BRIEF

Real Time Monitoring (RTM) 2022-2023: Flooding

May 2024 | Afghanistan

Key Messages

- Excessive rainfall is the primary driver of flooding in Afghanistan, particularly during spring and early summer. However, flooding risks vary by region, with snow melt and glacial activities in the north and northeast contributing to river overflows.
- Flooding was reported as the primary cause of croplands damage in Afghanistan in 2022 - 2023, severely affecting agricultural livelihoods and threatening food security.
- To counteract the regional variance in drivers and associated impacts of flooding, there is a need for comprehensive contextualised mitigation and flood risk reduction measures.

Context & Rationale

The impact of climate change is intensifying both the frequency and severity of climate-induced damage in communities throughout Afghanistan. According to the 2023 Afghanistan Humanitarian Needs Overview, 228,000 people were impacted by sudden-onset natural hazards in 2022, marking the most significant number since 2019, and a figure projected to rise in the coming years. Furthermore, the 2024 Humanitarian Needs and Response Plan identified that anticipated El Niño conditions in early 2024 pose increased flooding risks across the nation. The REACH Humanitarian Situation Monitoring (HSM) 2023 reports consistently identify floods as a primary cause of agricultural destruction, potentially contributing to food insecurity and hunger within the country.

To enhance understandings of flood dynamics in Afghanistan, this study utilises data from the quarterly REACH Humanitarian Situation Monitoring (HSM) in conjunction with the Flood Hazard Map (FHM) developed by NATO. Through the integration of specific flood-related question into the HSM Round 4 (September 2023), NATO's delineation of at-risk areas within the FHM can be complimented with a more nuanced understanding of the timing, causative factors and impacts of various types of flooding on local communities. Therefore, the objective of this analysis is to offer more precise and locally relevant information about the distribution, causes, and impacts of floods in Afghanistan, thus enhancing the utility of the existing hazard map for programming and monitoring.

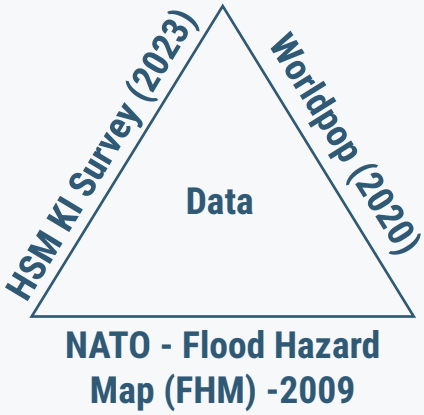
These insights are designed to enhance broader strategies for flood monitoring and proactive response through anticipatory action. By examining the relationships between various flood drivers and impacts, the study aims to provide a foundational understanding that informs strategies to mitigate risk and interventions that could counteract the incidence or damages caused by various floods.

REACH Informing more effective humanitarian action

Methodology Overview

The methodological framework of this analysis synthesises data from three distinct sources to provide a comprehensive understanding of flood dynamics in Afghanistan. The first source is the Humanitarian Situation Monitoring Survey (HSM), where Key Informant (KI) interviews conducted in September 2023 provided detailed insights into the timing, causes, and impacts of flooding as reported by those directly affected. This dataset exclusively includes information from 8,579 Key Informants (KIs) who experienced flooding, emphasizing the immediate human and infrastructural effects.

Additionally, the analysis incorporates iMMAP estimates of the population residing within Flood Risk Zones delineated by the 2009 NATO flood hazard map, alongside CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data) which offers excessive rainfall data from the same period. The integration of iMMAP population estimates based on the NATO flood hazard map, HSM KI survey data, and CHIRPS rainfall measurements ensures a multi-dimensional approach, aligning spatial and temporal data to robustly analyse and interrogate flood risks at both district and province levels in Afghanistan.



Limitations

The rigor of this analysis is tempered by inherent constraints related to data availability, the scale of data aggregation, and the scope of generalisability. The data used from HSM in this brief only reflects flood occurrences from July 2022 to June 2023, though it highlights the frequency across one year. In order to have more concrete understandings about flood occurrence patterns, data from additional years is required. In addition, HSM data collection occurs on a quarterly basis which may impact data quality due to KIs may focus more on recent events rather than older ones.

