



Kakhovka dam before the breach (2023-06-05, Sentinel-2).



The storage lake empties (2023-06-20, Sentinel-2).



Three months later (2023-09-13, Sentinel-2).

A flood disaster occurred when the **Kakhovka Dam**, a large hydroelectric dam on the Dnipro River in southern Ukraine, was destroyed in the context of the ongoing war in Ukraine. This event caused severe flooding, affecting settlements, farms, and ecosystems over a wide area.

Built in the mid-20th century as part of the Kakhovka Hydroelectric Power Plant, the Kakhovka Dam was more than 3 km wide and created a reservoir that held about 18 cubic kilometers of water. The reservoir supplied water for drinking, irrigation, industry, and for cooling systems at the nearby **Zaporizhzhia nuclear power plant**, then Europe's largest nuclear facility.

On June 6, 2023, the dam was destroyed by explosions causing extensive damage to the structure. Both Russian and Ukrainian sides blamed each other for the destruction.

When the dam failed, the reservoir emptied quickly. Water rushed down the Dnipro River, and communities along the river were hit by flooding. Entire towns and villages were submerged, and in many places only rooftops remained above the water level. Thousands of homes were inundated, forcing tens of thousands of people to flee. Emergency services evacuated residents stranded by rising water. The floods also damaged farms, destroyed crops, and disrupted water supplies for people and for irrigation of agricultural land.

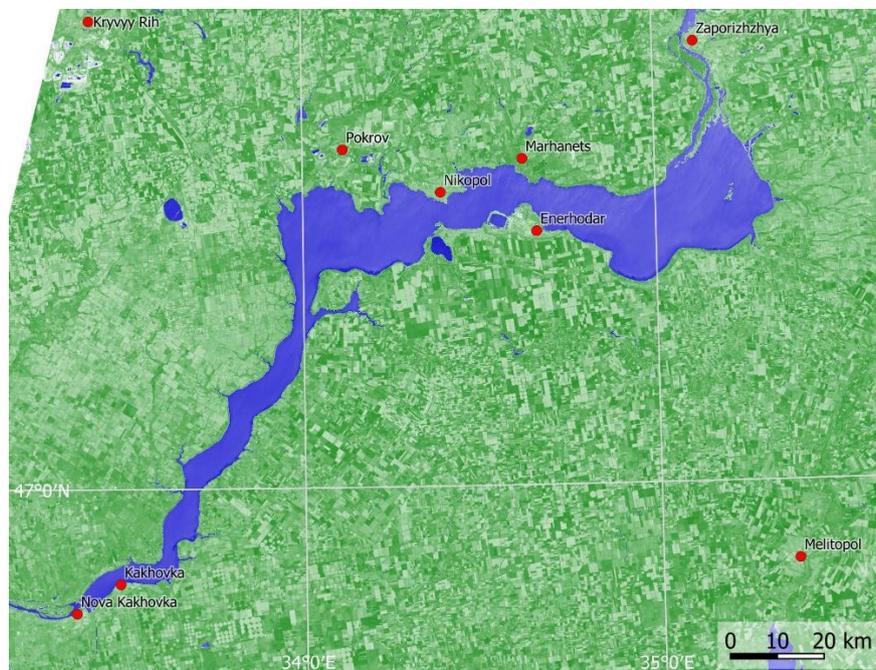
In some areas, floodwater reached several meters deep. Kherson city and smaller villages downstream from the dam saw large parts of their land and infrastructure flooded.

Due to the political situation, it was difficult for journalists, scientists, and emergency workers to reach the flooded areas on the ground. Therefore, satellite data became essential for understanding the destruction. Data acquired before and after the dam's collapse helped assess the extent of the damage. Beyond the immediate damage, the destruction of the Kakhovka Dam has longer-term consequences. Without the reservoir, water levels in canals dropped, affecting irrigation. Agricultural land risked turning dry and unusable without water. The flood released pollutants and heavy metals contained in sediments on the reservoir floor, remnants from decades of industrial use and farming.

## Exercises

- Look at the detail satellite image from 2023-09-13 and compare it with the image acquired on 2023-06-05, before the dam was destroyed. Which changes can you detect?
- Focus on the area of the original bed of the storage lake. What structures have become visible?
- Look at the areas surrounding the storage lake. What does the change in colour tell you about seasonal changes or about land use? Think about harvesting activities.
- Look at the overview image below and try to estimate the area originally covered by the storage lake (average width of the lake, approximate length). Use the scale bar in your considerations.
- The Zaporizhzhya Nuclear Power Plant is located in Enerhodar. Try to explain why this place was selected and think about the cooling required for the operation of this type of power plant. What can happen with a nuclear power plant if there is insufficient cooling? Do you know about disasters with nuclear power plants? Think about Chernobyl 1986 or Fukushima 2011.

## Additional Material



Overview of the extent of the Kakhovka reservoir before the destruction of the dam (2023-05-06, Sentinel-2).  
(NDWI, normalized difference water index; blue: water surfaces, green: other land cover)

## Links and Sources

- [https://civil-protection-humanitarian-aid.ec.europa.eu/news-stories/stories/disaster-photos-nova-kakhovka-dam-breach-ukraine\\_en](https://civil-protection-humanitarian-aid.ec.europa.eu/news-stories/stories/disaster-photos-nova-kakhovka-dam-breach-ukraine_en) - photos documenting the dam breach
- <https://reliefweb.int/map/ukraine/kakhovska-dam-damage-and-flood-event-monitoring-using-satellite-data-7-june-2023> - rapid damage assessment based on Sentinel-3 data
- <https://ukraine.un.org/en/295829-flooding-was-%E2%80%98just-beginning%E2%80%99-kakhovka-dam-disaster-two-years> – UN report about the aftermath of the disaster
- <https://www.preventionweb.net/news/water-war-long-term-environmental-consequences-destruction-kakhovka-dam-ukraine> - environmental consequence of the disaster