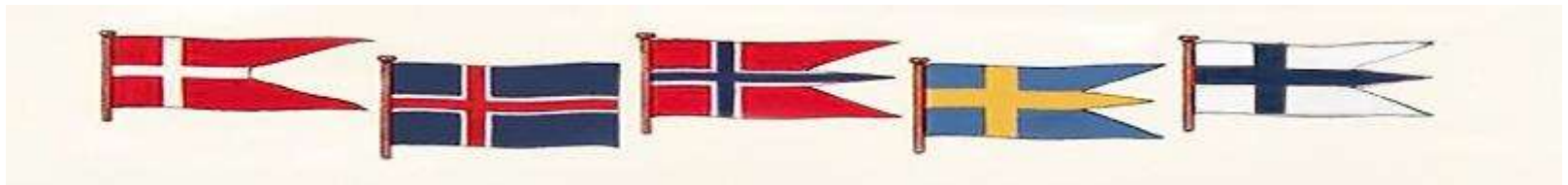




Ukraine at war: Historical perspectives with focus on the radiological situations

Vadim Chumak

National Research Centre for Radiation Medicine
NAMS Ukraine, Kyiv, Ukraine



Plan of the presentation

What is Ukraine

What is this war about

What is going on since 2014

Radiological threats

Ukrainian aspiration

What will be the war ending

Plan of the presentation

What is Ukraine

What is this war about

What is going on since 2014

Radiological threats

Ukrainian aspiration

What will be the war ending



What is Ukraine



Ukraine

Україна



- Population (2014): 45.7 million
- Area: 603,628 km²
- Capital: Kyiv

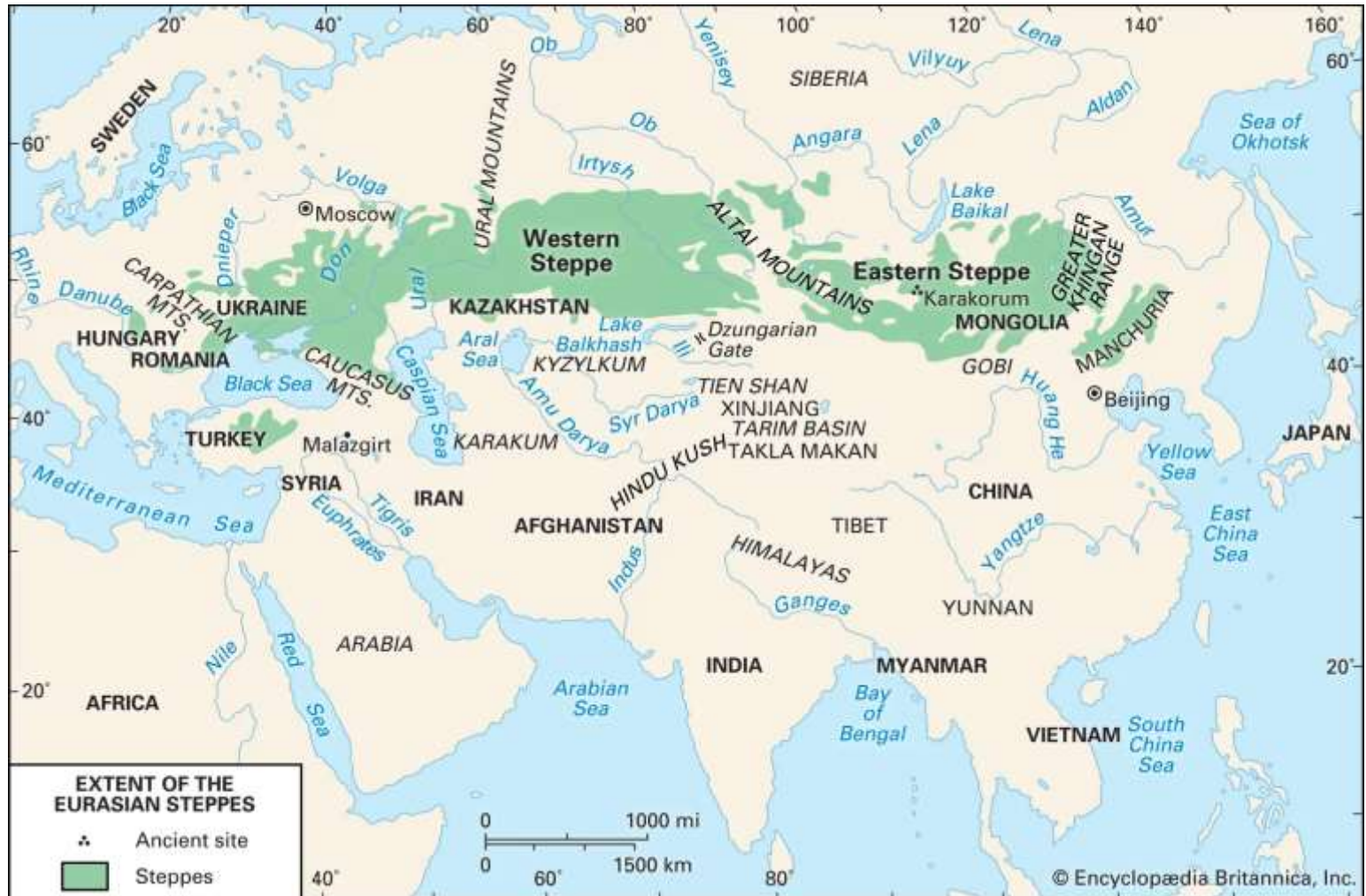


Ukraine: geography



<https://geomap.com.ua/uk-g8/28.html#&gid=maps&pid=1>

Ukraine: historical geography



<https://www.britannica.com/place/the-Steppe>

History of Ukraine at glance

Since paleolithic times the territory of Ukraine was permanently inhabited
(Cucuteni–Trypillia culture (4800-3000 BC), Scythians (700 BC – 200 AD), Sarmatians (300 BC – 400 AD), Slavs (known since IV century)

IX-XIII centuries - First pre-Ukrainian state Rus (Kyiv Rus), 988 - baptism of Rus from Byzantium (Christian Orthodox)

1240 – Mongolian invasion, fall of Kyiv

XIV-XVII centuries – within Grand Duchy of Lithuania, Rzeczpospolita

Second half of XVII century - Hetmanshina – Ukrainian Cossack independent state

1654 – union with Moscovia, till 1917 – within Russian Empire

1917-1921 – war for independence (failed)

1922-1991 – within USSR

August 24, 1991 – proclamation of independence of Ukraine

December 26, 1991 – official dissolution of the USSR

31 years of independence, 9 years at war with Russia

Definitive features of Ukraine and Ukrainians

- Crossroad of civilizations
- Religious, cultural and ethnic tolerance
- Frontier of western civilization
- Democratic tradition
- Value of freedom
- Creativity
- Military talents



