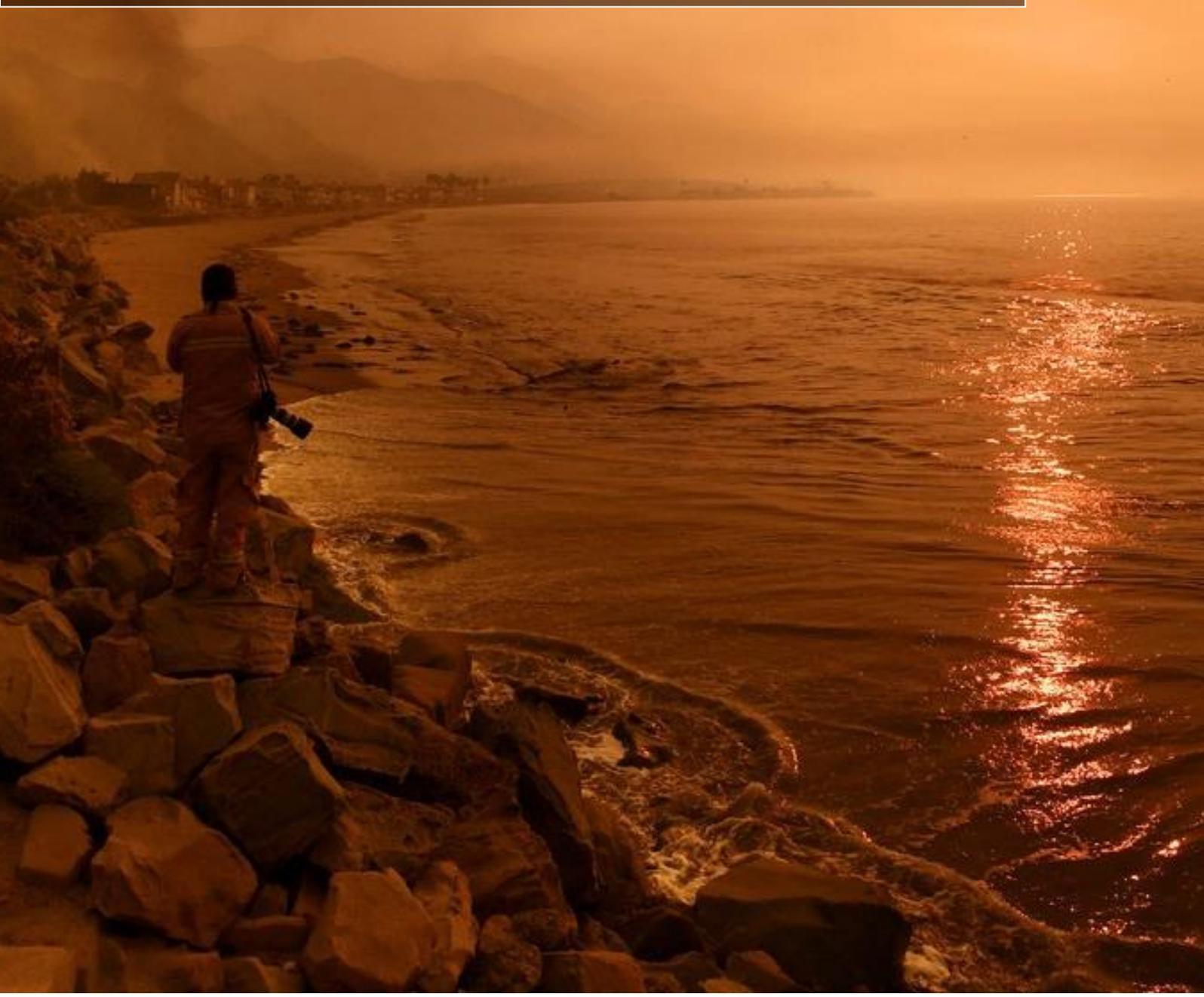




HUMAN MOBILITY IN THE CONTEXT OF ENVIRONMENTAL AND CLIMATE CHANGE

Assessing current and recommended practices for analysis within DTM



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Introduction

The objective of this thematic paper is to provide the readers with a better understanding of how DTM can contribute to data gathering and analysis on human mobility in the context of environmental degradation, climate change and disasters. The paper formulates recommendations for DTM practitioners to improve tools and explore new analytical approaches to allow IOM to be at the forefront in this growing field.

Through a critical analysis of current DTM practices, the paper proceeds to assess DTM current contributions, strengths and weaknesses in understanding human mobility in the context of environmental degradation, climate change and disasters and draws lessons from previously undertaken surveys and assessments. This introspective process serves to highlight opportunities to improve current tools and practices, as outlined in a set of targeted recommendations. Finally, this paper paves the way for more advanced analyses that could be carried out by taking into consideration external sources of data, such as publicly available meteorological databases, alongside information collected by DTM. The thematic paper thus seeks to assist practitioners in considering more consistently the possible impact and explanatory power of environmental factors in the context of population movements, and to apply an analytical lens focused on this intersection when interpreting data.

Background

IOM's Displacement Tracking Matrix (DTM) globally serves as key resource for population figures on internally displaced persons, migrants and returnees. It is designed to regularly and systematically capture, process and disseminate information to provide a better understanding of the movements and evolving needs of people on the move, whether on site or en route. DTM data provides the most granular data available, to the level of detailed locality description for displaced populations.

DTM has been growing as an operational tool since its inception in Iraq in 2004, to track and monitor displacement and population mobility. DTM has been deployed in numerous conflict and disaster settings, providing primary data to support the delivery of better targeted humanitarian assistance as well as transition and recovery efforts.

DTM information analysed alongside other data sources carries the potential to contribute to a better understanding of the complex relation between migration, environment and climate change, acknowledging that different forms of movements in the context of disasters, environmental degradation and climate change exist, including displacement, but also more voluntary forms of migration and planned relocations. Knowledge about the links between migration, environment and climate change is important to a broad range of policy and programmatic agendas, including migration management, protecting human rights of migrants, emergency preparedness, climate change adaptation and mitigation, urban planning, disaster risk reduction and sustainable development.

