# Assessment of the catastrophic events originated in the river Vere basin

Tbilisi, Georgia

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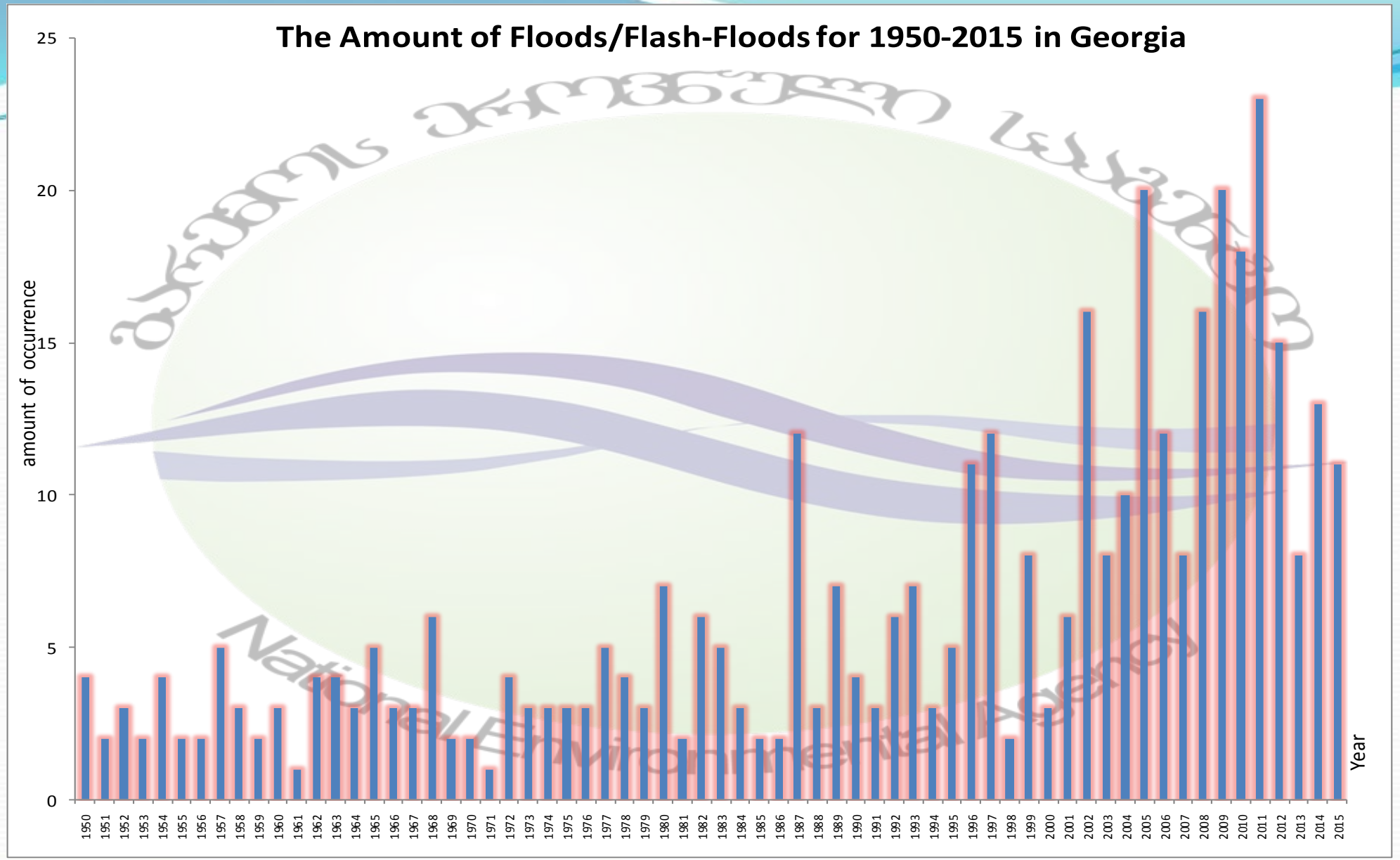
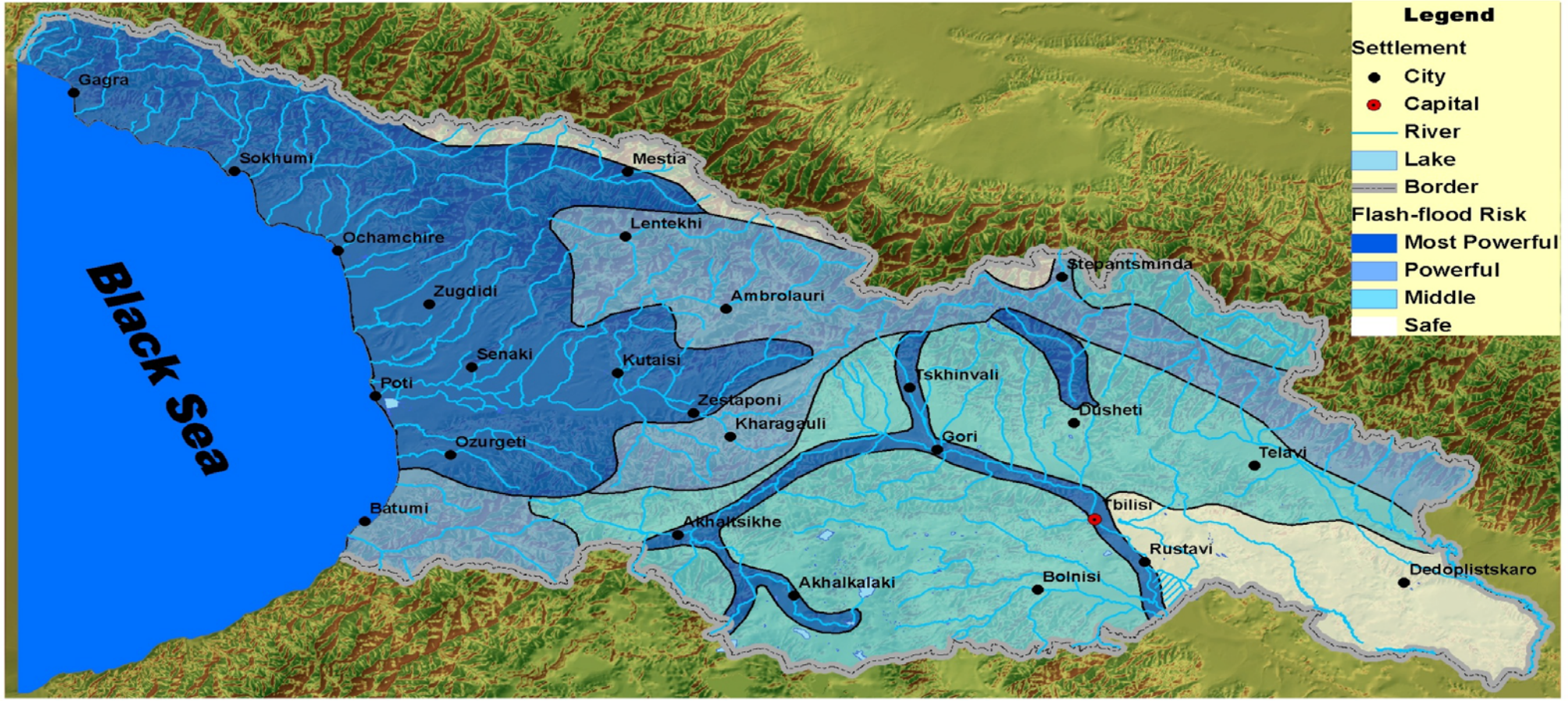
# The Amount of Floods/Flash-Floods for 1950-2015 in Georgia

