

Addressing Environmental Damage in Ukraine: A Workshop

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Ukraine Rivers and Water Systems as Weapons and Casualties of the Russia-Ukraine War

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Water Conflict Website

www.worldwater.org



THE WORLD'S WATER
Information on the World's Freshwater Resources

[The Books](#) [Water Data](#) [Water Conflict](#) [Other Resources](#)

WATER CONFLICT

In an ongoing effort to understand the connections between water resources, water systems, and international security and conflict, the Pacific Institute initiated a project in the late 1980s to track and categorize events related to water and conflict, which has been continuously updated since. The database, updated in May 2018, presents the information as a chronology and map. Use the links below to explore the chronological list of events or the interactive events map.



View the Water Conflict Chronology

Chronological List

A [table](#) listing conflicts over water that can be filtered by region, conflict type, and date range.

Map

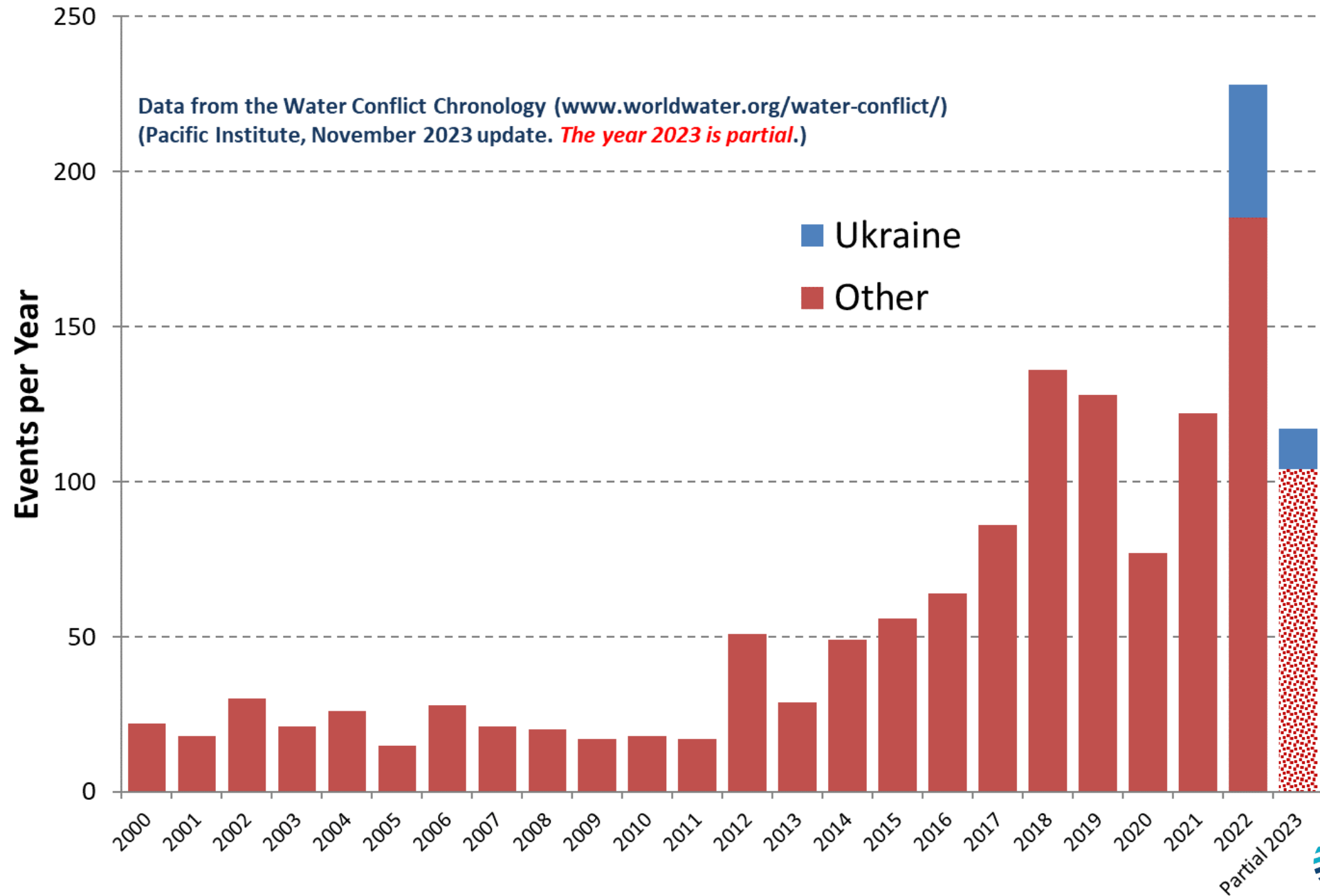
An interactive [map](#) showing the geographic location where conflicts over water have occurred and information about each conflict.

