

# Drone-Based Rapid Assessment of Melamchi Flood 2021



## **About Melamchi**

The Melamchi River originates from the Jugal Himal range at an elevation of 5,875 m and joins the Indrawati River forming a confluence at the Melamchi Bazar. Melamchi bazaar is one of the major settlements and economic zone of Melamchi municipality, Sindhupalchok District of Bagmati Province of Nepal. The bazaar is located at 27.830 latitude and 85.575 longitude at an elevation of 940m. The total length of the Melamchi River is 41 km and the total catchment area is 330 square km. Snowmelt and rainfall are the two main sources of water for the river. During the wet season, numerous local springs occur, only to disappear as the dry season progresses.



*Location Map of Melamchi Bazar*

Melamchi has always been in the limelight with the National Pride Melamchi water drinking project attracting students, travelers, and engineers. Besides, the landscapes at Helambu, Nakote, Melamchi Ghyang, and Tarke Ghyang are also places to look out at Melamchi. The Melamchi bazaar is well established as a commercial center within this region due to infrastructure development and market.

### **Melamchi Flood 2021**

The occurrences of natural hazards are inevitable in the Nepal Himalayas due to active tectonics and strong monsoons. These hazards are turned into disasters claiming lives and destroying properties. The Melamchi Flood is one of the recent extreme disasters that occurred on the late night of June 15. The debris flow hit the Melamchi Bazaar and destroyed a number of houses, and infrastructure along the road corridor. This debris flood partly destroyed the Head works of the Melamchi Water supply project.

The exact origin of debris flow is still in discussion in the scientific arena but evidence suggests that the loose material on the upstream part of the Melamchi River was reactivated by the prolonged rainfall. The Gorkha Earthquake-2015 has shattered the Nepal Himalaya and 14 districts of central Nepal were severely affected. Sindhupalchowk is one of the highly affected districts and the location of

the major aftershock epicenter. Studies suggest that the mountain relaxation time after a major earthquake takes some years. Therefore, this mountain chain is fragile as it is still in the adjustment stage.



*Photo of Melamchi Bazar and flood plains on the left and photo near the confluence of Indrawati-Melamchi river on the right from the drone survey (2021/06/20)*

Melamchi Bazar area, Sindhupalchowk district, was just recovering from the heavy impact of the earthquake. The prolonged rainfall during this early monsoon season triggered the unstable slopes in the Melamchi region generating numerous landslides. One of these landslides blocked the Melamchi River for a few hours creating Landslide Dam. This dam could not withstand the large amount of incoming water and burst generating flash floods with lots of debris downstream. The images obtained from the Planet lab also confirm that huge sediments were deposited at multiple places upstream. The flood carried a mixture of sand, boulders, and wood fragments. This is a typical example of the cascading effect of multiple hazards in the mountains.

According to the locals, the local government authority issued the warning after knowing the river damming upstream. Local people were suggested to move up to higher ground. The flood from the Indrawati hit the Melamchi bazaar in the night and much more devastation due to debris flow in the Melamchi River. The damage assessment is still ongoing using drone surveys and ground surveillance. This flood has also caused damage to several public infrastructures mainly road networks, Bridges, Electricity Transmission Lines, and structures of much much-awaited Melamchi Drinking Water Project. The preliminary study has estimated the loss of 260 households displacing more than 600 people. Many researchers are doing research to identify the cause and mechanism of this flood to understand the natural process in the Himalayas.

## Before and After



*Baseline imagery from Maxar compared to drone-collected imagery from Geovation Nepal ( June 18, 2021)*