

Why is Jowhar Constantly Flooding?

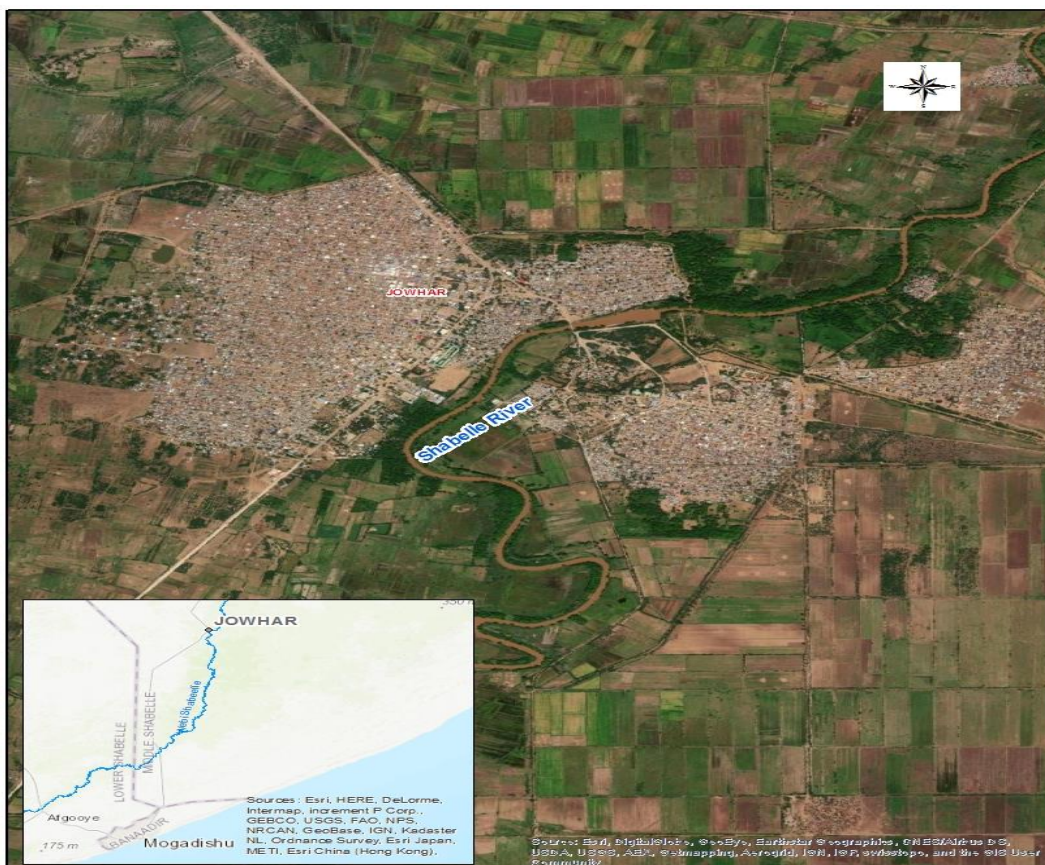


Figure 1: Jowhar Location Map

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Frequent flooding has been the norm in southern Somalia during the Gu and Deyr rainy seasons. Many factors attribute to the increase in flooding. Communities that live along the river banks of the Juba and Shabelle rivers experience the brunt of these floods. The riverine communities experience hardships in terms of displacement, loss of crop fields, and loss of life stock. Jowhar located 90 km northeast of the capital Mogadishu has been one of the cities impacted the most by these challenges.

How is Jowhar Different?

The city of Jowhar presents unique challenges due to its topography and development near the river. The city is flat with a general slope of less than 0.5% and the river splits the development along both sides of the banks. The second challenge is that the river is higher than the adjacent lands. Once the flood flows escape the river banks, all the adjacent land on both sides of the river banks are inundated. The figure below from FAO SWALIM illustrates how the river is higher than the adjacent lands. FAO SWALIM cut several cross sections along the river using detailed topographic mapping. Note the river banks are the highest point on the profile (distance on the x-axis, elevation on the y-axis).

