Report - Uzbekistan's Sardoba Dam Failure

Summary

On May 1, 2020, the Sardoba reservoir in Uzbekistan, which held 922 million cubic meters of water, partially collapsed, releasing 500 million cubic meters. This caused flooding in neighboring regions with villages north of the dam (Simonov, 2020). In response to the emergency, maps are urgently needed to assess the impact and damage caused by the flood in the Syrdarya region of Uzbekistan.

Intro

The Sardoba Reservoir was completed in 2017 after seven years of work. The Sardoba reservoir, located a few kilometers from the main flow path of the Syr Darya river, was intended to function as a source for irrigating cotton and other agricultural products in the region. The dam sustained a 922 million cubic meter capacity; However, the dam failure was caused by a gap formation in the 29-meter-high wall of the reservoir (Hydroreviewcontentdirectors, 2020). Thirty-five thousand hectares of land in Uzbekistan and Kazakhstan were affected. One hundred eleven thousand people were evacuated from the area, six people died as a result of the flood (Simonov, 2020).

A detailed map that will indicate the state of the Sardoba reservoir before the dam broke, the flood path area (where the water potentially moved to Kazakhstan), and the pooled area needs to be created to analyze the situation and the damage done.

Methodology

The DIVA provides two satellite images of the area on April 22, 2020, and May 1, 2020, for further analysis. April 22, 2020, the raster image is already georeferenced for the geographical area of study, but the May raster image is not. The first step in the analysis is to georeference the May 1, 2020 raster image by adding the control points and comparing the May and April raster images. A minimum of 5 control points must be added to georeference the raster image to the study area correctly.

The second step of the analysis is to create a polygon feature for the Flooded area, the Flood pathway, and the Sardoba Reservoir. Sardoba Reservoir is digitized and traced based on the original shape in the April raster image before the flood. Flood areas of interest are traced and digitized based on the May raster image. After all features of interest are traced, the area for each needs to be calculated in square kilometers.

The last step is identifying the villages affected by the dam wall breach. Villages that are both in the flooded pathway and flooded area are going to be considered as impacted. In order to achieve this task, the Syrdarya region data provided by DIVA needs to be filtered by geospatial location. All village data points that are contained within flood or flood pathway polygons will be selected.

After all necessary elements have been found and analyzed, the proper title, legend, and other map elements will be added for a clear understanding of the audience.

Results

Looking at the map, the white highlighted area represents the Sardoba Reservoir before the wall breach and equals approximately ~56 square kilometers. Purple and blue hatched areas represent the Flood pathway and the pooled area. The floodpath area is around 342 square kilometers, and the inundated area is 191 square kilometers.

Significant places affected are represented by red tear symbols on the map. Four villages and one lake area were affected by the Sardoba dam failure. Flooded villages are: Almachi, Katta-Chuybek, Murza-Rabat, and Imeni-Volkova. The lake area is: Ozero Sardobinskoye. The map also shows the roads and Field irrigation points in the study area, represented by yellow and orange colors. The analysis was based on the satellite images provided by DIVA; the actual area of impact might deviate slightly from what is shown on the map, depending on the measurements used.

Citations

hydroreviewcontentdirectors (2020, May 4). *Sardoba Dam bursts in Uzbekistan*. Hydro Review. Retrieved September 29, 2024, from https://www.hydroreview.com/dams-and-civil-structures/dam-safety/sardoba-dam-bursts-in-uzbekistan/

Simonov, E. (2020, June 23). *Uzbekistan dam collapse was a disaster waiting to happen*. Dialogue Earth. Retrieved September 29, 2024, from https://dialogue.earth/en/water/uzbekistan-dam-collapse/

