From Protection to Dependency

Hydrological Lock-In, War, and the North Crimean Canal

Anna Tymoshenko

English speech for a 15 minute presentation

Dear colleagues, this conference examines the consequences of war that develop over decades. War can initiate processes that alter water, soil and the conditions of life for several generations. My presentation examines how the North Crimean Canal enabled territorial development, made that development dependent on a particular water regime, and then became vulnerable to political rupture and war.

I use the term hydrological lock-in to describe this dependence.

In Vietnam, dioxin contamination associated with the US military use of herbicides persisted in hotspots long after the war. Contaminated soil and sediment required specialised remediation programmes. Military operations ended, but the environmental problem continued.

Understanding this process does not require reconstructing President Kennedy's thoughts. We need to examine the actions, the contamination and the processes they initiated. The same principle applies to Crimea.

We do not need to speculate about President Putin's expectations. Russia began aggression against Ukraine. The consequences also affected the water system of territory Russia occupied and seeks to retain.

The mechanisms in Vietnam and Crimea differ, but their environmental duration exceeds the duration of military operations.

This Soviet stamp from 1951 presents the Kakhovka hydropower plant together with the South Ukrainian and North Crimean canals. It shows an early political and engineering vision, rather than a precise map of the completed system. Water infrastructure belonged to a large project of transforming dry territories.

Its development assumed the continuation of a common administrative space. The reservoir, canal and receiving territories were governed within one state. The stamp is useful because it makes this original vision visible: hydraulic engineering would support a new geography of production and settlement.

This schematic introduces the canal to those unfamiliar with it. Water entered from the Kakhovka Reservoir on the Dnipro and travelled into northern and eastern Crimea. Pumping stations, distribution branches and reservoirs formed a wider system.

The canal began operating in 1963. Irrigated agriculture and water supply developed around regular deliveries. Water became part of the organisation of settlement and everyday territorial maintenance.

This schematic represents the historical system. It should not be read as a map of current operational supply. Sevastopol, shown in the southwest, has a separate water supply system.

I will return to it as an example of population growth under freshwater constraints.

Crimea used local runoff and groundwater before the canal. The limitations of these resources were already known. A 1983 account in the Soviet journal Science and Life described how local irrigation depleted sources and salinisation of groundwater began.

Irrigation had to stop and many artesian wells had to be plugged. This is evidence from the Soviet period, not a retrospective interpretation of the current crisis. Dnipro deliveries helped address existing water constraints.

They also enabled further development. Consequently, the later return to intensive groundwater use returns to a resource whose limitations were recognised before the canal existed.

Hydrological lock-in develops when a territory organises its activity around a particular source and delivery system over several decades. The regular supply supports settlement, agricultural specialisation and infrastructure. Those activities then require the water regime to continue.

Infrastructure initially expands territorial possibilities. Development turns those possibilities into continuing needs. When supply disappears, the established settlement and economy remain.

Ending water deliveries does not automatically return the territory to its earlier condition. This is why damage assessment must consider the regime of life supported by infrastructure, alongside the physical condition of the canal itself.

Russia's occupation of Crimea in 2014 changed the conditions of canal operation. Ukraine stopped Dnipro deliveries. Alternative sources and new supply arrangements followed.

Deliveries resumed after Russia's full-scale invasion in 2022. On 6 June 2023, the Kakhovka dam was destroyed and the reservoir lost its previous function. UNEP assessed the breach as an environmental disaster with long-term consequences.

For the canal, the distinction is fundamental. In 2014, delivery from an existing source stopped. In 2023, the hydraulic conditions supporting the previous delivery regime disappeared.

Possession of the canal's physical structure could no longer guarantee its former supply. Military control did not preserve the water system needed to sustain the controlled territory.

This photograph shows the canal at Lenino on 5 July 2014. Aleksander Kaasik photographed an almost empty channel after Dnipro deliveries stopped. The concrete channel and bridge remain.

Their physical survival does not establish the continued operation of the previous water regime. The photograph illustrates this distinction clearly. It documents one place and one date.

It does not describe the condition of every canal section today. To understand current operation, we need evidence about sources, deliveries and the use of the surviving infrastructure.