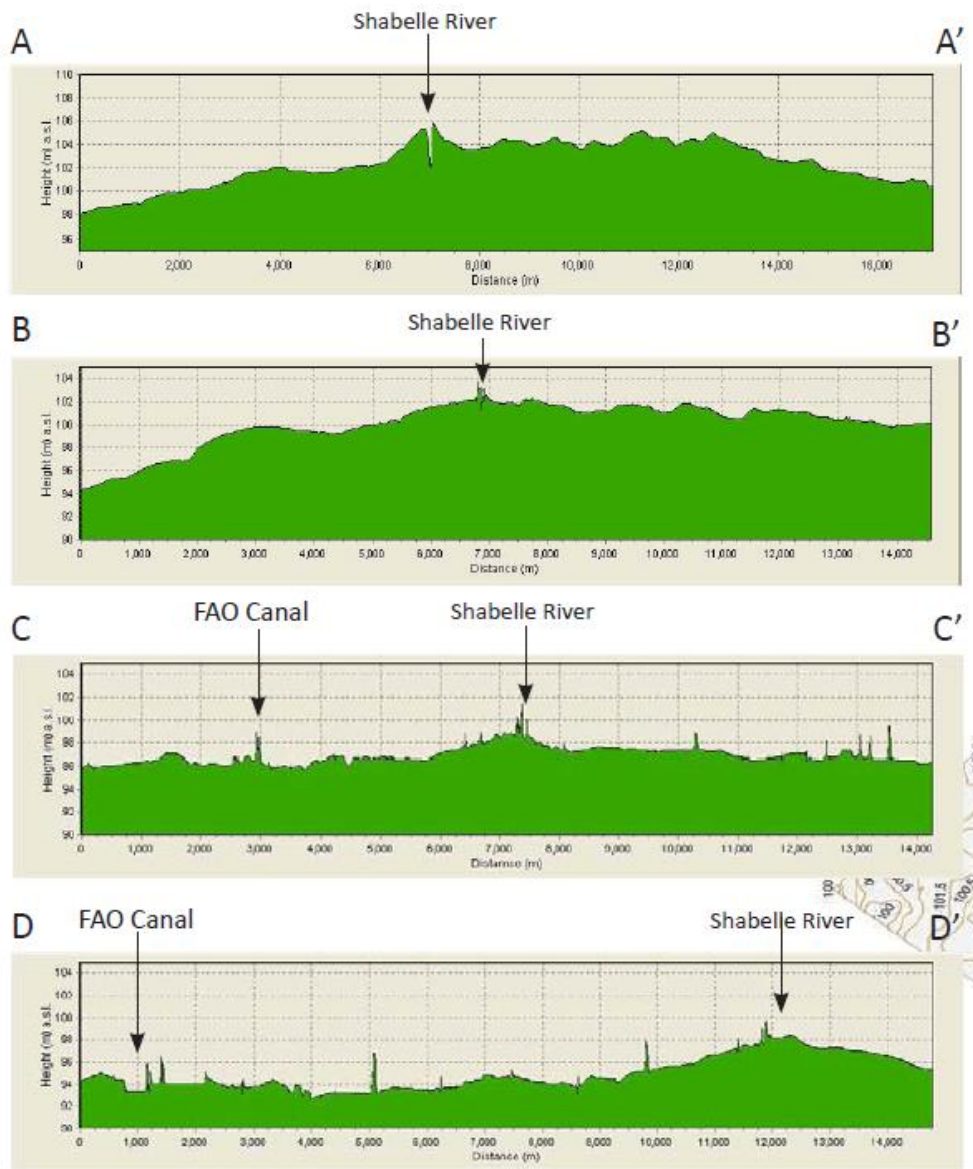


Figure 2: River Cross Section Near Jowhar (Source: FAO SWALIM)

Historical Context

Jowhar has one of the most robust irrigation and drainage infrastructure in Somalia dating back to the colonial era. The town was founded by an Italian duke during the colonial era who recognized the potential agricultural output of the land. Formally known as the Villagio Duca degli Abruzzi, Jowhar included numerous canals and overflow drainage structures to irrigate the plantations and protect the crops during flood events. The town also included trains and a roadway network to transport the agricultural output. Figure 3 illustrates the irrigation and drainage network during the colonial era.