"There are few books that can genuinely be described as indispensable. This is one...essential reading."

—*Financial Times Global Water Report*



The Number of Water Conflict Events, 2000 to 2023





Major river basins: Dnieper Don Danube Dniester

Categories of Water-Related Impacts of Conflict

- Disruption of water transfers, pipelines, irrigation systems
- Damages to/Attacks on dams
- Water pollution
 - From military actions/munitions/equipment
 - Contamination from mine wastes
 - Other water contamination events
- Attacks on civilian/urban water infrastructure
 - Water-supply systems, including energy systems
 - Attacks on wastewater treatment systems

Sources:

- Gleick, Peter, Viktor Vyshnevskyi, and Serhii Shevchuk. "Rivers and water systems as weapons and casualties of the Russia-Ukraine war." Earth's Future, 11, no. 10 (2023)
- Shumilova, O., K. Tockner, A. Sukhodolov, et al. (2023). Impact of the Russia–Ukraine armed conflict on water resources and water infrastructure. Nature Sustainability, 6, 578–586 (2023). <https://doi.org/10.1038/s41893-023-01068-x>



Damage to
Mykolaiv's water
supply pipeline,
Kherson region
(BBC. April 2022).



Damaged pipeline,
2019 Donbas,
Ukraine.

(<https://euromaidanpress.com/2019/11/03/on-the-verge-of-disaster-top-5-environmental-problems-in-ukraine/>)



