	121	12.6%	98	10.2%
tf.C2	indigenous	486	50.6%	418	43.5%	173	18.0%	99	10.3%
	non-urban	173	18.0%	167	17.4%	39	4.1%	40	4.2%
	urban1	225	23.4%	222	23.1%	123	12.8%	92	9.6%
	urban2	77	8.0%	35	3.6%	1	0.1%	14	1.5%
tf.C3	collaborative	305	31.7%	249	25.9%	92	9.6%	119	12.4%
	grassroots	211	22.0%	194	20.2%	111	11.6%	27	2.8%
	participatory	445	46.3%	399	41.5%	133	13.8%	99	10.3%
tf.C4	counter	431	44.8%	431	44.8%	185	19.3%	54	5.6%
	instructive	392	40.8%	273	28.4%	34	3.5%	174	18.1%
	pioneering	138	14.4%	138	14.4%	117	12.2%	17	1.8%
tf.C5	complex	143	14.9%	131	13.6%	185	19.3%	54	5.6%
	elementary	520	54.1%	445	46.3%	34	3.5%	174	18.1%
	guided	298	31.0%	266	27.7%	117	12.2%	17	1.8%

5.1. CAPACITY OF SPATIAL DATA PROCESSING TOOLS FOR DISSEMINATING LOCAL KNOWLEDGE

For this analysis, categories cf.D4.I and cf.D4.II are intersected with the categories pertaining to the 'cf.D5.Spatial Data Processing Tools' dimension, with the results presented in Table 5.2. Specifically, we look at previously obtained values for the different types of tools used by the knowledge-holding community, grouping them according to their main characteristics ('devices/digital' and/or 'manual' – they overlap slightly) for simplicity, alongside the average transference potential of the tool sets used during initiatives. The average diffusion potential of the product sets resulting from the initiatives are also provided.

First of all, it should be noted that 'integrated' initiatives have had to invest an extra level of effort to enter the formal sphere – use of devices and digital tools usually requires more investment in equipment and training, – effort which was not spent by initiatives of the 'formal' type. 'Formal' initiatives are already part of the decision-making flow. In fact, governmental entities typically belong to their respective actor networks and are involved in the initiative; perhaps for that reason there is no extra convincing to be done regarding the merits of the community mapping process. Additionally, 'formally' conducted initiatives, as seen previously in Table 4.42, favour the instructive type, while 'integrated' initiatives are much more associated to the counter type – and counter-mapping is not very conducive to good relationships between governmental entities and the agents involved in the process. Following the same line of thought, the fact that 'potential' initiatives are almost exclusively associated to the counter and pioneering types, conducted in opposition to formal policy or within policy deserts, and at the same time have not invested more in tools with more transference potential, might explain in part why they remain as 'potentials' and are not 'integrated'.

While the average product diffusion potential is roughly the same for all levels of this analysis (above 2 means that community mapping processes are likely producing cartography in addition to visual or data products), the tools (not) chosen by the community can affect the final quality of the products – they can make them more or less complete, appealing or unique. Ultimately, such choices might simply mean that more or less work is left to the ubiquitous technical support team, which might have to substitute much of the actual map-making in order to formalize the local knowledge harnessed. Technical teams generally seek community validation on the final product, sometimes reserving a final session within the process for that purpose, but that doesn't always happens, and with little data some things might be lost in translation.

Nevertheless, this is an important analysis, as one of the salient points of existing literature is that tools and methods have to be chosen carefully and according to context, and that it is better to opt for simpler and low-tech tools ('people before tools') than risk compromising the initiative altogether. While it can be verified that manual tools will obtain results, and are capable of ensuring that the local knowledge of the community is harnessed to be formalized and then transferred into spatial policy, in light of these results it is proposed that the type of process, and not only its context, also matters when trying to select the tools that eventually will lead towards better outcomes in influencing decision-making.

Table 5.2: The relevance of different spatial data processing tool sets, used during community mapping initiatives by the knowledge-holding community, in the transference of local knowledge into spatial policy.