Economics and industry of Ukraine

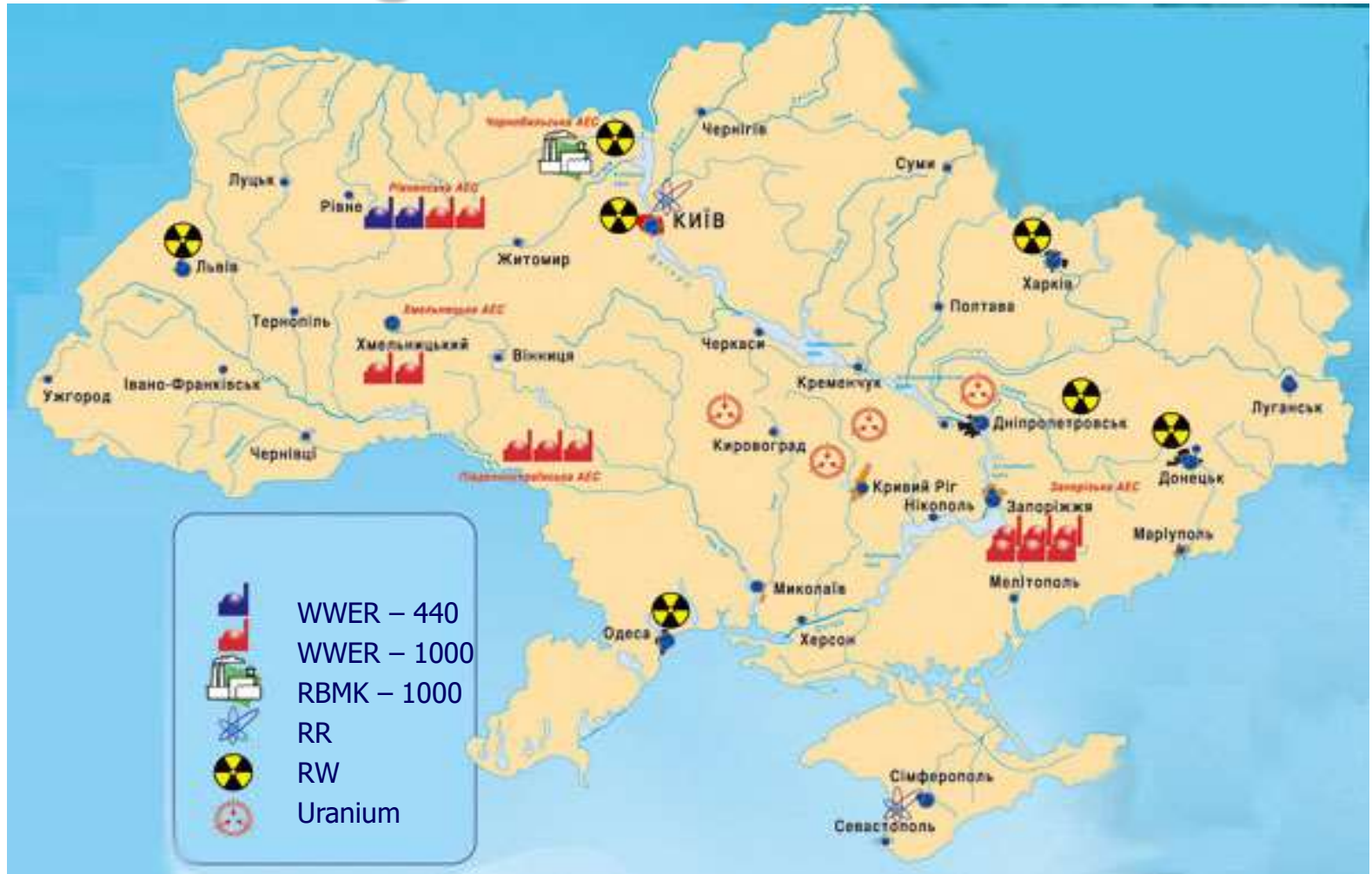
- Post-soviet industrialization: heavy industry, steel works, mining, military industrial complex
- High tech: IT, aviation, rocketry
- Science and research
- Medicine
- Hospitality sector
- Agriculture
- Education
- Nuclear power

Use of ionizing radiation in Ukraine

All IR applications except nuclear weapons
(gave up world third nuclear arsenal in 1994
after decay of the Soviet Union)

- 15 power reactors at 4 NPP produce >50% of electricity (now about 80%)
- Chernobyl NPP and Object Shelter at the stage of decommissioning
- Uranium mines
- Medicine, industry, research, education

Use of radiation and nuclear technologies in Ukraine



IR sources in Ukraine

According to the national registry of sources (2020/end of 2022):

- 25,248/26,558 RS, in particular –
 - 8,728/8,420 sealed isotopic sources and
 - 16,520/18,138 generators
- 4,531/4,620 users of RS (72%- medical use)
- 549 use sealed RS



What is this war about

In simple words

Russia: wants to privatize Ukrainian history, human and natural resources, continue multi-century domination, erase Ukrainian identity

Ukraine: don't agree with that and wants to use historical chance to gain independence and reunite with civilized world

Not much was known about Ukraine and Ukrainians

No great surprise - for last 350 years Ukrainians were in the shadow of Russia!
Popular concepts stemming from Russian view on things:

- “It is a part of Russia”
- Rich black soil, “bread basket of Europe”
- No prominent culture
- No distinctive national character

Just an example from a single area

Soviet space and rocket program actors:

Sergei Korolev (1907-1966)

Valentin Glushko (1908-1989)

Mikhail Yangel (1911-1971)

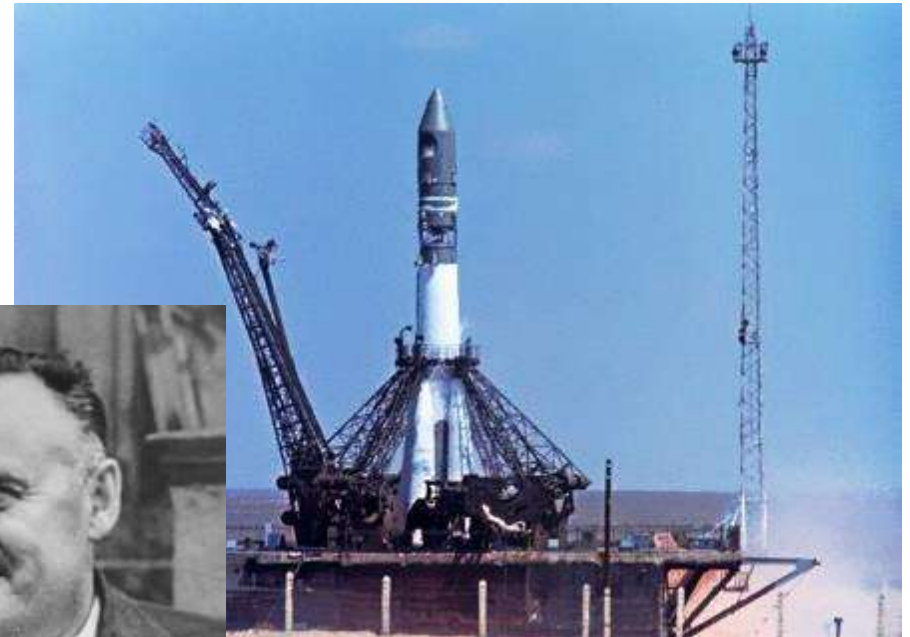
Vladimir Chelomey (1914-1984)

Gleb Lozino-Lozinskiy (1910-2001)



Sergei Korolev (1907-1966)

- Ukrainian born in Zhytomyr





Valentin Glushko (1908-1989)

- Ukrainian born in Odesa





Mikhail Yangel (1911-1971)

- Ukrainian born in Siberia (!)