With increased attention to the migration and environment nexus in the global discourse comes a need for quality and robust data on this phenomenon. DTM, through its set of tools and methodologies, is strategically positioned to respond to this need in close collaboration with colleagues from the IOM Migration, Environment and Climate Change (MECC) division whose thematic expertise has been essential in shaping this paper. Established in 2015 as a dedicated division to address the migration, environment and climate nexus, MECC has formalized IOM's engagement in this thematic area, making IOM the first international organization to have established an institutional

unit fully devoted to this topic. The MECC Division¹, within the Department of Migration Management, has the institutional responsibility to oversee, support and coordinate the development of policy guidance for activities with a migration, environment and climate change dimension.

Concerns around environmental degradation and sudden onset disasters as drivers of human mobility have existed for a long time and receive significant attention in public discourse. Since the 1990s, IOM has been addressing the migration, environment and climate change nexus at all levels: research, capacity building, policy development and operational response². There is no internationally agreed definition of the term “environmental migration” and considerable debate exists about the terms used to label people moving in contexts of environmental stress. The IOM Glossary³ adopts the following working definition of the term “environmental migrant”:

A person or group(s) of persons who, predominantly for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are forced to leave their places of habitual residence, or choose to do so, either temporarily or permanently, and who move within or outside their country of origin or habitual residence.

While the relation between migration and the environment is not new, there has been a growing recognition at the global level of the influence of disasters, climate change and environmental degradation on migration patterns. Data from the Internal Displacement Monitoring Centre show that disasters caused by weather and climate-related hazards have been the number one driver of internal displacement over the last decade.⁴ Research by the World Bank suggests that up to 140 million people across Sub-Saharan Africa, South Asia, and Latin America could be forced to move within their countries by 2050 due to slow-onset processes if governments fail to agree on more ambitious climate action and inclusive development⁵.

From a methodological point of view, environmental degradation is a difficult phenomenon to isolate from other drivers of human mobility related to economic, social, political and cultural conditions. This issue highlights the need to improve DTM instruments to collect data on mobility drivers, which most often capture only a main reason for movement, with an underlying assumption that a complex mobility decision can be narrowed down to a single explaining factor. Moreover, the analysis of other elements, such as livelihoods and income-generating activities, experience of specific environmental events, and implementation of disaster risk reduction and adaptation measures, could improve our understanding of such a complex issue, suggesting how environmental and climate change could shape the future of migration patterns.

¹ For more details, especially about the theoretical and policy background, please refer to MECC’s website (<https://www.iom.int/migration-and-climate-change>), where it is possible to access flagship publications, such as The Atlas of Environmental Migration (<https://environmentalmigration.iom.int/atlas-environmental-migration>)

² For more information, refer to the [Migration, Environment and Climate Change: Training Manual \(Facilitators’ Guide\)](#), or the [IOM Outlook on Migration, Environment and Climate Change](#) which also serve as useful background readings to familiarize with the topic.

³ The latest version of *IOM Glossary on Migration* can be found at the following link: https://publications.iom.int/system/files/pdf/iml_34_glossary.pdf

⁴ The Global Report on Internal Displacement 2019 is available here: <https://www.internal-displacement.org/global-report/grid2019/>

⁵ Rigaud, Kanta Kumari; de Sherbinin, Alex; Jones, Bryan; Bergmann, Jonas; Clement, Viviane; Ober, Kayly; Schewe, Jacob; Adamo, Susana; McCusker, Brent; Heuser, Silke; Midgley, Amelia. 2018. Groundswell: Preparing for Internal Climate Migration. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/29461> License: CC BY 3.0 IGO.

Whatever the initial reason for displacement, other factors may intervene to hinder transitional or durable solutions for people on the move. For instance, conflict-induced displaced persons may be kept from returning or finding durable solutions elsewhere by environmental degradation affecting their livelihoods and well-being. In such a situation, environmental factors would not be the initial cause of displacement but would nevertheless count as a cause of protracted displacement. This element is frequently overlooked.

This paper seeks to set a basis for better understanding environmental factors as drivers of human mobility. To this end, it is necessary to collect sufficiently granular data to be able to detect both drivers and root causes. Slight adjustments in already existing DTM tools and methodologies to improve the focus of some questions, increasing the amount of options available for respondents and introducing some questions taken from MECC-specific studies, can increase DTM’s contribution to a better understanding of this subject area.

For the purpose of this paper, DTM practices and MECC-specific studies ranging from 2014 to 2019 were analysed on the initiative of the DTM team and the MECC Division. The following section assesses these practices to lead towards a set of recommendations for future implementation. As shown in the illustration below, these recommended practices are developed throughout the paper to address different analytical dimensions:

- 1) to gain a more comprehensive understanding of **reasons** for movement (including the climate-conflict nexus) or non-movement (as in the case of immobile populations or people for whom return is not an option) through the establishment of a ranked scale system;
- 2) assessing the use of livelihood information captured through the addition of questions on income streams and livelihood practices to understand **risks and vulnerabilities**;
- 3) assessing **perceptions** of environmental degradation by analysing subjective and objective data on its impacts; and
- 4) **reactions** to the resulting challenges, and how they reflect in coping and adaptation behaviours.

This list is not exhaustive of all the various facets of the issue, but it still represents a good proxy to improve DTM tools and make them more effective in capturing the environmental dimension of human mobility.

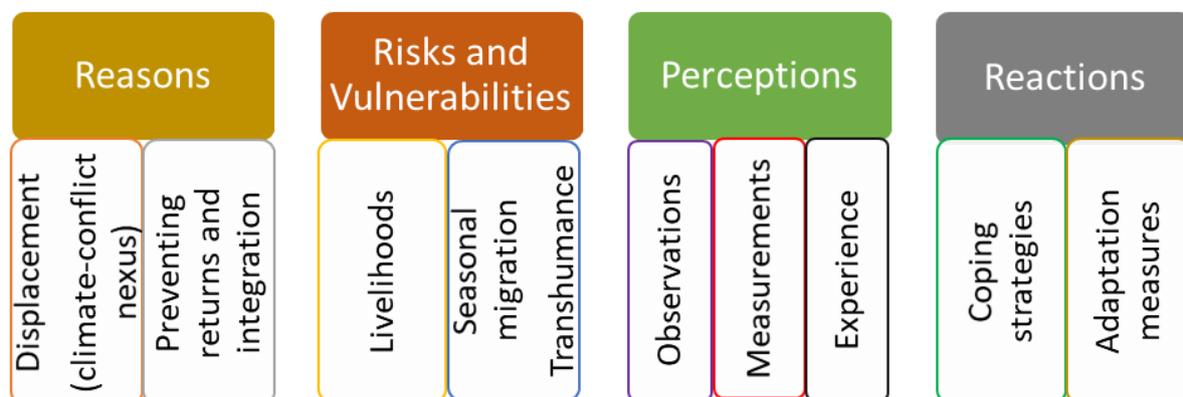


Illustration 1: Analytical dimensions for understanding human mobility in the context of environmental and climate change