Data availability poses a significant challenge, as the reliance on KI interviews and existing flood hazard maps might not capture the full spectrum of flood impacts or accurately reflect the current flood risk landscapes due to temporal lags in data collection and updates. The decision to aggregate data at the district level, while beneficial for broader analysis, may still dilute the granularity of local flood experiences and variability within districts, potentially overlooking micro-level flood dynamics.

Results

Drivers of Flooding

The analysis based on the HSM Round-4 data from September 2023 highlights several factors contributing to flooding in Afghanistan. Excessive rainfall, reported by 85% of Key Informants (KIs), emerges as the primary cause, often coupled with the soil's reduced capacity to absorb water. This interaction between heavy rainfall and poor soil absorption has the potential to lead to flash floods — sudden, intense floods that occur within minutes or hours of excessive rainfall.

Other notable causes of flooding include snowmelt, reported by KIs as the main driver of flooding in 4 districts in the Northeast region, and river overflow, mentioned by KIs as the main driver in 9 districts in the North region. The overflow or rupture of glaciers and obstructions from structures built on riverbeds are less commonly reported across the country, each by less than 1% of KIs.

As such, regional variations are evident in the drivers of flooding. For instance, districts along the northern border near the Amu River often cite river overflow as a primary cause, aligning with monthly river runoff data from the Shocks Monitoring Index (SMI). In Badakhshan, snowmelt and the rupture of glacial lakes are significant contributors to flooding, as indicated by KI reports. The integration of HSM data with estimates of populations living in Flood Risk Zones identifies only the most prominently reported drivers by KIs, serving as an indicative analysis of the areas potentially most affected by specific flooding causes. This approach underscores the complexity of flood risks across different regions of Afghanistan, highlighting the need for tailored response strategies.

% of population living in Flood Risk Zones, as per main driver type reported by KIs