		Total nr. initia-tives	cf.D5.I Different types of tools used by the knowledge-holding community							cf.D5.II Products of the initiative
			Devices/ digital tools		Manual tools		Tools: no information		Average transfe-rence potential	Average diffusion potential
			Nr	%	Nr	%	Nr	%		
All types of initiatives		961	395	**41.1%**	462	**48.1%**	104	**10.8%**	3.25	2.68
cf.D4.I. Actors' aspirations to exert influence over spatial policies	**Affirmative**	842	371	**44.1%**	381	**45.2%**	90	**10.7%**	3.32	2.68
cf.D4.II. Integration into existing spatial policy	**POTENTIAL**	336	50	**14.9%**	283	**84.2%**	3	**0.9%**	1.58	2.44
	INTEGRATED	174	92	**52.9%**	44	**25.3%**	38	**21.8%**	5.18	2.64
	FORMAL	71	21	**29.6%**	29	**40.8%**	21	**29.6%**	3.60	2.32
	FORMAL+ INTEGRATED	245	113	**46.1%**	73	**29.8%**	59	**24.1%**	4.76	2.55

5.2. THE AGENTS FIGHTING (FOR) SPATIAL POLICIES

The assimilation of outcomes/products of a community mapping initiative into the decision-making sphere can substitute moments and tasks in planning and territorial management; this happens, for instance, in the documenting or diagnosing of issues at the local level, or in the adjustment of existing policies (previously seen in Table 4.43). Thus, they effectively bring community governance to the formal sphere of decision-making. In this interpretation of results and in the context of this work, for all intents and purposes, such assimilation is regarded as a measure of success.

It has been noted that a significant number of community mapping initiatives manage to either achieve such assimilation and affect spatial policies, or to position themselves close to that goal. (Many counter-mapping processes, for instance, end with a statement regarding the intention to take the local of national government to court, using maps as a weapon, since previous similar cases have been successful in defending their land tenure, territorial boundaries adjustments, treaties, etc. While outcomes might be years in the making, the involved actors are certainly confident enough.) There are also initiatives that are not successful in these terms, nor give any indication of future success. As explored above regarding the use of spatial data processing tools, some insights into what makes or breaks the success of community mapping, with spatial policy adjustment as the end goal, can certainly be gained through the analysis of available data.

Another important theme in existing literature, and recurrent (unavoidable) in this work, is community engagement and the dynamics of participation, especially in what concerns governance and adaptive planning. There has been a whole section (4.2.2) dedicated to strategies of knowledge building centred on the community, and another to community engagement itself (4.2.3), in which their many dynamics within community mapping initiatives were explored individually. In this section, which reflects on markers of success regarding assimilation of community mapping outcomes/products as a representation of community governance within policy making, we thus use this context to look into some salient categories of Chapter 4. Four aspects were considered unavoidable: 'cf.D3.II. Leaders of the initiative: local agents', 'cf.D3.III. Actor networks: national governmental agents involved', 'cf.D3.III. Actor network value: weighted average per initiative', and 'cf.D2.II. Presence of background knowledge', represented in Tables 5.3 to 5.6.

Considering that community mapping requires dialogue with or within the mapping community, and that local knowledge is dependent on the community's specific codes, meanings and needs, the fact that a local agent took the lead in the implementation of the initiative was considered an important point of analysis: someone who knows the community's context sees a need or opportunity, and identifies/selects community mapping as a good way to fulfil that need or opportunity. In other words, there is already a pre-adjustment of the chosen model (community mapping) to the context (the community's specific needs and responsiveness to such model). It was thus theorized that the involvement of a local leading agent, either of the 'local intra-community' or 'local non-community' type, might be a predictor of success. Table 5.3 presents this analysis, corroborating that there is, indeed, an incremental increase of the percentage of initiatives with local agents in the lead the closer one gets to assimilation success: from 33.3% at the 'residual' general aspirations level, to 60.4% at the 'potential' level, to 69.5% at the 'integrated' level. The sole exception are initiatives already included in the 'formal' level, to which successful assimilation does not apply – with a better or worse understanding of the local community, they are already part of the decision-making flow; the presence of local agents in the lead, in 'formal' processes, is nevertheless high at 45%, keeping in mind that these local agents typically collaborate with other types of agents in taking initiative.

