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BRIDGING LAND ADMINISTRATION AND DISASTER RISK MANAGEMENT FOR EQUITY AND RESILIENCE

EVA-MARIA UNGER[1], ROHAN BENNETT[1], CHRISTIAAN LEMMEN[1], JAAP ZEVENBERGEN[2], DAVID MITCHELL[3], PAULA DIJKSTRA[1]
1. Kadaster International, Netherlands
2. ITC, University Twente, Netherlands
3. RMIT, University Melbourne, Australia

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Abstract

Over the previous decade, the necessity of integrating policies, practices and people associated with land administration (LA) and disaster risk management (DRM) has been strongly advocated for, particularly with the escalation and increase in large-scale natural disasters. This necessity has resulted in concepts, tools, and standards for better integrating the domains. In response, recent work already conceptually links responsible LA and DRM, and further examines the call for innovative recording and enumeration approaches, through the development of an integrated LA-DRM model. The model can support the resilience against natural disasters and provides an approach for 'collecting data once and using it multiple times'. Building on this, this paper identifies key blockers, opportunities, and implementation pathways. Specifically, the UNGGIM driven SFGISD and FELA frameworks are used to guide the paper, as is the LA-DRM data model itself.

Key Words: Land Administration, Disaster Risk Management, LA-DRM model, LADM, FELA

Introduction and Background

Over the previous decade, the necessity of integrating policies, practices and people associated with land administration (LA) and disaster risk management (DRM) has been strongly advocated for, particularly with the escalation and increase in large-scale natural disasters. The calls have resulted in concepts, tools, and standards for better integrating the domains.

At the global level, the 2030 Agenda for Sustainable Development with its defined Sustainable Development Goals (SDGs), together with other policies such as the Sendai Framework for Disaster Risk Reduction, or the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT), stimulate innovative and transformative approaches to secure land and property rights for all – and shed light on special attention being paid to land related issues in DRM. Specifically, SDG 13, the Sendai Framework, and hence the Strategic Framework on Geospatial Information and Services for Disasters (SFGISD), developed by UN-GGIM, call for investments in research and the development of a methodology and models for DRM.

In response, recent work already conceptually links responsible LA and DRM, and further examines the call for innovative recording and enumeration approaches, essential for both domains, through the development of an integrated LA-DRM model (Unger et al.2019). The model can support the resilience against natural disasters and provides an approach for 'collecting data once and using it multiple times. A design approach was used to develop the model – with adaption of the international Land Administration Domain Model (LADM) standard acting as a basis. Key features of the model include the support of interoperability through standardization, the inclusion of all people-to-land relationships, including those specific to disaster contexts, and the potential of the model to contribute to each of the disaster phases. The data model and software adaption were successfully trialed in Nepal in 2017 in a single country case study with three different pilot areas, all varying in their tenure relationships and hence resulted effects in the post disaster context. The trial of the LA-DRM demonstrated that the model is easy to understand and can be applied by non-professionals. This allows full participatory approaches. A local NGO intends to use the model in other areas in Nepal. The case results led to further refinement of the model. The integrated LA-DRM model is considered as a step towards an implementable strategy for applying responsible LA. With respond to the developed LA-DRM model, this suggests a level of objective truth with regards to the key data and information necessary for effective disaster response.

Approach and Methodology

Building on this previous work, this paper goes further to propose that the LADM model, and specifically its DRM extension, the LA-DRM model, are highly applicable in any land related context, where no land tenure information exists, or the national mapping authority already uses a LA system compatible with LADM. That is, the extensions provided in LA-DRM may be entirely appropriate to include into further developments of the ISO LADM 19152 standard, ensuring those country contexts utilizing LADM are simultaneously equipping or future-proofing land administration systems to support DRM activities, as they inevitably are required. Land tenure information provided through a national LA system contributes to the overarching effort of reducing the social, economic, and environmental impacts of natural disasters. The approach supports objectives for both equity and resilience in the delivery and functioning of LA systems.

