A Dispositional Perspective of Resilience and Power

An Application of Power Asymmetries in Farming Communities in Caroni, Trinidad and Tobago

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Abstract

Global change processes such as climate change and its impact on food systems, coastal communities and small island states requires us to rethink how sustainable development can be achieved in these coupled environments. As such, one of the core efforts within sustainable development goals is to build and strengthen resilience the resilience of communities and the vulnerable, thereby leaving no one behind on the pathway to development.

Yet, development researchers have often criticised the suitability of resilience as an analytical concept as it masks issues that underpin the *social*. It is well documented by social scientists that the social structure, power asymmetries and culture shape the behaviour of actors and structure what is possible for them in their livelihoods and how they cope with change. A systems thinking of resilience can downplay the role of the social in driving change.

To this end, researchers have proposed an actor-oriented perspective of resilience to draw out issues of power, drawing on concepts such as agency, capitals, knowledge, rights to conceptually bridge power and resilience. Yet, capitals, rights, knowledge are not power. This provoked the question of 'what is the relation between social-ecological resilience and social power?' Could the kind of entities

that resilience and power are determine how they are related at a meta level and thus inform how it unfolds on the ground level?

In this thesis, I set out to examine the relationship between social-ecological resilience and social power. Through an ontological analysis of resilience and power, it was deemed that both are extrinsic dispositions. This means that apart from the intrinsic properties of a material entity that give rise to these dispositions, extrinisic properties of a material entity also contribute to the possession of these dispositions. Dispositions are manifested through some processes, although they do not have to be manifested to say that they exist. Based on these categorisation and the notion that the social structure shape power and resilience, it further was postulated that resilience and power share a complementary dispositional relationship. This means that when resilience and power are co-located, they will unfold.

Through a field investigation of farming communities in Caroni, Trinidad and Tobago this complementarity was explored in two cases: i) between the farmer and land and ii) between the farmer and irrigation systems. Evidence of the co-location of the dispositions are reflected in both cases thus confirming that power and resilience are complementary. Additionally, the extrinsic feature of power and resilience rests on rights. This means that rights contribute to the

power and resilience dispositions of actors as rights provide access to resources. Therefore in order to discern who is being left behind or the winners of resilience approaches, a consideration of rights is needed in resilience. Lastly, the dispositional view of resilience informs that resilience manifests in actions. Thus, to analyse resilience within social-ecological systems requires not only capturing the enabling environment but also the processes through which resilience unfolds.

Zusammenfassung

Globale Veränderungsprozess, wie zum Beispiel der Klimawandel und sein Einfluss auf die landwirtschaftlichen Systeme, Küstengebiete und kleinen Inselstaaten erfordern, dass wir darüber nachdenken wie nachhaltige Entwicklung in diesen gekoppelten Systemen erreicht werden kann. Einer der zentralen Beiträge in den Zielen zur nachhaltigen Entwicklung ist die Stärkung der Resilienz von Gesellschaften, immer unter der Prämisse, dass niemand auf dem Weg zur Entwicklung vernachlässigt wird.

Wissenschaftler die sich mit der Entwicklung beschäftigen haben jedoch oft die Eignung von Resilienz als analytisches Konzept kritisiert, weil es die zugrundliegenden sozialen Aspekte verdeckt. In den Sozialwissenschaften ist gut dokumentiert, wie die sozialen Strukturen, Machtasymmetrien und kulturellen Hintergründe das Verhalten der betroffenen Akteure formen, und somit vorzeichnen, was ihnen in ihrem Lebensunterhalt möglich ist und wie sie auf Veränderungen reagieren können. Eine systemische Sicht auf Resilienz kann die Rolle des Sozialen als Treiber von Veränderung herunterspielen.

Zu diesem Zweck haben Forscher Akteurs-orientierte Sichtweisen auf Resilienz vorgeschlagen, um die Frage nach dem Einfluss von

Macht zu erklären. Dabei wurde auf Konzepte wie Handlungskompetenz, Kapital, Wissen und Rechte zurückgegriffen um eine konzeptionelle Brücke zwischen Macht und Resilienz zu schlagen. Aber, Kapital, Wissen und Rechte sind nicht selbst Macht. Dies provoziert die Frage 'In welchem Zusammenhang stehen sozio-ökologische Resilienz und soziale Macht?'. Könnte das Wesen der Dinge, die Resilienz und Macht sind, bestimmen auf welche Weise die auf einer Metaebene zueinander im Verhältnis stehen und könnte dies Aufschluss darüber geben, wie sie sich vor Ort praktisch entfalten?

In dieser Dissertation gehe ich der Frage nach dem Verhältnis zwischen sozio-ökologi- scher Resilienz und sozialer Macht nach. Aufgrund einer ontologischen Analyse von Resilienz und Macht komme ich zu dem Schluss, dass beide extrinsische Dispositionen sind. Das bedeutet, dass neben den intrinsischen Eigenschaften einer materiellen Entität, die diese Dispositionen hervorrufen, auch extrinische Eigenschaften der materiellen Entität zur Manifestierung der Disposition beitragen. Dispositionen werden in Prozessen manifestiert, sie existieren jedoch auch ohne manifestiert worden zu sein. Basierend auf dieser kategorischen Einordnung und dem Verständnis, dass die soziale Struktur Macht und Resilienz formt, wir weiterhin die These aufgestellt, dass Resilienz und Macht in einer komplementär-dispositionelle Beziehung zueinander stehen. Das wiederum bedeutet, dass Resilienz und Macht sich entfalten, wenn sie gemeinsam verortet

(koloziert) sind.

In einer Feldstudie in landwirtschaftlichen Gemeinschaften in Caroni, Trinidad und Tobago wurde diese Komplementarität in zwei Konstellationen erforscht: i) zwischen Landwirt und Land und ii) zwischen Landwirt und Bewässerungssystem. Beweise für die gemeinsame Verortung der Dispositionen wurde in beiden Konstellationen festgestellt, womit die Komplementarität von Resilienz und Macht in der Feldstudie erwiesen wurde. Weiterhin stellte sich heraus, dass die extrinsischen Merkmale von Macht und Resilienz auf Rechten basieren. Das bedeutet, dass die Rechte zu den Macht und Resilienz Dispositionen der Akteure beitragen, da durch Rechte der Zugang zu Ressourcen ermöglicht wird. Um Macht als Konzept in Resilienzansätzen zu extrahieren wird also ein Fokus auf Rechten gebraucht.

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List of Abbreviations

Abbreviation	Definition
ACP	African, Caribbean and Pacific Group of States
ADB	Agricultural Development Bank
BFO	Basic Formal Ontology
DAO	Document Act Ontology
EEC	European Economic Community
EPA	Economic Partnership Agreement
EU	European Union
GDP	Gross Domestic Product
GNI	Gross National Income
GORTT	Government of the Republic of Trinidad and Tobago
NAMDEVCO	The National Agricultural Marketing and Development Corporation
SDG	Sustainable Development Goals
SES	Social-Ecological System
TT	Trinidad and Tobago

Part I

Aim and Approach to Study

Chapter 1

Introduction

Global change processes such as climate change and its impact on food systems, coastal communities and small island states requires us to rethink how sustainable development can be achieved in these coupled environments (Denton et al., 2014). Towards this direction 'strengthen resilience', 'build the resilience of the poor and vulnerable', 'facilitate resilient infrastructure development' are integrated in the United Nation's Sustainable Development Goals (SDGs) targets under goals 1, 9, 11, 13 and 14 (UN, 2015). The "governmentalisation of resilience" (Welsh, 2014) has also taken root in the Vision 2030 National Development Strategy of Trinidad and Tobago,

with the national outcome–"increased resilience for climate vulnerable communities"–to be achieved by 2020 (GORTT, nd, p. 110).

A recent example for this can be found in resilience building for farming communities: To alleviate water woes, which farmers in Trinidad and Tobago experience due to changing weather patterns, the government of Trinidad and Tobago has provided irrigations systems. These irrigation systems (e.g. water pumps, sluice gates, and raw water systems) are deployed to farming groups as a community resource. However, although such resources are communal, it was observed that control of the irrigation system is not equally shared in the community, but lay in the hands of a few or just one member with access to the system[1].

In this scenario, issues of power with respect to water distribution surface. Thus, farmers may have communal rights to the infrastructure and water resources, but this does not imply that they all derive the same benefit of water access. As a result, some farmers take matters into their own hands by blocking the irrigation channels to create an artificial water reserve for their farm use. Even though this practice is encouraged from within the group, indiscriminate blocking has effects for subsequent farmers along the channels such

[1]In the communities with the water pump and sluice gate only one person operates the system daily.

as delayed water access and reduced water flow. The culminated effects of infrastructure and water control along the channels change the power dynamics and even reduce the resilience of some farmers in the community, to the degree that in one extreme case a farmer lost his livelihood.

The aforementioned scenario raises the question of how is it that a variation in adaptive capacities to cope with dry conditions occurs in the group when a communal resource is provided by the State for everyone's benefit? Part of the explanation relates to power, which in a resilience context should address "resilience for whom and at what cost to which others?" (Cote and Nightingale, 2012, p. 485). Yet, such qualitative interpretations of inequality driven by power dynamics are missed under a systems theorisation of the concept (Cannon and Mueller-Mahn, 2010; Cote and Nightingale, 2012; Fabinyi et al., 2014).

The United Nation's mandate of "no one left behind" (UN, 2015; UNDP, 2016), will therefore require that in the application of resilience approaches, the winners and losers of resilience building can be identified (Davoudi et al., 2012; Fabinyi et al., 2014). This leads to the following questions: How do the provision of resources as a means to increase resilience affect the members of the community? How does the control of resources lead to inequality and varying

coping capacities? To deal with resilience and power on the ground, the relation between both concepts needs to be understood at the conceptual level.

Such a theoretical undertaking is best served through a formal ontology. Formal ontology is about "the interconnections of things, with objects and properties, parts and wholes, relations and collectives" (Smith, 1998, p. 19). The objective here is to understand this relationship between social-ecological resilience and social power, and the implications for resilience approaches. This thesis therefore adds to the treatise of social power in resilience thinking through an ontological examination of resilience and power to ascertain how both concepts are related.

The remainder of the chapter is dedicated to further motivating the work through the comparison of how power is examined under an adaptive governance approach to resilience building in resource management and from a political ecology lens of resource management in social-ecological systems (Sections 1.1 and 1.2). Additionally, the actor-oriented framing of resilience is discussed as a means of addressing the soft treatise of power in resilience approaches (Section 1.3). Finally, the justification and objectives of the research are outlined in Section 1.4.

After introducing the thesis, the remainder of the document is structured as follows. Chapter 2, describes the theoretical framework used that underpins the analysis of social-ecological resilience and social power concepts. It explains the idea of formal ontology and how it can be used to understand the relationship between terms. Coupled with formal ontology, Searle's social ontology is described, which supports the explanatory power of the linkages made in the field data via the formal ontology.

The methodology executed in the study is outlined in Chapter 3. It is a two-pronged approach the undertakes an ontological analysis of resilience and social power notions found in literature, and on the other hand the methods used in the field investigation. The study area is also introduced in this chapter. This concludes Part I of the thesis.

Part II of the thesis contains Chapters 4 to 6, and is dedicated to the analysis of social-ecological resilience and social power concepts and the ontological categorisation of both terms. This entails a decomposition of the theories of resilience and social power, to understand the general form of both terms. Since both terms refer to the ability to perform some action, they are categorised as dispositions. But resilience and power abilities of actors do not rely solely on the actors' intrinsic properties. Their social environment

also contribute to these abilities. Consequently, social-ecological resilience and social power are deemed to be extrinsic dispositions. Based on this ontological form, both terms are posited to share a complementary relationship i.e. social-ecological resilience and social power are complementary dispositions.

In Part III of the thesis, this relationship is verified through the field data. To this end, Chapter 7 takes a closer look at the study area. Through a post-colonial historical description of Caroni as a sugar producing region and the closure of the sugar industry in the mid 2000s, the transformation of the farm lands as a governable space is discussed.

Chapters 8 to 9 examine how the governance in the space, through the relation between the farmers and their land and the relation between the farmers and communal irrigation systems relates to resilience and power. Through this exploration, the relationship between social-ecological resilience and power is verified and discussed. In Chapter 10, the objectives of the thesis are rehearsed and the insights made are summarised and discussed. The limitations of the study and areas of future work are outlined, which concludes the thesis. A graphical representation of the roadmap through this thesis is given in Figure 1.1.

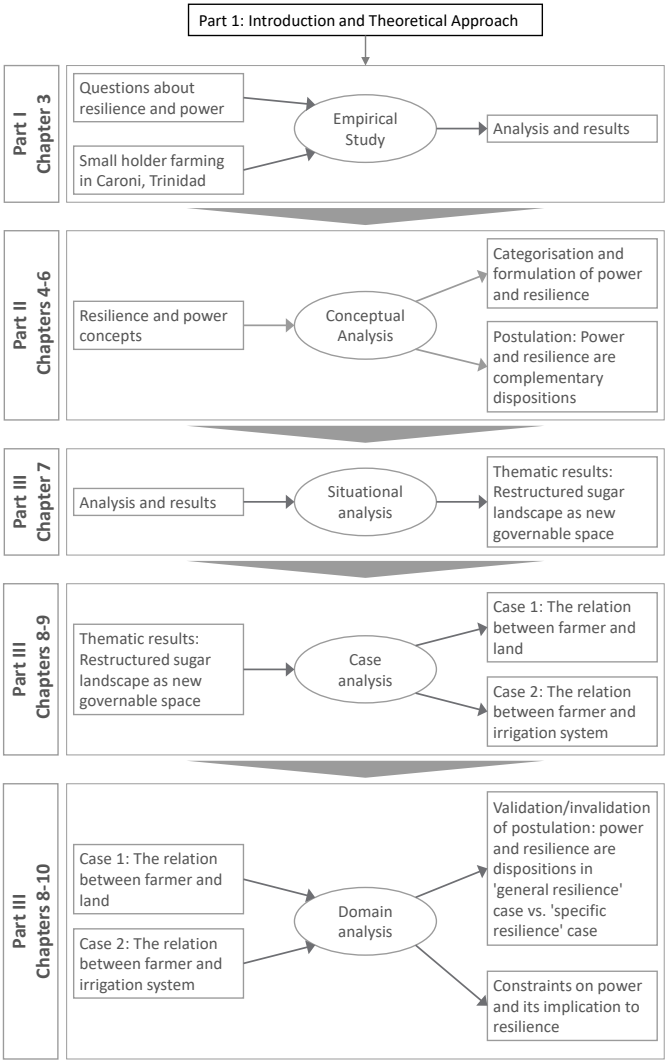

Figure 1.1: Methodological Flow of Study

1.1 The Situation of Resilience in an Adaptive Governance Framework for Resource Management

Resilience is a multifaceted concept used to describe a behaviour of social-ecological systems to disturbances or stresses (Walker and Salt, 2006; Obrist et al., 2010). Often regarded as a positive system attribute (Klein et al., 2003), it refers to "the capacity to adapt or transform in the face of change in social-ecological systems, particularly unexpected change, in ways that continue to support human well-being" ((Chapin III et al., 2010; Biggs et al., 2015) as cited in (Folke et al., 2016, p. 2)[2]). Adaptive governance in a resilience context, refers to "a process of creating adaptability and transformability in [social-ecological systems]" to achieve sustainable outcomes (Walker et al., 2004). The focus is placed on social systems and their flexibility in responding to changes as information becomes available in order to facilitate ecological system functioning for the well-being of people (Tompkins and Adger, 2004; Folke et al., 2005; Chaffin et al., 2014).

The ability of social systems to make changes is dependent on bonding and bridging ties between community stakeholders and state

[2]Ecology and Society articles are not published with page numbers. Quote appears on the given page number of the pdf extract.

actors through which collective action emerges (Folke et al., 2005; Chaffin et al., 2014; Stern and Baird, 2015). This point is illustrated in the case of adaptive management in Tobago's coastal zone of Buccoo Reef (Tompkins and Adger, 2004). To deal with coastal and reef degradation that has the potential to undermine fishing and tourism livelihoods, a participatory management programme was undertaken involving community and state actors (Tompkins and Adger, 2004). Evidence from this analysis illustrated how social processes (e.g. participation, trust building, knowledge sharing and social learning) directed collective action (such as boat operators decision to reduce diesel run-off in the waters) to the benefit of the coastal environment (Tompkins and Adger, 2004).

It was acknowledged that actors within networks have varying degrees of power, but through the creation of social capital, these powers can be channelled via collective action (Tompkins and Adger, 2004). This co-management arrangement reflected that the power to manage coastal resources is not solely vested in the State but also extends to stakeholders (Folke et al., 2005). In this sense, power is productive as it results in collective actions that are deemed good for the system. Social-ecological resilience thus emerges out of "the expansion of the [actor] networks of dependence and engagement" and their flexibility to learn and respond to social and environmental changes as they are made known (Tompkins and Adger, 2004).

Co-management efforts may not always result in the right set of responses for adaptive capacity and resilience (e.g. due to cultural differences) (Tompkins and Adger, 2004; Folke et al., 2005). Nonetheless, a general message of adaptive governance is that the creation of social capital, trust, participation in social learning, contribute to social-ecological resilience (Tompkins and Adger, 2004; Folke et al., 2005; Chaffin et al., 2014; Stern and Baird, 2015). This stems from the epistemology of the "social" in resilience approaches (Kull and Rangan, 2016; Olsson et al., 2017) which "resembles consensus theory [...whereby] shared norms and values are the foundation of a stable harmonious society, in which social change is slow and orderly - and where, in analogue, resilience thus becomes the equivalent of stability and harmony or the good norm" (Olsson et al., 2017, p. 56). Yet, it is these differences (e.g. w.r.t. culture, world views etc.) that are also matters of power, which contribute to social change and direct actions for coping within the social system (Cote and Nightingale, 2012; Olsson et al., 2017). While adaptive governance approaches may gloss over such power issues (Cannon and Mueller-Mahn, 2010), they are the focus of analysis under a political ecology approach, which is illustrated in the subsequent section.

1.2 Political Ecology, Power and Resource Management

Akin to resilience approaches, political ecology is concerned with social-ecological functioning in face of environmental and climatic changes (Kull and Rangan, 2016). What differs in both approaches is the lens of analysis used to understand the dynamic behaviour between both entities (Kull and Rangan, 2016). While resilience approaches describe such functions through an ecological systems perspective (Folke et al., 2010, 2016), political ecology provides an explanation through a multi-focal lens that encompasses socio-political, economic and ecological elements (Zimmerer and Bassett, 2003; Fabinyi et al., 2014; Kull and Rangan, 2016).

Under such optics, power relations between actors and resource management institutions are drawn out, and issues of injustice and inequality are confronted (Fabinyi et al., 2014; Leff, 2015). It also sheds light on how power structures can contribute and transform social-ecological sustainability (Leff, 2015). As such, geographers who uphold such an epistemology criticise resilience for its homogenising and simplification of the social system (Fabinyi et al., 2014) and its inability to answer normative questions of "resilience for whom?" (Cote and Nightingale, 2012).

An example of how political ecology exposes issues of power relations in resource use is illustrated in Pelling's case study of the flooding risk in Guyana[3]. The study shows how political power permeates through urban and peri-urban settlements in and around the capital city of Georgetown (Pelling, 1999). Present day vulnerabilities to flooding emerged out of the country's colonial past as these settlements were once natural cover, converted to coastal plantations in the latter 1700s (Pelling, 1999). The threat of flooding in coastal communities arises from the age of the East Demerara Water Conservancy dam (constructed in the 1880s) and drainage infrastructure, weather variability and sea level rise (Pelling, 1999; Bovolo, 2013).

Following, economic and political reformation in the mid 1980s, community groups emerged to facilitate development projects within the urban and peri-urban settlements, which included environmental and infrastructural rehabilitation projects (Pelling, 1998). In the participatory format, the management of flood risks encompassed local actors, political actors and funding agencies. Despite such an approach, power asymmetries emerged due to the appointment of community leaders by "political elites" in society, thereby creating "local political elites" in these communities (Pelling, 1998, 1999).

[3]A brief overview of the case study was presented here. For a detailed analysis, which explores the coastal settlements vulnerabilities to flood risk in the context of Guyana's colonial history, race relations, economic position and the role of social capital see Pelling (1998, 1999, 2003)

What was supposed to facilitate participation and decision making at the grassroots level ended up in the hands of government affiliates, with their agendas being taken as a reflection of the group (Pelling, 1998, 1999).

In the Plaissance community this led to disproportionate distribution of resources received from the State and funding agencies. Weak bonding and bridging ties involving local actors and leaders at the community level resulted in the exclusion of some actors from the participation process intended to build their adaptive capacities (Pelling, 1998). Consequently, it was the poor and marginalised who benefited the least from these resources to reduce their vulnerabilities to flooding (Pelling, 1998, 1999). This resulted in their disenfranchisement, retreat from community participation, and reliance on individual adaptation measures to flooding (Pelling, 1998, 1999).

Through the analysis of power, the curtain over the community was retracted to identify who were the beneficiaries of the participatory programmes. It also shows that those who feel dominated can use their power to go against the collective by taking on adaptation measures by themselves based on their available resources, thereby further transforming their level of vulnerability (Pelling, 1998, 1999). The study supports that actors have differing levels of power within

a community and how those in authority can shape people's vulnerabilities through resource allocation.

Although political ecology brings attention to the "social," one major criticism from resilience researchers is that there is a tendency to obscure the role of ecological processes in such analyses (Peterson, 2000; Ingalls and Stedman, 2016). This is partly due to its qualitative engagement with social-ecological systems, "which lacks the analytic rigour with regard to its treatment of ecological system dynamics" (Ingalls and Stedman, 2016). According to Folke et al. (2016), a narrow focus on social processes may miss broader issues of vulnerabilities in the social-ecological system as in the case of lobster fisheries in Maine[4]. Notwithstanding these critiques, there is merit in calling on the concept of resilience to have the explanatory capability to clarify, for example, how power structures can shape the options available to farmers to cope with water stress in the dry season and transform their livelihoods. This brings into focus the question: How can power be reconciled into the conceptual space

[4]Folke et al. (2016) highlighted how the lack of attention to the coupled environment in managing lobster fisheries in Maine has obscured the vulnerability of the lobster population to shell disease. According to the authors, the project drew on elements of social practice (e.g. collective action and social capital), and was deemed a success in maintaining lobster stock, however key information pertaining to the decline in lobster predators was not integrated. The lack of predators coupled with increased sea temperatures has led to the emergence of a lobster monoculture, the spread of shell disease, and the overall decline in lobster stock in the waters south of Maine in New England (Folke et al., 2016).

of resilience? In section 1.3, approaches towards bridging the gap between both concepts are outlined.

1.3 State of the Art: Bridging the Concepts of Social Resilience and Power

Despite the mileage of resilience, resilience as an inherently systemic concept is criticised by some geographers for its de-politicised and naturalised treatment of the social system (Cannon and Mueller-Mahn, 2010; Davoudi et al., 2012; Olsson et al., 2017). The explanatory ability of resilience to describe how social processes influence human actions and in turn drive change from within the system is often brought into question (Cannon and Mueller-Mahn, 2010; Armitage et al., 2012; Cote and Nightingale, 2012; Olsson et al., 2017). This stems from the conception of the social system in resilience theory as mainly institutions, which mirror such systems in economics (Cote and Nightingale, 2012; Welsh, 2014; Kull and Rangan, 2016). Although actors are part of these institutions, they are subsumed into "organized social units such as [...]committees, and communities [...]rather than human agency and political and cultural relationships" (Fabinyi et al., 2014, p. 3)[5].

[5]Ecology and Society articles are not published with page numbers. Quote appears on the page number of the pdf.

One way of bridging the epistemological divide between resilience and power entails re-thinking resilience from an agency perspective (Bohle et al., 2009; Miller et al., 2010; Obrist et al., 2010; Coulthard, 2012). This means examining resilience from an actor-oriented standpoint since the objectives of resilience such as transformation and fostering adaptive capacities involve people (Bohle et al., 2009). The purpose of agency is to draw attention to the fact that actors within a social system "mediate their own decisions, and hence actions" that impact their resilience (Coulthard, 2012). However, such decisions are shaped by the social structure to which one belongs (Coulthard, 2012). A similar argument about agency, resilience and social structure is supported in Obrist et al. (2010).

Obrist et al. (2010) suggested that people's ability to cope is dependent on their available capitals, which are obtained via and shaped by the social structure. This idea is credited to Bourdieu's theory of social fields, "which helps to capture the idea that actors have differential packages of capitals and power and that they are differently exposed to the same hazard, and thus face different constraints and opportunities in building resilience" (Obrist et al., 2010, p. 288). What bridges power to resilience is the notion of symbolic capital such as "honour, recognition and prestige" since this form of capital can be negotiated to access assets for coping with threats, as well as direct others' actions for coping (Obrist et al., 2010). In this

regard symbolic capital assigns a status function to actors,[6] which provides the power to transform people's resilience.

Apart from symbolic capital, the notion of rights is also seen as a bridging concept between resilience and power. Walsh-Dilley et al. (2013, 2016) proposed a rights-based approach, which stemmed from the field of food sovereignty, where the negotiation and protection of actors' rights are central to the discourse on food systems. This idea of rights extends the discussion beyond institutional property rights in social-ecological systems to encompass human rights that are apart of livelihood security (Walsh-Dilley et al., 2013, 2016). Similar to capitals (Obrist et al., 2010), the issue of rights further draws attention to the point that people have varying access to resources, and therefore different levels of resilience building can ensue within a community. Re-thinking resilience in this way places power, equity and fairness to the fore as actors have the right to challenge the system and make claims for resources that can be used to build their resilience (Walsh-Dilley et al., 2013, 2016).

A third way of reconciling resilience and power is through the notion of knowledge. This is related to the production of knowledge

[6] A line of reference is drawn to Searle's notions of status functions and deontic powers (Searle, 1995, 2006). When an actor acquires a status e.g. community leader, a set of deontic powers (e.g. rights and authorisation) is attributed to the role of leader and as such establishes his or her authority and power to perform certain actions. Deontic powers are elaborated further upon in Chapter 5.

and how it directs the actions of actors in building resilience (Cote and Nightingale, 2012). It has the bearings of a Foucauldian consideration of power, whereby "power and knowledge directly imply one another" (Foucault, 1995, p. 27). Their re-framing of resilience brings into focus the agency of actors and how their knowledge, which is shaped by their social structure, produces that agency. Thus decision-making with respect to resilience goes hand in hand with the production of knowledge in which cultural identities, norms, gender etc. are contributors (Cote and Nightingale, 2012). Power structures are therefore confronted through the actions of actors in the social-ecological system, which is tied to their knowledge production (Cote and Nightingale, 2012).

The various actor oriented ways of re-thinking resilience provide avenues for examining power within resilience approaches. A consideration of either capitals, knowledge, and rights adds to the discourse of resilience since they can be used for both enabling resilience and creating power structures amongst actors. Yet, capitals, knowledge and rights are not power in itself, although related to power one way or the other, since they can be used to create power structures of authority, domination, and facilitate collective action.

1.4 Objectives of the Study

From the system's point of view, the irrigation system (in the opening example), would be considered as part of the community's effort to build resilience. Yet, within the community, it is seen that some farmers enjoy the full benefit of water access while others derive partial benefits. The unequal access to water contributes to varying coping capacities amongst farmers in the community. What the scenario underscores is that coping with weather variability is not disengaged from power as the control of the irrigation system and access to water are matters of power.

In striving to establish the link between resilience and social power, the following two objectives are set.

1. Categorise social-ecological resilience and social power and deduce the ontological relationship between both concepts.
2. Explain what the connection between farmers and entities in the farming communities of Caroni reveal about social-ecological resilience.

Objective 1 deals with the ontological meat of the thesis. To categorise the terms means determining which ontological category of

reality they subscribe to. Such an understanding can shed light on how they are related to each other. The first step towards categorisation entails analysing the various theories of resilience and social power and drawing out their general form. It is only then one can establish what is it to be resilience and social power and how the both terms can be related. Through the use of ontologies, it is deduced that both entities are complementary dispositions, which unfold together when the bearers of the dispositions are co-located[7].

Having proposed a relationship between social-ecological resilience and social power entities, evidence of this relation is verified through two cases from the field data: i) land tenure and ii) communal irrigation systems and water access. Out of these cases, rights is seen as a factor that shapes both dispositions. In the land tenure case, use rights enabled farmers to access state resources to support their livelihoods. However those who have different use rights (formal v.s. informal) have different access to resources. In the second case, having a communal use right does not equate to building resilience. Although, farmers are enabled through the right, collective intentionality shapes how water is controlled thereby producing unwanted effects that overcome resilience. The next chapter proceeds with a look at ontologies as a theoretical framework.

[7]Throughout this work, co-location refers to the dispositions or the bearers of dispositions being located within the same social space.

Chapter 2

Ontologies as a Theoretical and Analytical Framework

The central aim of the dissertation is to explicate the link between power and resilience. To do this, the principles of formal ontology are drawn upon, which guide the arguments laid out in the subsequent chapters. In the simplest form, ontologies deal with what (*entities*) exist and the relations between these *entities* (Smith, 2004b; Lowe,

2006). Since the notion of resilience has become impregnated due to its multiple uses in various fields (Brand and Jax, 2007; Miller et al., 2010), it forces one to re-think what kind of *entity* is resilience, and what other *entities* are attributed to it.

