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ADAPTABILITY, TRANSFORMATION AND COMPLEX CHANGES IN NAMIBIA AND TANZANIA:

Resilience and Innovation System Development in Local Communities

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SUMMARY

This thesis is a research about the recent complex spatial changes in Namibia and Tanzania and local communities' capacity to cope with, adapt to and transform the unpredictability engaged to these processes. I scrutinise the concept of resilience and its potential application to explaining the development of local communities in Southern Africa when facing various social, economic and environmental changes.

My research is based on three distinct but overlapping research questions: what are the main spatial changes and their impact on the study areas in Namibia and Tanzania? What are the adaptation, transformation and resilience processes of the studied local communities in Namibia and Tanzania? How are innovation systems developed, and what is their impact on the resilience of the studied local communities in Namibia and Tanzania*?* I use four ethnographic case studies concerning environmental change, global tourism and innovation system development in Namibia and Tanzania, as well as mixed-methodological approaches, to study these issues.

The results of my empirical investigation demonstrate that the spatial changes in the localities within Namibia and Tanzania are unique, loose assemblages, a result of the complex, multisided, relational and evolutional development of human and non-human elements that do not necessarily have linear causalities. Several changes co-exist and are interconnected though uncertain and unstructured and, together with the multiple stressors related to poverty, have made communities more vulnerable to different changes. The communities' adaptation and transformation measures have been mostly reactive, based on contingency and post hoc learning. Despite various anticipation techniques, coping measures, adaptive learning and self-organisation processes occurring in the localities, the local communities are constrained by their uneven power relationships within the larger assemblages. Thus, communities' own opportunities to increase their resilience are limited without changing the relations in these multiform entities.

Therefore, larger cooperation models are needed, like an innovation system, based on the interactions of different actors to foster cooperation, which require collaboration among and input from a diverse set of stakeholders to combine different sources of knowledge, innovation and learning. Accordingly, both Namibia and Tanzania are developing an innovation system as their key policy to foster transformation towards knowledge-based societies. Finally, the development of an innovation system needs novel bottom-up approaches to increase the resilience of local communities and embed it into local communities. Therefore, innovation policies in Namibia have emphasised the role of indigenous knowledge, and Tanzania has established the Living Lab network.

TIIVISTELMÄ

Väitöskirjassani tarkastelen viimeaikaisia monimutkaisia alueellisia muutoksia Namibiassa ja Tansaniassa. Erityisesti tutkin paikallisyhteisöjen kykyä hallita, sopeutua ja muuntua erinäisiin ennakoimattomiin muutoksiin. Tutkin muutoksia resilienssin käsitteen avulla ja analysoin käsitteen sovellettavuutta eteläisen Afrikan paikallisyhteisöjen sosiaalisten, taloudellisten ja ympäristön muutosten tutkimukseen.

Tutkimukseni pohjautuu kolmeen tutkimuskysymykseen: Mitkä ovat keskeiset alueelliset muutokset ja niiden vaikutukset tutkittuihin paikallisyhteisöihin Namibiassa ja Tansaniassa? Mitkä ovat resilienssin kannalta keskeisimmät sopeutumis- ja muuntumisprosessit tutkituissa paikallisyhteisöissä? Miten innovaatiojärjestelmiä kehitetään, ja mikä on niiden vaikutus resilienssiin tutkituissa paikallisyhteisöissä? Vastaan näihin tutkimuskysymyksiin neljän erillisen etnografisen tapaustutkimuksen avulla, jotka koskevat alueellista ympäristön muutosta, globaalia matkailua sekä innovaatiojärjestelmän kehitystä Namibiassa ja Tansaniassa. Menetelmällisesti aineistoni on kerätty yhdistelemällä erilaisia laadullisia tutkimusmenetelmiä. Aineistoja käsittelen pääasiallisesti sisällönanalyysilla.

Tutkimustulokseni osoittavat, että paikallistason alueelliset muutokset Namibiassa ja Tansaniassa ovat ainutlaatuisia löyhiä kokoonpanoja (assemblage), jotka ovat syntyneet eri skaaloilla toimivien ihmis- ja ei-inhimillisten toimijoiden monimutkaisen, suhteellisen ja evolutiivisen toiminnan tuloksena. Useat erilliset muutokset ilmenevät rinnakkain ja ovat toisiinsa kietoutuneita, mutta samanaikaisesti epävarmoja ja vailla selkeää rakennetta. Nämä muutokset yhdessä erinäisten köyhyyteen liittyvien stressitekijöiden kanssa ovat lisänneet paikallisyhteisöjen haavoittuvuutta. Yhteisöjen omat mahdollisuudet hallita muutoksia ovat olleet enimmäkseen reaktiivisia, sattuman ohjaamia sekä perustuneet jälkikäteen oppimiseen. Erilaisista ennakointitekniikoista, oppimisesta ja oma-aloitteisuudesta huolimatta epätasa-arvoiset valtasuhteet rajoittavat paikallisyhteisöjen toimijuutta laajemmissa kokoonpanoissa. Näin ollen paikallisyhteisöjen mahdollisuudet parantaa omaa resilienssiä jäävät rajallisiksi ilman muutosta laajempien kokoonpanojen valtasuhteissa.

Tämän vuoksi laajemmat eri toimijoiden väliseen vuorovaikutukseen perustuvat yhteistyömallit ovat tarpeen. Innovaatiojärjestelmän viitekehyksestä on tullut yksi suosituimmista tavoista hahmottaa tätä yhteistyötä. Eri toimijat Namibiassa sekä Tansaniassa pyrkivät rakentamaan innovaatiojärjestelmiä tietoyhteiskuntakehityksen veturiksi. Innovaatiojärjestelmän kehittäminen ei kuitenkaan välttämättä hyödytä köyhiä paikallisyhteisöjä, jollei sitä ole kehitetty erityisesti heidät huomioiden. Näin ollen innovaatiojärjestelmän tulisi pohjautua ruohonjuuritasolta kumpuaviin lähestymistapoihin, joiden avulla se voisi juurtua osaksi paikallisyhteisöjen sosiotaloudellista kehitystä. Paikallisyhteisöjen erityistarpeiden huomioimiseksi Namibian innovaatiopolitiikassa on korostettu alkuperäisen tiedon merkitystä ja Tansaniaan on perustettu avoimiin työtiloihin pohjautuva Living Lab–verkosto.

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In October 2002, I was standing half-naked in the busy downtown area of Johannesburg, trembling and regretting the impulse that made me answer a newspaper call looking for volunteers. It was my first day in Southern Africa, and I had just been violently mugged with knifes wielders after my colleague and travelling companion from Ghana wanted to introduce me his 'home', the place that we had been talking and dreaming about over last four months in wet and windy Denmark. For me, this was the first concrete experience of what global inequality is all about and a small foretaste of multiple challenging conditions created by the poverty in places in which most of the Southern African communities continue to live.

Oftentimes, a challenging inception creates a beautiful story: this was the beginning of my personal journey, a journey that has led to myriad fascinating encounters and shaped me more than I could have ever imagined. Thereafter, I have constantly travelled back to different places in Southern Africa, where I have been living, studying, working and researching for several years. The time there has provided me a privileged vantage point from which to observe the decades of rapid transformation that are best described with two separate, front-covers in *The Economist*: in May 2000, the magazine called Africa as 'The Hopeless Continent' and thirteen years later, in March 2013, it was headlined 'Aspiring Africa'. I am remarkably pleased about the opportunity to conduct my doctoral studies during this time and examine this development more analytically and in greater detail.

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ABBREVATIONS

CAGR	Compounded Annual Growth Rate
COSTECH	Tanzania Commission for Science and Technology
CTA	Chief Technical Advisor
DUI	Doing, Using, and Interacting
FDI	Foreign Direct Investment
GDP	Gross Domestic Production
ICT	Information and Communication Technology
IK	Indigenous Knowledge
IKS	Indigenous Knowledge System
IS	Innovation System
KCC	Kigamboni Community Centre
LL	Living Lab
MCST	Ministry of Communications, Science and Technology
NCIKS	National Council for Indigenous Knowledge Systems
NCRST	National Commission on Research, Science and Technology
NPRSTI	National Programme on Research, Science, Technology and Innovation
R&D	Research and Development
SSA	Sub-Saharan Africa
STI	Science Technology and Innovation
SWAPO	South West Africa People's Organization
TANZICT	The Information Society and ICT Sector Development Project in Tanzania
TANZIS	Tanzanian Innovation Support Programme
SAIS	Southern Africa Innovation Support Programme
TAYI	Tanzania Youth Icon
UNDP	United Nations Development Program

LIST OF ORIGINAL PUBLICATIONS

I Hooli L. J. (2016). Resilience of the poorest: coping strategies and indigenous knowledge to live with the floods in Northern Namibia. *Regional Environmental Change,* 16(3), 695-707.

II Hooli L. J. (2016, forthcoming). From warrior to beach-boy: Resilience of Maasai in Tanzanian tourism industry. In Cheer, J. & Lew, A. A (eds.) *Tourism, Resilience and Sustainability: Adapting to Social, Political and Economic Change*, Routledge.

III Hooli L. J. & Jauhiainen J. S. (2016). Building innovation system and indigenous knowledge in Namibia, Submitted manuscript.

IV Hooli L. J., Jauhiainen, J. S. & Lähde, K. (2016). Knowledge creation processes and local communities: Living Labs as a tool for socio-economic resilience in Tanzania. *African Journal of Science, Technology, Innovation and Development,* 8(1), 61-70.

The specific contributions of Lauri Hooli in original publication III were in the research plan and empirical study. The article was written jointly with Jussi S. Jauhiainen.

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1. INTRODUCTION

In recent decades, new kind of changes concerning the environment, technology development, the economy and tourism have made the local communities in Southern Africa more permeable to effects that were previously considered to be external processes. Most countries have liberated their trade policies and economically are increasingly interconnected to global markets (Shizha & Diallo, 2015). The expanded global demand for raw materials has made countries whose economies are based on the exploitation of natural resources into desirable trade partners. Several of the fastest-growing economies in the world are now located in Southern Africa (World Bank, 2016). Rapidly, the increased number of global tourists has brought global processes to local communities that have traditionally been almost discharged from external relations. The extensive distribution of and access to mobile technology have connected even rural villages without electricity to global information flows. However, this economic growth has not had significant positive impacts on the socio-economic development of the majority; on the contrary, economic inequality has widened, several indigenous groups have been pushed further into the margins and environmental degradation has risen (Harrison, 2010).

The ability of local society to change, adapt and, importantly, transform in response to different changes and uncertainty varies (Carpenter *et al.*, 2005). Generally, several changes co-exist and are interconnected but uncertain and unstructured; together with the multiple stressors related to poverty, the global poor are more sensitive to various external and internal changes (Mertz *et al.*, 2009). One prominent way to describe this ability is to use the concept of resilience, which is the focus of this research. Resilience is one of the frameworks used to seek explanations for the future's uncertainty and threats that render these changes governable (Grove, 2014: 243; Anderson, 2010). The strength of resilience is its ability to distinguish the inherent ambiguity when anticipating the impacts of various changes and the dynamic and complex nature of how individuals, organisations and societies may respond to them (Davoudi, 2016). The popularity of the concept is also based on its malleability and holistic perspective, and how it emphasises the multiple spatial and temporal scales of these changes (Cote & Nightingale, 2012). Moreover, resilience has also become an important concept in policymaking.

Regardless of its many advantages, several authors in social science have recently challenged resilience (Swanstrom, 2008; Hassink, 2010; Walker & Cooper, 2011; Weichselgartner & Kelman, 2014; Brown, 2014; Grove, 2014; Davoudi, 2016). Their main criticism is related to the inability of this ecology-rooted concept to appropriately address and reflect social and political dimensions in general

(Brown, 2014), particularly for contemplating power and agency (Davoudi, 2012). Furthermore, the case studies regarding developing countries have been criticised for approaching resilience too descriptively (Béné *et al.*, 2014). The descriptive interpretation of resilience measures it using quantitative methodologies, by assessing the different attributes that increase communities' capacity to self-organise and cope when facing various disturbances (Brand & Jax, 2007). The limited analyses of the quantitative approach create a danger of overemphasising the capacity of communities and individuals to cope, and shift the attention away from the social–political relationships behind the actual changes that are making the communities vulnerable in the first place (Bunce *et al*., 2010).

Resilience is still most commonly applied from the equilibristic perspective developed in the field of ecology. The equilibrium approach to resilience focusses on the speed at which the system can return to the pre-existing or new normality after a shock or disturbance (Simmie & Martin, 2010). Analyses of long-term transformations from the so-called evolutionary perspective of resilience have been less frequent but are increasing. The evolutionary perspective of resilience is as interested in the long-term capacity to address different changes as it is the capacity to respond to short-term shocks (e.g. Christopherson *et al*., 2010; Simmie & Martin, 2010; Cooke *et al*., 2011). Thus, evolutionary resilience is not only about resisting change or the persistence of present structures but also adaptability and, when necessary, transformation. Adaptability is defined as the capacity to learn and combine different knowledge and experiences to develop new pathways, which can be, for example, departures from the existing path or a renewal of that path (Boschma, 2015). Transformation refers to the capacity to learn and create completely new and different trajectories. The active role of agency in adaptability and transformation, and its problematization, sets resilience apart from other anticipatory actions such as pre-emption and precaution (Grove, 2014: 242). The agential subjects of resilience are expected to take responsibility for their own adaptation and transformation (O'Malley, 2010).

1.1 Research objectives

My overall aim in this doctoral thesis is to create a more detailed understanding of the processes and context of spatial changes in localities within Namibia and Tanzania, and discuss the ways and limits to how local communities can respond to these changes through adaptability and transformation. I tackle this aim empirically through four case studies – concerning environmental change, global tourism and innovation system development in Namibia and Tanzania – that are reported in articles **I–IV** (Table 1). Conceptually, I approach this through the evolutionary perspective of resilience, which is interested in the long-term capacity to address

different changes, as well as the capacity to respond to short-term shocks (Simmie & Martin, 2010: 31). It refutes the equilibrist version of the concept and approaches (over)emphasising communities' capacity to self-organise.

In this research, I contribute to three different but overlapping aspects of the resilience discussion in Namibia and Tanzania: *Firstly*, I investigate the main spatial changes and their impact on the study areas. In connection to that, *secondly*, I analyse the adaptation and transformation processes of the local communities towards these changes. The answers to these objectives will provide empirical evidence for discussing communities' resilience by adding knowledge about the complexity and relational ontology of the changes against which the local communities' are expected to be resilient. Moreover, they will provide a more detailed understanding of the different adaptation and transformation processes occurring in local communities, as well as their limits and effectiveness, to increase communities' resilience towards these changes.

Thirdly, I will focus on a larger policy-level approach – innovation system (IS) development – to foster the transformation of local communities from resource-based economies to knowledge economies. Consequently, during the last decade, the concept and application of an IS – the co-operation between all economic, social, political, institutional and organisational factors, and all other factors influencing the development, diffusion and application of innovations (Edquist, 2005: 182) – has become important policy tool to foster transformative change in several countries in Southern Africa. National actors, together with international donors, have conceived that innovation-driven regional development fosters transformative change towards a knowledge economy and positively impacts the region's sensitivity to various changes, as well as the region's capacity to create new growth paths (Organisation for Economic…, 2012). My particular focus in IS development is on the approaches and knowledge base – indigenous knowledge and living lab network – to embed the universal concept of IS to the context of Southern Africa. Very few comprehensive analyses of ISs exist about African countries, especially about approaches to applying this universal concept to local communities. The research questions are:

1. *What are the main spatial changes and their impact on the study areas in Namibia and Tanzania?* (Articles **I** and **II**)

2. *What are the adaptation, transformation and resilience processes of the studied local communities in Namibia and Tanzania?* (Articles **I** and **II**)

3. *How are innovation system(s) developed, and what is their impact on the resilience of the studied local communities in Namibia and Tanzania?* (Articles **III** and **IV**)

I answer the research questions through four case investigations in Namibia and Tanzania. In *Case A*, I scrutinise local communities' resilience and coping strategies to endure the irregular but increased flood events in Northern Namibia. I place particular interest on the learning processes that enhance the residents' capability to cope as well as the role of indigenous knowledge (IK). In *Case B*, I study the adaptability and transformation processes of Maasai nomads in the growing global tourism business within Tanzania. The main focus is on the adaptability and transformation processes that enable these uneducated pastorals to be involved in tourism within the Zanzibar Archipelago. In *Case C*, I study the development of an IS in Namibia, since according to the country's main strategies, innovation-based development is expected to be an important tool for the social transformation from a resource-based economy towards a knowledge economy. My particular focus is on indigenous knowledge in the IS, as this is an opportunity to adjust the general concept of IS to local contexts and practises, and to include bottom–up approaches and local innovations in innovation-related policies. In *Case D*, I study knowledge-creation processes in Tanzanian Living Labs (LLs). LLs have become popular platforms with which to organise local innovation activities in the communities of developing countries, as they are expected to create new entrepreneurial skills and opportunities for people with limited formal education.

