GEOSPATIAL SUPPORT IN THE CONTEXT OF INTERNAL DISPLACEMENT CAUSED BY NATURAL DISASTERS

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ABSTRACT:
Millions of people are internally displaced worldwide every year through natural disasters such as floods, earthquakes, landslides, storms and wildfires. Countries affected aim to support displaced people by responding to their immediate shelter and other needs, by helping to restore their sustainable livelihoods in their home place or at a new location and reducing the risk of new displacement. The paper sets the scene for geospatial applications that effectively inform and support response and development efforts in the context of internal displacement. It illustrates the opportunities for GIS solutions, which foster common ground for understanding and decision-making in these complex multi-stakeholder and multidisciplinary settings. The paper first introduces terminology regarding internal displacement. It then describes different contexts in which geoinformation management can inform strategy development and decision-making in support of internally displaced persons and of understanding disaster displacement risks and their development over time. Finally, it highlights some practical issues for providing GIS support to those using internal displacement applications in practice.

1. Definition and scale of Internal Displacement

According to the United Nations Guiding Principles on Internal Displacement, Internally Displaced Persons (IDPs) are "persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border" (UN, 1998).

According to the Internal Displacement Monitoring Centre (IDMC), people may become internally displaced during or following the impact of a sudden-onset hazard, if their homes are rendered uninhabitable or they lose their livelihoods or access to basic services. Internal displacement numbers also include displacement that takes place in order to avoid the potential impacts of a hazard before it strikes, often in the form of pre-emptive emergency evacuations. These can be planned, ordered or recommended and facilitated officially, or be the spontaneous response of exposed populations based on their own information and perceptions of risk (IDMC 2017b). In 2016, evacuations accounted for more than eight million, or over a third of the displacements associated with disasters that were reported over the year (IDMC 2017c). Planned evacuations can often be found in countries that are regularly or frequently affected by recurring disasters, such as monsoon floods or typhoons.

In 2017 18.8 million people were newly internally displaced through natural disasters. Also, 11.8 million people were newly internally displaced through conflict in 2017. Of those people displaced through disasters, 18 million were weather-related such as floods, droughts and wildfires. Other causes of disaster displacements were geophysical ones such as earthquakes and volcano eruptions (IDMC, 2018). These numbers are in addition to those regarding people who had been internally displaced by natural disasters in previous years and had not been able to return to their homes yet or settle down in a new location and establish a sustainable livelihood there.

Internally displaced people remain under the responsibility of the country's Government authorities when it comes to response to, and resolution of, displacement. There is no binding convention or specific UN agency responsible for IDPs; the international aid community plays a complementary role (OHCHR 2018). In terms of capturing, managing and disseminating spatial data concerning IDPs, their immediate needs after disaster has struck and those to return to sustainable livelihoods, there are many different actors and approaches. GIS can play a vital role in bringing together and analysing information in an integrated way. In disaster situations input

data often stem from a wide variety of sources and are in different formats that require flexible design solutions for which some requirements will be described in section 4 of this paper.

2. Prevention of, preparedness for and mitigation of Internal Displacement

People are at risk of internal displacement to various degrees in different parts of the world. Risk analysis is used to identify the people and places most at risk and, therefore, reduce and manage the threat posed by a disaster. Estimations of risk generally include the consideration of hazard events that could occur and the exposure to these events, the vulnerability of communities towards these hazards and the degree of coping capacity of communities, local and national governments and other stakeholders (JRC, 2015). These influencing factors are multi-disciplinary, interrelated and location-dependent. Knowledge and understanding of their main drivers are the foundation for defining effective measures to reduce future displacement risk (IDMC 2017b), and for assessing whether, in line with wider development goals, displacement risk has decreased or increased over time.

Kälin (2015) advocates that displacement could often be avoided or at least mitigated by taking appropriate disaster risk reduction measures. The international community has developed disaster risk reduction strategies in the Sendai Framework on Disaster Risk Reduction 2015 – 2030[1]. The Framework moves away from disaster management to focusing on the underlying drivers of disaster risk and spells out priority for action for reducing the human impact of natural disasters (Wahlström 2015). It also specifically acknowledges the large number of disaster displaced persons in recent years as one of the devastating effects of disasters (Kälin 2015). Furthermore, it stresses the need to promote "the incorporation of disaster risk management into post disaster recovery and rehabilitation processes, facilitate the link between relief, rehabilitation and development, use opportunities during the recovery phase to develop capacities that reduce disaster risk in the short, medium and long term, including through the development of measures such as land-use planning, structural standards improvement and the sharing of expertise, knowledge, post-disaster reviews and lessons learned and integrate post-disaster reconstruction into the economic and social sustainable development of affected area. This should also apply to temporary settlements for persons displaced by disasters" (UN 2015, pp21 and 22). Implementing this in practice entails the inclusion of displacement figures in the development of disaster risk reduction strategies.