Table 5.3: 'Local intra-community' and 'local non-community' types of leaders, and their importance to the assimilation of community mapping initiatives.

		Total nr. initiatives	cf.D3.II. Leaders of the initiative: local agents			
			No 'LOCAL' agents		At least one 'LOCAL' agent	
			Nr	%	Nr	%
All types of initiatives		**961**	**438**	**45.6%**	**523**	**54.4%**
cf.D4.I. Actors' aspirations to exert influence over spatial policies	**'Affirmative'**	842	399	**47.4%**	443	**52.6%**
	'Affirmative' minus cf.D4.II	261	174	**66.6%**	87	**33.3%**
cf.D4.II. Integration into existing spatial policy	**POTENTIAL**	336	133	**39.6%**	203	**60.4%**
	INTEGRATED	174	53	**30.5%**	121	**69.5%**
	FORMAL	71	39	**54.9%**	32	**45.1%**
	FORMAL+ INTEGRATED	245	92	**37.6%**	153	**62.4%**

In the same vein, considering that the context are spatial policies and formal decision-making, another aspect considered was the presence of governmental entities as part of the community mapping initiative's actor network (Table 5.5). For this, only entities that can formalize decisions affecting the context of the initiative were included - supranational governmental entities, which have no jurisdiction and typically contribute with funding, resources, guidelines, etc., were not considered. Therefore, the analysis includes actors of types 'GV.A' and 'GV.B': local, regional or national governmental entities which either contribute with direct action, or are involved in a secondary capacity.

One might assume that the presence of governmental agents is a clear factor of differentiation regarding the possibility of success. There is in fact a slight difference from 'residual affirmative' to 'potential' to 'integrated' cases. The progression is there, although less significant than that of types of leading agents involved, and further muddied by the complicated relations of power within actor networks, very apparent within counter-mapping cases when one governmental entity sometimes aids the local community, in one form or another, against other governmental entities, at the local or national levels. Again, we also refer to Table 4.32 (noting once more that results per type of actor can overlap with those of other types): governmental agents are distributed throughout – even, it must be highlighted, in counter-mapping cases, – although they are not very representative within the 'instructive' type, as it includes many initiatives that do not pertain to an existing spatial policy but are simply classified for their potential to inform one in the future. Naturally, all 'formal' initiatives include governmental entities in their actor networks, so the corresponding result is not noteworthy.

Table 5.5: National governmental agents involved through the community mapping initiatives' actor network, both through direct ('GV.A' type) and indirect ('GV.B' type) action, and their importance to the assimilation of community mapping initiatives.

		Total nr. initiatives	cf.D3.III. Actor networks: national governmental agents involved			
			No 'GV.A/GV.B' agents		At least one 'GV.A/GV.B' agent	
			Nr	%	Nr	%
All types of initiatives		**961**	**478**	**49.7%**	**483**	**50.3%**
cf.D4.I. Actors' aspirations to exert influence over spatial policies	**'Affirmative'**	842	383	**45.5%**	459	**54.5%**
	'Affirmative' minus cf.D4.II	261	144	**55.2%**	117	**44.8%**
cf.D4.II. Integration into existing spatial policy	**POTENTIAL**	336	162	**48.2%**	174	**51.8%**
	INTEGRATED	174	76	**43.7%**	98	**56.3%**
	FORMAL	71	0	**0%**	71	**100%**
	FORMAL+ INTEGRATED	245	77	**31.4%**	168	**68.6%**

An aspect of analysis that is far more unequivocal is the weighted capacity of community mapping initiatives' actor networks, in what concerns resources, funding or ability to take action (Table 5.6). Initiatives that become 'integrated' have, on average, stronger actor networks behind them – larger, with weightier actors, more diversified – while 'potential' initiatives fall just a bit short.