Methodologically, all of my case studies are based on a mixed-method approach combining various complimentary study methods and materials to gain in-depth understandings and answers to each of the study questions. Methodological triangulation increases the understanding about the diversity of perceptions and the multiple realities from which the research phenomenon is constituted (Stake, 2005: 454). The different materials include interviews, participant observations, household surveys (282 answers) and analyses of various strategies and documents. The main method of analysis is content analysis.

After the introduction, in the second chapter, I will first present a literature review of an evolutionary approach to resilience and innovation systems as well as their main critiques. For the resilience approach, I especially focus on its spatial and temporal dimensions. Regarding IS theory, my main emphasis is on the approaches embedding this development into local communities. Subsequently, in the third chapter, I describe my research context, various study methods and the research data in detail. In the fourth chapter, I present and discuss the main empirical results of the thesis based on my four original research papers. Finally, in the fifth chapter, I will conclude by answering my research questions and discussing what kind of development the resilience approach and innovation system are creating and for whom in the localities of Southern Africa.

Table 1. *A summary of the original articles.*

Article	Research questions	Main concepts	Research material	Main result
Hooli L. J. (2016). Resilience of the poorest: coping strategies and indigenous knowledge to live with the floods in Northern Namibia. *Regional Environmental Change,* 16(3), 695-707,	What kind of coping measures do local communities apply? Can applied coping measures build resilience for the anticipatory flood events in the future? What kind of IK exists and what is its role increasing the resilience of the communities?	Resilience, indigenous knowledge	Survey; focus groups; interviews; statistical and content analyses	The complex changes have reshaped the socio-ecological dynamics and aggravated the floods; Communities living with multiple stress factors related to poverty, have only had limited opportunities to cope with and learn; Generally, coping measures have been reactive and functional; Due to rapid societal changes applying IK was challenging.
Hooli L. J. (2016, forthcoming). From Warrior to Beach-Boy: Resilience of Maasai in Tanzanian Tourism Industry. In Cheer, J. & Lew, A. A (eds.) *Tourism, Resilience and Sustainability: Adapting to Social, Political and Economic Change*, Routledge.	What are the adaptation, transformation and resilience processes of Maasai in Zanzibar tourism business?	Resilience, adaptability, transformation	Observation; interviews; content analyses	The complex changes can simultaneously be a source of threat and opportunity; The Maasai could be considered as a showcase for the resilient subject as presented in theory; The Maasai have self-reliantly begun to transform themselves into other socio-economic regimes; The tourism has not increased the long-term wellbeing of Maasai communities.
Hooli L. J. & Jauhiainen J. S. (2016). Building innovation system and indigenous knowledge in Namibia, Submitted manuscript.	How innovation system in Namibia is developed? How indigenous knowledge is used in IS in Namibia?	Innovation system, indigenous knowledge	Strategy, policy and legal documents; interviews; content analyses	Namibia was an early mover towards the IS, but the implementation has been challenging; Possible strategic mismatch between STI and DUI-modes of learning; IK has had special role in IS policies, but its operationalisation has been challenging; Traditional foreign aid donors have shifted policies from traditional aid toward development focusing STI.
Hooli L. J., Jauhiainen, J. S. & Lähde, K. (2016). Knowledge creation processes and local communities: Living Labs as a tool for socio-economic resilience in Tanzania. *African Journal of Science, Technology, Innovation and Development,* 8(1).	How Living Labs in Tanzania are developed? What is their impact on resilience of the studied local communities?	Resilience; innovation system, living labs	Observation; interviews; strategy, policy and legal documents; content analyses	LLs are becoming important and common development tools in developing countries; LLs connect innovation stakeholders on different spatial scales and bring local and non-local knowledge pools together in innovation processes; The focus of the Tanzanian LLs has been on the local communities and need-based solutions to respond to acute everyday challenges; LLs shift the development approach toward a more active entrepreneurial and technology facilitated approach.

2. EVOLUTIONARY RESILIENCE AND INNOVATION SYSTEM DEVELOPMENT

I have four different but overlapping goals for this literature review. *First*, I review the capabilities and limitations of existing resilience-based approaches in development, focussing especially on its spatial and temporal dimensions. *Second*, I will discuss different adaptability and transformation processes occurring in localities by problematizing the logic behind the resilience discourse based on communities' self-organisation and adaptive learning capacities. *Third*, as a more policy-oriented transformation model, I introduce an innovation system approach for Southern Africa. *Fourth*, I will discuss two bottom–up processes – indigenous knowledge and the Living Lab concept – that emerged in the study areas to embed innovation and knowledge-creation processes into local communities.

2.1 Towards an evolutionary perspective of resilience

Contemporary studies of spatial change have claimed that comprehensive analyses of the dynamics and complexity of these processes require more integrated and interdisciplinary approaches (Turner, 2010: 571). Resilience has evolved into one of the major approaches used in social studies to deal with development issues. It has become an interdisciplinary concept used to address complex changes and uncertainty that requires the integration of social, economic and environmental dimensions of sustainability (Pike *et al*., 2010: 59). Resilience has been seen as a bridging concept to bring environmental and social disciplines together through a common interest in addressing change characterised by unknowable risks and future surprises (Tompkins & Adger, 2004). The term resilience is based on the Latin root *resilīre*, which refers to springing back or rebounding (Simmie & Martin, 2010). Due to its emphasis on future-oriented dynamism and the active role of agency, resilience has often replaced conventional sustainability as a goal of development (Carpenter *et al*., 2005). One reason behind the popularity of resilience is its malleability, or how it may mean different things in different contexts (Christopherson *et al*., 2010: 3).

Resilience originates from multiple fields, such as ecology and biology, engineering and material science, business studies and psychology (Gunderson, 2000; Holling, 1973; Hylop, 2007). One consequence of these multidisciplinary origins is that the term has many different disciplinary-specific interpretations (Hudson, 2010: 12). Most commonly, resilience is defined from the equilibrium perspective developed in the field of ecology. In his article published in 1973, C. S. Holling divided resilience into engineering and ecological approaches. Engineering resilience is defined as the

ability and the time it takes for a system to return to equilibrium after a disturbance or shock. Disruption can refer to anything from an environmental hazard or economic crisis to social disorder, and resilience is measured by the time it takes for the system to recover to its pre-disturbed state (Holling, 1973). As for ecological resilience, the emphasis is on the capacity of the individual, material, organisation or ecosystem to cope with disturbance and stress, and retain or subsequently regain its form and functional capacity (Berkes & Folke, 1998). Compared with the single equilibrium approach of engineering resilience, the definition of ecological resilience assumes that there can be multiple equilibria and, after a shock, the system can either return to the pre-shock state or move on to another state or regime (Adger, 2000: 347).

The application of equilibrium resilience to social studies has been criticised because societies are hardly ever in equilibrium (Brown, 2014). Thus, the idea of bouncing back to normal without questioning what the original normality was has been considered an unsuitable framework for societal approaches (Simmie & Martin, 2010). Resilience has been considered to reinforce the existing status quo, and thereby may promote inequity and undermine sustainability (Davoudi, 2012). For example, in the context of the global poor, the idea of returning to normality would mean a return to the previous poverty after facing another shock (Article **I**). Similarly, in disaster studies, bouncing back is often associated with returning to a dysfunctional state, which may have incubated the conditions that contributed to the disaster's origin in the first place (Leitch & Bohensky, 2014).

O'Malley (2010) has argued that unlike other anticipatory logics – like preparedness, precaution and pre-emption, which all in some way aim to prevent unwanted futures from becoming real – resilience tries to improve an agent capacity to live with and actually flourish from the uncertainty (see also Grove, 2014). Reid (2012: 76) claims that human beings are perceived as resilient if they adapt rather than resist the conditions they suffer from in the world. Therefore, resilience has a tendency to reinforce the existing status quo and consider human-made change as unavoidable, and thereby may undermine sustainability and endorse inequity (Brown, 2014). However, at the same time, other social science scholars are increasingly considering that, by the social theory perspective contributing to the resilience approach, the concept has the potential to become a powerful vehicle, even for radical and transformative change (Biermann *et al*., 2016: 61). An example is for the social movements demanding better functioning and more transparent local democracy (Harvey, 2000).

Resilience has most often been used in connection to sudden disasters or shocks. However, its application to various analyses of slowly developing changes has

increased in number (Pendall *et al*., 2010). These analyses have focussed on incorporating the causal paths consisting, for example, of long-term political decisions and extra-regional actors, which affects the potential of resilience (Hassink, 2010). This approach is conventionally called the evolutionary perspective of resilience and has been especially popular in the field of economic geography (Bochman, 2015; Pike *et al*., 2010). The evolutionary perspective of resilience is as interested in the long-term capacity to address different changes as it is the capacity to respond to short-term shocks (Simmie & Martin, 2010: 31).

2.2 Spatial and temporal dimensions of resilience

According to Christopherson and her colleagues (2010: 4), one critical difference between the equilibristic and evolutionary resilience approaches is their ontological understanding of time and space. Equilibrium resilience considers time as linear and constituting pre-shock, shock and post-shock moments, with changes and risks considered as separate 'events'.

Space, in the equilibrium approach of resilience, is most often seen as absolute and is taken for granted. This view originates from classical physics, where space is treated as a fixed background against which things occur and exist (Smith, 2008: 85). Space is restricted to a geographical location, surface or fixed container of all happenings (Fawchett & Song, 2009). Regions are considered to be autonomous spatial entities where the relations between objects do not affect the space as such. This traditional metric understanding of space only poorly acknowledges agencies and their role in influencing what the space they populate might become (Herold, 2010).

The evolutionary approach of resilience challenges the idea of equilibrium and considers social development to be a constantly evolving, non-static process for which the most certain process is change (Davoudi, 2016). In philosophy, a process is defined as a 'coordinated group of changes in the complexion of reality, an organized family of occurrences that are systematically linked to one another either causally or functionally' (Rescher, 1996: 38). Urry (2007) pinpoints social changes as being a result of complex, multi-scalar and -sided, relational and evolutional development, without necessarily having linear causalities – with several co-existing changes that are interconnected, uncertain and unstructured. Changes are non-linear and often occasional; whereas a small shift may cause a major change, a larger transformation may not have any relevance (Anderson *et al*., 2012: 182).

In the evolutionary perspective of resilience, a space is often understood from the relational perspective, whelming from the 'the relational turn' in human geography

(Elden, 2009: 264). The space is unstable and non-perpetual, as it folds and unfolds, rendering the evolving relations of the objects. Massey (2005) defines relational space as always becoming a multiplicity resulting from interrelations. She does not make a sharp division between the objects and the space, because the objects can be only understood through their relationship to other objects, not through being in the space as such.

Martin Jones (2009: 496) has criticised the relational approach to the challenges related to the inability to turn fluid space from theory to practise, and how relational thinking considers space as non-spatial and without a geographical anchor. Relational thinkers have not been able to accurately model distinct relations and relational properties (2009: 495). Furthermore, the relational approach has been criticised for not heeding the role of material in illuminating the research objects (Murdoch, 2005). The critics of relational approaches of space have led many scholars towards a topological understanding of space. Jones (2009: 489), for instance, introduces the concept of phase space, which recognises the relational nature of space but also the demands on the confined, inertial, connected and always context-specific nature of emergence and existence. Similarly, Thrift (2008: 98) emphasises the role of absolute space begetting the relational space.

Post-human theorists have introduced multiple ways to conceptualise the relational and spatial intertwining of human and material elements. The most commonly applied of these theories has been the actor-network-theory (Latour, 2005) and an assemblage (Deleuze & Guattari, 1987). According to post-human scholars, space is constituted from a complex network of relations, interdependencies, commonalities and communication between the human and non-human elements. There is also a small but increasing body of literature approaching resilience from post-human perspectives (see, for example, Dwiartama & Rosin, 2014; Grove 2014; Kaufmann, 2015; Herman, 2016). By applying post-human theory to the resilience approach, which is generally interested in 'socio-ecological' or 'socio-economic' interrelations, it is possible to address the interdisciplinary questions regarding the materiality, forces, technologies and assemblages that form the local manifestations and responses to spatial changes. For example, in Case A, the floods in Northern Namibia are contingent and complex systems comprising dynamic and multiple relations between, among others, communities, infrastructure, water, weather, housing policy, dams, bridges, topography, government departments and laws. Therefore, the flood event is a relational and collective entanglement consisting of both human and non-human elements (Herman, 2016: 34).

Due to common discussions within the resilience debate, the scholars working on assemblage are especially interesting. Anderson and his colleagues claim

that assemblage offers an analytical tool to analyse how spatial changes that are constituted of disparate activities becoming entangled with one other, and how anticipatory action, such as resilience, can provide a coherent way to redeploy and reorder this space by acting in other ways (2012: 173). In addition, the shared considerations of complexity and the dynamic nature of spatial change, as well as the role that nonhuman elements have in explaining research objects, make the understanding of space in this dissertation in line with the core notions of assemblage theory.

While acknowledging the variety of ways to understand the concept of assemblage, in my thesis it is positioned as a heterogeneous, unique and non-stable relational configuration of actions, bodies, passions and different enunciative elements such as plans, strategies, laws and codes that attempt to intervene in the material contents (Deleuze and Guattari 1987: 87-91). Assemblages are never complete or permanent entities, as they are in a constant process of assembling and re-assembling the relations between the elements that form individual entities. Assemblages are always founded from disparate parts that have been entangled together but nevertheless are always connected to larger assemblage (Anderson *et al*. 2012: 173).

The spatial unit of my analyses is a community, which is one of the key scales in which societies operate and are organised with (Herman, 2016). In this research, a community is defined as a loose assemblage of agencies with shared geographical, political, social, cultural or economic characteristics (Herman, 2016: 35). It is a complex and dynamic network, and although it is most often understood as a social, it is an interdependent, contingent and co-constitutive assemblage of human and non-human relations, discourses and practices (Latour, 2005). However, Wilson (2015) denotes that it is also a contested term with different definitions. Community is always overlapping with other terms. It is fuzzy, changeable and exclusionary by nature; furthermore, it is always attached within complex networks of power.

2.3 Resilience and adaptability of agency

Notwithstanding the evolutionary approach to resilience, it is essential to notice that the ecology-rooted concept of resilience involves a number of normative and political questions that have not yet been adequately addressed. Resilience has been regarded as a value-laden concept. The particular issues that need further elaboration involve the ways in which resilience treats and recognises power, and the relationship between agency and structure (Obrist *et al*., 2010). Thus, critical questions are included, such as resilience for what, for whom and under what

conditions; what might appear as resilience, on some scale and for some actors or elements, may increase the vulnerability of others elsewhere (Cote & Nightingale, 2012: 479).

Folke (2006) emphasises the role of learning, combinations of different knowledge and the capacity for renewal, innovation and re-organisation as important dimensions of adaptive capacity and resilience. One important attribute of adaptive capacity is the ability for self-organisation, which is described as the community's or individual's own capacity to respond or recover from a disaster rather than depend on external assistance or aid (Etkin & Dore, 2003). Rather than acting as passive recipients, the communities or individuals are expected to act as an active agency that must take responsibility for planned actions and adapt to the different changes (Magis, 2010: 404). Referring to Dwiartama and Rosin (2014), agency, in social science, is commonly distinguished as 'the capacity for an agent (usually a human) to influence broader social relations (or structures) or to actively control its own well-being' (see also Brown & Westaway, 2011: 325).