Whilst the conceptual and methodological advantages of integrated LA-DRM are demonstrated, in practice the domains remain disconnected: at national and even global levels the policies, laws, institutions, governance structures, financing arrangements, standards, data, technologies, educational program, and communication programs often remain in silos. As such, awareness raising, coordinated partnerships and advocacy activities are now key demands. This paper undertakes dialogue with LA and DRM stakeholders, with a view to identifying key blockers, opportunities, and implementation pathways. The case of Mozambique and its two devastating cyclones will be investigated with a theoretical application of the LA-DRM model. Its impact on the SDGs will be shown to underline the importance of integration. Further the UNGGIM driven SFGISD and Framework for Effective Land Administration (FELA) frameworks are used to guide the dialogue, as is the LA-DRM data model itself. The results elaborate on how to theoretically best forward widespread uptake and implementation of LA-DRM at national levels and to institutionalize this integration to ensure both equity and resilience.

LA-DRM

The LA-DRM model is based on the LADM/STDM concept, using the same classes but with additional attributes describing the scale of vulnerability, hazard and exposure. LADM and STDM provide a standard set of terminology, classes and associations. Nevertheless, both models are flexible and can accommodate other attributes, associations, and are extensible to allow inclusion of other situations and disciplines. The core classes of LADM are the spatial unit (LA_SpatialUnit, this can be a parcel), the party (LA_Party, this can be a natural or non-natural person) and the rights, responsibilities and restrictions (LA_RRR), which links the two other classes (ISO, 2012).

Those core classes of the LADM can also be found in the STDM, but are named differently as they focus on a different context, SpatialUnit, Party and SocialTenureRelationship (GLTN, 2014). The difference in terminology is based on the fact that the attributes in STDM describe legitimate rights instead of the statutory rights as in LADM (Zevenbergen, et al., 2013). The SocialTenureRelationship is described through the continuum of land rights, as defined by (GLTN, 2014), to describe all people-to-land relationships. It can also be used to describe secondary use rights, overlapping rights or places where people perceive their rights contradictory.

The development of the LA-DRM is based on literature review, expert group discussions and field experiences from Nepal. Since the LA-DRM is based on the LADM/STDM all the requirements as defined in (Lemmen, et al., 2015) are considered to be valid. Various requirements as explained in (Unger, et al., 2019) were adapted and some additional ones were added.
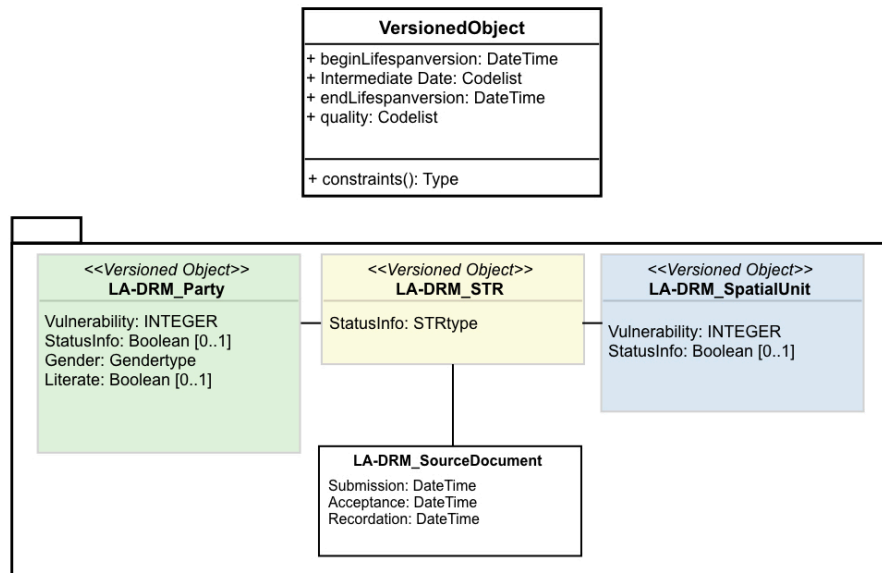

Figure 1: LA-DRM model (source: Unger et al., 2019)

Case of Mozambique

Two cyclones, 'Idai' and 'Kenneth', devastated the Northern and Central regions of Mozambique in 2019. Both cyclones are the deadliest storms to hit Mozambique in the last 30 years. The cyclones submerged large areas of north and central Mozambique, destroying houses, infrastructure and transformed some areas in the immediate aftermath into an "inland ocean" which are now, 3 months later, still not suitable for agriculture. The central district of Mozambique has traditionally been the country's breadbasket. The provinces of Sofala and Manica produced 25% of the national cereal output in Mozambique where 80% of the population relies on agriculture for support. More than 700,000 hectares of crops were destroyed by the cyclones threatening the country's food security. The UN estimates 1.85 million people are in need of urgent humanitarian assistance, this includes for example, children who lost their parents due to the cyclones; women who lost their husband (who was 'officially' the owner of the land); or the population who sustained their livelihood through fishing. Special attention needs to be paid to those people who are not addressed by the conventional Mozambique land administration system.

