



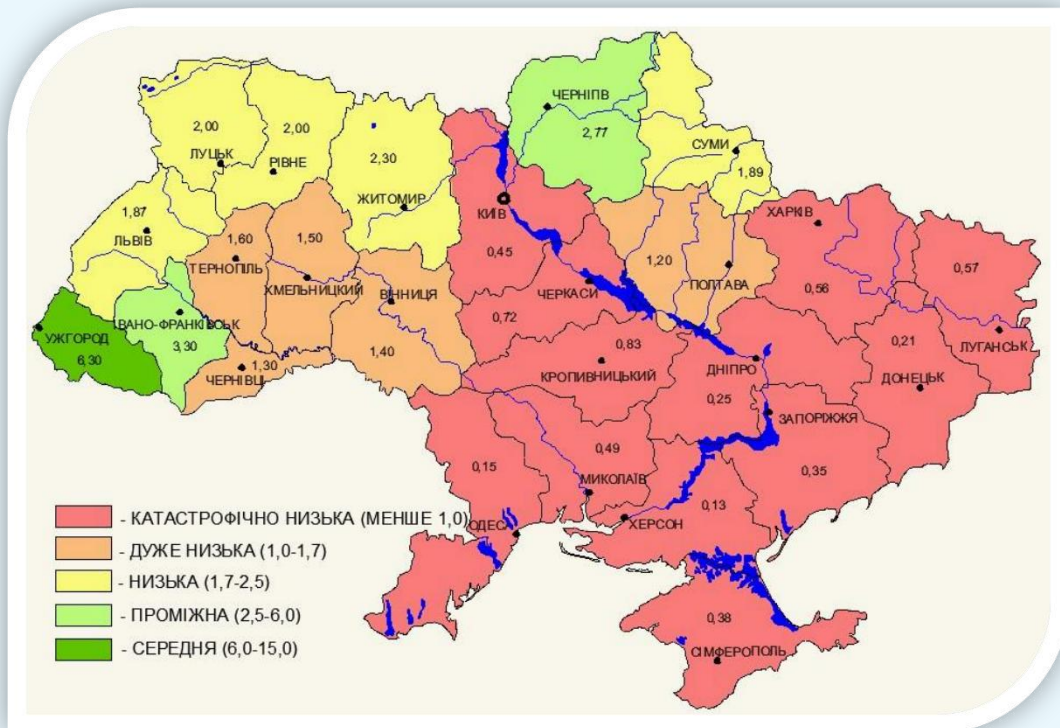
National Academy of Agrarian Sciences of Ukraine
Institute of Water Problems and Land Reclamation



The current state and possible consequences for the water security of Ukraine coming from the disruption of the Kakhovka Dam

**Mykhailo YATSIUK, the director of IWPLR of
the NAAS**

WATER SCARCITY (NATURAL DEFICIT)



By the inland river runoff (a little more than 1.2 thousand m³ per capita per year) Ukraine is one of the countries with the least water supply in Europe and ranks 124th in the list of 181 countries in the world.

The southern regions, where less than 0.5 thousand m³ of local water resources accounts for 1 person in an average by water supply year, are classified by the UNECE as having a catastrophically low water supply.

IN THE SOUTHERN REGION, THEIR OWN WATER RESOURCES ARE NOT ENOUGH NEITHER TO PROVIDE THE POPULATION WITH DRINKING WATER NOR TO DEVELOP IRRIGATION.