For development researchers, the shortcoming of resilience approaches lies in its unpacking of power (Cannon and Mueller-Mahn, 2010; Cote and Nightingale, 2012; Ingalls and Stedman, 2016). Social power is pervasive across the social-ecological space. It influences resource allocation and how actors access and use these resources to cope with environmental changes (Obrist et al., 2010).

Cutting across the debate about the need for a stronger presence of power in resilience framework, what is not explicitly espoused in the debate is: What relationship holds between resilience and social power, in the conceptual space of resilience? For example, is resilience a function of power? If so, what is the nature of this function? Such meta-level questions are best examined through an ontological lens. Deducing this relationship first requires an understanding of what kind of *entities* are resilience and power, thereby delving into logic and philosophy.

2.1 What is Ontology?

Ontology in the philosophical sense is concerned with "what is" (Smith, 2004b), "what kind of things could exist," and "what kind of things do exist" in the real world (Lowe, 2006). The objective of ontology is "to provide a definitive and exhaustive classification of entities in all spheres of being" (Smith, 2004b, p. 155). The root of ontology is often linked to metaphysics (Lowe, 2006), with Aristotle's thesis on categories being an early reflection of ontology (Thomasson, 2016). One of Aristotle's subject matters was dedicated to the fundamentality of beings (Cohen, 2016). It is related to the study of "things that can be said to be [...] insofar as they are beings", hence Aristotle's metaphysics was "the study of being qua being" (Cohen, 2016)[1].

The structure of these beings appeared in Aristotle's earlier disquisition on *Categories*, which proposed a set of fundamental beings (entities) that exist in reality (Cohen, 2016). Aristotle's ten categories of beings encompassed: substance, quantity, quality, relation, place, date, posture, state, action, and passion (Jansen, 2007; Thomasson, 2016). Contained in this early ontology were also formal relations to describe entities for example, being in something,

[1] A simplified explanation is provided by Cohen (2016): replacing *being* qua *being* with x and y, then the study of x qua y is the study of x with respect to the y feature of x only.

being predicated of something, having etc. (Jansen, 2007, p. 155). This system of categories form part of "Aristotelian realism" and laid the foundation for other categorisations in ontology (Thomasson, 2016). One such system of categorisation is the Basic Formal Ontology (BFO), the purpose of which is to elucidate the nature of entities for scientific enquiry.

2.2 Within a System of Categories: Universals and Particulars

Simply put, the field of ontology occupies itself with *things* that exist in reality (Arp et al., 2015). These *things* that occupy ontologies are structured along the lines of universals and particulars (Smith, 2004a; Jansen, 2007). This form of structuration has its footprints in Aristotelian realism and can be implied from Aristotle's system of categories (Jansen, 2007; Cohen, 2016). Universals are "that in reality to which the general terms used in making scientific assertions correspond" (Smith, 2004a, p. 78). For example, the universal *community* would reflect the aspects that are shared by all individual communities (particulars) in reality. Universals are the basic categories that provide structure and are therefore dependent on particulars (Arp et al., 2015). Particulars on the other hand are

"instances of such universals which exist in the real world" (Smith, 2004a, p. 78). They can be observed or identified through sensory experiences (Arp et al., 2015), for example the Jerningham farming community.

The idea of universals and particulars yielded various debates on ontology pertaining to their existence and whether systems of categories should contain particulars, universals or both (Lowe, 2006). For example, one strand of nominalism in metaphysics conceives its ontology as a system of particulars (Rodriguez-Pereyra, 2016). One argument against universals held within nominalism is that "all judgements pertaining to what is general involve our having imposed some order on a reality that does not posses such order in and of itself" (Arp et al., 2015, p. 14). However, one caveat of the system of particulars is that when it comes to scientific enquiry it lacks the explanatory power to give reason how general common features or structures are said to exist amongst individual entities (Arp et al., 2015). The purpose here is not to expunge these complexities of the debate but to recognise that various strands of thought exist relating to the structure of reality. The formal ontological approach and the overarching system of categories that is adhered to in this work (BFO) upholds the standard of universals and particulars.

2.3 Formal Ontology in the Philosophical and Applied Senses

The origins of formal ontology can be attributed to Edmund Husserl's body of work on Logical Investigations (Smith, 1998). Not only was that body of work instrumental in creating modern phenomenology, but it also enabled the cross pollination of mathematical logic and the ontological space, which is a feature of applied formal ontology today. Simply stated, formal ontology deals with "characterizing the simple 'something'" (Poli, 1993, p. 2).

Compared to the system of categorisation discussed earlier, what makes an ontology formal? It is not the string of mathematical symbols in which applied formal ontologies (as used in Artificial Intelligence of Computer Science) are represented in today (Hennig, 2008). It is described as formal because it is about the structure of the object in itself and its relation to other entities and properties (Smith, 1998). It relates an object to "the concepts of part, whole, unity, connection, etc." (Husserl as cited in Poli (1993, p. 3)), which according to Poli (1993) are "non-logical formal concepts." Formal logic, on the other hand, relates to "the interconnections of truths (or of propositional meanings in general) – with inference relations, consistency, proof and validity" (Smith, 1998, p. 19) through the

use of logical concepts such as quantifiers, implication, conjunction, negation etc. (Poli, 1993). Out of Husserl's body of work emerged the ontological principles of dependence, mereology (part-whole) and topology (Smith, 1998), which later influenced the creation use of meretopology in ontology development (Varzi, 1994). In his original thesis, formal ontology and formal logic are separate strands of the same science (Poli, 1993). What is common to both strands is that they are "able to grasp the properties of given structures in such a way as to establish *in one go* the properties of all formally similar structures" (Smith, 1989).

As the fields of ontology and mathematics progressed post Husserl, they made it possible to express ontological entities in a computational format, which today can facilitate reasoning and communication between information systems. A distinction therefore exists between contemporary uses of formal ontology (Smith, 2004b; Arp et al., 2015). There is the side of formal ontology that superimposes formal logic with ontology thereby creating formal ontologies. The formal ontology becomes a logical statement whose syntax and relations correspond to ontological categories and relations that represent reality (Smith, 1978; Cocchiarella, 2007). In this regard, the ontology transcends into a formal ontology when logical concepts, language predication and ontological categories are considered (Cocchiarella, 2007). Such constructs provide the analytical rigour to

check for consistencies or inconsistencies within the ontological representation of reality (Cocchiarella, 2007). Formal ontology in this sense is defined as "the systematic, formal, axiomatic development of the logic of all forms and modes of being" (Cocchiarella (1991) as cited in (Guarino and Giaretta, 1995, p. 27)).

The other side of formal ontology as undertaken by Arp et al. (2015), pertains to the categorisation and interconnection of entities in a hierarchical structure using the ontological principles of dependence, mereology and topology to inform scientific enquiry. It is thus "a representational artifact, comprising a taxonomy as proper part, whose representations are intended to designate some combination of universals, defined classes, and certain relations between them" (Arp et al., 2015, p. 1). It serves a theoretical and practical purpose as it can be used on one hand to elucidate entities represented by terms used in a particular domain of science and thus supports the application and development of scientific theories (Arp et al., 2015). On the other hand, once expressed in a computational format it has the practical purpose of facilitating data integration and communication within information systems (Arp et al., 2015).

Smith (2004b) synthesised that the usefulness of formal ontologies will lie in its ability to deal with the "Tower of Babel" problem

that occurs due to the production of large amounts of data from various sources. The "Tower of Babel" problem relates to the notion that "different groups of data- and knowledge-base system designers have their own idiosyncratic terms and concepts by means of which they build frameworks for information representation" (Smith, 2004b, p. 158). But this "Tower of Babel" problem can be extrapolated to resilience approaches, which reveals itself in the discussions about what does it mean to be resilient, and the application of such meaning towards sustainable development efforts that is drawn from the various disciplines concerned with resilience from Ecology to Social Sciences.

With the current critique of power dynamics being obfuscated in the application of the concept, the Tower of Babel problem persists as another concept (social power) is obscured in the already impregnated notion of resilience. Part of addressing the critique involves elucidating the notion of power in the context of resilience. In this treatise of social-ecological resilience and power, I am concerned with the relation of both concepts through the examination of their structural forms. A formal ontological approach which aligns to Arp et al. (2015) is undertaken whereby the interconnection of resilience and power is elucidated. I do not strive for a computational representation of this relationship, even though in future work this can be done. The formal ontological approach is outlined in Section 2.4.

2.4 The Principles of a Formal Ontological Approach

To reiterate, formal ontology here deals with the structure of an entity in itself and its relation to other entities drawing on the ontological principles of Husserl (Smith, 1998). This gives formal ontology the merit to explore 'what kind of *entities* are social-ecological resilience and power?' and to say something adequately about these things and the relation between both things. Such a programme that is followed in this work, upholds a realist perspective, which underscores that "reality and its constituents exist independently of our (linguistic, conceptual, theoretical, cultural) representations and can be known, for example, through perceptual experiences and through application of the scientific method" (Arp et al., 2015, p. 43-44). Other principles that guide the use of a formal ontological approach in this treatment of resilience and power are (Arp et al., 2015): fallibilism, perspectivalism, adequatism, and the principle of re-use. It should be noted that formal ontology is both the approach and result of an analysis. The approach guides in categorising entities and establishing relationships between entities the result, which can be illustrated in hierarchical format of entities and relations, is in itself a formal ontology.

Following a programme of formal ontology or ontology in general does not displace knowledge or how one comes into knowledge or mental representations of the world (Arp et al., 2015). The point here is not to diverge into a philosophical debate about the crux of knowledge but to simply rationalise knowledge and ontology. Regardless of how one comes into knowledge, one's knowledge reflects an aspect of the world around him/her, which is communicated for example in scientific frameworks, theories, policies, sensor data and depicts the truths in a domain. For example, the concept of resilience as a theoretical paradigm informs one that in society there is this entity resilience, which is in reference to other entities such as a system, actor, disturbance, stress, adaptation (Daniel, 2011). This is what Lowe (2006, p. 4) stated as one aspect of ontology, "the empirically conditioned part [that] seeks to establish, on the basis of empirical evidence and informed by our most successful scientific theories, what kind of things do exist in this, the actual world."

2.4.1 The Principle of Fallibilism

Since knowledge obtained through empirical evidence can never be regarded as complete and can contain misrepresentations that are purported through scientific theories and frameworks, an ontological enquiry will always reflect a partial, but explicit account of what

is contained within these theories (Grenon and Smith, 2004; Arp et al., 2015). This is the principle of fallibilism to which ontologies subscribe. The principle of fallibilism does not negate realism since entities exist in the world despite our incomplete understanding of them and our continuous quest to seek out more (Arp et al., 2015). Arp et al. (2015) illustrated this point with the example of the early theory of the sun rotating around the earth. The terms sun and earth are still used as referents to the entities in reality, despite the change in theory (Arp et al., 2015). This argument is also veridical for social theories on power, resilience, actor, systems, institutions, state etc. as the integrity of the terms as referents to reality persist regardless of the advancement or changes made to theories over time.

2.4.2 The Principle of Perspectivalism

With the evolution of theories, it is only rational that ontologies should keep abreast with changes as new referent terms may be introduced into a domain (Arp et al., 2015). As a result, formal ontologies should be viewed as non-static representations subject to change as new scientific theories take hold in a domain. However, the progression of theories is not bounded to a specific domain. Researchers in various domains take part in this endeavour, as is the case with social-ecological resilience, which began as an

object of investigation in Ecology and transcended as an object of investigation for various disciplines working in the area of Sustainability. For example, the development geography perspective does not negate the ecological viewpoint, instead both offer perspectives about the same reality. Hence the ambiguity of power relations in the social-ecological resilience framework was identified as a concern by development researchers (Cannon and Mueller-Mahn, 2010; Cote and Nightingale, 2012; Ingalls and Stedman, 2016). This is what Smith and Grenon (2004) and Arp et al. (2015) referred to as the principle of perspectivalism in formal ontologies. Reality is not multiplied, it is the viewpoints that are manifold (Mol, 1999), hence in this regard, "perspectivalism is constrained by realism" (Smith and Grenon, 2004, p. 280).

2.4.3 The Principle of Adequatism

The manifold perspectives of resilience and power, for example the system and actor oriented account both concepts, present different aspects of the concepts at varying levels of abstraction. An adequatist view of ontology recognises that in order to capture aspects of reality, this must be done across different levels of granularity (Grenon and Smith, 2004; Smith, 2014b; Arp et al., 2015). Such an ontology thereby yields a hierarchical structure of entities, which

is "a description of a sort that is based on adequate classification" (Smith, 2014b, p. 77). This is a stark contrast to the ontological approach of reductionism whereby the manifold aspects of reality are reduced to a few elements at a fine level (Grenon and Smith, 2004; Smith, 2014b).

2.4.4 The Principle of Re-Use

The final principle of formal ontology upheld is that of re-use. It is cited as good ontological practice to integrate other ontologies in the same direction of the entities which one is trying to understand (Arp et al., 2015). Here, re-use is evident through the application of the Basic Formal Ontology as the foundational ontology that is used to characterise the objects of investigation, power and resilience from the notions and frameworks discussed in Chapters 4, and 5. Additionally it is used in combination with the Document Act Ontology to characterise and ground the entities that emerged from the field data on farmers livelihood in Chapters 8, and 9. The Document Act Ontology is a taxonomic structure of entities pertaining to features of documents and actions that can be performed with documents[2] based on the theory of document acts (Smith, 2014a), which extends

[2]The classes and relations that constitute the document act ontology are found here: `http://www.ontobee.org/ontology/d-acts` (Accessed December 17th 2017).

Searle's social ontology (Searle, 1976, 1995). These document acts are part of social action and thus underlie social reality. A closer look at the Basic Formal Ontology and the Document Act Ontology is undertaken below.

2.5 The Basic Formal Ontology as an Analytical Tool

The Basic Formal Ontology is a foundational ontology representing the highest genera or categories for scientific domains (Arp et al., 2015). It is a system of universals, which presents itself in a taxonomic structure that subdivides reality into continuants and occurrents (Smith, 2015; Arp et al., 2015). BFO is a realist and adequatist formal ontology designed to support modelling of the kind of entities that exist and their relations in scientific domains (Arp et al., 2015). This foundational ontology is formal because it employs for example, theories of dependence, mereology, mereotoplogy, and inherence together with formal logic to define and establish ontological relations (e.g. specific-dependence, part-of) (Smith, 2015). In so doing, it provides the analytical rigour to check for inconsistencies in the classification of entities (Smith, 2014b). With these built-in tools, a foundational ontology takes the guesswork out of characterising

entities in a dataset (Arp et al., 2015). Therefore, the purpose of the Basic Formal Ontology is to guide ontological development and analysis in the characterisation of particulars and the establishment of relationships amongst particulars (Arp et al., 2015).

The Basic Formal Ontology divides the world into continuants and occurrents. Continuant entities are "entities that *continue* or persist through [space and] time" for example, you, my dog, this table (Arp et al., 2015, p. 87). Occurrent entities are "happenings" or "processes" which occur through time and involve the participation of continuants (Smith, 2015; Arp et al., 2015). For example, a drought, you playing football or the writing of this thesis. Continuants are further subdivided between independent and dependent continuants. Independent continuants are entities whose "identity and existence can be maintained through gain and loss of parts, [...]through changes in their qualities, and through gain and loss of dispositions, and of roles" and can be material or immaterial in nature (Arp et al., 2015, p. 90).

Conversely, dependent continuants are entities that require the presence of an independent continuant for its existence, such as social roles (e.g. teacher, student, community leader), the weight of my laptop etc. (Smith, 2015; Arp et al., 2015). In BFO, dependent continuants are subdivided further into generically dependent

continuants and specifically dependent continuants. It is under the latter category, that all dispositions belong. Dispositions are entities that inhere in some material entity and are realised through processes, however dispositions need not be realised to say that they exist (Smith, 2015; Arp et al., 2015). As the name of the thesis indicates, it is the premise that social-ecological resilience and social power are dispositions. The arguments for such a classification of both entities are set in Chapters 4, 5 and 6. A graphical representation of the BFO system of categories is presented in Figure 2.1.

The Document Acts Ontology conforms to the Basic Formal Ontology. The ontology is based on the theory of document acts, which, complements Searle's social ontology (Smith, 2014a). Where Searle proposed that speech acts (declarations) can create institutional facts in social reality (e.g. a couple saying "I do" in front of a pastor creates an institution of marriage) (Searle, 1995), the theory of document acts proposed that documents are able to do the same. Documents can create, change, or stop the existence of an entity (for e.g. marriage certificates and divorce decree), and give people the power to perform certain actions that are reflected in the document (Smith, 2014a). Document acts entail: giving or rescinding permission, transferring a land title to someone, signing an act into law, signing a document which brings into existence a NGO to name a

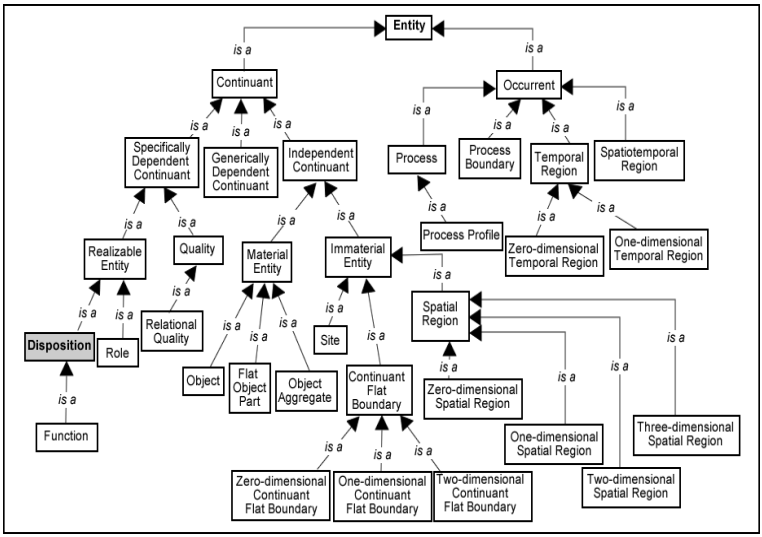

Figure 2.1: A Graphical Representation of the Basic Formal Ontology Categories (adapted from Smith (2015)).

few (Smith, 2014a). Unlike declarations, documents are material, can be stored, and arranged in numerous ways to represent social institutions (Smith, 2014a). Document acts support Searle's social ontology, which is discussed below.

2.6 Searle's Social Ontology as an Analytical Tool

Social ontology refers to the modes of being of objects, social processes, events and social facts (Searle, 2006). Searle share a naturalist position of reality i.e. a reality that is arranged based on physical particles, which can be organised into systems (Searle, 1995). The system of interest is the human system which has a consciousness and shares a human intentionality, through which social entities of the social world emerge (Searle, 1995, 2006). The basic structure or rule of Searle's social ontology is encapsulated by the axiom "X counts as Y in C" whereby X is an object, Y is a status function imposed on the object, C is the context, from which institutional facts emerge (Searle, 1995, 2006). For Searle, these institutional facts are only made possible through language (Searle, 1995, 2006).

Underlying this axiom are the principles of collective intentionality, status functions, constitutive rules and procedures (Searle,

1995, 2006). Collective intentionality is the shared belief, intentions, acceptance and values of a group of people (Schweikard and Schmid, 2013). Institutional facts[3], which emerge from the constitutive rules[4], are types of social facts that depend on human institutions (status functions[5]) and collective intentionality for their existence (Searle, 1995). For example, a person could be recognised as a landowner (institutional fact) due to the institution of property. Institutional facts are not necessarily standalone facts but can be nested together to represent complex social systems in society (Searle, 2006). It is these principles that I draw upon to reveal the underlying connections across farmers experiences. In this application, the social ontology supports the Basic Formal Ontology in understanding the relationship between social-ecological resilience and power. A further discussion on how power emerges through these principles is undertaken in Chapter 5.

[3]Institutional facts are "features of the world that are matters of culture and society" whose existence are dependent on human institutions (Searle, 1995, p. 27).

[4]Constitutive rules are rules that "merely do not regulate, [but] create the very possibility of [performing] certain activities" e.g. the rules of chess (Searle, 1995, p. 27). According to Searle, "The rules are *constitutive* of chess in the sense that playing chess is constituted in part by acting in accord with the rules" (Searle, 1995, p. 28).

[5]Status functions are collectively accepted status imposed on an object to which a function or functions are assigned to it by a community (Searle, 1995, 2006).

2.7 Application of Ontologies in Study

Figure 2.2 is a schematisation of how the ontologies connect to the study. The ontological analysis is fed by the Basic Formal Ontology and Searle's social ontology. The theories of resilience and power are analysed using the Basic Formal Ontology out of which the categorisation of resilience and power is provided. From these categorisations, the relationship between the entities are deduced, which is in itself an ontology. Likewise the textual descriptions from the field data are categorised using the Basic Formal Ontology and the Document Act Ontology. This produces an ontology containing entities and relations that underpins the connection between the farmer and land tenure, as well as the farmer and irrigation system. The social ontology provides the explanatory power to explore what these relations mean for resilience. These insights are used to verify the relationship between resilience and power. To support this undertaking, the methodology for data collection is discussed in the subsequent chapter.

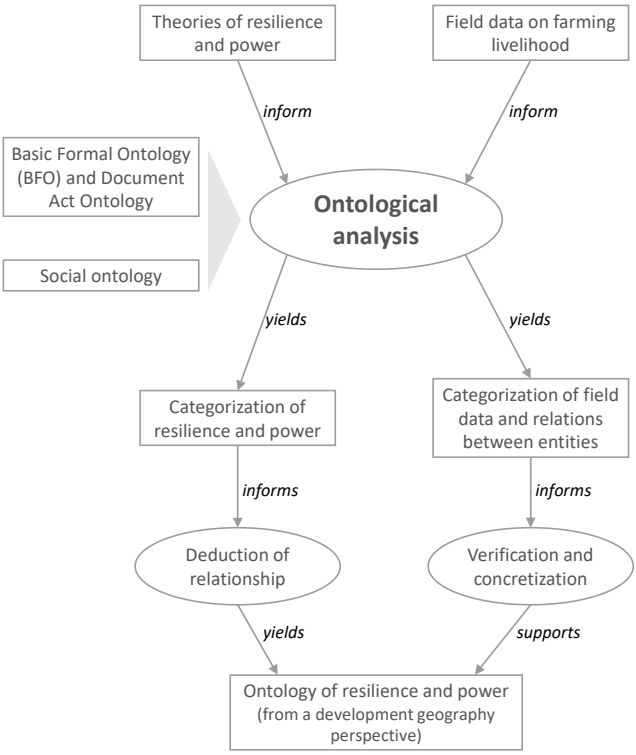

Figure 2.2: Graphical representation of how BFO and the social ontology are applied in this study.

Chapter 3

Methodology

To achieve the stated objectives, this work applies a two-pronged methodological approach: i) Conceptual analysis of literature to support the ontological categorisation of social-ecological resilience and social power terms and ii) Qualitative field study to verify the postulated relationship between social-ecological resilience and social power.

3.1 Conceptual Analysis of Literature and the Formal Ontological Approach

In order to categorise entities in the real world using formal ontology, a knowledge base is needed to draw on empirical aspects of reality. Here, the knowledge base entailed the scientific theories and frameworks of social-ecological resilience and social power found in peer-reviewed literature. Theories give an insight to the form of resilience and power entities. As Cohen (2016) stated: "The definition of tiger does not tell us the meaning of the word 'tiger'; it tells us what it is to be a tiger, what a tiger is said to be in respect of itself." Through a decomposition of resilience and social power theories, the general form of resilience and power can be reduced. The basic form of both terms centred around some *ability to perform some action*. A further examination of abilities revealed that abilities conform to the properties of dispositions in the BFO sense. Throughout the ontological exercise of the thesis, aligning terms to categories required a repeated process of examining the structure of terms and determining which set of ontological properties it best subscribes.

Receiving feedback from experts on ontological categorisations is considered to be good ontological development practice (Arp et al., 2015). During the course of my research, I had the opportunity to

attend the "Workshop on BFO and the Ontology of Social Entities 2016" wherein I presented my initial considerations of social power being a disposition. The formal definition of power presented was a point of discussion and it was suggested that I used Harre's formal definition of power (Harré, 1970) as a departure point into my ontological enquiry (see Chapter 5 for a discussion of Harre's notion of power). I used the feedback received from philosophers and other ontologists to revisit my initial arguments and refine my position about power as a disposition[1].

It should be reiterated that the ontological place-holding of power and resilience does not dismiss the current discourse and the knowledge imbued in resilience thinking. What it helps to do is clarify what is the nature of the entities that one currently engages in development discourse. For resilience research and its application in development studies, this has been a point that is overlooked but surfaces when questions about power are brought into the conceptual space of resilience. I will illustrate the use of the ontological frameworks discussed in Chapter 2 in the case study of farming communities in Caroni.

[1]The Workshop on BFO and the Ontology of Social Entities took place in February 2016 in Gainesville, Florida (`http://ncorwiki.buffalo.edu/index.php/Workshop_on_BFO_and_the_Ontology_of_Social_Entities_2016`). At the workshop, I was able to engage with Prof. Dr Barry Smith and Dr Ludger Jansen who provided constructive feedback about my work. It should be noted that the position defended in this thesis does not necessarily reflect their positions.

3.2 Study Area: Caroni, Trinidad

Trinidad and Tobago is a twin island state located approximately 11km off the coast of Venezuela making it the most southerly island in the Caribbean island archipelago. It has a population of approximately 1,354,343 million people (GORTT, nd). The islands experience a tropical marine climate and is marked by two seasons: a dry season which extends from December to May and a wet season from May to November. The islands receive an annual rainfall relief of 2152 mm[2] and experience an average yearly maximum and minimum temperature of 31.3 and 22.7 Celsius respectively[3]. With the effects of weather variability, farmers have noted that the timing of the seasons changes from year to year.

Trinidad and Tobago is a high income developing country with a GNI per captia of $16,240.00 US as of 2016[4] The main foreign currency earner for the economy is the oil and gas energy sector, which contributes 34.9 percent of the GDP[5] and 85 percent of the total export earnings (GORTT, nd). Agriculture as such is not a prominent industry for the country and only contributes around 0.4

[2] http://cso.gov.tt/latest-indicators/(Accessed December 15th 2017)

[3] http://www.metoffice.gov.tt/Climate(Accessed December 15th 2017)

[4] https://data.worldbank.org/country/trinidad-and-tobago Accessed December 15th 2017.

[5] http://www.energy.gov.tt/our-business/oil-and-gas-industry/ Accessed December 15th 2017

percent to the national GDP (GORTT, 2016). Rather, Trinidad and Tobago is a food importing country. However, in Trinidad and Tobago's Vision 2030 Plan, the government wants to address the gross food importing patterns by enabling the productivity of the agricultural sector and setting food security and sustainable agriculture as a national priority (GORTT, nd).

The twin island state is multi-ethnic as a result of its colonial past with Afro-Trinidadians and Indo-Trinidadians being the predominant ethnicities. Caroni a predominantly Indo-Trinidadian region is located in the western part of the island of Trinidad (Figure 3.2). The largest urban centre in Caroni is Chaguanas, which has a population of 67,433 people[6]. The significance of looking at farming communities in Trinidad especially in the Caroni region resides in the historical transformation of the space from a monoculture sugar industry established under colonisation into small farming holdings today. These small holdings that emerged out of a complex political economy of sugar are the lands upon which the majority of the participants carry out their livelihoods.

[6] `http://worldpopulationreview.com/countries/trinidad-and-tobago-population/` Accessed December 15th 2017.

Figure 3.1: Study Area: Trinidad and Tobago.

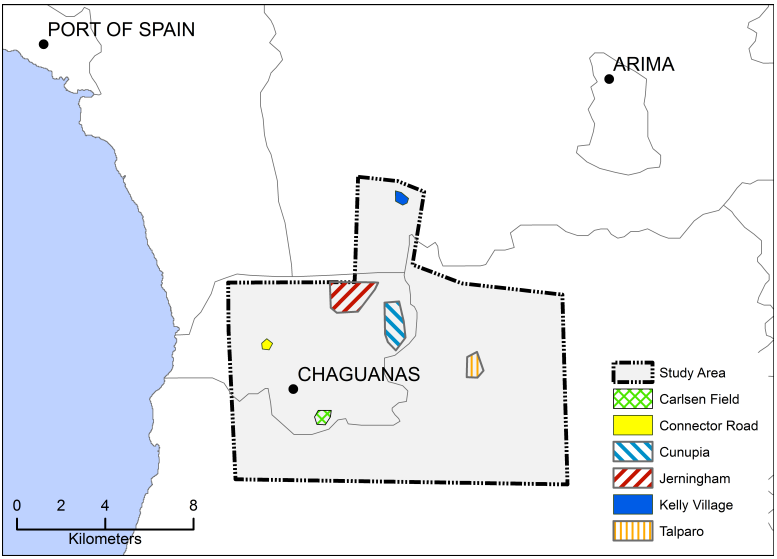

Figure 3.2: Field sites within Caroni, Trinidad

3.3 Field Approach and Characterisation of Participants

The purpose of the field investigation was to capture the farming experiences and practices of farmers within Caroni in order to find out about power and resilience, and how both entities unfold through their practices. A purposive sampling technique was followed whereby I chose the participants to suit the purpose of the study. Purposive sampling is used when the objective of analysis is

to "obtain insights into a phenomenon, individuals or events" (Onwuegbuzie and Leech, 2007, p. 242). The investigation began in 2015 when I contacted the County Caroni office. I was provided with a list of farming groups in the area. The two responsive groups were the Jerningham Farmers Association and the Cunupia Farmers Association. Through initial contact with the Directors of the groups, I was then introduced to other members, and these members led me to other farmers outside of these groups but within the Caroni region.

