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# On the need for pro-poor land administration in disaster risk management

E.-M. Unger\*, J. Zevenbergen and R. Bennett

There exists an intensifying and multifaceted relationship between rapid population growth, the increasing occurrence of natural disasters, and demands for land tenure security. Consequently, there is growing agreement on the need to adopt pro-poor land administration approaches, ones that better address the needs of the poor living in disaster prone contexts. Vulnerable communities and exposed lands could benefit from emerging pro-poor land administration, however, thus far, application of the pro-poor mind-set has gained minimal traction in the disaster risk management agenda. Using a research synthesis, existing evidence is analysed and consolidated, and a new inclusive conceptual framework is built; one that illustrates the underutilised potential for pro-poor land administration in disaster risk management. The developed framework explains the interactions between three identified and fundamental global change forces (people, land and disaster) and the three disaster risk drivers (vulnerability, exposure and hazard). The framework illustrates how pro-poor approaches can simultaneously have impacts on both land tenure security and disaster risk management. The conceptual framework is considered a first step toward an implementable strategy for applying pro-poor land administration technologies in the context of disaster risk management. Ultimately, pro-poor land administration should enable the poor to minimise vulnerabilities and disaster risks through an inclusive land tenure security approach to prevent, mitigate, prepare and respond to natural disasters.

**Keywords:** Pro-poor land administration, Disaster risk management, Natural disasters, People, Land

## Introduction

Pro-poor land administration focuses attention on improving the land tenure security of the poor. It is a set of counter approaches that supports recognition of the broader continuum of land rights, not just outright individual private ownership. It can be seen as a subset of 'responsible land administration', introduced in Zevenbergen *et al.* (2015) and more broadly related to ideals behind good land governance (FAO, 2012). These approaches emerge because individual land titling, the conventional approach for delivering land tenure security in developed countries at scale, has been shown to be incapable of delivering effective results in less developed contexts (Zevenbergen *et al.*, 2014a,b). The reasons for the ineffectiveness are usually a mix of factors relating to inadequately aligned land policies, legislative frameworks, institutional arrangements, technical standards, and a lack of available funding and skilled capacity.

The 'poor' often reside, although not exclusively, in disaster prone areas due to limited land resources, especially in urban areas. For this reason, there is a strong and

multifaceted relationship between demands for tenure security, rapid population growth (often in disaster prone areas), and the increasing occurrence and impact of natural disasters. This increase in the number of natural disasters affecting an increasing number of vulnerable and exposed people, who are not addressed through any land administration system, has eminent effects on people's resilience. For the field of pro-poor land administration, disaster prone areas therefore represent a special case where tools require development.

Pro-poor land administration has so far received minimal attention in the disaster risk management literature, even though the number of natural disasters and the people affected increased significantly throughout the 2000s. Developing countries are the most affected by natural disaster with regard to the number of natural disasters recorded and the numbers of people impacted. The lack or even non-existence of a functioning land administration, specifically missing land information, prevent and delay the disaster risk management processes (Mitchell, 2011). Various works highlight the increasing role of spatial information in disaster risk management (c.f. (Zevenbergen *et al.*, 2014a,b)). In addition to land tenure information, the relevance of land valuation and land use planning information is also described by Mitchell *et al.*

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(2014a,b) and Roy and Ferland (2014). The research of Mitchell *et al.* (2014a,b) and Griffith-Charles *et al.* (2014) illustrate the importance of including the poor in land and disaster risk management approaches. However, there is an apparent gap in the literature: the inter-relationship between three fundamental global change forces (people, land and disaster) and the three disaster risk drivers, defined by World Bank and GFDRR (2012) (vulnerability, exposure and hazard) is conceptually, and therefore practically, rather unexplored. In this regard, more dialogue between the discourses of pro-poor land administration and disaster risk management could be highly profitable to both domains.

This paper aims to close the cited gap and review the need for pro-poor approaches in developing countries prone to natural disasters. The review shows the inter-relationship, couched in the general study area of land administration, between the three identified fundamental global change forces: rapid population growth (people), increasing demands for tenure security (land), and increasing occurrence of natural disasters (disasters) and the three disaster risk drivers: vulnerability, exposure and hazard. Based on a synthesis of these drivers, the need for pro-poor land administration is identified and a conceptual framework is developed. This framework illustrates the need and potential contributions of pro-poor land administration in disaster-affected areas. Further it introduces and describes the link between people-and-vulnerability, land-and-exposure and disaster-and-hazard. The utility of the framework is demonstrated by applying it to example cases including the Haiti earthquake in 2011 and the typhoon Hayan in the Philippines in 2013. The examples highlight the need for alternative approaches for land administration that better address all people-land relationships in order to prevent, respond, mitigate, prepare and respond to natural disasters. This is important for any justification and advancement of pro-poor land administration and its subsequent application in natural disaster risk management.

The paper is structured as follows: first, a brief overview of the methodology explains the research method and materials used for the synthesis; subsequently, the research synthesis structured around each global change force – people, land and disaster – is presented. Specific attention is given to clarifying definitions, which are either diverse over different discourses or entirely missing in the literature. The clarification seeks to ensure a common understanding and forms the base for the development of a conceptual framework. The findings of the research synthesis justify the need for pro-poor land administration in disaster risk management, specifically to address the poor and vulnerable. This leads to the development of the conceptual framework, which summarises the findings, shows the inter-relationship between different concepts, and demonstrates the possible contribution of pro-poor land administration. Finally, a discussion of key issues emerging on the need of pro-poor approaches, based on the introduced framework is undertaken: this precedes the conclusion encapsulating future research opportunities.