Vladimir Chelomey (1914-1984)

- Ukrainian born in Poland (then Russian Empire)



Proton - 1965



Proton M - 2023



Gleb Lozino-Lozinskiy (1910-2001)

- Ukrainian born in Kyiv



Just an example from a single area

Soviet space and rocket program actors:



Sergei Korolev (1907-1966) – Ukrainian born in Zhytomyr



Valentin Glushko (1908-1989) – Ukrainian born in Odesa



Mikhail Yangel (1911-1971) – Ukrainian born in Siberia (!)



Vladimir Chelomey (1914-1984) – Ukrainian born in Poland (then Russian Empire)



Gleb Lozino-Lozinskiy (1910-2001) – Ukrainian born in Kyiv

More generally

... and myriads of engineers, scientists, statesmen, artists, writers, composers, entrepreneurs, religious and military actors of Ukrainian origin overshadowed by Russian/Soviet empire ...

But Ukraine is not Russia historically



U.S. Embassy Kyiv
@USEmbassyKyiv

...



3:32 PM · 22 февр. 2022 г. · Twitter Web App

4 148 ретвитов · 1 459 твитов с цитатами · 13,7 тыс. отметок «Нравится»

But Ukraine is not Russia mentally



But Ukraine is not Russia ethnically



But Ukraine is not Russia culturally



Ukraine's vulnerability to Russia



Budapest memorandum: the third largest nuclear arsenal (1240 warheads at 176 ICBMs + 2883 tactical warheads) was given up in 1994 against guaranties from nuclear states including Russian Federation



What is going on since 2014

War against Russia

- 2014 – annexation of Crimea and outbreak of the hybrid (proxy) war in Donbas



<https://detector.media/infospace/article/139392/2018-07-17-shcho-robyty-z-krymom-ta-donbasom-pislya-povernennya-zmi-mayut-shukaty-vidpovidi-vzhe-teper/>

Initial air strikes on February 24, 2022



<https://graphics.reuters.com/UKRAINE-CRISIS/WEAPONS/lbvgnzdnlpq/index.html>

Russia has military power superiority over Ukraine at least 5:1

In 1991

800,000

1,090/44

900/330

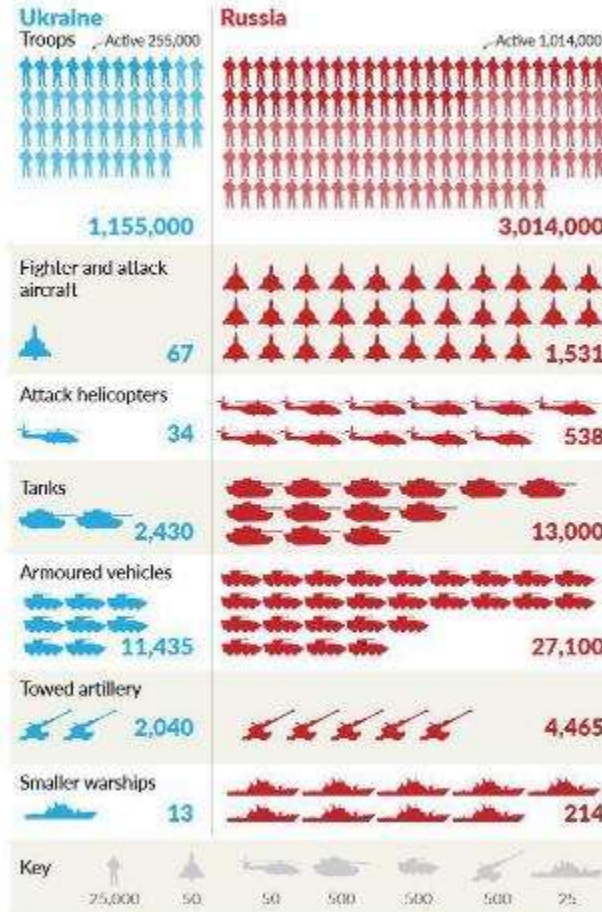
9,000

11,000

no data

850

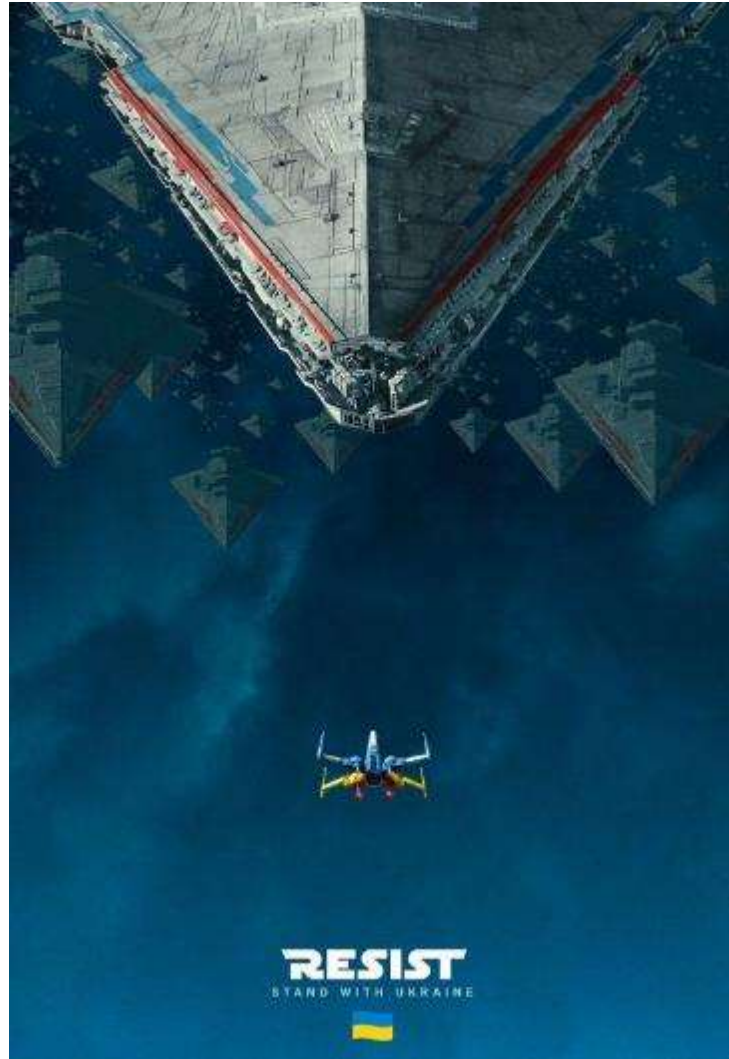
How the military forces compare



Source: Global Firepower 2021 | Graphic: Paul Scott/IRISH TIMES GRAPHICS

https://www.reddit.com/r/coolguides/comments/sa2gn3/ukraine_vs_russia_military_by_the_numbers/