Current DTM practices

One of the key distinctions in DTM's tools and methodologies exists with regards to the level at which data is gathered – either at group/location level (e.g. in mobility tracking), or at household/individual level (e.g. in surveys)⁶. Data captured at the group/location level is collected through key informant interviews and direct observation, whereas data at the household/individual level relies on surveys and direct interviews with the concerned individual/household. As such, the assessment of current practice and recommendations for further work in this thematic area is structured by distinguishing the indicators collected through key informants from the data gathered through individual/household-level interviews.

Data obtained through DTM methodologies can usually be disaggregated by sex and age. These dimensions are fundamental when looking at the spectrum of human mobility in context of environmental and climate change, as gender and age shape both individual impacts and mobility decisions. While the following sections make limited references to gender dimensions, as they focus on specific areas of improvement for DTM practices, it is strongly recommended to collect and analyse sex- and age-disaggregated data when working in this field.

Questions targeted to Key Informants

Mobility Tracking baseline assessments seek to provide clarity on the number of displaced persons (and at times other populations of interest) per observed area, as well as some key characteristics such as time of displacement and reason of displacement. This information is collected through key informants in each administrative sub-area. Key informants are asked to estimate the number of households and/or individuals displaced by specific reasons from within a set and limited choice of options that are typically laid out in a matrix (capturing simultaneously how many were displaced by which reason and in which time period). Usually there are about three different categories (for example conflict, communal clashes, disaster) and possibly an option “other types of displacement”. This approach allows to only record each displaced person (recorded as part of a broader group) as displaced by one specific reason, i.e. the “main” reason, thus preventing the capturing of multi-causality and at times risking masking underlying drivers. However, it is recommended considering whether it would be difficult to obtain more granular and time-disaggregated reliable data from key informants at this higher level of observation.

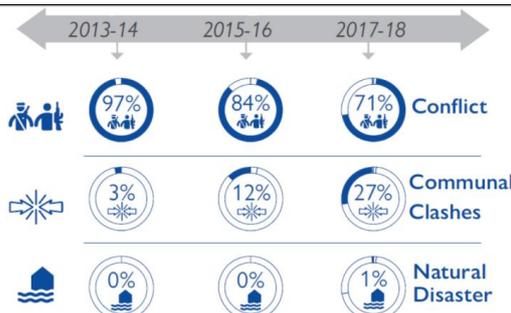
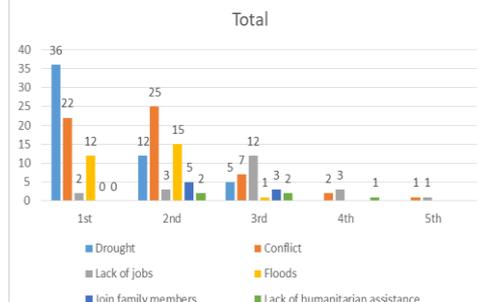
For the **Multi-Sectoral Location Assessment (MSLA)**, where the multi-sectoral needs (such as food security, safe water, sanitation and hygiene, education, shelter and non-food items or protection) of displaced persons and other populations of interest are assessed at the location level (displacement site, village or neighbourhood), often a similar approach of capturing exclusively the main reason(s) of displacement is currently employed. In some contexts, only a high-level distinction is undertaken between migration drivers, for example between “(political) conflict”, “communal clashes”, and “natural disaster” without further distinctions depending on the specific hazard that triggered the disaster. In other contexts, such distinctions are made. In Ethiopia, for example, key informants are required to select one answer among a more comprehensive list of options (*Drought, Conflict, Flash Flood, Seasonal Flood, Fire, Landslide, Other (specify)*). Whilst this offers more nuance than only declaring the reason for displacement to be “natural hazard”, it still provides only a single (the major) reason for displacement for each site, whether it applies to all of the IDPs on site or not. Focusing on the main reason for displacement simplifies the questionnaire but may hide multiple causality (at

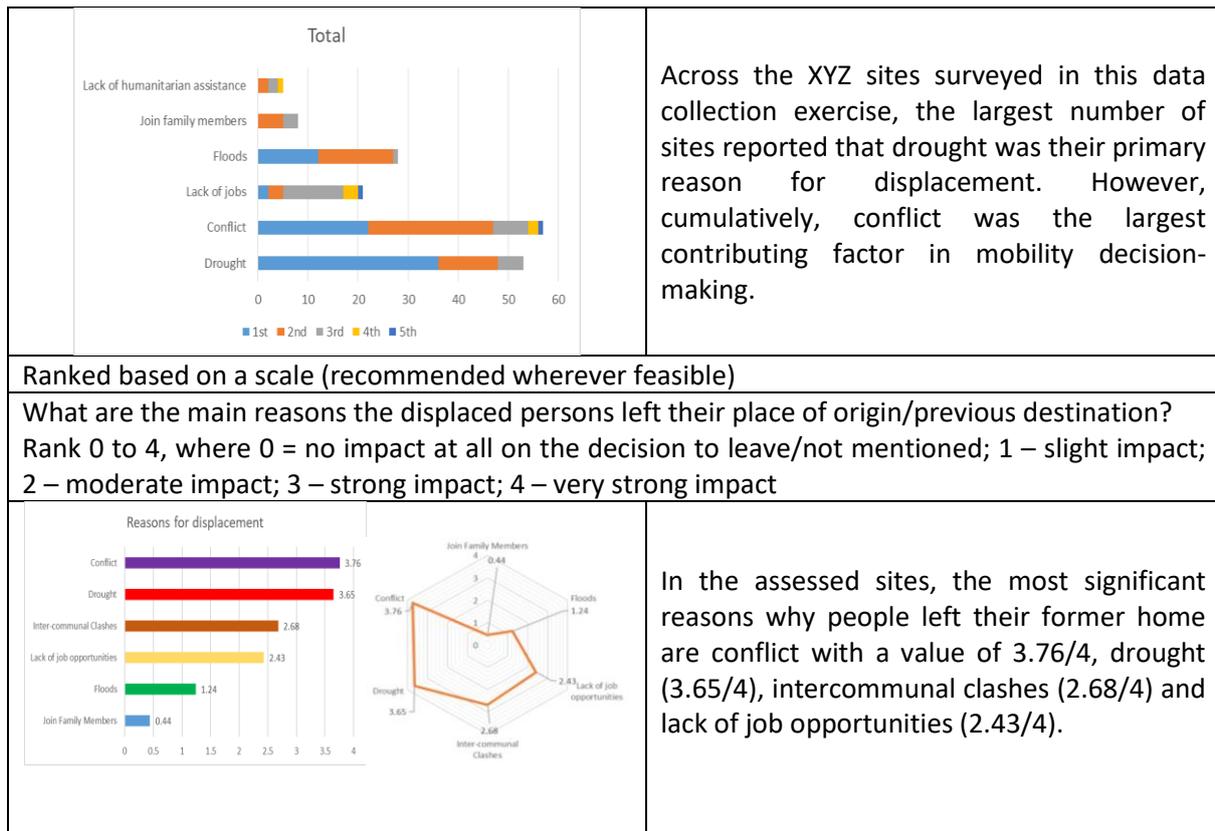
⁶ For more details on DTM Methodologies, please refer to the *DTM Methodological Framework*, available online at the following link: <https://displacement.iom.int/content/methodological-framework-used-displacement-tracking-matrix-operations-quantifying>