The agency of a resilient subject is also one of the most criticised attributes of the resilience approach; in a social context, self-organisation easily becomes ideological, with an emphasis on the 'self-reliance' and the individualistic 'adaptive' subject of neoliberalism (Walker & Cooper, 2011). In practice, the effect of resilience is often individualised and depoliticised. According to Grove (2014: 242), '(f)ar from empowering vulnerable peoples by recognizing their agency, the agential subject of resilience in need of empowerment is an effect of resilience assemblages that immunize neoliberal order against adaptive capacity through depotentializing socioecological life.' Reid (2012: 69) claims that resilient people do not expect the state to secure their wellbeing, as they have been rendered into believing that it is their responsibility to do it themselves. Self-reliance exaggerates the ability of individuals and communities to raise themselves out of difficulty or reinvent themselves when confronted with adversity (Swanstrom, 2008: 10).

One central presumption has been that communities and individuals are capable of learning from uncertainty and change by building upon memories from the past and using their previous experiences in their coping process to face anticipatory disturbances in the future (Berkes *et al*., 2003). Adaptive learning processes are often social and pragmatic, and take place in practice. According to Müller and Ibert (2015: 340), learning in practice is an embodied and a kinaesthetic process that occurs regardless of formal qualifications, the institutions involved or the intensity of the information processing. Generally, it takes place in traditional apprenticeship through imitation and repetition, supervised by an experienced practitioner. It is a local and tacit process that requires close proximity and co-presence with

colleagues or clients, as it involves physical interaction or joint work on objects (Müller & Ibert, 2015).

Folke (2006) pinpoints that social learning stresses the role of social institutions and networks in resilience, as these encourage and engage knowledge creation, leading to flexibility in transformation, innovation and the reformation of values and norms. Critics have claimed that the resilience approach easily overemphasises the importance of post hoc and reactive learning (Chandler, 2014; Davoudi, 2016). Reactive learning might be crucial for coping with short-term changes as they emerge; however, it might be less relevant for the long-term capacity to address different transformations, achieve collective goals or create new pathways. This is especially true when the knowledge acquired from the learning in practice is commonly socially contextualised and materially situated (Muller & Ibert, 2015). Among others, Reid (2012) argues that the role of the communities' capacity to cope, learn or self-organise must not be overemphasised in the resilience approach. Instead, to increase the communities' resilience, the complex and long-term social and political relations and processes constituting the actual events need to be contemplated.

2.4 Innovation system as a transformative model in Southern Africa

A knowledge economy based on knowledge creation and a well-established IS is a critical driver of socio-economic success in the most developed countries (Tödtling *et al*., 2013). According to Christopherson and her colleagues (2010: 6), a successful IS and strength factors that foster regional learning are key-elements of increasing regional resilience (see also Clark *et al*., 2010). Recently, it has been conceived that innovation-driven regional development also fosters transformative change towards the knowledge economy in developing countries. In addition to economic growth, a well-functioning IS is a useful tool for poverty alleviation, inequality reduction and the fostering of socio-economic resilience (Organisation for Economic…, 2012).

According to Agenda 2063, launched by the African Union in 2013, the science, technology and innovations (STI) approach should become an engine to tackle social and economic challenges hindering the development of Southern African countries (African Union, 2013). During the last decade, IS has emerged as a common policy tool in Southern Africa countries (African Union, 2014). Notwithstanding, innovation scholars share a common understanding that innovation policies in less-developed regions and countries should not be based on the imitation of successful policies pursued in more developed countries. One

size does not fit all, e.g., the same policies cannot produce equally outstanding results in a different socio-economic context (Tödtling & Trippl, 2005). Instead, the focus should be on smart specialisation in which place-based policies promote the economic diversification based on unique assets, characteristics and comparative advantages in the regions (McCann & Ortega-Argiles, 2013; Boschma, 2015). However, in Southern Africa, agriculture and the extraction of raw materials are the fundamentals of the economy. The industrialisation level is low and the service sector is underdeveloped.

Non-linear and complex evolutionary processes relate to knowledge utilisation of individuals and institutions (Pavitt, 2005: 87–88). Learning and knowledge creation are based on the interaction between different actors in a specific socio-economic context in which innovations and development processes are embedded (Strambach & Klement, 2012). The socio-economic context influences the capacity of institutions, regions and countries to develop, diffuse and apply innovations (Doloreux, 2002; Tödtling & Trippl, 2005). The past development trajectories influence the present opportunities and the overall emergence of IS (Boschma, 2015). The context in developing countries differs substantially from the more economically and technologically advanced countries (Lundvall *et al*., 2009). As indicated below, Southern African countries suffer from both organisational and institutional thinness regarding the IS development.

Organisational thinness is the absence or limited quality of a critical mass of firms, R&D laboratories, intermediate organisations, universities, research institutions, associations, unions and other relevant organisations for the innovation creation processes (Tödtling & Trippl, 2005; Moodysson & Zukauskaite, 2014). In Southern Africa, universities usually conduct very little international peer-reviewed research, are often excluded from the governments' developmental strategies and mostly focus on education at lower academic degrees. There are only a few enterprises conducting proper R&D activities. Furthermore, enterprises network insufficiently in the private sector, and there is often a poor connection between them. There is very limited knowledge exchange between the actors in private and public sectors. This hinders the collective learning among the enterprises and their systematic interaction in innovation activities. Furthermore, in Southern Africa, a key constraint is the constant lack of advanced human capital and experts familiar with the holistic nature of the IS (Adebowale *et al*., 2014).

Institutional thinness is the absence or limited quality of both formal institutions (e.g., rules, laws, regulations) and informal institutions (such as norms, values and other relevant cultural aspects for innovation and cooperation) that would

promote knowledge exchange and collective learning (Moodysson & Zukauskaite, 2014). In Southern Africa, there is a lack of co-operation, insufficient funding and blurred operational description in innovation-related activities. Furthermore, the related formal institutional, legal and regulatory settings are underdeveloped (Oyelaran-Oyeyinka, 2006). The governments rarely create entirely transparent developmental strategies with clear implementation plans (Watkins *et al*., 2015). The government effectiveness and regulatory quality are two institutional measures that have the most equivalent impact on innovation in Africa (Oluwatobi *et al*., 2015).

Earlier studies indicate that the structure and actors of IS are generally rather universal. However, ISs vary according to the knowledge they are expected to create (Asheim *et al*., 2011). Analytical knowledge is new scientific knowledge. Innovations result from formal learning processes and well-organised R&D activities that are based on the science technology and innovation mode of learning (STI mode). Synthetic knowledge refers to innovation processes where innovations are created through a new application of existing knowledge or through new combinations of knowledge. Of importance here is the doing, using, and interacting (DUI) mode of learning (Jensen *et al*., 2007). Symbolic knowledge is associated with the aesthetic elements related to innovations. This division is not exclusive, and, generally, all three knowledge bases are utilised with different emphases in an IS (Asheim *et al*., 2011). Due to the organisational and institutional thinness, innovations based on analytical knowledge have been scarce in Southern African countries. Innovation creation is more often based on synthetic and symbolic knowledge, information networks and the DUI-mode of learning (Jensen *et al*., 2007; Kraemer-Mbula & Wamae, 2010). Another aspect is the potential of IK in IS. The transfer of Western science and technology has failed to transform the lives of the majority of people in the global south, which is especially true in Sub-Saharan Africa (SSA) (Briggs, 2013: 232).

2.5 Embedding innovation systems in local communities

Recent academic discussion and activities embarked on by various national governments and international organisations emphasise the role of knowledge integration in the resilience-building processes. Weichselgartner and Kasperson (2010: 266–267) have argued that resilience continues to be externally defined and that the role of expertise knowledge is overemphasised. They denote (2010: 267) that professionals undertake many of the resilience-building activities without sufficient understanding about the local circumstances or engagement of the local stakeholders or residents and their local knowledge.

In developing countries, it is expected that an IS contributes positively to socio-economic sustainability, poverty alleviation and resilience (Lundvall *et al*., 2009; Adebowale *et al*., 2014). However, the relationship between innovation, poverty alleviation and inequality is complex and co-evolving, and there is no linear positive correlation between them (Cozzens & Kaplinsky, 2009). An IS may alleviate poverty if it is designed and applied to tackle related problems and involves local communities (Altenburg, 2009: 37). According to Altenburg (2009), in less-developed countries, IS should develop and disseminate affordable and adapted innovations instead of 'new to the world technologies'. Such local socio-cultural inclusiveness in innovation development requires a paradigm shift (Sillitoe & Marzano, 2009). To tackle these issues, there is a need to pay attention to the potential of socially inclusive innovations. Inclusive innovations enhance the social and economic wellbeing of disenfranchised society members (Heeks *et al*., 2014). These innovations are novel to the context and can be heterogeneous products, processes, institutions, services, business models and supply chains (George *et al*., 2012).

Thus, the community development debate and practices regarding the developing countries are shifting from top-down directed development models to the encouragement of transformative action from below. There is a need to root the IS more fully within local communities as well as for the inclusion of bottom-up approaches in policies. In this dissertation, I scrutinise that the two most eminent processes of this discussion occurred in the study areas of IK and LLs. These two approaches are ontologically different, as IK is a knowledge base from which the future innovations are expected to rise from, and LLs are concrete platforms to increase the local community's role in innovation development and combine IK with external knowledge.

2.5.1 Utilising indigenous knowledge in innovation system development

One approach to embed the IS into the Southern African context is to consider IK as a source for innovations and an asset in the IS (Domfeh, 2007; Sillitoe & Marzano, 2009; Head & Atchison, 2015). IK refers to knowledge accumulated over time and unique to a given society or culture (Sillitoe & Marzano, 2009). A growing number of studies advocate IK as an important source of innovation in Africa and an inherent part of social development there (Warren *et al*., 1995; Berkes *et al*., 2003; Dekens, 2007; Bohensky & Maru, 2011; Weichselgartner & Kasperson, 2010). Potentially, the IS supported by IK enhances the comparative advantages of IS and makes the innovation policy more inclusive. Recently, IK has been taken into official development policies, for example, in Botswana, Ghana, South Africa and Tanzania (Nfila & Jain, 2011).

IK refers to traditional and invariably local and geographically specific grounded knowledge that is transferred from the earlier epoch and influenced by external knowledge (Bohensky & Maru, 2011). IK is often transmitted orally or through demonstration and imitation, and it is learned by repetition (Subba Rao, 2006: 224). Local communities have their own culturally and economically situated IK that is generated throughout generations. IK is especially important for the poor rural communities in developing countries, where it is often the best accessible and applicable knowledge in their daily livelihoods. As IK is not a property of any certain person, group or company (Hagar, 2003; Domfeh, 2007), it creates challenges for institutions that store, develop and transfer IK (Bertelsen & Muller, 2003). Specifically, the protection and ownership of IK are problematic because intellectual property rights and patent laws are designed to protect different kinds of knowledge. Furthermore, the questions of equitable benefit sharing with the IK holders must be resolved (Sen, 2005; Wynberg *et al*., 2009). These challenges are also evident in Namibia, as elaborated in the empirical analyses (see section 4.4.1).

IK should not be considered in isolation of other types of knowledge without recognising their mutual benefits (Article **III**: Table 1). IK is influenced by internal creativity and experimentation driven by changes in localities that dynamically mix the traditional knowledge and present innovations (Flavier *et al.*, 1995; Bertelsen & Müller, 2003). Indigenous innovations may be based on the latest external knowledge adjusted to local circumstances through IK (Weichselgartner & Kasperson, 2010), or IK can be an essential part of the external knowledge-based innovation; for example, the ingredient of a new medicine. Indigenous innovations vary from agricultural products and techniques in Africa to the space industry in India (Baskaran, 2001). The evolution of IK may take centuries, but it is a constantly evolving process intertwined with external knowledge. Instead of emphasising the content of passable information from one person to another, the focus of applying IK should be on processes and methods of observing, discussing, questioning, analysing and making sense of new and received information (Berkes, 2009; Briggs, 2013).

2.5.2 Living Labs as a localised innovation system

LLs have become a common IS instrument in more developed countries in order to increase interaction between parties germane to the innovation processes. Most commonly, LLs have been considered either as an innovation approach (R&D methodology) or an innovation milieu (environment, arena) (Bergvall-Kåreborn & Ståhlbröst, 2009). According to Cunningham and his colleagues (2011), in the White Paper of IST-Africa (IST-Africa, 2012):

> *'Living Labs are environments, a methodology or an approach, which caters for user-driven open innovation within real-life rural and urban settings/communities, where users can collaborate with multiple committed stakeholders (whether NGOs, SMEs, industrial, academic/research, government institutions or funders) in one or more locations, to become co-creators or co-designers of innovative ideas, processes or products within multidisciplinary environments'.*

Initially, LLs were formed as a platform in which firms, public authorities and citizens worked together to create, prototype, validate and test new services, businesses, markets and technologies in real-life contexts in cities, rural areas and virtual networks (Niitamo *et al*., 2012). Later, LLs began to focus on a broader area of open innovation and co-creation of products, services or societal innovations together with the users. LLs can work as a bridging platform to support knowledge exchange between different agencies such as communities, the private and public sector, universities and NGOs (Leminen & Westerlund, 2012). LLs can also, for example, connect endogenous local community knowledge pools and knowledge from LL participants to exogenous non-local expert knowledge pools (Buitendag *et al*., 2012; Bathelt & Cohendet, 2014). New knowledge is created and applied to new contexts. By the mid-2010s, there were well over 500 LLs in Europe and a considerable number in other advanced economies. In developing countries, the number of LLs has been growing, and in Africa, there are now LLs in Burkina Faso, Burundi, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Lesotho, Mauritius, Mozambique, Namibia, Rwanda, Senegal, South Africa, Tanzania, Tunisia, Uganda and Zambia; however, some rely on project-based funding (ENOLL, 2015; IST-Africa, 2015). In the African context, the few studies that have been conducted so far have been done in one particular country and discuss the limited experiences of LLs in South Africa (such as Siyakula, Sekhukhune and Rlab LLs) (Coetzee *et al*., 2012).

3. EMPIRICAL RESEARCH SETTING

3.1 Changing localities in Sub-Saharan Africa – Africa rising?

Over the last decade, one of the major changes in the dynamics of world development has been the rapid economic growth of SSA. According to the forecasting of World Bank's Global Economic Prospect (World Bank, 2016), six out of the twelve countries with the highest projected compounded annual growth rate (CAGR) between the years 2014 and 2017 were from SSA. The main driver of success has been the increased demand and price increase of the continent's commodities such as oil, minerals and tropical agricultural products. New enormous mineral resources are constantly discovered across the region.

Another driver of the economy has been the favourable demographic development, the external debt reliefs and the decline in intra-African conflicts (Weeks, 2010: 10). Due to the high fertility rate, before 2050, the population of the continent is projected to reach 2 billion, and there is expanding young generation and rapid urbanisation dynamics (African Development Bank, 2015). Aryeety and his fellows (2012: 8) add that the improved macroeconomic frameworks, together with expanding democratisation with political stability and multiparty elections in a majority of countries, are central drivers for the enhanced economic performance. Furthermore, there are also some transformation processes from resource-based economies towards knowledge-based development. This is mainly based on rapidly growing cell-phone penetration. In 2014, 742 of 1,000 people increasingly had access to telephone services with connection to the Internet (African Development Bank, 2015: 19). New communication technology has boosted the local access to services, knowledge and markets. Africa has even become a forerunner in some mobile-based technologies, such as mobile banking and health services (Déglise *et al*., 2013; Källander *et al*., 2013; van der Boor *et al*., 2014).

Notwithstanding the rapid economic growth, several socio-economic researchers have been considerably more sceptical about these development trends in SSA (Amin, 2014; Obeng-Obdoom, 2014; Bush, 2013). The strong economic performance has only had a minor impact on the continent's poverty rate, which only improved 0,1% between the years 2010 and 2014, being 42,4% in 2014 (African Development Bank, 2015). Generally, the income gap between those few who have benefited from the economic success and the poor majority has significantly widened. Moreover, the economic growth has not solved many challenges related to social injustice, environmental sustainability or poverty and inequality alleviation (Obeng-Obdoom, 2014). Taylor (2015) claims that on-going development dynamics primary based

on commodity exports are actually pushing SSA further into underdevelopment, dependency and marginality. He argues that the emerging success has been based on superficial features (the gross domestic product [GDP] figures, debt levels, prices and exchange etc.), and it has not led to any apparent structural transformation (2015: 3). The economic growth has been concentrated on a limited range of the extractive industries and commodities depending solely on raw materials without local value addition (Sindzingre, 2013: 26).