A variety of examples of GIS applications exist for evaluating locations at risk. These are used for designing and implementing measures intended to reduce disaster risks and plan for mitigation measures and recovery in case disaster strikes. A lot of GIS application research goes into the evaluation of risks in thematic approaches, such as the evaluation of the factors affecting the generation of erosion processes and torrential floods, in order to provide effective erosion control and torrential flood protection described by Ristic et.al. (2017). Other GIS systems have been proposed for the entire risk management cycle such as the Decision Support System for Emergency Response in Taiwan that was developed for supporting the preparedness and response to typhoon hazards (Hsu et.al., 2005). Participatory GIS applications have been successful in risk mapping by local communities, where local spatial risk information provided for a better understanding on how household-level flood hazard, exposure, and vulnerability interact, such as in the case of flooding in Nepal (Liu et.al., 2018).

3. Internal Displacement in Disaster Response

IDPs, whether in collective camps or in makeshift temporary accommodation have needs in terms of the provision of water supply, health services and sanitation facilities, food supply, shelter and non-food items, protection, and school education for children during their displacement. These needs have to be assessed. Displacement, and especially protracted displacement also affects host communities in terms of access to services, limited accommodation and changing housing prices, labour opportunities etc. and of governments and regional and local authorities with the increased pressure on infrastructure and service provision such as health and education.

The number of displaced persons and their needs and vulnerability in their current location tend to be assessed and monitored over time in the response phase by dedicated actors, either part of a national emergency response

[1] "The Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted at the Third UN World Conference in Sendai, Japan, on March 18, 2015. It is the outcome of stakeholder consultations initiated in March 2012 and intergovernmental negotiations from July 2014 to March 2015, supported by the United Nations Office for Disaster Risk Reduction at the request of the UN General Assembly." (UN, 2015, p.5)

system or external entities. There is a range of methodologies used for capturing the extent of and monitoring the displacement. This includes new actors that have emerged in the form of huge numbers of people who collect and submit spatial information with new technologies such as social media, mobile technologies and, at times, dedicated crowdsourcing platforms. With it comes the possibility to benefit from location-related information - though of varying reliability - that otherwise would not have been captured. Crowdsourcing events to support evacuation efforts have for example been described for the response following Hurricane Harvey that affected Florida in 2017 where a platform enabled residents to report on the flooding situation in their area near-real time (GIM, 2017).

Where internally displaced people have been identified, their temporary locations of people captured and monitored these can be mapped, as can the needs these people have, and any response be informed accordingly. This support also includes establishing the return-home options for people, as often, one of the needs that displaced people have is information regarding the situation in their home place, which likely requires information input from other stakeholders than the response people.

IDMC (2017a) reports that especially in rapid-onset disasters movements of people are often complex and hard to track. Also, IDPs often move several times during their displacement, which makes support for them difficult to grasp.

Not all displaced people are counted; IDPs who seek shelter with family, in remote areas with little information available, and in general outside established or dedicated camps are often not recorded and hence their needs and return intentions are not known. This, and the discontinuation of monitoring, for example because of a lack of resources or when displacement becomes protracted, can lead to a lack of appreciation of when displacement ends. Often, there are also assumptions about rapid return when this may not be the case (IDMC 2017a).

Regarding the ending of internal displacement situations, The (non-binding) Guiding Principles on Internal Displacement spell out three solutions an IDP should have the right to choose from:

- Return to the place of origin; though, as Ferris (2008) points out, in some natural disasters, IDPs do not have the option of return, such as when entire riverbanks get eroded by flood events;
- Integration into the place of displacement;
- Settlement in another part of the country (UN, 1998).

All of these options pose responsibilities for government authorities and require the capacity to plan for and enable returnees, the newly to be integrated and resettled people to attain sustainable livelihoods in line with disaster risk reduction and development planning intended to decrease vulnerability to risks. These are very different tasks from response operations and entail relevant data and information on displacement and its effects that was collected during the response phase, to be integrated in a meaningful way. The next section will discuss some of the necessary capabilities in spatial information management that would enable the continuity of understanding, and therefore of usage, of relevant displacement data that was collected during a response for planning purposes between heterogeneous actors in the longer term.