individual and group level). This is of particular concern in large sites containing various IDP groups. Moreover, it remains linked to an underlying assumption that a complex mobility decision can be narrowed down to a single defining driver, which often is not the case.

In challenging contexts (e.g. emergency response) when implementing MSLA, it is thus recommended that key informants should, at a minimum, be asked to list all the main applicable reasons for displacement, giving each a rank (e.g. 1 conflict, 2 disaster [drought], 3 economic reasons).

However, whenever it is manageable, key informants should be asked to provide a numerical value on a ranked scale (0-4) for each potential reason for displacement in order to understand how much any given reason is applicable to a specific group of displaced individuals. Later, these answers should be weighted according to how many displaced individuals the key informant is referring to in order to obtain weighted averages across sites or regions. This allows for the recording of multi-causality, for example if a specific group was displaced by intercommunal clashes, but the displacement was underpinned by additional political or environmental factors. This approach allows to create a larger database of reasons of displacement, and subsequently more accurate analyses of the interlinkages between the impact of environmental changes and other causes of displacement. The following table illustrates the different approaches to collecting reasons for displacement described above, at both baseline and MSLA level, including the distinction between a simple ranked multiple choice versus utilizing a ranked scale.

At baseline level	
Data visualization	Data description
 <p>2013-14 2015-16 2017-18</p> <p>97% 84% 71% Conflict</p> <p>3% 12% 27% Communal Clashes</p> <p>0% 0% 1% Natural Disaster</p>	<p>In region X in the years 2017 and 2018, 71 per cent of the individuals were reported to be displaced by conflict, while 27 per cent by communal clashes. Natural disaster was the least common, with only 1 per cent of the displaced individuals reporting to be displaced for this reason.</p>
At MSLA level	
Ranked multiple choice, select as many as apply (in challenging environments)	
 <p>Total</p> <p>40 35 30 25 20 15 10 5 0</p> <p>1st 2nd 3rd 4th 5th</p> <p>Legend: Drought, Conflict, Lack of jobs, Floods, Join family members, Lack of humanitarian assistance</p>	<p>In 36 sites, drought was reported to be the primary reason for displacement, and in 22 sites conflict was reported as the primary reason. Floods accounted for the main reason in 12 sites and were ranked the second most important reason in 15 sites.</p>



Environmental factors as a reason preventing durable solutions

In order to capture the factors preventing durable solutions and the type of support needed by displaced persons to return or integrate elsewhere, it is necessary to add some questions to DTM exercises, where feasible applying a similar numerical ranking (0-4) as described above to identify the different factors hindering solutions. If this is not feasible, then questions such as ‘what are the factors preventing the largest IDP group (majority of IDPs) from returning’ or ‘what kind of support does the largest IDP group (majority of the IDPs) need to return or locally reintegrate’ can be considered – however the disadvantage is that these may not fully capture multi-causality. If using the latter option, it is also important to remain consistent with the phrasing, especially in cases where the largest IDP group accounts for less than 50% of the IDPs, otherwise it might lead to misinterpretation by the data users.

It is recommended to add this type of questions at the MSLA level. Factors preventing return can include, for example: *Accessibility, Lack of food, House damaged / destroyed, Lack of safety / security, No livelihood, Basic infrastructures damaged / flooded, Unknown, Nothing*. Types of support needed to return or reintegrate may include: *Livelihood, Land, Water / Resources, ID / Documentation, Access to services, Safety & Security, Livestock / Restocking*.⁷ In both cases, the options refer to more proximate factors than those available as reasons for displacement. These proximate factors might indicate that environmental factors are preventing IDPs to return.

Livelihood questions as proxy for environmental displacement risk

⁷ Adopted from DTM Ethiopia

Ethiopia's MSLA questionnaire included a set of eighteen questions on livelihoods. These questions were designed to inform livelihood interventions rather than to identify or characterise environmental displacement. Nevertheless, they can provide insights on the underlying risk of being displaced.

Data about livelihoods and employment can be used to infer how households are affected by environmental degradation and highlight their vulnerability to different environmental hazards / changes. Farmers, herders, and fishermen, for instance, are expected to be more likely directly impacted by environmental degradation and disasters than those engaged in other livelihood activities (traders, carpenters, blacksmiths, etc.).

At the same time, data about available and lost assets can be used to derive a measure of severity of impact. However, the questions are not formulated to distinguish the reasons for the loss of assets. This is a limitation in contexts where multiple causes (environmental, conflict, economic) contribute to displacement and associated losses.

Livelihood profiles provide information about people's likelihood to be affected (and potentially displaced) by disasters and the severity of the impacts they might suffer can help better target disaster risk reduction, climate change adaptation, disaster preparedness, response and recovery measures, and will be crucial in particular under environmental change scenarios in which the frequency and severity of disasters is expected to increase.