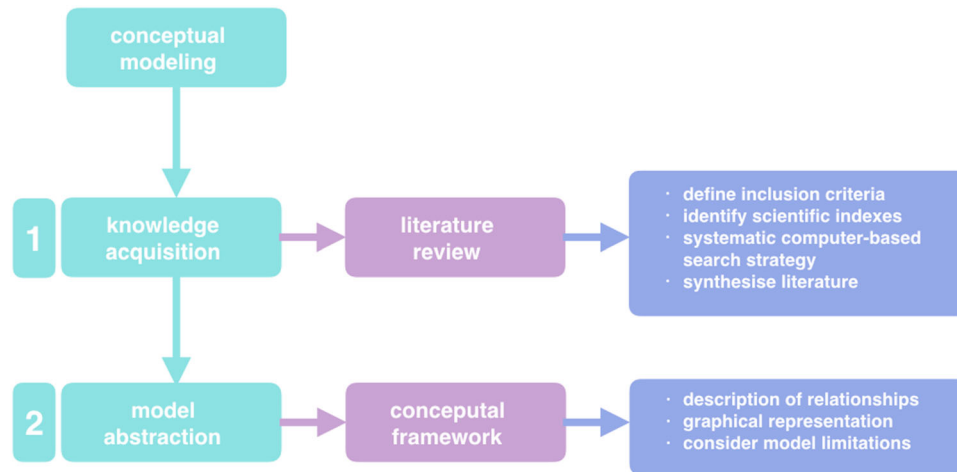
## Research method and materials

In order to review the need for pro-poor land administration in areas prone to natural disasters, two processes of conceptual modelling were followed: knowledge

acquisition and model abstraction. Justification of the approach is found in a similar work relating to modelling pro-poor land tenure security (Simbizi *et al.*, 2014).

Regarding knowledge acquisition a research synthesis was applied to enable comparison of research outputs from multiple studies. The approach aims to provide an empirical understanding of the research field through introducing model abstraction processes, explanatory frameworks, enhanced theories, or new conclusions (Cruses and Dybåb, 2011). Through the literature review three global change forces emerged: increasing world population, summarised through the term ‘people’; the limited resource of land, summarised through the term ‘land’ and the increasing number of natural disasters, summarised through the term ‘disaster’. These terms are considered the fundamental global change forces that underline the need for pro-poor land administration for disaster risk management. They provide the foundation reasoning for the subsequently introduced conceptual framework.

The literature review used terms related to the identified global change forces and its three identified disciplines relevant for the research focus: people (social science, development studies), Land (geography, land administration, urban and regional planning science) and Disaster (earth science). It should be noted the disciplinary areas denoted in brackets are indicative disciplinary areas relating to the global change forces, rather than precise divisions of the disciplinary area. It should also be noted that during the review it was revealed that only a relatively small number of studies existed where all three components were addressed concurrently. To conduct the review, inclusion criteria were developed to define boundaries. Four types of documents were considered for the review: (1) peer-reviewed journal articles, (2) dissertations, (3) books and (4) technical reports published by international organisations. For the journal articles, literature were retrieved from scientific indexes including Web of Science, Elsevier, SCOPUS, GEOBASE, Springer Link, JSTOR and libraries to which the researchers were subscribed. For the technical reports, four international organisations were evaluated as the most active in the research fields on pro-poor land administration and disaster risk management: the United Nations’ Human Settlement Programme (UN-HABITAT), World Bank Group (WB), Food and Agriculture Organization of the United Nations (FAO) and International Federation of Surveyors (FIG). In addition, resources and grey literature available on the Internet were utilised. Only resources written in English were selected. Since the research area on pro-poor land administration is quite novel, the focus of literature was on recently published material. Therefore the review period was set from 1995 to 2015, bearing in mind that the literature from 1995 was included because of the definition of land in the cadastral statement of Henssen (1995). The study area was not limited although the focus, especially for the application of pro-poor land administration, was on developing countries. To use the above-mentioned scientific indexes, a systematic computer-based search strategy was utilised. The strategy was developed using selected key words and Boolean operations (and, or). This resulted in a number of search queries that could be reused across the repositories. These search queries were extended through reviewing the reference lists of retrieved articles, in detail, to find additional literature.



## 1 Overview research method

The process resulted in approximately 80 documents being reviewed (63 documents are cited in this work). The dominant focus of these 63 documents was on Land (geography, land administration, urban and regional planning science). The results of the research synthesis, which gave an understanding on the need for pro-poor land administration approaches for disaster risk management, serve as the base for the modelling process.

The second phase of conceptual modelling as described by Simbizi *et al.* (2014) is model abstraction. Steps for model abstraction involve identifying and describing the relationships between the components, graphical modelling, as well as considering the model's limitations. This activity was completed through both graphical and textual representation of the inter-relationships, couched in the general study area of land administration, between the three identified global change forces of people (rapid population growth), land (increasing demands for tenure security) and disasters (increasing occurrence of natural disasters), and the three disaster risk drivers: exposure, vulnerability and hazard Fig. 1.

## People

This section commences the presentation of results from the knowledge acquisition process. Specifically, it focuses on the global change force of people, which is defined in this context as people exposed to natural disasters, is linked to the disaster risk driver, vulnerability. It will be shown how relevant and prominent the interaction and linkages between the two constructs are – particularly with regard to rapid population growth. Furthermore, terms used in both disciplines, land administration as well as disaster risk management, will be linked to the global change force people.

### People and rapid population growth

Increases in people, or 'population growth', is a key driver behind pro-poor land administration (Alemie *et al.*, 2015) as well as a key driver behind the increase of human activity, which is suspected to increase the occurrence and impact of natural disasters (Huppert and Sparks, 2006). The disciplinary areas embodied by the domain of social science, and development studies more

specifically, tend to concentrate on 'people' – be they individuals or groups, as a scientific unit of analysis, whereas in this context the unit of analysis is people who are exposed to natural disasters and its effects. By definition, any discourse on either land or natural disasters necessarily includes people-related dialogue: it is people who form local understandings of land and natural events, and when impacting negatively upon people these are described as natural disasters. With regards to pro-poor land administration, it is people who form a community with their intangible variety and values and it is people who rely on sustainable development and fit-for-purpose approaches, whether in the land tenure security or disaster risk management domain.