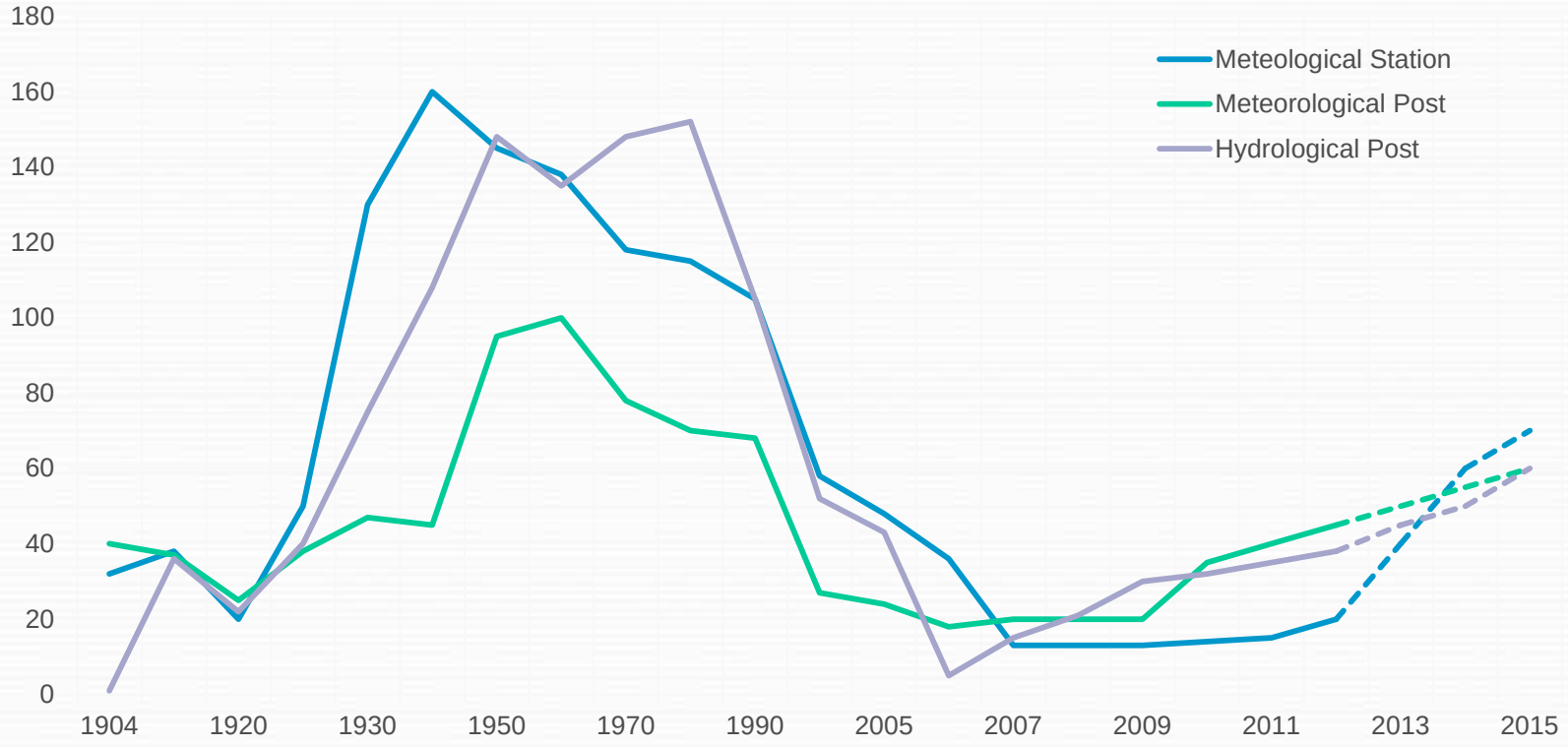


# Flash-flood Risk map of Georgia

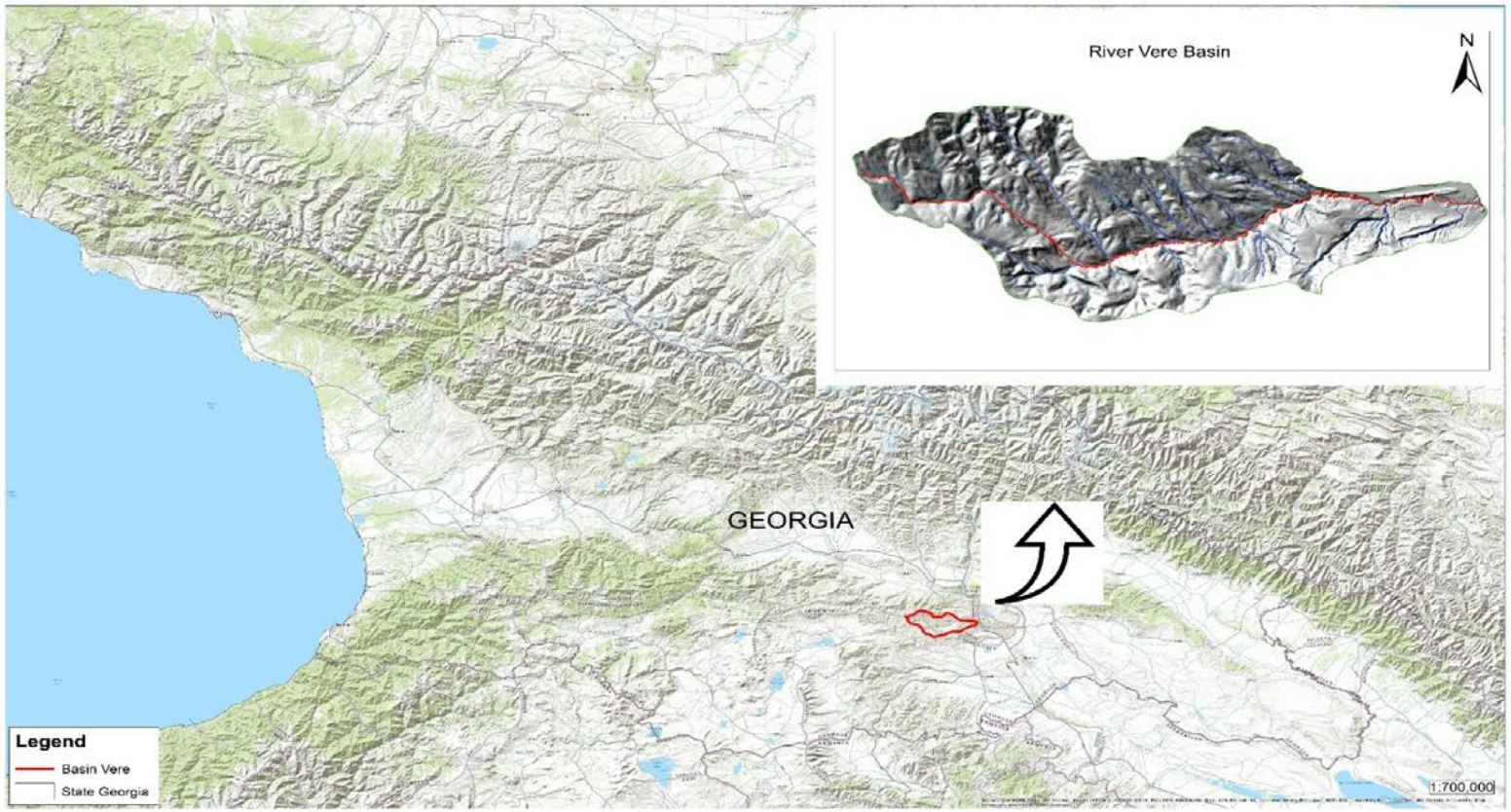


The regular meteorological observations in Georgia started since 1844 and it has more than 160 years history. Tbilisi meteorological station was established in 1837 year and correspondingly Batumi - 1881 year, Poti Port - 1894 year. By the year of 1916 about 90 meteorological stations and posts were functioning