The recently established Transhumance Tracking Tool (TTT) fits exactly in this context. This new tool, developed and implemented across some of the DTM operations in West Africa, seeks to provide information about mobility trends and patterns, allowing to highlight unusual movements and anticipate the associated, potential emergence of possible tensions and conflicts, through the monitoring of pastoralist movements along traditional transhumance channels in key periods of the year. Specifically, the presence of an alert mechanism, among the different tools of TTT⁸, with both ex-ante and ex-post alerts is aimed to enable DTM to provide data that could be used to infer how environmental degradation contributed to tensions and conflicts.

The inclusion of information on whether people in the assessed area practice **seasonal migration** is another key indicator, as economic migration correlates closely with environmental conditions. When using DTM questionnaires to investigate this kind of movements, it is useful to include questions/answer options to understand which population sub-groups practice seasonal labour migration in determined areas or economic sectors, for example male/female youth, entire households, etc. The sub-group division might be useful in assessing whether particular age/sex groups are more vulnerable to environmental stresses and/or more ready/willing to adapt to environmental changes through migration. Such questions should be complemented by more specific ones about previous livelihood shocks in defined past time periods and their cause, for example drought, floods, livestock diseases, human epidemic, crop diseases, pests, conflict.

Other livelihood questions (e.g. concerning the ability to sell at profit, access to market services, access to natural resources, economic demographics) can all be linked to ascertain which elements have the highest correlation with increased vulnerability to disasters and people's ability to recover. The inclusion of questions on disaster risk reduction/adaptation measures already put in place by the government, international organizations or the communities themselves could also help in this sense.

⁸ For more details, please refer to the « *Outil de suivi des transhumances – Note Methodologique* ».

Annex 1 – Field Companion – outlines a set of questions that DTM operations can consider including in their tools to more comprehensively assess and analyse the contribution of environmental factors as reasons for human mobility or as factors preventing durable solutions.

Questions targeted at individual/household level

During individual/household level surveys and questionnaires targeted directly to IDPs/beneficiaries, more detailed and specific questions can be asked. The introduction of a ranking system on **reasons for displacement** like the one suggested at MSLA level is highly recommended, where different possible drivers are listed, and where multiple drivers can be indicated as having prompted the migration/displacement, weighted with different degrees of relevance where applicable. This allows DTM to gather data on the individual factors driving migration/displacement, and to aggregate for a population to see how uniformly significant certain drivers are. The data collected in this fashion allows DTM to categorize migrants/displaced persons by their own subjective assessment of the main drivers of their movement, empowering respondents, as well as providing the opportunity to develop new analytical dimensions such as the study of tipping points and complex interdependence within the system.

Similarly, in a questionnaire section about the **needs**, the same ranked scale can be employed. For the same reasons outlined above, the data can be analysed and provide key insights that current standard questionnaires tend to not capture. In crisis response scenarios, the standard question is “Please indicate your three most urgent primary needs” followed by a list of various items (for example used in the hurricane responses in Malawi, Zimbabwe and Mozambique in 2019). In a context where information needs to be collected and disseminated very rapidly, it may not always be feasible to collect the more granular, ranked data and the higher-level data may suffice to meet the key information needed by stakeholders. Where time allows though, the ranked scale is recommended.

To better understand the vulnerability of different households it is also beneficial to add questions to gather information concerning the **household income streams and main economic activities**, and how they have been affected by disasters and ensuing displacement, for example: “Have you experienced loss of production or animal deaths due to environmental factors (drought, floods, etc)?” This type of question could provide useful insights concerning livelihood shocks (that could be attributed to environmental change or any other list of disaster, whether triggered by man-made or natural hazards). It also opens up the possibility for longitudinal analysis drawing on findings from multiple surveys (that employ the same or similar questions throughout the displacement period), to gather information on economic deterioration, particularly for those households who derive most of their income from agriculture.

Additionally, questions on the **perceptions of the impact of environmental change on livelihoods and conflict** can be employed. However, one ought to be cautious to pose questions in a clear and understandable way. Some examples from previous household surveys are illustrated below, along with lessons learned.

Question	Answer Option	Observation / Limitation
<p><i>Do you see a link between the conflict and one of the following?</i></p> <p><i>(Check all that apply)</i></p>	<p><i>Resource availability; Rainfall variability; Temperature variability; Ecosystem variability; Population growth Regime change; Other (please specify); I don't know; Not applicable</i></p>	<p>Relies on unrealistic assumptions about the ability of non-technical respondents to identify complex, non-proximate causal relationships</p>

If 'increase' or 'decrease' [of temperature] by how much per year?	<0.5°C .5-1.5°C 1.5-2.5°C >=2.5°C I don't know	Asking individuals very precise estimation is impractical and will likely yield incorrect estimations
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In the second example above, maintaining a more generic question on how individuals characterize/perceive a variation (as an INCREASE or DECREASE) might be useful if compared with the available data on weather patterns, climate and other environmental variables⁹. This is particularly relevant considering that perceptions of their own vulnerability, rather than vulnerability in itself, are the factors that influence people's choices to move and knowing whether the affected individuals have realistic perceptions about the environmental changes that are surrounding them might help in addressing better their needs. It is also advisable to ask since when people are noting a variation in temperature or rainfall patterns in the area of observation.

Other questions of interest relate to **resource availability** (water, timber, farmland, grazing land, etc.). Follow-up questions can inquire whether respondents have noticed a change in resource availability (yes, no, don't know) and if yes, since when (with different time spans as response options). Such a question structure only works if the follow up questions are asked separately for each initial answer option, since different natural resources could have been differently affected by availability over different time periods. A frequent pitfall which needs to be avoided is that a survey is structured in a way that seeks to extract too much information at one time, causing it to be lost in the data gathering process.

Another example of this is highlighted below. Question 1 along with 2,3 and 4 could offer an effective sequence for establishing more specific information by narrowing the scope of the investigation and giving an indicator for how livelihoods have been affected. However, the multiple-choice nature of the first question risks conflating multiple trends into a single one and does not allow for variation within a community. By singling out each of the potentially applicable livelihood practices (Q1) and then asking follow up questions separately for each applicable practice, the resulting information could be very effective in providing insight into local economic conditions.