Another challenge in the discussion of SSA development dynamics is that the region has been treated very homogenously, although there is significant fluctuation and variation in the general economic performance among the regions' 49 independent countries. Moreover, development issues vary significantly within the countries. The economic growth has been highly concentrated to a limited number of locations, sectors and individuals. This is also an important notion for this research. The social, political, economic, historical and environmental dynamics between the two countries Namibia and Tanzania are significantly distinct. Hence, there is a risk for generalisation or comparative analyses. In the following sections, I will elaborate on the country-specific socio-economic development in Namibia and Tanzania more accurately.

3.1.1 Socio-economic development of Namibia

Namibia, in South West Africa (Fig. 1), became independent in 1990 after emancipating from the ethnic-based homeland system instituted by the South African apartheid government. After the independence, the new constitution and free and fair elections have made Namibia one of the most stable and democratic countries in Southern Africa. Namibia is administratively divided into 14 regions, but central authorities possess the most significant power in terms of regional development policies. Moreover, the main political party SWAPO (South West Africa People's Organization), formed from the ex-liberation army, has had superior dominance in local politics and has gained simple majority in all national, regional and local elections. The opposition has been very fragmented, and the respectable challenger has been lacking. Recently, members of SWAPO have had difficulties accepting the emergence of new political movements, and political ambiguities and tensions have been increasing (Sims & Koep, 2012). Despite the conflictual past with South Africa, Namibia has strong economic and political ties with it. Exports to South Africa consist of over 5% of the GDP, and it is also the largest source of foreign direct investments (FDIs), accounting for up to 80% of the total inward FDI (World Bank, 2016: 166). South Africa is also a major source for Namibia policy development. The contents of many policies implemented in Namibia, including innovation policies, originate from there.

Namibia has the second lowest population density of any sovereign country. It has a large surface area (824,292 km^2) with a small population (2.3 million inhabitants). The northern part is the most densely populated with more than 1 million inhabitants living in villages and small rural towns. In the central part of the country is the rapidly expanding capital, Windhoek, with over 400,000 inhabitants. All other towns have less than 80,000 inhabitants and are a far distance from each other. A lot of territory is without a permanent population (Fig. 1).

Namibia has small GDP, e.g., 13.4 billion USD in 2015 that is partly related to its small population. The economic growth of Namibia has been substantial, annually around 4–5% in the past two decades, and it is expected that the growth will continue (World Bank, 2016). Namibia is nowadays a transition country, having left the status of a developing country in 2012 (United Nations, 2012). The most important industries – mining, tourism and marine technology – are potentially relevant for innovations and IS. Diamonds alone account for 8.5% of the national GDP. The rest, including uranium, gold and copper mining and quarrying, accounts for 11.5% of the GDP (World Bank, 2016). Following the opening of a new mine in 2017, Namibia will be the second largest uranium producer in the world. However, the mining industry is based on unrefined raw materials without local value addition. It is mostly foreign owned, contributes poorly to taxation and provides few employment opportunities (Hopwood *et al*., 2014). Since the 2007–2008 global economic downturns, the mining, tourism and marine technology industries have been negatively influenced by these external shocks. Agriculture contributes about 7% to the GDP. It suffers from low productivity, but it is the main income activity for the rural majority. Despite the potential, mining and marine technologies are hardly at all connected to the IS of Namibia.

Namibia's GDP per capita (around 5,600 USD) is among the highest in the Sub-Saharan contexts. However, the income differences are among the widest in the world with a strong urban-rural bias. In 2015, Namibia was ranked 126 out of 187 countries in the United Nations Development Program's (UNDP's) *Human Development Index* (UNDP, 2016). Despite that, poverty has decreased substantially since the independence; also, in the rural areas, almost half (44,9 %) of the population lives below the multidimensional poverty line defined by the United Nations (UNDP, 2016). The estimated unemployment rate of 28% is highest in Southern Africa (World Bank, 2016). Unemployment affects mostly young and uneducated rural populations. Furthermore, informal employment accounts for 44% of non-agricultural employment (Vanek *et al*., 2014). Wide income differences and informal economy create challenges for the formation of IS based on formal institutions.

Figure 1. *Namibia.*

3.1.2 Socio-economic development of Tanzania

Tanzania (Fig. 3 & 4), in East Africa, gained its independence in 1961 when it discarded the yoke of British colonial rule. It is currently one of the most rapidly growing nations in population and economy. The population is over 52 million, and the annual economic growth has been approximately 7% (World Bank, 2016). During 2015, it was ranked to be the fifth fastest growing economy in the world.

After the independence, the president, Julius Nyerene, declared his social and economic development reforms called *ujamaa* (family hood in Swahili), which were based on socialism, self-reliance and pan-Africanism. During the *ujamaa,* the country's social welfare and equality were among the highest in the continent. However, after the global economic crises during the late 1970s, the economy of the regime was dismal, and in the mid-1980s, Tanzania was forced to finance its economy by borrowing from the International Monetary Fund and the World Bank. The terms of these loans required Tanzania to undergo tight structural adjustment programmes focussing on privatisation, market liberalisation, reducing the role of state and other adjustment policies (Edwards, 2014). Thereafter, the economic growth has remained robust; however, these neoliberal policies have had serious negative social, cultural and environmental consequences. They have, for example,

increased social inequality, threatened indigenous people's rights and allowed multinational corporations to exploit natural resources without considering the environmental consequences (Aminzade, 2013). In the beginning of the 1990s, Tanzania amended its constitution and the multiparty system was allowed. Nowadays, Tanzania is a presidential constitutional republic.

Tanzania has a relatively large surface area (947,303 km^2) and, as in Namibia also in Tanzania, the population distribution is extremely uneven. Most of the people live in the northern border and eastern coast area. The rest of the country is relatively sparsely populated. Since 1996, the official capital has been Dodoma, as the government attempted to mitigate the uncontrollable rapid urbanisation of the former capital Dar es Salaam. The former capital retains its rapid population growth, and it is the largest city with more than 5 million inhabitants. Furthermore, it is still the main commercial centre, and most of the public administration offices are still there. Mwanza is the second largest city with more than 700,000 inhabitants. In addition, three cities, Arusha, Dodoma and Mbeya, have a population around or beyond 400,000, and around 20 towns have more than 100,000 inhabitants.

Contemporary economic growth is based on the newly discovered natural minerals and a young and growing population. Economic development has been particularly fast in mining, tourism, ICT, construction and trade and finance services. The mining sector contributes less than 3% of the GDP, but its importance is expected to rise significantly in the near future (Tanzania Chamber of Minerals…, 2016). The majority of mining revenues come from gold, which accounts for 89% of the value of mineral exports. Other important minerals are gemstones, iron ore, copper, cobalt and silver. Moreover, Tanzania has discovered major natural gas reserves from the deep-sea offshores at Indian Ocean. Tanzania's overall GDP is around 46.9 billion USD in 2015 (955 USD per capita).

Despite the advancements in macroeconomic activities, most economic development focuses on urban areas and is relatively capital-intensive with high spatial exclusion creating only limited job opportunities for the poor majority. The most labour-intensive sector, agriculture, particularly employs up to 75% of the labour force, but its economic significance is low (around 26% of the GDP) and it suffers from the infrastructure gaps. The income gap between the rich minority and poor majority is wide. In fact, in 2015 Tanzania was ranked 151 out of 187 countries in the UNDP's *Human Development Index* (UNDP, 2016). Well over half (66.4%) of the population is estimated to live under the multidimensional poverty line (UNDP, 2016). A concern exists as to how the larger and poorer part of the Tanzanian society can become active in their socio-economic development.

3.2 Methodology of the empirical studies

The empirical study of this dissertation involves special ontological and epistemological questions of the methodology and data for two main reasons. Firstly, the study focuses on spatial changes that are processes where the entities are conceived as unstable and uncompleted, and thus they are in a constant state of 'turning-into-something' (Sthyre, 2002: 580). Secondly, conducting inquiry into the developing countries involves special ethical and political concerns (Lund, 2010: 32).

Ibert, Hautala, and Jauhiainen (2015) claim that as a process is always dynamic, incomplete and in a continuous state of flux, it causes a significant challenge for any strategy of conducting empirical analyses. They argue that, for empirical investigations, '(i)t is necessary to identify units of analysis that represent some internal coherence and consistency' (2015: 324). However, entities must be regarded as being 'no more than temporary instantiations of ongoing processes, continually in a state of becoming' (Langley *et al*., 2013: 5).

The social inquiry done in the developing countries includes additional methodological and ethical considerations (Chambers, 2008; Ballard & Belsky, 2010). Generally, in development studies, those considerations are related to inequality, impoverishment and insecurity (Lund, 2010: 32). This includes possible imbalance in the gender and age of the research subjects. Another possible bias might appear in the relationship between the Western privileged researchers and the research subjects often living in poverty. The different cultural and socio-economic background and the lack of common language may decrease the common understanding of what the research is all about. Thus, Ballard and Belsky (2010) claim that the development inquiry requires approaches that foster learning, knowledge and actions supporting positive change through reorienting the customary processes of knowledge production. Therefore, the research community should not only be the external research object, nor should the researcher only be an external observer, but the researched community should be active stakeholders who are able to participate and influence the direction of the research; for example, what, who and where it will be researched (Chambers, 2008).

The methodology of my thesis consists of a mixed-method approach that is also called a multi-strategy research (Bryman, 2015). The mixed-method approach refers to the application of multiple, often quantitative and qualitative, research methods to answer one research question (Flick, 2006). Triangulation of different data sources is important to gain an in-depth understanding about the reliability and validity of the quantitative analyses and to generalise the subjectivity of the

qualitative analyses (Philip, 1998). Essentially, different methods are regarded as complementary rather than being mutually exclusive (Stake, 2005). In this dissertation, each article-specific research setting and study question requires different research methods that are presented in Table 2. The different research methods approached the same research questions from different perspectives that are complimentary to each other and reduce the potential bias that any single method could have.

Table 2. *The main empirical materials and method of analyses*

	A. Floods in Namibia	**B. Maasai in Zanzibar Tourism**	**C. Innovation System in Namibia**	**D. Living Labs in Tanzania**
Year of data collection	2012	2013-2014	2009–2016	2014
Systematic observation	–	8 weeks	–	7 weeks
Interviews	4	40	19	30
Survey	282	–	–	–
Document analyses	–	–	Strategy, policy and legal documents	Strategy, policy and legal documents
Focus group	4 (38)	–	–	–
Analyses	Content & Statistical	Content	Content	Content

Within all four case studies, my aim is to understand the events from the perspective of the communities and individuals who are at the centre of my analysis. This aim brings my empirical study close to the ethnographic research, where the researcher completes the analyses from the perspective of the agencies that are the subject of the study (Armstrong, 2008; Ybema *et al.*, 2010; Fetterman, 2010). Fieldwork and observation are central elements of ethnography. Although compared to the duration of the fieldwork in classical ethnographic research, for example, in the fields of development studies and anthropology (Chambers, 2008), my seven-month fieldwork period is relatively short. Due to this shortage, it is possible that the empirical data leaves some relevant everyday practices, events or power relations untouched. On the other hand, in order to avoid this pitfall, I paid extra attention for careful planning of the fieldworks, obtained secondary data from the Internet and used emails and Skype to stay in contact with the key informants before and after the actual time in the field. Furthermore, before starting my doctoral studies, I mostly lived, worked and studied in the research area in Namibia for several years, which certainly increased my understanding of the local dynamics. Moreover, all of

the case studies were designed in collaboration with the local partners; Case A with University of Namibia, Department of Geography; Case B with University of Dar es Salaam, Department of Geography; Case C with the Southern African Innovation Support Programme; and Case D with the TANZICT and coordinators from Pamoja-network.

Interviews and observations are my main empirical methods. Furthermore, Case A includes survey (N=282) that was collected in 2012. Most of the interviews were thematic, meaning that there were similar topics related to the discussed themes in each interview. This provided a certain degree of flexibility and openness in the interview events (Bryman, 2015), but it also allowed me to reflect on the observations that I had acquired with the interviewees through other methods. The challenge in the narrations of interviews is related to selective memory, time-bound interpretations of the past and ex-post rationalisation (Golden, 1992; Ibert *et al.,* 2015). One of my strategies to avoid this challenge was to conduct the research 'here and now' when the events were happening (Hautala & Jauhiainen, 2014). This was precisely the situation in Case B and D, but only somewhat in Case C. However, in Case A, due to the emergent nature and multiple stressors caused by the floods, the empirical research was conducted during the dry season.

Participant observation was applied in Case B and D of this research. According to Bryman (2015), conducting the interviews with the agencies having a different perspective may increase the reliability of the data; however, there is a risk that it may foreshorten researchers' comprehensive picture of the process, as the agencies' interpretations and perspectives of the same event may be significantly different. Participant observation can add more comprehensive understanding of how various agencies and elements relate and reveal the power relationships between them (Ybema *et al.*, 2010). Moreover, observation can increase the understanding of the behaviour, communication, interaction, workflows and tasks that are taking place in practice (Spradely, 1980).

In addition to fieldworks, I used various strategies, policies and legal document analyses, with different emphases, in all of the case studies. In Case C, the documents constituted the main research material, and in Case D, those documents included important secondary data to situate LLs to the Tanzanian IS framework. However, in Cases A and B, documents have been used as a background material for collecting information about the research objects. The documents offer complementary data in order to understand the processes occurring in the case area from a larger perspective. Documents can situate the processes to longer-term historical evolutionary development and scale; moreover, they can provide information about the other relevant activities taking place elsewhere (Spradely,

1980). Furthermore, as a certain public authority often produces the documents in order for the tools to anticipate and steer future development, for researchers, those reflect the wider changes occurring in the governing of spatial development. Documents usually represent a wider institutional view of their creator, and Flick (2006: 249) denotes that the documents represent a specific form of realities created for certain purposes. Thus, it is important to analyse who has created them and for what purposes.

In general, all the research materials of this study, except the survey in Case A, have been analysed with the qualitative content analysis. Hsieh and Shannon (2005: 1278) pinpoint that compared to more systematic quantitative methods of arranging and summarising the data, the qualitative content analysis is a research method based on the subjective interpretation of the thematic and contextual variations of the text data (also see Elo & Kyngäs, 2008). In this research, the content analysis was used for structuring the data (Hsieh & Shannon, 2005: 1281–1283). The data was first translated word-for-word into text. Thereafter, the content was systematically coded into themes and patterns that were significant for the particular study question. I more accurately explain the exact methods of analysis for each case study in the next sections, where the specific research settings, materials and methods applied are described in detail.

3.3 Case studies

In the following sections, I will present the case studies of the dissertation. A case study is an approach to the research process in its context (Flyvbjerg, 2006). Usually, theoretical concepts applied in social studies emerge from the case studies. Similarly, case studies allow researchers to observe researched theoretical concepts, such as resilience, in the 'real world' and reflect on their contextuality (Yin, 2013). Each case event is complex and unique and is not necessarily linear from the beginning to the end or spatially bound to the specific territory (Beck, 1992; Erikson, 1994). Therefore, in social inquiry, a case study always involves questions about the limits of its generalising, abstracting and theorising of results.