The methods of field investigation were in-depth interviews, key informant interviews and observation. Forty-five interviews were conducted over two consecutive dry seasons in 2015 and 2016. Of the forty-five interviews, four were key informant interviews which included a former Minister of Agriculture, an Extension Officer within Caroni, the former Communications Manager from the state's agriculture marketing agency (NAMDEVCO) and a former Board Member of the Agricultural Society of Trinidad and Tobago (ASTT), a state agency mandated with representing farmers across the country. These informant interviews serve to corroborate farmers' accounts as well as provide an understanding of the state's position within the farming network. Additionally, secondary literature was used to further support this study such as Parliamentary Hansard records, technical report on land tenure in Trinidad and Tobago (e.g. Stan-

field and Singer (1993)) as well as the State Lands Act of Trinidad and Tobago.

In 2015, twenty-three farm interviews were conducted and in 2016 eighteen farm interviews were conducted (Table 3.2). Of the eighteen interviewees, eleven were interviewed both in 2015 and 2016. For the farm interviews a semi-structured approach was undertaken. Since the unit of analysis was the farmer and I was interested in the descriptions of their livelihood, the small sample afforded the opportunity to interact with the farmers through manifold one on one encounters and discussions, and also was sufficient to generate the level of detail needed for the domain analysis (Chapters 8 and 9). If a question in the interview triggered an important event or issue for the farmer, I allowed the participant to divulge their experiences or thoughts. These deviations were often rich in content and formed part of the basis of understanding the complexities of the farming network and livelihoods. Interviews were predominantly conducted over more than one encounter with farmers with each interview lasting roughly between twenty minutes to one hour depending on the farmer's openness and time availability. Additionally, informal conversations and observations from farm group meetings played a role in shaping my comprehension of the complexities of their farming livelihoods.

The objective of the first round of interviews in 2015 was to acquaint myself with the farmers from the area, establish trust, learn about their farming activities, and understanding the general challenges they encounter, which is reflective of the wider Caroni farming system. These farmers engaged in dairy farming, citrus and crop production and farm in various farming enclaves within Caroni: Jerningham, Cunupia, Todd's Road, Talparo, Connector Road, Kelly Village. In 2016, the enclaves were narrowed down to Jerningham, Cunupia, Talparo, Carlsen Field and Kelly Village. Although Talparo and Kelly Village are outside of the Caroni region, the participants from these areas were included in the study. The farmer from Talparo is an executive member of the Cunupia Farmers Association whereas the farmer from Kelly Village farms along a portion of the Caroni River bank that passes through the village. I went in the investigation with the naive idea that climate change was the major challenge affecting farmers. Additionally, issues about farm labour, market, and land tenancy also occupied farmers' experiences. The first investigation was broad and did not generate the responses needed to examine aspects of power and resilience in the groups.

Subsequently, a second field investigation was undertaken in 2016, with targeted questions on challenges, network ties, perceptions of stakeholders, visions of farming that seek to expose elements of power dynamics and resilience that occur through the space from

the farmer's point of view and experience. Conducting interviews during the dry season, a greater emphasis was placed on the challenge of water availability. In both investigations, the majority of participants interviewed were male. In 2015, I interviewed two female participants alone and one with her husband, which I counted as a single farm interview. In 2016, I interviewed two female participants alone and two with their husbands, which I also counted as a single interview. The ages of the participants ranged from 25 years to 70 years old. Although the sample size was small and may raise questions of representativeness, for the explorative purpose of the case study it is useful as it allows for a thorough engagement with participants through in-depth interviews and participant observation (Crouch and McKenzie, 2006). The purpose here is to extract the underlying structure across participants' experiences and not to establish patterns in behaviours and make generalisations about this pertaining to their livelihoods.

A salient feature that emerged from the study is that over 50% of the participants interviewed are farming on former sugar plantation lands, and one farming group the Cunupia Farmers Association, at the time of the interview was trying to access a portion of these lands to carry out their vision of farming as a cooperative (Table 3.1). In the discussion, with the former Minister of Agriculture in 2015, the intentions for the lands under his tenure were discussed,

Mode of occupation	**n**
Squatting	6
Probationary Tenure; Lease Tenure	7
Renting	7
Using land from family or friend	9

Table 3.1: Farmers farming on former sugar lands (n = 13) 2016. Farmers can use multiple plots with different modes of occupation.

Year	Dairy Farmers	Citrus Farmers	Crop Farmers
2015	3	1	19
2016	2	1	15

Table 3.2: Participants and Type of Farming Activity

which included the mega farm project and its role in national food security. These lands symbolically uphold the burden of its colonial past and as such a framing of Caroni in relation to this history and the closure of the sugar industry is undertaken to contextualise the social space through which present day farming activities are carried out and the livelihood resilience of farmers manifest. An analysis of this transformation is presented in Chapter 7.

3.4 Domain Analysis

Through a domain analysis of the field data, a light-weight ontology is created from the textual descriptions of farmers experiences in

Caroni. A fine line is traversed between Spradley's domain analysis (Spradley, 1979) for social science research and domain analysis in ontological engineering. The overlap between both approaches lies in the creation of a network of concepts and relations based on textual data, a sort of semantic network and taxonomic hierarchy, which reference entities in a domain. The essential objective of both approaches is to understand what concepts constitute a domain or how the domain is organised, for example the domain of farm systems, which is embodied in the textual descriptions about the domain. Where the approaches diverge is in the use of the networks created. For knowledge engineering such networks developed from field data lead to the creation of application ontologies, the purpose of which is to create a computational knowledge tool for e.g. about the domain of farming systems which can then be integrated into an information system through the formalisation of the networks in a machine readable language, through abstracting primitive terms from the data. For social science, such a network is used to understand the cultural artifacts that would comprise farming livelihoods in Caroni paying particular attention to the deployment of language of the participants.

The data generated from the second field investigation formed the basis of this analysis. The qualitative data analysis software MAXQDA was used to parse the interview transcriptions. Since the

corpus of text generated from an interview averaged thirty pages, it was deemed manageable to assign appropriate codes to chunks of descriptions. Codes were derived based on the text descriptions of the participants as well as pre-defined codes obtained from resilience literature (e.g. Ifejika Speranza et al. (2014)) such as Network Cooperation, Entitlements, Knowledge Sharing etc. to name a few, were appropriately assigned to texts that related to these categories. A total of 820 coded segments were initially generated. Coded segments that were not directly related to farming practices and livelihood were then excluded.

Although Spradley (1979) discourages the establishment of predefined categories, it was done for ease of management of the corpus of text. This allowed all the text descriptions that are related, for example, to network cooperation to be retrieved in the software. It should be noted that the textual descriptions were not mutually exclusive, meaning that a text excerpt was not bounded to one category only. An excerpt can be assigned to multiple codes as seen fit since as Spradley (1979, p. 102) stated "for one thing, informants do not talk in domains but in sentences which skip rapidly from one domain to another."

Where the ontological development meets Spradley's domain analysis is in the assignment of covering terms or concepts and specifi-

cation of relations between these terms based on the symbols presented in the textual description. Where I stepped away from this sociological approach is in the specification of relations wherein ontological relations that subscribed to BFO and the Document Act Ontology were used to connect covering terms. It is acknowledged that Spradley's relations have similarities to the onotological relations of BFO. For example, Spradley's kind of relation is equivalent to the ontological relation of is-a, where both implies a hierarchical structure between concepts, where one concept is a subclass of the other.

Identifying such hierarchies within data is a foundational step in the creation of an ontology (Arp et al., 2015). Additionally the attributive relation is similar to the has-quality relation, which is used to relate characteristics of entities e.g. the colour of a plant. Since BFO was used to anchor the ontological development, the BFO relations would be used as best as possible to specify the relations between terms. This is because BFO is a stable upper ontology with application use across disciplines and again the categories and relations defined in this ontology have been rigorously defined and grounded through mereology and topology. Where I also step away from the sociological approach is tying the concepts to BFO upper ontology as a means of grounding the field data into universal truths about reality. Although it is acknowledged that the ontological anal-

ysis upholds a realist perspective and qualitative data is subjective, the realist categorisations does not negate the subjectivity. The point here is to unpack what exists through the communications and not the state of the participant's knowledge.

The essence of the thesis centres on exploring the nature of social power and resilience from a realist perspective. For such research agendas, according to Crouch and McKenzie (2006), the underlying logic of the thesis is irrespective of the sample size. This fine-grained analysis is targeted to unearth the entities that constitute the farming space, and as such generalisations on the overall community's well being or the implication of family land to farmers' livelihood in Caroni cannot be concluded. However, generalisations on the basic entities that make up the participant's farming experience, and the relations between these entities can be reasoned.

3.5 Validity

In doing research, bias is inescapable, but there are measures that can be taken to circumvent bias. During the interview process, at times I asked farmers the same question in different ways in separate encounters as a means of verifying their responses throughout our

encounter. After the data was categorised and relations between terms established, a schematic representation using layman translations of the ontological relations were presented to seven farmers in order to ascertain if the underlying structure of their experiences represented their reality. Only two participants questioned a relation specified. This pertained to the specification that a Director of a farming group is also a farmer in the group. In their group, this was not the case as there is an executive member who is not a farmer. As a result, the relation was corrected. In the end, the participants agreed with the underlying representations, which were then used to inform the discussion of the thesis. An example of the verification is provided in the Appendix in Table 10.3.

This chapter brings Part I of the thesis to a close. In Part I, the objectives of the study were set and theoretical underpinning discussed. The field study was laid out, the results will be used to verify and explore the relationship between resilience and power in Part III. But first in Part II, the conceptual analysis of resilience and power theories are undertaken and the categorisation of both resilience and power are presented. Once the categorisations and relationship between resilience and power are established objective one will be achieved.

Part II

Conceptual Analysis and Categorisation of Resilience and Power Concepts

Introduction

> ...how can we attain knowledge of being or of reality 'as it is in itself', especially if ontology is conceived as to be not an empirical but an *a priori* science. The answer that I favour divides the task of ontology into two parts, one which is wholly *a priori* and another which admits of empirical elements (Lowe, 2006, p. 4).

The part of the ontology that is of concern here is the part that admits empirical elements. It is common knowledge that social power and resilience are referent terms to features of reality that occupy empirical investigation, treaties, discussions in the geographical field. The ontological analysis that permeates the thesis deals with what kind of *entities* are social power and resilience, which can be only informed through scientific theories and notions based on the empirical in reality. What follows in this chapter is an ontogenetic analysis of the social power and resilience concepts. The notions of power would be limited to the social science field, whereas the examination of social-ecological resilience will follow the transition of the concept from Ecology to Development as an inter-disciplinary concept used in sustainable development research.

The analysis underscores the variegation in meanings attached to both the resilience and power concepts. The plurality of mean-

ings stems from the research agendas of scientific disciplines or researchers over the years, with each meaning revealing part of the portrait of resilience and power in reality. In this collage of meanings, a general structure of the concepts can be deduced, which will be used to answer the following research questions: i) What constitutes social power? and ii) What constitutes social-ecological resilience? The answer to these questions establishes the ontological position that is defended throughout the thesis.

Chapter 4

An Analysis of Resilience Concepts and its Categorisation as a Disposition

In this chapter, the evolution of resilience as a concept is described, starting with Holling's conceptualisation to the current notions embraced within the contemporary resilience thinking framework. The

lineage of the concept lays the basis for categorising resilience as a disposition.

4.1 Genesis of the Ecological Resilience Concept

Resilience Thinking is a conceptual framework put forward to explore and describe how social-ecological systems respond to change in the context of environmental and climatic variability, and under the overarching normative objective of sustainable development (Plummer and Armitage, 2007; Folke et al., 2010; Cooke et al., 2016). It deals with "how periods of gradual change interplay with periods of rapid change in intertwined social-ecological systems confronted with true uncertainty and what that means for people and the planet" (Folke et al., 2016, p. 2)[1]. Inherent to Resilience Thinking is a social-ecological systems perspective pertaining to the management of resources for development, whereby this system is adaptive, self-organising and capable of transforming in face of change (Folke et al., 2005; Walker and Salt, 2006; Folke et al., 2010, 2016). This

[1]Ecology and Society articles are not published with page numbers. Quote appears on the given page number of the pdf extract.

paradigm represents a shift from the traditional ecological conceptualisation of resilience, which was originally conceived by Holling (1973, p. 17) as "a measure of the ability of...systems to absorb changes of state variable, driving variables, and parameters and still persist."

The concept of resilience was introduced by Holling (1973) to challenge the stability ideology of ecosystem behaviour, which is based on the system "[returning] to the initial equilibrium point" after a disturbance (Pimm, 1984). For the author such a position was one-dimensional, and excluded the "transient behaviour of systems that are not near the equilibrium" (Holling, 1973). A further analysis of ecosystem behaviour was possible with the integration of a resilience perspective, which is based on the measure of persistence, and has implications for the management of resources (Holling, 1973). The resilience framework envisioned by Holling foreshadows the trajectory of the concept and its new place in Sustainability discourse wherein building human, system capacities for unforeseen circumstances is a core focus:

> A management approach based on resilience[...]would emphasize the need to keep options open, the need to view events in a regional rather than in a local context, and the need to emphasize heterogeneity. Flowing from this would be not

> the presumption of sufficient knowledge, but the recognition of our ignorance; not the assumption that future events are expected, but that they will be unexpected. The resilience framework can accommodate this shift of perspective, for it does not require a precise capacity to predict the future, but only a qualitative capacity to devise systems that can absorb and accommodate future events in whatever unexpected form they may take (Holling, 1973, p. 21).

Ecological resilience was also conceived as a variable of stability and centred around a system's rate of return to its equilibrium position after a perturbation (Pimm, 1984, 1994). This is what Holling (1996) distinguished as engineering resilience, where assumptions of a closed system i.e. "simplified, untouched ecological systems" are upheld. This ecological and engineering dichotomy also emerged in the conceptualisations of economic resilience, as resilience was cross-fertilised with scarcity and resource allocation in applied economics (Holling, 1996; Rose, 2007). In essence, economic resilience from an ecological perspective deals with the "ability of an entity or system to maintain function (e.g., continue producing) when shocked" (Rose, 2007, p. 384). Conversely, the engineering view is reflected in definitions such as "the ability to maintain output close to potential in the aftermath of shocks[...i.e.] the extent to which shocks are dampened and the speed with which economies revert to normal

following a shock" (Duval et al., 2007, p. 6).

Under the normative goal of sustainable development, definitions that subscribed to the engineering paradigm have been radically overturned by researchers from various disciplines. This was based on the common assumption that systems are non-linear and have multiple states across scales (Holling, 1996; Walker et al., 2004). Furthermore, a return to equilibrium implied that the system would be placed in the vulnerable state it once held (Holling, 1996; Klein et al., 2003). Thus, the ecological viewpoint that promotes the maintenance of system functioning was favoured until the 2000s where the concept underwent another metamorphosis.

4.2 From Ecological Resilience to Social-Ecological Resilience

At the turn of the millennium, the emphasis shifted from ecological systems to social-ecological systems, underscoring the symbiotic relationship between people, institutions and the ecological landscape. The referent term changed from ecosystem or ecological system resilience to social-ecological system (SES) resilience, which became

the object of scientific inquiry by the Resilience Alliance[2]. The social-ecological system was described as a complex adaptive system (Folke et al., 2002; Holling, 2001) with this system being "self-organizing...[which] creates systems far-from-equilibrium, characterized by multiple possible outcomes of management" (Folke et al., 2002, p. 438). Additionally, a complex adaptive system experiences "adaptive cycles of growth, accumulation, restructuring, and renewal", which form a "panarchy" that is interactions of "nested" hierarchies at multiple spatio-temporal scales (Holling, 2001). Over the period, new concepts were tied to SES resilience such as adaptation, learning, self-organisation and transformation, which re-oriented the concept as a desirable outcome that must be achieved in face of climatic and environmental changes, with the Resilience Alliance leading this charge. The Resilience Alliance defined SES resilience as a multi-dimensional concept as:

> The capacity of a social-ecological system to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions. It describes the degree to which the

[2]The Resilience Alliance is an authoritative body on social-ecological system resilience research. The organisation was formed in 1999 and contains a cohort of inter-disciplinary scientists who work on the theoretical, empirical and application advancement of social-ecological system resilience for the purpose of climate change and sustainable development. `https://www.resalliance.org/` Accessed August 8th 2017.

> system is capable of self-organization, learning and adaptation (Resilience Alliance, 2010)[3].

With the growing usage of the term, shift in perspectives and the impregnation of the concept, the operationalisation of SES resilience was brought into question (for e.g., Carpenter et al. (2001); Klein et al. (2003)). The concept was deemed not measureable due to definitional ambiguities and figurative usage of the term (Carpenter et al., 2001; Klein et al., 2003). To add some directionality to the application of the concept, Carpenter et al. (2001) proposed that SES resilience be framed in the context of 'resilience of what, to what' that demarcates the part of the system, disturbance(s) of interest, time period and scale that is to be investigated. Thus, a distinction is currently made within the concept between specified resilience (of what to what) and general resilience i.e. "coping with uncertainty in all ways" (Folke et al., 2010)[4].

Although the purveyors of the SES resilience concept acknowledged the role of the social system in facilitating adaptation and management of resources, it was still ecosystem ladened and remained unclear how the resilience of social entities emerged from

[3]Definition sourced from the Resilience Alliance website `https://www.resalliance.org/resilience`. Accessed December 1st 2017

[4]Ecology and Society articles are not published with page numbers. Quote appears on page 5 of the pdf extract.

their ecosystem counterpart (Adger, 2000). Consequently, a thrust towards unpacking social systems and social resilience under the umbrella of SES resilience emerged, usually situated in Disaster Management contexts.

4.3 Social Resilience as a Special Type of Social Ecological Resilience

Social resilience is a concept that emerged in Psychology that predates the SES resilience notion applied today. Essentially, it relates to "patterns of positive adaptation in the context of significant risk or adversity[...][which] individuals manifest[...]in their behavior and life patterns" (Masten and Powell, 2003, p. 4). Prior to the normative SES resilience concept, social resilience in a sustainability context was tied to social entities such as: human systems (Handmer and Dovers, 1996), economic systems (Perrings, 1998; Levin et al., 1998), institutions such as households and political institutions (Levin et al., 1998), and communities (Adger, 2000). Resilience was explained as the ability to cope (Wildavsky, 1988; Adger, 2000), to adapt (Handmer and Dovers, 1996), to recover (Levin et al., 1998), to persist (Levin et al., 1998) in face of some stress or disturbance, which can either be environmental or social in source.

For Adger (2000), social resilience emerges through the dependency of communities to ecosystem services provided by the environment, and determined by the social institutions that regulate and distribute ecosystem resources. Resilience is manifested when resources are under threat by environmental or social disturbances and social institutions either facilitate in maintaining the resource or in the collapse of the resource. In this context, social resilience was defined as: "the ability of communities to cope with external stresses and disturbances resulting from social, political and environmental change" (Adger, 2000, p. 347).

Transitioning from theory to measurement, Cutter et al. (2008) developed the Disaster Resilience of Place (DROP) model to provide indicators for observing disaster resilience, with the community as the unit of analysis. The authors conceptualised community as "the totality of social system interactions within a defined geographic space such as neighborhood, census tract, city, or country" (Cutter et al., 2008, p. 599). A systems perspective is maintained in this model with the social system, natural system and built environment being interconnected, and operating at various scales. These scalar interactions are "place-specific" and create pre-existing (antecedent) conditions at the community level and macro level that are observable through endogenous factors in the former and exogenous factors in the latter (for e.g. national policies) (Cutter et al., 2008).

Resilience and vulnerability are part of the antecedent conditions and are described as "inherent" to the system (Cutter et al., 2008). The authors noted that national policies and regulations (exogenous factors) shape endogenous factors, which in turn shape community resilience (Cutter et al., 2008).

Central to the model is the idea that vulnerability and resilience are overlapping concepts since there are community resources (e.g. level of education of actors, actors' wealth status) that play a role in both the resilience and vulnerability of a community (Cutter et al., 2008). The authors viewed resilience as being both inherent to the system and a process, which is dependent on the antecedent conditions. When the antecedent conditions meet the hazard event, effects are created that are dealt with through the coordinated deployment of resources in actions that constitute coping and the facilitation of recovery (Cutter et al., 2008). According to Cutter et al. (2008), if the capacity to absorb the effects is exceeded (i.e., existing coping strategies are unable to deal with the effects), adaptive resilience may set in, which occurs through "improvisation and learning."

New ways of doing things are outcomes of adaptive resilience that filter into the system as improvements on disaster management policies, and reinforces the system's capacity to cope with the next

event (Cutter et al., 2008). If no adaptive resilience occurs subsequent to exceeding absorptive capacity, then the level of recovery for the system will be low (Cutter et al., 2008). Thus based on this model, social resilience is conceived as: "the ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organize, change, and learn in response to a threat" (Cutter et al., 2008, p. 599).

Although, there is focus on drawing out *the social* under the resilience concept, some efforts are still ecologically laden with system parameters being used to draw conclusions about SES resilience, downplaying social markers such as embedded power relations within the system (Cannon and Mueller-Mahn, 2010). As a result, development researchers (e.g. Pelling (2003); Bohle et al. (2009); Obrist et al. (2010)) have opted to adopt an agency perspective of resilience that places the actor's "capacity to act in view of a threat" (Obrist et al., 2010, p. 288) at the core of analysis. For Pelling (2003, p. 48), resilience is "the ability of an actor to cope with or adapt to hazard stress."

Similarly, Obrist et al. (2010) proposed an actor oriented approach that incorporates Bourdieu's concepts of social fields and

capitals. In this sense, building resilience "occurs in specific fields where actors can access different forms of capital" (Obrist et al., 2010, p. 288). Social resilience is therefore defined as the "capacity of actors to access capitals in order to – not only cope with and adjust to adverse conditions (that is, reactive capacity) – but also search for and create options (that is, proactive capacity) and thus develop increased competence (that is, positive outcomes)in dealing with a threat" (Obrist et al., 2010, p. 289).

The variation in conceptualisations reflects that resilience is a polysemic concept. The affixed terms to resilience such as social, economic, SES, urban etc. "indicate from case to case the fields of application of a 'reality' [namely of the [resilience]], the nature of which eludes us" (Seukwa, 2007, p. 43). A common structure lies beneath the polysemy, which points us in the direction to answer what kind of *entity* is resilience. In the subsequent section, I unpack this common structure.

4.4 Resilience as a Special Type of Disposition

[5] The objective here is to extract the common structure that lies beneath the notions of resilience. A common pattern emerges, as most definitions describe resilience as being inherent to a system or actor as some ability to do something (Rose, 2007). As the reconnaissance of the concept of resilience was undertaken in Daniel (2011) and the formalisation of resilience as a disposition presented in Daniel (2014), I draw on both articles to build a theory on the relation between resilience and power. This section represents an adaptation of both pieces of work.

Based on the conceptualisations of resilience, Daniel (2011) identified five key tenets pertaining to the genealogy of the concept: i) resilience relates to a social object i.e. system or actor; ii) this object has an ability or capacity; iii) this ability is related to coping; iv) the ability to cope is in relation to some external factor, which is some stress or disturbance that threatens the social object and v) the social object copes to bounce back i.e. to recover from the disturbance and retain its functioning. Thus the basic tenets of resilience were noted as: system, ability, cope, external factor, bounce back.

[5]This section is adapted from Daniel (2014) wherein the categorisation of Resilience as a disposition using BFO is presented.

Before the work undertaken in Daniel (2011), the notion of system resilience being tied to transformation took root (e.g Folke et al. (2010)). Although it was introduced in Holling (2001) and Walker et al. (2004), it since has become mainstream in resilience research (e.g Folke et al. (2010); Keck and Sakdapolrak (2013); Folke et al. (2016)). In keeping with the evolution of the concept, I will include the tenet of transformation. Thus, the social-ecological system has the ability to cope with some disturbance not only to recover but also to transform. This basic deconstruction has some semblance to the genealogy of the concept presented by Keck and Sakdapolrak (2013). The authors identified three fundamental dimensions of resilience: i) adaptability ii) coping capacity and iii) transformation. The first dimension referred to the actors' capacities to learn from past events and make changes in face of future threats; the second dimension pertained to actors' capacities to cope with threats; and transformation essentially referred to actors' capacities to "craft institutions that foster individual welfare and sustainable societal robustness in the event of present and future crises" (Keck and Sakdapolrak, 2013, p. 11).

The formal theory of resilience was based on the general form of resilience specified as "the ability of a system to cope with an external factor that undermines it with the system bouncing back" (Daniel, 2011). In this theory the act of coping was deemed to

be at the centre of resilience, for to cope, according to the Oxford English Dictionary, is to "deal effectively with something difficult" (Waite and Hawker, 2009). The action of the system dealing with the disturbance is encapsulated in terms such as adapt, resist, maintain, absorb as they relate to actions the system or actor takes to deal with the disturbance, threat or stress (Daniel, 2011). Thus this suite of actions was taken as forms of coping a system may perform in face of a disturbance, threat or stress (Daniel, 2011).

The purpose of the general form of resilience was to provide a foundation for the ontological analysis and formalisation of resilience. To this end, resilience was classified as a referential quality by Daniel (2011), a type of quality that is related to something that can be perceived or measured, however it requires the presence of two entities (one being a material entity) for its existence (Daniel, 2011). It was argued in Daniel (2011) that the existence of resilience was predicated on the existence of a disturbance or threat being present. However, this ontological assertion can be challenged on the basis that resilience is often taken in reference to a social object having an ability to perform some action (Daniel, 2014). This ability encompasses forms of coping such as adapting, maintaining, and absorbing (Daniel, 2014).

Consider a community that experiences diurnal seasons of wet and dry periods each year with seasonal flooding during the rainy

periods. The community for example has building codes for flood zones, evacuation plans, emergency supplies in stock, households have flood insurance, which contribute to the community's ability to cope with a flooding event during the rainy season. Indeed, this ability is present in the rainy season where the threat of flooding is imminent and is manifested when a flood event occurs. However, in the dry season when there is no threat of flooding and no flood events, this ability to cope does not go away, it is still possessed by the community. Evacuation plans, building codes, flood insurances etc. become durable features of the community and part of its internal structure. Thus, the ability still exists in the dry season, although the conditions for flooding are not present.

Abilities are deemed as special types of dispositions for abilities share the commonality that they both can exist without the manifestation of the action (Clarke, 2009; Maier, 2014). According to Clarke (2009, p. 323), "to be able to perform an action of A-ing, it is said, is to have a disposition or power to A." Since both abilities and dispositions employ some variation of the conditional analysis, then both can be represented by counterfactuals[6] and expressed in the locutions of if-then statements (Clarke, 2009; Choi and Fara, 2014),

[6]Counterfactuals are markings of dispositions and abilities. Counterfactuals represent conditional statements that are used to express dispositions, which reflect that dispositions are manifested when their bearer is in a certain condition (Clarke, 2009).

for example, *if the community experiences a flood event, then it will cope.*

However, caution must be adhered when it comes to relying solely on the conditional analysis. The insufficiency of the conditional analysis was revealed through the establishment of *finkish* (Martin, 1994) and *masking* (Bird, 1998) dispositions in dispositional theory. Finkish dispositions are dispositions that change over time due to a change in the internal properties or stimulus required for an entity's disposition (Martin, 1994; Lewis, 1997). A classic counter-example to the conditional analysis is the fragility of glass whereby a glass can lose its fragility (disposition), for example, if the external condition for its breaking is changed (Martin, 1994, p. 1):

> A piece of glass can be fragile for an hour and cease to be fragile for an hour. This change of disposition can be arranged by means of a change in temperature. A disposition and a change of disposition need not manifest themselves. The glass need not actually break during the hour that it is fragile.

However, in the theory of masking dispositions or antidotes, the disposition is not lost, but rather is retained although something blocks an entity's disposition from manifesting (Bird, 1998). A simple analogy given by Bird of antidotes at work is the disposition of a poisonous substance: "one can ingest a lethal dose of poison, yet

not die if a suitable antidote is administered soon enough" (Bird, 1998, p. 228). What antidotes highlight is that the causal basis and the stimulus at times does not result in the manifestation of an entity's disposition, but this does not mean that the causal basis and disposition is not present within an entity (Bird, 1998).

To re-iterate, the existence of resilience as an ability does not necessitate that both the actor or system and the condition for manifestation (e.g. some threat or disturbance) being present at the same time. Such an ability can be retained by a social object even though a threat or disturbance has not been formed or perceived. In the absence of a specific identifiable threat or disturbance, the system retains a general resilience. It is for these reasons the categorisation as resilience as a referential quality collapses on the ontological traits of an ability and instead resilience is dispositional by nature (Daniel, 2014).