Q1 What are the main livelihood activities practiced in your community (check all that apply)	<ul style="list-style-type: none"> <input type="radio"/> Subsistence farming <input type="radio"/> Commercial agriculture <input type="radio"/> Cattle rearing <input type="radio"/> Transhumance <input type="radio"/> Small livestock rearing <input type="radio"/> Fishing <input type="radio"/> Commerce <input type="radio"/> Mineral extraction <input type="radio"/> Timber collection (and/or trade) <input type="radio"/> Charcoal extraction (and/or trade) <input type="radio"/> Public service <input type="radio"/> Other
Q2 Have you observed a change in livelihood practices?	<ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Don't know
Q3 If yes, since when?	<ul style="list-style-type: none"> <input type="radio"/> <1 year <input type="radio"/> 1-3 years <input type="radio"/> 4-6 years <input type="radio"/> 7-10 years <input type="radio"/> >=10 years <input type="radio"/> I don't know

⁹ See for an example of publicly available database: <https://climateknowledgeportal.worldbank.org/download-data>

Q4 If yes, how would you characterize this change?	<ul style="list-style-type: none"> <input type="radio"/> Diversification of livelihoods (practicing more than 1) <input type="radio"/> Loss of certain livelihoods <input type="radio"/> Addition of new livelihoods <input type="radio"/> Other <input type="radio"/> I don't know
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Other questions that could be added are “Is it common for individuals to practice multiple livelihood activities in your community?” and “If yes, has this always been the case?”.

Also consider employing questions that deal with the **impacts of surveyed climate variability** (increase/decrease). Below sample questions provide simple and concrete subjective observations about the effect of climatic shocks on social and economic life in a community, and hence could serve as effective indicators. The data they provide could be used to anticipate or analyse potential political instability within communities or to better understand the coping strategies that the household employs when faced with adverse environmental conditions, therefore providing information on how changing environmental conditions affect the livelihoods of the community.

For example, an inquire on how environmental degradation has impacted the respondent’s resources could be articulated in the following dimensions:

B7.1 PRODUCTION OF RESOURCES <i>(single answer)</i>	<ul style="list-style-type: none"> <input type="radio"/> Increased production capital <input type="radio"/> Decreased production capital <input type="radio"/> No effect <input type="radio"/> Don't know
B7.2 AVAILABILITY OF RESOURCES FOR YOUR WORK <i>(single answer)</i>	<ul style="list-style-type: none"> <input type="radio"/> Increased resource availability <input type="radio"/> Decreased resource availability <input type="radio"/> No effect <input type="radio"/> Don't know
B7.3 RESOURCES AND GOODS (FOOD, ITEMS) COSTS <i>(single answer)</i>	<ul style="list-style-type: none"> <input type="radio"/> Increased market prices (specify) <input type="radio"/> Decreased market prices (specify) <input type="radio"/> No effect <input type="radio"/> Don't know
B7.4 CONFLICT AND DISPUTES <i>(single answer)</i>	<ul style="list-style-type: none"> <input type="radio"/> Created further competition over resources <input type="radio"/> Created further disputes over land and tenure <input type="radio"/> No effect <input type="radio"/> Don't know
B8.1 RISKS AND HAZARDS <i>(single answer)</i>	<ul style="list-style-type: none"> <input type="radio"/> Less exposure to hazards and weather conditions <input type="radio"/> Greater exposure to hazards and weather conditions <input type="radio"/> No effect <input type="radio"/> Don't know

Further, surveys could include questions to assess how respondents feel that this change has impacted their living conditions, including:

B8.2 SHELTER <i>(multiple answers)</i>	<ul style="list-style-type: none"> <input type="radio"/> Shelter damage <input type="radio"/> More living space <input type="radio"/> Less living space <input type="radio"/> No effect <input type="radio"/> Don't know
B8.3 WATER <i>(single answer)</i>	<ul style="list-style-type: none"> <input type="radio"/> Increased availability of water <input type="radio"/> Decreased availability of water <input type="radio"/> No effect <input type="radio"/> Don't know
B8.4 FOOD <i>(single answer)</i>	<ul style="list-style-type: none"> <input type="radio"/> Increased availability of food <input type="radio"/> Decreased availability of food <input type="radio"/> No effect <input type="radio"/> Don't know

Coping and adaptation strategies/mechanisms vary across countries and regions, with different communities and households reacting very differently to changing environmental conditions (World Bank, 2013). Understanding the coping strategies and adaptation methods people employ supports the implementation of risk reduction, early warning and preparedness, response and recovery programmes. As an example, adaptation to slow onset disasters and environmental change can manifest in: increasing levels of seasonal labour migration, people changing work, moving their house, relocating to a new area, changing the type of shelter construction and materials used, changing eating habits, changing spending habits, alternating crops and farming habits, etc. Coping strategies can provide guidance in identifying vulnerability to environmental degradation of specific households or communities. They might also be able to provide data to start an analysis of tipping points. For example, a study by IOM in Haiti under the MECLEP project¹⁰ created a vulnerability score by combining information on livelihoods, coping mechanisms put in place by the households and other socio-economic dimensions.

Question	Answer Options
In the last year, has your household taken any of these measures to prevent impacts of future hazards?	<ul style="list-style-type: none"> - Relocated to a safer place - User safer building materials - Constructed physical barriers - Diversified economic activities - Sent household members outside to earn money - Other - None - Don't know
Ten years ago, has your household taken any of these measures to prevent impacts of future hazards?	Same answer options as above, tick all that apply

Questions on **livelihood practices, and adaptation and coping strategies** are relevant to include as they allow for an analysis of how environmental shocks or variability, and related displacement, may have affected different sectors of the economy. The design of the question also allows for the study of knock-on effects following an environmental shock on different economic sectors, potentially providing key economic information that would help in relief, post-disaster recovery and development effort. Besides establishing which livelihood activities area practiced (Q1), it is important to assess if there have been any changes (Q2) and if yes how these changes are characterized (Q3). These questions, analysed together with information on impacts of natural disasters and environmental degradation, could provide useful insights on potential tipping points, enhancing the capacity of DTM tools as an early warning system.