50% Excessive rainfall

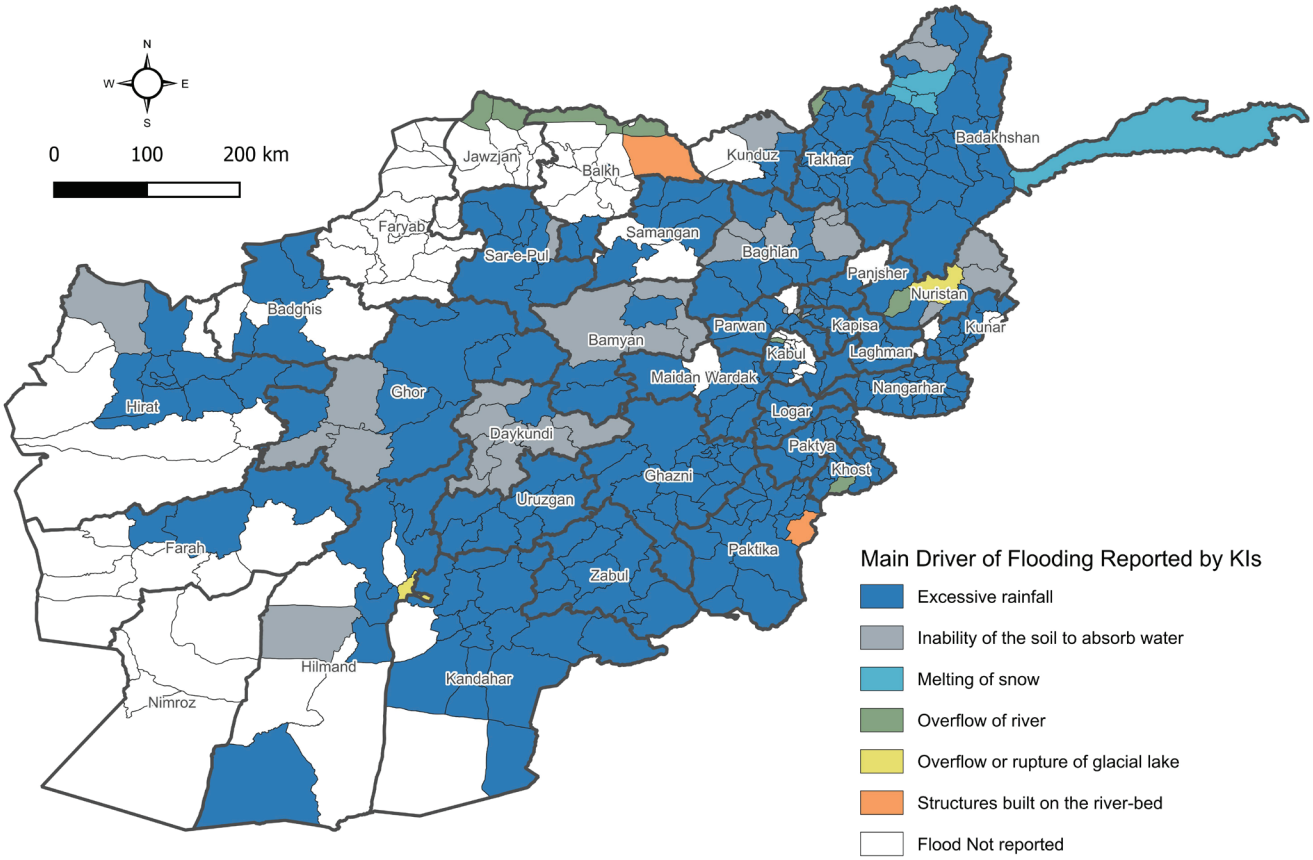
14% Inability of soil to absorb water

7% Structure built on river body

4% Overflow of river

4% Melting snow

1% Overflow or rupture of glacier

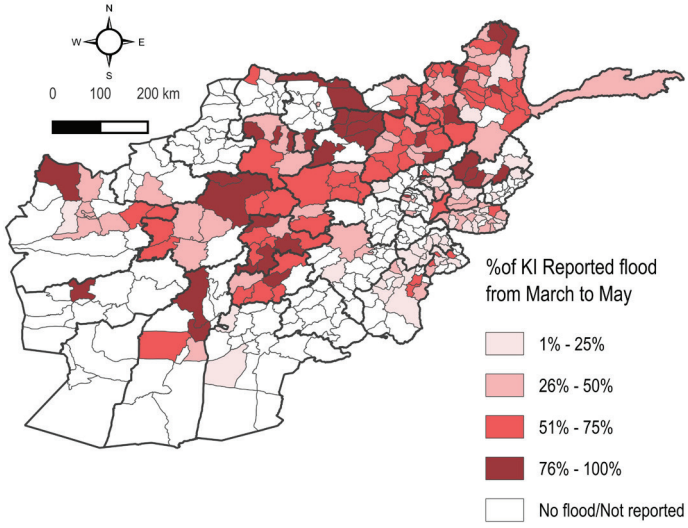


Flood Timing Analysis

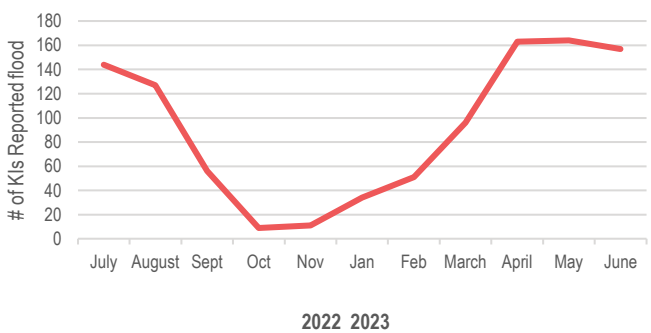
The temporal distribution of floods, as reported in the September 2023 HSM data, demonstrates significant seasonal variation, which is visually supported by the maps and graphs to the right. Flood occurrences were minimal during the initial and final months of the year, with a marked increase beginning in March, coinciding with the onset of spring. Flooding peaks in April 2023, with about 2000 Key Informants (KIs) reporting incidents in, and remains elevated through May before gradually decreasing in June.