Just to illustrate our starting positions



<https://www.facebook.com/theeuropennetwork/photos/a.1063590023758856/4937718226345997/?type=3>

Full scale war against Ukraine

- February 24, 2022 – invasion from several directions, up to 190,000 Russian troops



Full scale war against Ukraine

- April 3, 2022 – retreat of Russian forces from Kyiv area and northern Ukraine



<https://www.ft.com/content/4351d5b0-0888-4b47-9368-6bc4dfbccbf5>

Full scale war against Ukraine

- Occupied territories Feb 2022 – Feb 2023

Russia's invasion of Ukraine has slowed to a standstill as Ukraine has fought back

Full-scale invasion

Russia launches a full-scale invasion of Ukraine advancing on Kyiv, hoping for a quick victory



Pullback from Kyiv and redeployment to Donbas

Ukraine's strong resistance, and logistical and tactical errors by the Russian army force them to withdraw from Kyiv



Stalemate

During the summer months the Russians make little progress but some gains in the northern Donbas region



Ukraine's lightning offensive

In early September Ukraine conducts a lightning offensive around Kharkiv and regains thousands of sq km of territory



Russians retreat from Kherson

Russians forced to surrender the only provincial capital it had captured in the war



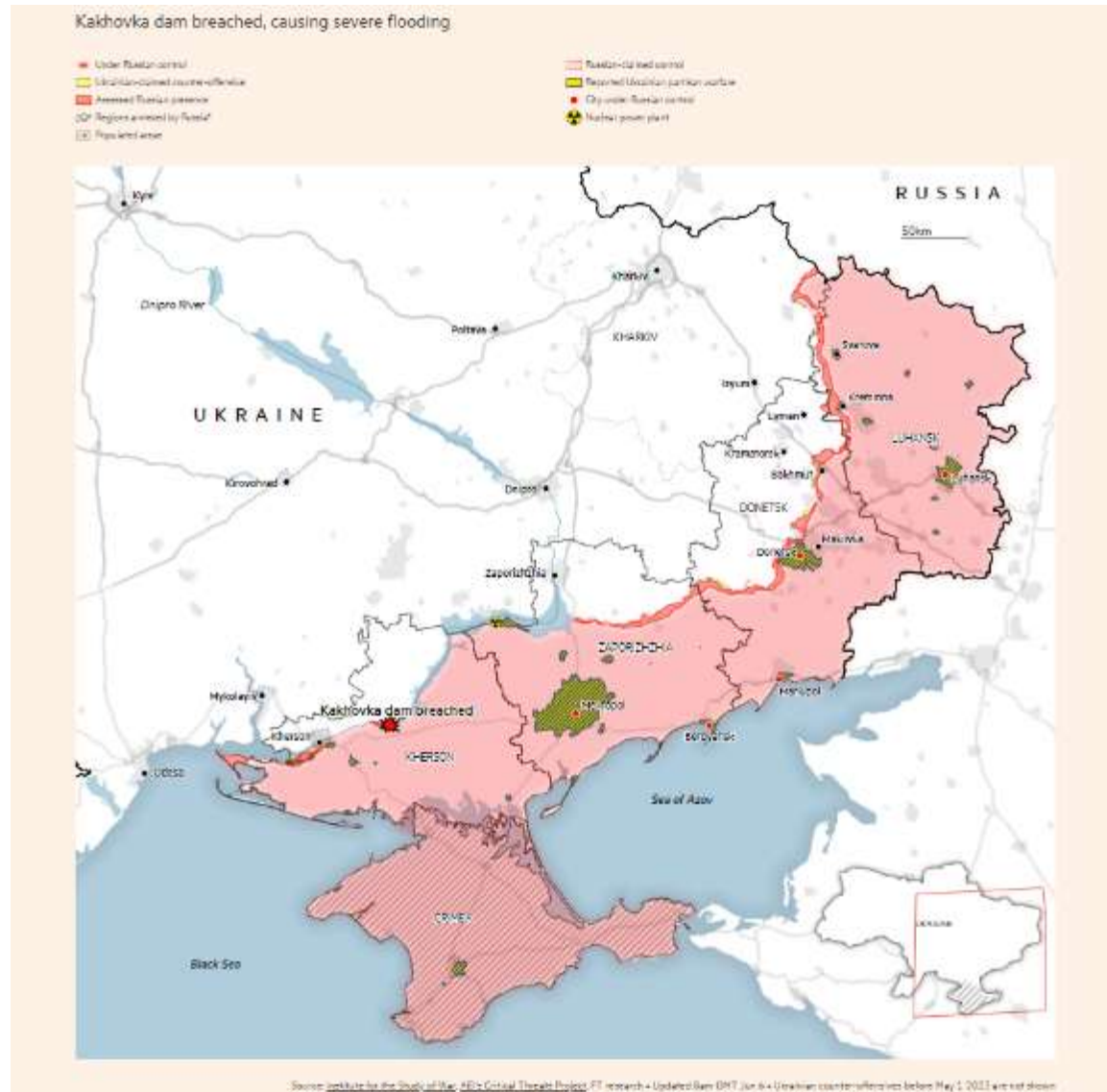
Slow advance on Bakhmut

After eight months of grinding combat, Russian forces are bearing down on Bakhmut



Sources: Institute for the Study of War; AEF's Critical Threats Project; FT research
© FT

Most recent status (06.06.2023)



<https://www.ft.com/content/4351d5b0-0888-4b47-9368-6bc4dfbcbf5>

NSFS, 08/06/2023

Military success of Ukraine

- High morale and strong motivation
- Mobilization of society
- Unexpectedly efficient defensive and offensive tactics of UA military
- Financial and material non-combat support of the civilized world
- Military supply led by USA, UK, Poland, Baltic states
- Intelligence support by allies

Military supply by country of origin (September 2022)

НАЙБІЛЬШІ ПОСТАЧАЛЬНИКИ ВАЖКОГО ОЗБРОЄННЯ УКРАЇНИ



Володимир Довженко
@Volodymyr.D

<https://www.ostro.org/ua/general/society/news/648229/>

Local and global detriment

- Loss of lives of fighters and civilians
- Unseen atrocities
- Loss of housings
- Loss of infrastructure
- Refugee crisis
- Global food crisis
- European energy crisis
- Global trade problems
- Ecological disaster
- Radiological threats