Question on adaptation strategies	Answer options																				
<i>Q1 What livelihood activities do you practice here? (Check all that apply)</i>	<table style="width: 100%; border: none;"> <tr> <td><input type="checkbox"/> Subsistence farming</td> <td><input type="checkbox"/> Commercial agriculture</td> </tr> <tr> <td><input type="checkbox"/> Cattle rearing</td> <td><input type="checkbox"/> Transhumance</td> </tr> <tr> <td><input type="checkbox"/> Small livestock rearing</td> <td><input type="checkbox"/> Fishing</td> </tr> <tr> <td><input type="checkbox"/> Commerce</td> <td><input type="checkbox"/> Mineral extraction</td> </tr> <tr> <td><input type="checkbox"/> Timber collection (and/or trade)</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Charcoal extraction (and/or trade)</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Transport</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Small repairs (electronic, car, etc.)</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Construction (and related: plumber, carpenter, mason, etc.)</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Public service</td> <td><input type="checkbox"/> Other</td> </tr> </table>	<input type="checkbox"/> Subsistence farming	<input type="checkbox"/> Commercial agriculture	<input type="checkbox"/> Cattle rearing	<input type="checkbox"/> Transhumance	<input type="checkbox"/> Small livestock rearing	<input type="checkbox"/> Fishing	<input type="checkbox"/> Commerce	<input type="checkbox"/> Mineral extraction	<input type="checkbox"/> Timber collection (and/or trade)		<input type="checkbox"/> Charcoal extraction (and/or trade)		<input type="checkbox"/> Transport		<input type="checkbox"/> Small repairs (electronic, car, etc.)		<input type="checkbox"/> Construction (and related: plumber, carpenter, mason, etc.)		<input type="checkbox"/> Public service	<input type="checkbox"/> Other
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¹⁰ Accessible here: <https://publications.iom.int/fr/books/catastrophes-changements-environnementaux-et-migration-apercus-issues-de-milieus-vulnerables-en>

<p>Q2 Have you faced a change in livelihood practices during your time here?</p>	<p><input type="radio"/>Yes <input type="radio"/>No <input type="radio"/>Don't know</p>
<p>Q3 If yes to Q2, how would you characterize this change to your livelihood activities?</p>	<p><input type="checkbox"/>Diversification of livelihoods (practicing more than 1) <input type="checkbox"/>Loss of certain livelihoods (please specify which ones) <input type="checkbox"/>Addition of new livelihoods (please specify which ones) <input type="checkbox"/>Other <input type="checkbox"/>I don't know</p>

Other aspects to explore relate to **food insecurity** that can be caused or exacerbated by environmental events. Questions should explore whether food consumption was in any way compromised over a defined time period (e.g. the last seven days), if so why (health reasons, to save money, due to inability to access to specific products, etc.), and whether individuals concerned had to deploy any coping strategies in order to be able to access food (such as selling assets and belongings, spending savings, borrowing money, begging, scavenging, etc.).

Limitations

From the investigation of current DTM practices, several limitations come to light in the current data collection process. The first is that **tools do not capture ‘trapped populations’**, despite this sub-group of the affected population being mentioned many times in the existing environmental change and migration literature. Secondly, for mobile populations, **not all DTM exercises capture in detail environmental factors as reasons for displacement**, instead referring more generically to “natural disaster”. Furthermore, the subjective assessment of ‘main reason for displacement’ functions well for sudden-onset disasters but may mask risks overlooking environmental factors when these overlap with other salient but not necessarily more important factors (conflict/insecurity, livelihoods/economics) that are underpinned by local ecosystem features and processes, and their change. Environmental pressures may be contributing to conflict or underlying an economic downturn – knowing this and addressing it in interventions is key for successful anticipatory actions, as well as transition and long-term recovery interventions. Finally, the **current tools are good at tracking displacement ex post but say little about the risk of displacement or the possibility of searching for a tipping point**. Additional consideration ought to be given to potential options for indicators and analyses that could contribute to an early warning system or have some predictive capacity before people are displaced, especially in the context of slow-onset disasters.

The DTM tools need to address the trade-off between standardization and the relevance to local programming. The possible solution would be to disaggregate disaster typology nationally to the degree required in a specific response and to have it consistently aggregated at regional and HQ levels in a comparable manner. Another trade-off links to the desire to capture more granular data, such as through a ranking scale, versus the need to keep questionnaires short and simple to allow for their rapid use in an emergency response. Where time pressures are less significant, a more extensive use of livelihood questions/indicators offers opportunities to measure environmental impact on populations on the move, contributing to the study of drivers and the complex interdependence between them.

Recommendations for field implementation

It is important that upcoming, relevant efforts be developed and implemented in partnership between DTM and MECC specialists – in the field (i.e. RTSs and focal points) and at HQ. Collaboration is essential from the early stages of the inception of activities and products all the way to the analysis and publication of the results, and that includes specific attention to learning and knowledge-sharing within the Organization. This could help better address the complexity of relevant data collection and

analysis work and the limitations of current DTM services highlighted in the previous sections. If needed, additional support for relevant activities can also be provided by colleagues at GMDAC, as well as through the extensive network of research partners IOM has built on migration, environment and climate change issues over time. Moreover, whenever time and resources allow, it is highly recommended to organise focus groups with affected populations and further qualitative assessments in order to improve the understanding of this issue.

The following table summarises the key steps recommended to improve DTM capacity to analyse environmental change, degradation and related disasters as a cause of migration.

Key Informant/Group Level	
Baseline Level: reasons for displacement	Maintain the current system.
MSLA level (preferred choice when feasible): reasons for displacement	Introduce a numerical ranking system (0-4), assigning a value to each reason of displacement.
MSLA level (alternative choice when time constraints do not allow to implement the preferred system): reasons for displacement	Rank applicable reasons for displacement (from most important to least important).
MSLA: Factors preventing returns	Introduce questions on factors preventing returns. Apply the numerical ranking system whenever is possible.
MSLA: Economic activities and jobs	Introduce questions on jobs, economic activities and livelihoods in order to understand if (and to what extent) jobs and economic activities rely on natural resources and how different lifestyles are affected by environmental factors.
MSLA: Proximate factors	Use questions referring to more practical examples of environmental impacts (e.g. lost assets), which are easier to understand for respondents and give more nuanced insights about the impact of climate-related disasters.
MSLA: Seasonal migration, transhumance	Have specific questions on (seasonal) migration and transhumance and which members of the household practice them in order to provide insights about early signs of environmental stress.
Household/Individual Level	
Reasons for displacement	Whenever it is feasible, implement the abovementioned ranking system (0-4).
Income streams and livelihoods	Use a set of questions to investigate how individuals earn a living and the challenges faced in their daily activities in order to assess how environmental factors affect people and households differently, according to their livelihood profiles.
Livelihood shocks	Introduce a set of questions on very practical impacts of environmental shocks and stresses. Practical/user-friendly questions are a very reliable source considering the ability of respondents to correctly assess the damages incurred.
Perceptions of surrounding environmental changes	Avoid requesting responders very precise estimations (e.g. mm of precipitations). Questions

	targeted at understanding the ability of individuals to assess the ongoing environmental changes are critical to get a picture of individual perceptions (the factor behind the decision to move or not).
Coping strategies	Introduce questions on coping strategies (e.g. seasonal migration, changing food habits, changing livelihoods) in order to provide key information to predict future movements. This information might help also to create vulnerability scores.