4.5 Aligning Resilience to BFO

In BFO, dispositions are realizable entities and therefore inhere in some material entity that bears the disposition because of its physical makeup and is realised in some process (Smith, 2015; Arp et al.,

2015). Aligning resilience to the category Disposition of BFO provides a formal systematic way of unpacking entities and their relations to other entities, by taking the guesswork out of explicating these relationships. The material entity is some actor or system and the realising processes are some coping actions that the system or actor performs through which the disposition to be resilient is manifested (Daniel, 2014). For example, farmers in a community using a water schedule during drought conditions to conserve water. Furthermore, it is also implied that the existence of resilience is not necessitated on its manifestation.

Yet, Lukes (2005) states that inaction can be considered a form of action which manifests a disposition. In a resilience context, this is akin to Handmer and Dovers (1996) Type 1 resilience, which depicts a system's resistance to change (Daniel, 2014). Consider a scenario where a community ignores the possibility of flooding after a period of rain because it is not deemed a real threat. In such a case, the decision-makers may opt to not make any changes such as putting in place evacuation plans, emergency relief because the threat is not real to the community, however such inaction can produce real effects if the disturbance takes place. Notwithstanding the downside of inaction, Handmer and Dovers (1996) also stated that Type 1 resilience has the short term advantage of preserving the system's institutions by avoiding immediate decisions that can result in mal-

daptation. Thus, inaction under certain conditions can be conceived as an act of resistance to change and a way of handling unwarranted change in a society (Daniel, 2014).

In resilience thinking, the bearer of resilience is typically a social-ecological system. This system is a coupled-system, which entails communities, institutions, actors in various roles and the natural environment or biosphere, which supports human existence via ecosystem services. The social-ecological system is not static and over time it undergoes internal changes, for example, new communities are formed while others collapse, government regimes undergo changes, population increase, actors change roles, laws are enacted, rules are created, and resources are extracted from the environment at a faster rate than it can be replaced (Daniel, 2014). Despite such changes to the internal structure, the identity of the overall structure as a social-ecological system remains intact (Daniel, 2014).

A social-ecological system as an entity can be deemed as a continuant (Daniel, 2014), since it persists through time and maintains its identity even though it undergoes changes (Smith, 2015; Arp et al., 2015). Material entities are continuants but a further specification can be made based on the fact that the social-ecological system consists of other material entities such as people, organisations, natural

resources such that the social-ecological system is an object aggregate (Daniel, 2014). For example, if a farming community is taken as a social-ecological system, which comprises of a group of farmers, farming on lands in close proximity to each other, at a given time slice the social-ecological system as an object aggregate would have farmers who are members of the farming group, land, water resource, soil, crops as material parts.

According to Morriss (2002) this consideration on the nature of social concepts is not the norm in social science domain. Morriss argues that:

> Most writers in the social sciences pay far too little attention to these preliminary problems, with the result that they go rushing off in the wrong direction, pursuing the wrong quarry. When they eventually catch it, they may claim to have caught the beast they sought; but how do they know, if they didn't know what they were looking for? (Morriss, 2002, p. 2)

Morriss (2002) underscored the need for such conceptual considerations of entities so that one knows the type of entity one wants to investigate. What he is advocating for is a philosophical nuance in social research, whereby attention is given to the ontological traits of entities. In doing so, one has an orientation, a heading of some sort

on what it is one wants to theorize and investigate (Lawson, 2015). An understanding that resilience is a disposition, for example, calls for analyses into what gives rise to the inherent nature on one hand and the exercise of this ability on the other in which resources are deployed and negotiated in the process. In addition, occurrences of inaction must also be investigated since dispositions need not be exercised to exist. In a particular context, inaction can be a way of dealing or coping with unwarranted change by a system, community or actor. Having deduced that resilience is a disposition (Daniel, 2014), a similar examination is undertaken for the concept of social power in Chapter 5.

Chapter 5

Social Power Conceptualised

The inescapability of power and its pervasiveness that is seen, interweaves itself in the interactions with others and felt in our social lives, makes power a salient object of scientific investigation. Like resilience, power is also a polysemic word due to multiple disciplines defining and theorising power for their research agenda (Lukes, 2005). The purpose of this section is to draw on established notions of social power to determine its underlying structure. To this end,

power as agency, structural power and the categorisations of power within formal accounts of the social world are used in this analysis.

5.1 Social Power as Agency

Social Power is referred to as an omnipresent or pervasive force that invisibly organises or structures society through institutions (religion, family, law) and social interactions (Foucault, 1978; Sturm and Antonakis, 2015). Early conceptualisations of power linked the term to either enforcing one's will, influence or dependency (Weber (1947); Dahl (1957); French and Raven (1959); Emerson (1962); Burt (1977)). These notions share the commonality that power is possessed by an individual, thus underscoring an agential nature of power (Clegg, 1989).

Apart from agency, power is also framed asymmetrically whereby an individual exerts control over another. For example, in Weber's notion of power, power is "the probability that one actor within a social relationship will be in a position to carry out his or her own will despite resistance, regardless of the basis on which this probability rests" (Weber, 1947, p. 152). For Weber, power (in German

"Macht") is a general category, qua being of social action[1] and is separate from imperative control or authority (in German "Herrschaft") another general category, which is defined as "the probability that a command with a given specific content will be obeyed by a given group of persons" (Weber, 1947, p. 152).

According to Clegg (2013), authority is a type of power. Power and authority in this sense do not occur in a vacuum. Their exercise rests in the belief of actors that there is some "legitimate order" or "structure of dominancy" such that the actor commanding or exerting will anticipate the other to acquiesce (Weber, 1947; Clegg, 2013). However, each structure of dominancy would have a set of rules governing the social interaction (for e.g. teacher–student, landowner–land tenant), and the domination (structure) is tied to power (agency) via rules (Clegg, 2013). Thus for Clegg (2013, p. 62), authority is "the exercise of a 'rule' located in a 'structure of domination', in which resides the 'capacity' to be able to 'exercise' that 'rule' more or less authoritatively."

Other researchers who held this agency and asymmetric view of power, such as Dahl (1957), argue that the existences of a power-over relation are governed by certain properties which must be satisfied. Firstly, the actors must be connected in some way for such

[1]The social refers to the domain of Sociology, which Weber (1947, p. 88) stated is concerned with "the interpretive understanding of social action [...] to arrive at a causal explanation of its course and effects."

a dynamic to present itself (Dahl, 1957). Secondly, there must be a time sequence present wherein A's actions of power occur before B's response; lastly, A must have an influence over B which is manifested through the opportunities available to A to act upon (base of power), and the means through which A exerts his will effectively over B (Dahl, 1957).

On the other hand, for French and Raven (1959) and Emerson (1962), this power-over relation is governed by the property dependence. In the latter, the dependence is solely between the two actors involved in a relation, which upholds the actor-oriented view of power-over conceptualizations of power. It is out of this dependence power dynamics evolve since "these ties of mutual dependence imply that each party is in a position, to some degree, to grant or deny, facilitate or hinder, the other's gratification[...]the power to control or influence the other resides in control over the things he values[...]" (Emerson, 1962, p. 32). The power of an actor A over actor B is equal to the dependence of actor B on actor A and is thus defined as "the amount of resistance on the part of B which can be potentially overcome by A" (Emerson, 1962, p. 32).

However, in the former case, this dependence can occur between an actor and its environment. According to French and Raven (1959), if A's state changes then this can invoke a change in A,

which can impact on A's influence on B and thus B's response to A. This connection to A's environment subtly points to the dichotomy of power i.e. the structural mechanisms of the social space, which enables an actor to act. This notion of A having power over B is a common manifestation of power that is visible at all levels within the social space, e.g. from interactions between the farmer and farming group, to the regional or national level between farming group and State agencies in the context of resource distribution such as agriculture lands.

This asymmetric conceptualisation also extends to Foucault's notion of power. Power was conceived by Foucault as "a mode of action which does not act directly or immediately on others[...]it acts upon their actions: an action upon action, on existing actions or on those which may arise in the present or the future" (Foucault, 1982, p. 789). Power as a mode of action is made possible due to resource disparities amongst actors, and exists only when manifested (Foucault, 1982). Furthermore, power manifests through social networks, and its "action upon action" is not to be considered as having negative but rather productive effects (Foucault, 1995). Power produces entities such as objects, truth, knowledge, while at the same time shaping the individuals involved (Foucault, 1995). Power also encompasses a structural element, for Foucault (1982) noted that the field of "action upon action" through its effects, organises the pos-

sible actions of others within a social network. Although Foucault denies that power is possessed by individuals (Foucault, 1978), this action emanates from an actor, thus highlighting the agency inherent in the concept. Through this type of power, whether it is power over self or the conditioning of one actor by another, the exercise of power occurs e.g., through acts of punishment, surveillance, and other techniques of government (management of resources) (Foucault, 1982).

5.2 The Structural Side of Social Power

Structural power is based on "systematically structuring possibilities for action" (Allen, 2016). Layder (1985) and Hayward (2000) for example recognised power as being woven into the fabric of social structure, and that structural power 'constrains' or 'shapes' the actions of actors. For Hayward (2000), an agent centric view of power is one-sided and omits the impact of social constraints (structure) on agents capacity to act or not act (Hayward and Lukes, 2008). Structural power is a result of the multiplier effects of social actions in a network, that is exerted on actors within a network, but cannot be entirely pinned down to the intended action of an actor or particular group (Hayward and Lukes, 2008). This effect then shapes what is

socially possible for actors within a social network, which is reflected in Hayward's notion of structural power to "a network of boundaries that delimit, for all, the field of what is socially possible" through mechanisms of power such as rules, norms, customs etc. (Hayward, 2000, p. 3).

Conversely, Layder acknowledged that a complete theorisation of power accepts both the structural and agential forms of power although "structural power is relatively independent of agency, [...] agency, for example in the form of exercise of power, is always subject to the influence of structural power" (Layder, 1985, p. 133). Layder conceived power as being central to social structure, but offered no clear distinction between the concepts of social structure and structural power. Essentially, both notions were viewed as "asymmetric social relations" that constrained the agency of actors (Layder, 1985). These asymmetric relations are created, reinforced and maintained through resource disparities amongst actors within a network.

Through an example of the relation between professional actors and agents, Layder illustrated how the structural power results from the enduring features of the job market. The endowment of agents with knowledge of jobs and connections to directors creates an asymmetry between agents and actors, which is reinforced and maintained

by the nature of the job market that offers short-term employment through varied employers, and in turn shapes the agents' power over actors (Layder, 1985). Consequently, structural power is defined as "a set of (prior) reproduced asymmetric social relations between groups based on the possession of, and restriction of access to, certain resources" (Layder, 1985, p. 134).

Thus far, social power has been discussed along the lines of agency and structure, but to what end? One such reason put forward by Hayward and Lukes (2008) in their dialogue about the location of power in structure and agency was to facilitate the critical evaluation of power relations in order to assign responsibility for injustices in a given context. For such a charge, Lukes argued that the decomposition of power into structural power and agential power was unwarranted. He opined that an agency perspective adequately draws out the extent of actors' capacities to intervene, correct or perpetuate injustices experienced by other actors and identify the actors in the process (Hayward and Lukes, 2008). Notwithstanding this position, Lukes also acknowledged that structure does indeed shape the agency of actors by placing limits on actors or making available possibilities, which is an ascription of structure in itself not power (Hayward and Lukes, 2008). As he puts it:

> Unlike Hayward, however, I continue to think that the concept of power should remain attached to the agency that op-

> erates within and upon structures. Consider, again, the institutional and other frameworks that shape the constraints and opportunities individual and collective agents face...In the case of urban restructuring and white flight leading to disadvantageous housing for the poor and black, the contribution of political, bureaucratic, and corporate actors may be minor or minimal. However, to the extent that such actors could realistically make a significant difference to the availability of housing for the poor and black...– whether by challenging exclusionary zoning decisions, say, or by extending the jurisdictional reach of decision-making bodies – then, to that extent, the most appropriate explanation will be in terms of power. Nevertheless, to the extent that white flight and urban deindustrialization are the uncoordinated outcomes of multiple actors pursuing their varied respective interests, with consequent effects on the housing available to the poor and the black, then, to that extent, the explanation must indeed be structural (Hayward and Lukes, 2008, p. 11).

Although an agency perspective of power was defended by Lukes, it did not address the polysemic nature of the concept and the consequent quagmire of its application. In Lukes' revision to his seminal piece *Power: A Radical View*, he espoused that:

> there is, indeed, a single, comprehensive, extremely general or generic concept of power common to all cases and that, in

> application to human agents (individual and collective) it exhibits two distinct variants (which we can provisionally, but misleadingly, label as the concepts of 'power to' and 'power over'), where the latter is a subspecies of the former [...] (Lukes, 2005, p. 69).

Lukes argued that the concept of power by nature is dispositional (Lukes, 2005). In line with this ontological stance, power is thus framed as: "agents' abilities to bring about significant effects, specifically by furthering their own interests and/or affecting the interests of others, whether positively or negatively" (Lukes, 2005, p. 65). For Lukes (2005, p. 74) these effects are related to the production of "subordination, subjugation, control, conformism, acquiescence and docility."

A dispositional view of power was put forward earlier by Harré (1970). Adhering to a realist philosophy of science Harré states that "power of a thing, material or person X has the power to A = if X is subject to stimuli or conditions of an appropriate kind, then X will do A, in virtue of its intrinsic nature" (Harré, 1970, p. 85). This definition of power is similar to what BFO attributes as a disposition. In essence, to describe some entity as having the power to do something is to describe some disposition of the entity (Harré, 1970).

Embracing a dispositional view led to notions of power as agency, which focused on the exercise of power (e.g. Dahl (1957); Foucault (1982)) being criticised by Morriss (2002) and Lukes (2005) as subscribing to what they called the "exercise fallacy" and the "vehicle fallacy." The former refers to the reduction of power to simply the actions of doing, which negates the fact that one can have power without taking action (Morriss, 2002; Lukes, 2005). Both authors attributed this to the agenda of operationalisation of power within Sociology and Political Science. For Lukes, such a limited focus on the exercise of power trained one to look for the evidence of doing and thus miss opportunities of inaction that also have power effects over others (Lukes, 2005). In contrast, the vehicle fallacy is related to the equation of power to the resources that provide the means for power such as assets and status (Morriss, 2002; Lukes, 2005).

Overall, power as a disposition promotes the understanding that power is a "capacity to bring about effects" (Morriss, 2002) and thus exists even when it is not manifested through actions. By examining the nature of power and categorising it as a disposition, these researchers provided an answer to the question: What kind of *entity* is power? This is a position that I uphold, for to talk about capacities or abilities of an entity is to refer to the dispositions of that entity. I will defend this position in Chapter 6.

To summarise what has been discussed about power here, power

as agency refers to the abilities of actors to perform some action over others either to the benefit of the former or the benefit of both parties, whereas structural power is the network of social relations and rules that structure what is possible for actors. In the next section, a look at power from the perspective of social ontology is discussed. I will draw on the structure of the social world presented by Lawson (2012) and Searle (1995, 2006) and compare how power is situated within this organisation.

5.3 Power and Social Ontologies

Lawson (2012) viewed the social world as an emergent phenomenon that comprised of organising elements, which are "causally and ontologically irreducible." In the context of resilience, an emergent phenomenon such as community resilience that emerges due to the interactions and behaviours of community members cannot be reduced to the individual members that make up the community at the local level. Therefore, community resilience does not depend on each member of the community being individually resilient, rather this resilience occurs due to the organisation and interactions of the members at the lower level who form part of the community structure. Since the emergent phenomenon emanates from the interac-

tions of lower level entities, then the social world can be ontologically deemed a process (Lawson, 2012).

In Lawson's ontology, social reality is structured along the following categories: community, collective practices, rules, rights, obligations, positions, processes, events and social relations (Lawson, 2012). For example, collective practices are essentially activities that members of a community participate in such as farmers of a farming group conducting group meetings every month to discuss issues impacting their livelihood. A collective practice is the "accepted way of proceeding with regard to achieving a particular outcome...[and] involves the participation of all members of the community" (Lawson, 2012, p. 360).

Rights and obligations are properties of collective practices, which demarcate social positions held by individuals in a community. Individuals in the positions become the bearer of those rights and obligations, which are evident in the collective practices they participate in, and in virtue of the position they gain "a status or identity" (Lawson, 2012). Lawson (2012) regards rights and obligations as forms of power that have "influencing [effects] on the behaviour of others" in a social relation. Power in this sense, is aligned to the structure which imposes effects on the agency of individuals. However, the

mechanisms of power i.e. rights and obligations presupposes that social relations are asymmetric (Lawson, 2012).

As discussed in Section 2.6, for Searle (2006), the underlying structure of social reality can be captured in the axiom "X counts as Y in C" whereby X is an object, Y is a status function imposed on the object, C is the context, from which institutional facts emerge (Searle, 1995, 2006). But where does power lie in this axiomatic representation of the social world? In the axiom, the Y term (accepted status function) is imposed on X (physical object), based on the intentionality imbued in the count as relation, thereby giving X certain powers (Searle, 1995).

Power as an entity emerges through mechanisms of status functions (Y) a sort of structural power, albeit Searle also recognises an agential form of power. Power as agency is taken as the "power to do something or constrain someone else from doing something" and is logically represented as "we accept(S has power(S does A))" (Searle, 1995, p. 104). If Mary is a landowner, by virtue of the conditions that made her come into the possession of land (which constitutes a procedure of other institutional facts) and obtain the status function landowner, which is recognised by the State, she would now have certain powers qua being landowner, for example, the right to sublet the land to a farmer, and the obligation to pay the state land

tax each year. Such obligations and rights are termed deontic powers upon which agential power rests, and according to Searle these deontic powers give "institutional independent reasons for action" (Searle, 2006).

Searle argues that accepted institutional status functions create the space for deontic powers to emerge. These deontic powers entail rights, obligations, authorisations, permissions, duties and so forth. However, the existence of status functions and deontic powers in social reality are dependent on language, which provides the semantic substance of these entities (Searle, 1995, 2006). For example, landowner, Ministry of Agriculture, Director of farming group, land rights, obligations to pay land rent and land tax, permission to use land are not language independent objects such as land, tree and river. One can observe in reality *a person on a piece of land*, but one cannot connect this cognitively to the status function 'landowner' or 'renter' (a person that has permission to use the land) without, according to Searle, the representations or meanings provided by language. It is through the assignment of status that a physical entity is said to have power (Searle, 2006).

Thus far, it is understood that the social world constitutes institutional facts, which carry status functions and deontic powers that are imposed on social objects, and these deontic powers enable

agential power of individuals. Akin to Lawson, power is reduced to rights and obligations, which represent a structural sense of power; and positions in Lawson's ontology would be status functions for Searle. The collapse of power to rights, obligations, permissions, authorisation, and so forth muddies the concept of power. For example, Searle (2006, p. 64-65) stated that when deontic powers are assigned to an individual such as "my having a thousand dollars is not a matter of my having a wad of bills in my hand but my having deontic powers. I now have the right, i.e. the *power*, to buy certain things." Two things are occurring here: i) The status of money, produces a 'deontic power' such as the right to purchase goods; ii) This power is transcended from the structure to the individual in the form of rights, hence a right is the power to do something.

But having the right to do something is not the same as having the ability or capacity (power) to do so at the level of the agent (Zaibert, 1999; Miller, 2014). In the context of landed property, Zaibert stated that one can have the right to own a property but not necessarily the power to sell the property (Zaibert, 1999). Every person qua being a member of society, has the right to participate in the exchange of goods and services. One's power to do so is dependent on several factors for example, the availability of funds, distance to the market, the opening hours of the stores, possession of a credit card in the case of online purchases etc..

Rights are defined in the Oxford dictionary as "an entitlement to have or do something" (Waite and Hawker, 2009), places boundaries on what is possible for me to do or receive within the community. In a sense rights provide a scope for action or an affordance for action (Varela and Harré, 1996). As a landowner, I have the right to sublet, the right to put a structure on the land. These are scopes or bounds on what is possible for me to do on the land, but not my actual ability to do so for that is dependent on the availability of resources. If the other deontic properties are examined a similar claim can be made that obligation, permission, authorisation are not power per se. One reason being that these properties are not dispositions by nature. As stated earlier, the disposition view of power is supported and in the next section a deconstruction of this argument is undertaken to show why power is a disposition.

5.4 Power as a Special Type of Disposition

In the previous section, a review of social power concepts was presented from authors who contributed to the social power debate. Additionally, social ontology perspectives of social power were integrated to illustrate its genesis in social reality. Since an ontological

perspective is adopted throughout this work, it was deemed useful to understand where the phenomenon of power fits within other social ontologies.

Power was described earlier in the chapter as a polysemic concept conceived broadly as being either structural or agential in form. The agential form of power is similar to resilience in that power as agency relates to the inherent nature of power as it is tied to the ability of an actor to perform some action over someone or in concert with other actors. The former referring to the *power over* or asymmetric qualification of power and the latter to the *power to* qualification. It should be noted that *power to* qualifications are not restricted to collective action but also to individual actions such as the power to spend my own money. As discussed in Chapter 4, abilities are special types of dispositions (Clarke, 2009; Maier, 2014) and as such the markers of a disposition put forward previously to categorise resilience also apply to the concept of power. To recall briefly, power being a disposition implies that:

1. It is a realizable entity (in the BFO sense), which inheres in some material entity and is manifested when the material entity is in some circumstance or condition (Smith, 2015; Arp et al., 2015).

2. The manifestation of power is not a pre-requisite for its existence as a disposition, thus someone can have power without demonstrating one's power (Morriss, 2002; Lukes, 2005).

3. Inaction can manifest a power disposition (Lukes, 2005). In certain circumstances inaction by an actor can produce power effects on other actors either intentionally or unintentionally (Lukes, 2005).

If the agential forms of power are categorised as dispositional, where does the structural forms of power fit? Are they thrown out because they are not expressed in their locution as an ability of some sort? Consider Hayward's notion of structural power or power de-faced: "power is a network of social boundaries that constrain and enable actors" (Hayward, 1998, p. 2). These social boundaries comprise of "laws, rules, norms, customs, social identities, and standards, that constrain and enable inter- and intra-subjective action" (Hayward, 1998, p. 12). There is some semblance here to Searle's deontic powers as rights, obligations, permissions, and authorisations act in a similar manner to enable an actor's agency (Searle, 1995, 2006).

Based on this conceptualisation, power can be characterised as a social network or system of sort that performs two actions: action of

constraining actors and the action of enabling actors. This idea of power as a social network or system is further compounded by the fact that within the social fiat boundaries[2] created by laws, rules, standards etc. are people that operate and live their lives. According to Hayward (1998), these boundaries demarcate what is or is not permitted, how to carry out certain social procedures thereby structuring what actions are possible for all actors, producing emergent effects on these actors. Layder's definition of structural power is also similarly defined as "a set of (prior) reproduced asymmetric social relations between groups based on the possession of, and restriction of access to, certain resources" (Layder, 1985, p. 134). Once more, power is reduced to a network or system of asymmetric social relations. In both notions, power gains a materiality. It becomes animated as it can be considered a system that functions by producing effects on people.

The essence of power shape-shifts depending on its context, from materiality when it is the structure, to a disposition when it is examined in dyadic relations. If power were a material entity (taking material entity in the BFO sense), then locutions of an individual inherently having power collapses because a material entity cannot logically inhere in an individual. One could only talk about the

[2]Fiat boundaries are boundaries created by social actors based on system of law, beliefs or customs and pertain to social objects (Smith and Varzi, 2000).

systemic effects of power on a person (Foucault, 1982) and how a person through actions reinforces or changes the system (Hayward, 1998).

Such shape-shifting renders logical inconsistencies in how power is theorised and then these inconsistencies transpire to how power as a concept is treated methodologically and practically. What is being alluded is that power in one context bears physical traits, qualities, other material parts that come together to form power as a whole entity that one can identify readily as power. In a next context, power switches to being inherent that requires some action to manifest itself. Such metamorphosis is illogical for example, I as a material entity cannot in one context appear to be physical in sight, touch, hearing and participate in a series of social actions in my daily life and then in a next context be inherent to some material entity, where I only appear real in social actions that I manifest myself in.

In a simpler example, the ability to run is a natural power, a disposition that is inherent in a person and is exercised through the act of running. Running is a process, an occurrence that requires the involvement of a material entity (person or animal). The actual running occurrence that spans from 17:00 to 18:00 on Sunday is not a material entity since it does not bear physical attributes that appeal to our physical senses. Essentially, *running* is spatiotemporal in

nature and is captured by the movement that occurs across space and time, made by the person who engages in the *running*. The person is a material entity that has physical qualities and dispositions, which are manifested through the action of his/her legs and arms through space and time. Here, it is easy to make the distinction that running is an occurrence and not a material object.

As Morriss (2002, p. 9) puts it, "verbs describe happenings, actions, events, occurrences and the like; but 'power', I shall suggest, is an entirely different logical category." The unpacking of power as both a material entity and disposition makes explicit the logical inconsistency of the concept. This stems from the semantics of the term power in English parlance and the expansion of the concept in social science (Morriss, 2002). Indeed, "power" is a noun (Morriss, 2002) and according to Morriss (2002) and Clegg (2013) it is derived from the root word "to be able to," however, power in English parlance encapsulates both the capacity and its exercise, thus veering away from its root (Clegg, 2013). The structural form of power loses the root of the word through the conceptualisation of power as a "network of social boundaries" or "asymmetric social relations."

To preserve the intention behind the structural formulation of power, the network of social boundaries or asymmetric social relations can be considered as a social system having an ability to

perform some actions that produce effects on individuals. In this regard, the social network is not power, but rather it is a material entity disposed to power. The basis of its materiality lies in the fact that a network contains people and resources[3] with people occupying various roles in different social settings and through these roles they have rights, duties, obligations, norms, access to resources or lack thereof etc.. Given that the social system is in some socio-economic setting, the system will shape, reinforce, constrain or enable the behaviour of individuals who are part of the system. In this sense, structural power is also a disposition.

To recap, this chapter began by reviewing the two strands of social power in social theory: power as agency and power as structure. Power as agency is related to people's abilities to perform actions over others that have consequences for those involved, while structural power relates to the structuring effects on actors that are produced by the social structure. Subsequently, the notion of power within social ontology was discussed, which takes the form of rights, obligations, permissions that enables actors. Following Morriss (2002) and Lukes (2005), a dispositional view of power is supported based on the principle that abilities are special types of dispositions. But what does it mean for power to be a disposition?

[3]Resources here not only encompass land, machinery, crops, notes of money etc. but also documents which encode rules, laws, institutions e.g. marriage certificates, degree certificates, land titles etc.

In the next chapter, a closer look at both resilience and power as dispositions are undertaken.

Chapter 6

A Closer Look at Power and Resilience Dispositions

Having argued for power being a special type of disposition, what is the formal definition of power being a disposition? The basic markers of power being a disposition was put forward in Harré's general theory i.e.: "to say that a thing has power is to say what is possible for it, for that is what it is to talk of its dispositions," such

that "power is the power to G [manifest action], so G is what does happen or might be expected to happen when a [a material entity] is in C or were to be in C [condition]" (Harré, 1970, p. 101). However it should be noted once again that power does not need to manifest for a to have power (Harré, 1970). By replacing the phrase "power is the power to" with "resilience is the ability to G[...]" this formal definition is also applicable to a dispositional view of resilience.

What gives rise to the disposition is a debate between intrinsic and extrinsic dispositions, i.e., whether dispositions are solely internally grounded by properties of a or if in some cases dispositions are externally grounded relying on properties of a and *a's* environment (McKitrick, 2003; Bauer, 2011). For dispositions that are internally grounded, a change in disposition results in a physical change in the material entity (Smith, 2015; Arp et al., 2015). This is separate from the discussion on the general checklist of dispositions elaborated earlier to which power and resilience subscribe. The focus now is on the material entity or the bearer of the disposition as to what of the bearer, intrinsic to or extrinsic to it, which the disposition hinges on, i.e., as McKitrick (2003) states "its circumstances of possession." In taking a closer look at resilience and power as to whether the disposition is intrinsic or extrinsic paves the way forward for postulating what is the relation between power and resilience. Examples from case studies are used to examine what gives rise to an actor's social

power before validating in my field data. Firstly, a look at agro-pastoral households in Makueni District, Kenya, (Ifejika Speranza, 2006) is used to establish what give rise to power dispositions. Later on, a study on land rights and agricultural productivity in Akwapim, Ghana (Goldstein and Udry, 2008) is drawn upon to examined the proposed relationship between resilience and power.

6.1 The Extrinsic Nature of Social Power

In the Akamba community, a patriarchal community within the Makueni District, the male head of household a has the power to sell his family's livestock or land G (Ifejika Speranza, 2006). This is due to the social and cultural institutions of that community, whereby the male member has the right to own and control these resources or assets C (Ifejika Speranza, 2006). When his power to sell the family's resources is put into action through a sale negotiation G, only then is his power exercised. However, the male head of household will always retain this power regardless if he participates in the sale process as long as the condition i.e. the patriarchal set-up is present, and he is in possession of resources. The condition which is external to the individual but a property of the community as a whole. If the same community tomorrow becomes matriarchal where women have

the sole ownership of resources and the power to sell the family's assets, then a man's power to sell resources will be displaced.