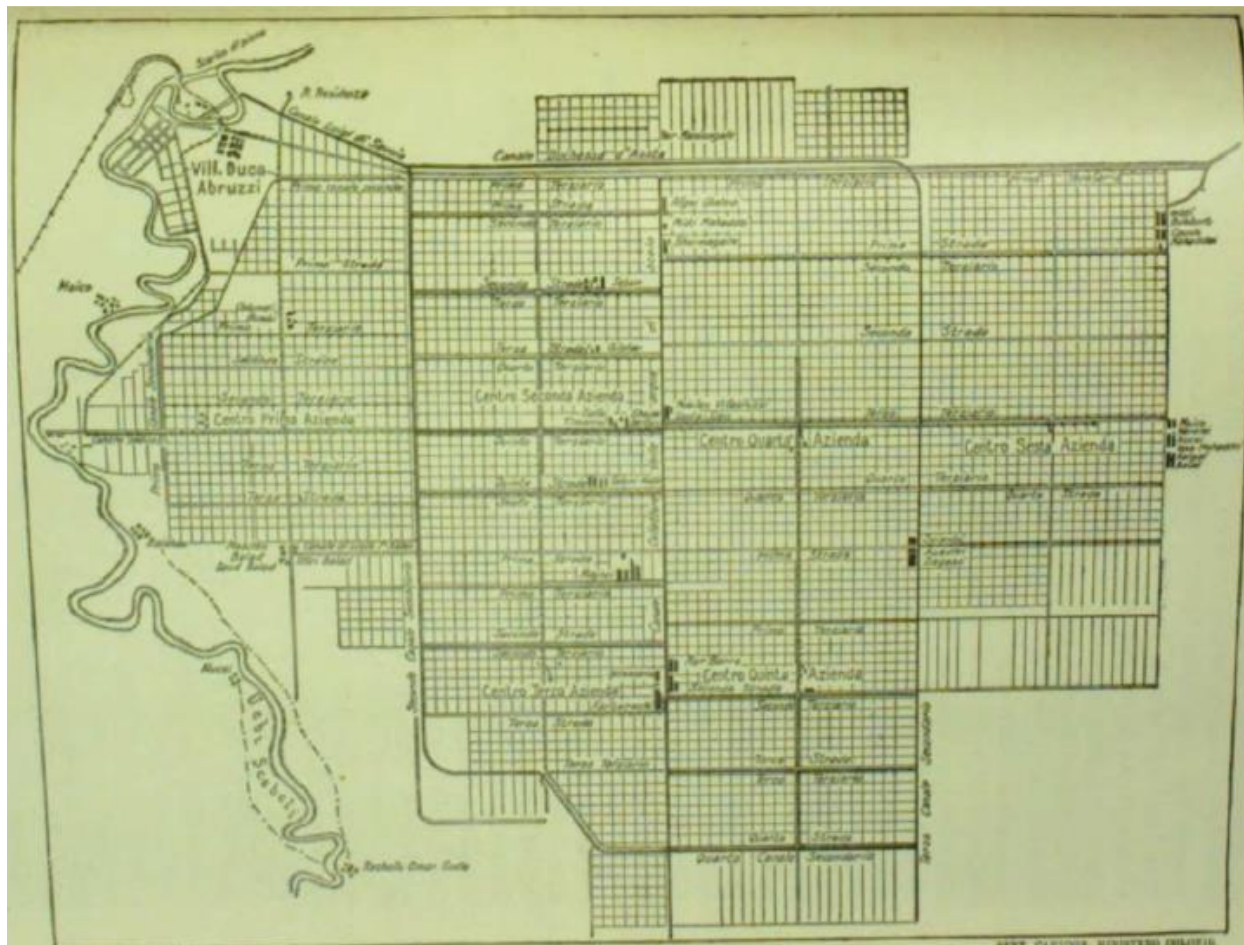


Figure 3: Villagio Duca degli Abruzzi (Source: Tesi Alessandro Mura Thesis)

In the 1970s and 1980, the central government in Somalia rehabbed some of the canals and constructed multiple barrages and reservoirs to alleviate the flood risk. One example is the Duduble flood control channel built by the Chinese government. This channel was intended to divert the excess river flows during flood stages. The UNDP and WFP rehabbed this channel in 2005. Numerous other canals were rehabbed by various NGOs in the last 10 years.