Appendix

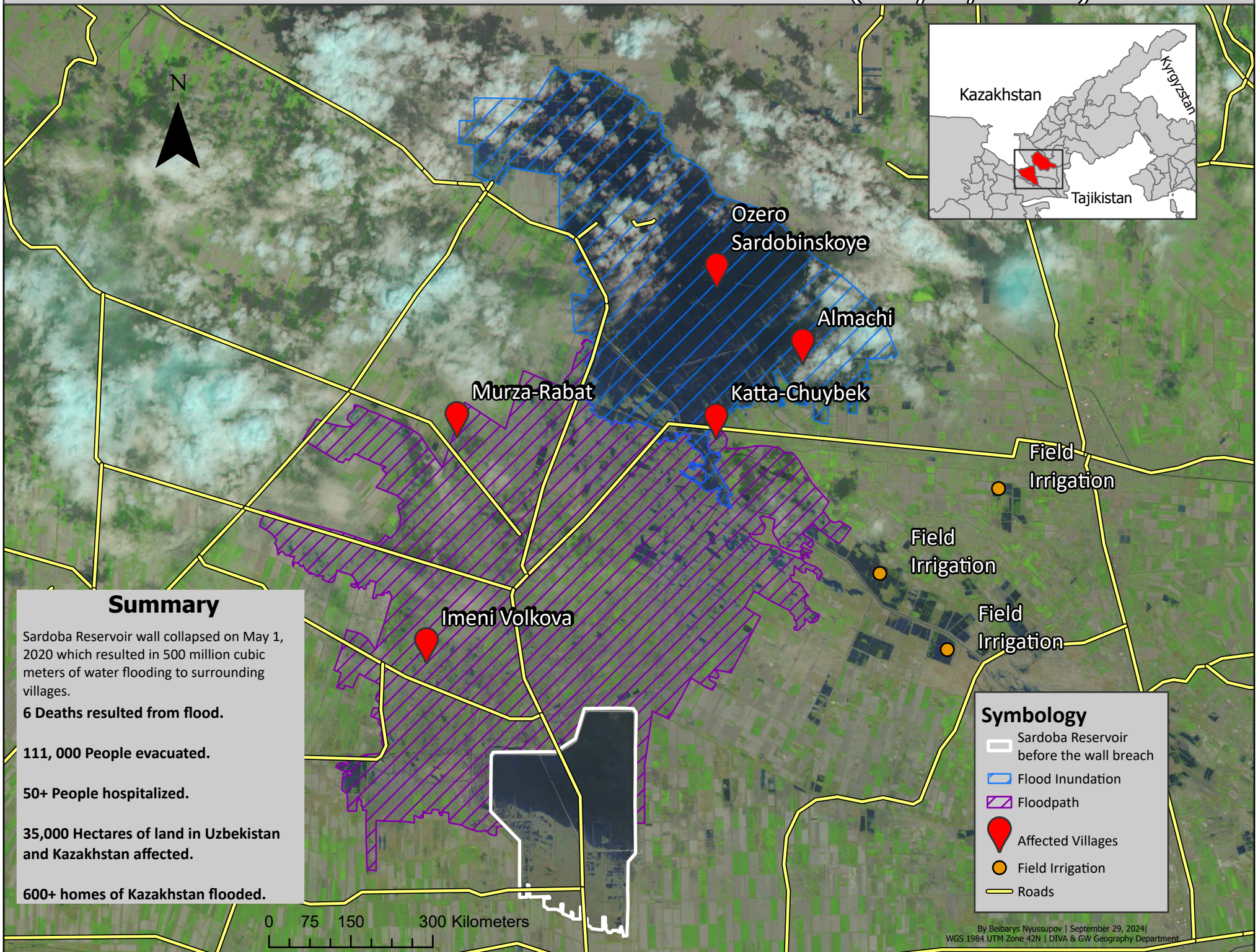
The white bright color for Sardoba Reservoir was chosen due to two specific reasons: 1) The White color is initiated with a starting point. It represents the Sardoba reservoir shape before the wall breach. 2) It shows the audience the place where the breach happened without the overlap with other features' colors.

Hatched fill was used for flooded areas, and the flood path to represent affected areas. Blue hatched fill was applied to the flooded area polygon, as blue is often interpreted as a water source, and it will be easy for the audience to understand that the blue polygon represents a pooled area. Purple hatched fill was used on the flood path to show the direction of the flood, distinguishing it from already flooded areas. This differentiation helps the audience quickly interpret the map by separating areas inundated from those affected by the flood's movement.

A red tear symbol was used to mark affected villages. The choice of red is often associated with distress. The chosen red color emphasizes the danger and urgency, attracting the attention of the audience and ensuring that the audience viewing the map can easily identify the location of villages most affected by the Sardoba Dam failure. Field Irrigation points were marked in orange to differentiate them from other map features while also having good visibility, as orange stands out well against natural landscape colors. As roads intersect and overlap with most elements on the map, this feature was highlighted in bright yellow to ensure that all road paths are easily distinguishable from other features, such as flooded areas or flood pathway polygons. Observing locations of roads could help indicate potential points of access where help might be given to victims during and after the reservoir incident.

A raster background of the May satellite image with the flooded area was chosen instead of creating an artificial background for the map to ensure a realistic and context-based visualization. By plotting all map elements on the raster image, the audience can observe real shapes of the flooded region, the flood pathway, and the Sardoba reservoir, which should bring better understanding, transparency, and interpretability of the event portrayed by the map.

Sardoba Reservoir Flood in Uzbekistan (May 1, 2020)



Summary

Sardoba Reservoir wall collapsed on May 1, 2020 which resulted in 500 million cubic meters of water flooding to surrounding villages.

6 Deaths resulted from flood.

111, 000 People evacuated.

50+ People hospitalized.

35,000 Hectares of land in Uzbekistan and Kazakhstan affected.

600+ homes of Kazakhstan flooded.

Symbology

- Sardoba Reservoir before the wall breach
- Flood Inundation
- Floodpath
- Affected Villages
- Field Irrigation
- Roads

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