Under two different conditions, i.e., patriarchy and matriarchy respectively, the ability to sell resources is attributed to different groups of people (men in the former and women in the latter). Therefore, the power disposition does not only ontologically rely on the internal properties of men and women for e.g. their knowledge of markets or how to negotiate a sale, but its ontologically dependent on the extrinsic markers of the social environment that the members of the community belong to, in this case the condition of patriarchy and matriarchy. Taking the community to be a replica of itself with the same distribution of male and females, households, farming activities but the socio-cultural conditions differ in the two cases, then the power dispositions of men and women to control and sell resources under the condition patriarchy is not the same as the power dispositions under the condition of matriarchy although the men and women to which the disposition belongs are not physically changed in both cases. Thus social power is externally grounded and thus extrinsic.

In the typical example of fragility, it is straightforward to see that a glass vase's disposition to break (fragility) hinges on the internal properties e.g. the brittleness of the vase and thus fragility is

internally grounded and thereby an intrinsic disposition (Armstrong et al., 1996; Mumford and Anjum, 2011; Bauer, 2011). Its antithesis, extrinsic dispositions are "partially ontologically grounded solely in some property or property-complex of the environment or of some object(s) other than the object bearing the property in question" (Bauer, 2011, p. 84). A distinction between natural powers and social powers by Varela and Harré (1996) highlights the intrinsic and extrinsic properties attached to powers. According to Varela and Harré (1996), "the grounding site of natural powers is the asocial and material organism: the condition of enablement" which relates to the internal properties of humans.

On the other hand, social power which Varela and Harré termed "personal powers" is grounded externally by social acts, with these powers being possessed by "the person and not the organism because their enactment can only be accomplished socially, not individually" with person being a social category (Varela and Harré, 1996). For example, individuals qua being human organisms have the natural power to breathe, walk, smile. People qua being social members of society may have the power, depending on their role, to bargain for resources as in the case of a Director of a farming group seeking the interest of a group of farmers or the power over a group of people as the case of a community chief. Therefore, properties that are not tied to the innateness of the human organism but are external to it, and

are required for the circumstance of possession of an ability implies the extrinsic nature of the disposition. In this regard, social power is not only tied to internal properties of an individual or a group but it is also related to external properties of the environment.

6.2 The Extrinsic Nature of Resilience

To examine what gives rise to a system or actor's resilience, the previous example on agro-pastoral households (Ifejika Speranza, 2006) will be used once more. Within the patriarchy, family structure is either monogamous or polygamous with the man being the primary provider. Regardless of their contributions on the farm and in the household, women do not have access to or control of income that comes from the sale of goods and livestock. The women's access to money comes from other activities they participate in such as basket and rope making, women's crops and poultry (Ifejika Speranza, 2006). Moreover, when it comes to the land ownership, the wives do not share these rights with their husband. The land is solely vested in the husband and he controls how the plot should be utilized for crop production and livestock rearing; however the wives have access to use the land to facilitate agricultural production (Ifejika Speranza, 2006).

In this patriarchal society, the man has the right to own and control assets (crops, livestock and land) while the women cannot own assets but possess the right to access these assets through her husband for productive use. Therefore men and women have differentiated power dispositions in the household within a patriarchal environment. Upon the death of the husband, a woman's right to own her husband's assets is lost and the ownership rights are transferred to male relatives with her right to access being in the hands of the male relatives (Ifejika Speranza, 2006). If one considers the general livelihood resilience of households[1] run by widows and men, then the socio-cultural condition of patriarchy is a property of that community that contribute to differences in resilience capacities between men and women through the access of assets. The point here is to establish that the "circumstance of possession" of the resilience disposition of a bearer is also dependent on external properties thus making it an extrinsic disposition. In this case the same condition is tied to both the possession of resilience and power and the production of their asymmetries between men and women.

If the resilience of the collective community is considered, one may classify the patriarchy as an intrinsic feature of the community

[1]By livelihood resilience, I refer to "the capacity of all people across generations to sustain and improve their livelihood opportunities and well-being despite environmental, economic, social and political disturbances" (Tanner et al., 2015, p. 23).

amongst other system properties such as identified by Carpenter et al. (2012) such as openness, diversity, feedbacks, reserves, nestedness etc.. However there are other properties that are external to the community to which the resilience of the community is related. This is illustrated when the resilience of a community to specific disturbances, stresses or threats are integrated.

For example, a farming community has the disposition to cope with a pest invasion *D1* in the dry season. Given the there is a threat of flooding in the rainy season, the same community also has the disposition to cope with flooding *D2* during that period. In both cases, the specific ability has a specific dependence to the external condition thus rendering separate disposition tokens in each context, therefore $D1$ is not equal to *D2*. This is implied in resilience literature through the claim that focusing on the specific resilience of a system to a disturbance may cause the general resilience of the system to be lost (Folke et al., 2010; Carpenter et al., 2015; Folke et al., 2016). Once more, supporting an extrinsic dispositional view of resilience does not negate the disposition markers to which resilience subscribe.

Thus far, power and resilience were established as dispositions based on the central idea that they are abilities and these abilities subscribe to disposition markers. It was further argued that apart

from intrinsic properties that give rise to the abilities, extrinsic properties are also tied to these abilities to provide a "circumstance of possession" (McKitrick, 2003). These extrinsic properties are related to the social and physical environment the bearer is in.

6.3 The Vehicle Fallacy of Resilience

In the resilience literature, there are other external properties, which actors or systems possess that are attributed to their capacity to cope with some change. These external properties are said to "cushion" or determine an actor's resilience, which are in the form of capitals and entitlements (Ifejika Speranza et al., 2014). The former encompass social, financial, human, physical and natural capitals whereas the latter are the actors' rights and access to capitals (Ifejika Speranza et al., 2014).

Folke et al. (2005) as well note that social capital (knowledge, trust, participation that evolves from social networks), and cultural capital (social memory/experiences) shape resilience of social-ecological systems. Adger (2003) also corroborated that endowments and entitlements determine one's ability to cope with stress. In the case of power, some of these capitals are considered as "means of

power" which "can be a clue to its distribution" but not power as a disposition (Lukes, 2005). Reducing power to its means, for example, assets or status is to violate the dispositional view of power by committing the vehicle fallacy (Morriss, 2002; Lukes, 2005). Could this vehicle fallacy also apply to resilience?

In resilience scholarship, endowments (ownership of resources) and entitlements (access to resources) are said to contribute to actors' abilities to cope (Adger and Kelly, 1999; Dulal et al., 2010; Ifejika Speranza et al., 2014). Efforts towards building resilience capacities are centred around actors growing their resource base through network participation, collaboration and learning (Tompkins and Adger, 2004; Folke et al., 2005; Ifejika Speranza et al., 2014). Thus possessing some combination of resources and entitlements are likened to being resilient, building resilience, shaping resilience or having resilience (Cutter et al., 2008; Ifejika Speranza et al., 2014). In light of the dispositional view of resilience advocated for, the question to be answered is whether or not these capitals that serve as proxies for resilience assessment ground resilience or provide the circumstance for possession. If a farmer has land, water, belongs to a farming network, receives information and labour through this network, knows agricultural officials from state agencies, has savings, does this make him possess the *ability* to cope against livelihood stresses?

My short answer is no, for having these means does not guarantee that a farmer can manage conditions on his farms and continue farming activities during or after a disturbance, highlighting that the ability and resources are not the same. What it gives the farmer is a set of options that can be combined and used in a series of realising processes to display forms of coping. For assessing resilience, financial, physical, social, natural, human capitals are rather proxies for observations of an actor's buffer capacity (Ifejika Speranza et al., 2014).

A juxtaposition can be made to understanding the performance of an economy. To assess performance, GDP, level of foreign reserves, employment, interest rates, amongst other factors are used in some matrix to determine good, average or bad performance. However, the idea of performance itself cannot be reduced simply to employment, interest rates or the other means used to achieve performance. A similar argument is used for power, since power as an ability is not the wealth or status used as the vehicle for observing power in social relationships (Lukes, 2005).

A closer look at capitals would reveal that actors' experiences, a form of cultural capital, are intrinsic to actors of the system or community. These experiences can be concretised as plans, policies, regulations in order to manage some future event unto the system or

community (Folke et al., 2005; Cutter et al., 2008). Such experiences, which generate knowledge about a particular type of disturbance or threat are intrinsic to the actors thereby re-calibrating their ability to cope to future events (Cutter et al., 2008). A link can be made here to Bourdieu's habitus and field theory as drawn by Obrist et al. (2010). The authors stated that cultural capital shapes agency and is important for resilience (Obrist et al., 2010). Identifying part of this intrinsicness that gives rise to resilience does not negate the extrinsic properties that also ground this ability. It shows that the ontological dependence is not only by virtue of the bearer but also on properties external to the bearer since under certain conditions some abilities come into existence (Dowding, 2008). Nevertheless, resilience as a disposition means that it is foremost an ability that is manifested through some realising processes and it is not the bundle of capitals and entitlements that are used to assess resilience.

6.4 The Relation between Power and Resilience

It was determined in the previous section that power and resilience are both extrinsic dispositions meaning that there is a dependence relation between the disposition and some properties external to the

bearer. However, it should be noted that by making this claim there is an infraction when it comes to aligning power and resilience to the BFO notion of disposition. The BFO notion of disposition upholds the view that dispositions are internally grounded by intrinsic properties of the material entity, which is in line with the intrinsic disposition theory. Nevertheless, both power and resilience still possess the markers of a realizable entity under BFO and the markers of dispositions. Although the examples used in the previous section focus on varying conditions that the actors or community was under, the point is to establish that there is some external property of the environment to which the abilities (power and resilience) are related to ontologically. According to Dowding (2008, p. 247) "abilities (at least some of them) are then intimately connected to the environments in which people who have them live." This means that some forms of coping can only come into being when faced with a particular threat, stress or disturbance.

Having established a dispositional view of power and resilience, what is the relation between both entities? I postulate that power and resilience share a complementary dispositional relationship i.e. they work together to bring about mutual manifestations, which have effects. This claim is based on the notion that the social structure, which facilitates the creation of resources, rights, rules and so on also gives rise to an actor or community's social power and their

social resilience, and that both dispositions combine to result in social actions that produce effects on actors and their environment. A mutual manifestation claim denounces the single-manifestation notion of dispositions, i.e., a one to one mapping of a disposition to its manifestation that awaits a stimulus to be activated (Martin, 1996; Mumford and Anjum, 2011). It assumes that the manifestation of dispositions require dispositional pairings or partners and that the dispositions are active, for example, the manifestation of a match lighting requires the disposition of the match to light and the disposition of the match box surface to ignite the match when struck, amongst other dispositional properties (Martin, 1996; Heil, 2005). Thus a many to one mapping of dispositions to manifestation or a one to many mapping of a disposition to many manifestations is subsumed in a mutual manifestation claim of dispositions (Mumford and Anjum, 2011; Austin, 2016; Mumford and Anjum, 2017). The properties of mutual manifestation adapted from (Mumford and Anjum, 2011, 2017) form the assumptions for the relationship between social-ecological resilience and social power entities, and are as follows:

1. Power and resilience are complementary dispositions, which implies that when they are brought together they manifest and create effects. However, these effects can be mitigated

or blocked by the presence of another bearer (Mumford and Anjum, 2011).

2. Although power and resilience are complementary, this does not imply that they manifest together immediately. The manifest action can unfold slowly or quickly depending on how one disposition triggers the other (Mumford and Anjum, 2011).

3. What brings power and resilience together for mutual manifestation is the proximity of dispositions or of their bearers, which extends across space and time.

4. The mutual manifestation of complementary dispositions imply a "simultaneity of cause and effect" (Mumford and Anjum, 2011).

Support of this claim is illustrated through the study of land rights and agricultural productivity in Akwapim, Ghana (Goldstein and Udry, 2008). Although the case study did not explicitly examine the resilience of farming systems or livelihoods within the political structure of land rights, the connections made between power, land rights and productivity have implications for resilience livelihoods. In Akwapim, the economic constraint of high fertilizer cost causes farmers to engage in fallowing practices in order to build soil fertility for maize and cassava crop production (Goldstein and Udry, 2008).

Through the system of land tenure, the community chief and his officials allow members of the community to utilise lands for farming, however, establishing and maintaining one's interest in a parcel is problematic. According to Goldstein and Udry (2008), once a parcel is under cultivation, an individual's land tenure is secure, however it is during fallow periods that this security is in danger, since other members could claim an interest in the land. As a result, farmers are inclined to shorten their fallow period in order to retain their lands thereby sacrificing potential yields (Goldstein and Udry, 2008). "Rights over a particular plot of land are political[...]. Hence the security of tenure is highly dependent on the individual's position in relevant political and social hierarchies" (Goldstein and Udry, 2008, p. 1017). Thus farmers who also have roles in the chief's polity display a higher sense of security during periods of fallow, since no one will try to dispossess them from their lands (Goldstein and Udry, 2008).

Due to the social circumstance of being in the polity, such individuals have the power to control ordinary members' use of land. Ordinary members have the ability to maintain their farming activities, which manifests through the act of fallowing. This mutual manifestation produces the effect of either short crop turn over by farmers who fear displacement or dispossession of land. The mutual manifestation of power and resilience is also illustrated through the

power of market mechanisms on fertiliser and the ability of farmers to maintain farming activities, which is also realised in the process of fallowing, the effect of which is soil fertility.

To briefly summarise, in Part 2 a dispositional view of social power and social resilience was advocated on the basis that both social power and social resilience relate to abilities that a material entity bears. In so doing, the first research objective was achieved: Categorise social-ecological resilience and social power and deduce the ontological relationship between both concepts. Through a dispositional lens, the relation between social power and social resilience was proposed as being complementary in nature manifesting mutually through some realising process. In Part 3, this claim will be evaluated through a case study of farming communities in Caroni, Trinidad.

Part III

Exploring the Relations between Social Power and Social Resilience

Introduction

Resilience and Power being intangible social entities make it complex to delineate what these concepts are in the social environment, but more importantly the connection between resilience and power. The criticism of resilience (Chapter 1) draws to the forefront the question: what is the relation between social power and resilience? Having argued for a dispositional view of resilience and power in Chapters 4, 5 and 6, it was postulated that power and resilience are complementary dispositions meaning both dispositions coming together provide the necessary condition for their manifestation.

To evaluate where the connection between power and resilience lies, a field investigation on the farming livelihoods of a small group of farmers in Caroni, Trinidad was undertaken. What exists in a particular field (e.g. farming in Caroni) are the behaviours and practices of social agents (referents), which can be observed and communicated to understand how these entities (power and resilience) unfold together. Engaging with local knowledge provides a bottom-up perspective to facilitate the mapping of the referents (behaviours and practices) to the meta-level categories discussed in Chapter 2 in order to ground the meaning of entities. These linkages are explained in Chapters 8 and 9. An understanding of the farming practices should take into consideration the creation of the present day

farm spaces from the re-structured sugar lands. A look at the post-colonial transformation of Caroni as an industry and sugar producing region is discussed in Chapter 7.

Chapter 7

A Look at Farming Communities in Caroni

This chapter discusses how the creation of present day farm lands in Caroni for small holder activities emerged through the transformation of the sugar industry post-independence in 1962. The historical perspective shows that these new farm spaces did not emerge in a vacuum but were a result of the effects of global and local political power that is tethered to the colonial past of the country.

7.1 A Brief Background of Caroni

The name Caroni can refer to both the former sugar producing region located in the western part of Trinidad and the former national sugar industry. The government's decision to close the state-owned sugar industry in 2003 has indirectly shaped current farming activities in the Caroni region. At the time of its closure in 2003, the industry was the largest source of employment for the agricultural sector and controlled the majority of agricultural lands in the country (Wilson and Parmasad, 2015). From the 76,608 acres of Caroni lands available (GORTT, 2004), two-acre plots were to be distributed via lease agreement to each former worker for agricultural usage, which to this date is still an ongoing process. It is these lands that most of the participants in the sample are farming on through the ownership of state leases, rental agreements between former workers or in some cases squatting on the lands. As a result of the decades of monoculture, these plots are highly acidic and require high investments in time and money to produce viable crops (Persad and Rampersad, 2012).

The Caroni Region in Trinidad has a long-standing history of sugar production, which is rooted in the periods of slavery and indentureship, with production continuing throughout the post-colonial

era up until the closure of the national sugar industry, Caroni 1975 Limited in 2003. Although the government's decision to withdraw from sugar production was based on economics, those who have cultural ties to the industry shared an opposing view, and saw the decision as an affront to the Indo-Trinidadian community who constituted the majority of the sugar workers (Wilson and Parmasad, 2015). In a 2004 contribution to parliament on the divestment of Caroni 1975 Limited, the then Leader of the Opposition related such a sentiment (GORTT, 2004, p. 73-74):

> Mr. Speaker, this Bill is the final nail in a coffin which the PNM has been building for the burial of sugar workers for the past 27 years; sugar workers who have been the salt of this land, the sons and daughters of slaves and indentured labourers upon whose blood, sweat and tears upon this nation was built[...]. For me, today is a sad day. It is a sad day as the PNM performs the last funeral rights on the sugar industry and upon sugar workers. It was the industry to which I had given the best years of my life.

This opinion of a political slight was also noted by a field participant (2015)[1]:

[1]This sentiment was extracted from the transcript of an introductory meeting between a farmer in the sample study and myself on February 26th 2015. This meeting took the form of an open discussion on issues facing him as a farmer

> I not political but I am telling you the truth. They saw Caroni as a predominantly based Indian group. They tried to destabilise that, that was their main agenda...they closed down Caroni. They didn't see the bagasse for chicken coming from sugar. Now the farmers cannot even get poultry manure. Since Caroni closed, it like a scarce commodity[...]. And what they were not seeing was the trickle-down effect. Caroni was making a profit. Caroni involved with [inaudible], cattle, buffalypso, rice, sugar, everything. If you separate each one by itself you would see which one profitable. Sugar was making money but if everything else feeding from the sugar you cannot make money[...]. Let's put it in another context. Petrotrin losing billions a year [and] nobody complaining. When oil was $ 11 a barrel my gosh we were making money[...]recently oil was $ 111 and you losing money? What really going on? You see, you see, so politics is a nasty, nasty game.

What these excerpts point to, as Wilson and Parmasad (2015, p. 14) stated, is "a fundamental tension in Trinidadian society between industrial and agricultural models for development, and between competing political interests of Trinidadians of African origin and

and the wider farming community. The pre-designed questions were not administered in this encounter. It should be noted that interviews were conducted in a mesolectal form of Trinidad English creole. Whole transcriptions of interviews were translated to standard Trinidad English where seen fit.

those of Indian origin." The complexities of the Indo-Trinidadian ties to Caroni date back to the indentureship period which extended from 1845 to 1917 (Wilson and Parmasad, 2015). After the abolition of slavery in 1838, a new source of labour was needed to sustain production on plantations (Vertovec, 1990; Hangloo, 2012). Since the former slaves had very little interest in providing labour on the plantations, the British government created a new form of labour trade to Trinidad after noticing the success of using Indian workers on plantations in Mauritius and British Guiana (Vertovec, 1990).

The system of indentureship was a paid labour programme whereby workers predominantly sourced from India "primarily to serve a specific tenure and then be free after completing their obligations, which in most cases were agricultural" (Hangloo, 2012, p.2). These specified tenure periods lasted at least 5 years, those who remained were promised parcels of land as remuneration for extending their contracts on the plantations (Vertovec, 1990). Through the access of Crown Lands either by lease or ownership via remuneration, some former indentured workers became independent sugar cane growers (Vertovec, 1990). During the indentureship period 143,000 Indian workers were transported to Trinidad (Vertovec, 1990). After indentureship ended in the British Empire, the Indo-Trinidadian community provided the greatest source of labour to the sugar industry up until its cessation of its production in 2008 (Richardson and Richard-

son Ngwenya, 2013).

The state control of Caroni Limited post-independence was made possible due to the economic revenue derived from the oil boom of the early 1970s. In 1974, the average price of oil was $ 11.20 US (Hosein, 2007), which at the time resulted in an upswing in revenue derived from the taxation of petroleum production (Vertovec, 1990). This upswing in revenue continued throughout the decade as oil prices remained favourable and oil production increased on the island (Vertovec, 1990; Hosein, 2007). What followed was an impetus towards industrialisation, albeit a narrow form of industrialisation that pivoted around the petro-chemical sector[2] (Vertovec, 1990). By 1976, the government was in a position to gain complete control of Tate and Lyle, a multinational sugar entity that controlled sugar production on the island since 1937, and formed the Caroni 1975 Limited (Pollard, 1985; Wilson and Parmasad, 2015).

The troubles of Caroni 1975 were foreseen in the 1970s as operational costs were increasing in comparison to the variability in sugar output throughout that decade. These costs were predominantly driven by increases in the price of labour, which "have not been

[2]By 1980, oil production contributed to 71.4% of national revenue (Hosein, 2007). Today, Trinidad and Tobago still has a predominantly energy based economy with oil and gas production contributing to 34.9% of the GDP `http://www.energy.gov.tt/our-business/oil-and-gas-industry/` Accessed April 4th 2017.

matched by improvements in productivity" (Pollard, 1985). Moreover, Pollard (1985, p. 828) stated that "given its economic stake in the industry and the untold social havoc and political repercussions that would follow the allowance of any collapse, the government's continued injection of funds into Caroni is inevitable." This statement is a foreshadowing of the tale of Caroni that continued for decades until 2003. Notwithstanding the management issues that affected Caroni 1975 Limited, in the subsequent section the role of economic policies in the closing of the industry and the transformation of the sugar lands are also considered.

7.2 Changes in Sugar Policies: From Guaranteed Markets to Liberalisation

The government policy towards the agriculture sector has always been "agriculture protection" (CEPPI, 1994) which is supported by energy sector revenues. On the local level, the inability to curb operational costs and streamline production in Caroni 1975 Limited were attributed to the non-viable position of the industry (GORTT, 2004, 2009). At the global level, the politics of sugar that were negotiated in Europe also set in motion the fateful trajectory of Caroni 1975, a case of state structure (being reinforced by the hegemonic

powers of Europe) and it's agency to produce economically unfolding in the same space (Richardson and Richardson Ngwenya, 2013; Wilson and Parmasad, 2015). These economic policies that negotiated power relations are discussed below.

The Lomé Convention of 1975 replaced the Commonwealth Sugar Agreement as the standard trade agreement between Britain and the Commonwealth as Britain joined the European Economic Commission (E.E.C.) in 1973 (Francis, 2012; Wilson and Parmasad, 2015). Akin to the Commonwealth Sugar Agreement, the Lomé Convention Sugar Protocol provided a guaranteed market for raw sugar between Europe and the African Caribbean Pacific (A.C.P.) states with each country being given a quota to fulfil (Francis, 2012; Richardson and Richardson Ngwenya, 2013; Wilson and Parmasad, 2015). Unlike the former Sugar Protocol, the ACPs had to pay a new tariff for exporting sugar to Europe in the form of Cost Insurance Freight, a cost that was absorbed by the processors such as Tate and Lyle under the old Sugar Protocol (Francis, 2012). Negotiation of quotas was not done at the European Parliament level but at the level of the processing companies with Tate and Lyle being a major market player (Francis, 2012). Anything outside the quota was subjected to import tax.

Throughout the Lomé agreement, Europe protected its local

sugar beet farmers and sugar producers through subsidies that ensured that beet sugar entered the world market at low prices making it competitive with cane sugar, and at the same time multinationals enjoyed refunds and subsidies for the exportation of value added products (Raworth, 2002; Francis, 2012). While the Sugar Protocol between the EU and ACP states should encourage net importation of sugar by the EU, the EU Common Agriculture Policy (CAP) ensured that beet sugar thrived through subsidies despite being generally higher than the world market price, with the EU becomi-ng a net exporter of sugar (Raworth, 2002). Despite quotas to regulate the internal EU beet sugar output, supply tend to exceed internal demand and excess beet sugar partly makes its way on to the global market competing with cane sugar at a lower cost than the production of beet sugar in Europe (Raworth, 2002).

Although, there was a guaranteed market, Caroni 1975 Limited's production cost of US $ 679 per tonne was high in comparison to other ACP members (GORTT, 2009). As outlined by the Minister of Finance in her contribution to the Senate:

> I want to put on the record that it is not true to paint this Government as heartless, without compassion and without care for the Caroni (1975) Limited workers. This is a difficult thing perhaps to accept, but it is not one year; it is 30 years of persistent loss in an industry, so then, when do you

> make the hard decision—and I have to say, the courageous decision? It takes courage to do it; to realize that to continue that charade, you are not doing anyone any good, least of all the Caroni (1975) Limited workers. I want to note what really put the icing on the cake or concretized the circumstances was the decision on November 24, 2005, by the European Union, to discontinue the protocol arrangement that had been implemented under the Lomé Convention and continued under the Cotonou Agreement (GORTT, 2009, p. 281).

The ruling government at that time was aware that changes needed to be made to the sugar industry especially having bailed out the industry twice in its almost 30 year existence, once in 1990 at a cost of $2.2 billion TT dollars and again in 2001 to the same amount (GORTT, 2009). While the opposition appealed to the cultural legacy and importance of the industry, the ruling government used the discourse of the non-viability of the industry to justify their decision to end its operations. This discourse of the lack of viability and future prospect of the sugar industry for Caribbean states was also shared by international organisations such as the World Bank (Richardson and Richardson Ngwenya, 2013) and outlined in Mitchell's World Bank Research Policy Working Paper on Adjusting to Eroding Preferences (Mitchell, 2005).

The turning of the tide occurred in the 2000s when the Lomé

Convention was challenged at the WTO in the mid 90s by non-ACP members as being unfair and against the ethos of liberal markets (Richardson and Richardson Ngwenya, 2013; Wilson and Parmasad, 2015). This paved the way for the Cotonou Agreement which allowed ACP members to re-organise themselves to face liberal market conditions in the latter part of the 2000s (Richardson and Richardson Ngwenya, 2013). The actions of the GORTT to transition out of sugar was commended in Mitchell (2005). From 2003, this took the form of privatising sugar cane production, with Caroni 1975 Limited being responsible for refining sugar for the local market (Mitchell, 2005; Richardson and Richardson Ngwenya, 2013). However, workers knew that this re-structuring marked the end of Caroni (Wilson and Parmasad, 2015). This new model was not sustainable as production costs remained high (Richardson and Richardson Ngwenya, 2013).

To soften the blow of the liberal trade agreements, development aid was provided by the EU to help former ACP states to transition their sugar industry (Richardson and Richardson Ngwenya, 2013). The new Economic Partnership Agreement (EPA) between the EU and the Caribbean states was brokered in 2008 (Richardson and Richardson Ngwenya, 2013). Richardson and Richardson Ngwenya (2013) cited the hegemony encapsulated in the agreement as Caribbean states did not offer a strong position. The development

aid was used to transition the former workers out of the industry to equip them with new skills and provide them with land to continue small-holding activities (GORTT, 2009; Richardson and Richardson Ngwenya, 2013). Caroni 1975 Limited eventually ceased productions in 2008. Now looking inwardly at local food security, the government also used former sugars lands to engage in mega farm activities and niche market production.

7.3 Re-structured Sugar Landscape as a Form of Governable Spaces

Based on the political account of Caroni, the concept of governable spaces (Rose, 1999; Watts, 2003) is applicable here to illustrate how the forces of power have re-structured the landscape of sugar into the identity of small-holding spaces through which farming livelihoods are carried out. The governable spaces here are these farm lands. The feature of interest is the resilience of the farming livelihoods that are shaped by the land tenancy, which impacts farmers sense of security in planning of activities to the entitlements that one can derive through documentation of tenancy, and also the ecological consequences of farming on lands that have been subjected to decades of monoculture.

The notion of governable spaces was first conceptualised by Rose (1999) in his analysis of political power drawing on Foucault's body of work. It was then deployed by Watts (2003) in his examination of the political economy of oil in Nigeria and the contested spaces that emerge as a result of resource extraction as "identity, territory and rule are in play" (Watts, 2006). It is a manifestation of governmental thought mapped on to a geographic space that can be produced across scales e.g. towns, regions, societies, and is continuously shaped by the laws of political economy (Rose, 1999; Watts, 2003). According to Rose (1999, p. 32):

> Governable spaces are not fabricated counter to experience; they make new kinds of experience possible, produce new modes of perception, invest percepts with affects, with dangers and opportunities, with saliences and attractions[...]. They are modalities in which a real and material governable world is composed, terraformed and populated.

This space was composed from the historical and cultural complexities of Caroni 1975 Limited, which saw a government throughout the years protecting an industry while building the transformative capacities of the energy sector to meet capitalist demands, the revenue from which was used to maintain the operations of Caroni 1975 Limited. When maintenance was no longer an attractive option, which was further compounded by the end of preferential

markets and the European Commission's aid in the sum of 41.643 million Euros[3] to assist the government in the transitioning of the sugar industry and engendering the agriculture sector, re-structuring and eventual retreat from sugar production at a national level occurred. What resulted was the release of lands, labour, machinery and other capitals that the government had to re-organise for the new development of agriculture. Part of this re-organisation involved the creation of mega farms with the aim of generating produce for export and large supply chains locally as well as the distribution of parcels to former workers to encourage small-holdings (GORTT, 2008). Concomitantly the regularisation of squatters on these lands is also an agenda in this re-organisation (GORTT, 2008).