Ukraine's losses – civilian targets



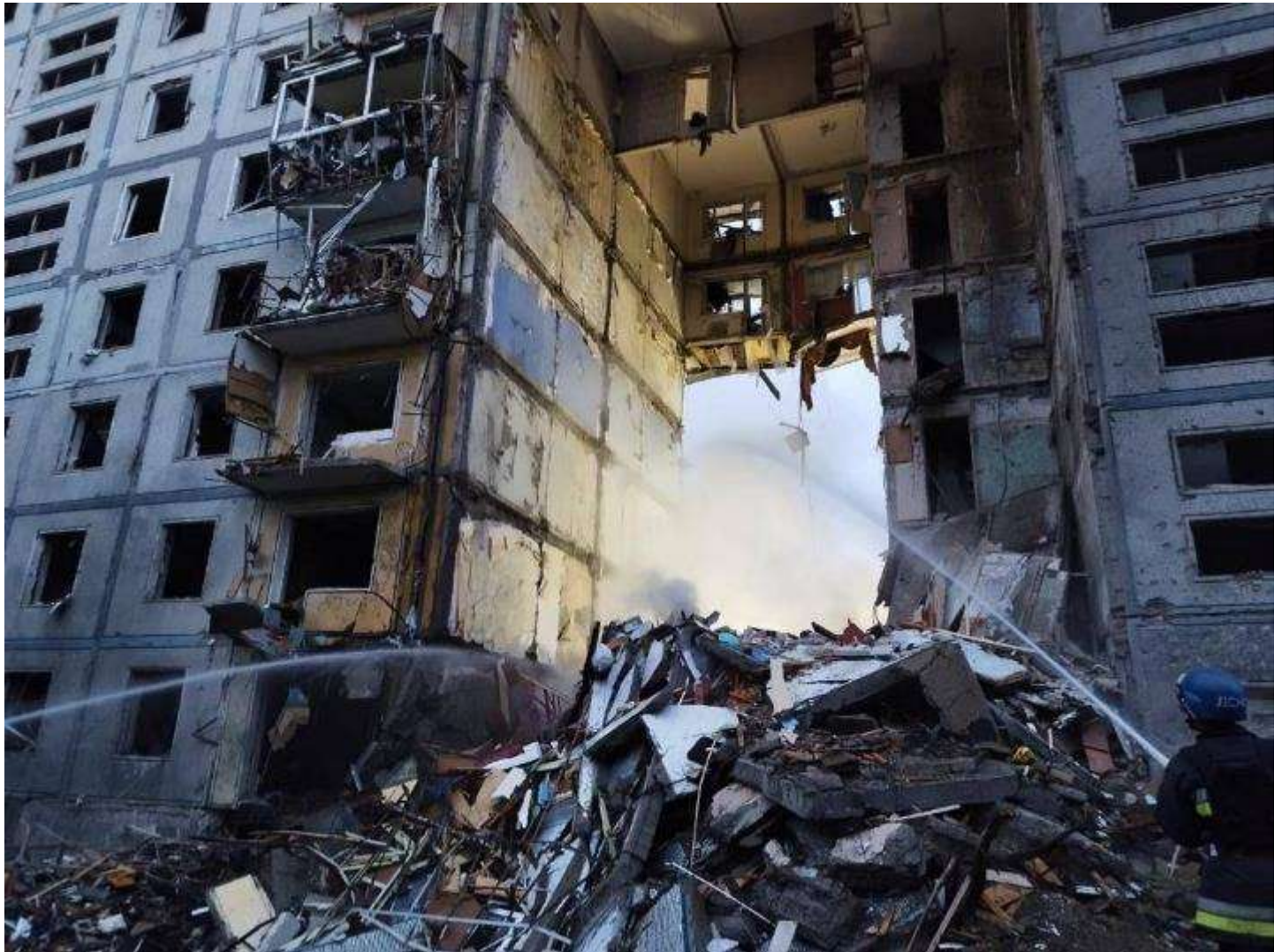
Top - A residential building destroyed by shelling in the settlement of Borocypka in the Kyiv region, Ukraine, March 3, 2022. Picture taken from a drone. (Rita Tiro/Reuters/Liaison)

Middle - Surveillance footage shows a missile hitting a residential building in Kyiv, Ukraine, February 24, 2022. (AP Photo/Markus Söder)

Right - Firefighters work to extinguish a fire caused by a gas cylinder in Kyiv, Ukraine March 2, 2022. (AP Photo/Sergey Gornenko)

<https://graphics.reuters.com/UKRAINE-CRISIS/WEAPONS/lbvgnzdnlpq/index.html>

Ukraine's losses – civilian targets



“Missile graveyard” in Kharkiv



“Missile graveyard” in Kharkiv



May 2023 – the hottest month is a year

Russia fired more than 560 missiles and kamikaze drones at Ukraine during May

- 400+ drones
- 150+ missiles

29.05.2023
(00.00 - 05.00)

ЗНИЩЕНО:
 - 37 крилатих ракет Х-101/Х-555
 - 29 ударних БПЛА «Шахед-136/137»
 - 1 розвідувальний БПЛА (ОТР)

Президент Сили



Russia attacks Kyiv and Ukraine almost everyday

- May 1
- May 3
- May 4
- May 5
- May 6
- May 8
- May 9
- May 13
- May 14
- May 16
- May 17
- May 18
- May 19
- May 20
- May 22
- May 23
- May 25
- May 26
- May 28
- May 29
- May 30



У травні виключно над Києвом знищено*:

- 7 АЕРОБАЛІСТИЧНИХ РАКЕТ "КИНДЖАЛ"
- 13 БАЛІСТИЧНИХ РАКЕТ "ІСКАНДЕР"
- 65 КРИЛАТИХ РАКЕТ:
 Х-101
 Х-555
 "КАЛЬБР"
- 169 БПЛА