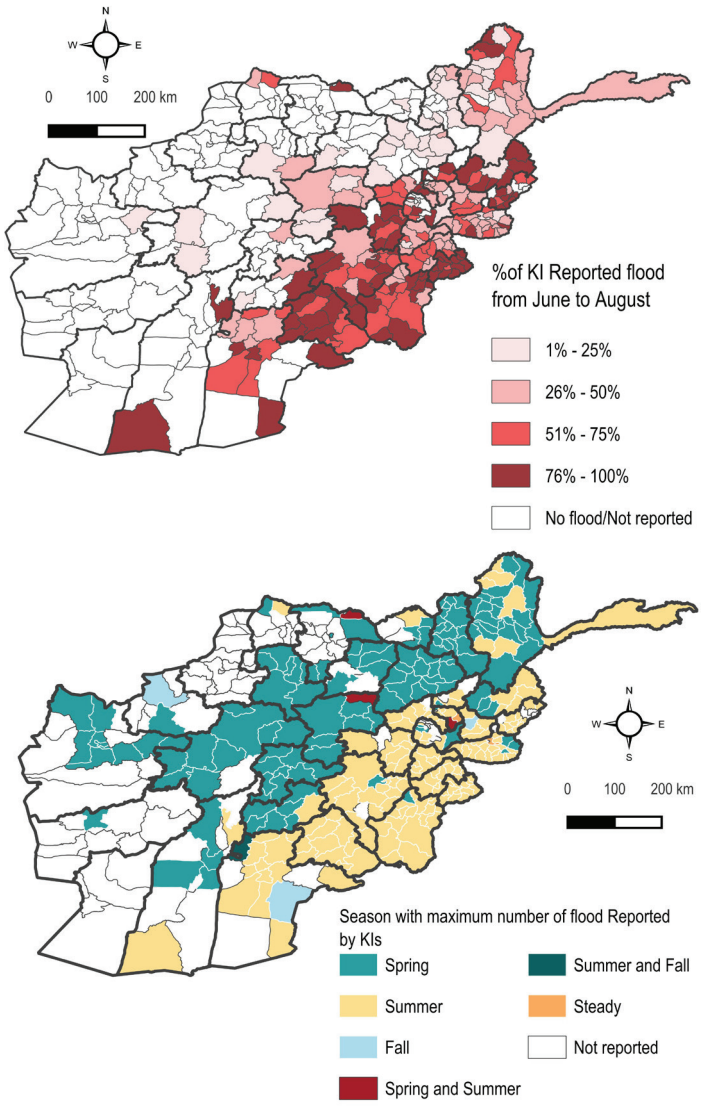
A secondary surge in flood reports is noted during July and August, reflecting a distinct phase of flooding primarily localized in the Capital and Southern regions of the country. This period contrasts with widespread but less frequent floods from April to June. The incidence of flooding then diminishes from September to November, though isolated reports continue. This pattern underscores a clear seasonality to flooding, carrying important implications for disaster preparedness and response strategies in Afghanistan.

The data, which excludes December, aligns with the climatic context of Afghanistan where winter precipitation predominantly falls as snow. The low temperatures during this time are understood to prevent melting,[9] thereby reducing the likelihood of floods. Knowledge about this annual cycle of flood risk and regionality is critical for informing targeted interventions and enhancing resilience in flood-prone areas.



Number of districts where a KI reported at least one flood occurence in the previous 12 months

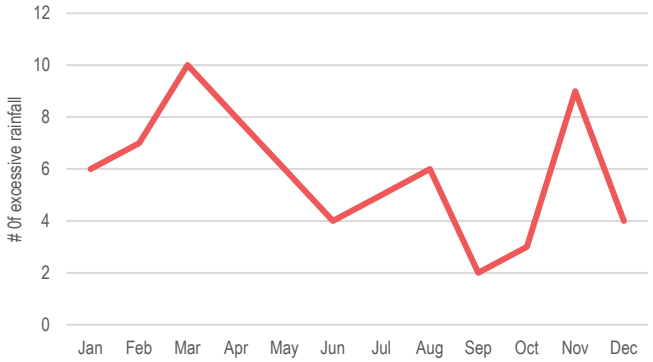




Based on the CHIRPS excessive rainfall data from last 10 years, it has been observed that during the months of March, April and June, there is a notable occurrence of excessive rainfall across the country. Which reported as main driver of flooding widely by KIs.

Distribution of excessive rainfall is not uniformly distributed during August. Instead, it tends to be concentrated in specific regions, particularly the Capital, Southern Southeastern regions.