Natural disasters are occurring worldwide, although the damage and intensity of the disasters varies within regions: developing countries and their people are more prone to natural disasters and their effects. According to IEG World Bank (2006) it is estimated that around 95% of all casualties occur in developing countries. They also identified China, India, Indonesia, the Philippines and Vietnam among the world's most disaster prone countries, while Small Island Developing States (SIDS) are among the most vulnerable. The population increase as well as the increase of slum dwellers has major consequences on how people access land and increases the people affected and dealing with insecurity of tenure. Further, it influences human activity in a societal context as well as natural resources context, which consequently is suspected to increase the occurrence and impact of natural disasters.

As identified by Mitchell (2011) many developing countries are prone to natural disasters and the impact on the in those country's poor is often greater. Developing countries experience the most excessive population increases as well as being the most likely to have land administration systems that are insufficient or non-existent, particularly ones that are able to respond to or mitigate against natural disasters. This lack of spatial information, which is linked to basic census data, was witnessed in recent disasters. For example, the numbers of people settled in affected areas was unknown for example during the 2014 Badakhshan mudslides in Afghanistan. Further resettlement strategies failed based of missing land-use strategies, as seen after the Haiti earthquake. Therefore, pro-poor land administration focuses on

developing contexts, and on people–land relationships, which have not been formally addressed.

The impact of tremendous population increases in developing countries over short periods is crucial as it significantly influences people's livelihoods. Further, land and property issues, especially in relation to natural disasters, become more present in those countries. The urgency of addressing this population increase, in all its manners, is emphasised in the international agenda through the Sustainable Development Goal 11 (SDG). This goal seeks to address people's need to inclusive, safe, resilient and sustainable cities through ensuring access to safe and affordable housing, and upgrading slum settlements (United Nations, 2015). Therefore, pro-poor land administration is by the researchers seen as a key in building the resilience of the poor to reduce their vulnerability to natural disasters.

### People – vulnerability

The UNFPA (2013) as well as Woodward (2014) identify specific risks related to rapid population growth, which can be directly linked with one of the disaster risk drivers – 'vulnerability'. The specific risks include rising inequalities between developed and developing countries, as well as within those countries, in terms of access to land, housing, food, water and work. Further, the link between access to land, housing and security of land has been highlighted as a significant issue with regards to urban and rural divides. Those risks increase vulnerability and hinder people's ability to mitigate and respond to natural disasters. Demographic trends, for example, the lack of work and food, are shown in Desai (2012) as key for rapid urbanisation. Desai states that people are more likely to move to urban areas, where housing is limited or inaccessible. Especially in Asian and African countries, urbanisation is occurring rapidly (UN-Habitat, 2010a,b,c). This on-going rural–urban migration, which also boosts assets in at-risk areas, is resulting in an increase of urban population. Further Woodward (2014) and Shrestha *et al.* (2014) identified that these internal migrations are accompanied by so called 'push' and 'pull' factors. Whereas 'push' factors are seen to be directly related to livelihood problems, unemployment, low standards of housing, displacement due to conflicts and natural disasters, 'Pull' factors on the other hand are described as economic opportunities, better education and better health facilities in the urban areas. Consequences are high levels of urban poverty and rapid expansion of unplanned urban settlements and slums in areas at risk. These informal settlements and slums are prone to natural disasters and people living there are threatened not just by the potential loss of their informal tenure, but also of life-threatening situations due to, for example, the lack of building standards. An increase of population increases the scale of informality through an increasing number of informal settlements. The rising inequalities further strengthen the above-mentioned push and pull factors, which further fosters rural–urban migration. According to De Filippi (2009) the most affected by natural disasters are the urban poor who reside in slums located in hazardous areas mainly impaired by insecurity of tenure. The poor implementation of building standards and land use planning regulations has been identified as key factors in worsening disaster impacts. Owing to this high

population density, especially in informal settlements in urban areas, and the inequalities rising within those, the scale of vulnerability increases exponentially. Further settlements arise, again with insufficient adherence to building standards, sanitation and education causing more people to be made vulnerable to the impacts of natural disasters.

These 'push' and 'pull' factors, which can be empirically presented in figures and statistical data, are inter-related with the concept of 'social capital'. It is a term identified and used by Shrestha *et al.* (2014), which describes the concept of a strong social network within and outside of informal settlements. Social capital is closely related to resilience, where a community with a strong social capital is more resistant to the effects of natural disasters. Referring to social capital and resilience, in the context of articulating the link between people and vulnerability, it is important to also look at how people organise themselves in different ways in different places as for example, groups, communities, parties or individuals. Nevertheless, the researchers argue that understanding existing levels of social capital and resilience is core in adapting pro-poor land administration solutions that support the disaster risk management domain.

In summary, global populations are on the rise, particularly in developing contexts. When people are not included in an established land administration system, an increase of people affected and dealing with insecurity of tenure tends to lead to an increase of the number of informal settlements and slums in at-risk areas, which further increases vulnerability. Vulnerability is related to the push and pull factors of rural–urban migration as well as to levels of societal capital. The push and pull factors are directly linked to the global change forces and can be seen as consequences of them. Therefore, in this section vulnerability is identified as the disaster risk driver most directly linked to *people*. The global change force of people and its disaster risk driver vulnerability can be addressed and linked with census data gathered via participatory enumeration, for example.

### Land

In this section the global change force land, its scarcity as well as the increasing need for tenure security are linked to the disaster risk driver, exposure. It will be shown how land administration experts are working on new concepts, which addresses the need of tenure security in the developing world, and how those can be linked and used within the disaster risk management domain. Furthermore, a definition for pro-poor land administration is explored and introduced.