*орієнтовні дані

Refugee crisis



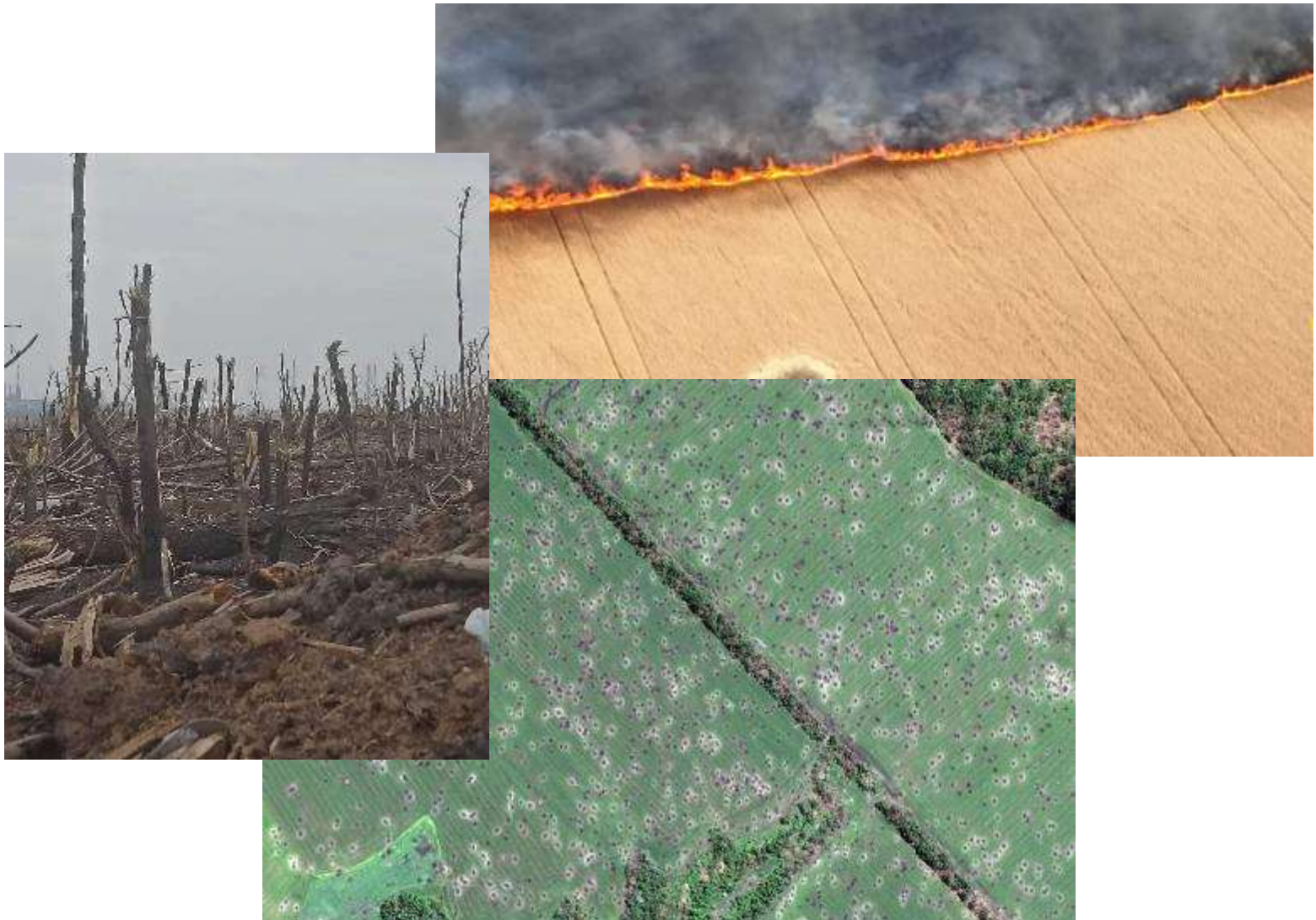
Note: The Crimean peninsula was annexed by Russia in 2014, but the region is not internationally recognised as part of Russia.

<https://graphics.reuters.com/UKRAINE-CRISIS/zdpxokdxvx/>

Demographic crisis



Ecological disaster

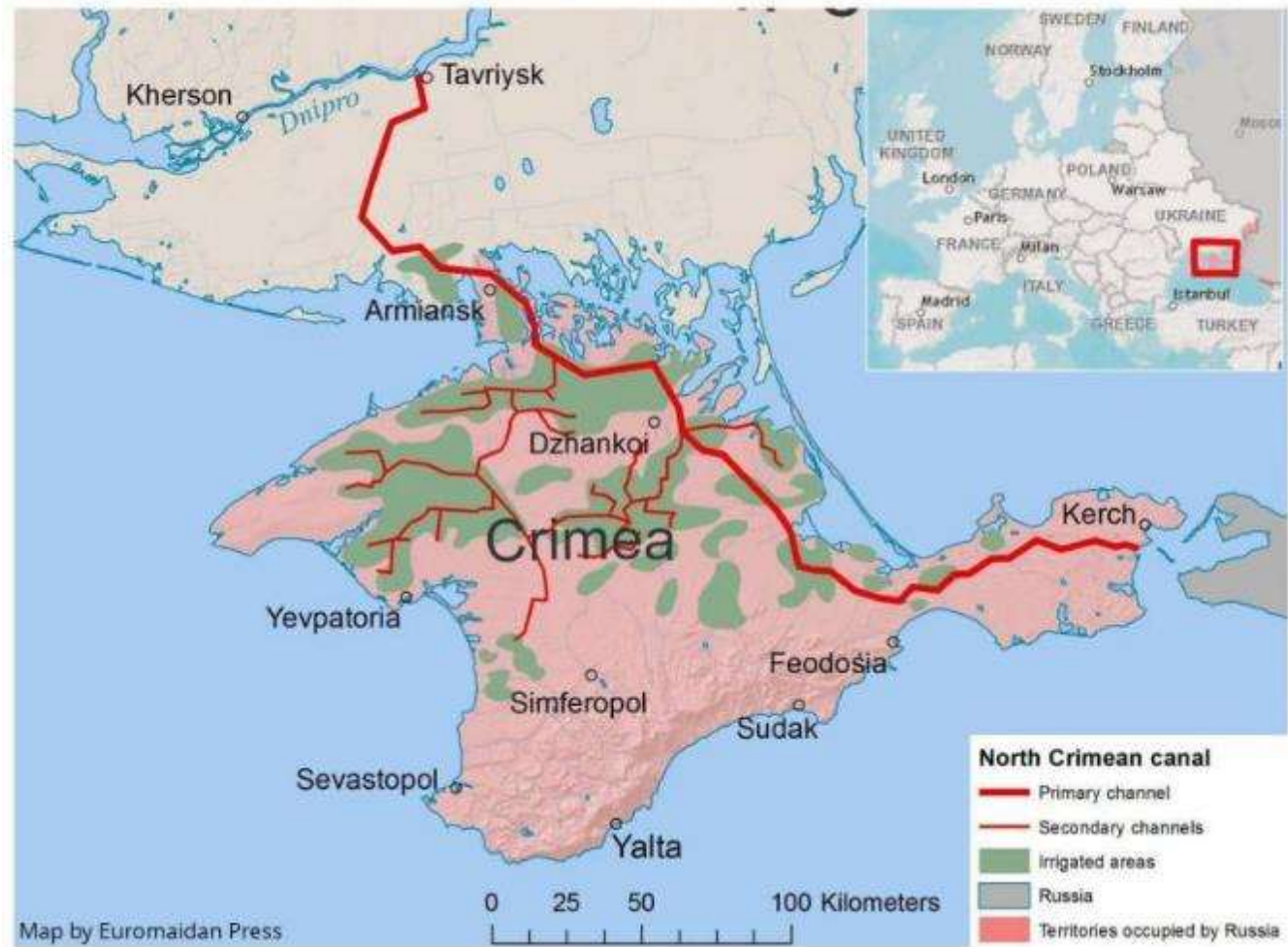


Ecological terrorism - Ecocide



Ecological terrorism – long term consequences

THE NORTH CRIMEAN CANAL: CRIMEA'S WATER LIFELINE





Radiological threats

Current radiological threats

- Russian control over ChNPP and the Exclusion Zone (Feb 24 – Mar 31, 2022)
- Russian control over Zaporizhzhia NPP (Mar 4, 2022 – present)
- Lasting bombardment of nuclear facilities in Kharkiv
- Problem of stolen and destructed sources
- Threat of a nuclear attack