Figure 4: Layout of Jowhar with the Main Irrigation Canals

The canals shown in Figure 4 are the main canals that extract irrigation water directly from the river and feed other minor canals. Luigi canal extracts water from the river upstream of the weir control structure. The canals were constructed in a grid system with gates and flow regulating structures to route flow efficiently to the appropriate locations. Since the collapse of the central government in the 1990s, little to no maintenance occurred on many of these irrigation structures. Sedimentation is also an issue in both the river and irrigation canals which resulted in an increase in water surface elevation.

Flooding in the Past Couple of Months

Flooding has inundated thousands of hectares in the past month due to the river flow overtopping the banks and breaking out in few locations. The river channel and floodplain are encroached on by developments and farmers wanting to create their own canals. This disregard to the integrity of the river channel has catastrophic consequences. Throughout the years, multiple breakages have been reported by aid agencies to warn the residents during the rainy season.

The figures below using remote sensing techniques illustrate water accumulation in the villages north of Jowhar from March, 25th 2021 to June 3rd, 2021. The images were obtained from optical sensors therefore clouds could not be filtered out. False-color composite is used to illustrate the areas

inundated with water. Dark blue and black areas showcase areas that are inundated with flood waters. Figure 9 shows a closeup of one of the breakages south of the FAO canal (same area is shown on the upper left in Figures 7 and 8).