4. Outline of the nature of integrated geospatial application support in the context of internal displacement

Both the displacement response and the recovery phase and day-to-day spatial planning processes involve a variety of organisations and authorities, each with their own geospatial data and information requirements, role, requirements, capabilities and capacities in the information management domain. Interoperable capability, to discover and share what has become available, can have its uses if its value and utility has been recognised in advance and can be realised in practice (Broenner 2012). The necessity to comprehend the scale and context of internal displacement caused by natural disasters and to understand the interrelationships between actors in the response and beyond is important in setting up geo information management solutions. This is because displacement information, especially on protracted displacement, and the monitoring of displacement risk inform recovery activities and also, necessarily, the development of disaster risk reduction strategies. The significance to include displacement information in spatial planning was furthermore highlighted on the occasion of the 20th anniversary of the Guiding Principles on Internal Displacement in 2018 in their GP20 Plan for action through the suggested action “Support the analysis of internal displacement within a broader context including investigating

the impact of internal displacement on social and economic indicators, urban systems, governance and the policy environment with the overall goal of including IDPs in local and national development plans“ (UN 2018, p6).

From the humanitarian side, it has been recognised that long-term considerations are critical in meeting needs of displaced people (ICRC 2018). There is also the realisation that needs assessments tend to favour humanitarian indicators but are not guiding tailored development strategies. Rather, a nuanced analysis of the impact and causes of displacement is advocated, especially for protracted displacement situations, where a lack of sufficient analysis of IDPs and their situation in the context is perceived (UNOCHA 2017). The kind of information and knowledge to help create situational awareness and understand the vulnerability to displacement *is* often available from those who work with disaster risk reduction measures or from stakeholders involved in spatial planning tasks. This information can be exploited practically if suitably flexible GIS applications are provided.

Bringing the information and analysis together in a meaningful way for developing an understanding of displacement situations and their drivers over time, enabling continuity in the support of displaced people and preventing new internal displacement through reducing displacement risks, opens opportunities for GIS-supported working. These users require flexibly designed systems to be developed, or existing ones adapted, to accommodate the information provision, reception, integration and analysis when and as long as needed, before, during or after crises.

These designs entail but are not limited to:

- Acknowledging that varying degrees of interoperable capabilities are required - in order to accept data from different sources and in different formats as and when needed. Interoperability can be achieved between systems and applications that have been developed based on user interactions and processes that take place within the organisation on a day-to-day basis and other systems. Data exchange with known response collaborators can be enabled for such systems using open source standards or using pre-agreed proprietary standards established through prior formal agreement. Systems that, through their design, are able to collaborate and exchange services as part of a federation, in a plug-and-play manner when and as long as needed, do so entirely through the use of open standards (Broenner 2012). Such systems can enable users to collaborate in a federated manner as long as needed.
- The development and availability of meaningful metadata is necessary in a way that allows users to find out which data is available and judge the appropriateness of the data for their own purpose. This is vital in the displacement context, as data collected and recorded by another entity has often been developed for a different purpose than one’s own, yet may be relevant for the own work and useful to have. Therefore, descriptions that go beyond referring to the technical details of the data (such as scale, time of collection etc.) and describe the data content and attributes is necessary. Open standards-based, but not rigidly standardised, description and documentation of data (and the alternative meanings ascribed to them) enables the querying of information. This augments human understanding, and not just provides machine-to-machine interoperability (The abaci Partnership, 2012).
- The review of policy and operational frameworks in which geospatial applications and systems are embedded is useful so that the sharing and use of relevant geoinformation from a range of potential stakeholders on-the-fly during the response or in the longer-term planning is possible beyond existing institutional agreements and proprietary rights.

Systems designed or adapted following such principles can efficiently and effectively support the work of ad-hoc communities of interest in the field of displacement. They take into consideration that these communities are formed of heterogeneous actors with different skills, equipment and data collection tasks and needs, and area working to different time scales, yet can facilitate collaboration by adapting or designing systems that are fit-for-purpose for data sharing and dissemination if needed to develop common understanding.

5. Summary

Internal Displacement caused by natural disasters is a situation that affects millions of people worldwide every year anew. Efforts are underway to analyse space in terms of locations where populations are exposed and vulnerable to disaster, and what the risk mitigation options are in these areas. Once disaster has struck, the immediate efforts of the responder community dealing with the displaced persons are of different nature; they count them and assess and monitor their needs and vulnerability over time. Geospatial support in both situations has been developed and is effective to varying degrees; some countries do roll out disaster management schemes that provide integrated approaches of disaster management cycles. In other cases, often in disaster-prone less developed countries, these processes are not as well developed and interrelationships of dealing with displacement before, during and after disaster less addressed. This paper has provided insights, on the need for

flexible geospatial support for those involved in this field of work, with the intention of helping practitioners 'join up the dots' for effective GIS-based support in what is a complex, dynamic, ambiguous and often intangible multi-stakeholder context, where all efforts ultimately are intended to save human lives.

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