#### Land, its limitation and demands for tenure security

Population increase drives land scarcity and tends to force poorer people onto lands more exposed to disaster. Therefore, land appears regularly in discourses on both pro-poor development approaches and disaster risk management. The importance of addressing land is also highlighted because it is a limited resource: 29.2% of the earth surface is land according to Hoekstra, (2013) – and much less is actually able to be easily inhabited. The meaning of land changes across cultural settings and

temporal contexts: land has different meanings for different people, as well as its perceptions differ across disciplines. Viewpoints might be technical, spiritual, physical, social, cultural or economical. The need to organise access to land for people, in one way or another, is apparent especially when natural disasters occur and the ability to respond to this relies on land information. A definition of land by Henssen (1995) and Kaufmann and Steudler (1998) focuses on land as seen from a cadastral perspective. Another definition could be far more widespread showing the necessity and importance of access to land to meet the basic human needs for shelter and food, especially in connection with natural disasters – or even include spiritual connotations relating to disasters. Therefore, it is essential to include and specifically address the poor in land administration approaches for disaster risk management.

Land administration is a tool, which aims to document the people–land relationship. Generally, it can be described as the study of how people organise land including the way people think about land and how it is built and managed by institutions and agencies according to Williamson *et al.* (2010). The term *land administration* has been defined in many different ways, all-varying in the focus and the background of the definition. Whereas the authors of Williamson *et al.* (2010) see land administration as a process which is performed by government, public and/or private sectors related to the four core functions: land tenure, land value, land use and land development, Ting (2002) emphasises that the traditional role of land administration was to manage the rights and interests that exist over land.

In practical terms, land administration is mostly performed through the use of Geographic Information Systems (GIS). Developments in GIS or spatial technologies are now serving a much broader market and are therefore more flexible in its use and application area (Bennett, 2007). Van der Molen (2006) emphasises that land administration systems are more than a mere GIS and manage the social relationship between people concerning land. However, in practice, commonly land administration systems are used to only capture legally recognised people–land relationships. Nevertheless, especially these social relationships are meaningful in a society and cannot only be captured through attributes used in a GIS. In this regard, all people–land relationships, legal or legitimate, are essential to know for improving disaster response and mitigation. They play an important role in all phases of the disaster risk management framework. Lack of this information means a delay and hinders recovery and mitigation. Various papers highlight the increasing role of spatial information in disaster risk management (Zevenbergen *et al.*, 2014a,b) as well as pointing out the relevance of land valuation and land use planning in this context (Mitchell *et al.*, 2014a,b; Roy and Ferland, 2014). Land administration has been recognised by the disaster risk management domain as a fundamental instrument for mitigation and responds to natural disasters.

Further, it is estimated that in most developing countries, cadastral coverage is less than 30% (Lemmen *et al.*, 2009; GLTN, 2012; Antonio, 2011). Various scholars suggest that individual land titling, on its own, cannot cover the need of tenure security to the majority in the developing world according to Antonio (2011), Deininger

(2003), Jacoby and Minten (2007), Payne (2002), Payne *et al.* (2009), Undeland *et al.* (2010), Wehrmann and Antonio (2011). According to Desai (2012) there is still a lack of tools and strategies to deliver secure land rights for all. This lack of strategies and tools can be explained by the variety and complexity of the range of land rights existing in developing countries, each with a different level of tenure security. Therefore, the global land administration community introduced the metaphor of a continuum of land rights (Barry, 2006) in order to address the above-mentioned tenure security for all, which is key in disaster risk phases as for example mitigation and response. This continuum of land rights has been widely debated, but largely agreed upon conceptually at the global level.

However, limited cadastral coverage, as well as the urgent need for tenure security for all, and the implication of adopting the continuum of land rights emphasised a broader view of land administration. Consequently, this leads to alternative recording and mapping approaches, which are needed in order to address all sets of rights in an affordable and fair way. New tools had to be designed, as the conventional land administration and land record systems could not accommodate the range of social tenures as being discussed in Lemmen (2012) and Augustinus and Lemmen (2011). In this regard, as already explained, pro-poor land administration emerged as an umbrella phrase to capture these emerging tools. In literature, there are many different terms used for such an approach but they all, in principal, encompass the same: addressing all, rather than only limited numbers of, people to land relationships.

Therefore, pro-poor land administration aims to serve the needs of the poor by providing *de facto* tenure security. Van Asperen and Zevenbergen (2007) distinguish between *de jure* security, which is assessed through laws and regulations and *de facto* security, which especially matters to informal settlers, and do not need necessarily documents. The general aim is to recognise the people–land relationship by either government or local communities or even just by the surrounding neighbours. Tenure security matters especially when natural disasters occur as identified by Mitchell (2011) and IISD (2006): land tenure security is an incentive for landholders to invest in adaption measures, as for example, building standards. Those investments are also hindered in rural areas by the limitation or even no possibility to access credit, which can be used to finance the construction of a house or to improve the constructions so that the effects of natural disasters can be limited. As stated in United Nations (2015), a life without the safety net of savings and especially property drastically reduces people's ability to cope with a crisis like a natural disaster. Consequently, the lack of security of tenure is directly linked to exposure and reduces the peoples ability to mitigate and respond to natural disasters. Mitchell *et al.* (2014a,b) and Griffith-Charles *et al.* (2014) both mention the importance on including the poor in land and disaster risk management approaches. This is also emphasised by the researchers and can be realised by the application of pro-poor land administration in the disaster risk management domain.

Further, it is most likely that in areas where land tenure security is not prevalent, disputes over land may delay recovery and reconstruction efforts. After a disaster, tenure problems, such as losing shelter or land, land

grabbing, lost records and inheritance issues because of deaths, are likely to arise (Flamm, 2011). As definitions of tenure security vary over literature, it is important, as proposed by the authors of Simbizi *et al.* (2014), to relate the term to a regional context. As stated by Maxwell and Wiebe (1998) researchers must be aware that there is no one-size-fit-all definition of tenure security. Barry (2006) further highlights the limitations in providing tenure security and the acceptance of it. Nevertheless, it is the information on all people-land relationships that is needed with regards to disaster risk management in the context of increasing populations using and occupying land.