Table 5.6: The different weighted capacities of community mapping initiatives' actor networks and their relevance to the assimilation of community mapping initiatives.

		cf.D3.III. Actor network value: weighted average per initiative		
		resource capacity	funding capacity	action capacity
All types of initiatives		**11.52**	**6.13**	**6.02**
cf.D4.I. Actors' aspirations to exert influence over spatial policies	**Affirmative**	12.16	6.48	6.28
cf.D4.II. Integration into existing spatial policy	**POTENTIAL**	8.06	3.99	4.43
	INTEGRATED	19.32	10.89	9.13
	FORMAL	16.08	8.87	7.34
	FORMAL+ INTEGRATED	18.38	10.31	8.61

One final, interesting aspect of this analysis is that the presence of background knowledge - specifically on community mapping is important to the assimilation of community mapping initiatives, as it is strongly represented in both 'potential' and 'integrated' initiatives. However, there is no clear progression between levels of assimilation. It might be that the generalized presence of technical teams throughout initiatives, even when their skillset is more oriented towards geography, cartography and land measurement, is able to compensate when there is no specialist in community mapping or set of guidelines to be followed. It might be that there are agents present with generalized experience in community engagement and participatory methods, as well as the backing and funding of large organizations, and that is enough.

Table 5.5: Presence of background knowledge in community mapping initiatives, and its importance to their assimilation.

		Total nr. initiatives	cf.D2.II. Presence of background knowledge			
			No background knowledge		With background knowledge	
			Nr	%	Nr	%
All types of initiatives		**961**	**86**	**8.9%**	**875**	**91.1%**
cf.D4.I. Actors' aspirations to exert influence over spatial policies	**Affirmative**	842	78	**9.3%**	764	**90.7%**
	'Affirmative' minus cf.D4.II	261	39	**14.9%**	222	**85.1%**
cf.D4.II. Integration into existing spatial policy	**POTENTIAL**	336	10	**3.0%**	326	**97.0%**
	INTEGRATED	174	16	**9.2%**	158	**90.8%**
	FORMAL	71	13	**18.3%**	58	**81.7%**
	FORMAL+ INTEGRATED	245	29	**11.8%**	216	**88.2%**

5.3. PERCEPTIONS OF SATISFACTORY PROCESSES AND DESIRED OUTCOMES

Theoretically, desired (and just) outcomes – in this case, the ability to affect and change policies to make them more adequate to the local reality – do not have to go hand in hand with agent's perception of satisfactory processes, nor even with their own beforehand perception of whether the outcome will be just. This section dedicates itself to these perceptions, as they are not a factor in the selection of the community mapping model for initiative implementation in the first place, on the part of involved agents, but they also reflect the (participatory) planning debate on processes vs. outcomes.

For this purpose, categories cf.D2.V and cf.D4.I are filtered through the gradual 'assimilation base' previously established from categories cf.D4.I and cf.D4.II. Two queries are highlighted: 1) 'Does the community express a positive perception regarding the contribution of the community mapping initiative to capacitation and empowerment?' (Table 5.6); 2) 'Do actors mention a positive relevance of the community mapping model to planning/development in general?' (Table 5.7). The first query is related to notions of empowerment and capacity building through community engagement and participatory processes, while the second is more centred on actors' (especially those with technical expertise and a connection to planning and governance) perceptions of the potential of the community mapping model to contribute towards desired outcomes and policy change/adjustment.

The first thing that is immediately apparent is that perceptions regarding empowerment and community capacitation are not a direct function of initiatives' success in changing the community's environment and the policies that support them. This is not unexpected, as many initiatives focus on capacity building to sustain prolonged action in favour of change, instead of expecting the outcome of the initiative to generate that change immediately. Another important result is that the community's perception of its own capacitation is high, starting at around 70% – put simply, people are satisfied with the process they find themselves involved in, and the competences they develop through it. Equally as important, satisfaction and positive perception do not drop in 'formal' initiatives, even though the stronger governmental presence in these initiatives sometimes runs counter to some of the community's objectives.