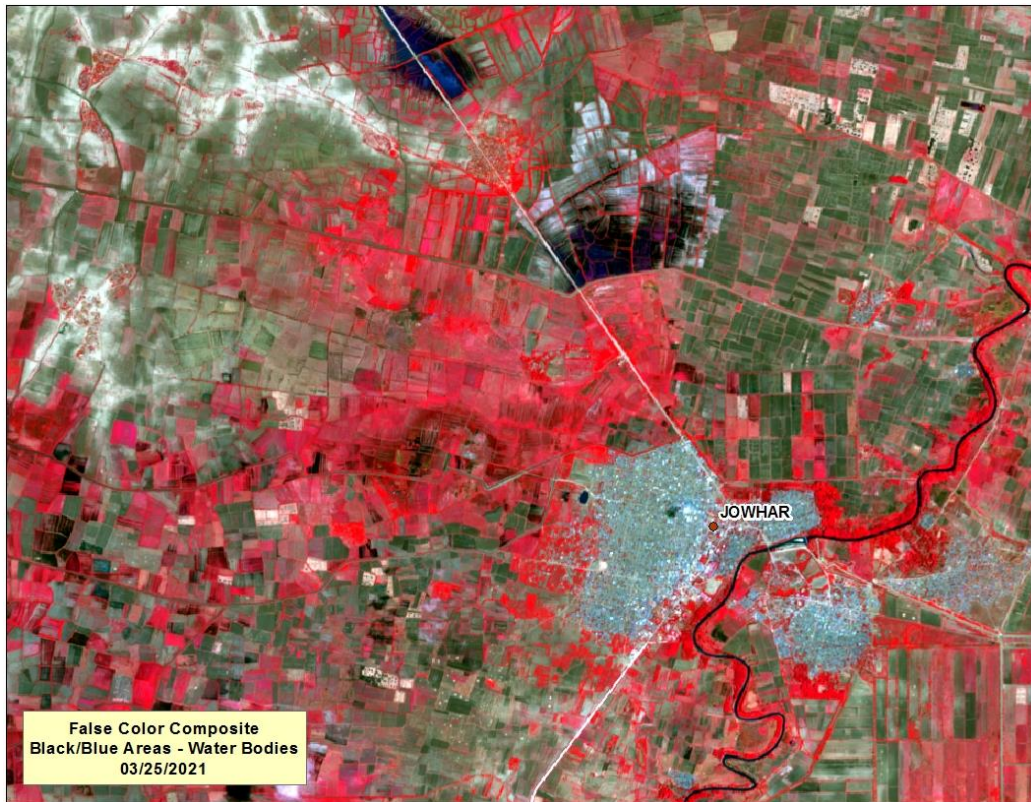


Figure 5: Jowhar in 3/25/2021

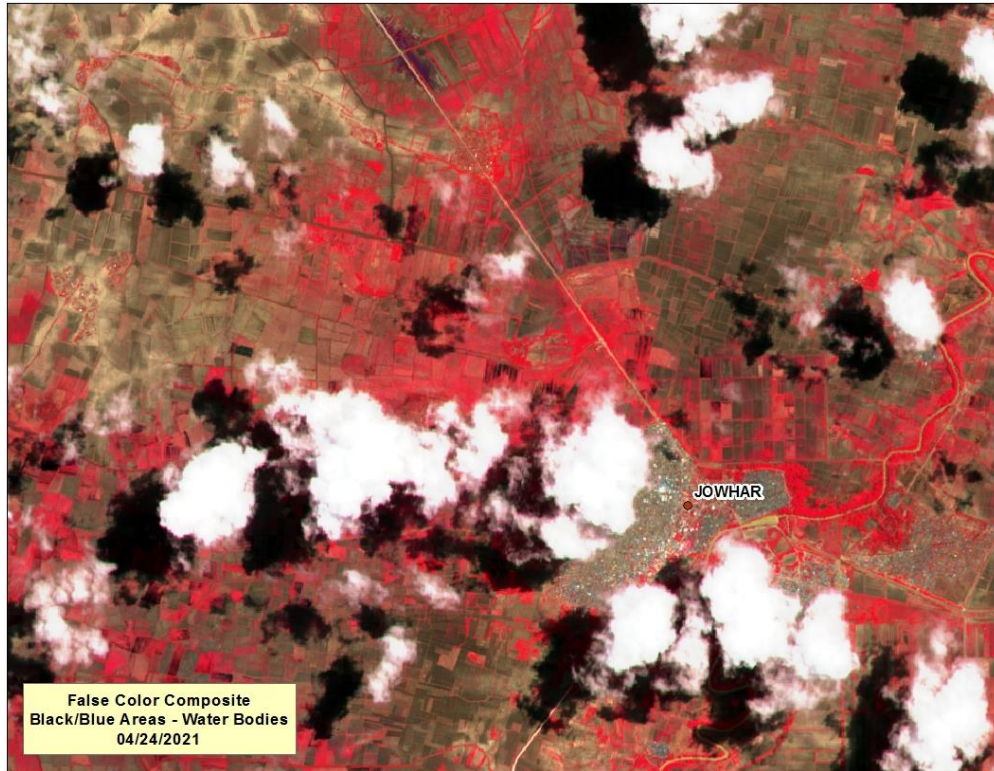


Figure 6: Jowhar in 4/24/2021

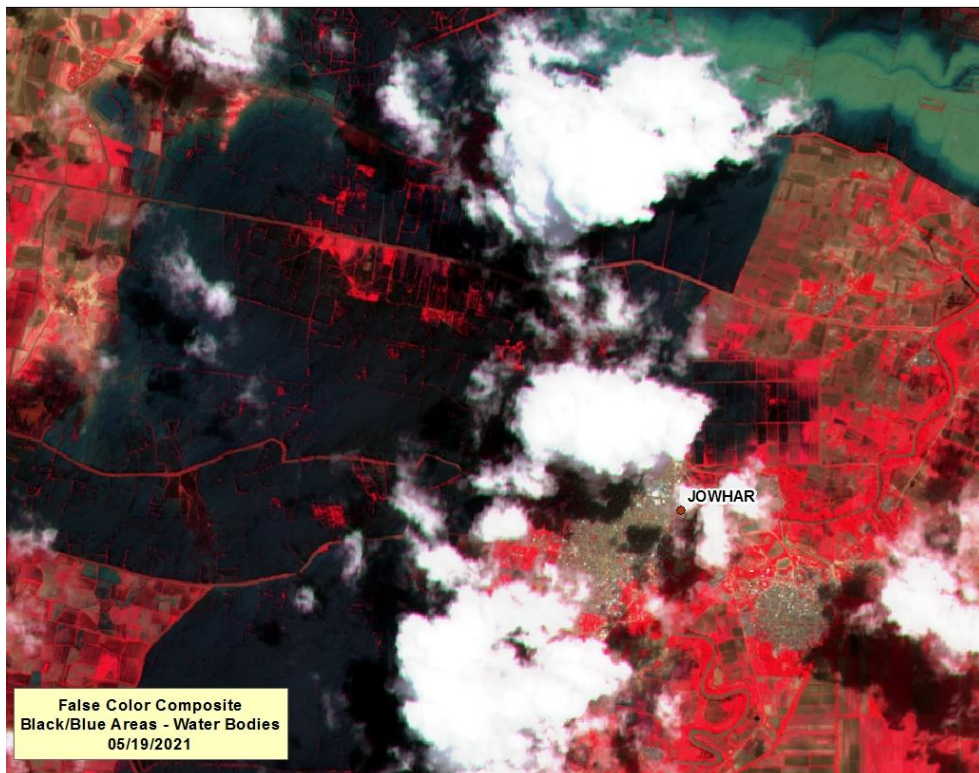


Figure 7: Jowhar in 5/19/2021

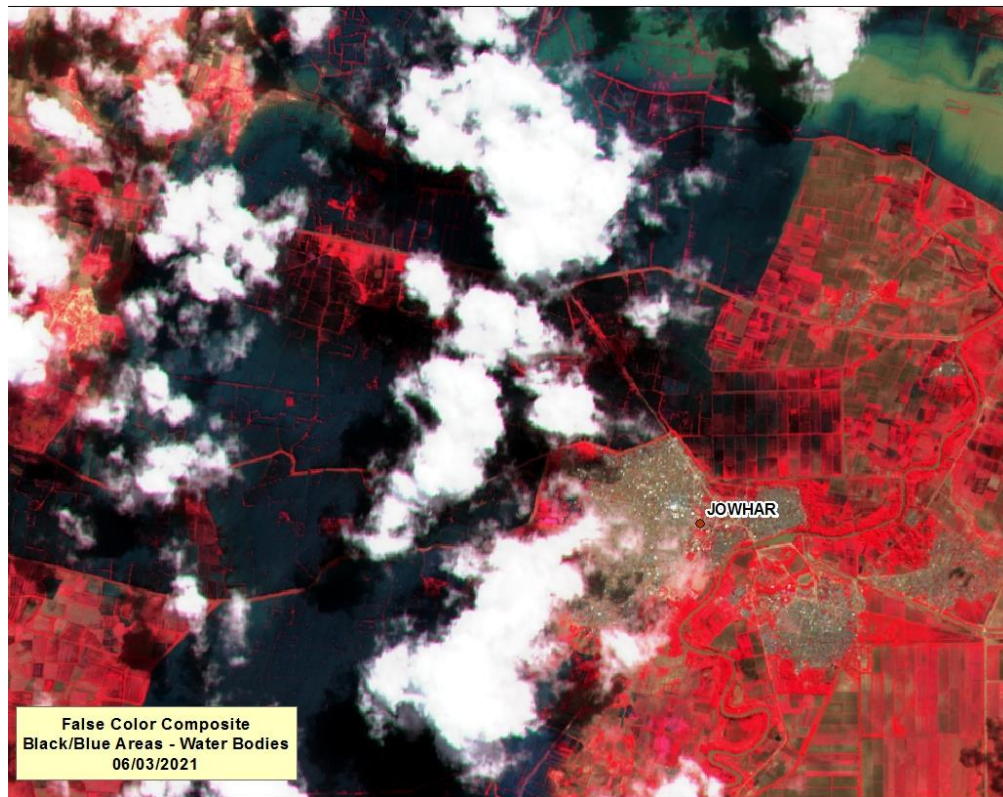


Figure 8: Jowhar in 6/03/2021

The towns of Barey and Bullo Geesaale north of Jowhar have been completely inundated based on satellite imagery. An investigation needs to be completed to determine the main cause of flooding at this location and whether the channel capacity was exceeded or there is a breakage in the river bank. Once floodwaters escape the channel, the adjacent land is inundated and the flow moves south to inundate other farms near Jowhar. The canals running east-west act as a dam and trap much of the flow causing higher flow depths and potential loss of crops.