### Pro-poor land administration and exposure

Until now there is no universal definition of 'pro-poor land administration' although various papers have already been published including its criteria and design elements. Within Williamson *et al.* (2010) the focus on the poorest of the world's population has been identified as the main distinguishing element between land administration built on legal systems and pro-poor land administration. This suggests that the set of pro-poor land administration approaches focuses on broader social systems ahead of narrower legal systems. Within Anaifo (2013), once more the regional context is emphasised. Nevertheless, a working definition of pro-poor land administration is necessary within this and future research, therefore the definition by Williamson *et al.* (2010) is extended to: 'Pro-poor land administration is the management of land tenure, land valuation, land-use, and land development, in a way that addresses the needs of the poor', where land tenure is seen to encompass the continuum of land rights.

Pro-poor land administration tools are available and their effects on land administration and its four functions can be directly observed through existing participatory enumeration efforts or indirectly by political statements. Contemporary pro-poor land administration tools implemented and in use are, for example: *Social Tenure Domain Model (STDM)*, *Open Title and Solutions for Open Land Administration (SOLA)*. However, these tools have not necessarily been developed for the use within the disaster risk management domain. Although it needs to be highlighted that these tools have one strategy of data gathering in common: participatory enumeration. Participatory enumeration is an important and vital component for gathering data for both pro-poor land administration systems and disaster risk management applications (Cadag and Gaillard, 2012). It is a very sensitive process and, based on one definition by UN-Habitat (2010a,b,c), the involvement and the acceptance of the community is imperative. The sensitivity can be shown by various papers using this method and is highlighted in Barry (2006). Use cases showed for example that the acceptance sometimes relies on only one person, the community chief. Nevertheless, through participatory enumeration, land disputes can be for example addressed and prevented. Within disaster risk management, participatory enumeration finds application in community based disaster risk management – particularly within the assessment phases. Participatory enumeration and community based disaster risk management are

driven by similar philosophies – namely the active contribution and inclusion of the community.

In summary, exposure is identified as the disaster risk driver directly related to *land*: when land is not represented through the *in situ* people-land relationship on the ground, it leads to an increase of peoples inability to respond and mitigate towards natural disasters, which further increases exposure. Therefore, exposed communities could benefit from emerging pro-poor land administration, for example those based around participatory enumeration. Indeed, the researchers argue that this communality is the key in the application of pro-poor land administration for disaster risk management. However, thus far application of the pro-poor mind-set has yet to gain significant traction in the disaster risk management agenda.

### Disasters

In this section the global change force disaster, specifically the increasing number of natural disasters, is linked to the disaster risk driver, hazard. Countries, like the SIDS, are particularly experiencing increasing numbers of hazards – and this is highlighted. Furthermore, the linkages and common strategies used within both domains highlight the need for cooperation strategies.

Although disasters vary in their effects and causes, they disrupt people and their people-land relationship tremendously. Statistics as well as researchers point to an increase in disasters over the 2000s, which are suspected to be related with population increase and subsequent land related activities.

A disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (UNISDR, 2009). Within World Bank and GFDRR (2012) three variables have been identified which drive disaster risk: exposure, hazard and vulnerability. Comparing other definitions of *disaster* by van Westen (2006), van Westen *et al.* (2011) and World Bank and GFDRR (2012) shows that they differentiate just by the wording and by the focus set within the definition, whereas the focus of the definition can be seen in relation to the institution behind the definition. Nevertheless, all of the definitions highlight the social as well as the resource (land) dimension.

This definition and relationship is deepened by the term hazard, which is a *dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage* (UNISDR, 2009). Within the term hazard, the social dimension and land dimension becomes even more prominent. In literature, as well as in science, this relationship is already well known and published, for example (Cadag and Gaillard, 2012; IISD, 2006; Mitchell, 2010; Usamah *et al.*, 2014; Mitchell, 2011).

Reports of disaster recording databases such as Emergency Events Database (EM-DAT) hosted by WHO (CRED, 2015) and the database hosted by UNISDR (2013) show that the occurrence of natural disasters resulting of natural processes or phenomena are a severe problem worldwide. Three-hundred and thirty seven

disasters related to natural hazards have occurred in 2014 stated in CRED (2015). Ninety five percent of those natural disasters struck developing countries, which again shows that those countries have to be focused on. The increasing scale and number of natural disasters affect land and the people–land relationship tremendously, which is directly linked to hazard. These statistics refer to various kinds of natural disasters for example, drought, flood, earthquake and so on – all affecting the people–land relationship.

This variety in disasters also indicates the necessity to focus on different conditions of the three disaster risk drivers and to work on a framework encompassing all of them in relation to people and land. Recording the occurrence and dimension of natural disasters is done using various databases: it is possible to compare data and show trends. According to FAO (2013) the SIDS as for example, Fiji and Tonga are among the most vulnerable. The impacts of natural disasters can vary and are always location specific; they can even differ within a region and even within a country. Awareness of the local context addresses social, cultural and economic aspects. Nevertheless, it is present that the most affected countries are developing countries with the highest number of people living in slums and informal settlements. They are suffering from insecurity of tenure, which is directly related to vulnerability.

### Disaster and the increase of hazards

As explained, this work is attempting to link understandings of the concepts of people, land and disaster further – in the context of pro-poor land administration – into disaster risk management. As already identified in Weichselgartner and Pigeon (2015) the domains of Disaster Risk Reduction (DRR), knowledge management, and social learning are interlinked: understanding these connections can help to improve DRR. Land is one of those links and the missing understandings and information on people–land relationship increases the scale of hazard. The coordination of training, strategies and actions need to accompany land in relation to people and disasters. This risk-informed decision-making is dependent on the land information provided by the land administration system that has attained the information through the people. Those findings go in line with Enemark (2004) and many other land, as well as disaster experts, so that a combination of disaster risk information with relevant information on land tenure, land value and land use – will help identifying and assessing necessary risk prevention and mitigation in relation to legal, economic, physical and social consequences. As already mentioned in Section ‘Land, its limitation, and demands for tenure security’, the importance of considering land issues in order to respond to natural disasters especially for the poor is a significant issue and on the international development agenda.

