

Bursting at the Seams: The Potential Impact of a Mosul Dam Collapse

Overview

Humanitarian experts believe that the Mosul Dam in Northern Iraq is likely to collapse if significant effort is not made to improve the failing infrastructure. A collapse would unleash 11 billion cubic feet of water over the surrounding area, creating a devastating humanitarian crisis. The current conflict in the region has the potential to seriously complicate the humanitarian response if aid agencies are unable to access affected populations in ISIL (Daesh) controlled areas. This analysis provides a framework for understanding the potential impacts and subsequent humanitarian challenges associated with the likely collapse of the Mosul Dam.



Mosul Dam - <https://commons.wikimedia.org>

Research Questions

Flood disasters are among the most devastating humanitarian crises. Although those living in the potential flood areas can take some steps to prepare, the collapse of the Mosul Dam would produce waves of water inundation with such force that those living in the highest risk areas are unlikely to have adequate time to respond. Those who did survive would be at increased risk for disease, would face food and water shortages, and would likely be left without shelter and other basic needs. Determining the expected inundation zone and the anticipated degree of flooding within this area will enable humanitarian agencies to prepare a coordinated, targeted response in advance. Understanding impact according to district will further enable humanitarian agencies to coordinate with local governments in advance of the anticipated impact. Finally, the ability to determine the regions where ISIL (Daesh) remains in control will inform potential access and security challenges that humanitarian agencies are likely to face.

The Mosul Dam is located in Northern Iraq along the Tigris River approximately 45 miles north of Mosul city. The dam has been in service since July 1986 and provides hydroelectric power to Mosul city and the surrounding areas.

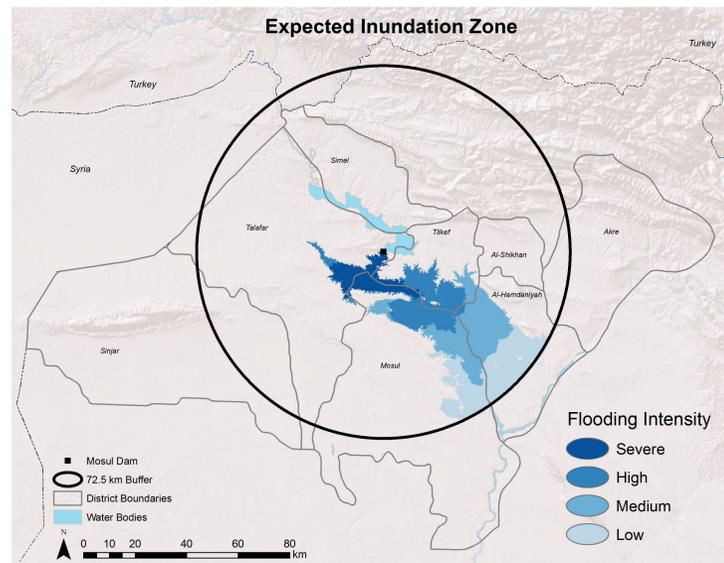


Methodology

This analysis began with a thorough desk review in preparation for data gathering and synthesis. Based on the literature, a likely inundation radius of 72.5 kilometers from the Mosul Dam was determined. Using a maximum elevation of 315 meters, the expected inundation zone was created using Least-Cost Path modeling. This method enables mapping a path from a source point to determine the potential extent of flooding in a given region with respect to topography. In order to utilize the cost raster tool to define the inundation area, slope and elevation were analyzed by creating a slope raster and extracting by mask the likely affected regions. The final cost distance raster was then extracted by attribute to conform to the 72.5 kilometer impact area anticipated by experts. Intensity of flooding was determined using Jenks breaks in the resulting data. With this primary analysis complete, the likely affected population was investigated. The current conflict across the region has resulted in a lack of recent and reliable census data, therefore, Landscan data was used to determine the likely affected population. Unfortunately, Landscan does not provide any demographic details therefore sex and age disaggregated data was not available for analysis. In order to understand the potential security and access issues associated with the conflict, information about ISIL (Daesh) controlled areas was generated from Liveuamap.com. The data was then synthesized to determine the severity of impact within the likely inundation zone and to identify the areas most likely to present access challenges for humanitarian aid agencies. Finally, summary statistics and charts were generated to complement the graphic data.