CCURRENT STATE AND POSSIBLE CONSEQUENCES OF THE KAHAVSKA HPP UNDERMINING FOR WATER SAFETY



Irrigation and agricultural production



Drinking water supply



Zaporizhzhia NPP



Flood regulation



Water bioresources



Transboundary pollution



Objects of the nature reserve fund

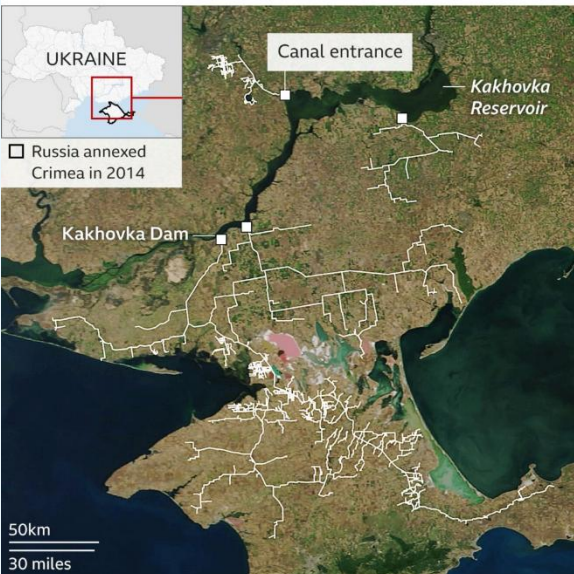
Water deficit

Kakhovka Reservoir almost completely dry

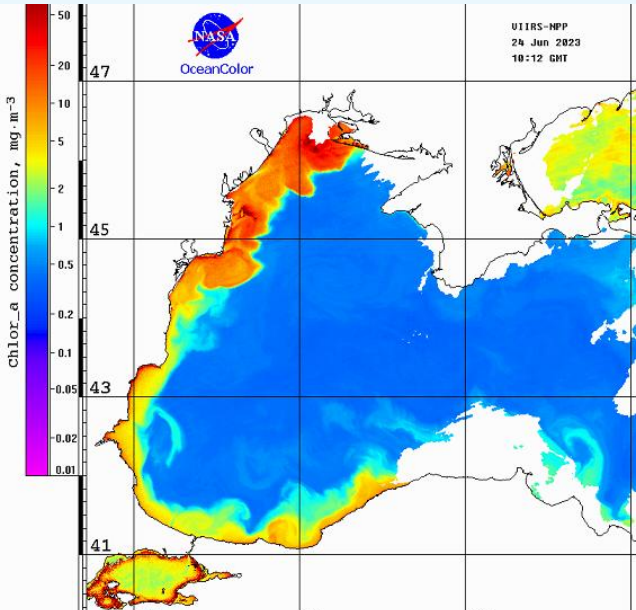
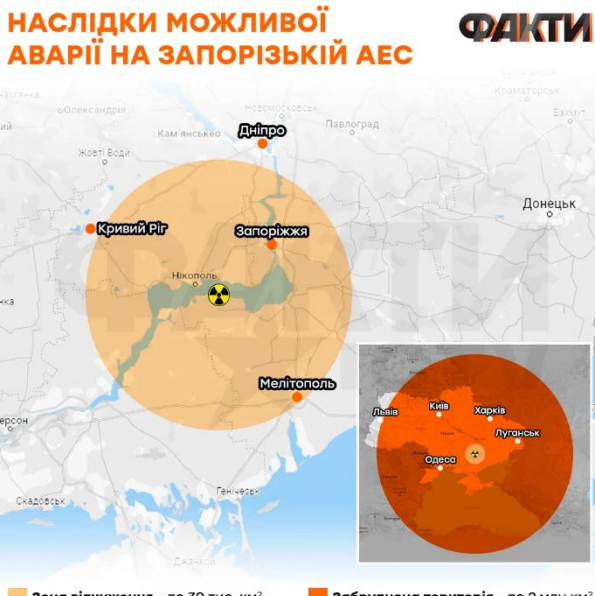