In summary, the researchers argue that the potential of pro-poor land administration in disaster risk management is underutilised. The missing existence of spatial information as well as information on the people–land relationship increases the scale of hazard. Pro-poor land administration can therefore improve links between people and land. The spatial information created supports improving knowledge about the relationship between

those same people, their lands and potential disasters – especially information on hazard risks for assessment, mitigation and prevention. Therefore, hazard is identified as the disaster risk driver directly related to *disasters*.

### Consolidating the links between pro-poor land administration and disaster risk management

This section aims to holistically synthesise the identified links between the global change forces (people, land and disaster) and the disaster risk drivers (vulnerability, exposure and hazard): a conceptual framework that illustrates the need and potential contributions of pro-poor land administration in disaster-affected areas is the intended outcome. From the review, the following links are suggested as already established:

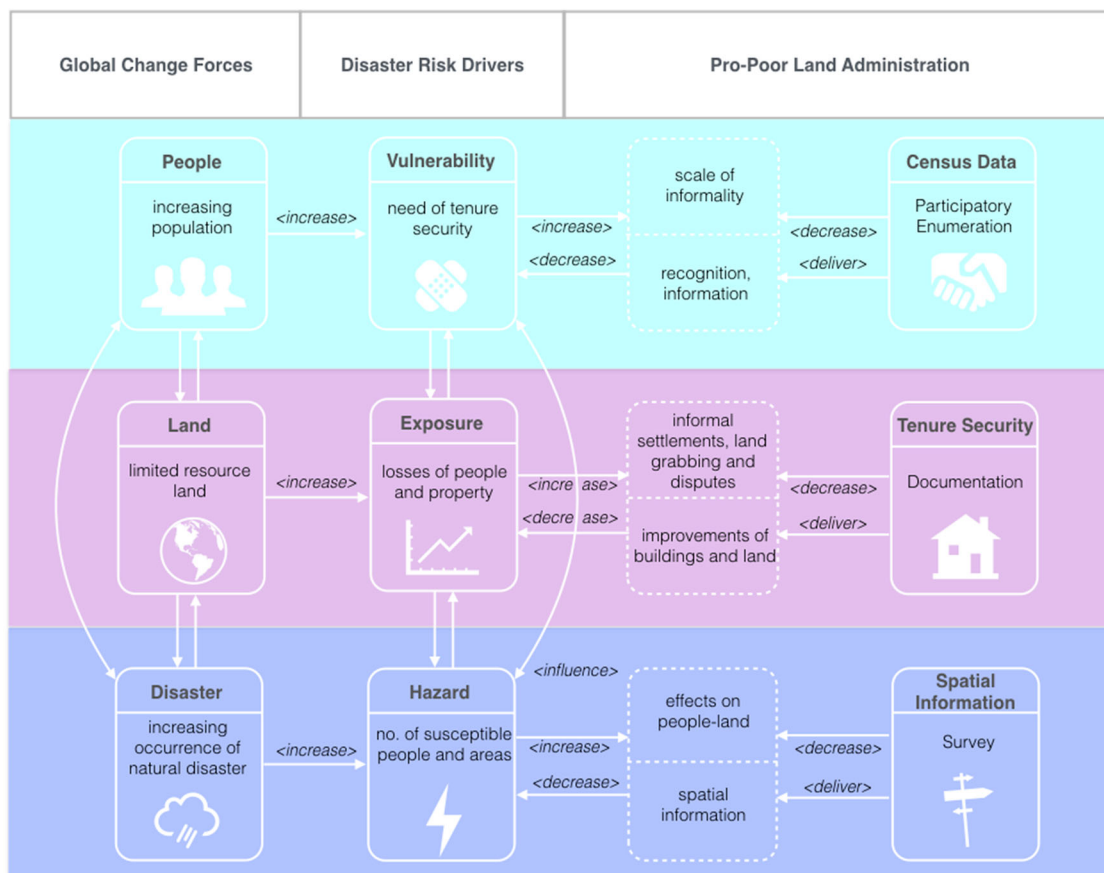
- *People-and-vulnerability*: Population growth causes more people to be affected by insecurity of land tenure and natural disasters. It further increases the scale of informality of people and property in the affected areas, which links to;
- *Land-and-exposure*: The limited resource land and the lack of security of land tenure is directly linked to exposure. Through natural disasters exposure is further increased through losses of people and property. Consequently, the number of informal settlements, land grabs and land disputes increase; which links to;
- *Disaster-and-hazard*: The increasing occurrence and scale of natural disasters increases the number of susceptible people and areas and therefore affect land and the people–land relationship.

These relationships are further articulated in a conceptual framework (Fig. 2)

The left-hand column in the framework (Fig. 2) represent the three global change forces: increasing world population, summarised through the term *people*; the limited resource of land, summarised through the term *land*; and the increasing number of natural disasters, summarised through the term *disaster*. The middle column of the framework represents the three disaster risk drivers, as described in Section ‘Disaster’. The right-hand column represents the key findings and identified needs through the research synthesis, which could likely be addressed by, and contributed to, through pro-poor land administration. The framework has to be read from the left to the right side and then back again. The readers have to bear in mind that the conceptual framework represents a generalised view of the topic: the main aim is to show the inter-relationship and relevance, as well as the identification of the need, for pro-poor land administration. Therefore it does not claim to address all issues in regard to people, land and disaster. The drivers used influence each other and an increase on one component will increase another one. Each row of the framework is now unpacked in more detail:

The global change force *people* (row 1), illustrated through the increasing world population, is seen to be directly linked to the disaster risk driver *vulnerability*. Consequently, the need for tenure security increases at the same rate as the increasing scale of informality especially for people who are prone to natural disasters. A key step towards reversing the cycle is to create





2 Conceptual framework on the need for pro-poor land administration for disaster risk management

population data, for example census data, collected using appropriate techniques – for example participatory enumeration, which emphasises the inclusiveness of people.

