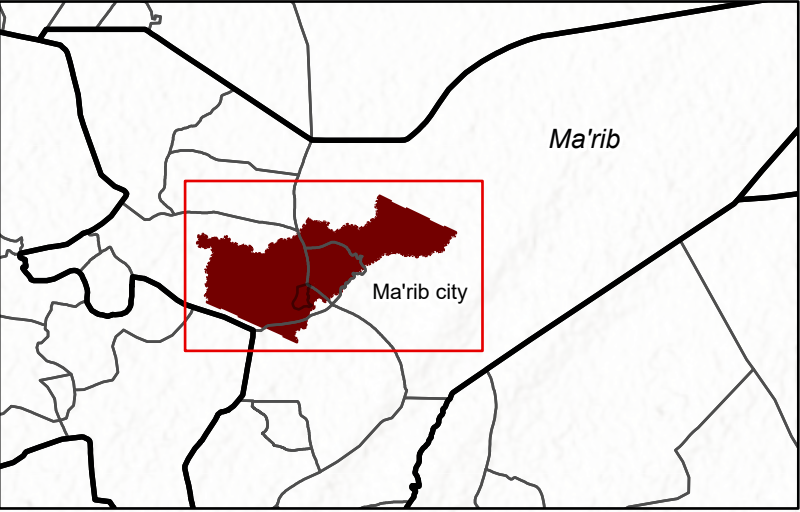
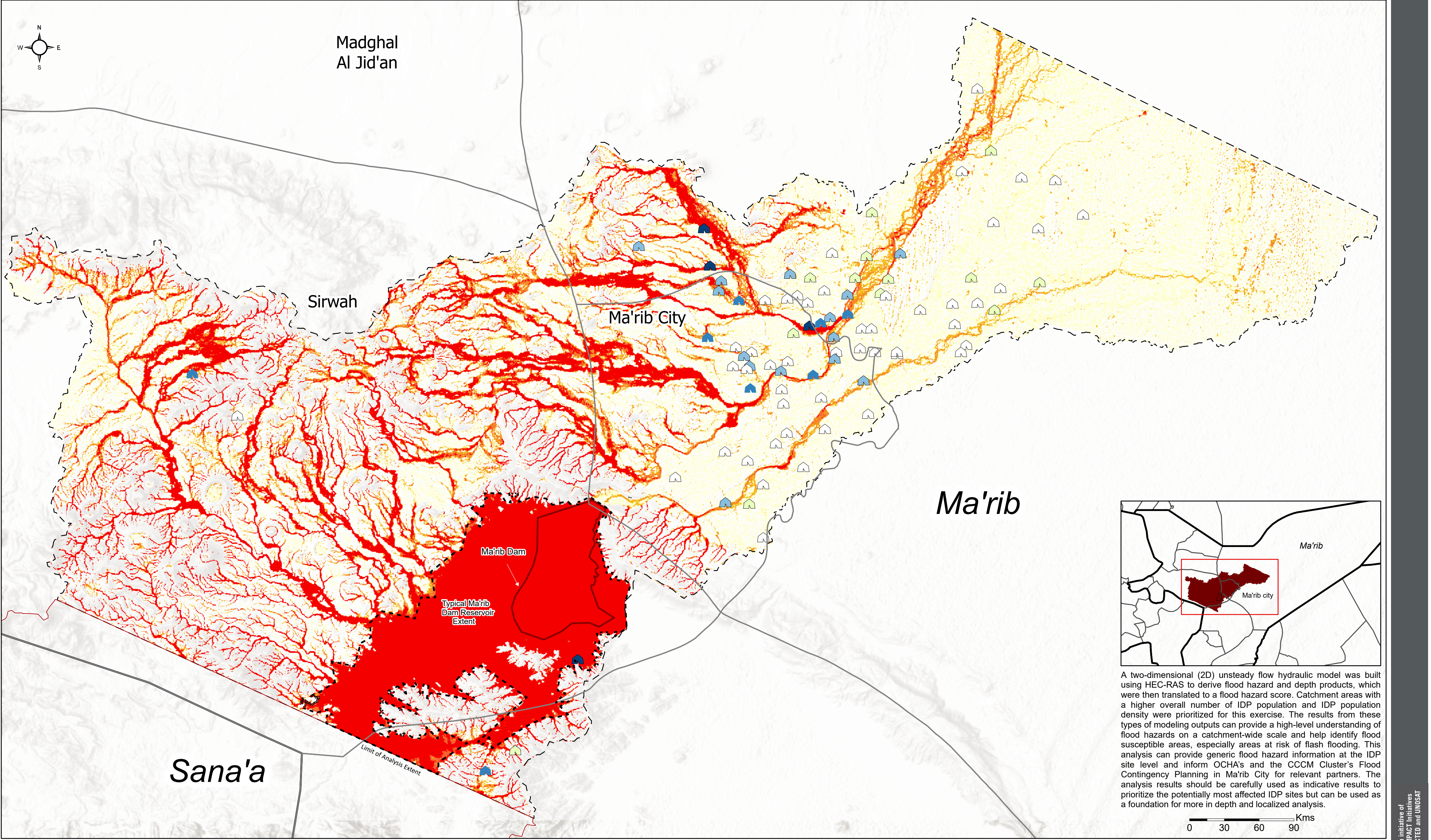