and before the World War II their number reached 200. Some Meteorological stations are located in high mountain areas, difficult to be reached. Among them in Western Georgia Mamisoni Pass (1932) and in Eastern Georgia Kazbegi (1933) are the oldest and the highest meteorological station in Europe.

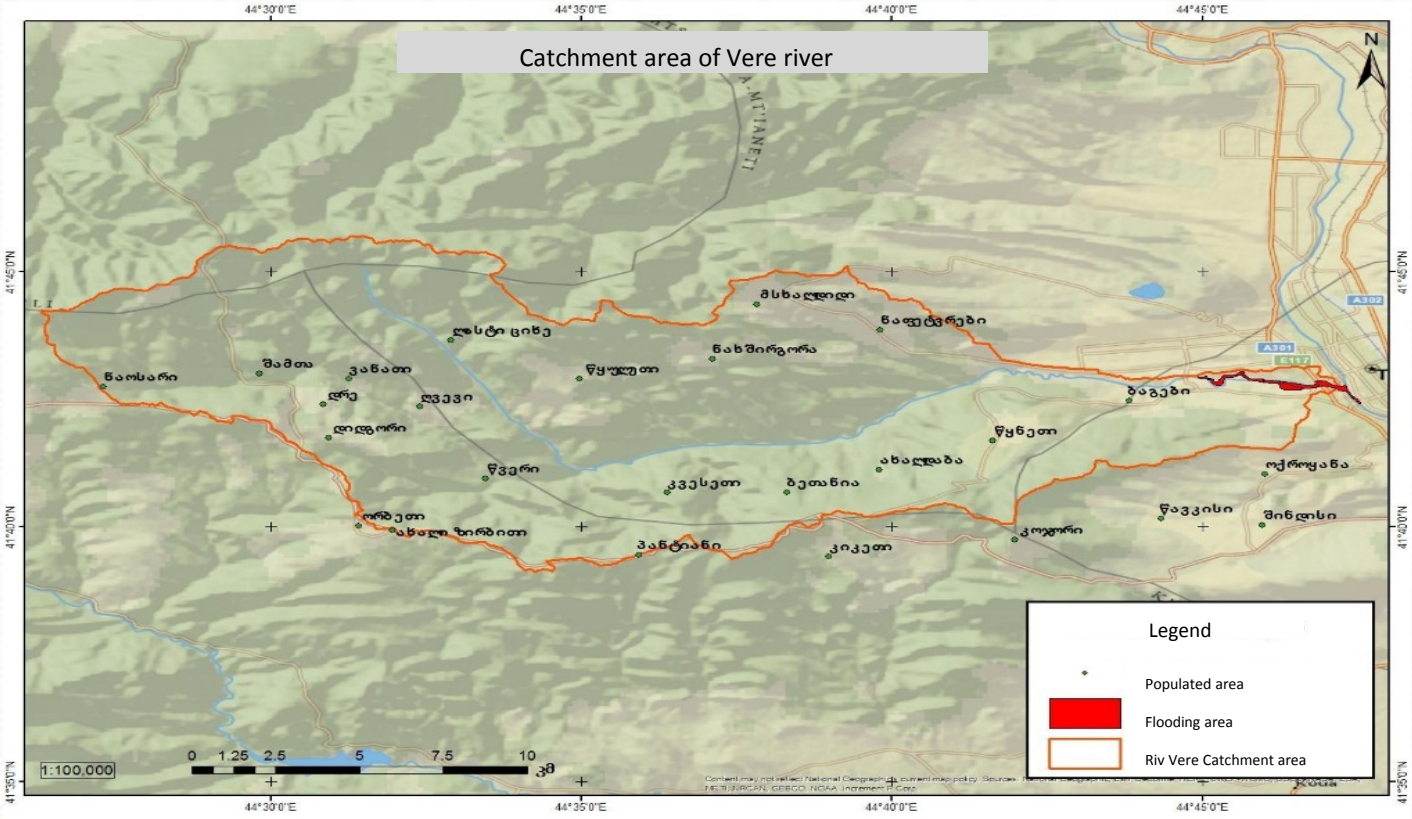
Until the 1990 the number of Meteorological stations comprised over 100 and posts - 60.