In terms of land rights and information, documented, recognized or registered 'people to land' relationships are no longer visible on the ground. The transformed landscape is affecting land tenure security, particularly for women and vulnerable groups. Further, the impact of the cyclones is affecting land use and land development in a dramatic way, and will do so for the foreseeable future, driving up the proportion of vulnerable people. The situation will hinder and delay access to reconstruction and resettlement programs, with a devastating impact on food security and the economy. Land conflicts and famine seem unavoidable.

As the affected areas ran dry again, access to owned, used and claimed properties has to be renewed, recognized and reconfirmed by the government. Land administration, as a part of the broader recovery strategy, is needed to support the reconstruction program and other country experiences show it must be integrated with damage inventories, vulnerability and hazard assessment, and new land use zoning and resettlement planning.

A way ahead - utilizing theoretically LA-DRM

LA-DRM supports the use of innovative land tools, which is realized through the continuum of data acquisition methods. Innovative land tools to document and restore already existing people-to-land relationships effected by the cyclones can support any natural disaster recovery. The location of the people, their houses and temporary shelters as well as their related supporting livelihood could be identified using innovative land tools.

Further LA-DRM is at its core inclusive and participatory through the continuum of land use right claimant. Hence, a gender-sensitive and inclusive (women, youth, orphans, elderly and marginalised groups) validation, through the community, could ensure the quality of the collected data. LA-DRM supports a range of authentic source documents and history of documents, hence through the extension of Temporary, qualified, or 're-starter' land certificates could be issued and handed over to ensure the access to reconstruction grants and the reestablishment of their livelihood. For areas which cannot be re-established, resettlement and land reallocation options and actions could be undertaken. Further special vulnerability assessment procedures could be conducted to identify the most vulnerable, who cannot recover without additional support. Therefore, special partnerships and cooperation would need to be established with leading NGOs working in Mozambique which is supported in the LA-DRM through the more flexible model boundaries. Scaling up efforts could further be met through the integration of the collected data in the national land program.

The LA-DRM requirements are shown in the table below, which is also published in (Unger et al. 2017).

Requirements based on (Lemmen, et al., 2015)		
No.	Requirement	Impact
1	A continuum of land use right claimants (subjects or parties)	The requirement No. 2 as defined in (Lemmen, et al., 2015) is extended with the following: the LA-DRM model enables a 'party' to be, for example, a household, family, or group of families (e.g. 4 families live in 1 building) with each person to be recorded. Especially in regards to DRM, the inclusion of children in any system is essential and needs to be recorded. Further gender information is currently not explicitly covered by LADM. In any case women, have to be represented by the LA-DRM model, and therefore recordation of men and women is necessary.
2	A continuum of spatial units (objects)	The requirement No. 3 as defined in (Lemmen, et al., 2015) is extended with the following: DRM requires the building or any construction to be recorded and changed / updated over time.
3	A range of data acquisition methods	The requirement No. 5 as defined in (Lemmen, et al., 2015) is extended with the following: data acquisition methods especially in regards to DRM should support and include community acquired data. Further collaboration and data sharing with different domains should be