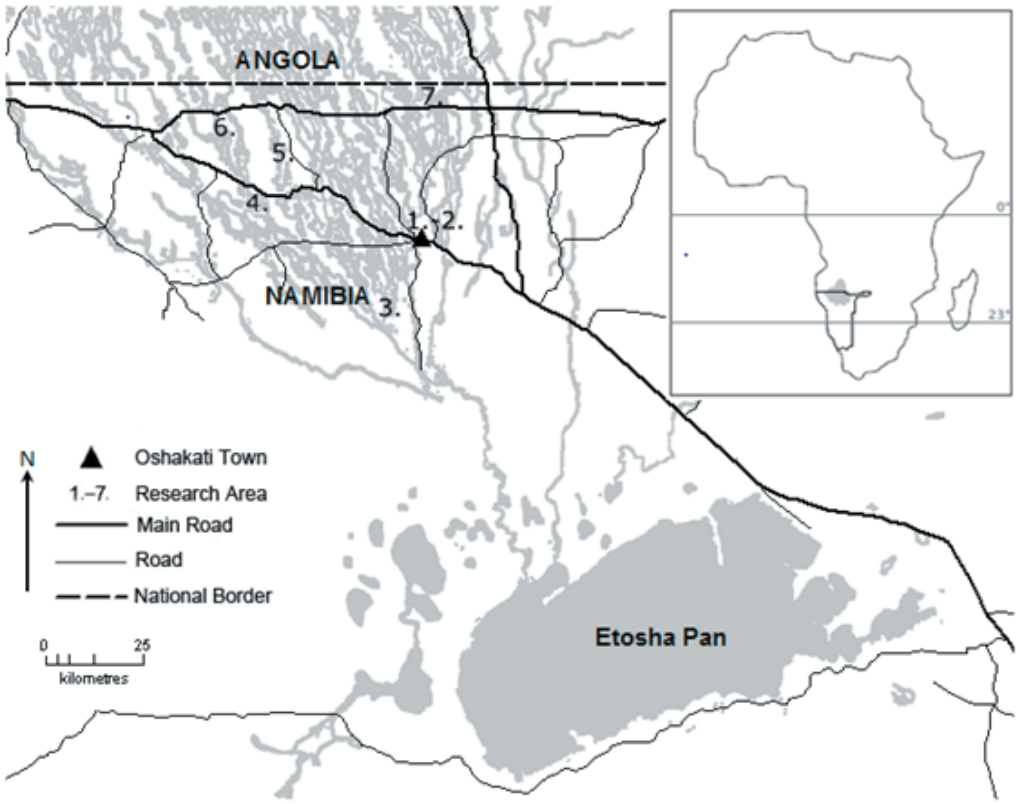
Case studies are always specific and concrete event occurring in spatio-temporal reality; they become scientifically interesting only when the cases relate to, and resonate with, other research (Lund, 2014: 224). With triangulation and iteration, it is possible to reach a certain degree of saturation to be confident enough to make generalisations among the studied group (Bauer & Aarts, 2000). Furthermore, systematic selection and high quality cases improve the accuracy of generalisations (Gomm *et al.*, 2000: 106-107). However, more universal generalisations and

extrapolations of study results in social science are always fuzzy, relational, and dependant of the argument. Lund (2014: 231) highlights that in addition to choices of sample, concepts and theory, it is always the movement and navigation back and forth between observation, generalisation, abstraction and theorisation that produces new analytical knowledge and epiphanies in social science (see also Klag & Langley, 2013).

3.3.1 Case A: Floods in Northern Namibia

In Northern Namibia, the climate is highly polarised between dry and wet seasons, and local communities have lived with these varying weather extremes for centuries. However, recent changes in socio-environmental dynamics associated with urbanisation, inappropriate spatial planning, and population growth have disturbed the river system in the area. These changes, together with torrential seasonal rains, have aggravated the social impacts of flood events. The floods have particularly affected the most disfranchised members of the local communities. Annually, close to 700,000 people are affected. Around 50,000 people need immediate relocation and 100 people lose their lives. The water stays in the settlement areas from one to three months causing a serious disturbance to economic activities, agriculture, businesses, and the industry of local residents.

The study area in North-Central Namibia consists of four administrative regions (Ohangwena, Omusati, Oshana and Oshikoto) located within the Cuvelai-Etosha river basin (see Fig. 2). The area is one of the poorest and most densely populated in the country. The overall population of these four regions is over 847,000 inhabitants living in approximately 150,000 households (Namibia Statistical Agency, 2011). More than 93% of the households in the area are Oshivambo speaking and most of the population are Ovambo by ethnicity. The population has grown rather rapidly: by 13% between the years 2001–2011. Although most of the people still live in rural areas, the urban population has more than doubled during the last decade, reaching 17% (Namibia Statistical Agency, 2011). Migration from the rural villages is predominantly directed to the urban informal settlement areas, which are uncontrollably expanding to the marginal outskirts and wastelands of the urban centres. Many of these areas are extremely flood-prone and have not been planned for housing.



No.	Study District/Village	Urban / Rural	Household Survey (N =)	Focus Group Female (F) / Male (M)
1.	Uupindi	Urban	84	8 F
2.	Oshoopala	Urban	76	4 F / 5M
3.	Ompundja	Rural	18	N/A
4.	Olumpumbu	Rural	19	5 F / 4 M
5.	Oshitutuma	Rural	33	N/A
6.	Epoko	Rural	24	8 M
7.	Omuloka	Rural	28	N/A

Figure 2. *Cuvelai-Etosha river basin (grey) originates in Angola and spreads across the flat plains in Namibia, finally draining into the Etosha pan. Research was done in two informal settlement areas in Oshakati town, plus in five rural villages.*

Two urban informal settlement areas of this study, Oshoopala and Uupindi, are situated in the northern part of Oshakati town, approximately one to three kilometres from the town centre. Oshakati is the most important commercial centre in Northern Namibia, but it is also very vulnerable to floods. The dwellings of these areas are mainly constructed from corrugated iron sheets and lack proper sanitation and waste management, while the communities overall lack municipal engineering and proper roads. Only a few houses on the edge of the study area had

ERF numbers indicating formal municipal recognition. Less than a quarter of the respondents (23%) in the urban area had access to private or shared piped water and only 18% had electricity. Based on an Oshakati town council official's oral estimation Oshoopala's population is around 3,500 and Uupindi has over 10,000 inhabitants. However, due to the informal nature of the settlement areas and the rapid migration, the exact populations of these locations are unknown. Oshoopala is the most densely built informal settlement area in Oshakati and the residents are some of the most disfranchised members of society. Uupindi is the largest informal settlement area in the town, both in terms of its geographical size and its population. People in the urban areas mostly derive their incomes from small and often informal businesses, industrial activities, and employment in the service sector; however, the unemployment rate is high.

The other half of the research was conducted in five rural villages. Based on calculations from satellite imagery the sizes of the villages vary from relatively large (approximately 200 households in Ombundja) to small (less than 80 households Omuloka). The average size of a household in the research area is five people per household (Namibia Statistical Agency 2011). In addition to size, the villages differ in terms of road connections and access to different services. While some of the villages are connected with relatively good gravel roads, have their own schools and some other basic services, more remote villages lack any maintained roads and basic services. Due to agricultural activities, the villages are large and scattered without proper road connections between the homesteads. Thus, the access and connections also vary within the villages. The majority of the households interviewed were traditional homesteads consisting of mud huts covered with straw roofs and surrounded by crops of pearl millet sorghum (called *omahangu*). More than a quarter (28%) of the households had access to private or shared piped water and 8% had electricity. The livelihood of the population is still strongly dependent on agriculture and subsistence farming of, for example, *omahangu*, beans, peanuts, sorghum flour and *ekaka* (traditional dried spinach). Most of the households also had small herds of cattle, poultry and goats. Agriculture-based income-generating activities are particularly vulnerable to different weather extremes.

By using various qualitative and quantitative data sources and comparative analyses between the flood dynamics in urban and rural environments, I studied local residents' coping strategies for enduring irregular flood events from the perspective of socio-ecological resilience in order to answer research questions 1 and 2. The research data was collected between May and November 2012. The field studies included a household survey of 282 residents, and four focus group meetings in which 38 members of the societies participated. The exact study

areas, their locations, and the research methods applied at each study site are presented in Fig. 2. To be able to perform comparative analyses between urban and rural environments, two of the four focus group meetings and 160 household interviews were conducted in the two most-flooded informal urban settlement areas in the town of Oshakati. Similarly, 122 household interviews and two focus group meetings were conducted in five rural villages. In addition, semi-structured interviews were conducted with four traditional authorities. Traditional authorities (*Omukwaniilwa,* 'the King') have predominant control over the rural population in Ovamboland (Keulder, 2000). Their selection process follows old customs and can be considered as undemocratic. Officially their activities are regulated by *the Traditional Authorities Act* (No. 17 of 1995) but local practices rather follow the traditional customs.

The household survey was conducted door-to-door using random sampling procedures to select the households. The structured survey included both open-ended and close-ended questions. The mean duration of one household survey was 46 minutes. The focus group meetings followed a similar semi-structured agenda in different locations but there was also time to discuss local issues specific to each study site. The meetings lasted from two to three and a half hours. Four semi-structured interviews conducted face-to-face with traditional authorities lasted from 35 minutes to 50 minutes. The governing regions of the traditional authorities were Oukwanyama, Ondonga and Ombandja and Uukwambi.

The themes were related to basic demographic and household information, overviews of the flood events, IK and strategies to predict, mitigate, cope with, and learn from the events. The main research unit was a household, described as a group of people living in the same compound and who contribute to the food or income of the dwelling unit (Osbahr *et al.* 2010). The field studies were conducted together with four local university graduates who were experienced research assistants. The main language of the research was Oshivambo, but as English is the official language in Namibia it was also generally used. The focus group meetings and semi-structured interviews were recorded, transcribed verbatim and later, with the help of the research assistants, translated into English.

The closed answers in the household questionnaire were analysed using standard statistical tests suitable for non-parametric survey analyses (De Vaus, 2002). The parameters included variances and means, but also some cross-tabulations. The open-ended answers of the household questionnaire, focus group meetings and traditional authority interviews were analysed by applying qualitative content analysis. For structuring the data, the content was systematically coded into themes and patterns that were significant for the study questions.

3.3.2 Case B: Maasai in Zanzibar's Tourism Business

It is estimated that there are over 430,000 Maasai in Tanzania. Originally, they were a semi-nomadic, Nilotic people. They have inhabited the arid and semi-arid rangelands situated in northern Tanzania and southern Kenya for around two centuries (Spear & Waller, 1993). The area is commonly known as Maasailand and it is also the place where the most popular natural attractions and wildlife areas are located. During the late 1980s, due to structural adjustment policies and neoliberal reforms, the Tanzanian government began to transform these areas to achieve internationally significant conservation and tourism statuses. According to Gardner (2016), this led to restrictions on the customary lifestyle of the Maasai, and many of them have been forced to relocate from their places of origin.

The evictions together with rapid population growth have forced Maasai communities to seek out alternative livelihood strategies. Tourism has become one of their most significant new sources of income. The Maasai have not only become involved in tourism in their homelands but gradually they are also exploring new possibilities from other tourist regions in Tanzania. The Zanzibar Archipelago, famous for its golden beaches, turquoise sea, and unique Afro-Arabic culture, has become one of the most popular packaged-tourism locations in Tanzania (Anderson, 2013). It is also where an increasing number of Maasai seasonally migrate to be involved in various tourism activities. Approximately more than 1,000 Maasai annually seek seasonal livelihood opportunities on the islands and the number is growing. In this research, my particular interest is in the resilience of the Maasai in the Zanzibar tourism industry, and the social transformation and adaptability processes enabling these mostly uneducated nomads to be involved in tourism in Zanzibar; an involvement that requires quick learning of different skills related to languages, business, and social interaction. I will scrutinise some of the key attributes of their adaptability and transformation—namely social learning and self-organisation, as those have been argued to be the central elements in the creation of communities' resiliency towards different uncertainties and changes (Magis, 2010). The case study will answer mainly study questions 1 and 2.

The empirical research material is based on my ethnographic study conducted in Tanzania (see Fig. 3) between October and December 2013, and October 2014. Most of the study materials were collected in the Zanzibar Archipelago, which is located off the coastline of the Indian Ocean around 32 kilometres from Tanzania and the capital Dar es Salaam. The archipelago comprises two main islands, Unguja and Pemba, and around 50 smaller islands. The population of Zanzibar is around 1.3 million. The majority (64%) of the population live on Unguja island and this is also where the tourism activities are highly concentrated (Sharpley & Ussi, 2014).

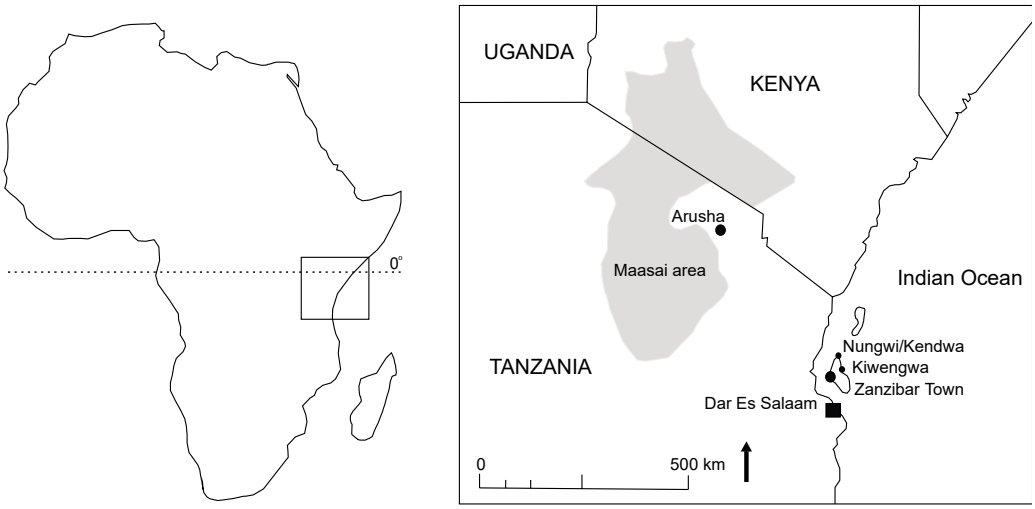


Figure 3. *The research area in Tanzania.*

During the last decade, tourism in Zanzibar has become the most important sector of the economy. According to the estimations of Sharpley and Ussi (2014), the tourism economy as a whole accounts for approximately 44% of the GDP. Notwithstanding the benefits, the heavy dependency on the tourism sector has caused major economic, environmental, and cultural vulnerabilities. Most of the tourism businesses in Zanzibar are foreign owned and more than 50% of those in employment are non-Zanzibarians (Anderson, 2013). As the tourism is mainly based on pre-fixed packages bought before the journey and because the businesses are foreign owned, most of the economic benefits flow out of Tanzania.

During my field studies, it emerged that tourism is causing constant cultural and social conflicts between the different formal and informal actors involved in the industry. Tourist behaviour, such as nudity and the use of alcohol and different substances, is inconsistent with the local Muslim culture. This has also been one of the reasons why it has been challenging for locals to become involved in the tourism industry. The growth of the business is constantly alluring various actors from the mainland to seek new opportunities in different formal and informal tourist activities. At times, the number of "beach boys" and vendors on the beaches exceeds the number of tourists. In this research, a beach boy is defined as any informal actor in Zanzibar beach locations who is aiming to economically benefit from the tourism. This has caused constant conflicts among the locals, the beach boys, the Maasai and the police. For example, the local inhabitants have organised night patrols, which in some extreme cases have led to muggings of the guest workers and arsons of their stalls. Corruption

is very common among government officers, the police, village leaders, and the middle-level hotel managers.

In Zanzibar, the research was mainly conducted in the northern part of the main island of Unguja where two popular tourist beachfronts, Nungwi and Kendwa, are located. In addition, the study included one week's research in Kiwengwa and several shorter visits to the capital Zanzibar Town. The ethnographic study materials consist of observation notes, 28 transcripts of in-depth interviews, and various unofficial conversations and interviews. The interviews included the leaders of both Nungwi/Kendwa and Kiwengwa Maasai communities and two security guards who were a part of the first organised group of Maasai to arrive in Zanzibar in 1998. Furthermore, to better understand the dynamics in the tourism industry, I also interviewed the leader of Nungwi village, the special advisor at the Zanzibar Tourism Commission, two regional planning officers, police officers, hotel and business owners, regular tourists, and beach boys on the beach.

During the first week of my fieldwork, I acted as a regular tourist so as to observe the social dynamics from a tourist's perspective. Thereafter, I began to introduce myself as a researcher and gradually transitioned my presence from an external observer to an active researcher. The research was conducted at different hours of the day to observe normal daytime activities, nightshifts with the security guards, and observations in nightclubs where the Maasai make their acquaintance with the tourists. In the interviews, conducted in English and Swahili, the themes were related to the transformation process of the Maasai from nomads to migrant workers in Zanzibar. The interviews included questions about their general backgrounds, motivations, and the practicalities related to their decisions to come to Zanzibar. In addition, thoughts about their work and stay on the island were included as well as future plans and different learning processes occurring at the beach. The interviews were recorded and later transcribed verbatim. However, during the more informal interviews only systematic notes were taken. The study material was analysed using content analyses and classified under different themes such as capacity to self-organise, capacity to learn, and general resilience. The fieldwork was conducted together with a local research assistant from the University of Dar es Salaam.

The fieldwork also included a study visit to the village of Losinyai in northern Tanzania, which is the home village of several key informants who worked in Zanzibar. It is located in the Simanjiro district around 100 kilometres southwest of Arusha. Losinyai is one of the places where Maasai communities were relocated after the dispossession of their original land. The village has no electricity or proper road connections, and the land is too dry for agricultural or pastoral activities.