Figure 9: Vicinity Map of the towns of Barey and Bullo Geesaale

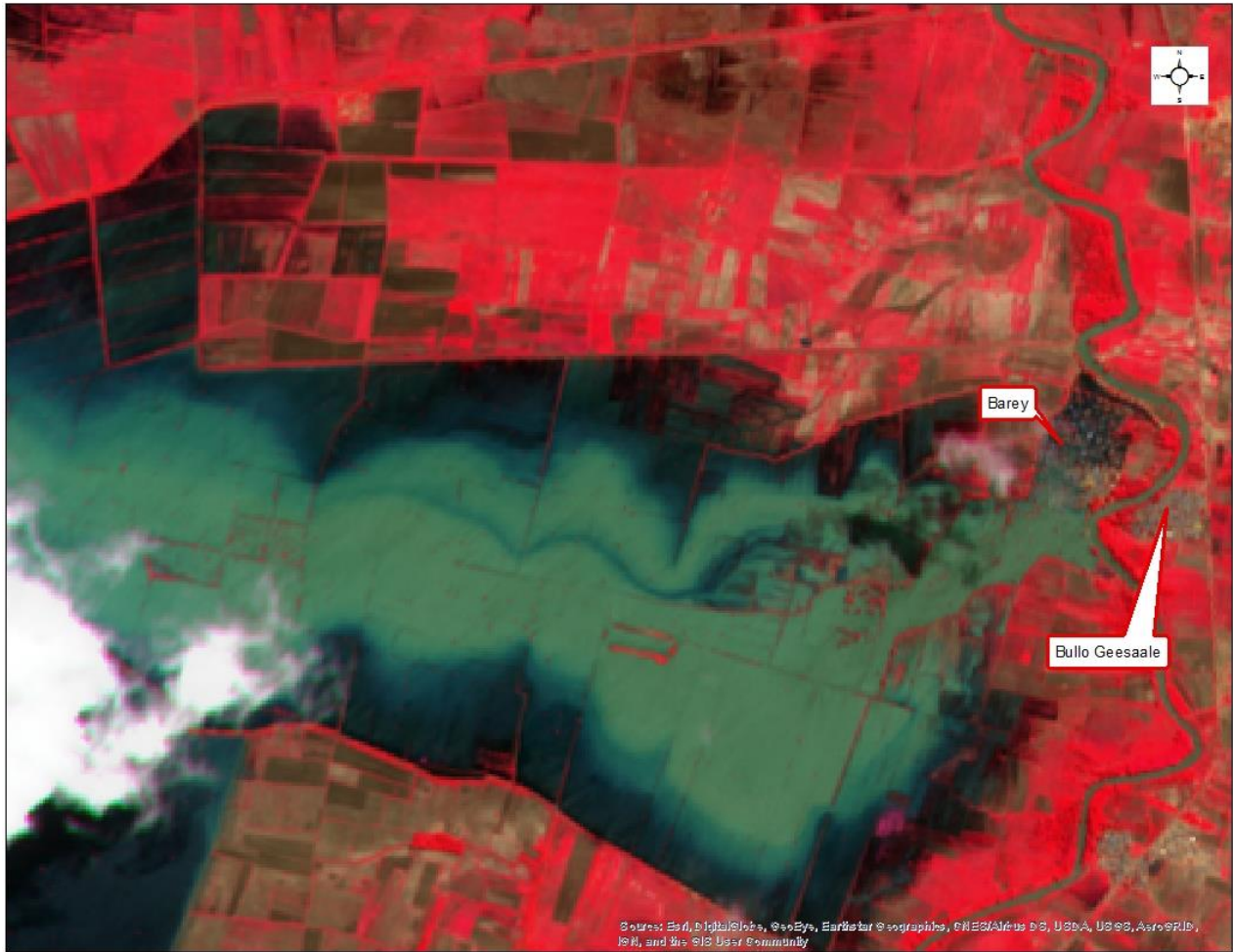


Figure 10: Flooding at Barey and Bullo Geesaale on 6/3/2021

Is there a solution?