Chornobyl case

- ChNPP personnel was captured and kept a gunpoint for almost a month
- Some equipment was destroyed or stolen
- Radiation monitoring network disabled
- Radiation safety rules violated



https://news.online.ua/karta-mira-bez-rossii-nabiraet-populyarnost-v-seti_n831660/

<http://ukr.radio/news.html?newsID=98408>

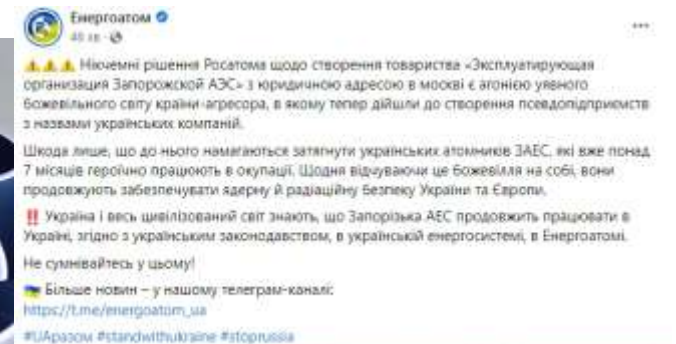


Zaporizhzhia NPP case

- Under control of Russian forces since March 4, 2022, operated by Ukrainian Energoatom corporation
- Artillery fire at the time of capturing and afterwards
- IAEA mission end of August 2022
- Cold shutdown of all reactors since Sep. 2022
- Permanent provocations

Zaporizhzhia NPP case

- Putin's decree of subordination of the ZNPP to Russian Rosatom
- Wild looting of equipment

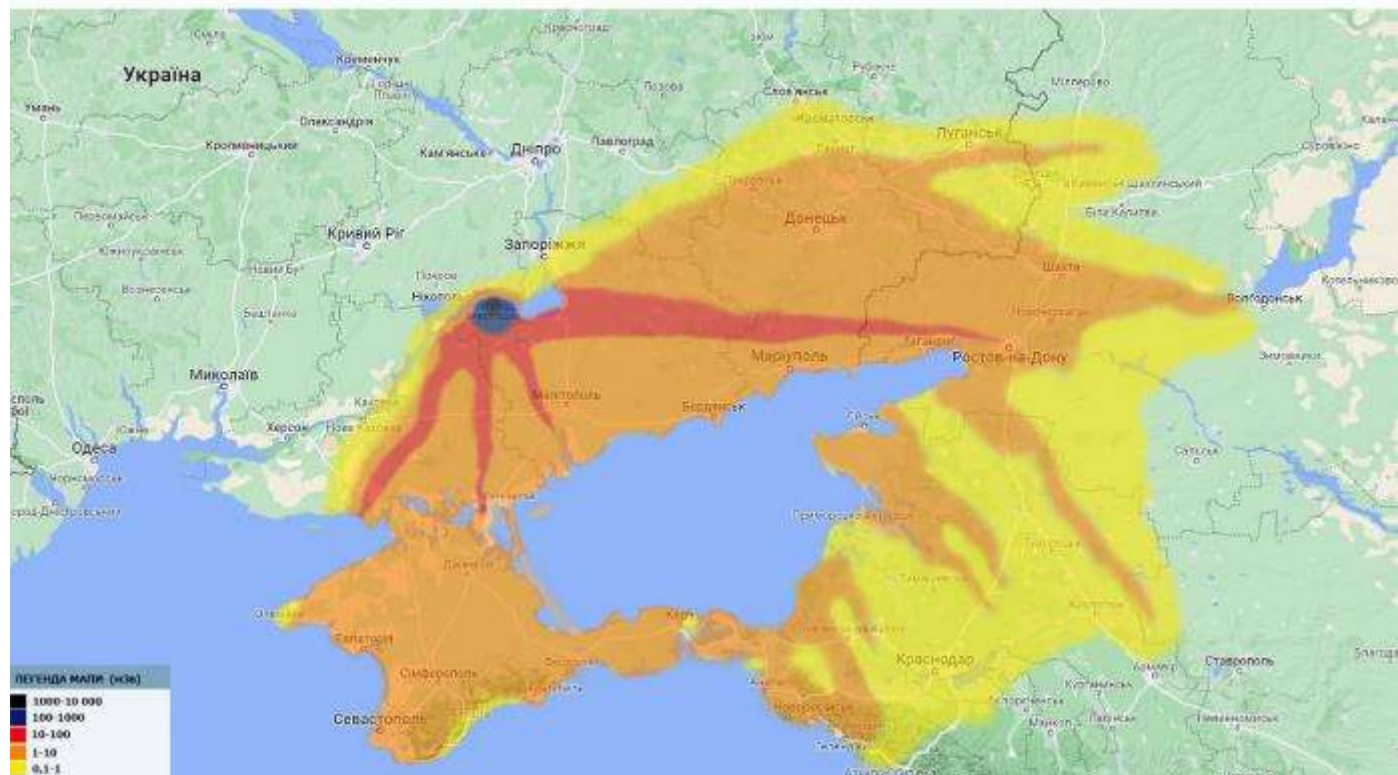


<https://war.obozrevatel.com/ukr/rijte-glibshe-sidit-dovshe-okupanti-vikopali-okopi-v-rudomu-lisi-v-zoni-chaes-yakij-prijnyav-na-sebe-najbilshe-radiatsii.htm>

Zaporizhzhia NPP case

- Modeling of release and air transport

Сумарна доза від усіх джерел, потенційна за 14 днів



Ukrainian Hydrometeorological Institute ©

Ukraine's power grid and NPPs




<https://graphics.reuters.com/UKRAINE-CRISIS/ZAPORIZHZHIA/mypmznjqvr/>

Problem of orphan sources

- Destroyed or severely damaged factories and hospitals (i.e. Azovstal steel works)



<https://biz.nv.ua/ukr/markets/yakim-bude-noviy-zavod-ahmetova-v-yes-ta-chomu-zminilisyaplaninovini-ukrajini-50270613.html>



Situation dynamically changes, so prioritization of radiological threats and challenges evolves day by day.

At the moment (June 8, 2023) the scenario of nuclear terrorism at ZNPP is on the top of the threat list - may change at any moment



Outlook of the war – Ukrainian aspiration

Ukraine's slogan

WE ARE NOT AFRAID.

@ukraine.ua

Full scale war against Ukraine

- Bitter reality



Full scale war against Ukraine

- Historical inspiration

“You ask, what is our aim? I can answer in one word. It is victory, victory at all costs, victory in spite of all terror, victory, however long and hard the road may be; for without victory, there is no survival.”