In what concerns the second query, general positive perceptions of the community mapping model are expected (otherwise it would not have been chosen). Nevertheless, the query implies something more, namely knowledge of the field of governance and planning, and how community mapping fits into it. Taking that into consideration, there was a large number of answers, especially amongst the initiatives that originate outside the 'formal' sphere. This reflects the type of actors that happen to be involved at each level and their experience with governance, which leads them to make a specifically positive connection between planning/governance and community mapping. As the type, knowledge and experience of involved agents varies significantly amongst initiatives, it should be nevertheless noted that answers on the perception of community mapping towards desired outcomes do not follow the actual satisfactory outcomes of the respective initiatives.

Table 5.6: Actors' perceptions regarding the contribution of the community mapping initiative to community capacitation and empowerment.

		Total nr. initia-tives	cf.D2.IV. Knowledge building: contributions to capacitation and empowerment *'Does the community express a positive perception?'*			
			No		Yes	
			Nr	%	Nr	%
All types of initiatives		**961**	**217**	**22.6%**	**744**	**77.4%**
cf.D4.I. Actors' aspirations to exert influence over spatial policies	**Affirmative**	842	155	18.4%	687	81.6%
	'Affirmative' minus cf.D4.II	261	79	30.3%	182	69.7%
cf.D4.II. Integration into existing spatial policy	**POTENTIAL**	336	5	1.5%	331	98.5%
	INTEGRATED	174	53	30.5%	121	69.5%
	FORMAL	71	18	25.4%	53	74.6%
	FORMAL+ INTEGRATED	245	71	29.0%	174	71.0%

Table 5.7: Actors' perceptions of the potential of the community mapping model to contribute towards desired outcomes and policy change/adjustment.

		Total nr. initia-tives	cf.D4.I. Actors' aspirations to exert influence over spatial policies *'Actors mention positive relevance of community mapping to planning/development in general?'*			
			No		Yes	
			Nr	%	Nr	%
All types of initiatives		**961**	**263**	**27.4%**	**698**	**72.6%**
cf.D4.I. Actors' aspirations to exert influence over spatial policies	**Affirmative**	842	192	22.8%	650	77.2%
	'Affirmative' minus cf.D4.II	261	18	6.9%	243	93.1%
cf.D4.II. Integration into existing spatial policy	**POTENTIAL**	336	57	17.0%	279	83.0%
	INTEGRATED	174	110	63.2%	64	36.8%
	FORMAL	71	7	9.9%	64	90.1%
	FORMAL+ INTEGRATED	245	117	47.8%	128	52.2%

5.4. WRAP UP

In order to better understand the concrete influence of community mapping over spatial policies, and the role of spatial data processing tools in transferring local knowledge to the sphere of decision-making, this study undertook a cross analysis which focused on several salient aspects, as proposed in the conceptual referential developed in Chapter 3. Several of these aspects were seen as important for their potential contribution to successful assimilation of community mapping initiatives and their outcomes into spatial policy. Informed by existing literature, this analysis validates some existing perceptions and leads to some questions.

First of all, it corroborates that community mapping initiatives have a significant weight in conveying local knowledge into spatial policies, as a large part of them starts within a 'formal' environment, manages to be integrated into one, or is perceived as being close to such. Secondly, that the type of tools used by the community is indeed flexible, but it might be important to pay attention to the type of community mapping at hand. Thirdly, that a certain mix of local and governmental agents in key roles is a contributor to success, particularly regarding local agents who take the lead in non-formal processes, something which can be further explored; and that strong actor networks with mobilization capacity can be crucial to formalization, although the same cannot be said about requirements for background knowledge on community mapping initiatives. And finally – something which is often discussed in literature, – that satisfaction with the process itself is not necessarily related to its outcomes, making the process implementation desirable as an end in itself for its potential in community capacitation and empowerment; nevertheless, the perception of involved agents regarding the capacity of community mapping to obtain desired outcomes is positive, making it a model of community engagement with favourable connotations in the minds of agents connected to governance and planning.

What is unveiled: findings and conclusions

"The eye that looks ahead to the safe course is closed forever."