Next Steps: avenues for future research

Outside the small set of recommendations listed in the previous section, there are a few possible avenues to explore in order to understand how DTM data could be used in the future to monitor and anticipate movements in the context of environmental shocks and stresses. Displacement and migration in the context of disasters, climate change and environmental degradation is a long-term and evolving issue: the strategic decisions concerning DTM operations should take into consideration that early investments will provide DTM with the expertise and methods to be one of the key institutional actors in future contexts.

One of the priorities could be to combine information on population movements collected through DTM methodologies with available data related to climate, conflicts and other phenomena that are linked to environmental change. Specifically, a field that needs to be explored is represented by the linkages between environmental factors and other reasons for displacement. Understanding the underlying reasons of tensions and conflicts that led to displacement is a good exercise to improve the humanitarian action, especially considering the increasing impact of environmental change in some specific conflict-affected regions (e.g. Sahel). Similarly, understanding the importance of climate in the economic stability of agriculture-oriented rural areas (e.g. in Central America, Maghreb, Sub-Saharan Africa) and its potential mobility consequences (e.g. rural/urban mobility) can help in the design of adequate strategies.

Meteorological data (e.g. average rainfall patterns, average temperatures, water vapour, aerosol optical depth, fires, temperature anomalies, vegetation) should be collected and integrated in such a way that GIS units can provide ad hoc maps of historical or recent displacements with meteorological and climatic overlays. Meteorological data could be gathered from global sources as well as from regional systems. Much data is already publicly available through NASA and the ESA, more could be accessed through partnerships and agreements with university climate departments. This data would provide effective visual and analytical tools for establishing linkages between recorded movements and environmental factors (verifying subjective answers for reasons for displacement or allowing reporting units to establish clear linkages between differently labelled movements and the environment). Such data would also be useful ahead of establishing a data collection exercise, indicating whether the questionnaire would need to be adapted to include specific questions (e.g. whether to include more questions on communication and infrastructure damage in an area recently affected by a certain disaster). Concretely, capacity for this kind of data collection and analysis could be established within the DTM Global/Regional support structure, or by hiring external consultants or service providers.

Another possibility is to use this data to assess perceptions of people regarding the environmental changes they have experienced. Comparing climatic and environmental data with the affected population's impression might contribute to develop models to forecast future movements:

ultimately, perceptions of environmental changes, not the changes themselves, are the decisive factor in the decision-making process of a person establishing whether to move or not.

A further avenue for investigation relates to the coping mechanisms put in place by people affected by environmental change. Analysing certain types of behaviour (e.g. seasonal migration, increasing number of economic activities practiced by a household/differentiation strategy, changing traditional nutritional habits) could also help understand household-level decision making, and potentially help predict future mobility decisions and patterns.

A possible project could build upon the already extensive coverage of DTM Flow Monitoring and the tracking of labour migration and transhumance corridors within the West and Central Africa region. Labour migration and unexpected pastoralist movements might be a key indicator of economic hardships as a result of a slow-onset disaster (typically drought) or environmental degradation process (e.g. depletion of water resources of grazing land). In order to fully realise the analytical potential of this approach, current datasets should be integrated and continuously updated to provide an expected rolling average for the number of individuals/households passing through an FMP for any given month. In order to provide a stable baseline, ideally more than ten years of data should be compiled. This is a difficult proposition, as various factors from funding to conflict will allow or hinder the enactment and systematic continuation of flow monitoring activities across various points. The long-term benefits would be to be able to establish when there are unexpected upticks in labour migration, which could indicate that a region is descending into crisis and warrant further in-depth, survey-based assessments. An econometric analysis could provide key information on what areas have the most significant outflows, or where migration flows are below an expected value depending on various development indicators. This information may direct DTM to areas not only affected by slow-onset disasters as they unfold, but also discover areas of trapped populations who will require the most humanitarian assistance in the future and thus anticipate and better prepare for potential events. The possibility of addressing a situation before it evolves into a crisis also implies that development-based programming can help prevent the worst consequences of inaction.

In order to further study the drivers of mobility and discover the ‘tipping point’ at which large segments of a population become mobile, decision-making needs to be considered as a complex system. Studying individual elements of a system is unlikely to provide insights or to develop predictive capacity. Instead a system must be studied as a whole, to provide a range of possibilities and outcomes depending on key inputs, for example by undertaking a type of “neural network analysis” to establish which questions are most correlated together and to which degree. For instance, when individuals cite environment as being a more significant factor in their mobility decision, this approach requires observing what other nodes are also increased: perhaps food insecurity or something seemingly unrelated such as fear of crime/violence. The analysis would first aim to establish the most interconnected questions and move them into a new survey. From there, a composite indicator (in the same vein as composite indicators for Protection, Shelter, and WASH severity are employed) could be established, that instead governs the lower limit for a mobility decision. It would, in effect, create a numerical value that would indicate how close a population is, on average, to experiencing such detrimental conditions that migration becomes a suitable mitigation strategy. The questionnaire could be adapted to survey as yet immobile populations, establishing a clear tipping point, while also providing key data that could be used for programming. This integrated tool would serve as both an investigatory system to direct humanitarian aid, and a tool to anticipate a crisis based on the susceptibility of a given population.



Conclusion

This thematic paper has outlined how DTM's current work already results in relevant information that can inform discussions around human mobility in the context of disasters, environmental degradation and climate change. Yet it also highlighted the potential to do much more, often with minor adjustments to programming. Building on lessons learned and best practices, a set of recommendations for field implementation as well as avenues for future research have been elaborated. The paper, jointly with the accompanying field companion, thus seek to assist DTM practitioners in making adjustments to ongoing and future operations which allow for an enhanced analytical lens on the nexus between displacement and environmental stressors.