Source: Copernicus Sentinel-2

Canal networks fed by Kakhovka Reservoir



Source: Open Street Map, Nasa Modis



ENVIRONMENTAL CONSEQUENCES OF THE UNDERMINING OF THE DAM OF THE KHAVSKA HPP BY THE RUSSIAN OCCUPIERS



146

billion hryvnias
losses



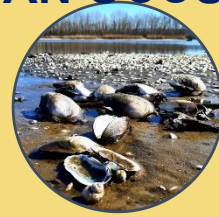
Changing
landscapes and
flood risk



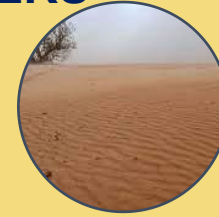
Damage to
biodiversity



Pollution



Flooding of
objects of the
nature reserve
fund



Change in the
hydrological
regime and
increasing the
impact of climate
change



Flooding of forest
ecosystems



Sanitary and
epidemiological
danger



48

Objects of NRF

> 5000

km²

> 60

ha of forest

> 20

thousand of
animals

thousands of tons
of fish

Black Sea Biosphere
Reserve

130 ha

National Natural Park
"White Coast of
Svyatoslav"

1900 ha

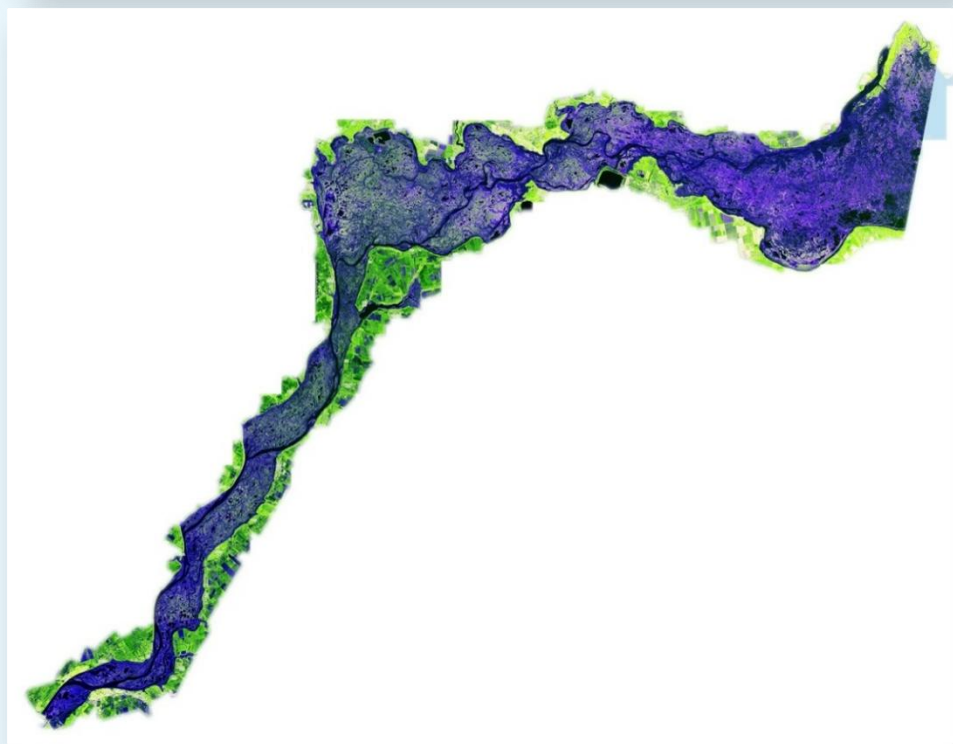
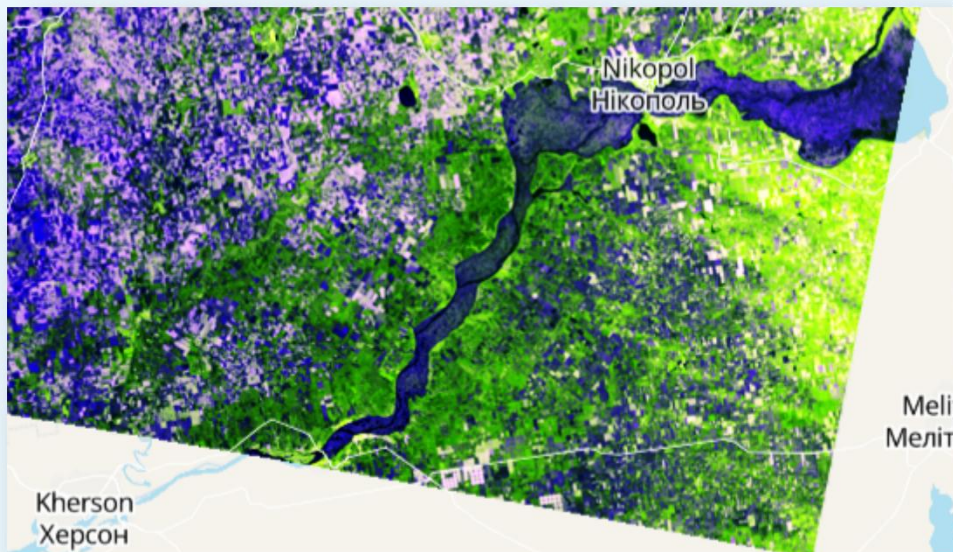
Regional landscape
park "Kinburnska spit"