Although the concept of governable spaces upholds a Foucauldian notion of power, it is potent in understanding how the former estate lands emerged as governable spaces upon which farming livelihoods are transacted and the agency of the farmers is deployed based on their social positions. The intention after the closing of Caroni were for people who were once tied to the land to continue through small holdings to generate agriculture productivity (GORTT, 2008), an action that can contribute to agriculture output and make a dent

[3]This figure was obtained from the House of Representatives Twenty-Second Sitting-First Session-Ninth Parliament Hansard Report, Parliament of the Republic of Trinidad and Tobago. Url `http://www.ttparliament.org/hansards/hh20080606.pdf` Accessed May 25th 2017

in the importation food bill of Trinidad and Tobago. The granting of the land parcels to the former workers as part of their separation packages can be classified as a technique by the state for people to remain in agriculture and boost agriculture output, a way of producing agriculture subjects.

However, what followed in subsequent years was continued stagnation in agriculture productivity[4]. Although the stagnation in agricultural productivity can be attributed to other reasons as shortage of labour, high cost of production etc., it was observed during field visits and have been reported also by field participants that throughout Caroni some former estate lands remained unoccupied. This could be linked in part to the fact that the persons who were awarded lands thus far have not all transitioned into agriculture as intended. At the same time, the government is still in the process of distributing lands to former workers, a process that is still ongoing 10 years later. The figure is unknown as to how much of the Caroni holdings were allocated to small holding activities and other industries.

What the government intended and what manifested have diverged and in turn what occurs presently is the proliferation of gov-

[4]GORTT, 2015 `http://www.ttparliament.org/hansards/hs20151020.pdf` Accessed December 15th 2017. In a parliamentary contribution, the Minister of Finance noted that stagnation of the agriculture sector, which contributed 0.5% of the GDP for the last 5 years at the time of his contribution.

ernable spaces via the rental of these lands by former workers to farmers. Jampolsky (2016, p. 117) argued that "other types of legal rights relating to property in land that fall short of fee title can generate governable spaces, across, without consideration of, or in spite of landed boundaries delimited by fee-title ownership." In my field investigation, I have interfaced with former Caroni workers, farmers who are renting from former workers (especially in the Jerningham area, which was one of the first sugar lands redistributed to former workers), farmers who are squatting on Caroni lands and those who have received state leases on Caroni lands.

Through the dissemination of the two-acre state leases, the government legitimises the former workers' rights to use the land for agricultural purposes and access to agriculture entitlements (for example, farmers identification card, state subsidies etc.). However, at present the state allows former workers to sell these lands and transfer their leases, a condition that did not exist prior to 2014. Furthermore, the lease does not prevent the holder from allowing others the right to use the land for agricultural purposes. As a result, the lease holders are free to rent the lands to other farmers for agricultural purposes.

In so doing, the state legitimises the former workers' rights to enter a rental agreement with farmers and thus the conditions imposed

by the landlord to the tenant. The state spatialises the power of the lease holders, and legitimises what the owners of the lease can do or not do, even the exclusion of farmers through the rental market. The spatialisation of power in this way sets up power differentials amongst farmers, which are evident when documentation of ownership or rental agreement is required by the state agencies to access state entitlements that can improve their ability to be resilient i.e. their resilience disposition, and when the owner does not provide documentation pertaining to the rental of the land. This highlights that the space give rise to farmers power disposition through land ownership and access, which in turn partly shapes the resilience disposition of farmers via their access to further entitlements and capitals through their documentation of land ownership and use. Thus the nexus between power and resilience is in the bundle of rights assigned to a farmer which facilitates access to resources. It empowers on one hand and builds resilience on the other.

Figure 7.1: Restructured Caroni Sugar Lands into Small Holding Activity in Jerningham.

Chapter 8

Case 1: The Relation between the Farmer and the Land

If it is accepted that the farming communities are governable spaces, then power is distributed through the governance of "things". Taking the idea of governance of things to mean "men in their relation to [...] wealth, resources, means of subsistence [...]" (Foucault, 2002,

p. 208-209), and using the principles of formal ontology to make explicit the relation between those things, power asymmetries and its impact on farmers' resilience are examined.

Through a domain analysis of the field data, a light-weight ontology is created from the textual descriptions of farmers' experiences in community enclaves in Caroni. Logical structures underlying the responses from farmers are extrapolated in the quest for meaning. The purpose here is to verify whether the complementary disposition relationship holds between social power and social-ecological resilience. For this proof of concept, data from the second field investigation is used since the study was designed to solicit responses based on livelihood practices and social involvement in farming networks. Drawing on governable spaces, two cases of men in relation to things will be explored: i) Farmer in relation to land and ii) Farmer in relation to irrigation systems (Chapter 9).

The remainder of the chapter is dedicated to the relationship between farmer and land. Section 8.1, discusses how the BFO and the DAO are used to align the entities that are extracted from the field data. Domain analysis (as discussed in Chapter 3) is the method used to deduce terms and their relations from the data. An example of the domain analysis is provided in Subsections 8.1.1, 8.1.2 and 8.1.3. From the underlying logical structure that relate the farmer

to the land, a discussion on what these relations imply for power and resilience is provided in Section 8.2.

8.1 Ontology Alignment

In the context of this study, ontology alignment entails corresponding entities extracted from the dataset with categories in the Basic Formal Ontology and Document Act Ontology. The formal ontological relations in these ontologies are used to specify the relationship between entities in the dataset. These formal relations are governed by rules, which constrains their usage between entities. Using these rules and considering the type of entities extracted from the data, the appropriate relations were stated to tie entities together. In so doing, the entities are grounded and their meanings become explicit. The ontology alignment complements the domain analysis. A coded segment pertaining to a farmer's land tenure was taken from MAXQDA as an example to illustrate how the domain analysis and the ontology alignment works hand in hand.

> Interviewer: the family land, you pay them a rent?
> Farmer: No. I don't really pay rent because we can't afford the way the garden going. We can't afford to pay rent too

> much right now. The land that is near the family and whoever have and I could rent, I pay a little rent for it, but the family no. I does only pay their tax...which is not high, about $200 a year.
> Interviewer: the ones in JJ, you have a lease as well?
> Farmer: I don't have a lease. I have nothing in JJ. The land in JJ belongs to my family who don't make garden and they don't want their foot to be mess up in the dirt. They tell me to plant, to occupy the land for them (Farmer D, 2016)[1].

According to Spradley (1979, p. 102), categories are not explicit in participants communication since "they do not, when speaking, arrange words in categories based on the relationship of inclusion, but arrange them in linear fashion, one word after another." Unpacking the knowledge embodied in the short communication means to first extract the basic constructs pertaining to the farmer and the land and then to identify covering terms (entities) which describe these assertions. As a result, the following assertions are reckoned:

1. The farmer plants family land.
2. The farmer's family permitted the farmer to use the land.
3. The family owns the land.

[1]Excerpt from interview with Farmer D, February 2016

Assertions	Objects
The farmer plants family land.	Farmer; Planting Activity; Land
The farmer's family permitted the farmer to use the land for planting.	Farmer; Family; Permission; Land; Use Right
The family owns the land.	Family; Landowner; Ownership Right

Table 8.1: Assertions and categories derived from textual descriptions.

Based on the assertions, the entities in Table 8.1 are deduced to cover the descriptions.

Knowing the context through which the lands came into existence for the new purpose of small holding activity, additional concepts can be deduced to reflect the underlying land structure upon which the farmer's activity takes place. These entities are: *State* and *Lease Document*. A knowledge representation model is constructed whereby the concepts are transformed to nodes in a network linked together with the ontological relations from BFO. These relations anchor the concepts to the upper ontology and constrain the interpretation between nodes, which enables reasoning across the knowledge network pertaining to the farming space. This model is depicted in Figure 8.1.

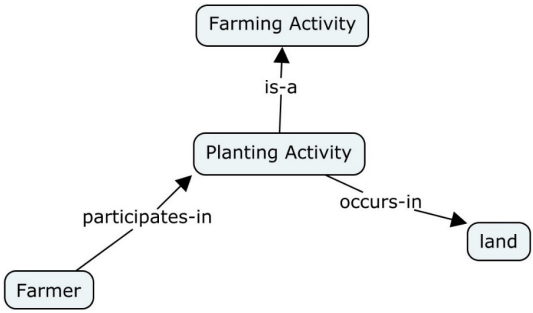

Figure 8.1: Schematic Knowledge Representation of Assertion 1

8.1.1 Assertion 1: The Farmer Plants Family Land

To explicate the relation between the nodes farmer and planting activity, the relation *participates-in* is used, which indicates that the farmer being a particular continuant, participates in some particular planting activity. The *participates-in* or *has-participant*[2] relation holds across a *continuant*, a *process* and the *temporal region* of the process (Smith, 2015). Here the *temporal region* is the time dimension on which the process is projected (Smith, 2015). Thus, the *has-participant* relation implies that for the duration of the planting activity (whether planting takes 1 hour, 2 days or months), the farmer is present for all of the duration of his planting activity.

[2]Participates-in is the inverse relation of has-participant. BFO defines has-participant as "an instance-level relation between a process, continuant, and a temporal region at which the continuant participates in some way in the process" (Smith, 2015, p. 74)

A further specification is made between *planting activity* and *farming activity* as planting activity is a kind of farming activity making explicit that a subtype relation holds between both entities. Through the use of *participates-in* relation, the concept *farming activity* is classified as a *process*, an *occurrent* in the ontological sense that has "temporal parts, and always depend on some (at least one) material entity" (Arp et al., 2015, p. 121). Additionally, this planting activity *occurs-in* the land. The relation *occurs-in*[3] implies that for some planting activity *b*, *b* unfolds within some material entity, some land, *c*. The *occurs-in* relation delimits the relation between planting activity and land and unpacks the nature of both nodes. The implication here is that the process, planting activity, has a spatio-temporal dimension whereas the material entity, land, has a spatial dimension. Furthermore, the spatial dimension of the planting activity is a sub-region of the spatial dimension of the land.

8.1.2 Assertion 2: The Farmer's Family Permitted the Farmer to use the Land for Planting

Due to the fact that the farmer is planting family land, this implies that some family member is the landowner. Landowner and

[3]The formal definition of *occurs-in* together with its axioms are provided in the Appendix.

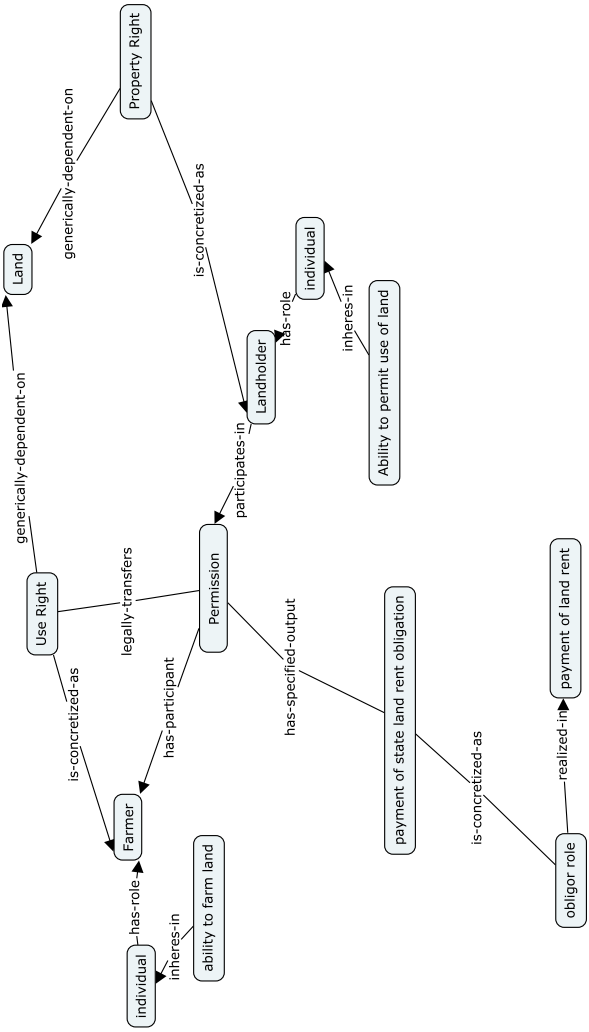

Figure 8.2: Schematic Knowledge Representation of Axiom 2

farmer are entities that reflect positions held in the farming community by individuals. This ties back to Lawson's notion of positions that emerge in social reality through rights and obligations (Lawson, 2012). The positions of farmer and landowner are roles in the BFO sense, a type of realizable entity[4]. Thus an individual can be a farmer and landowner in a social space, however in this communication the person who has the role farmer is not the same person who has the role landowner.

Through the communication, the farmer revealed that the family member told him to occupy the land. Thus it was deduced that some permission to use the land was granted by the person in the role of landowner to the person in the role of farmer via some act of communication. The concept *permission* was specified to cover the utterance "they tell me to plant, to occupy the land for them." Permission is a type of social act, more specifically a deontic declaration (Searle, 2006) that occurred at some point in time involving the landowner and the farmer, from which the farmer gained the right to use the land for planting. Deontic declarations are relational acts involving some material entity *a* being in one role and another material entity *b*, being in another role, taking part in the act (Smith,

[4]Roles are realizable entities, which means that they inhere in some material entity (for e.g. an individual) being in some social condition, and is realised through some process (Smith, 2015).

2014a). As a result, the *participates-in*, and *has-participant* relations are specified for the landowner and permission, and permission and farmer respectively, making explicit that the permission (deontic declaration) is a *process*. In the document act ontology, deontic declaration is defined as "a social act that brings about, transfers or revokes a socio-legal generically dependent continuant or brings about or transforms a role."[5] A deontic declaration is a type of social act in the Document Act Ontology.

By virtue of permitting the farmer to plant and occupy the land the right to use the land for agriculture purposes comes into existence, thus the *legally-transfers* relation is specified between concepts *Permission* and *Use Right*. In the document act ontology, the *legally-transfer* relation holds between a deontic relation and a *socio-legal generic dependent continuant*[6]. Therefore, the concept *Use Right* is a type of *socio-legal generically dependent continuant*, which is a *generically dependent continuant* that is created from a social act and is concretised as a realizable entity[7].

[5]Deontic Declaration definition is provided in the Document Act Ontology online resource: `http://www.ontobee.org/ontology/d-acts?iri=http://purl.obolibrary.org/obo/IAO_0021005` Accessed on June 26th 2017.

[6]Here it is presupposed that the owner of the land got the required consent from the state to sublet the land for agriculture purposes.

[7]Socio legal generically dependent continuant definition is provided in the Document Act Ontology online resource: `http://www.ontobee.org/ontology/d-acts?iri=http://purl.obolibrary.org/obo/IAO_0021004` Accessed on June 26th 2017.

In the Figure 8.2, the concept *Use Right* is tied to *Farmer* via the *is-concretized-as* relation. However, a use right can be tied to another independent entity such as a water pump or to more than one parcel of land, implying that a use right can be duplicated, hence the *generic-dependence-relation*[8] anchors the nodes *Use Right* and *Land*. BFO refers to this as the migratory property of GDCs since they can depend on more than one independent continuant as a bearer for its existence, resulting in a copy of a realizable entity (e.g. role) being created in the case of the migration of the GDC to other independent continuants (Smith, 2015; Arp et al., 2015). The GDC becomes 'real' in a sense when it is concretised in some realizable entity. In this scenario, the use right is concretised in the role, farmer. The same explanation holds for the entities landowner, property right and land.

In the communication, the farmer stated that he pays the family member's land tax, which is essentially a land rent to the state for the leasehold of agriculture property. Therefore, from the permission, an obligation was created that the farmer pays the "land tax" thereby creating an *obligor role*, which the farmer obtains and through which the obligation to pay the land rent is materialised. The *has-specified-output* relation holds between a planned process such as the deontic declaration and a continuant, which in this case

[8]The formal definition of *generic dependence* is provided in the Appendix.

is the obligation to pay the land rent, which came into being when the landowner granted the farmer the right to use the land. The obligation is concretised through the obligor role, a role which the person who has the role of the farmer also bears, reflecting that a person can have various roles or positions in a social space. In the scenario, by the farmer carrying out the process of payment, his obligor role materialised in the process. *Obligor role* is a category in the document act ontology, which comes into existence via some social act that generates an obligation, and is realized in some process the bearer is part of, the end result of which satisfies some agreement[9].

8.1.3 Assertion 3: The Family Owns the Land

Since the farmer is planting on family land which some member of his family owns, it reflects that the farmer through his family network was able to access this resource, and highlights the importance of network cooperation to livelihood resilience (Ifejika Speranza et al., 2014). Given the context in which the parcel of land in Jerningham was created, other objects can be added to "the family owns land" to explicate the underlying structure of this ownership. A simple

[9] Obligor role definition in the theory of document acts: `http://www.ontobee.org/ontology/d-acts?iri=http://purl.obolibrary.org/obo/IAO_0021300` Accessed June 26th 2017.

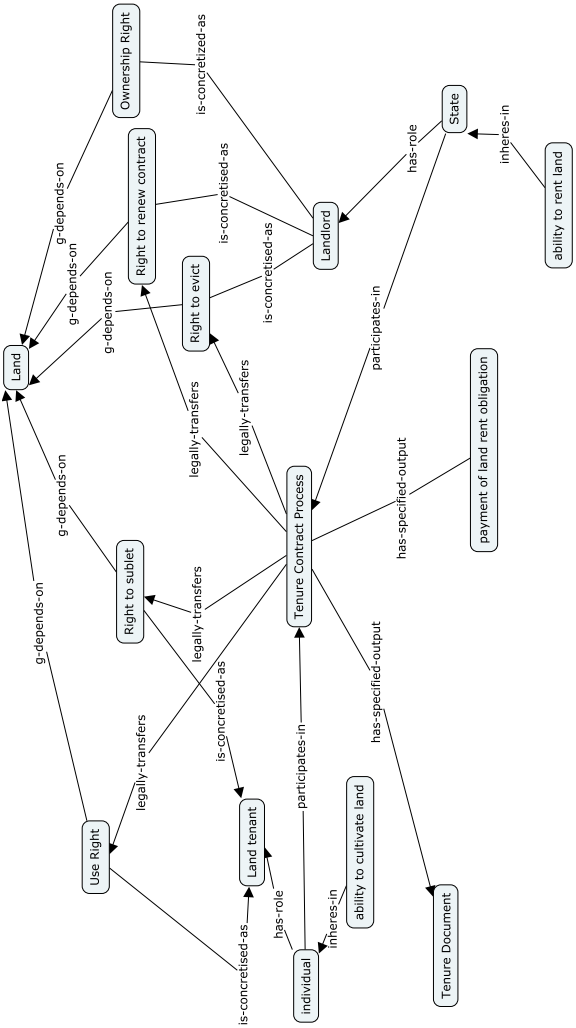

Figure 8.3: Schematic Knowledge Representation of Assertion 3

logical structure can be deduced that reflects how the leaseholder comes into possession of a land parcel (Figure 8.3).

This structure does not hinge specifically on a particular real estate law or act, but is based on a generalisation of the real estate transactions, which can be transferred to any other context. The terms landlord and leaseholder are roles, whereby the state by virtue of being an organisation bears the former and an individual the latter. Both entities represent material entities, which under the principles of BFO are capable of inhering roles. Legally the ownership of state lands is vested in the state (GORTT, 2015) and as a result the entity *Ownership right* specifies this type of ownership that is concretised in the role landlord. As stated previously, a right is a generically dependent continuant and therefore has the same properties as a use right.

The transfer of land from state to individual involves some agreement between both parties which produces a lease document. These actions constitute a document act, a type of social act, which is a planned process that brings into being entities, mainly rights and obligations, and as such tie people to things (Smith, 2014a). The entity *Tenure Contract Process* was specified to encompass this document act of agreeing to a tenancy and the enactment of the tenancy via the creation of a lease document and its ratification. Thus, the

landlord and leaseholder participate in the document act, which has a specified output some lease document (*Tenure Document*). Additionally, the document act created the obligation to pay land rent, which is concretised as the obligor role. The person who is the tenant will take on this role, which is realised through the rent payment transaction.

In the communication, the farmer indirectly acknowledged one of the rights of the tenancy between the state and the leaseholder i.e. the right to use the land for cultivation. This is covered by the term *Use Right*, which is bounded to the concept *Tenure Contract Process* by the relation legally-transfers. The rights that are created through this process are concretised in the leaseholder role and generically dependent on some land parcel being present. Similarly, there are rights that are generated through the process that is concretised in the role of the landlord e.g. the right to renew the lease.

The brief interview excerpt was used to illustrate how the domain analysis is applied to the field data to generate modular representations depicting a person's tie to the land through various roles in the social space. MAXQDA facilitated the organisation of text and retrieval of the coded segments pertaining to the participants and land tenure. From the farmers' documented experience pertaining to their land tenure, logical structures were deduced that underpin the

relation between person, state and land and represented graphically. As a consistency test, relations were continuously checked against the rules of BFO.

8.1.4 Farmer to Land Ontology

Figure 8.3, illustrates the general underlying structure of the farmers relation to land [10]. The network of entities and relations are representations of a light-weight ontology. It is considered light-weight since axioms and formalisations of the relations depicted were not undertaken. Such an endeavour is best suited for computational objectives by information systems. The objective here is different. It is about exploring what these relations mean for the relationship between resilience and power. By laying bare the entities of the space, what can these relations say about resilience and power? In this scenario, a connection between land, power and resilience is seen through the access to State resources for agriculture via documentation. This can be taken as a case of general resilience, whereby these state resources provided a cushion or buffer to cope with disturbances that may affect their livelihood.

[10] A simple network representation was shown to some participants as a form of a verification check to determine that terms and their relations captured their reality of land tenure.

Entities such as ability, and tenure document are also included in the representation. The ability inheres-in the individual. Farmers noted that they received information through participating in government agriculture programmes, interactions with agronomists from chemical companies, from learning by doing and learning from past failures. The role of networks as conduits for actors coming into knowledge that can be used for resilience is well documented in literature (Tompkins and Adger, 2004; Folke et al., 2005; Ifejika Speranza et al., 2014). I see this knowledge as forming part of the intrinsic properties of the individuals that contribute to their resilience disposition. But, as stated in Part II, resilience and power are extrinsic dispositions. Therefore there is some property of the social environment that contribute to this ability. This property here is the use right.

I recall here the rules of complementary dispositions that are taken as the assumptions for the dispositional relationship between power and resilience (cf. Chapter 6). It is the co-location and proximity of the bearers that will facilitate the unfolding of the power and resilience dispositions. How are the bearers co-located in this representation? I see this co-location occurring via the tenure agreement (Permission). In the next section, a look at permission and its effect on power and resilience will be examined.

8.2 Discussion: The Co-location of Resilience and Power

Table 3.1 reflect the number of farmers farming on former Caroni lands and the type of tenancy they have on the lands. The rights and obligations created from the permission to use the land for cultivation legitimises the roles of the leaseholder (owner) and farmer. Oral permission was the mode through which rights were given to farmers renting or occupying lands. Farmers either stated that there was no formal written agreement between them and the owner or that the owner told them to occupy the land, with few noting that their only proof of document was a receipt for payment of rent. Those renting are obligated to pay a yearly rent to the owner. For the farmers occupying land from a family member or someone they know, the majority are obligated to pay (to the owner or on behalf of the owner) the value of the land 'tax' (rent) to the state, which one farmer on a two acre parcel noted to be about $200.00 TTD per year.

Permissions also occur between farmers within the same farming group, thereby also creating informal use rights. One farmer stated that upon losing the land due to the owner wanting it back, he was given a parcel of land from a member to produce a crop, even though

this member was renting the land from its owner. Another noted that he offered part of his land to a fellow member to continue his activities when this member had to return the land to its owner. The farmer was aware that given his provisional tenure status (at the time of the interview the document was expired) on the land from the state that such an act was not permitted.

Lemel (1993) also discussed the use of verbal permission in creating tenure and use rights for people in Trinidad and Tobago. In the author's country-wide story, it was noted that verbal permission creates complexities in managing a tenure system that is based on having a legitimate documentation (Lemel, 1993). According to the author:

> If the adjudication process evaluates claims solely on the strength of currently available documents, it will ignore a complex historical reality and in so doing will undervalue the equity claims in situations [where verbal permissions were granted] (Lemel, 1993, p. 27).

In the practice of verbal permission, the state was also a participant in relation to "aspiring farmers" with the occasional promise of converting the informal use right into a lease document (Lemel, 1993). The most prevalent form of informal use right creation was

observed between owners and family members or friends via "rent-free arrangements" as a means of preventing squatters unto the land (Lemel, 1993). This type of arrangement is also reflected in Farmer A's communication. On the other hand, verbal permission also occurs between renters and owners on private and state lands (Lemel, 1993) as illustrated below:

> Interviewer: What about the incentive programmes, subsidies[...]?
>
> Farmer: well you see I can't get anything because they want you to have a 3 years farmers badge. Once you renting you not be able to get that. You would get a temporary badge just for Larceny Squad not to lock you up. All the things you buy and you supposed to get back subsidy like drip hose, spray can, pump and thing, me ain't able to get anything from that.
>
> Interviewer: I think you could get one if the owner of the land willing to write something.
>
> Farmer: yes but the owner of the land has to go by a JP [Justice of the Peace] and sign paper and give you permission not less than 3 years. Remember the badge is 3 years old, not less than 3 years (Farmer N, 2016)[11].

Although the reason for a lack of documentation was not expounded by farmers renting, few farmers have admitted that it pre-

[11]Excerpt from Interview with Farmer N, March 2016.

vents them from accessing some of the agricultural incentives and subsidies by the state. Figure 8.4 shows the number of farmers who have farmers identification card from the study. However, one reason that emerged from Lemel's Warren-Munro study that could shed light on such a decision is that a lack of documentation is seen as a protectionary measure by owners to prevent farmers from making a formal claim to the state for the land (Lemel, 1993). This can be seen as a power play by the owners (leaseholders) to maintain power over the farmer and by extension their lands.

What is evident from this analysis is that oral permission is a common feature within farming communities and that out of this process use rights and obligations are created for farmers to carry out their livelihoods. This aligns with the ontological view that deontic entities are part of the basic building blocks of social reality (Searle, 1995, 2006; Lawson, 2012; Smith and Zaibert, 2001; Smith, 2014a). According to Searle (2006), such deontic entities enable an individual's power. Keeping in mind that power is a disposition that has the possibility of manifesting when in certain conditions, how do deontic entities such as rights fit in with power? More specifically, how does the permission between leaseholder (owner) and farmer relate to the farmer's social power and livelihood resilience?

An examination of the case with landowners using permission to grant use rights but without documentation would classify such a

set up as a power over (asymmetric) social relationship. According to Lukes (2005), an asymmetric power relation occurs when A is able to effect B's outcomes and interests. What ties the landowner and farmer together is the *permission.* One can say that the owner's power (A) is manifested by permitting the farmer (B) to use the land. Although, this condition contributed to the farmer's power to use the land for farming, the other part of the condition i.e. the lack of documentation contributes to the farmer's ability to maintain[12] his farming activities or his disposition to be resilient against disturbances. The lack of documentation prevents the farmer from accessing all the state incentives and provisions available for agriculture. In the next section, a closer examination of the relation across use rights, power and resilience dispositions is undertaken.

8.2.1 Where is Power and Resilience?

Having discussed what constitute the relation between farmer and land, the questions still remain: i) Whose power and resilience are we discussing in this context? ii) Where is power and resilience located in the context of farmer and land? An actor oriented perspective of power and resilience is the focus here. More specifically,

[12]Maintain here is considered as a form of coping (see Chapter 4 An Analysis of Resilience Concepts and its Categorisation as a Disposition)

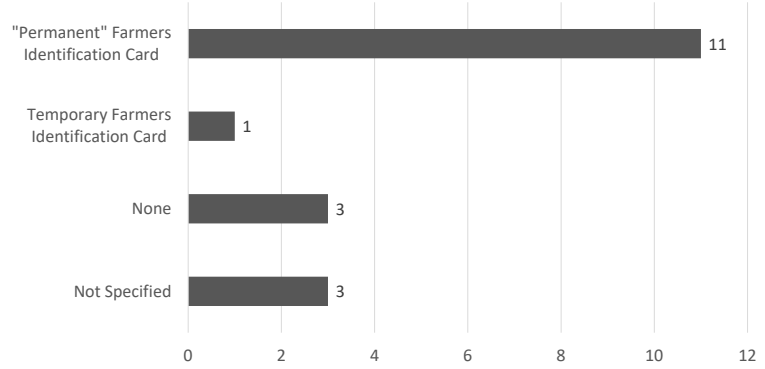

Figure 8.4: Type of cards farmers possess (n=18)

the landowner's power over the land, the farmer's power to farm and the farmer's ability to maintain his livelihood and how both are shaped through social acts.

Farmer D's communication described how a use right for a parcel is created through permission. According to Lemel (1993, p. 28), "this connection between use and rights finds its way into virtually all land tenure situations." Additionally, this connection between use and rights also finds its way into the distribution of state resources for farming livelihoods. Farmers who were without documentation to prove their use right on a parcel reported that such a circumstance prohibited access to a permanent farmers identification card. Coupled with this, one farmer who was awaiting renewal of his lease tenure noted that this limbo state limited his access to loan

facilities from the state's Agriculture Development Bank (ADB) to invest in his farm business. One subsidy that is available to farmers regardless of possessing a farmer identification card is the Flood Damage Assistance or "flood subsidy" as long as there is evidence of crop loss after a flood event.