Frank Herbert, *Dune* (1965)

What is seen: contributions

This study sought, first and foremost, a better understanding of the potential of local knowledge for the transformation of spatial policy. In order to achieve this, a specific vehicle for the harnessing and conveying of local knowledge was chosen: the process model commonly designated as 'community mapping'. While this model was not, in itself, the object of this work, it intersected the three markers deemed essential to the study of local knowledge in this context: the inclusion of local knowledge itself, the construction of dialogue with or within the knowledge-holding community, and the production of a result capable of transmitting spatial-based knowledge, thus signifying the use of spatial data processing tools.

While traditionally a more exhaustive description of findings and conclusions would take place at this point, the systematic nature of the analysis lent itself to 'wrap up' moments that follow the application of the theoretical referential throughout this work. This sequential exploration fits well with the complexity of the referential, and provides the comprehensive overview that was sought from the very beginning. Thus, this section focuses mainly on the contributions of the work, and the bridge that connects them to the initially formulated hypotheses.

The need for a systematic analysis of the community mapping model and for concrete data is expressed by Hypothesis 1 and required the creation of a referential to be applied in the analysis of community mapping cases. This systematization of reality through its typification and conceptual categorization, meant to be applied to all case studies equally, was unavailable to such an extent in existing literature; the frameworks created proved invaluable in the systematization of information on case studies and its analysis on a large scale, providing the backbone upon which several conclusions were made. These were provided in the interpretation of results undertaken throughout the two chapters that include the empirical research (Chapters 4 and 5).

Although there are several instances, in existing literature, of analysis and reflection over the necessity of incorporating local knowledge into policy, it can be said there is also a research gap that calls for a systematic analysis of how local knowledge is truly being harnessed and influencing policy-making. Attending to this gap was one of this study's priority, summarized by Hypothesis 2, and thus one of its main contributions. The data provided by the multiple case study research provided a clearer picture of how many of these processes – and consequently local knowledge, harnessed amidst its holding communities – are able to reach the decision-making sphere, as well as in which ways, moments and through which means this takes place, Chapter 4 provides this analysis, dimension by dimension and category by category, observing

and dissecting every facet of community mapping initiatives and their harnessing of local knowledge by the respective knowledge-holding communities.

An overview of success factors (with success being defined as successful assimilation of initiatives and their outcomes, and thus local knowledge, into policy and decision-making) within the 'community mapping' model was also provided in Chapter 5, in which is considered the third main contribution of this study and the answer to Hypothesis 3. While this is a complex matter, depending on many different factors, it was possible to highlight some aspects which correlate with greater success or failure rates – in other words, possible strengths and weaknesses, depending on the context. While these success factors are not a measure of the efficiency of this model for harnessing local knowledge, for this would require comparing it to other community-based and/or participatory processes, they can pave the way for such a comparison to be made in the future.

All in all, it is considered that the research question and the hypotheses proposed at the beginning of this study are answered by the case study research design, supported by the theoretical referential built in parallel to it. The mixed methodology selected for the research was adequate in providing the necessary answers and thus validating the research, in the view of its starting point and the existing body of knowledge that informed it.

… and what is not: paths forwards

The multiple-case research design presented in this study, with its typological and conceptual referential as a foundation, is geared towards querying aspects of the reality of community mapping. It relies on affirmative assertions derived both from existing literature and from the dimensions of context acquired from the case studies themselves – i.e., 'the initiative influences spatial policy'; 'the process is empowering'; 'evaluation was conducted'. What is *not* – *not* policy influencing, *not* efficient, etc. - can be inferred, often as the opposite of affirmative queries, but only to an extent.

Thus, there are still many paths open to better assert the non-existence or exclusion of aspects of local knowledge integration in spatial policy; in other words, the less desirable or negative aspects that can compromise decision-making. Further research should explore in more detail, especially in determining what to avoid, the outcomes of different tool use in community processes (elementary to complex, analogue to digital), the long term consequences of integrating local knowledge into spatial policy (at different moments, through different types of processes) in cases which accomplished this transference, the medium and long term impact of such initiatives on the communities themselves, the consequences of a lack of monitoring and evaluation, or the relationships and potential conflicts between the many different types of agents commonly involved in a single process. Through the exploration of these paths, it is hoped that the proposed theoretical referential will crystallize into a useful operational tool in the near future.

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