The global change force land (row 2), which is a finite and limited resource, directly links to the disaster risk driver exposure. People’s exposure increases as the loss of people and their land increases through the effects of natural disasters. As seen from examples of current natural disasters, failing land use planning, and therefore failing resettlement strategies, leads to an increase of informal settlements as well as land grabbing and land disputes. Through documenting all people–land relationships, people more feel secure of their tenure and invest in improvements of their land and their buildings, which further decreases the scale of exposure.

The global change force disaster, which increases in size and severity, directly links to the disaster risk driver hazard. Those hazards, which evolve to natural disasters, affect all people–land relationships. Especially those people–land relationships that have not been addressed in any land administration system are considered exceptionally hazardous. Therefore spatial information derived from spatial analysis and surveying technologies can be used alongside census data and land data in land use planning and disaster risk management assessment, resettlement and mitigation processes.

Based on this conceptual framework the linkages, identified above, can subsequently be further examined and applications of pro-poor land administration articulated. Several such examples are now provided.

### Potential example applications of the framework

First, as shown, increasing population growth and resulting rural–urban migration of *people* leads to an increasing scale of informality and increase of *vulnerability*, which is directly linked, with an increasing need for tenure security. Through the introduction of pro-poor land administration in disaster risk management those issues could be addressed through participatory enumeration and identification of priorities for the people living in informal settlements. The census and people–land relationship data could further support disaster prevention and early recovery strategies, which can be improved through information provided by pro-poor land administration and influence land use planning especially addressing informal settlements. Through improvements in land use, disaster prevention and early recovery strategies can be better addressed as well as people could be more willing to be evacuated and agree to resettlement strategies from disaster prone areas considering concepts like the social capital. Through including informal settlers in those strategies, the scale of informality would decrease as well as the scale of vulnerability.

The case of the Mashimoni slum area in Nairobi, Kenya provides an example of the above: a pro-poor inclusive approach in land can decrease the scale of informality. Mashimoni is one of the villages in Mathare slum, a populated slum area in Nairobi, Kenya. The impact of pro-poor land administration on the livelihood of a community can be witnessed in various ways. People started to settle in Mashimoni in 1975. One of the reasons

for its establishment was the rural–urban migration as well as the linked increase of population and the lack of accessible land in Nairobi. In 2011, Mashimoni leaders piloted the STDM. The members of the settlement gathered information regarding their tenure and community information through participatory enumeration. One of the priorities identified by the people living there was the improvement of sanitation and an establishment of a channel system. Through the application of STDM and followed negotiations with the owners they received tenure rights. Further coordinated land use planning strategies within the community, helps the slum area to deal with minor flooding and improve the livelihood of the poor. The case shows improvements towards disaster mitigation through the application of pro-poor land administration.

Second, as shown, the limited resource *land* and poor management relating to it leads to an increasing number of informal settlements, land grabbing and disputes over land: especially to those people who are not properly addressed within the given land administration system. Poor people tend to settle in areas prone to natural disasters, as they are most likely government land and of less interest for example investors. If then a hazard occurs, which is evolving to a natural disaster, the loss of life and livelihoods, property as well as building shelter damages and damages to services increase. Through the use of pro-poor land administration *de facto tenure security* can be provided which may lead to a stronger relation to the land. Through this stronger relation, it is shown in literature (Mitchell, 2011) that people are more likely to invest in their land and buildings. Also the potential access to credit is easier feasible through tenure security as well as disputes over land are less likely since all different stakeholders have been involved in the process. Although the limitations stated in Barry (2006) have to be considered. Nevertheless, through the introduction of pro-poor land administration, peoples *exposure* would decrease.

An example of where the failure in managing land increased vulnerability and exposure and therefore hindered rebuilding efforts relates to the Haiti earthquake of 2010. The missing spatial information and lack of land-use planning strategies prior to the disaster lead to a delay in reconstruction efforts. The unclear property rights led to the failing of ‘building back better’ efforts, which resulted in transitional shelters turning into permanent shelters. According to Blake (2015) rebuilding efforts failed due to the unclear property rights. This was apparent as families were keeping their own land in sub-standard conditions because they feared someone else would occupy it. The Gujarat earthquake of 2001 provides another example. The case highlights the importance of coordination and shows how improvements in land management contribute to rebuilding efforts. Within Mukerji (2010) it is shown that homeowners and squatters were able to rebuild and improve their housing through a coordinated strategy of the local government of Bhachau and leading NGOs. Public assistance was critical for housing recovery for both homeowners as well as low-income squatters. Whereas Haiti clearly shows that tenure security can be the key especially in recovery phases, the example of Gujarat shows that the coordination between the government, NGOs and the community itself can be key for the success of rebuilding strategies. Both examples

highlight the importance of managing land in an inclusive way.

Third, the increasing occurrence of natural *disasters* increases the number of effects on the people–land relationships, as well as increasing numbers of susceptible people, societies and areas to the damaging effects of *hazards*. Through the introduction of pro-poor land administration and providing *de facto* tenure security, the scale of hazard could decrease: coordination strategies and actions can provide up-to-date *spatial information* which can provide improved tenure security to susceptible people – and may ultimately discourage people from putting themselves in danger by staying and protecting their land. This spatial information enables various stakeholders to specifically address the poor prior or in the aftermath of a natural disaster. Accessible information about land leads to easier and transparent land dealings since information is provided and structured. Investments and building efforts in order to prepare for natural disasters would be facilitated for people who have been previously not addressed through any land administration system. If this information is then linked or enriched with data gathered through participatory enumeration, mitigation and preparedness strategies can focus on the most vulnerable and exposed people. Resettlement strategies could also be more specifically targeted and consider social aspects, as known through participatory enumeration.