Three key informants interviewed who were affiliated with state agencies under the Ministry of Agriculture, Land and Fisheries reiterated the issue of land tenure as a national problem concerning agriculture and that documentation of use right is required for accessing a farmer identification card, subsidies and incentives. An Extension Officer from the County Caroni office stated that there is a protocol that officers follow in recommending identification cards and having legal documentation to the use of the land is integral.[13]

[13]On the GORTT service portal, one of the requirements for receiving a farmers identification card is "proof of interest in land..." with this proof of interest encompassing documents to show "privately owned land, 'permission to use' privately owned land, state lease [or] state occupied. According to the portal, "farmers without legal tenure are issued buff (off-white) coloured cards and are not entitled to access agricultural incentives." This is the temporary badge that farmers refer to in their communication. `http://www.ttconnect.gov.tt/gortt/portal/ttconnect/!ut/p/a1/jdDBDoIwDAbgp-FKC8tUvHFARUwMGBV2MWjmwCAjY4KPL3ozKNpbm-9P_hQYxMDKtMlFqnNZpsVzZ6NDENpIfYfgOkQH7ci3PKQBmY9JB5I3EM1nHfCotQh2BBH_y-OXcX_mN7yEPbBBtqQ9OK_5AgM9lsBEIY-vnyRueSQTAUzxM1dcmTfVnTOtq3pqoIFt25pCSlFw8ySvBn6KZLLWEL9LqK7b-O5faNGs3AdjOzzp/dl5/d5/L2dBISEvZOFBIS9nQSEh/?WCM_GLOBAL_CONTEXT=/gortt/wcm/connect/GorTT+Web+Content/TTConnect/Citizen/Topic/FoodandAgriculture/Agricultural+Training+and+Services/Registration+of+Farmers` Accessed December 15th 2017.

The effects of lack of documentation are reflected in the following excerpts from farmers in Table 8.2.

What is evident is that a use right is the condition that makes farming possible on the lands, but a use right without documentation creates another condition, which shapes how farmers maintain their livelihoods. So out of different instances of one type of social act, two conditions are created that enable power and resilience: i) use right not encoded in a document (C1) and ii) use right encoded in a document (C2). For the farmers who are the leaseholders, then out of the tenure agreement (social act) the condition created is a lease document which entails the property rights for a specific landed property (C). It is these extrinsic conditions that the farmers' power and resilience as dispositions hinges on in addition to their intrinsic properties.

At the other end of the permission or tenure agreement is the landowner (state or individual as a leaseholder). The landowner exercises his power through permitting the use of the land for agriculture, which is in the interest of the farmer. Although the owner gives a use right, this does not change his role as owner as he or she still retains the "property right-the absolute relation of belonging-remains ontologically speaking in tact" (Smith and Zaibert, 2001). If permitting use without documentation is a protectionary measure

Excerpt 1	Excerpt 2
Farmer M: I don't want to stay in abeyance having no title to the land. I want to have the lease in my hand, you know. I studying if I have my children and them who have to face the bank to get a loan to improve the industry to go into another direction, they can go and get money. You don't have any title to the land you can't do that, you have to have capital otherwise. We can't face the ADB and get a big loan. So having your title to the land is also having a hold on the property too.	*Interviewer*: This land you have here you have a lease from the government? *Farmer D*: Not really a lease. They promise to give we a lease. They have we on a 3 year probation. *Interviewer*: Something new they introduced? *Farmer D*: What happened, it supposed to be so from the beginning, I think it's something new yes...to see who really planting, but nobody came and check me because not all the time I had the land plant up. They supposed to give us the lease but we waiting on that. Government come and change and nothing doing yet but we hoping that they renew it for us. When they renew it we can use the lease to get loan, whatever. So we depending on that to be renewed right now.
Excerpt 3	Excerpt 4
Farmer H: My uncle went and co-sign my loan for me. He had a choice. He could have make a receipt for me stating that he gave me permission to plant the land for 5 years or 10 years so that I could get a loan or he could co-sign the loan for me. So I told him better thing is to come co-sign the loan.	*Interviewer*: Relating to subsidies and stuff like that you have to get permission? *Farmer Q*: We don't get any subsidy for anything. *Wife*: We don't have our farmers badge. *Interviewer*: Why you don't have a farmers badge? *Farmer Q*: Because we have no land. *Wife*: We renting but I think we could get a temporary one. *Farmer Q*: You don't really get any kind of subsidy with that. You have to have the yellow one to get the real subsidy price.

Table 8.2: Excerpts from Interviews with Farmers in the Study Area 2016.

by owners (Lemel, 1993) that is assumed to be applicable in this case study, then it is a mode of control used by landowners over farmers to secure their interest in the land. In so doing, the control indirectly extends over the farmers' livelihoods as the lack of "proof of interest in the land" inhibits farmers from making claims for agricultural resources from the state, which provide a cushion for their livelihoods and goes in the direction of strengthening their resilience disposition.

Searle (2006) stated that deontic entities such as permission create "deontic power relations" in society since such entities "make possible desire-independent reasons for action." Whether this control over the livelihoods of farmers is intentional or unintentional cannot be assessed since leaseholders who rent or grant lands to farmers were not part of the study. However, in Table 8.2, excerpt 3, a glimpse of the relation between a landowner and a farmer is illustrated from the perspective of the farmer. Here the owner participated in a document act, which facilitated the access to a loan at the ADB, which the farmer used to start a crop on the land. In this case, the owner was acting in the interest of the farmer and as such here a power over relation resulted in a productive outcome. This reinforces that power over relations do not only result in repressive effects but can also have positive outcomes (Lukes, 2005).

In the context of land, what underlies the landowner's power,

farmer's power and farmer's general resilience are use rights. Such scenarios underscore that when it comes to the relation between farmer and land, it is not the physical land that is the focus but rather the relation of the farmer to landed property (Zaibert, 1999; Smith and Zaibert, 2001). The initiation of the permission creates the informal use right, which give rise to the farmer's power to use the owner's parcel of land for farming. Since the nature of deontic entities is that they can exist after beyond initial creation (Searle, 2006), the permission becomes the manifest for the unfolding of the owner and farmer's power.

A landowner can permit a farmer to use the land and the right to usage extends until the owner wants the land once more. The use right (be it informal or formal) that is created out of the social act is the entity that hinges on the farmer's overall ability to maintain or cope with his livelihood (resilience). However, could it be claimed that the permission is a manifest action for the unfolding of a farmer's general ability to cope with general stresses or disturbances? This question will be further explored in case of the farmers and their relation to an irrigation system. This case looks specifically at the manner in which the disturbance of drought was managed through the operations of a communal irrigation system. However, in the following section the temporal effect of a use right is examined through they eyes of a farmer who has no formal right.

8.2.2 Effects of Landowners' Power on a Farmer's Livelihood

When the use right is bestowed unto the farmer, the duration of the right structures what is possible for the farmer to carry out on the land. The constrain of the farmer's livelihood is illustrated in the excerpt below:

> Farmer: Let me show you something. It don't make sense I going to rent a plot here, these 2 acres for one year because remember I have to put out plenty money. You have to brush cut, you have to disc plough, you have to loterie roll, you have to lime. All that in your expense and you still have to keep waiting. It ain't finishing in one day. And then now when the soil structure change, the chemical makeup in the soil change to suit what you want to plant, you have to give up the land. So, when you renting a piece of land you need at least 3 to 5 years on it so that you could benefit. The first year you plant you don't make money when you go in a new place. You might catch a price but the cost of the rent and the cost of preparation [and] when you now start to produce they want back the land.
> Interviewer: so after this crop finish you have to look for 2 acres again because inside here you just down to 4.
> Farmer: 2, and this 2 is 4 but I go be down to 2 and that is

> yearly. I get piece across there which is about half acre but the guy say that I could get it for 5 years but I can't get it prepared yet because the tractor man giving trouble.
> Farmer: Remember renting a piece of land for one year, when that year almost up it's headache again. So you under pressure because you don't know where you stand next year. And is only farming I doing for a living so I need to know so to have less headache and worries next year what I doing. We pay yearly but we have the land about 4 years (Farmer N, 2016)[14].

In the communication, the farmer mentioned the short temporality of rental agreements which makes it difficult to plan his livelihood. Short temporal arrangements foster uncertainty, especially when that arrangement is between a farmer and a private citizen since there is the possibility looming that the owner could ask for the land at any time. It constrains his ability to plan his farm in the long term and by extension his livelihood.

Temporality thereby structures what is possible within a given time frame, and thereby the power to do so in the land. For example, under a short rental contract of one or two years, it can be assumed that a farmer would not invest in long term crops, but would aim to

[14]Excerpt from Interview with Farmer N, 2016

maximise yield by doing crops with a short cycle and having the land under constant production. In the case of the squatter, temporality can work to the farmer's advantage, where the occurrence of farming activities over a long period establishes an interest in the land, and is the determinant for legitimising one's right to the land giving rise to the farmer's legitimate power over the land.

The use right also has a temporal component which expires at some point in time, for landholders it is the duration of the lease imposed by the state, for farmers it coincides with the rental period of the land agreed upon with the landholder, for a squatter it is unknown since it depends on whenever the owner (person or state) shows up to reclaim their land. The exercise of the farmer's power to use the land therefore extends for the duration of the tenancy.

Two ways in which time constrains the power over the land are given in Table 8.2, excerpts 1 and 2. With arrangements between farmer and state, the expiration of the legal right to use the land does not prohibit the farmer's power to use the land as the farmer continues his activities in some manner while the agreement is in the process of renewal. The limitation is enacted when the lack of a lease document prevents the farmer from approaching the bank for large loans to facilitate the expansion of farming activities. The

farmer's exercise of power over his land is thereby confined in this regard.

In this chapter, the farmers relation to land in the study area was examined. The network of entities and relations served to extract the underlying features that establishes power over relationships between the owner and farmer. This feature is the social act of permission out of which formal or informal use rights are created. The use right is the extrinsic feature of the bearer that gives rise to power and resilience dispositions of actors in the study. Although the manifestation of resilience is not observed here, under the process of permission, the right contributes to the farmer's resilience disposition as it is the gateway to access state resources. Note that I did not say it is the resources that is the basis of their resilience for to do so is to commit to the vehicle fallacy of dispositions (Part II). The idea of rights shaping power and resilience lends support to Walsh-Diley et al.'s proposal of a rights-based approach to resilience in order to draw it issues of power (Walsh-Dilley et al., 2016). The complementarity between power and resilience is further explored through the case of water access in the subsequent chapter.

Chapter 9

Case 2: The Relation between Farmers and Irrigation Systems

In the continued quest of the search for meaning between power and resilience, a specific case of resilience of farmers to water shortage brought on by drought conditions is presented. Once more, BFO is used to analyse the relations between entities in the data, making explicit implicit connections of farmers' experiences. The purpose

here is to verify this complementarity between power and resilience in a specific case of farmers resilience to weather variability, and explore what this connection to irrigation systems and water access tells about resilience.

Water is a scarce but important resource in the functioning of farming livelihoods. Apart from land, the bane of agriculture productivity is water. The issue of water is felt both in the dry and rainy seasons, i.e., there is too little in the dry season and too much in the rainy season. Coupled with climate variability, the seasons are subjected to weather shocks or abnormalities, extreme dry conditions and intense rainy seasons. These abnormalities can have negative impacts on the productivity and viability of agriculture in Trinidad and Tobago in the long run. For farmers in the study area, water access and management is key for the maintenance of livelihoods during the dry season. The specific case of farmers with respect to water availability stood out since both field investigations occurred during the dry season.

In 2015 and 2016 both dry seasons were marked by drought warnings from the Meteorological Office.[1] During the 2016 period of investigation, irrigation was on the forefront of discussions as it was

[1] `http://www.trinidadexpress.com/20160216/editorial/all-must-heed-drought-alert` (Accessed December 15th 2017).

the early phase of the season (Jan/Feb 2016). Rivers and secondary waterways were the main source of irrigation (Figure 9.1). To allow for the distribution of water to farmers of the Cunupia Farmers group, the Jerningham Farmers Association and the Carlsen Field community irrigation systems in the form of industrial water pump, sluice gate and raw water systems were provided by the state as support for effective water distribution to all farmers. It is this relation between farmers and irrigation systems that will be further explored.

At the core of the water shortage scenario, is the relation between farmers and communal irrigation systems provided by the state. The state provided irrigation systems best suited for the needs of the community. In community x, the irrigation system took the form of a community water pump, community y a sluice gate and in community z a raw water system. For these resources, the executive members from the respective farming groups lobbied for the infrastructure to be put in place. The implementation of these water management systems can be regarded as adaptation measures provided by the state as a means of enabling communities to cope with water stresses during dry conditions. In keeping with the examination of the relation to people and things, the alignment between the entities and relations follow the same process as in Chapter 8. This way of structuring the responses adds directionality in interpreting

Figure 9.1: Farmer accessing water for farm operations from a nearby river.

the results, since the logical relations ground the meaning of the terms expressed in conversation. What underpin these experiences are deontic entities (Searle, 1995, 2006), and how these relate to the complementarity of power and resilience dispositions form the basis of the discussion in the remainder of the chapter.

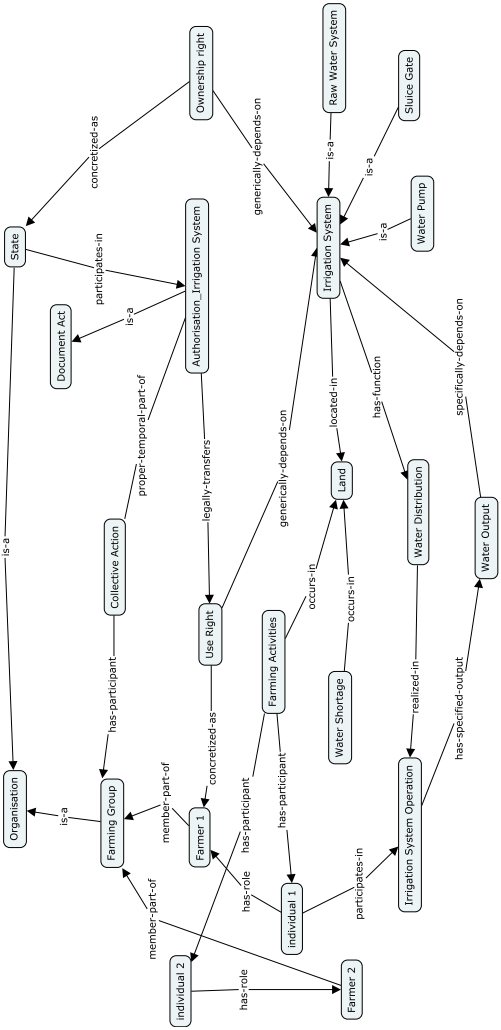

Figure 9.2: Schematic knowledge representation of relationship between farmers and irrigation system

9.1 Ontology Alignment

The ontology alignment follows the piecemeal approach taken in Case 1. Figure 9.2, represents the network of entities identified from the data and their relations, which stem from the Basic Formal Ontology and the Document Act Ontology. Similar to case 1, there is a physical resource that is negotiated between the farmers and the state which produces rights. *Irrigation system* is the term used to cover the various types of water systems provided by the state to facilitate water distribution. To receive these resources for the benefit of the group, the executives petitioned the state in various forms (see Tables 9.1 and 9.2). These modes of petitioning for example, meetings with state representatives, internal discussions with group members and writing to the Ministry of Agriculture were classified as *collective action* which *has-participant* the *farming group*, since the executives are the front line representatives of the group.

This collective action is a planned process and is the first step towards the authorisation of the system. Hence the *proper-temporal-part-of* relation is used to describe the connection between the collective action and the authorisation process. This relation is used between processes to describe phases of processes that do not overlap with each other (Smith, 2015). The *Authorisation-Irrigation system*

is a document act, that involves a series of communication within the Ministry and the documentation of approval and specifications for the system. The authorisation of the system by the state is a form of formal permission for the possession and use of the system by the group.

Similar to Case 1, out of a permission a use right is created. Since only one person operates the system on behalf of the group, the use right is therefore concretised into the role of farmer. For the raw water system, each farmer can operate the tap that connects to the system. In this case, each farmer has a use right. The term *Irrigation System Operation* is used to describe the process of operating the water system, out of which there is a *water output*. The *specifically-depends-on* relation is used to explicate that the existence of water output is based on the irrigation system being present. The irrigation system bears the function of *water distribution*, which is realised in the process of the irrigation system operation. The relations between entities elucidate the ontological categories to which they belong. Figure 9.3 provides a visualisation of how these entities are connected to the Basic Formal Ontology and the Document Acts ontology. A list of formal ontological relations and their definitions used in both cases are given in the Appendix (page 151).

While the authorisation of the irrigation system creates the use right for the system, it does not create the use right for the water.

This use right is obtained through another permission process that entails the group or an individual farmer making a request to the Water and Sewage Authority of Trinidad and Tobago, a state agency, for a license to use the water from rivers, channels, groundwater etc. for a certain period. While one executive member of a group made it known that at some point in time, the group will have to pay the state agency for water, it was not specified if such a license was applied for by the groups or by individual farmers. In this regard, the permission will create the formal use right that is concretised in the role farmer. The license is the document that encodes the right to use the water. For those using the water without the license, they have entered into an informal permission thereby creating informal use rights for water.

Having laying bare the entities underlying the groups coming into the possession of the irrigation system, how can these relations be used to explain power and resilience in the specific case of water stress? The following sections discusses how permission and rights contribute to power and resilience. In the final section of this chapter, the co-location of power and resilience is examined through a case of a farmer exiting his livelihood due to issues with water.

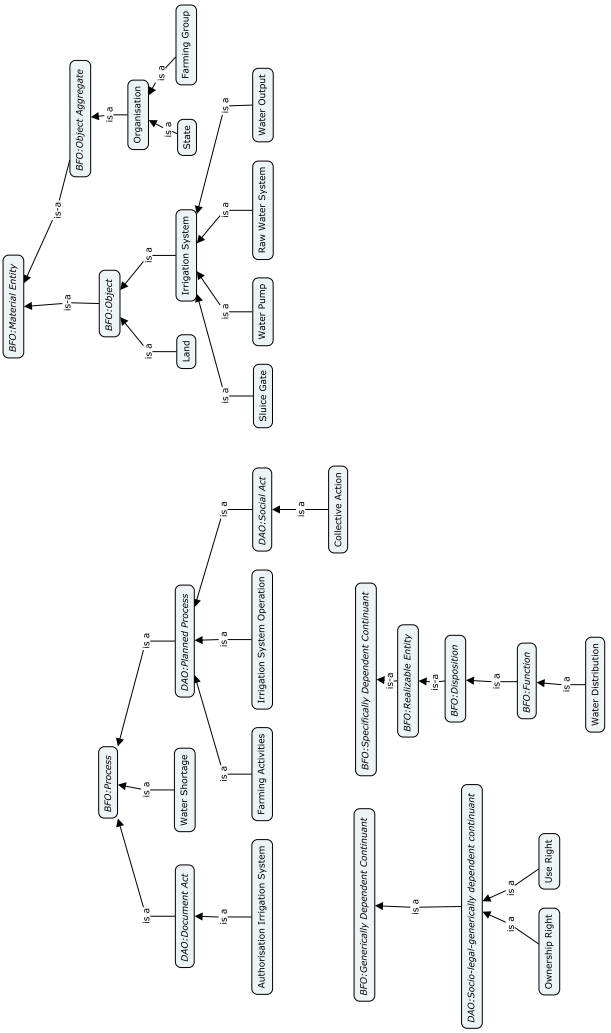

Figure 9.3: Alignment of entities from field data to the Basic Formal Ontology and the Document Acts Ontology categories.

9.2 Discussion: The Relationship between Farming Groups and the State

A common feature of the excerpts (Table 9.1) is the use of the word 'we' which suggests that the farmer is a part of a group of farmers in the community. Utterances such as "We agitate him, I myself together with a few other farmers getting him to put raw water system for farmers to get water"; "We apply for the pump[...]"; "We were able to get Ministry of Agriculture[...]to put a sluice gate[...]" underscore that some collective action occurred to which the farmer as part of a group was a part of, which resulted in the irrigation systems being provided by the Ministry of Agriculture. Additionally, these farmers were also directors of their groups at the time this resource was requested for the community.

What underpins collective action is social capital as lobbying for irrigation systems requires coordination and cooperation within farming groups, and between the groups and the Ministry of Agriculture (Evans, 1996; Ostrom, 2000). Here, social capital is embodied in the farming groups and is translated into expectations (Durlauf, 2002). Expectations of what the group is supposed to do for farmers are embedded within the farmers' idea of the purpose of the farming groups. Essentially, participants attributed that this purpose is to

Excerpt 5	Excerpt 6
Interviewer: With respect to weather variability and so forth, in what ways have you contributed to further developing your agriculture knowing that weather variability is around, is here? Farmer: getting the irrigation system installed in [community z] . The government at that time was in the 1990s. . . the UNC was in office. [Mr. X] was the Minister of Agriculture then. We agitate him, I myself together with a few other farmers getting him to put raw water system for farmers to get water. I end up benefiting from it and there are other farmers benefiting. Interviewer: So you were instrumental in that raw water system? Farmer: Yeah and also in seeing how it was laid down and all that.	Interviewer: The water pump there, you all were instrumental in getting the pump to come to [community x]? Farmer: Yes. We apply for the pump and we take the responsibility to watch the pump and service the pump. All the government used to do was come and full diesel in the pump. We clean around the place, we clean the grass, we watch the pump, we do everything. Well the government service the pump, diesel and filter and oil. If it has a breakdown they come and service the pump. We thankful for that, but we do most of the work ourselves.

Table 9.1: Excerpts from 2016 interviews with farmers who were in executive position in their respective farming groups.

Excerpt 7	Excerpt 8
Interviewer: And in what ways do you benefit from the groups and associations you belong to? Farmer: whatsoever we lobby for collectively and comes to a group I would also benefit as an individual. The group that lobbied for the sluice gate but I did all the work. Everybody knows that. When there was not a ray of hope on the horizon I made alternative plans and get things done.	Farmer: Water availability...well you have to physically do things to ensure that water is available either you dig a pond or if there is a natural watercourse you dam it or whatever, you need to put in those structures in place. We were able to get Ministry of Agriculture in [community y] to put a sluice gate on the river so that the guys in [community y] they know when the season approaching to put down your sluice gate. You have catchment areas where you have a lot of water and they could open the sluice gate to allow water to flow, lock it back and conserve your water. All of these things are measures people could do.

Table 9.2: Excerpts from 2016 interviews with farmers who were in executive position in their respective farming groups (continued).

receive public goods and other resources from the state to collectively improve their farming activities. These resources are separate from the incentives and subsidies that each farmer with documentation can access on an individual basis.

It is common knowledge amongst the farmers that public goods and services for agriculture can only be obtained through a recognised farming group. For example, the farming group in community x emerged solely out of the necessity to receive access roads within the community, but over time benefited from other goods such as culverts, drainage, but most importantly a water pump.

> Farmer: We main goal is that...to get whatever help we could get from the government. The only way to get help from the government is by having a group. I went for certain help. I went by myself and they tell me that they cannot help me. They say it's not to say that they going to give anything to Mr. [Y], they going to give it to a farmers group. I come here and I form a farmers group. Before the group started you couldn't drive in this road. It's I who get all this road and irrigation and everything (Farmer D, 2016)[2].

One farmer noted that the only reason he joined the group in community 1 was to have access to water. The relationships between

[2]Excerpt from Interview with Farmer D, March 2016

farming groups and the state are important since they provide the vehicles to obtain buffers (resources) that are used in the realisation of resilience (Ifejika Speranza et al., 2014).

However, the establishment of a group and rapport with state representatives do not mean that resources are distributed immediately. A number of factors shape the distribution of resources to groups. One executive highlighted from his experience that bureaucracy, lack of political will, competing interests (mainly w.r.t. the issuance of land), and limited budget allocation to the Ministry of Agriculture structure the administration of resources to farmers. Their receipt of communal resources required relentless lobbying and discussions with various state representatives. For example, the process for obtaining the sluice gate took a number of years, during that time the executives saw a change in government. In Tables 9.1 and 9.2, excerpt 5, the farmer acknowledged that he was no longer an active member of the farming group in community z. Although the group is still in existence, he cited improper management of the group, lack of transparency by the President, greed and lack of unity amongst members as reasons for not being invested as in

earlier times.[3][4] Nevertheless, the need for resources within farming groups x and y partly keeps the groups going because it is only through a group the farmers could join the table with state officials and make their requests known on behalf of their members.

Although farming groups receive resources from the state, the relationship between the state and the groups is mutually beneficial. Through this relationship, the Ministry of Agriculture disseminates information about agricultural workshops, trainings and consultations via the executives. Furthermore, it facilitates the ease of taking stock of challenges faced by farmers. The key informant from NAMDEVCO, one of the state agencies under the Ministry of Agriculture, stated that the Minister once stressed in a meeting with farmers the importance of organising themselves into a farmers group. The reason being that it is impossible for the Minister to meet each farmer individually to be informed of the problems faced

[3]At the time of the interview in 2016, the farmer recently joined a newly emerged farmers union. According to the farmer, the objectives of the union are to represent the issues of all farmers in the country, and to bring about productive change in the sector for farmers. He trusts the founder of the new group since he has worked with him before in their local village council. He believes that the founder has the best interest of farmers at heart.

[4]Ramdwar and A. (2015) stated that similar issues as mentioned by the farmer put the longevity of farming groups in Trinidad at risk. From their cross-sectional study of farming groups in Trinidad, the authors noted that "mistrust of leaders; associated greed; the inexperience of leaders[...] lack of transparency in procedures [...]" are factors that undermine the existence of farming groups within the country (Ramdwar and A., 2015). Perceptions of mistrust and greed of the executives, selfishness amongst members, lack of feedback from the executives after meeting with state officials have been noted by participants.

in his/her livelihood. By way of a group, the main problems can be presented to facilitate assistance to a community.

Under a resilience lens, such network relationships play a role in providing the means to cope with disturbances (Tompkins and Adger, 2004; Ifejika Speranza et al., 2014; Rockenbauch and Sakdapolrak, 2017), but there is a subtle feature that is overlooked within this relationship that makes cooperation possible. The fact that the groups are cooperating with the state and the state is in turn engaging the groups require collective intentionality (Searle, 1995). There is a shared direction in the relationship by both parties towards farming livelihoods. Furthermore, there is a collective acceptance that the farmers are part of the group and that they are indeed a group by the state. There is a collective belief of farmers that it is only the group that can receive state resources and lobby on behalf of farmers. Once there is an intentionality that the group is a group, the group acquires a status and with it a function that is recognisable by the state.

9.3 The Provision of Communal Resources Creates Use Rights

The authorisation (*social act*) of water systems for communities by the state created rights, which were transferred to the farming groups. Drawing on the analogy of property rights as a collection of sticks, with each stick representing a type of right ((Hohfeld, 1913) as cited in Zaibert (1999); Smith and Zaibert (2001)), only a few rights are transferred to the communities. For example, the farming groups will have the right to use and the right to monitor the infrastructure. These irrigation systems are state resources that are granted to the group for the benefit of all within the community. It is not possible for all farmers to access the rivers directly due to the location of lands. In this regard, the creation of use rights should enable the livelihood resilience of farmers by providing a buffer, which shapes their ability to cope with insufficient water during the dry period (Ifejika Speranza et al., 2014). However, having a communal use right does not necessitate that each person has the power over the irrigation system and therefore control of the water output, as in the scenario for the groups that received the sluice gate and water pump. Nonetheless, the farmers (being members of the group) will have a legitimate claim for the fair distribution and access of water.

Excerpt 9	Excerpt 10
Farmer: Now what happened, I plant in three traces. The three up the road, I am last. So I have to run the pump to get water for me last. Everybody in front taking the water and they just don't even care to [word inaudible]. They just wait for me to prepare land and as I prepare the land, they start preparing because I pumping water. So they get their benefit through me. It is not a problem for me there because I need the water anyways. It's government thing.	Farmer: Well what would happen is that nobody would do it in a manner where it would be convenient to everybody, they would do it in a manner-if somebody else had to manage the gate-where they go release it based on their water supply only. So if they don't need water, they won't release it and vice versa. Why I let it go [the water] today, the first 2-3 days I didn't let it go because I trying to send a signal to everybody lower down 'aye water done' tie a few bags now. If I allowed it to trickle, they would have done it [...].

Table 9.3: Interview Excerpts (2016) from Farmers who Control the Irrigation Systems.

Typically, the daily operation of the communal resource is placed in the hands of a member of the group (Table 9.3). For the sluice gate and water pump, the right to monitor and the right to use the system is bestowed upon one person thereby giving rise to his power over the resource. In both groups, the person who operates the system is also an executive member of the group. The excerpts in Table 9.3 highlight that through this role of 'operator', the individuals can shape the behaviour and farming patterns of other farmers dependent on the system for water. But why is it that through such a role power is dispersed?

An ontological explanation can be found in Searle's 2006 principles of social reality. Collective intentionality fosters power (Searle, 2006). By members of the group recognising these individuals as the operator of the systems and accepting that the operator controls the system, these individuals acquire a status and by virtue of that status a function i.e. to operate the system. In Table 9.3, excerpt 9, collective intentionality reveals itself as there is an implicit recognition that the farmer controls the water pump since, as the farmer stated, the members organised their land preparation around his use of the pump to derive their benefits. Consequently, the role of operator legitimises his power over the resource and farmers in the group dependent on the irrigation system.