Average days of CHIRPS excessive rainfall per month over the last 10 years



Note: In November 2022, the 10 years excessive rainfall showed high occurrence, but in the HSM data, only a few number of floods were reported. This may be due to exceptional climactic conditions in 2022 - in order to study this further, data from more years should be collected.

Flood Damage

KIs reported various types of damage due to flooding in their communities. Damage to cropland was the most frequently reported, with 81% of KIs reporting it. The other main damage types reported were damage to shelter at 10%, loss of livestock 3%, transportation infrustructure at 2%.

In order to have a picture of the population exposed to the various flood damage types reported by KIs, the population data living in flood hazard zones was integrated with KI-reported damage types in order to present a preliminary understanding of the percentage of the population living in different Flood Risk Zones.

The process involved combining the primary damage types reported by KIs within a specific district with the total population residing in the flood risk zones within that district. this process applied for all the districts. This was then expanded to encompass the entire country, with populations living in flood risk zones grouped according to the main damage types.The resulting calculation yielded the percentage of the population living in flood risk zones categorized by the types of damage reported by the KIs. This information is depicted in the figure below.

% of population living in Flood Risk Zones by main flood damage type as reported by KIs

25% Sanitation facility

19% Cropland

10% Shelter

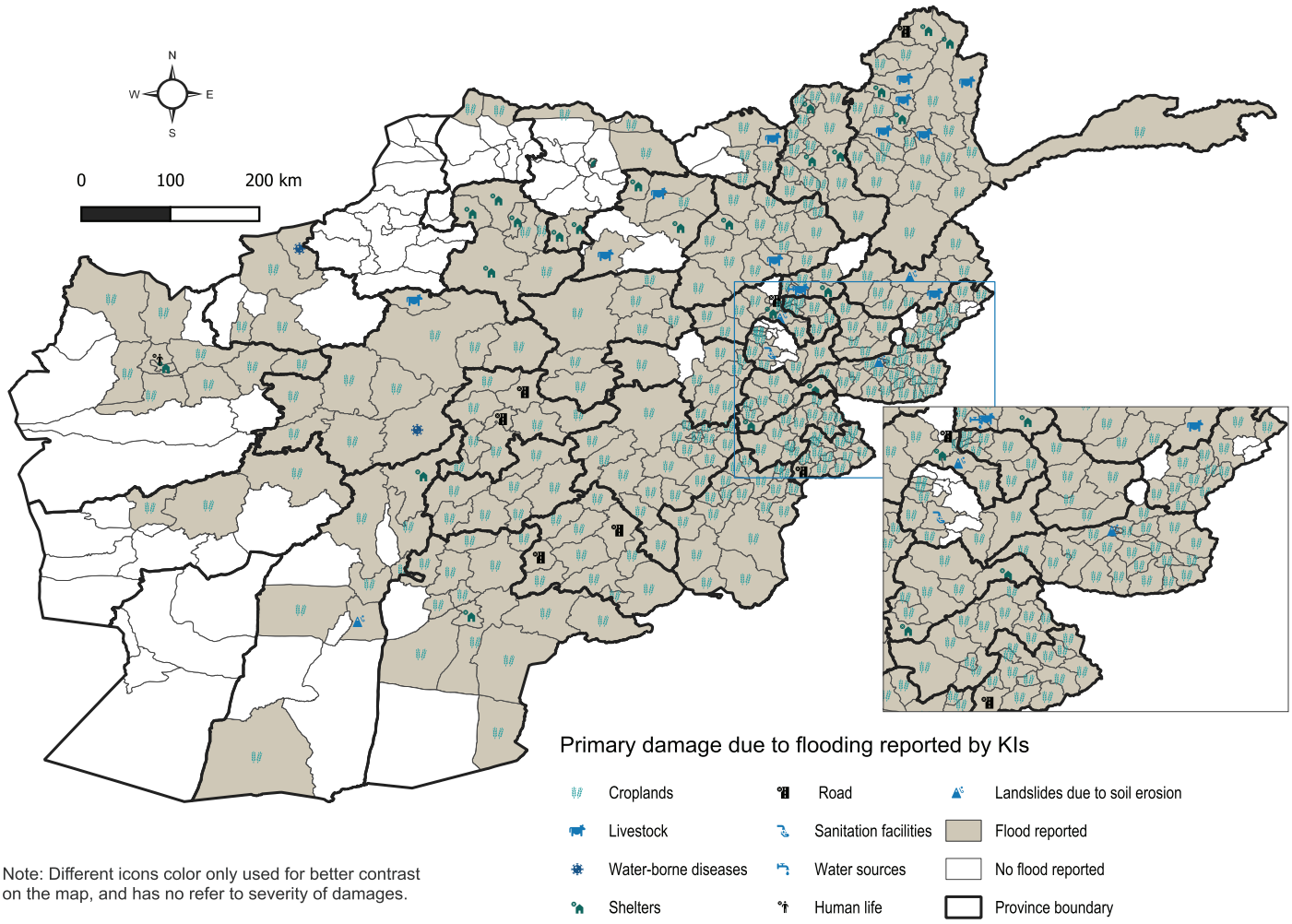
5% Livestock

5% Road or other transportation

3% Reduce access to basic services

4% Human

3% Landslide



Note: Different icons color only used for better contrast on the map, and has no refer to severity of damages.

Conclusion

Based on the analysis and findings from the datasets used in this brief, the following conclusions are drawn:

1. **Prevalence and Impact of Flooding**: In Afghanistan, flooding emerges prominently as a recurrent shock, significantly influenced by the region's topography and environmental attributes. Annually, such flooding variably impacts communities, with widespread damage to croplands being notably prevalent. This pattern underlines flooding as a critical factor exacerbating food insecurity, particularly in rural areas where agriculture and livestock are predominant livelihoods.

2. **Predictability and Timing of Flood Events**: Flooding events in Afghanistan exhibit a relatively predictable pattern, barring exceptional deviations in seasonal trends or extraordinary occurrences. Typically aligned with the peak rainfall season from March to June, floods are frequently triggered by excessive rainfall during the summer and autumn months, manifesting often as flash floods.