River Vere, which has its origin at the eastern slope of the Trialeti Range (in the surrounding area of Didgori mountain), at an elevation of 1670 meters, and flows into Kura River from the right bank, 0,5 kilometers below, at the Queen Tamara Bridge, 390 meters above sea level. The river characteristics are: **length - 38 km**; overall water fall - 1280 m; average inclination of 0,034%0; **basin area - 194 km$^2$**; average elevation of the basin – 1060 m. The river has 41 tributaries with the total length of 95 km, the average rate of 0.72 km/km$^2$.

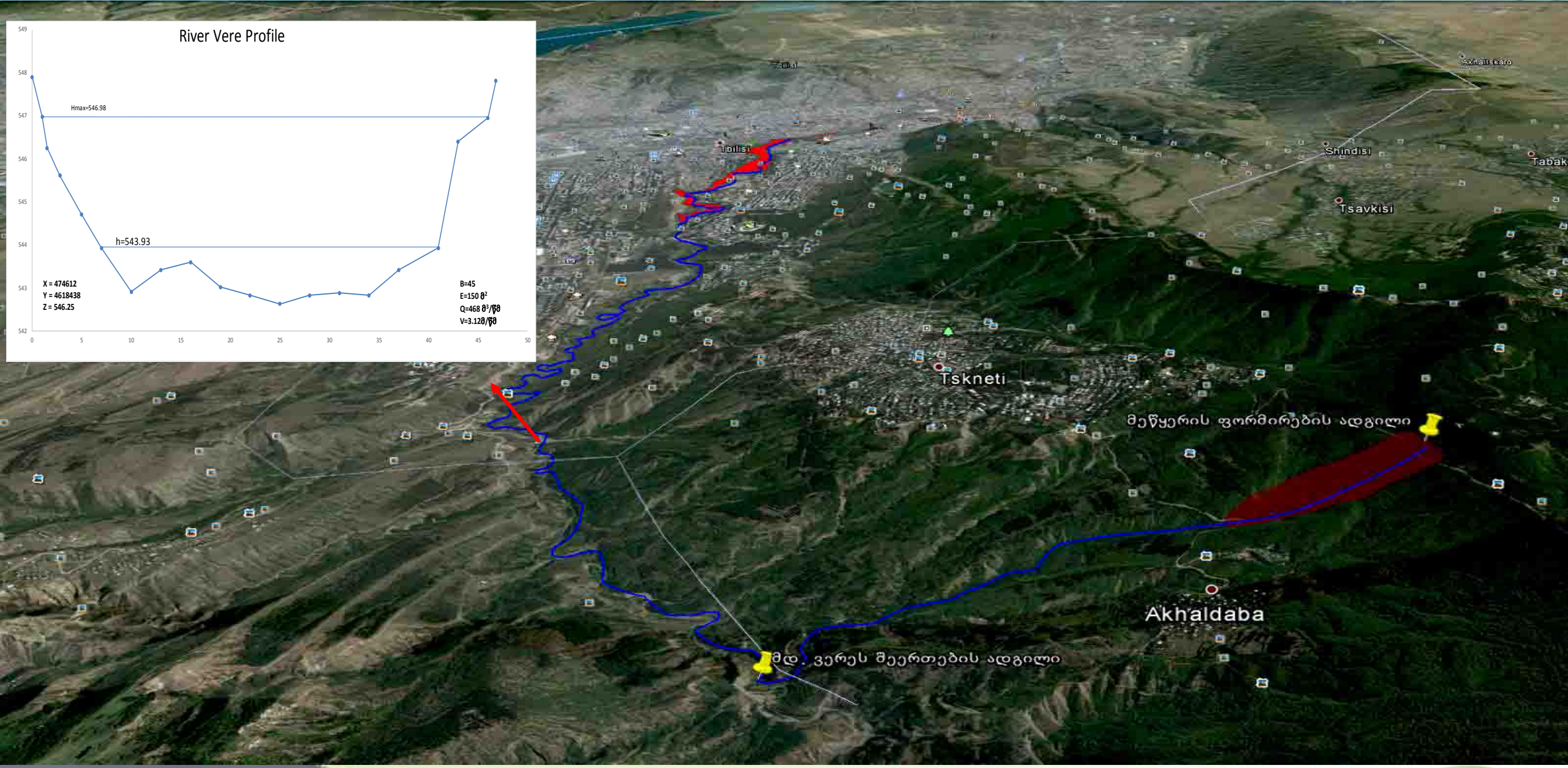


The annual normal flow ranges from **0.26 to 1.22 m³/sec**. The maximum flow typically occurs in spring, in some years – in summer and autumn. The maximum flow is 48.3 m³/s. The minimum flow in summer and winter ranges from 0.001 m³/s to 0.16 m³/sec. 1% provision, i.e. the water flow of centennial recurrence is 240 m³/s. A catastrophic flow passed through Vere River on July 4, 1960 and made 259 m³/s, which exceeds the water flow of centennial recurrence; in addition, 153 m³/s and 155,3 m³/sec were reported in 1972 and on June 4, 2015 respectively at Vere River.