Water needs to be transported into the town daily by a donkey cart from the nearest village 12 kilometres away.

According to Spear and Waller (1993), Maasai society is traditionally based on strong leadership and tight social organisation among themselves. The age-set is the central unit of their society. All men belong to an age-set following their initiations, and the economic responsibilities in Maasai culture are divided functionally between different ages and by gender (Spear & Waller, 1993). The interviewees were between 18 and 43 years of age, but most of them were between 20 and 30. They originated from different locations of Maasailand. According to my observations, most of the Maasai in Zanzibar are senior Morani (warriors) who are circumcised, non-married young adults. Traditionally, Morani have been physical guardians of Maasai society but nowadays their role has changed and they are not needed as protectors. Thus, they have a more important role in the community's economic activities; because they have no family responsibilities they can migrate to distant places to seek new job opportunities. The rest are married junior elders and there are also a few women. Moreover, according to the interviews, the junior elders were Morani when they first arrived in Zanzibar but they have continued to work in Zanzibar regardless of their initiation to the next rung on the age-ladder.

On average, the interviewees had worked in Zanzibar from three to seven years. They were seasonal workers, who worked in Zanzibar during the tourism high seasons from September–October until May–June. During the low tourism seasons, they returned to their home villages to do agricultural and rural activities. All of the interviewees considered migration to Zanzibar as only a temporary measure to earn income and none of them had plans to stay there for long. Generally, their future plans were related to activities in their own homes. Most of the interviewed Maasai in Zanzibar had never attended school; only a few had attended primary school, always for less than four years. The main reason for this is the unavailability of education and their tradition whereby cattle herding is the task of uncircumcised young boys. For example, in the village of Losinyai it was not until 2008 that a private charity programme built the first primary school.

3.3.3 Case C: Innovation System Development in Namibia

In Case C, I together with Jauhiainen analyse the development of the IS in Namibia and the special role IK has had in its development. Namibia, like many other countries in Southern Africa, emphasises the use of IS as a key driver to tackle the country's social challenges and foster economic growth for the future. Thus, Namibia has aimed to

enhance co-operation between the government, the private sector, universities and the civil sector and to establish an IS (National Commission, 2014). In the African context, Namibia was an early and consistent mover towards institutionalization of the setting for the knowledge-based economy and IS. Since the late 1990s, Namibia gradually established important frameworks and institutions for IS. However, it has been and currently is taking a long time to approve the drafted policies and laws. Meanwhile, in the past ten years the two universities and international donors, especially Finland and Germany, have taken initiatives.

With this case study, I answer research question 3 by studying the development of IS in Namibia until 2016. Attention is paid to developing socio-economic processes and contexts since the late 1990s, in particular to the international development aid related to the IS formation. For this, the innovation-related strategies, policies and laws in Namibia, as well as key stakeholder interviews were analysed using content analysis.

The empirical material consists of documents, interviews and studies related to the IS development in Namibia from the 1990s until early 2016. The most relevant strategies, policies and legal documents analysed include the *National Research, Science, and Technology Policy* (1999), the *Namibia Vision 2030* (2004), the *Fourth National Development Plan* (2012), the *Research, Science and Technology Act* (2004, in effect from 2013), and the *National Programme on Research, Science, Technology and Innovation* (NPRSTI, 2014).

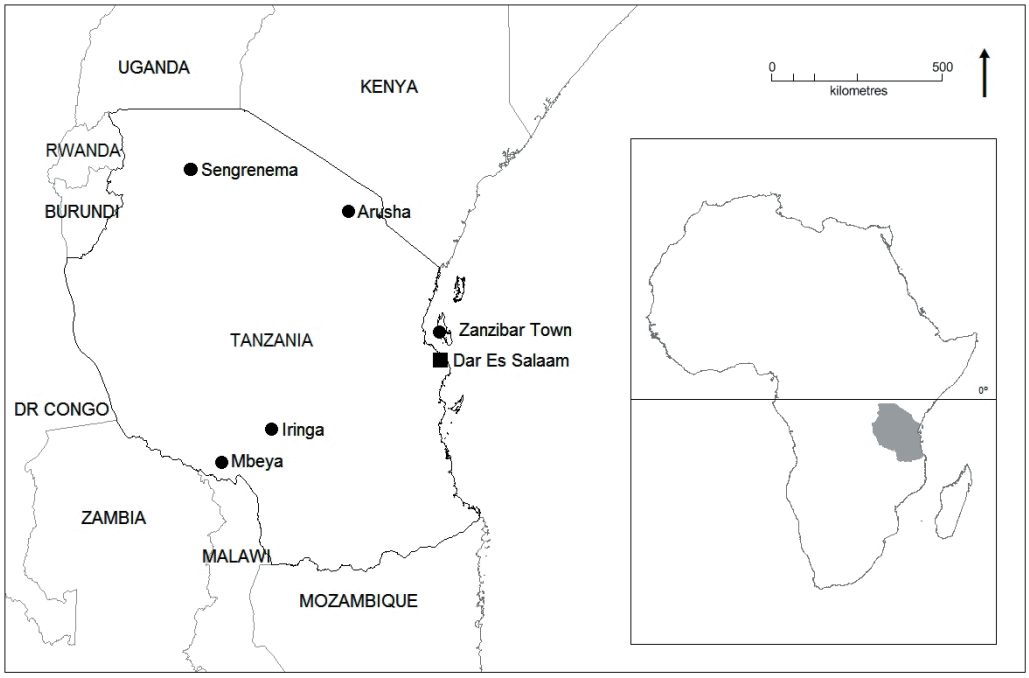
Examples of IK were traced from these documents. Furthermore, additional IK-related material was acquired from earlier studies (World Health Organization, 2006: 345; Wyndberg *et al.*, 2009; Percy *et al.*, 2010; Saarinen, 2011; Shapi *et al.*, 2011; Embashu *et al.*, 2013; Chinsembu *et al.*, 2015; Novelli, 2015) and through the participation in the *2nd Symposium, Indigenous Knowledge Systems (IKS): From Concepts to Applications* on October 8–9, 2012, in Windhoek, Namibia, resulting in the publication *Indigenous Knowledge of Namibia* (Chinsembu *et al.*, 2015).

The analysis of these published documents was complemented with 19 semi-structured, key-stakeholder interviews. These were conducted face-to-face with interviewees in Namibia during March 2009 (10 interviews) and October 2012 (nine interviews). Two stakeholders that I interviewed were executives from the Ministry of Education who led the policy development for IS. I also interviewed rectors and deans from the country's two most significant higher education institutes—the University of Namibia and the Namibia University of Science and Technology (formerly the Polytechnic of Namibia)—because of their roles as the strategic forerunners and operational initiators of the IS in Namibia who led the universities'

innovation strategy development. I also interviewed professors and coordinators who run operational activities related to the IS. In addition, I interviewed key persons, managers and special experts related to the IS development, namely experts from the Namibian Business Innovation Centre and the Southern African Innovation Support Programme, the private consultant who drafted the national innovation policy, the special advisor from the Ministry of Trade and Industry, and the counsellor in charge of knowledge society affairs in the Embassy of Finland in Namibia. The interviews took 45–100 minutes and were recorded (except for two informal meetings) and later transcribed and analysed.

3.3.4 Case D: Living Labs in Tanzania

In this case study, Jauhiainen, Lähde and I scrutinize LLs in Tanzania, with a focus on their knowledge-creation processes as a part of the local innovation system and their contribution to socio-economic resilience of local communities—an emerging topic on which very little research has been conducted yet. The case study answers research questions 3. In Tanzania, LLs create new entrepreneurial skills and opportunities for people with limited formal education. The participants in LLs discuss and define local challenges in groups and find solutions through co-creation. Tanzania had eight LLs in the mid-2010s (Fig. 4). The most well-known are the Buni Hub and the KINU Hub located in Dar-es-Salaam, the country's largest city with almost 5 million inhabitants. Buni Hub was founded in 2012 as an open innovation platform. It provides space for projects, businesses, and innovations as well as enhancing interaction between innovation actors. It has around 4,000 registered users and 400 weekly users, mostly university students or graduates, and it is situated in the premises of COSTECH. KINU Hub was founded in 2012 by six young Tanzanian entrepreneurs and is registered as a non-profit company. It is a co-creational space for Tanzanian technology developers, having around 200 weekly users. It works as a social enterprise to support technology start-ups and incubate new businesses and innovations. Both LLs have similarities with many LLs in Europe.



Living Lab	Location	Organisational Model	Weekly Users	Founded
Buni Innovation Hub	Dar-es-Salaam	Technology Hub	400	2012
KINU hub	Dar-es-Salaam	Technology Hub	200	2012
Kigamboni Community Centre (KCC)	Dar-es-Salaam (Kigamboni)	Community Centre	270	2007
Tanzanian Youth Icon (TAYI)	Zanzibar Town	Community Centre	200	2011
Elimu Living Lab	Sengrenema	Born as a LL	180	2012
Mbeya Living Lab	Mbeya	Born as a LL	15	2012
Rlab Iringa	Iringa	Born as a LL	70	2012
Arusha Ecolab	Arusha	University outreach	N/A	2012

Figure 4. *LLs in Tanzania in early 2015.*

The remaining six LLs in Tanzania are members of the LL network *Pamoja*, 'together' in Swahili, located outside of Dar-es-Salaam (Fig. 4). They combine community development, ICT, and innovations in local communities in distinction to the conventional, technologically more-advanced LLs. This approach is becoming increasingly popular in Southern Africa (IST-Africa, 2015). Internationally, a significant drive for these six LLs came from the innovation-oriented development aid program TANZICT of the Government of Finland. TANZICT is a bilateral *Information Society and ICT Sector Development Project* between national authorities of Tanzania and Finland, and a flagship project of Finnish innovation-oriented development aid. Tanzania is one of the largest recipients of Finnish development aid.

The empirical material consists of documents and strategies related to IS and LLs in Tanzania, themed interviews with the key LL stakeholders in Tanzania, and

field observation employing participatory ethnographic methods in Tanzanian LLs in October–November 2014. Semi-structured interviews were held with the coordinator of the Tanzanian LL network, the chief technical advisor (CTA) of TANZICT, and the director of the Ministry of Communications, Science and Technology of Tanzania (MCST). MCST is the ministry in the government of Tanzania responsible for LL development. The interviews were analysed with content analysis.

The field studies were planned together with the CTA and the LL coordinator. The data gathered in the LLs encompassed an approximately one-week visit to each LL, including participatory observation of their daily activities. The observations lasted from four-to-12 hours per day depending on the activities of each day. During the observations, systematic field notes were made. In addition, semi-structured interviews were conducted with the LL coordinators, staff members, volunteers, and participants. Most interviews were recorded and later transcribed verbatim and analysed with content analysis, however, during more informal interviews only systematic notes were taken. The empirical research was conducted in cooperation with the local research assistant who had been working with the LLs for several years. The main language of the interviews was English, except when interviewing those who felt more comfortable in Swahili.

4. EMPIRICAL RESULTS

In this section, I draw conclusions from the four research papers studying different perspectives of resilience in Namibia and Tanzania. Each section answers to a specific research question. First, I will demonstrate how the spatial changes are loose assemblages evolving from the relations of human actions, material entities, and laws and policies operating in the manifold scales, sectors and spaces. Secondly, I will analyse communities' and individual's processes of adaptability and transformation towards these changes and how those processes enhance their resilience. Thirdly, I scrutinise IS as a policy tool for transformation from a resource-based society towards a knowledge-based society. Lastly, I discuss IK and the concept of LLs to apply IS in local communities.

4.1 Constitution of local changes

With the two distinct case studies addressing exacerbated flood situations in Northern Namibia (Case A) and socio-economic transformation of the Maasai (Case B), I revealed how the changes in the localities are complex, unique and constituted of various short-term and long-term changes in social and material relations occurring in multiple scales and sectors. The direct and indirect, predicted and unpredicted changes have reshaped the dynamics in the areas. Within this section, I provide empirical evidence to support my answer to the first research question.

In Case A, historically, the seasonal floods in Northern Namibia have been vital for the rural majority whose livelihood depends on agricultural activities, as they have renewed pastures, recharged ground-water supplies, and provided fishing grounds. However, since 2008, the floods have turned into major social disasters. Although the floodwater is a result of heavy seasonal rains, there is no significant increase in the annual precipitation. Thus, the main factors turning the seasonal rains to social disaster have been the various changes—population growth, urbanisation and building of modern infrastructure—in the socio-ecological dynamics, which have interfered with the fragile natural water system and directed the seasonal rainwater to the settlement areas.

The population growth has been rather rapid: 13% between the years 2001 and 2011 (Namibia Statistical Agency, 2011). Although most of the people still live in rural areas, the urban population has more than doubled during the last decade, now being 17% (Ibid.). The rapid urbanisation also became evident from the empirical findings of the household survey, as most of the urban respondents (63%) had lived in their households for less than 10 years, and 78% of them had

migrated there from the rural areas. Migration is especially common among young people starting from the age at which they become independent. The most common reason for urban migration was the hope of attaining a better-living standard. Many had considered it as their only choice when the rural homesteads could not offer livelihood opportunities for the rapidly expanding young generation. Migration from the rural villages is predominantly directed to the urban informal settlement areas, which are uncontrollably expanding to the marginal outskirts and wastelands of the urban centres. These have increased the pressure to constantly inhabit more flood prone zones and even riverbeds. Many of these areas are extremely flood prone and have not been planned for housing. Some of the informal settlements have literally been built at the bottom of the water channel. Population growth has also caused vegetation destruction, leading to accelerated erosion and thereby affecting the water run-off.

Furthermore, the social changes are intertwined with the changes of the material relations in the catchment area. After its independence, Namibia is experiencing a rapid modernisation process that has been accomplished without appropriate planning nor considering the fragile river network. Hundreds of kilometres of road and railway network have been constructed in the area, mainly across the water channels, with insufficient or non-existent culverts and bridges. Generally, the building of new infrastructure, for example large shopping complexes, has been done without adequate environmental impact assessments or consultations with the local experts who possess knowledge concerning the water channels and topography in the area. Moreover, the master plans of the urban areas have been non-existent or insufficient, with the storm water drainage systems being particularly inadequate.

Similarly, in Case B, although the Maasai beach boys in Zanzibar are a rather recent phenomena, the complex processes that have resulted in the socio-economic transformation of the Maasai from pastoralists to tourism labourers has been slowly evolving to include changes in the relations of law, policies, space, and the network of different human actors and non-human elements. During the late 1980s, due to the structural adjustment policies, neoliberal reforms, and the growth of international tourism, the Tanzanian government began to transform these areas to internationally significant conservation and tourism statutes. According to Gardner (2016), this led to the restrictions upon the customary lifestyle of the Maasai, and many of them have been forced to relocate from their origins. This situation has been aggravated by the use of their grazing lands and water posts, thus making it difficult to maintain their traditional lifestyle and hunting habits. The conflict over the land is on-going and the most recent plan, although put on the hold due

to international pressure, was to evict 40,000 Maasai from the border area of the Serengeti National park, as the area was planned to be reserved for the Dubai royal family to use for trophy-game hunting (IWGIA, 2016: 77-78).

Paradoxically, although the growth of global tourism has been the main reason for the decline of traditional livelihood opportunities for the Maasai, tourism has also become one of the most important new economic opportunities for them. As most of the Maasai lack basic education, their main asset in tourism has been their indigenousness; due to their distinctive appearance and dress they have become tourist attractions themselves. The first organised Maasai groups started to travel to Zanzibar at the turn of the millennium. The origin of this seasonal migration was partly coincidence. The first groups became associated with the resort constructions in Kiwengwa because in 1998 a British resort owner employed his Maasai acquaintance, whom he bumped into in a night club in Dar es Salaam, to be a night guard on his resort construction site. When the hotel was opened, more security guards were needed. So they started to systematically recruit Maasai from the home village of the first Maasai guard. Other resort managers in the area also became interested in rapidly recruiting them as security guards.

Today, most of the Maasai in Zanzibar still work as security guards. According to the resort managers, they are desired for security jobs because of their good reputation, low salary requirements, and tight social control as they are well-organised among themselves. Due to their 'warrior' culture and the light traditional armaments they bear, they are considered to be particularly suitable as security guards. As the Maasai have only weak social linkages with the local society, it is unlikely that they would become involved in any organised crimes against their employer.