3. **Causative Factors of Flooding**: Excessive rainfall is identified as the primary catalyst for floods across most districts. Complementing this, the soil's limited absorption capacity further aggravates the situation, leading to more severe and frequent flooding incidents. The interaction between these two natural factors forms a critical nexus contributing to the widespread incidence of flooding.

Analytical Insights for Planning

1. The predictability of flood timings, especially from March to June, underscores the need for robust monitoring and early warning systems, such as the REACH Shocks Monitoring Index. This regularity provides a critical window for enhancing preparedness and optimising response mechanisms.

2. Given the recurrent interplay between excessive rainfall and inadequate soil absorption, there is a clear indication of the regions that are recurrently affected. Highlighting these areas can help focus monitoring efforts and inform more targeted emergency response and resilience-building strategies.

3. Infrastructural solutions such as check dams are noted in discussions concerning flood management.[10] It is important to understand that further research and sector-specific evaluations are necessary to explore their suitability and potential unintended consequences in the local context. Such infrastructural solutions should be considered carefully, involving expertise from technical and environmental specialists.

ENDNOTES

1 - OCHA, Afghanistan Humanitarian Needs Overview 2023 (HNO).
2 - OCHA, Humanitarian Needs and Response Plan 2024.
3 - NASA Earth Observatory, El Niño.
4 - REACH Afghanistan, Factsheet HSM R4 Factsheet – October 2023.
5 - NATO, NC3A Flood Model.
6 - IMMAP, Flood Exposure Map - District Level.
7 - REACH, Afghanistan Shocks Monitoring Index (SMI).
8 - CHIRPS, Afghanistan: Rainfall Indicators at Subnational Level.
9 - Waether Spark, Climate and Average Weather Year Round in Afghanistan
10 - c.f. Assessment of check dams' role in flood hazard mapping in a semi-arid environment; Optimal Design of Check Dams in Mountainous Watersheds for Flood Mitigation

ABOUT REACH

REACH Initiative facilitates the development of information tools and products that enhance the capacity of aid actors to make evidence-based decisions in emergency, recovery and development contexts. The methodologies used by REACH include primary data collection and in-depth analysis, and all activities are conducted through inter-agency aid coordination mechanisms. REACH is a joint initiative of IMPACT Initiatives, ACTED and the United Nations Institute for Training and Research - Operational Satellite Applications Programme (UNITAR-UNOSAT).