No.	Requirement	Impact
		facilitated and encouraged e.g. weather radar stations, ministries of forest and agriculture, geological and geophysical institutions etc.
4	A range of authentic source documents	The requirement No. 6 as defined in (Lemmen, et al., 2015) is extended with the following: in case of a natural disaster all kind of documents can be destroyed and may not be able to be retrieved from any system. Further witnessing through neighbours may not be applicable in case they are deceased; therefore any kind of source document at different stages should be supported.
5	History	The requirement No. 8 as defined in (Lemmen, et al., 2015) is extended with the following: DRM is describing an agile and fast environment whereas LA is defined through long-term processes and defined rules and regulations with fewer changes over time. A disaster is in great numbers influencing the life cycle of the core classes immediately. Normally change in either 'party', 'social tenure relationship' or 'spatial unit' are long on- going processes but in case of a natural disaster, this life cycle can be seriously disrupted, ad hoc, or changed into a non- existing stage. Further historical data give information on the pre-and post-disaster status.
	Additional Requirements	
No.	Requirement	Impact
16	Vulnerabilities	Vulnerabilities at individual, household, family, organisation or business level shall be described. Those vulnerabilities should also deliver information such as the level of literacy, education or poverty.
17	Status Info	Each core class should be supported by a 'Status Info' attribute, as for example each party/individual can have a different status as e.g. a party can be deceased, can be handicapped etc., which all influence the social tenure relationship. Also, the spatial unit itself can have different statuses in the phases of a natural disaster. Therefore, interoperability and data exchange with other domains will be supportive in data maintenance and complete coverage based on the principle" collect once and use multiple times".
18	Source Document	Based on the extended requirement No. 4 this requirement now describes that various timestamps for the source documents are needed and should be supported by the system. Those dates could be, for example, the date of acceptance, or recordation, or reconstruction. This is especially relevant when the issuance of land documents should be enabled in the aftermath of the disaster.
19	Model Boundaries	LADM is organised into several packages, which already cover the needed packages for the LA-DRM. Nevertheless, this requirement shall describe and emphasise the importance of linking such a model to other registers such as the population register, taxation, addresses, land use and land cover and valuation systems.

Table 1: LA-DRM requirements (source: Unger et al. 2017)

The long-term aim/impact of the such an application of the LA-DRM model in the case of Mozambique could be increased levels of land registration (a disaster responsive land administration). The recognition of land rights of women and vulnerable groups and the establishment of enhanced provincial and national partnerships. In the intermediate term, the application of the LA-DRM could mean the use of Fit-For-Purpose Land Administration approache (a cost efficient, rapid and acceptable approach in) in the impacted provinces. This could lead to reduced land disputes by using conflict resolution mechanisms in impacted regions. All the collected data and information could be used as input for resettlement mechanisms in the impacted regions (parcels, aerial photos, owners, users).

To summarise the above, the possible effect of the LA-DRM model in Mozambique could be:

- People in the affected areas who had already recognized and legal access to land could be recertified.
- People whose tenure was not secured could be recorded and a temporary certificate could be released to ensure access to reconstruction grants could be guaranteed and compensation measures could be met.
- The government of Mozambique could have a database covering all people-to-land relationships to be used in all other governmental procedures (e.g. Terra Secura) and to produce base materials for decision making.