Later, when more Maasai descended on Zanzibar and they acquired experiences and knowledge from the tourism sector, some of them also started to vend their crafts at the beachfronts and in the town of Zanzibar. Their merchandise included wooden crafts, paintings, traditional Maasai jewellery and more general tourist junk. According to my interviews, the main reason for the migration of the craft vendors is the distinctive nature of the tourism between northern Tanzania and Zanzibar. In the north, tourism has only involved a small number of Maasai. Mostly they have been employed or self-employed at the bottom of the employment scale: as security guards, craft vendors, and exhibitors in traditional *bomas* (settlement) built for tourists, or at traditional dance exhibitions at tourist lodges. At the upper end, a very small number of them are working as tour guides or they have their own tour operation. Moreover, as walking and hunting has been forbidden in the natural parks, tour operators have been renting communal lands from the Maasai communities for tourist activities (Gardner, 2016). In the north, the tourism mostly

focuses on safaris and far distant natural attractions where tourists are transported according to fixed timetables. This makes tourists unapproachable for the Maasai. However, in Zanzibar, tourism offers better opportunities, as tourists can move about more freely and are easier to contact and do business with as they spend time at the beaches and Zanzibar town.

4.2 Adaptability and transformation in the local communities

In this section, I focus on various adaptability and transformation processes identified in the empirical studies of Case A and B. Thus, I answer my second research question. In Case A, the local communities applied various coping strategies to increase their resilience towards floods. These coping measures included both long-term proactive anticipatory measures to prevent floods and prepare households for floods, and more direct response measures, i.e., short-term actions, to cope with immediate threats or react to existing floods (López-Marrero, 2010). Furthermore, the different coping strategies can be classified into structural and more functional, non-structural measures. Generally, the households used different measures simultaneously.

Most of the coping measures have been reactive and functional. A few proactive measures have alleviated the negative impacts of the floods, but their effects on the long-term resilience of the communities have been only palliative. The temporal relocation into government tents was the most effective coping measure as it increased resilience towards immediate flooding; however, it had other important negative trade-offs for the overall well-being of the communities. Notwithstanding the coping measures, local communities, already living with multiple stress factors related to poverty, have only had limited opportunities to cope with these suddenly deteriorating circumstances. Furthermore, the high frequency of the floods decreased the resilience of the households, as they have become so regular that the households have hardly recovered from the previous one before they have to face the next event. Moreover, several changes co-exist and reduce communities' resources to be resilient in the face of flood-related challenges, as those have been severely exacerbated by extensive droughts in between the flood events.

In Case B, the transformation of the Maasai has, for them, often meant travelling beyond their traditional territorial boundaries. Their participation in the Zanzibar tourism business has required considerable self-organisation from uneducated Maasai; they have organised security guard groups, negotiated market places, organised learning activities and maintained their weekly meetings. They have also been quick learners, acquiring different skills related to foreign languages and

cultures and partaking in forms of social interaction that have been completely new to these uneducated pastorals. One of the key attributes of their resilience has been that they have managed to promote their traditional strong leadership, tight social organisation, and networks among themselves in these new kinds of socio-economic circumstances. Despite the modest economic advantages of tourism, resilience has not alleviated the poverty or increased the long-term wellbeing of Maasai communities. The local conditions in Zanzibar are harsh, including constant conflicts between the Maasai, the local people, beach boys, and the police. The business of tourism is a very uncertain income generator and is sensitive to global and local changes.

Both case studies emphasised the ability to deal with uncertainties and short-term changes as they emerge. This was based on reactive and post hoc learning and contingency rather than acquiring skills that could be important for the long-term capacity to address different transformations, to achieve collective goals, or to create new pathways. In Case A, the most important learning processes related to the experiences gained in how to prepare and live with the floods when they emerge. This knowledge included: what to do when a flood warning has been proclaimed, how best to protect personal assets by raising the floor levels of dwellings, securing personal belongings during an evacuation, how to judge when the time is right to evacuate, and what to expect of and how to manage relocation camps.

For the Maasai, the uncertainties and rapid changes in tourism have meant that the learning processes are more challenging and reactive, as the knowledge acquired from the learning in practice is commonly socially contextualised and materially situated (Muller & Ibert, 2015). For example, between my two fieldwork periods, 2013 and 2014, the grand holiday resort where many of Maasai clients reside was sold by the Italian owners, who organised tours for Italian tourists, to Israeli owners, who organised tours for Israeli tourists. For the Maasai, this meant that the most important part of their clientele now came from a different socio-cultural background, and very quickly, the most important skills related to language, social intercourse and customs related to Italian culture lost their relevancy. Furthermore, as none of the Maasai planned to stay in Zanzibar for long, they lacked certainty about how they could use their skills in the future after returning home. This is because, in the north, the dynamics of tourism are completely different.

4.3 An innovation system development in Namibia and Tanzania

In this section, I analyse how ISs, consisting of a loose interrelationship of different local agencies, international donors, laws, policies, and development aid, aim to

become the main transformative policy bodies. Their aim is to transform societies in Namibia and Tanzania into knowledge societies. In this section, I answer the first part of research question three: How are ISs developed? The second part of the research question: What is the impact of an IS on the resilience of the local communities? This is mainly answered in 4.4.

During the last decade, IS has emerged as a common policy tool in Southern African countries to tackle social challenges and foster economic growth for the future (African Union, 2014). In this context, both Namibia and Tanzania have expressed their aims to become knowledge-based societies in their main strategy papers: for Namibia, in *the Namibia Vision 2030* (published in 2004) and *the National Development Plan Four* (published in 2012); and for Tanzania, in *the Tanzanian Development Vision* 2025 (published in 1999) and *the National Strategy for Growth and Reduction of Poverty* (MKUKUTA II published in 2010) (Case C and D). According to these strategies papers, to achieve these goals, both countries need to foster co-operation between the government, the private sector, universities and the civil sector and to establish an IS.

In Case C, I, together with Jauhiainen, analysed how, in the African context, Namibia was an early consistent mover towards institutionalization of the knowledge-based economy and IS. Since the late 1990s, Namibia gradually established important frameworks and institutions for IS (Article **III:** Table 2). Accordingly, in 2016, Namibia has an IS, and many stakeholders for it have been identified. However, it is still far from functioning as a proper IS. Over the years, Namibia has lost its early momentum in terms of innovation-related policies and practices. It has taken a long time to approve and implement the drafted policies and laws. These failures to establish a comprehensive innovation policy in Namibia have complicated the steering of the IS, which has led to a mismatch between the different knowledge bases that the IS builds on. Furthermore, most government policies do not acknowledge the complex, non-linear and evolutionary process of innovations.

A functioning IS requires good interaction between the public and private sector and civil society. This includes economic, social, political, institutional and organizational factors. However, this is still missing in Namibia. Knowledge creation is intended to be the process run by government institutions. However, the unclear co-ordination within the government and the scattered policy implementation between ministries create inconsistencies and overlaps in the innovation policy framework. The few multinational corporations in Namibia, mostly in mining and marine technology, have not invested in local R&D capacity building or interaction with local agencies but have operated as enclaves without connection to the IS. The IS in Namibia needs to open up to international inward knowledge flows and

linkages to innovation capacities from other countries (see Watkins *et al*., 2015). This would support local capacity building and allure international experts to fulfil defects related to the lack of critical mass in Namibia. Trust and shared values are needed, but, again, institutional thinness characterizes Namibia in terms of innovation-related development.

Similarly, in Case D, I reveal how, in Tanzania, many relevant elements for the IS have been gradually established since the mid-1990s. Nonetheless, the Tanzanian IS is also still an emerging system. The roles, responsibilities and mandates of government bodies are not clearly defined, and implementation activities are scattered. Innovation policy formulation and its implementation among various ministries are poorly coordinated. In addition, the shortage of experts familiar with innovation and technology activities hinders IS development. Furthermore, the available public funds are insufficient, and the private sector contribution to R&D activities is almost non-existent.

Due to the challenges in local contexts, the international development assistance and co-operation between national and international agencies have played a key role in the IS development in Southern Africa in the 21st century. Since the United Nations classified Namibia as a transition country in 2012 (United Nations, 2012), most donor countries such as Finland and Germany have withdrawn their traditional bilateral grant assistance to the country. The former direct development aid has changed to foster institutional collaboration, strengthen trade relations, and support economic development and the capacity to establish an IS in Namibia (Deutsche Gesellschaft…, 2016; Ministry for Foreign…, 2016). Also, in Tanzania, which is one of Finland's oldest development partners, the aid is increasingly directed to support the establishment of IS. TANZICT (2012-2015) and its successor TANZIS play an important role in fostering innovation-based development in the country. Finland also supports the broader macro-regional cooperation of the Southern African Innovation Support Programme as a way to connect sparsely distributed and small nuclei of innovation actors in Southern Africa, including Namibia and Tanzania. IS became a tool to structure the innovation potential and practice of a developing country.

According to the analysed innovation-related policies, strategies and stakeholders, Namibia has experienced difficulties in strategically directing its IS development to support smart specialisation and comparative advantages. The doing-using-interacting mode of learning and IK creates comparative advantages and provides the best ability for positive societal change in Namibia's local communities. However, in operational IS practices, the focus has been on an STI mode of learning. This requires high analytical knowledge, advanced technological human capital and

a well-functioning IS, which rarely exist in Namibia. Namibia, like many Southern African countries, suffers from organisational thinness in terms of innovation-related activities. The main strategies, the donor countries' development policies and interviewed actors shared a consensus that the IS should tackle the immediate severe development issues in Namibia. Less clear was how the IS could tackle poverty and inequality in practice.

4.4 Innovation systems in local communities

The two most applied but distinct approaches to achieving this target in Namibia and Tanzania are indigenous knowledge and the LL concept. Notwithstanding the popularity of IK and LLs as policy tools, previous academic research on the integration of IK and LLs into innovation policies and systems in Africa is limited. In this section, I will provide my main empirical findings concerning the utilisation of IK in IS development in Namibia (Case A and C) and its role in the socio-economic resilience of local communities (Case D). Thereafter, I will illuminate the role of LLs' approach to connecting IK to external knowledge pools in Tanzania and embedding the IS development in local communities.

4.4.1 Indigenous knowledge in Namibia

Case A pinpoints how IK has traditionally played a significant role in local communities' resilience in Namibia. Only a few decades ago, the communities' resilience towards different weather extremes was based solely on IK. Locals had limited access to any formal weather forecasting, and thus IK was used to predict the weather, which was the key element in communities' coping methods. Local communities accumulated IK over generations and their livelihood was reliant on their capacity to observe and interpret nature by following different events in their local living environment. This IK, for example, contained knowledge of how and when local weather extremes occurred, how to mitigate those extremes, and how to cope with the impacts.

Case C illuminates how IK is still an important part of contemporary policymaking and the IS-building process. It has been acknowledged in innovation-related government strategies, in new institutions and in universities' research programs. The role of IK in the Namibian IS is stated most clearly in the NPRSTI, the most important document for innovation policy. The document mentions 'indigenous knowledge' no less than 26 times. The strategic development of IK is highlighted as one of the 'cross-cutting thematic area(s)' of the program (National Commission…, 2014: 27). Furthermore, it was intended that the National Commission on Research,

Science and Technology (NCRST) would establish national councils to coordinate economic sectors of particular national importance. One of the first councils the NCRST established was the National Council for Indigenous Knowledge Systems (NCIKS), launched in July 2014. The early establishment of the National Council for Indigenous Knowledge Systems indicates the high priority of IK for the government. Moreover, the two universities in Namibia—the University of Namibia and the Namibia University of Science and Technology—are carrying out ongoing research to create innovations based on pharmaceutical, social, and agricultural IK. Some projects directly relate to R&D, such as the attempt to utilise indigenous plants to develop compounds for anti-malaria drug, medicinal plants against HIV/AIDS-related conditions, various food and agricultural products and other projects that aim to document and register the various types of IK existing in Namibia in a database.

In practice, in Case A, I identify various types of IK related to prediction, prevention, and preparation concerning contemporary floods (Article **I**: Table 1). The majority of the IK concerned methods of predicting weather events by observing the processes in the immediate natural environment. Most commonly, such methods concern predictions from the local flora (trees and plants). Other IK is affiliated with different prevention methods, coping measures and spiritual and mental preparations. Nonetheless, many examples of this type of IK have recently disappeared or lost their significance due to rapid societal changes. The main reason IK is not conceived as being applicable to the recurrent floods is the uncontrollability of the floods. Another common explanation is that recent changes in the socio-ecological dynamics related to rapid urbanisation, population growth, and the building of a new infrastructure have made IK inappropriate. Some IK, once used in rural areas, is conceived as ineffective in the urban environment. Population growth and new infrastructures have caused changes in the local environment, and thus, for example, familiar trees, anthills or relocation places, on which IK had been based, may no longer exist or may not be distinctive in the urban environment. Moreover, different traditional practices that concerned coping with floods have been forgotten during the last decades when major flood events did not occur. Likewise, due to globalisation, these societies have been in transition and are becoming more connected to and dependent on processes and knowledge outside their local environment.

In Case C, the interviewed participants, especially government officials, considered IK to be an important knowledge source for IS due to its localised uniqueness, which creates a comparative advantage. IK was the central element for the successful contextualisation of the universal IS in Namibia. The development of

IK-based innovations was seen as a linear and straightforward process. Similarly, NPRSTI describes the '(v)alidation of IK with potential for commercialization' (National Commission…, 2014: 59). However, it was challenging for the interviewed participants to name any successful innovation based on IK. The researcher directly involved with several IK-related research projects argued that the portrayed image of IK's utilisation has been oversimplified. Many politicians and government officials had too-large expectations about the potential of IK. Many only expressed concerns about the legal and institutional framework without acknowledging the complexity, slowness, and high expenses of developing IK-based innovations. Moreover, they have not engaged the interaction needed to develop innovation. Private companies are also not interested in investing in R&D related to IK as the risks and uncertainties are too high, and appropriate platforms for involving local communities in this process are lacking. Namibia has inadequate competence in many crucial issues such as analytical knowledge, institutions and the R&D activities needed in the commercialization of many indigenous innovations. More prominent have been IK-related innovations based on symbolic and synthetic knowledge, for example, in tourism. However, there are also ethical considerations and ambiguity in terms of benefit sharing.

Despite these challenges, IK is frequently mentioned in different strategies, policies and political rhetoric (Case C). Beyond its economic value, IK is important as a traditional heritage and cultural artefact in Namibia's identity creation processes in the African context. During the apartheid governance, the Witchcraft Suppression Act of 1970 forbade many practices related to IK—for example, the use of traditional medicines (Republic of South Africa, 2007, quoted in Meincke, 2016). After independence, IK has become an inherent part of the national building process. It echoes the nostalgic Namibian past, which existed before it was suppressed and neglected due to colonial history. Many interviewed participants also emphasised the long traditions and suppressed nature of IK. In their definitions, IK is clearly juxtaposed with Western colonial knowledge and heritage.

4.4.2 Living Labs in Tanzania

LLs are becoming important and common development tools in developing countries, rooting the universal concept of IS in local communities' knowledge-creation processes. LLs connect innovation stakeholders on different spatial scales and bring local IK and non-local knowledge pools together in innovation processes. LLs can ensure that their local participants become actively constructed subjects in the future instead of passive recipients of aid and development initiatives from outside.

In Case D, I, together with Jauhiainen and Lähde, demonstrate that LLs in Tanzania are open to anyone interested in participating in them but that their main target groups are the unemployed and young people who have dropped out of school. LLs offer basic education and training in ICT, the Internet, and social media. Furthermore, LLs organize different activities for other community members, such as ICT and social media training for municipality officials, meetings for farmers, homeless shelters, and rehabilitation programs for young people with a criminal background. In addition, they identify challenges in their nearby communities and create new entrepreneurial and business activities based on social innovation processes. Locally, this has generated new job opportunities for many vulnerable young people and has made LLs less dependent on external funding, because LLs' own some businesses and create their own income.