Again, the response efforts for Haiti 2010 earthquake, or lack thereof, are exemplary for the above. Prior to the earthquake, Haiti had neither a sufficient land administration system nor a land policy. By 2015, Haiti was still struggling with the aftermath of the earthquake and the lack of secure land rights among the poor and displaced. Indeed, inadequate tenure security is identified as the key factor hampering rebuilding efforts according to Myers (2014). Typhoon Haiyan in the Philippines in 2013 provides a further example. The Haiyan typhoon showed according to Hanstad and Prosterman (2014) the extreme danger people were exposing themselves to hazards because of insecurity of tenure. Families, living in low quality buildings, remained in their homes during a natural disaster fearing the loss of their homes because of the lack of tenure security, which consequently increased the damaging effects of hazards. The authors strengthen their arguments with examples from Cyclone Odisha from 1999: most of the people killed and affected were the poor who refused to evacuate their informal settlements because they feared eviction. These cases clearly show the importance of some simple form of up-to-date spatial information, an inclusive land-use planning and a land administration system addressing the continuum land rights.

### Limitations of the conceptual model

Having demonstrated the potential of the framework to support developing more integrated understandings of existing weaknesses and opportunities in land administration and disaster management systems, it is also necessary to articulate the limitations of the conceptual model. One of the most prominent limitations is the visualisation of the framework. Through visualising the framework misinterpretations and misunderstandings are more likely to occur. Especially, as already seen within the discussion

of ‘the arrow’ of the continuum of land rights, the use of arrows can specify but also create exclusion or hierarchy between the attributes used. Also by labelling the activities between the attributes limitations can arise. Therefore it is important to emphasise that the main aim of the framework is to show that there is an inter-relationship between the global change forces listed and that this can vary over the variables the users are applying. The three global change forces (people, land and disaster) as well as the focus of the global change force could be extended or adjusted for future applications. For example, the global change force disaster could focus on man made disaster, whereas the people global change force could then be focused on refugee migration. The conceptual framework is only a starting point for further discussions and more in depth research. Also the contribution of pro-poor land administration is much broader than visualised through the framework. Contributions could also be side effects, for example facilitation of communication between informal settlers and government authorities. Consequently, it could be argued that the global change forces and their focus need further subdivision. Owing to the limitations of visualisation and the lack of documented case studies in the research domain, the conceptual model needs continuous adaption in the future. Yet, the conceptual model in this paper is considered accurate and complete in the present moment with the focus set and the literature used for the synthesis.

## Conclusions and key lessons

The global land community has accepted that individual land titling on its own cannot deliver security of tenure to the majority of people in the world in a timely fashion: pro-poor approaches need to be adopted in some contexts. These approaches also need to be embraced by the global disaster risk management community in order to prevent, mitigate and respond to natural disasters regarding land. This paper and the conceptual framework aimed to show the need for the application of pro-poor land administration in developing countries, which are prone to natural disasters.

To do so, it first examined three global change forces (people, land and disaster), the inter-relations between them, and the multifaceted relationship with land tenure and the three disaster risk drivers. Results were used to develop a conceptual framework showing and describing this inter-relationship and fostering the emergent need of pro-poor land administration in disaster risk management. The conceptual framework consist of the three global change forces: people, land and disaster, the three disaster risk drivers: exposure, vulnerability and hazard as well as the entry points for pro-poor land administration approaches.

The possible contribution of pro-poor land administration to disaster risk management was identified as follow:

- Census data, gathered through for example participatory enumeration could be used to decrease the scale of informality and deliver important information for land use planning and resettlement strategies
- Tenure security gained through documenting the continuum of land rights could be used to decrease the number of informal settlements and deliver improvements in building standards and land transactions.

- Spatial information gathered through fit-for-purpose surveys could decrease the effects on people and land.
- Hazard risk assessment and mapping – linked to pro-poor land administration – could bridge the gaps between people-land-disasters and therefore address each global change force.

The possible contributions were emphasised through case studies in Kenya, the Philippines, India and Haiti. Within those, especially participatory approaches were identified as a critical aspect towards an implementable strategy for applying pro-poor land administration technologies in the context of disaster risk management. Participation is crucial in enabling the poor to minimise vulnerabilities and disaster risks through an inclusive land tenure security approach to prevent, mitigate, prepare and respond to natural disasters.

Finally, looking ahead, the framework can be used for more in depth research on each of the articulated relationships in specific contexts. Each of the global change forces as well as the disaster risk drivers have different aspects to focus on and therefore more research could be done on each of them. Second, land administration systems are often using spatial data infrastructures, which are using data models for gathering and storing spatial information. The ISO approved land administration domain model (LADM) provides such an underlying data model. Currently developed pro-poor land administration tools are using this standard. Future research and application of the framework could therefore be the development of such a data model based on this framework. Third, the developed framework could be used as a tool to validate the impact of pro-poor land administration on the identified global change forces and disaster risk drivers. For this validation process indicators and variables would need to be more specifically and clearly defined. Nevertheless such a validation could be used within any disaster risk phase. For example, evaluating the success of ‘building back better’ strategies or mitigation strategies could be undertaken.

Further work should focus on refinement of the framework with stakeholder and expert groups; piloting and designing the framework in different contexts tailoring pro-poor land administration so that it is able to accommodate disaster risk management related information. Importantly, each of the drivers (global change forces and disaster risk drivers) have positive as well as negative effects on each other. Further research on these complex relations was deemed essential. The entry points mentioned in the paper are more nuanced than presented and there are a variety of options and variables, which need to be thought through within a regional context. Further information, which has already been gathered through participatory enumeration, will be tested on how it can be included and used. Finally, the conceptual framework represents the first step towards the design of a framework, based on field experiences.

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