500 ha

NNP

**46 million 550
thousand UAH of
losses**

80177,80 ha

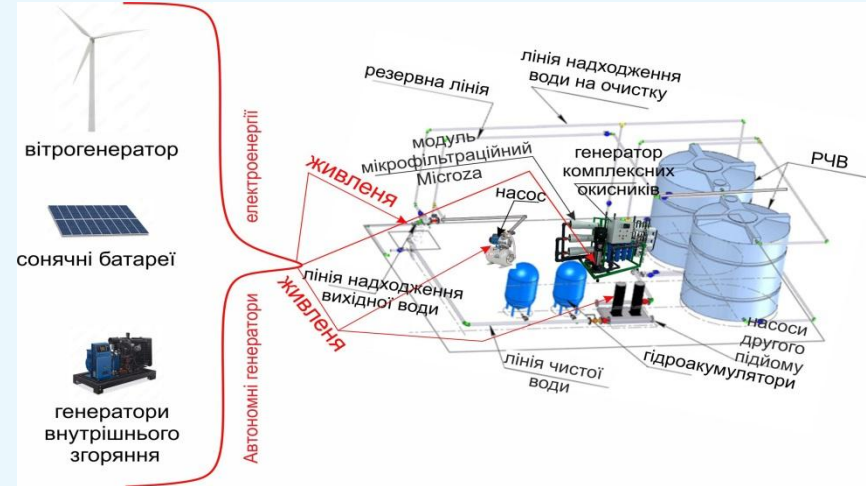
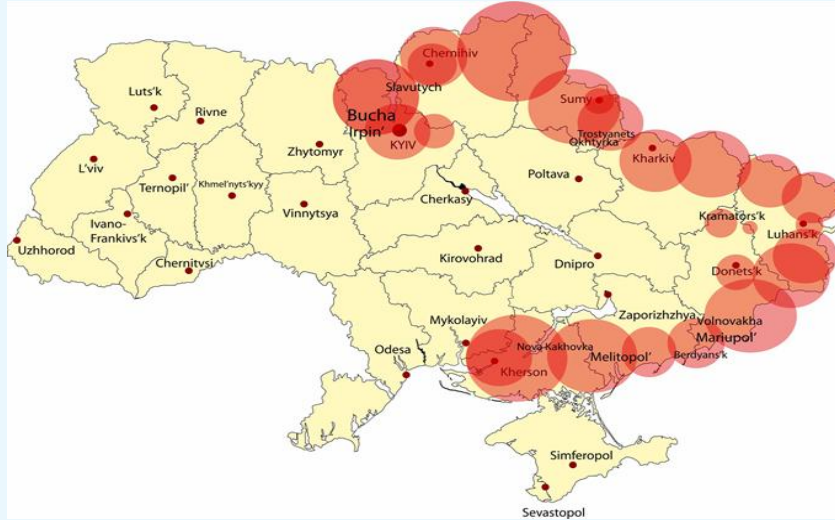