# Yemen - Rapid Flood Hazard Assessment - Flood Hazard Scores

## Ma'rib City IDP Sites - September 2022

For humanitarian purposes only  
Production date : 27 September 2022



A two-dimensional (2D) unsteady flow hydraulic model was built using HEC-RAS to derive flood hazard and depth products, which were then translated to a flood hazard score. Catchment areas with a higher overall number of IDP population and IDP population density were prioritized for this exercise. The results from these types of modeling outputs can provide a high-level understanding of flood hazards on a catchment-wide scale and help identify flood susceptible areas, especially areas at risk of flash flooding. This analysis can provide generic flood hazard information at the IDP site level and inform OCHA's and the CCCM Cluster's Flood Contingency Planning in Ma'rib City for relevant partners. The analysis results should be carefully used as indicative results to prioritize the potentially most affected IDP sites but can be used as a foundation for more in depth and localized analysis.

0 30 60 90 Kms

- Legend**
- Governorate
  - District
  - Basins
- Flood Hazard (m2/s)**
- 0 - 0.2 (Low - No hazard)
  - >0.2 - 0.5 (Medium)
  - >0.5 - 1.5 (High)
  - >1.5 - 2.5 (Very High)
  - >2.5 (Extreme)
- IDP Sites Flood Scores**
- Low hazard (52 sites)
  - Medium hazard (9 sites)
  - High hazard (14 sites)
  - Very High hazard (6 sites)
  - Extreme hazard (7 sites)

This map shows the estimated locations and Flood Hazard scores of internally displaced person (IDP) hosting sites in Ma'rib governorate. REACH aimed to develop Flood Hazard Scores for IDP Hosting sites by modeling flood hazard areas using HEC-RAS and HEC-HMS software. This map specifically shows the HEC-RAS flood depth product. A hazard score is attributed to an IDP site based on how much estimated site extents overlap with modelled flood hazard areas. Ma'rib is part of a large basin that captures vast amounts of water from precipitation events that occur upstream. The water flows north into the Ma'rib dam, and depending on the severity, through Ma'rib city. HEC-HMS was used to model the hydrologic flow from the downstream portion of the basin before the dam, while HEC-RAS model builds on this information to determine the extent where flooding is likely to occur upstream (displayed on the map). Both simulations consider 25-year return period extreme precipitation events.

Limitations: Some general limitations of the hydraulic model were identified, such as the lack of input datasets for HEC RAS 2D modelling, the lack of exact site extents and locations, or the usage of a 30-meter Digital Elevation Model (DEM) that potentially underestimate the depth and overestimate hazard extent. In addition, the hydraulic model results were not validated on the ground to confirm whether the extent of modelled events match actual flood events. IDP hosting sites presented in this map are from July, and the number and location of sites per Flood Hazard/Depth score may change over time. Site without GPS coordinates were excluded from this analysis. Ma'rib dam and its influence on modelling the flow of water across the landscape was difficult to determine without knowing key details about the dam. Two HEC-RAS scenarios were produced, differing on how much water was present in the dam before the extreme precipitation event in the simulation. The scenario used for this map does not include Ma'rib dam overtopping, which according to consulting experts is very unlikely.

**Data sources:**  
IDP Sites: July CCCM Master List and CCCM Site Report List  
Flood Data: UNOSAT HEC-RAS and HEC-HMS Models  
Admin Boundaries: OCHA  
Background: ESRI, NGA, USGS, CGIAR

**Coordinate System:** GCS WGS 1984  
File: REACH\_YEM\_Map\_Ma'rib\_CCCM\_Flood\_Depth\_IDPSites\_27Sep2022\_A2\_V1  
Contact: reach.mapping@impact-initiatives.org

Note: Data, designations and boundaries contained on this map are not warranted to be error-free and do not imply acceptance by the REACH partners, associated, donors mentioned on this map.