On 13-14th of June 2015, heavy rainfall (according to data from Tbilisi meteorological station, 49 mm precipitations were recorded within 3-4 hours) in Vere River basin and its tributaries caused a sharp increase in the water level, and, as a result of landslide processes, large volumes of mudflow/debris flows generated in the Tskneti-Akhaldaba section.

- Simultaneously occurred several disasters: **Landslide, mudflow, flash-flood, bank erosion, rock fall and hail**;
- Landslide from **800 thousand to 1 million** cubic meters of ground masses generated at the left slope of the river;
- During 3-4 hours, from the calculations, the amount of precipitation reached **100 mm**;
- Tbilisi meteorological station has fixed **49 mm** precipitation (which is 67% of the norm for June), in some places of Tbilisi rain wasn`t fixed;
- Water discharge compiled **468 $m^3$/sec** (calculated by the water traces);
- Compared to the average multi-year level, the current level in Vere gorge rose **3.4-4.0 meters**, in some parts **18-20 m;**
- **Trees has blocked the entrance of the tunnel** (culvert), the culvert was calculated for 450 $m^3$/sec discharge.

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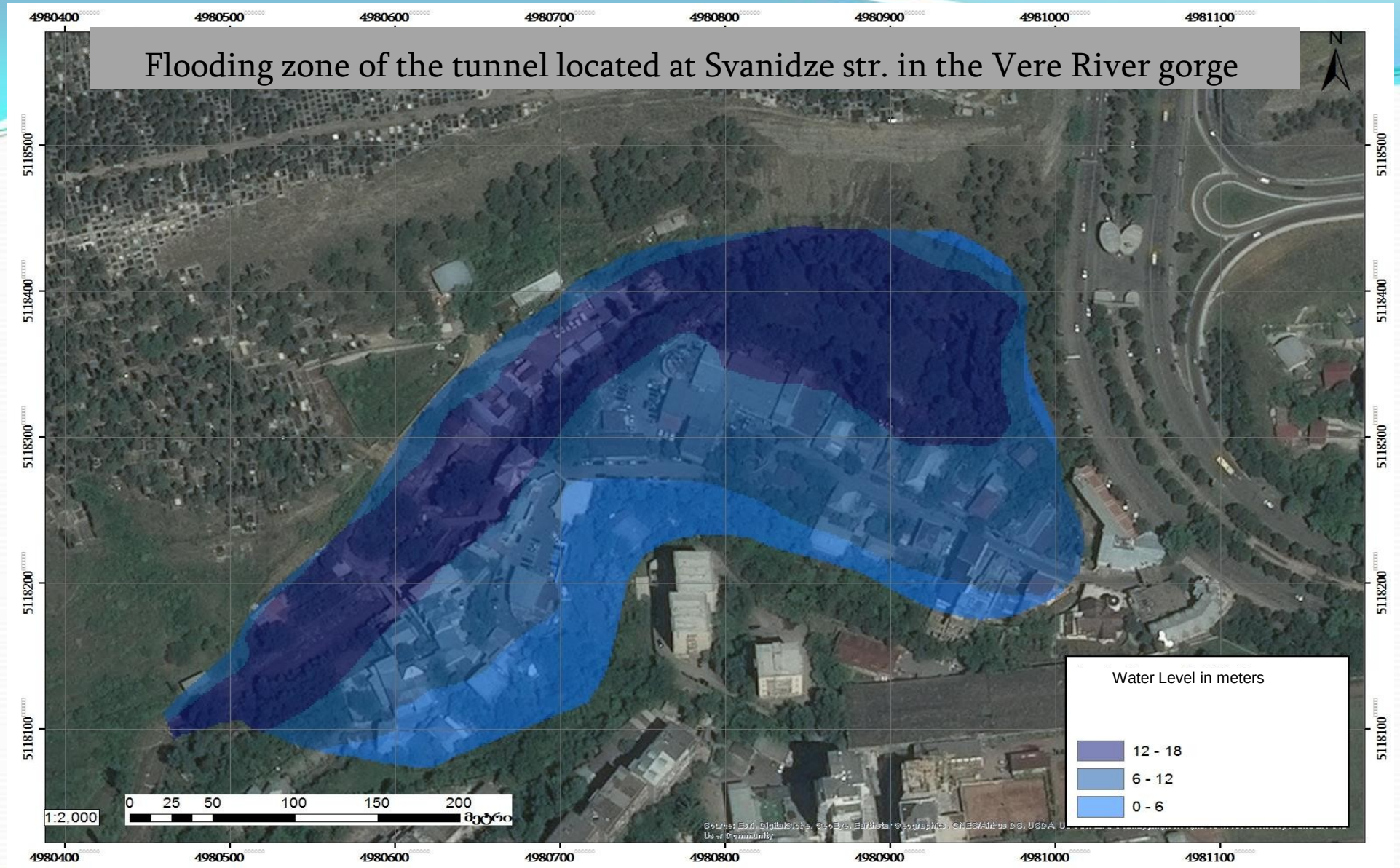
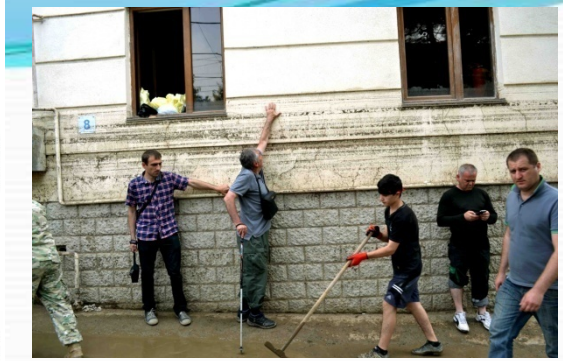
# Flooding zone of the tunnel located at Svanidze str. in the Vere River gorge