Dam in Kryvyi Rih,
Ukraine damaged by
Russian missile strike,
September 14, 2022

Kakhovka Dam and Reservoir, Dnipro River

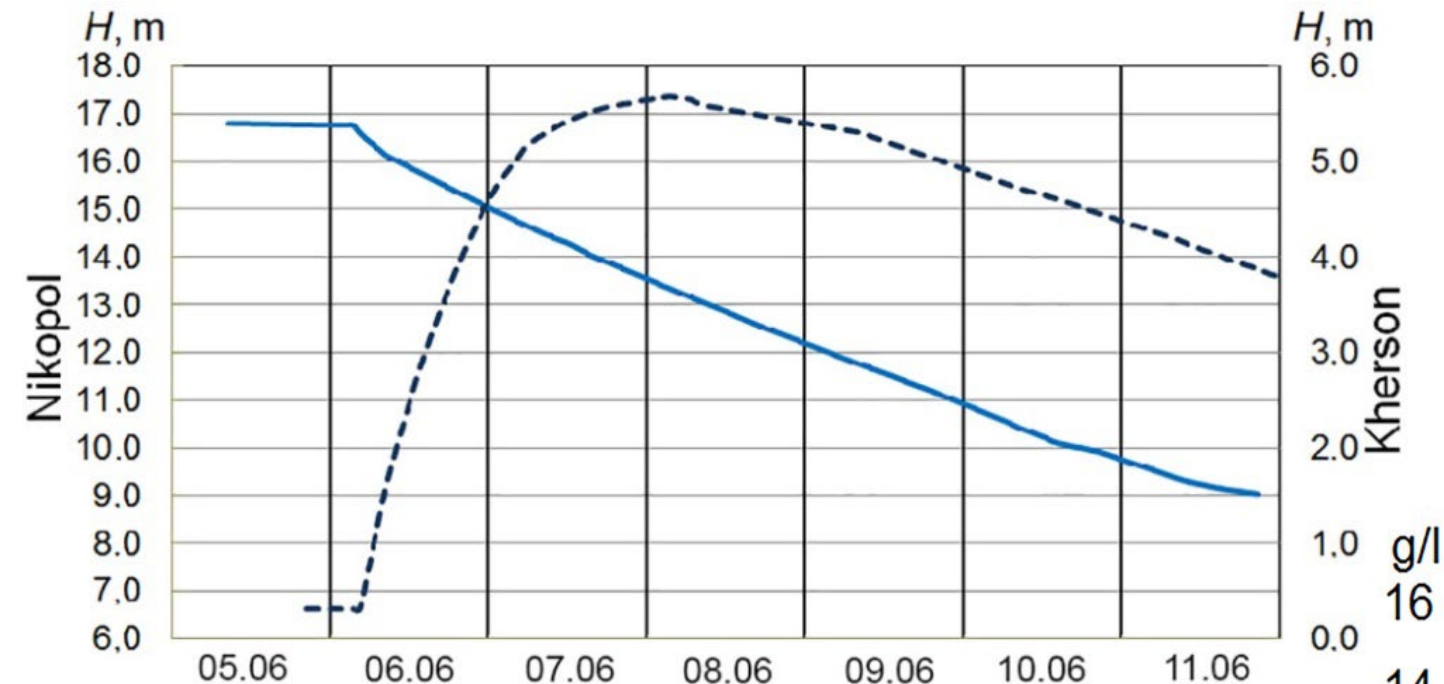


- Completed in 1956
- 357 MWe Installed Capacity
- Length 3.3 km; 30 meters high
- Reservoir Capacity of >18 cubic kilometers
- Provided water supply to hundreds of thousands of people and >500,000 hectares of land

Key Impacts from the Destruction of Kakhovka Dam and Reservoir

- The Kakhovka hydropower plant on the Dnipro River in Ukraine, its spillway dam, and adjoining structures were destroyed June 6, 2023, leading to the draining of Kakhovka Reservoir.
- In the lower reaches of the Dnipro River, four cities and several dozen villages were extensively flooded.
- 50-100 deaths were reported.
- Extensive destruction of industrial and urban infrastructure.
- Bacteriological and chemical pollution has been recorded in both the lower Dnipro River and the northwestern part of the Black Sea.
- Water supplies have been cut off for extensive agricultural areas, several large cities and towns, and major energy stations, including the Zaporizhzhia nuclear power plant.

Evaluating the impacts of the Russia-Ukraine War on water systems has involved extensive use of real-time and near-real time remote sensing; and rapid on-the-ground field assessments.