Relation to the SDGs

Further to highlight the close relation of the LA-DRM and the SDGs an analysis was done matching the three core classes with the 17 SDGs.
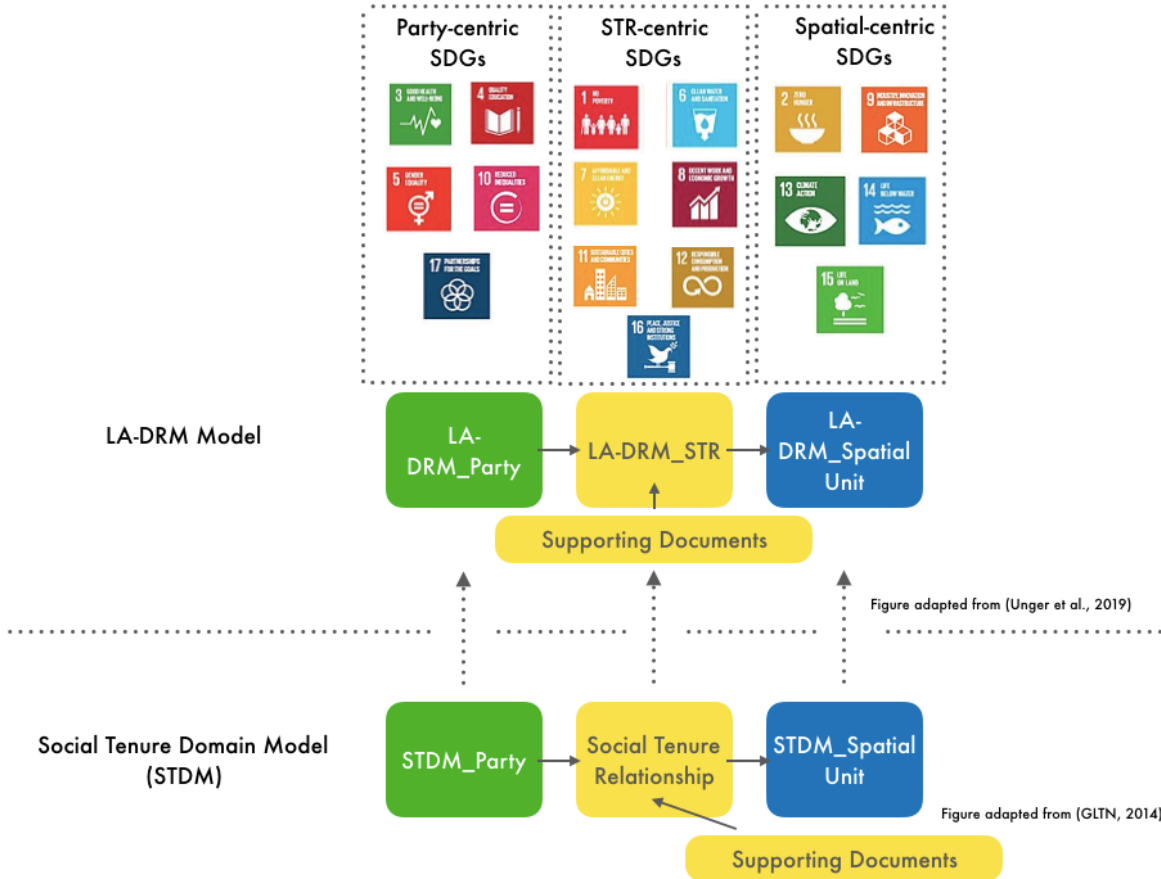
Figure 2: LA-DRM and its relation to the SDGs

Further an increased numbers of recognized and recovered people to land relationships would contribute to SDG's 1,2,5,13,15 and 17. Supporting the use of recovered land and natural resources through the integrated land data capture processes with attention to resettlement strategies could contribute to SDG's 1,2,5,10,8,9,10,11,13,15 and 17. Ensuring less disputes over land by an inclusive and gender-sensitive validation and identification and recordation of conflicts and dispute sources, following the cyclones could contribute to SDG's 2,5,8,9,11,13,15,16 and 17.

Framework development within UN-GGIM

In 2016, plans for The Framework for Effective Land Administration (FELA) (UN-GGIM, 2018a) and the Strategic Framework for Geospatial Information Services for Disasters (SFGISD) (WG GISD, 2017) were instigated. Both frameworks are driven by the SDGs (United Nations, 2015a) and are developed through global consultation and agreement among member states within the UN. The SFGISD builds from the Sendai Framework for Disaster Risk Reduction (2015-2030) (United Nations, 2015b) and aims to support the prevention of the human, socio-economic and environmental risks and impacts of disaster. Through the use of geospatial information and services, the FELA uses globally accepted concepts and approaches with a view to effectively and efficiently link people to land - recognizing, documenting and recording people to land relationships in all their forms – and, in this way, securing land and property rights for all. A key benefit of the two frameworks is that they constitute important steps in creating shared understanding and knowledge in the creation and use of geospatial information for LA and DRM. The transfer of the policies could support better collaboration between institutions with increased interaction at global policy level as well as local level harmonization, and ultimately help to achieve the SDG ambitions.

Framework for Effective Land Administration

The UN-GGIM Expert Group on Land Administration and Management (EG-LAM) seeks to tackle the challenge that an increasing number of humanity do not enjoy recognized and secured land and property rights. There is a need to accelerate efforts by developing the FELA (UN-GGIM, 2018a). The FELA promotes the documentation, recordation, and recognition of people-to-land relationships in all forms. The FELA further includes references to existing concepts, approaches and mechanisms, such as the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (VGGTs) in the Context of National Food Security (FAO, 2012), the continuum of land rights (UN-HABITAT, 2008) (Barry & Augustinus, 2015), and the Land Governance Assessment Framework (Deininger, et al., 2012). The framework also considers standardization developments by international bodies such as the Land Administration Domain Model (LADM) (ISO, 2012) (Lemmen, et al., 2015) and defines a reference for the development, improvement and modernization of national and regional land administration and land management systems.