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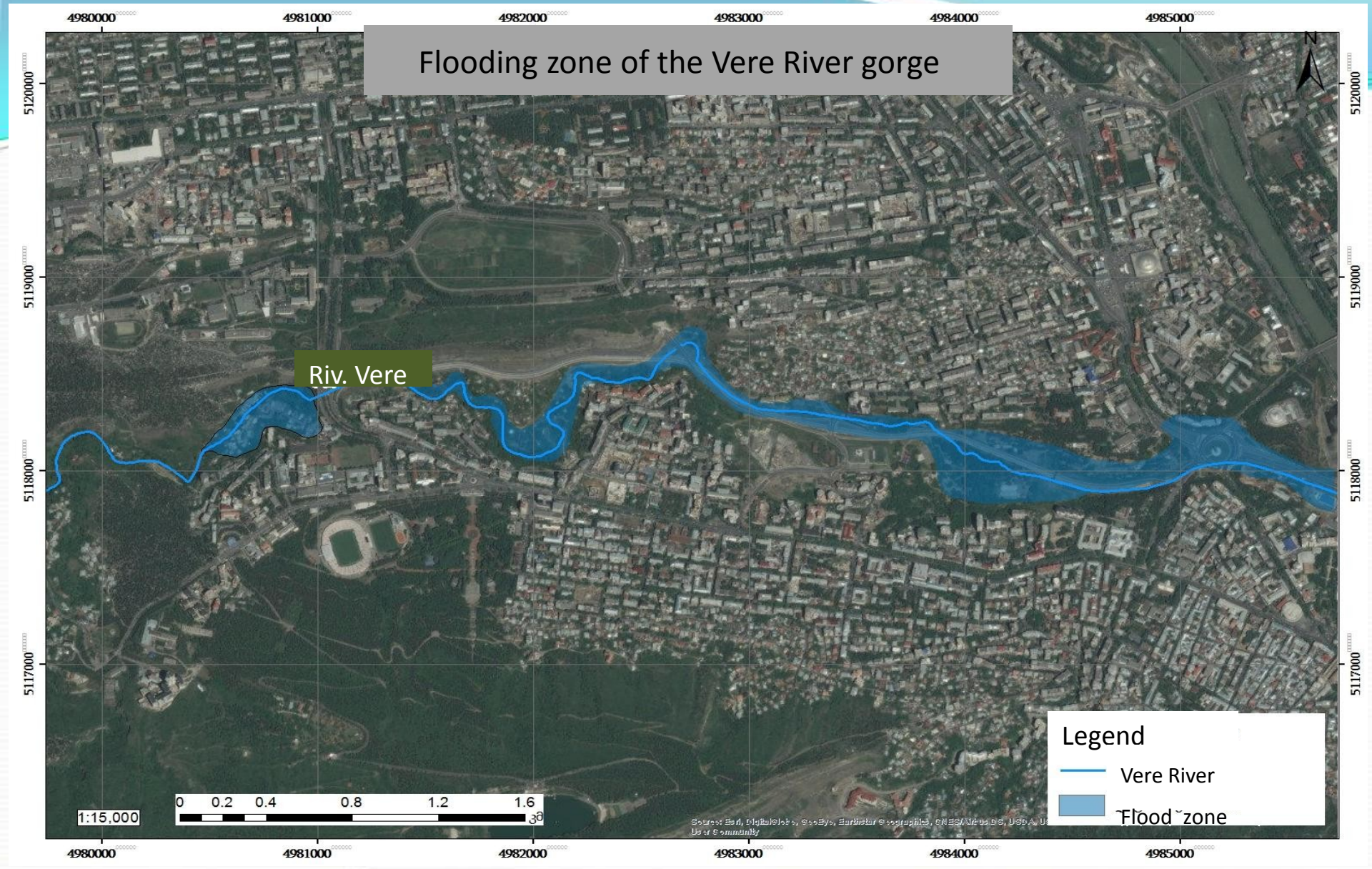
# Flooding zone of the Vere River gorge