Ideally for those dependent on the communal system, the resilience of each farmer to the lack of water during the dry season should unfold through the use of the system and access to the water output in their daily operations. However, this was not the only practice observed on farms to maintain operations during the dry period. There was evidence of self-reliance as farmers stored water in barrels on the land or brought water from home to spray plants (Figure 9.4)[5].

An alternative practice noted is the placement of "bands" in the waterways along the parcel of the land, thereby creating an artificial storage or reservoir (Figure 9.5). This practice was continuously encouraged within the groups. To get the water out of the river or irrigation channels small water pumps were used by farmers. Furthermore, drip tapes were a common practice on the land for irrigation. One farmer in the vicinity of the sluice gate took matters into his own hands by getting the grade of the waterway around the lands changed by state contractors (when they were doing infrastructural work in the area) so that the water flow would have been favourable

[5]This action was also partly due to the pH levels of the water causing chemical breakdown. Some farmers noted that the water was not suitable for mixing agricultural chemicals and as such brought water from home for this purpose. This issue was also addressed during a farmer meeting I attended by an Agronomist from a chemical company. The Agronomist promoted the sale of a chemical agent to neutralise the water obtained from the irrigation drains in order to facilitate effective spraying. At least one farmer explicitly noted that he uses this chemical agent for spraying.

in the direction of his parcel. Furthermore, he placed pipes from the sluice gate to the waterway to access water. In this waterway "bands" are also used to create artificial storage areas along the way. According to the participant, the farmers before his parcel also benefit from his action. These practices represent forms of adaptation used to manage livelihoods during dry periods. It underscores that the manifestation of resilience occurs through a combination of practices.

Figure 9.4: Storage of water in barrels or drums as a means of coping with water stress in the dry season.

The distribution of use rights unfolded differently in the dairy

farming community, which received the raw water systems. Each farmer has the ability to operate the water tap and control the output he/she receives. However, one dairy farmer noted that the system worked for some farmers but not others. As he stated it was not a matter of access since the tap was located close to his property, but an issue within the physical system. Here, the farmer's use right over the infrastructure gave rise to his ability to access and use the water from the system. However, in this case his ability was not manifested due to some external condition blocking his power manifestation.

Although this effect constrained his ability to maintain his operations, it did not block the unfolding of his resilience. The farmer had a pond as well as access to regular water from his home located on the holdings. Nevertheless, he noted that the use of the regular water increased his input costs since the raw water system is a free service provided by the state, another cushion for farmers. This scenario underscores that his power and resilience dispositions are not the same. In defence of the claim of power and resilience are complementary dispositions, the blocking of power did not result in the non-manifestation of resilience (Goldfain et al., 2010).

With this specific case of water stress in the dry season, the relation between the farmer and irrigation is placed on the forefront.

What governs this relation are property rights (Schlager and Ostrom, 1992; Smith and Zaibert, 2001), which enable both resilience and power dispositions. The focus on rights and social acts reiterate that underlying social (farming) reality are deontic entities (Searle, 1995, 2006). Given the circumstance of water stress, the manifestation of the power triggers the manifestation of resilience. The power held by the operator is manifested through the operation of the irrigation system. This produces an effect of water output or limited output supply, which triggers the manifestation of resilience through the use of the available water and or other adaptation practices employed on the land.

Another take-away point is that having communal rights do not mean that everyone shares equally in the benefit of the water. If this was the case, the issue of water distribution to maintain activities during the dry period would not have been a recurring topic (within the group that received the water pump) during the farmers meetings attended in 2015 and 2016. Furthermore, one participant would not have exited farming by the end of the 2016 dry season due to the continued water stress exacerbated by extreme dry conditions and limited access to water flow on the field. Having the use right gave rise to the community's resilience disposition but the unfolding of the farmers' resilience is impacted by the unfolding of power in the same space. It further supports the assumption that the overall

effects produced by the manifestation of power and resilience are related to the spatio-temporality of both dispositions (Mumford and Anjum, 2011). But who's power is responsible for these effects? Is it solely the power of the operator that produce effects on a farmer's way of coping? Whose power and how far these effects affected the farmer's livelihood before exiting farming will be explored as a closer look at power dynamics surrounding the system is undertaken in the subsequent sections.

Figure 9.5: An Example of a "Band" or Blockade Placed in Irrigation Channel to create an Artificial Water Reserve for Farm Use.

9.4 Special Case: When Power and Resilience fails for Farmer

This is a special case where the effects of water stress led to a farmer in community x making the decision to exit his livelihood at the end of the dry season in 2016. The farmer cited the ineffective distribution of water as the main contributing factor.

In community x, the operator of the pump controls the water output in the irrigation channels. There is no schedule for water distribution, and as such which channels are irrigated and when is the decision of the operator. In the group meeting attended in March 2016, the need for a schedule arose as complaints of unfair distribution of water by farmers along the furthest irrigation channel from the river highlighted their problem with water access. The farmers agreed upon a schedule to facilitate all farmers through a rotation of water supply to the irrigation channels, one day per irrigation channel. The operator who is also an executive member also agreed to pass on the key to another member who can control the water for the irrigation channel he farms along. The reason being is that this member has the means to supply the diesel needed to operate the pump. According to the executive, what followed was the farmer

supplying his channel only for a number of consecutive days while other farmers suffered thereby rendering the schedule ineffective.

The farmer who exited farmed along the channel furthest from the river. This channel is irrigated by waste water from the surrounding settlement and forms part of the water supply for farms along the channel. The farmer was interviewed on three occasions during the course of the field investigation. The first interview took place in January 2016, which was early on in the dry season. Under production was dasheen bush, pumpkin and peppers (Figure 9.6). The dasheen bush grows in moist conditions and the farmer's 1 acre patch required a supply of water at least once per week. In the first meeting, the farmer noted that there was no improvement to water access from the 2015 dry season and he did not know how the water situation would have unfolded in the 2016 dry season. To manage with this, the farmer brought water from home in barrels for spraying and wetting his crops. However, this was not feasible for the dasheen bush and therefore he still required a sufficient water flow along the irrigation channel. To get around issues of access, the farmer also changed his times of wetting his crops via the channels.

By the final visit in March, the farmer was discouraged by the future outlook of his farm. Apart from his field of pumpkin being stolen, he was having problems getting water into the land to supply

Figure 9.6: An example of dasheen bush growing in a drain on a farmer's land.

the dasheen bush and also to start a new crop on the remainder of his land. This was due to the low volume of water in the channel. Although his concern was made known to the executive who operates the pump, his situation did not improve. At that point, he was considering finding a new piece of land somewhere else to continue his livelihood. The farmer stated that there is only so much water he can bring for wetting and spraying. Apart from the water not being diverted from the river to the irrigation channel, he noted that

a blockage placed in the channel by the farmer located before his parcel, as a means of creating an artificial storage, also contributed to his situation since it reduced the flow in his direction. In a post-interview, the farmer stated that by the end of the dry season he exited the livelihood and turn to retail of goods in the market to make a living citing the issue of water and the ineffective distribution by the group as his main reason for his decision.

The patterned effect of water control contributed to the farmer's exit from his farming activities. In this scenario, the co-location of power and resilience occurred via the spatial connection of the farms. The placing of the block by farmer A is a manifestation of A's power to control water and A's resilience to cope with water stress in the abnormal dry season. Here the disposition overlaps in the individual, since the right to water contribute to both dispositions. When A's power to control water is co-located spatially to B's resilience, the proximity of the bearers mean that A's exercise of water control and use of water exacerbates B's water stress and causes B's resilience to manifest for example, by bringing water from home. However, the effect of A's power, together with the effects of the operator's power is greater than the effects produced by B's coping. Here the co-location of the dispositions was due to the spatio-temporality of the bearers via the connection of the land space.

In this chapter, the farmers relation to communal irrigation systems was examined. Similar to case 1, permission emerges as an underlying feature of the farmers' farming reality out of which rights are passed on to them, which enables their resilience and power dispositions. Another underlying feature is that of collective intentionality. It is a subtle feature that relates to the shared belief, recognition, acceptance amongst people (Searle, 2006).

Receipt of resources is made possible because there is the shared recognition that the farmers are part of a collective group. Likewise the status of irrigation system operator requires the collective acceptance and recognition that farmer x is the operator and has a certain power over the system and water supply. Power asymmetry emerges surrounding the control of the irrigation system due to the use right that is transferred to one member and the collective intentionality attached to the status of operator. In community y such control was not an issue as compared to community x.

In community *x*, the manifestation of power and resilience was observed in the operation of the system by the operator and in the creation of bands in irrigation channels to store water for farm use by farmers. For farmers, their rights to water enables this action and here both power and resilience disposition overlaps. The co-location of dispositions, i.e., A's power and B's resilience occurs due

to the connectivity and proximity of the lands. Thus the control and use of water by A cause B to practice alternative means of coping to water stress. Here the complementarity of power and resilience affixed through the spatio-temporality of the farmers. A further discussion on this complementarity, and the contribution of a dispositional outlook of resilience is provided in the subsequent chapter.

Chapter 10

Discussion and Conclusion

Against the background of arguments for a better integration of power in resilience approaches, the aim of this thesis was to understand the relationship between social-ecological resilience and social power. This was undertaken through the unconventional approach of ontologies. To summarise and bring this thesis to a close, the objectives are rehearsed to ascertain what was achieved. To this end,

the chapter is subdivided into Sections 10.1 and 10.2, which discusses the objectives set out in the introduction. Subsequently, the limitations of this work and the future outlook are stated in Section 10.3.

10.1 Objective 1: Categorise social-eco-logical resilience and social power and deduce the ontological relationship between both concepts

To arrive at what type of relation holds between both concepts, first required an understanding of the kind of entities that are resilience and power. Scientific theories and definitions tell us about the form or the nature of entities (Cohen, 2016). The question that arises is: *what is it to be social-ecological resilience and social power.* Through the review of resilience and social power notions, the general forms of both terms were demarcated. Both forms can be reduced to *abilities to perform some action*, which relates that power and resilience are entities inherent to some material entity and through some actions they unfold over time. This is the general structure of what it is

to be a disposition, and abilities are special types of dispositions (Clarke, 2009; Maier, 2014).

However, in the case of social power, the dispositional view of the entity was put forward by other researchers (e.g. Morriss (2002); Lukes (2005)). Through a comparison of structural and agential notions of power, I argued why this position holds. Nevertheless, what gives rise to these dispositions is a debate on intrinsic versus extrinsic properties of the bearer of the these dispositions. In my exegesis, it was argued that, apart from intrinsic properties of an actor (e.g., skill, physical strength, knowledge of opportunities etc.), entities in the social environment also give rise to resilience and power dispositions. This was determined to be rights, specifically use rights in the context of farmers and resources. In this regard, both social-ecological resilience and social power are extrinsic dispositions. This is an infraction on the Basic Formal Ontology category of dispositions that upholds the theory that all dispositions are intrinsic. Nevertheless, both entities (social-ecological resilience and social power) have the markers of *realizable entities* under the Basic Formal Ontology, but uphold an extrinsic disposition position.

What does this dispositional classification of resilience imply? Two salient features of dispositions are: i) They are realizable entities meaning that they manifest through processes (Arp et al., 2015)

and ii) Their manifestation is not necessitated by their existence (Choi and Fara, 2014; Arp et al., 2015). Thus, a system or actor may have resilience without putting it in action. Yet, their resilience reveals itself in processes they participate in, which facilitate their coping. Understanding resilience in this way implies not only paying attention to the enabling conditions and properties that shape their abilities, but also the manifesting processes through which their resilience unfolds. These manifesting processes do not occur in a social power vacuum (see Objective 2).

For example, in the resilience indicator framework put forward by Ifejika Speranza et al. (2014), these enabling conditions and properties that shape actors abilities are captured in various combinations of indicators across the dimensions of buffer capacity, self-organisation and capacity for learning. However, to encapsulate the unfolding of a community or actor's resilience, an area of focus should be these manifesting processes.[1] What are the manifestation processes associated with resilience? Which parts of the community participate in them? Exploring these question would therefore require a context and place specific examination of the unfolding of people's resilience to environmental and climatic changes. Out of

[1]This idea that a dispositional view of resilience requires a focus on the manifestation processes and the parts of the system that participate in these processes is also presented in Daniel (2014).

this a new set of indicators focusing on these manifestation processes and their enabling conditions can be derived.

Although, Obrist et al. (2010) conceptualised resilience as a capacity and a process, a similar proposition was made by the authors. Their conceptualisation of resilience as a capacity and process brings to the fore the exercise fallacy of dispositions (Morriss, 2002). Ontologically, an entity cannot belong to disjoint categories, in this case it cannot be at once a disposition and a process. The exercise fallacy is the reduction of dispositions to its actual process of manifestation (Morriss, 2002). Nevertheless, the authors proposed that resilience as an analytical concept requires two distinctions in its analysis: an account of "resilience building (pre-impact)" and the "manifestation of resilience (post impact)" (Obrist et al., 2010, p. 290).

In this thesis, social-ecological resilience and social power are considered to be extrinsic dispositions. Apart from belonging to the same ontological category, what is the relationship between both entities? I posited that resilience and power dispositions have a complementary relationship and thus are complementary dispositions. This means that when power and resilience are co-located via their bearers, they will unfold. This claim is based on the position that the social structure shapes actors' resilience, for example through the distribution of resources, and that power is a part of

these social structures (Tompkins and Adger, 2004; Obrist et al., 2010; Walsh-Dilley et al., 2016). In light of the dispositional view of resilience and power, it was postulated that the social structure in which a community or actor is embedded in provides the extrinsic conditions (i.e. rights), which give rise to their social power and social resilience dispositions. Both dispositions in tandem result in social actions that produce effects on actors and their environment. Their complementary relationship subscribes to the mutual manifestation theory of paired dispositions (Mumford and Anjum, 2011, 2017). The assumptions about their complementarity are rehearsed and discussed in the subsequent section. By establishing a dispositional position for both resilience and power objective and deducing their relationship based on this position, objective one was achieved.

10.2 Explain what the connection between farmers and entities in the farming communities of Caroni reveal about social-ecological resilience

The properties of mutual manifestation adapted from Mumford and Anjum (2011, 2017) formed the assumptions for the complementary

relationship between social-ecological resilience and social power entities. These assumptions are:

1. Power and resilience are complementary dispositions, which implies that when they are brought together they manifest and create effects. However, these effects can be mitigated or blocked by the presence of another bearer (Mumford and Anjum, 2011).

2. Although power and resilience are complementary, this does not imply that they manifest together immediately. The manifest action can unfold slowly or quickly depending on how one disposition triggers the other (Mumford and Anjum, 2011).

3. What brings power and resilience together for mutual manifestation is the proximity of dispositions, which extends across space and time.

4. The mutual manifestation of complementary dispositions imply a "simultaneity of cause and effect" (Mumford and Anjum, 2011).

In the land scenario, the landowner's power and the farmer's resilience were the objects of investigation[2]. The conduit for the com-

[2]Landowner here can refer to either the state or an ordinary actor who is in the possession of a tenure document from the state and rents the land to a farmer

ing together of the dispositions were the social network relationships between actors be it bonding or bridging ties. The landowner has control over the land, and therefore a power-over relationship exists between him/her and the farmer who is renting or leasing the land. This is because the owner only gives a few rights away while retaining the majority of the property rights (Smith and Zaibert, 2001). The effect of this relationship is seen when informal use rights are passed on to the farmer, which prevents him/her from accessing state incentives and provisions. What does this imply for this property of complementarity? The manifestation of A's power can produce effects that strengthen or weakens B's general resilience.

In this case, the markers of complementarity are evident. The disposition partners come together through the act of permission. *Permission* is a social act, which exists beyond the verbal utterances of the landowner, and allows the farmer to use the land for a period of time. Apart from the temporal nature of the permission, it also reflects that the actors are brought into social proximity with each other via this social act. It is an unfolding of the landowner's power, out of which a use right is created for the farmer. If the right is encoded in a document, the document becomes a representation of that power, which the farmer can use (in accordance to the rules of the Ministry of Agriculture) to access a farmer's identification card that legitimises his role as a farmer. With the legal status of farmer,

the actor has the right to access all the state subsidies and provisions for agriculture. If the landowner provides no documentation, it limits what the farmer can access from the state and reduces his buffer capacity.

In this scenario, the unfolding of resilience is not present. Rather, it depicts how the farmer's resilience disposition can be strengthened or weakened through a formal or informal use right. The reason, I say strengthened or weakened is because there are farmers who have no documentation and are able to persist with their livelihood. This indicates that what contributes to their disposition of resilience is not entirely hinged on the use right. Consider a farmer who has an identification card. If his or her livelihood was to be affected by a disturbance, and he/she needed to go to the Agricultural Development Bank to access a loan to continue operations, then the fact that he can access a loan facility and re-start his operation is embedded within permission. This shows that his/her unfolding of resilience is not in the absent of the manifestation of the landowner's power. If the individual is considered alone then power and resilience disposition overlaps in his/her ability to access the loan.

The relation between the farmer and land, and the farmer and the irrigation system is mediated through rights. It extends beyond property rights as in the land scenario to include socio-economic

rights (the right to a farmers identification card). The second recommendation of the thesis is that to understand power in resilience is to draw upon actors' bundles of rights and the relational roles of actors. Differentiation in bundles of rights attached to roles establishes power over relations through which resilience can be strengthened or weakened since rights are gateways to resources. The consideration of rights lends support to the proposal of a rights based approach to resilience (Walsh-Dilley et al., 2016).

I argued in the thesis that one of the entities of the social environment that give rise to power and resilience dispositions is rights[3]. Rights are attached to roles, roles carry status, and collective intentionality reinforces the status (Searle, 2006). Drawing out social power in resilience approaches requires not only a consideration of rights, but also of collective intentionality, which was evident in both Cases 1 and 2.

However, collective intentionality has so far been overlooked in resilience studies. Collective intentionality give rise to the shared beliefs, intentions, acceptance and values of a group of people, and cannot be reduced to individual intentionality (Schweikard and Schmid,

[3]I acknowledge that there may be other entities outside of the bearer that give rise to resilience, however, given the case study examples rights came into focus. Dispositions also rely on intrinsic properties. Although this was not a focus here there are intrinsic properties of the bearer of resilience that contribute to the disposition for e.g. the bearer's knowledge of disturbances, markets, farming techniques, his/her endurance, etc. will form part of the intrinsic properties

2013). It is something that emerges from the interactions of people in a group and gives a "desire-independent" explanation as to why individuals perform certain actions (Searle, 2006). Although both entities are dispositions, the reason for manifestation can be explained by collective intentionality.

For example, I see the placing of bands in the waterways (an exercise of control and a form of coping to water stress) as an instantiation of collective intentionality. It is a collective acceptance and shared belief to better manage water on parcels such an act should take place, which underscores everyone's right to water, but in some instances it can contribute to unwanted power effects (as evident by the farmer exiting his livelihood), which has consequences on how people cope with disturbances to their livelihood. Through the analysis, markers of the co-location of the dispositions and their mutual unfolding were evident. Therefore, resilience and power share a complementarity.

In the introduction, the resilience and political ecology approaches were contrasted through a case study example to illustrate how power is addressed in both frameworks. Having argued for a dispositional view of power and resilience, how does this work address the political ecology approach? To recall, a political ecology approach uses elements of socio-political, economic and ecological perspectives

to draw on issues of power relations in resource use (Zimmerer and Bassett, 2003; Kull and Rangan, 2016). In so doing, power is intertwined with power relations as in the case study example of flooding in Guyana discussed in Chapter 1. In this work, power is dealt with as a standalone entity and not a second order citizen. Although power contributes to these power relations, it is not in itself domination. A dispositional place-holder for power and resilience provides the means to analyse the various potentials of both entities.

10.3 Limitations of Study and Future Work

Since the lens of analysis was ontologies, it limits what can be answered about power and resilience. An ontology answers for example, i) 'what is resilience?' ii) 'what are the relationships between resilience to other entities?' iii) 'how do these relationships exist?' Questions pertaining to normative issues such as the domination of farmers in informal tenure arrangements and the constraints placed on their agency to manage their livelihoods requires a different lens of analysis. Hence, I refrained from qualifying the power over relations between actors as either part of a structure of domination or authority, although involving power, they are not power in itself.

Secondly, the ecological dimension was not incorporated into the study. By not considering the ecological, a social bias occurs, which can miss broader implications about social-ecological resilience of the community (Folke et al., 2016). For example, in the land scenario, for the farmers with informal use rights, is there a correlation between their farming activities and degradation of the land? Despite of the resources that can be accessed through an informal use right, if uncertainty in tenure results in overuse of the land and poor farming practices, then this can impact overall social-ecological resilience and undermine the cushion of social benefits. Such an analysis requires a larger sample size and different theoretical underpinning than undertaken in the study in order for generalisations to be made in this direction. Given the small sample size and the theoretical focus, any remarks on normative issues of power and livelihood resilience can only be explorative at this point. Lastly, social-ecological resilience being dispositional implies that there are also ecological processes through which resilience unfolds. What are these ecological processes? How are the social processes that manifest social resilience embedded within the ecological processes? These are some of the departure points for future research.

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Relation	Definition	Ontology
occurs-in	b is a process and c is a material entity or immaterial entity. And there exists a spatiotemporal region r, and b occupies-spatiotemporal-region r. And forall (t), if b exists at t, then c exists at t. And there exist spatial regions s and s' where and b spatially-projects-onto s at t. Spatially-projects-onto is a relation that holds between a spatial region and a spatiotemporal region at time t, such that s is the spatial extent of the planting activity b at t (Smith, 2015). And c is occupies-spatial-region s' at t and s is a proper-continuant-part-of s' at t. The relation s proper-continuant-part-of s' is a parthood relation that holds between spatial regions whereby s is a sub-region of s' (Arp et al., 2015).	BFO relation
participates-in or has-participant	A relation that holds across a continuant, process and a temporal region. For example, a participates-in b at t. This implies that a is a continuant that exists at t, b a process and t, the temporal region.	BFO relation

Relation	Definition	Ontology
s-depends-on	A type of dependence relation that exists between entities when one entity's existence is based on the other entity being present. For example a s-depends-on b implies that a and b do not share common parts and that a's existence is based on b being present.	Dependence, BFO relation
inheres-in	A type of dependence relation that exists between a dependent continuant and an independent continuant	Dependence, BFO relation
g-depends-on	A type of dependence relation that exists between a generically dependent continuant and an independent continuant.	Dependence, BFO relation
member-part-of	A mereological relation that holds between an object and an object aggregate.	Mereology, BFO relation
has-specified-output	"A relation between a planned process and a continuant participating in that process."	Document Act Ontology[4]

Table 10.1: BFO and DAO Relations and Definitions. The BFO relations are taken directly from Smith (2015); Arp et al. (2015). The Document Act Ontology relation is taken from `http://www.ontobee.org/ontology/d-acts?iri=http://purl.obolibrary.org/obo/OBI_0000299` (Accessed December 15th 2017).

[4]This table is not an exhaustive list of BFO and DAO relations.

Author	Definition	Structure
Pelling (2003) Social resilience	The ability of an actor to cope with or adapt to hazard stress.	Inherent property
Manyena (2006) Social resilience	The intrinsic capacity of a system, community or society predisposed to a shock or stress to adapt and survive by changing its non-essential attributes and rebuilding itself.	Inherent property
Cutter et al. (2008) Social resilience	The ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organize, change, and learn in response to a threat.	Inherent property
UNISDR (2009) Social resilience	The ability of a system, community or society exposed to hazards to resist, absorb accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.	Inherent property

Author	Definition	Structure
Keck and Sakdapolrak (2013) Social resilience (multidimensional concept)	1st dimension Coping capacities: The ability of social actors to cope with and overcome all kinds of adversities; 2nd dimension Adaptive capacities: – The ability of social actors to learn from past experiences and adjust themselves to future challenges in their everyday lives; 3rd dimension Transformative capacities: The ability of social actors to craft sets of institutions that foster individual welfare and sustainable societal robustness towards future crises.	Inherent property
Folke et al. (2010) SES Resilience	The tendency of a [social-ecological system] subject to change to remain within a stability domain, continually changing and adapting yet remaining within critical thresholds.	Inherent property
Rose (2007) Economic System Resilience	The ability of an entity or system to maintain function (e.g. continue producing) when shocked. Adaptive resilience refers to the ability in crisis situations to maintain function on the basis of ingenuity or extra effort.	Inherent property

Author	Definition	Structure
Meerow et al. (2016) Urban System Resilience	The ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity.	Inherent property
Walker et al. (2002) SES Resilience	The potential of a system to remain in a particular configuration and to maintain its feedbacks and functions, and involves the ability of the system to reorganize following disturbance-driven change.	Inherent property
Nelson et al. (2007) SES resilience	The amount of change a system can undergo and still retain the same function and structure while maintaining options to develop.	Inherent property

Table 10.2: Resilience and its polysemic descriptions. The Table provides a list of resilience notions that underscores the polysemy of the resilience concept. These definitions support the inherent nature of resilience and that resilience tied to an ability is a disposition.

SN	Constructs for validation	Questions to Ask Respondents	Comments
1	Lobbying for resources has-participant Famer	Do farmers participate in lobbying process for resources?	
2	Lobbying for resources has participant State Actor	Do Government representatives participate in lobbying for resources?	
3	Lobbying for resources temporal-part-of Stakeholder Meeting	Lobbying for resources happens at Stakeholders Meeting?	
4	Stakeholder Meeting has-participant State Actor	Do government representatives attend stakeholders meeting?	
5	Stakeholder Meeting has-participant Farmer	Do farmers attend stakeholders meeting?	
6	Stakeholder Meeting is a Bridging Activity		Assertion, verified by me
7	State Actor is-member-part-of Social Network	Do government representatives take part in any of the community, famers association, and any other farmers' informal group?	
8	State Actor is-member-part-of Government Organisation		Assertion, verified by me

SN	Constructs for validation	Questions to Ask Respondents	Comments
9	Farming Group is-member-part-of Social Network		Assertion, verified me
10	Director_Farming Group is-member-part-of Farming Group	Do you agree that farming group directors are farmers and a members of the group?	
11	Person has-role Farmer		Assertion, verified by me
12	Person has-role Director_Farming Group		Assertion, verified by me
13	Person has-role State Actor		Assertion, verified by me
14	Farmer is-member-part-of Farming Group	Do you as a farmer belong to a farming group?	
15	Farming Group bearer-of Use_Right	Do you agree that the use right of water pump is vested in the hands of farming group?	
16	Water Pump specifically-dependent-on Use_Right	Do you agree that farmers can't use the water pump unless they are given the right to do so?	

SN	Constructs for validation	Questions to Ask Respondents	Comments
17	Government Organisation confers Use_Right	Do you agree that it is the government that gives the right to use the water pumps to the farming group?	
18	Use_Right realizes Farming Practice	Do you agree that the use of the water pump influence cropping practice in the community?	
19	Farming Practice occurs-in Land		Assertion, verified by me
20	Farming Practice is-a Process		Assertion, verified by me
21	Bridging Activity is-a Process		Assertion, verified by me
22	Government Organisation bearer-of Ownership_Right	Do you agree that government owns the water pumps?	
23	Water Pump specifically-dependent-on Ownership_Right		Assertion, verified by me

SN	Constructs for validation	Questions to Ask Respondents	Comments
24	Water Shortage affects Farming Practice	Do you agree that water shortage affect how farmers plant and what they plant?	
25	Water Shortage is a threat	Do you agree that water shortage negatively impact your framing practice in your community?	
26	Farming Practice has-participant Farmer		Assertion, verified by me

Table 10.3: Relation to Farmer and Irrigation System Verification

SN	Constructs for validation	Statements to Ask Respondents	Comments
1	Ability to permit use of land inheres-in Landowner	As a landowner, you have the authority to allow others to use your land for farming	Ask Landowner
2	Property Right is-concretised-as Landowner	As a land owner, you have either ownership right or a lease right	Ask Landowner
3	Property Right generically-dependent-on Land	The property right that you have as landowner is attached to a specified land	Ask Landowner
4	Use Right generically-dependent-on Land	There is a specific land that you are permitted to use for farming	Ask Farmer
5	Landowner participate-in Permission	Landowners interact with farmers to give permission to use land for farming	Ask Landowner
6	Permission legally-transfers Use Right	The permission given by a landowner provide the farmer the authority to use the land for farming	Ask both Farmer and Landowner
7	Use Right is-concretised-as Farmer	The authority given to use the land for farmers is given to a farmer	Ask Farmer

SN	Constructs for validation	Statements to Ask Respondents	Comments
8	Farmer participate-in Permission	Farmers interact with landowners to gets permission to use land for farming	Ask Farmer
9	Ability to use land inheres-in Farmer	As a farmer, you have the authority to use the land given to you for farming	Ask Farmer
10	Payment of state land rent obligation has-specified-output Permission	A farmer renting a land is only permitted to use the land when he/she pays the land rent	Ask both Farmer and Landowner
11	Payment of state land rent obligation is-concretised-as Obligor Role	Payment of rent is a mean to establishing a contract that allows a farmer to use a land	Ask both Farmer and Landowner
12	Obligor Role realizes Payment of Land Rent	As a farmer, you affirm your commitment to using the land by paying the rent for the land, thereby fulfilling your end of the contract	Ask Farmer

Table 10.4: Relation to Farmer and Land Verification.