Strategic Framework for Geospatial Information Services for Disasters (SFGISD

On the other hand, the UN-GGIM Working Group on Geospatial Information and Services for Disasters (WG-GISD) developed the SFGISD (WG GISD, 2017) bringing together stakeholders and partners involved in Disaster Risk Reduction and/or Emergency Management that deal with geospatial information. It is based on the principles included in the Sendai Framework for Disaster Risk Reduction (2015-2030) (United Nations, 2015b) with a focus on geospatial information. The SFGISD aims for geospatial information and services to be available, at an appropriate level of quality, and accessible in a coordinated way, in support of decision making and operations prior, during and post disaster, in order to formulate policies on and manage risks and impacts of disasters.

Framework Alignment for Equity and Resilience

Both frameworks are clearly and necessarily based on the United Nations Integrated Geospatial Information Framework (IGIF) (UN-GGIM, 2018b), and when merging/aligning those as shown in the figure below, it is clear that the priorities as defined in the SFGSID align with the strategic pathways as defined in the FELA. This alignment is further investigated in (Unger et al. 2019). Both frameworks aim to increase resilience through equity and the alignment with the overall SDGs.
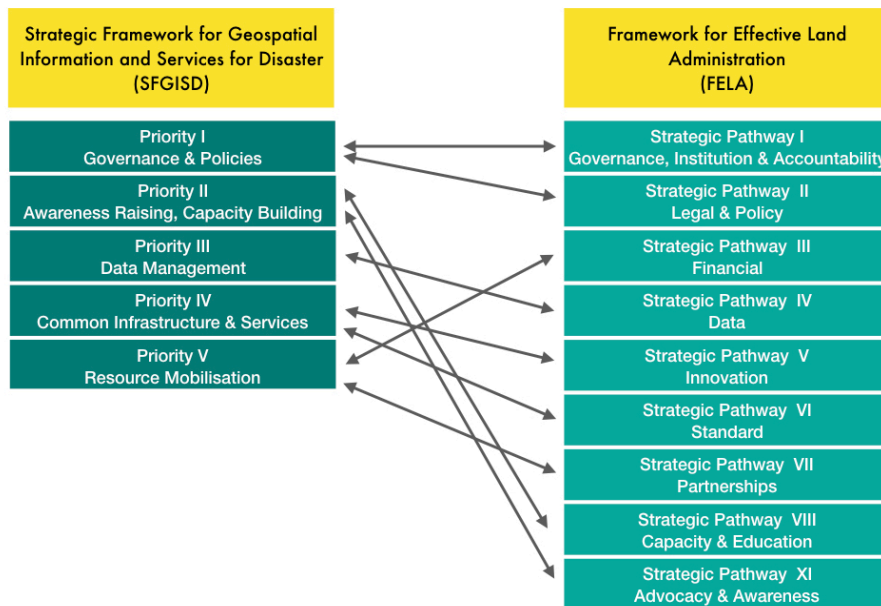

Figure 3 (source: Unger et. al., 2019)

Discussion and Conclusion

Contemporary global policy and tool/model development is increasingly shaped through the 2030 Agenda for Sustainable Development. UN-GGIM together with the Worldbank and other international organisations such as FIG and academia play a leading role in the development of global policy frameworks with regard to geospatial information as well as to modelling approaches and applications. Two frameworks, FELA and SFGISD, are developed to tackle global issues in regard to tenure security and natural disasters. In this regard, especially with increasingly multi-disciplinary approaches in the domains, LA and DRM, a dialogue needs to happen on a regular basis, especially when it comes to field applications based on these frameworks. This is further stressed through an increasing speed of emerging technological but also socio-economic developments which call for further opportunities to strengthen this dialogue.

References

Barry, M., & Augustinus, C. (2015). Property metaphors, property theory and communicating the continuum of land rights. Washington DC: Paper prepared for presentation at the "2015 WORLD BANK CONFERENCE ON LAND AND POVERTY" The World Bank - Washington DC, March 23-27, 2015.