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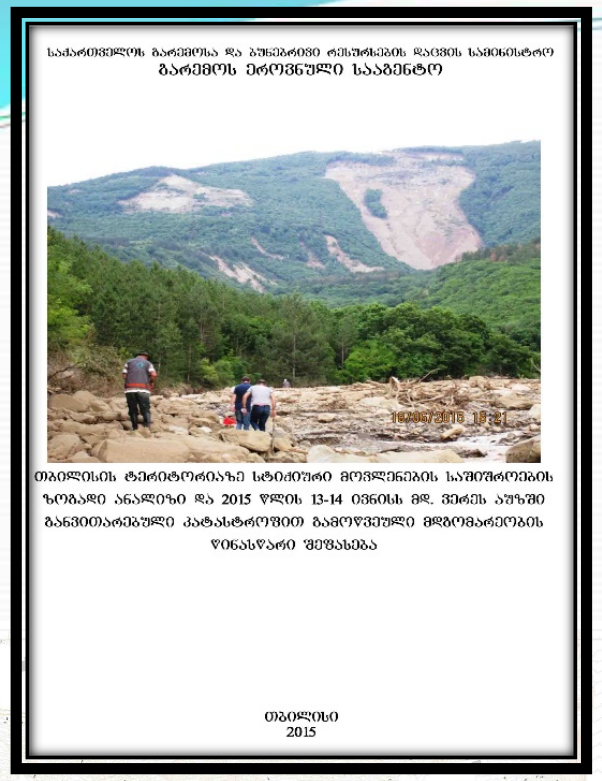
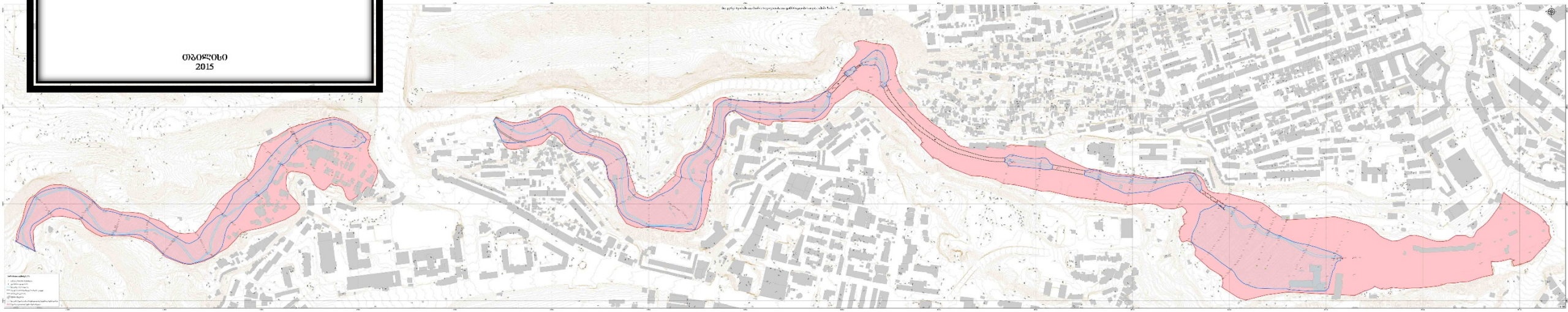
Due to the Vere disaster, the houses, various infrastructure facilities, buildings located below the lowest mark of the River gorge, as well as Tbilisi Zoo were significantly damaged and/or destroyed. According to the latest data, 20 people died and two people are missing




# Risk zoning and reports



# Prevention measures

- Installation of automatic rainfall measuring equipment and hydrological stations in the gorge;
- Flood modelling;
- Full provision of Vere gorge with EWS;
- Building hydrotechnical constructions;
- Investigation and hazard assessment of the other river gorges around the Tbilisi.

**Thank you for your attention**