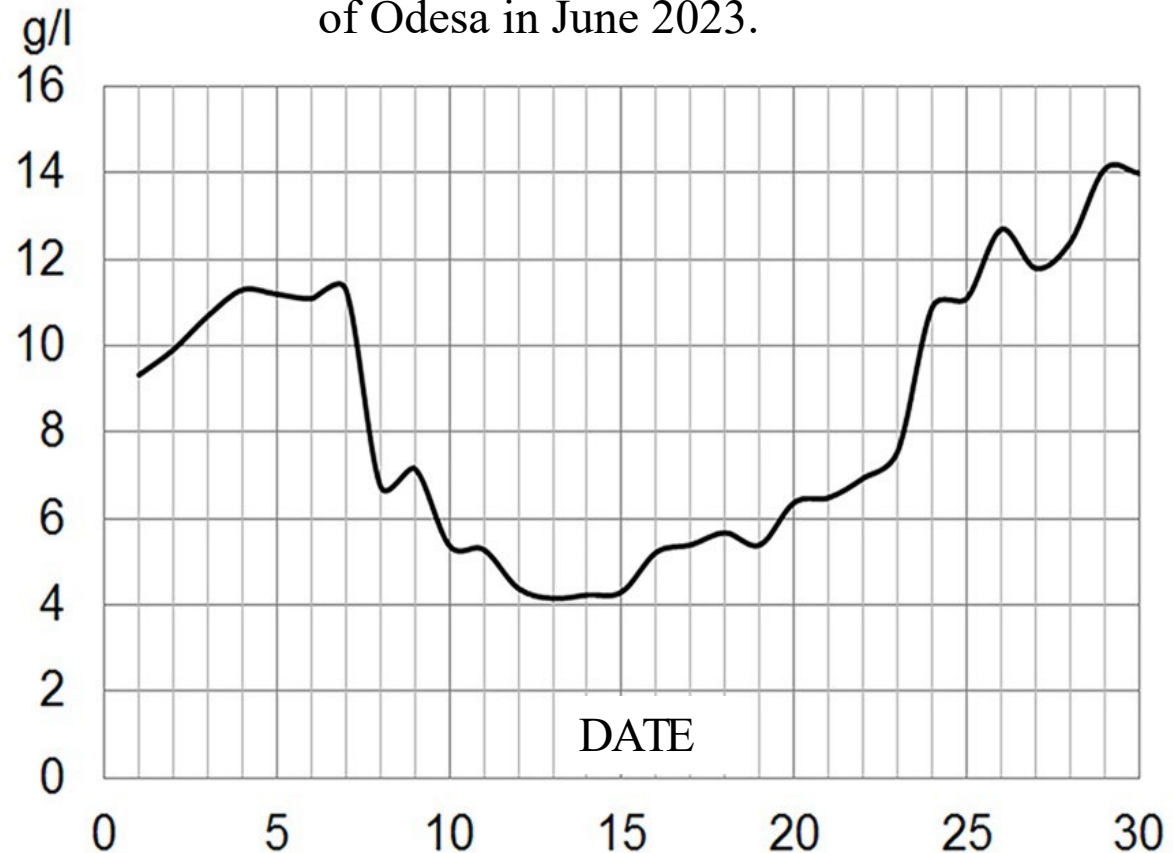


Changes of water level at Kherson and Nikopol hydrological stations between June 05–11, 2023.

Vyshnevskiy, V., S. Shevchuk, V. Komorin, Y. Oleynik & P. Gleick (2023). The destruction of the Kakhovka dam and its consequences, Water International, DOI: 10.1080/02508060.2023.2247679