The government of Tanzania has recognized LLs as creating resilient communities, although their role in the national IS has not yet been clearly indicated. Compared to LLs in Europe, where the common aim of the LLs has been co-creation between companies and end-users (see, for example, Bergvall-Kåreborn & Ståhlbröst, 2009), the main objective of LLs in Tanzania has been to increase local communities' own capacity to solve challenges within the communities. In Tanzania, LL is defined as an open community platform in which local community actors interact, solve, and change the challenges of the communities, giving them a new innovation potential. Instead of private companies, the focus of LLs is on local community capacity building. They lack a critical mass of technological expertise, so LLs rarely become competitive regarding products, services, and processes that the advanced Western LLs provide. In developing countries, it is difficult to create a competitive advantage through LLs based on the STI approach.

The success of LLs depends strongly on the charisma, motivation, and individual skills of their coordinators, so the possibility of advancing the LL trajectory is important. The LL network in Tanzania supports the organizational performance of the LLs by sharing experiences and best practices and creating a positive image of the community-embedded innovation network. Some LLs may become simple and inexpensive test beds for new technologically mediated services developed elsewhere. These provide job opportunities for a few people but rarely allow innovation processes to become rooted in the local context.

Up until now, the knowledge creation process in Tanzanian LLs has been less systematic compared to LLs in South Africa. In Tanzania, the command of Swahili is an advantage because it is the most widely spoken language in southeast Africa. This makes LLs attractive as R&D locations for new mobile- and ICT-based technology development. In addition, understanding the needs of the poor majority

in developing countries helps to develop and market new pro-poor products and services to improve everyday living standard. There is an immense need for simple local innovations, so many LLs in developing countries rely on and repeat year after year their simple knowledge creation practices. This facilitates the expansion of LLs to new localities. However, the committed and skilled LL leaders may lose their motivation in such repetitive actions that are novel only for new participants. In addition, if only local volunteers are teaching each other, knowledge will not advance at a sufficient rate. Therefore, LLs need to interact with universities and the skilled stakeholders of innovation systems.

5. CONCLUSIONS AND DISCUSSIONS

In this dissertation, I examined local communities' adaptability and transformation processes to increase their resilience toward complex changes in Namibia and Tanzania. The conceptual clarity of the approaches to resilience and to an IS and their contextualisation in the localities of Southern Africa is relevant, because IS has become one of the most fashionable policy tools for development and resilience the central discourse behind this development. Theoretically, I approached resilience from the evolutionary perspective and combined it with a spatial understanding of post-human theory. IS development in Southern Africa was considered as a transformative model that could lead to a knowledge society. I emphasised the need to apply IS development in the context of local communities. Empirically, I first scrutinized what local changes are occurring in local communities in my research area, and thereafter, I investigated the main adaptability and transformation processes of these communities. Subsequently, I presented my empirical results about the aims and processes of establishing an IS in both Namibia and Tanzania, focusing especially on community-level development. In this concluding section, I answer my research questions and explain the contribution of my thesis to the existing literature.

In my first research question, I ask: *What are the main spatial changes and their impact on the study areas in Namibia and Tanzania?* During the last two decades, new kinds of spatial changes, combining global and local elements, such as global tourism, the modernisation of infrastructure and IS development, have formed new scalar and spatial arrangements in the localities of Southern Africa. I demonstrate that these spatial changes, occurring in the localities of Namibia and Tanzania, are unique loose assemblages—a result of the complex, multi-sided, relational and evolutional development of human and non-human elements, without necessarily having linear causalities (article **I** and **II**).

The flood events in Northern Namibia are caused by relational spatial arrangements of, for example, weather, housing policies, macro-regional water management agreements, new infrastructure, constructing and demolishing of informal settlements and poverty. Similarly, the growing global tourism in Tanzania and the role of the Maasai in it are formed, for example, from global tourism flows, laws and policies that regulate national parks, international media, declarations of indigenous people, tourism laws, the construction of new resorts and so forth. These assemblages are relationally constituted from smaller parts and are always connected to larger entities. The assemblage of the flood event can be reduced to the livelihood changes in a single village or a household, while the assemblage of tourism

is related to changes in hotel ownership or can be reduced to the well-being of cattle in a Maasai family. Accordingly, these issues are also related to macro-level changes, such as global climate change or fluctuations in global tourism flows. Assemblages are deliberately open as a form of unity. They are complex, messy and unfinished ongoing processes that are constantly folding and unfolding. Furthermore, several changes co-exist and are interconnected while being uncertain and unstructured at the same time. Communities coping with floods are also affected by possible droughts before the floods. Correspondingly, Maasai livelihood in tourism is dependent on Italy's economic prospects (article **I** and **II**).

In my second research question, I ask: *What are the adaptation, transformation and resilience processes of the studied local communities in Namibia and Tanzania?* The answer to the second study question also brings me to the three main theoretical contributions of my dissertation, which is related to the communities' resilience approach. Firstly, it adds new knowledge to the discussion of what adaptation and transformation processes are occurring in the localities of developing countries. Secondly, I have found that post-human theory and assemblage thinking adds new and legitimate perspectives that provide answers to the question; what are the changes communities are expected to be resilient with? Thirdly, I argue that the resilience approach easily overemphasises communities' capacity for self-organisation and adaptive learning without considering the inequitable political and economic relations in the larger multiform entity.

In my empirical analyses, I identified the various coping strategies and processes of adaptability and transformation that have been used to increase the resilience of communities. In Case A, the coping measures were categorised as proactive or reactive and structural or functional. Correspondingly, in Case B, the Maasai in the Zanzibar tourism industry could be considered a showcase of the resilient subject presented in theory. This is because, after the decline of their traditional livelihood activities, they have self-reliantly begun to transform themselves and adopt a different socio-economic regime.

However, in both cases, the adaptation and transformation measures of the communities have been mostly reactive, based on contingency and post-hoc learning. Frequently, the communities' way of coping with the floods was functional and reactive, such as evacuation or protecting belongings from water. These reductive coping measures can only palliate the consequences of the floods, and it is unlikely that they will eliminate the fundamental reasons behind the disastrous events. Similarly, the transformation of the Maasai from pastoralist into touristic labourers has not been the result of a conscious decision, but rather, it was forced on them by poverty and a reduction in their traditional livelihood opportunities.

Additionally, the uncertainty in global tourism flows, such as changes in resort ownership, can make some learning processes dispensable and can render some of their most important, acquired skills, such as language skills, useless within a very short length of time. Reactive learning might be crucial for coping with short-term changes as they emerge; however, it might be less relevant for the long-term capacity to address different changes, achieve collective goals or create new pathways (Chandler, 2014, Davoudi, 2016).

The assemblage and the focus on human and non-human elements in spatiality offer novel analytical tools for the resilience debate, which has always been interested in interdisciplinary socio-ecologic and socio-economic interrelations. By assembling both the social and material factors affecting the changes within various spatial scales, it is possible to understand the complexity and relational ontology of the changes that will require resilience on the part of local communities, as explained in the answer to the first research question. Indeed, this examination reveals that the communities' capacity to learn and self-organise may have some limited benefits in terms of their resilience to complex changes; however, many of the reasons for the changes are beyond their control. Thus, it will be very difficult to build a resilient future without confronting the larger development issues related to poverty alleviation and a more equal distribution of resources.

The resilience approach, focusing on communities' adaptation and transformative processes, may be a useful tool to analyse and unveil the challenging nature of the complex and relational transformation processes occurring in the localities. However, the adaptive capacity of local communities must not be overemphasised without considering the political and economic relationships constraining these agencies. Instead, to increase the communities' resilience, the complex and long-term social and political conditions and processes behind the actual changes need to be contemplated on various scales. Moreover, the governance of these complex changes requires a holistic consideration of the loose assemblages and an understanding of their heterogeneous and divergent parts. It also requires an understanding of the relations between humans, policies, laws and non-human entities beyond the assemblage. This could be based in locally embedded transformative social processes that require collaboration, interaction and input from a diverse set of stakeholders, combining different sources of knowledge, innovation and learning.

Complex changes in the localities of developing countries have often led to contingent and ambiguous developments causing both positive and negative impacts on local communities. Anticipatory action in relation to uncertainty emerges in a condition in which it is, indeed, the contingency of life that can, simultaneously,

be the occasion of danger and opportunity (Anderson, 2010: 782). For example, in Case B, the impact of increased global tourism in Tanzania has been twofold for the Maasai. Firstly, the land grabbing related to tourism has been the main reason why Maasai communities have been forced to relocate to more unfavourable areas and seek alternative livelihood activities. Secondly, tourism has created new economic opportunities resulting in the socio-economic transformation of the Maasai from pastoralists to tourism labourers. This is an example of the ambivalent development of complex changes in which both the changes and the uncertainty arising from them can be a source of threat and profit. Resilience has been conceived to be a suitable approach to dealing with such uncertainties because it concurrently emphasises the need for adaptability and adjustment in order to live with the changes and to take advantage of them through transformation (Davoudi, 2016).

The second part of my dissertation explores IS development as a transformative model for knowledge societies and for increased socio-economic resilience in Southern Africa. Thus, in my third and last research question, I ask: *How are innovation system(s) developed, and what is their impact on the resilience of the studied local communities in Namibia and Tanzania?* Very few comprehensive analyses of ISs exist in relation to African countries, excluding studies of South Africa, which is a comparatively advanced country. Furthermore, a few existing studies emphasise sectorial ISs, most often in agriculture.

Several countries in Southern Africa and different macro-regional associations, such as the African Union, the Southern African Development Community [SADC], the Organisation for Economic Co-operation and Development [OECD] and the World Bank, have, together with donor countries interested in development co-operation, emphasised the utilisation of an IS as a key driver to tackle social challenges, increase socio-economic resilience, and foster economic growth for the future in Southern Africa. Accordingly, both Namibia and Tanzania are developing an IS as their main policy to foster this transformation (article **III** and **IV**). My empirical results highlight how, in both countries, this has led to the establishment of several strategies, policies, institutions, organisations and laws relevant to IS development. Furthermore, the number of actors who understand the comprehensive nature of IS and work in innovation-related activities has increased. However, the general number of these stakeholders is still limited, and the types of experts required in innovation activities are scarce.

The existing literature of IS in Southern Africa has focussed on describing different defects of and hindrances to IS development in Southern Africa. Many of these are related to the organisational and institutional thinness, as explained in theory. The essential elements of IS, such as relevant institutions, organisations and actors,

are weak, poorly developed, work inadequately or in isolation and might even be non-existent (Moodysson & Zukauskaite, 2014). According to Case C, the failure to establish a comprehensive innovation policy in Namibia complicates the steering of the IS. This has led to a mismatch between the different knowledge bases the IS builds on. Furthermore, most government policies do not acknowledge the complex, non-linear and evolutionary process of innovations. A well-functioning IS requires high social capital and good interaction between the public and private sector, higher education institutes and the involvement of civil society. However, these are still mainly missing in Namibia. Knowledge creation is a process led by government institutions. Unclear co-ordination within the government and scattered policy implementation between ministries can cause inconsistencies and overlaps in the innovation policy framework. Case D indicates that similar challenges, at least to some extent, exist also in Tanzania.

Article **III** demonstrated that very few studies exist about the strategic steering of IS in Southern Africa. More discussion is needed about what kind of innovations the IS is expected to create and for whom it is expected to create them. How the IS is expected to achieve its objectives of socio-economic development also needs to be discussed. Recently, the smart specialisation and comparative advantages of IS have been an important subject of discussion and a common research topic in economically more advanced countries, for example, in Europe. Due to the above-mentioned difficulties, STIs are rare in Southern Africa, and most related institutions and expert knowledge competence need to be transferred from elsewhere (Pietrobelli & Rabelotti, 2011). To foster the socio-economic resilience of local communities by developing an IS, there is a need to adjust the general concept of IS to local contexts and practises and to include bottom-up approaches and local innovations in innovation-related policies. Furthermore, despite the general assumption that IS in developing countries will contribute positively to socio-economic resilience and poverty alleviation, the relationship between IS and community development is much more intriguing and is still co-evolving. Innovation development, requiring high levels of analytical knowledge and skilled individuals may even have the opposite effect in terms of reducing inequality and poverty. An IS can impact positively on local community development only if it is strategically designed to support these targets and is operationally implemented accordingly (Cozzen & Kaplinsky, 2009).

Therefore, innovation policies in Namibia have emphasised the role of IK, and Tanzania has established an LL network (article **III** and **IV**). Most often, these are based on the DUI-mode of learning (Jensen *et al*., 2007; Kraemer-Mbula & Wamae, 2010). However, in operational IS practices, the focus of IS development in Namibia

has been on an STI mode of learning that requires high analytical knowledge, advanced technological human capital, and a well-functioning IS, which rarely exists in Namibia.

According to Case C, IK has been acknowledged in innovation-related government strategies, new institutions and universities' research programmes in Namibia. The early establishment of the National Council for Indigenous Knowledge Systems indicates the high priority of IK for the government. In the interviews, IK was considered among the most important sources of innovations. However, so far, hardly any successful examples of IK-related innovation of national or international significance exist. Namibia has inadequate competence in many crucial issues such as analytical knowledge, institutions and R&D activities, which are needed in the commercialisation of many indigenous innovations. For example, testing, developing and patenting traditional medicines through the STI-mode are expensive and slow without any guarantee of commercial success. More prominent have been IK-related innovations based on symbolic and synthetic knowledge, for example, in tourism. However, there are also ethical considerations and ambiguities around benefit sharing. Beyond its economic value, IK is important as a traditional heritage and a cultural artefact in the identity-creation processes of Namibia in the African context. Another research gap exists in the identification of successful or potential IK-based innovation development initiatives and in the detailed scrutinizing of development processes. This could provide more accurate knowledge about the opportunities and challenges in terms of using IK in innovation development.

Potentially, IK could lead into smart specialization in which IK's unique assets would support diversifying place-based policies. Although developing new product innovations from IK is challenging, IK can facilitate the focus on participatory development processes. Applying and better understanding IK may allow for the embedding of explicit professional knowledge in local processes and may emphasise the local communities' ways of observing, discussing, and interpreting the changes that are occurring. Therefore, there is a need for new approaches and platforms, such as LLs, to connect IK and local practices to broader ISs.

In developing countries, LLs are mechanisms to combine IK and external knowledge and apply it in a local context. Thus, LLs support knowledge creation and the emergence of innovations through a doing-using-interacting approach. According to Case D, the use of LLs in Tanzania is a new approach that should shift the development from an earlier passive approach, in which governmental initiatives are simply awaited, to a more active entrepreneurial and technology facilitated approach, even among the most vulnerable participants, namely school dropouts and the unemployed. LLs proactively support positive change in terms

of local capability building, employment creation and empowerment. The focus of the Tanzanian LLs has been on the local communities and need-based solutions to respond to acute everyday challenges. However, there is the risk that LLs will become outsourced tools to restore the government's defects and structural barriers related to basic education, social security and poverty alleviation. ISs, IK and LLs have potentially an important role to play in supporting socio-economic resilience in the face of complex changes in developing countries. However, just as with any adaptability and transformation measure related to resilience, the impacts are relational and can only be evaluated in hindsight.

Furthermore, the role of Western donors in Southern African IS development indicates wider changes in international development aid policies. Instead of traditional humanitarian and social welfare-oriented aid, the new development aid focuses on innovations, technology development and mutual business interests between the donor and the receiver. Finland has been one of the forerunners of this innovation-based development co-operation. At its best, the development interaction based on knowledge creation and innovation can create new kinds of networks, peers and co-operation models that would not otherwise exist. Local stakeholders can identify local needs and the IK related to them, while international stakeholders can provide human capital and technological know-how for their implementation. However, this development is part of the larger paradigm shift in the ideology of developmental aid, in which donations are expected increasingly to bring mutual reciprocity and economic opportunities for the donor countries as well. Likewise, resilience considers underdevelopment as a potential development opportunity, while the IS approach in Southern Africa considers IK and poverty as a potential source of innovations and new economic opportunities. This is the kind of development that emphasises entrepreneurial skills and competitive individuals rather than helping the poorest to achieve common goals.

Lastly and most importantly, every time resilience is referred to, the following question needs to be considered: 'resilience for what and for whom and under what conditions?' (Cote & Nightingale, 2012). This question is particularly pertinent because it is, above all, the most marginalised communities, living in poverty, who bear the brunt of changes and who are expected to adapt and transform, even though their role in the creation of these changes has been negligible. Rather than considering the communities and individuals as problems, the resilience approach should focus on the uneven relations in the larger assemblages in which they are embedded. In the end, building a resilient future in Southern Africa will be challenging without confronting the broader development issues related to more equal opportunities and a more equal distribution of resources.

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