Bennett, R., Rajabifard, A., Williamson, I., & Wallace , J. (2012). On the need for national land

Deininger, K., Selod, H., & Burns, A. (2012). *The Land Governance Assessment Framework.* Washington, D.C.: The World Bank.

FAO. (2012). *Voluntary Guidelines on the responsible Governance of tenure of land, fisheries and forests in the Context of national food security.* Rome, Italy: Food and Agriculture Organization of the United Nations.

ISO. (2012). *ISO 19152:2012 Geographic information - Land Administration Domain Model (LADM), Geneva, Switzerland.* Retrieved from https://www.iso.org/standard/51206.html

Lemmen, C., Oosterom, P., & Bennett, R. (2015). The Land Administration Domain Model. *Land Use Policy, 49*, 535-545.

Mitchell, D. (2011). *Assessing and Responding to Land Tenure Issues in Disaster Risk Management.* Rome, Italy: FAO: Land Tenure Manuals.

Mitchell, D., McEvoy, D., & Antonio, D. (2018). A Global Review of Land Tenure, Climate Vulnerability and Adaptive Capacity. Washington: 2018 World Bank Conference on Land and Poverty.

UNFCCC. (2008, 11). *KYOTO PROTOCOL REFERENCE MANUAL ON ACCOUNTING OF EMISSIONS AND ASSIGNED AMOUNT.* Retrieved 01 28, 2019, from https://unfccc.int/resource/docs/publications/08_unfccc_kp_ref_manual.pdf

Unger, E.-M., Chatkuli, R., Antonio, D., Lemmen, C., Bennett, R., & Dijkstra, P. (2019b). Creating resilience to natural disasters through FFP land administration – an application in Nepal. Washington DC: 2019 World Bank Conference on Land and Poverty.

Unger, E.-M., Zevenbergen, J., & Bennett, R. (2017). On the need for pro-poor land administration in disaster risk management. *Survey Review, 49*(357), 437-448.

Unger, E.-M., Zevenbergen, J., Bennett, R., & Lemmen, C. (2019a). Application of LADM for disaster prone areas and communities. *Land Use Policy, 80*(January), 118-126.

Unger, E.M., (2019) Responsible Land Administration in Disaster Risk Management – Approaches for Modelling, Integrated Governance and Policy Transfer of People Land and Disasters. Enschede: University of Twente, Faculty of Geo-Information Science and Earth Observation (ITC).

UN-GGIM. (2018a, 08). *8th Session.* Retrieved 12 24, 2018, from http://ggim.un.org/meetings/GGIM-committee/8th-Session/documents/GGIM8-report-e.pdf

UN-GGIM. (2018b, 08). *Integrated Geospatial Information Framework.* Retrieved 01 22, 2019, from http://ggim.un.org/meetings/GGIM-committee/8th-Session/documents/Part%201-IGIF-Overarching-Strategic-Framework-24July2018.pdf

UN-GGIM. (2019). *Committee of Experts on Global Geospatial Information Management.* Retrieved 02 10, 2019, from http://ggim.un.org

UN-HABITAT. (2008). *Secure land rights for all.* Nairobi, Kenya : United Nations Human Settlements Programme.

UN-Habitat. (2018). *Fit-For-Purpose Land Administration - a Country Level Implementation Strategy for Nepal.* Kathmandu: UN-Habitat.

United Nations. (2015a, 01 19). *Sustainable Development Goals.* Retrieved 01 22, 2019, from https://sustainabledevelopment.un.org/?menu=1300

United Nations. (2015b). *Sendai Framework for Disaster Risk Reduction 2015-2030.* Retrieved February 19, 2018, from http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf

WG GISD. (2017, August). *Working Group on Geospatial Information and Services for Disasters.* Retrieved from United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM): http://ggim.un.org/documents/UN-GGIM_Strategic_Framework_Disasters_final.pdf

Zevenbergen, J., Kerle, N., & Tuladhar, A. (2014). Spatial Information for Adressing and Assessing Land Issues in Disaster Risk Management. *Land Tenure Journal, Food and Agriculture Organization of the United Nations*, 09-35.