Parts of the canal continue to transport local resources. A report published in February 2026, citing the Russian-controlled Crimean water authorities, states that 45.7 million cubic metres were delivered to the filling reservoirs of eastern Crimea during 2025. Sources included the Nezhinsky, Prostornensky and Novogrigoryevsky groundwater wellfields, as well as the Belogorsk and Taigan reservoirs.

The canal therefore retains a transport function with a different resource base. This delivery figure establishes reported activity during one year. It does not establish that the new resource base can support the same demand over the coming decade.

The central question is how that supply is maintained and what happens to its sources.

Groundwater extraction can change groundwater flows and draw more mineralised water towards wellfields. Coastal areas also face seawater intrusion. The risk concerns the rate and location of abstraction and the replenishment of the resource.

Russian research published in 2025 examines these mechanisms using a regional groundwater model. It discusses saline-water movement in steppe Crimea and reports established seawater intrusion at the Orlovsky wellfield. The authors warn that further increases in abstraction require additional investigation.

These findings do not mean that every Crimean aquifer has already become saline. They establish a mechanism through which attempts to replace lost deliveries can worsen the remaining freshwater resource.

Water reaches consumers today while changes in an aquifer can accumulate gradually. Deterioration may become visible later, after dependence on that source has increased. We therefore need to ask what happens over the next ten years if the former Dnipro supply remains unavailable and intensive groundwater extraction continues.

The dangerous scenario combines the loss of an external source with deterioration of some local sources. We cannot assign a date for the complete exhaustion of Crimea's groundwater. We can identify a serious risk of reduced usable freshwater through salinisation.

This is a scenario requiring investigation, not a claim that all groundwater will disappear by 2036. The consequence may be a growing mismatch between limited resources and a territorial system formed under different water conditions.

Sevastopol illustrates another aspect of this contradiction. It has a separate supply system, with the Chernorechenskoye Reservoir as its main source and additional local sources, including the Belbek intake built in 2021. Russian statistics record growth from 393.3 thousand residents in the 2014 census to 558.3 thousand at the start of 2025, approximately 42 percent.

These figures refer to the entire administrative territory. Sevastopol is Russia's naval stronghold. Its strategic importance helps explain the significance of territorial development, but it cannot increase freshwater availability.

Is rapid expansion reasonable where resource limits are already known? The growth figure establishes increased potential demand. It does not determine the contribution of military policy to every demographic change.

Reliability must be assessed through drought periods and future demand, rather than a single year's successful supply.

Russia began aggression against Ukraine. The resulting cascade also affected water security in occupied Crimea. An aggressor can gain territorial control while undermining the conditions needed to sustain that territory.

Environmental harm need not have been the original objective. Actions can create conditions under which damage develops over decades. Responsibility concerns those actions and consequences.

An absence of intent to cause a prolonged water crisis does not erase the role of aggression in producing it. The consequences affect residents regardless of who made the decisions. This argument is an interpretation of the documented sequence and dependence, rather than a reconstruction of a leader's private expectations.

Ending the war will not automatically restore the former reservoir or remove salinisation where it has developed. It will not immediately change settlement or economic demand. Even new engineering solutions require an assessment of the territorial system they can sustainably support.

Historical experience, observations and models already identify water constraints. The issue is whether this knowledge influences political, military and development decisions. Research must follow those decisions through to their environmental results.

It must examine source quality, extraction and replenishment together with population and economic demand. Delivering water today is essential. Long-term security also requires preserving the possibility of continued delivery.

I conclude with the main point. Hydrological lock-in explains why the effects of war cannot be removed simply by returning to the pre-canal landscape. The territory has already changed.

In Vietnam, wartime actions left persistent contamination. In Crimea, disruption of the established water system and pressure on alternative sources can create a prolonged freshwater crisis. The mechanisms differ, but both cases require attention to environmental processes beyond military operations.

The canal supported an enduring dependence. War disrupted its resource base while the established population and economy remained. Russia's aggression demonstrates that an aggressor can gain control of territory and simultaneously undermine the conditions of its long-term existence.

Thank you for your attention.