Results

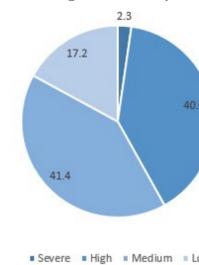
A collapse of the Mosul Dam would have disastrous consequences for the people of Iraq. This analysis suggests that 272,166 people would be directly impacted by flooding. Among those affected, 134,447 people reside in ISIL controlled regions. Humanitarian access to this portion of the population is likely to be significantly restricted making an adequate response very difficult. The remaining 137,719 people reside in Kurdish controlled regions, which are expected to be readily accessible to humanitarian agencies.



Total at Risk Population by Flood Severity

| Risk Category | Population |
|-------------------------|----------------|
| Severe | 6,635 |
| High | 106,039 |
| Medium | 112,815 |
| Low | 46,677 |
| TOTAL POPULATION | 272,166 |

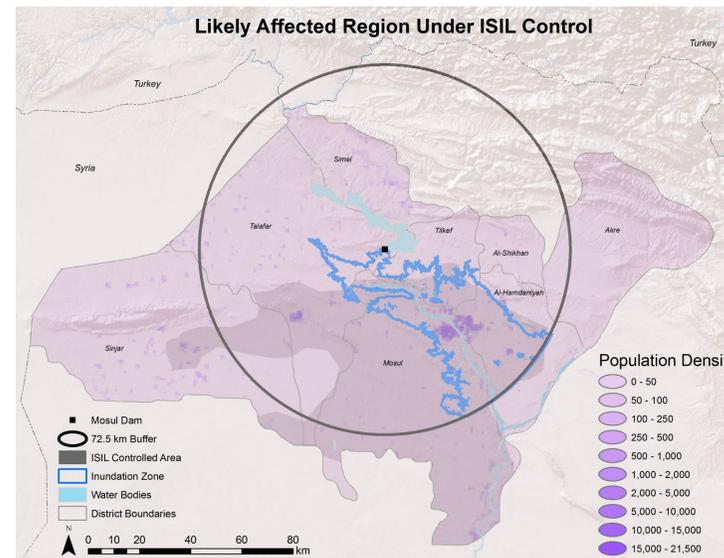
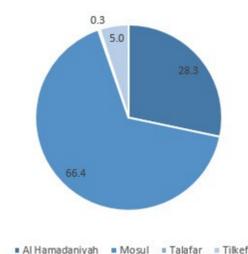
% of Total Population by Flood Severity



Total at Risk Population Under ISIL Control

| District | Population |
|-------------------------|----------------|
| Al Hamadaniyah | 38,098 |
| Mosul | 89,290 |
| Talafar | 449 |
| Tilkef | 6,610 |
| TOTAL POPULATION | 134,447 |

% of Population Under ISIL Control by District



Limitations

The primary limitations associated with this project include data availability, reliability, and production date. Although structural information about the Mosul Dam is readily available, data required to thoroughly investigate the potential impacts of a collapse of the dam are more difficult to find. Conflict in the region has resulted in somewhat unreliable population data driving reliance on Landscan for basic data resulting in lack of ability to understand the specific gender and age demographics of the likely affected population. Moreover, conflict data that accurately depicts current ISIL (Daesh) strongholds is also difficult to obtain given the changing nature of the conflict. Despite these limitation, this analysis has successfully provided insight into many of the important aspects of a potential humanitarian disaster should the dam collapse.

Conclusion

A collapse of the Mosul Dam is likely to lead to a significant loss of life and destruction of property and livelihoods for those who survive. The infrastructure in Mosul city and the surrounding rural areas is not sufficient to sustain the expected rapid inundation following a collapse. The ongoing conflict in the region would make an adequate humanitarian response extremely difficult. The international community must work with the Government of Iraq and the regional local governments to fortify the strength and stability of the dam and to ensure emergency preparedness among the population. The fragility of the dam and the likely destruction caused by a collapse is cause for immediate international attention.



Rural Village Outside Mosul City - <https://commons.wikimedia.org>



TUFTS UNIVERSITY

Cartographer: Cate Klepacki

Date: May 6, 2016

Class: DHP P207 Geographic Information Systems (GIS)

Sources: ESRI, GADM, ASTER Global DEM, Oakridge National Laboratory, DIVA-GIS, OpenStreetMap, Liveuamap, Tufts M: Drive, ArcGIS Online

Projection: WGS 1984 UTM Zone 38N