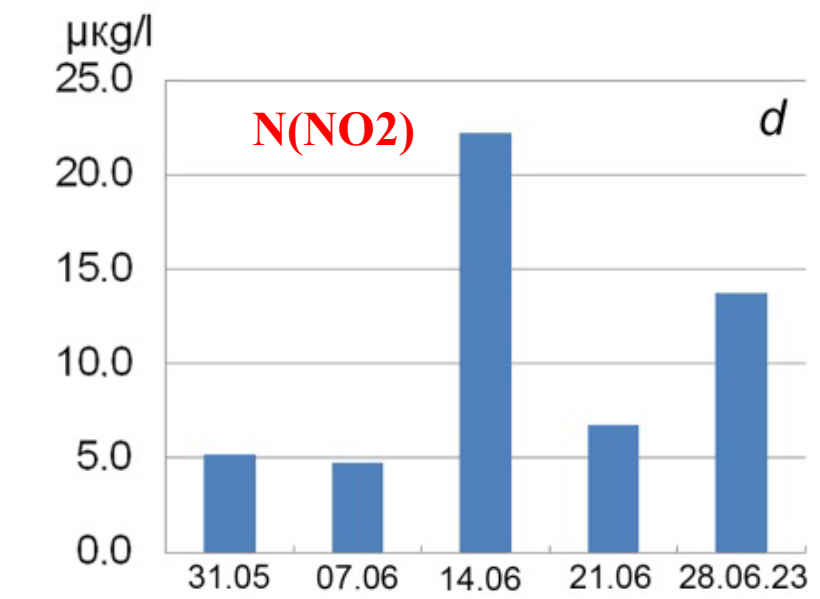
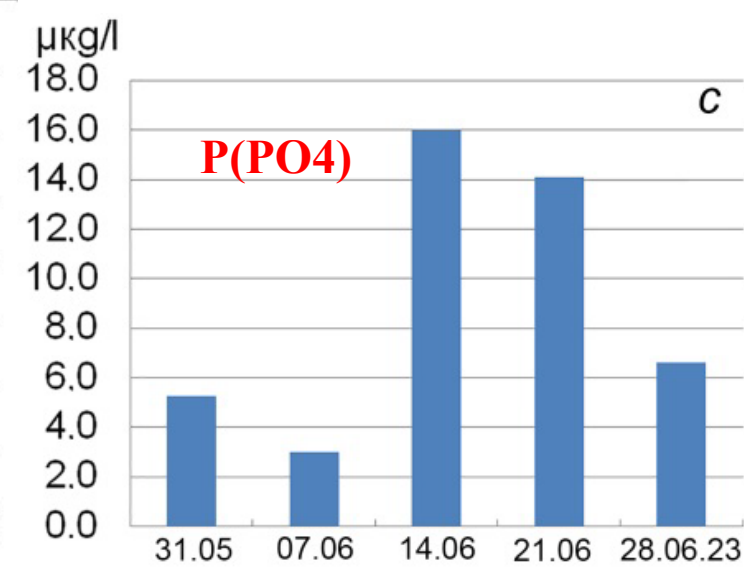
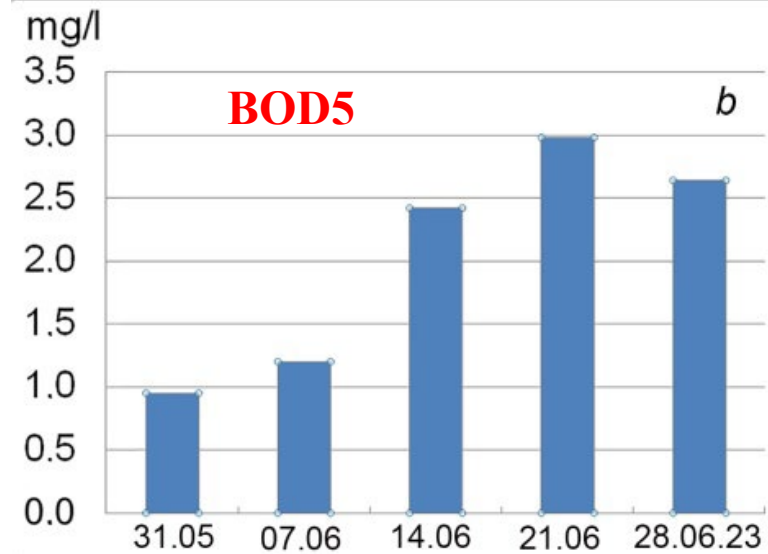
Data from the Hydrometeorological Service of Ukraine.

The changes of water salinity at seaport of Odesa in June 2023.





Satellite images of the northwestern part of the Black Sea: June 23, 2023.
Image from <https://scihub.copernicus.eu>



Water Quality Sampling Site Near Odessa

Vyshnevskiy, V., S. Shevchuk, V. Komorin, Y. Oleynik & P. Gleick (2023). The destruction of the Kakhovka dam and its consequences, Water International, DOI: 10.1080/02508060.2023.2247679

June 9, 2023

June 16, 2023

June 30, 2023



Water (and Energy) as a Casualty of Conflict



Attack on
Dnipro Dam,
Ukraine
March 22, 2024

Summary

- History shows extensive water-related violence in the past.
- The extent and severity of recent events is increasing and is unprecedented.
- These include the use of water and water systems as weapons and casualties of war, with extensive recent events in Ukraine.
- The consequences are being evaluated with real-time remote sensing and field surveys
 - Human
 - Ecological
 - Economic
 - Political
- These events raise important questions of international law and how the international community should respond.

References

Gleick, P., V. Vyshnevskyi, and S. Shevchuk. (2023). "Rivers and Water Systems as Weapons and Casualties of the Russia-Ukraine War." Earth's Future, 11 (10).
<https://doi.org/10.1029/2023EF003910>

Vyshnevskyi, V., S. Shevchuk, V. Komorin, Y. Oleynik & P. Gleick (2023). The destruction of the Kakhovka dam and its consequences, Water International,
<https://doi.org/10.1080/02508060.2023.2247679>

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