PRIMARY SCIENTIFIC RESEARCH FOR JUSTIFICATION OF DAMAGE MITIGATION MEASURES FOR THE TERRITORIES IN THE INFLUENCE ZONE OF THE WATER RESERVOIR



- topographic survey of the river banks, detection of areas with active processes of erosion and landslides;
- development of measures to stabilize banks using special technical solutions for bank protection;
- development of mechanisms to control pollution of the territory to take the necessary measures to prevent further destruction of the coastal zone;
- monitoring of changing river course;
- monitoring of changes in the groundwater regime in the adjacent territories;
- assessment of changing the distribution of precipitation;
- development of the regime of high water passage (flushing, irrigation, floods);
- preservation of biodiversity through the formation of wetlands (old lands, lakes, wetlands);
- application of the latest technologies and satellite surveillance for monitoring hydrological conditions;
- development of preventive measures (emergency plans that allow timely response to water level dynamics);
- assessment of changing agroclimatic characteristics.

CREATION OF DECENTRALIZED WATER SUPPLY SYSTEMS AS ALTERNATIVES TO DESTROYED CENTRALIZED WATER SUPPLY SYSTEMS



Removal of impurities $>0.1 \mu\text{m}$ in size from water - suspended and colloidal substances, microorganisms, radionuclides, heavy metals, high molecular weight compounds, and after preliminary oxidation - iron, manganese, arsenic, hydrogen sulfide, organochlorine compounds in the form of residues of pesticides, herbicides, military poisons, etc.

Stable water quality during the entire service life of supply systems

Compactness of the systems (high permeability of membranes allows filtration with a high specific speed).

Low operating costs.

The systems can operate in a wide pH range.

A high degree of system automation (independence from the "human factor").

Environmental friendliness (small consumption of reagents and water consumption for own needs - up to 3% of system productivity).

WATER SUPPLY SCHEME FROM THE KARACHUNIVSKE RESERVOIR



1 tract: Karachunivske reservoir - Ingulets river - Snigurivka - Ingulets main canal – Mykolaiv

2 tract: Karachunivske reservoir - Southern reservoir - Maryanske - Pokrov - Nikopol - Marganets - Tomakivka

ОСНОВНІ ЗАГАЛЬНОДЕРЖАВНІ МІЖБАСЕЙНОВІ КАНАЛИ УКРАЇНИ ТА ПЕРСПЕКТИВНІ РЕГІОНИ ДЛЯ РОЗВИТКУ ЗРОШЕННЯ НЕЗАБЕЗПЕЧЕНІ ВОДОЮ І ІНФРАСТРУКТУРОЮ ВОДОПОСТАЧАННЯ (середньорічні об'єми забору води каналами)



Північно-Кримський Канал



Канал Інгулецької зрошувальної системи



Канал Дніпро-Інгулець



Канал Дніпро-Донбас



The main state inter-basin canals of Ukraine and promising regions for irrigation development, which are not provided with water and water supply infrastructure (average annual volumes of water intake by canals)

North Crimean Canal, Canal of the Ingulets irrigation system, Dnipro-Ingulets Canal, Dnipro-Donbas Canal, Main Kakhovsky Canal

Inter-basin canals of Ukraine promising regions for irrigation development

Головний Каховський магістральний канал



- МІЖБАСЕЙНОВІ КАНАЛИ УКРАЇНИ



- ПЕРСПЕКТИВНІ РЕГІОНИ ДЛЯ РОЗВИТКУ ЗРОШЕННЯ

IRRIGATION POTENTIAL INCREASE IN ODESSA, MYKOLAIV, KHERSON, ZAPORIZHZHIA AND DONETSK REGIONS