Jowhar like many cities along the Shabelle river needs urgent flood control infrastructure to combat the reoccurring floods. Jowhar needs a holistic approach to protect the city and surrounding towns since the elevations in the area are very flat. Government-sponsored programs are the only solutions since individual farmers or residents can not perform the scale of repairs required. The local government should work with the regional government to initiate a multi-phased flood control project to improve the livelihood of the residents. The following tasks are needed urgently and can be performed by the local government and residents:

1. Identify the breakages in the river and locations where historical overtopping occurred
2. Identify obsolete irrigation canals that exacerbate the flooding problems
3. Identify developments that encroach on the river channel or floodplain

Once the tasks above are identified then the local government could develop an action plan and an emergency plan on how to deal and respond to floods at those locations. The above task will not address all the issues but will at least will minimize the loss of life and life stock. For a long-term solution, local government, regional government, and federal government coordination are required. Reconstruction of

the existing flood control structures and the addition of new flood control infrastructure is paramount to mitigate the repeated flooding caused by mankind and climate change. The reconstruction of existing and the addition of new irrigation canals is also crucial and might act as an incidental benefit. The local, regional, and federal governments could assist with the following tasks:

1. Perform topographic mapping using the latest technology and identify areas where there is excessive sedimentation
2. Remove sediments from the river where needed while taking the elevations of the canals into account
3. Educate the residents and farms about the hazards of encroaching on the river channel or tampering with the river embankment. Many of the current breakages are currently due to farmers tampering with the river banks to extract water.
4. Establish Shabelle River Water Authority In Hiiraan, Jowhar, and Afgoi to manage Shabelle river infrastructures and control illegal water extractions. Provide 2-year irrigation technical training of up to 50 people for capacity building to become self-reliant and plan to transfer responsibility in the next 5 years from FAOSWALIM to Shabelle River water Authority with granted funding.
5. Establish new weather stations at Awdheegle, Afgooye, Balcad, Jowhar, Mahadi Weyne, Bul Burde, and Beledwayne. Not all stations need to be the same but having redundancy will help account for all the water in the system and determine locations where losses occur. Having data in near real-time will assist in estimating the river flows more accurately. These weather stations can be powered by solar and a mechanism to transmit the data.
6. The existing reservoirs within Jowhar reach and Shabelle river needs to be reconstructed and new ones need to be planned between Beledwayne and Balcad, and between Awdheegle to near Shabelle river tail for the following reasons:
 - a) Reservoirs Duduble and Sabuun reservoirs within Jowhar reach were originally designed to store up to 200 Million Cubic Meter (MCM), however, based on our study for evaluating potential irrigation within Jowhar reach existing reservoir using 10-year Shabelle river flow data from 1980 to 1989, the reservoirs can store up to 172 MCM at 70% reliability to meet irrigation demand throughout the year; due to climate change impacts and upstream irrigation activities in Ethiopia. and the likelihood of irrigated area increase in post-civil war within Jowhar reach area, it warrants reconstruction instead of rehabbing of the existing reservoirs with prerequisite establishing new Shabelle river flow measurements and new evaluation studies.
 - b) the irrigation of middle Shabelle combined with climate change and Ethiopia upstream irrigation activities increased the drought season period on Lower Shabelle river reaches. And the fact that between Awdheegle and tail of Shabelle river lacs any reservoirs has impacted livelihoods of the lower Shabelle farmers and overall food security in Somalia; thus, new reservoirs would be required to mitigate the climate change impacts and irrigation activities on upper reaches of Shabelle river both in Somalia and in Ethiopia.
 - c) Re-evaluate seasons i.e Gu use to last 70 days and Der 150 days, similarly, the flooding drought seasons has been changed due to climate change; thus, would require readjusting overall Somalia seasons by region to adapt to climate change that could have a positive impact and planting and harvesting seasons of the farmers.