— Winston Churchill

Full scale war against Ukraine

- Resistance in progress



Full scale war against Ukraine

- Resilience



Full scale war against Ukraine

- Resilience



Full scale war against Ukraine

- The price we pay



Full scale war against Ukraine

- Russia's miscalculation



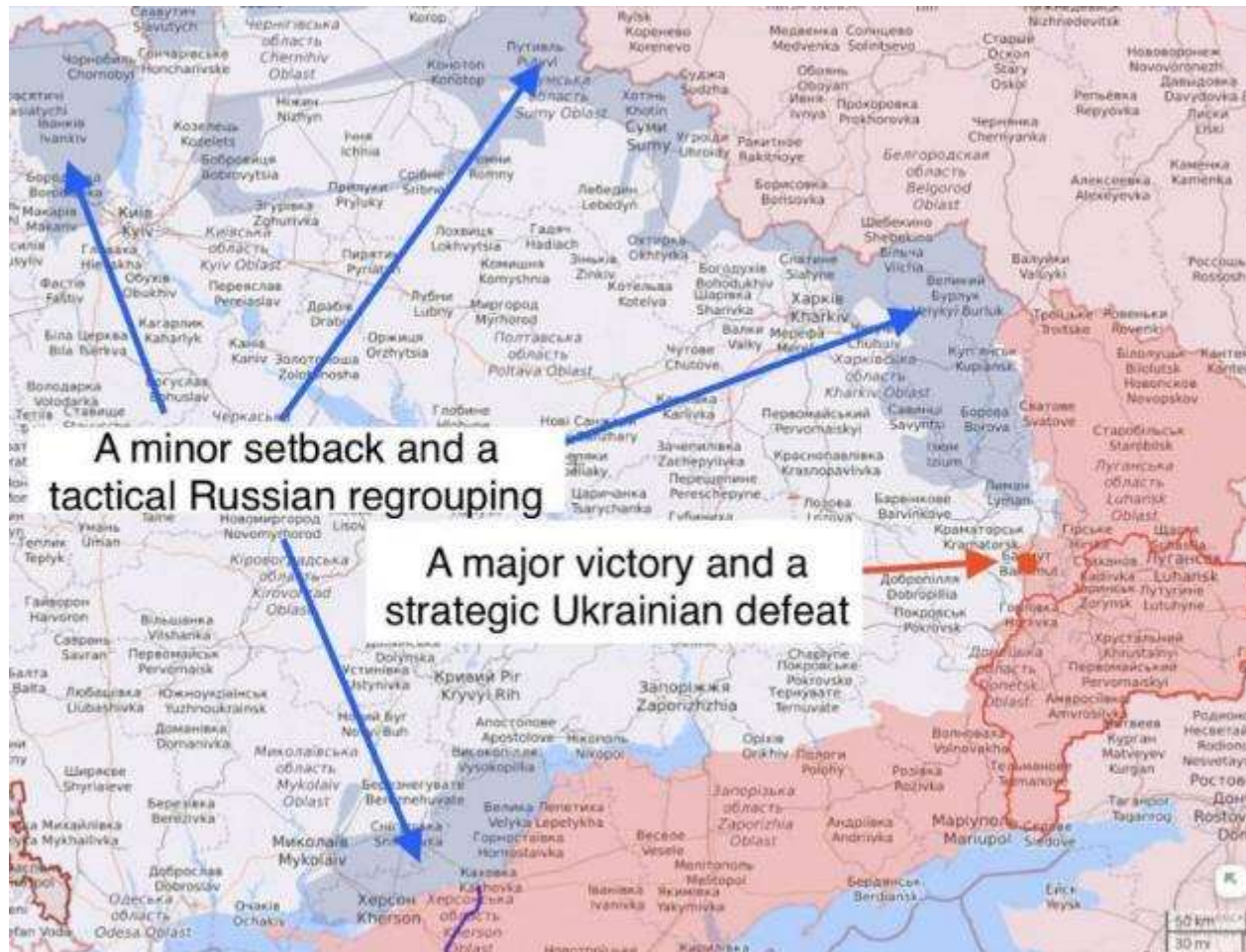
Full scale war against Ukraine

- News from the Evil Empire



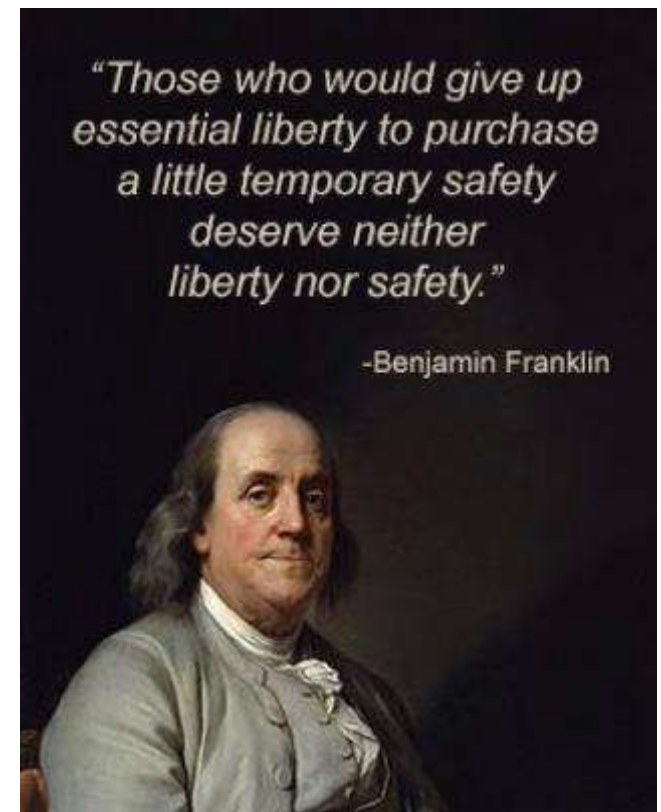
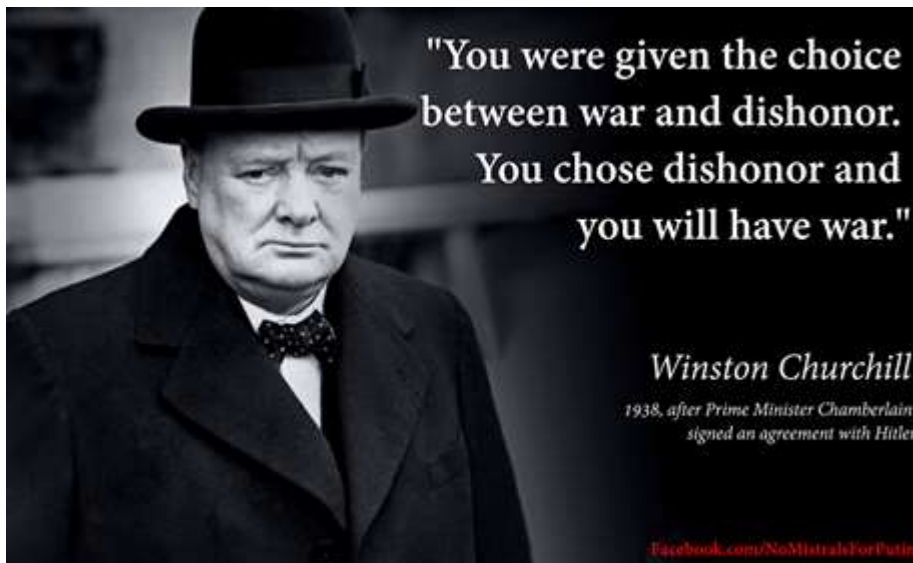
Full scale war against Ukraine

- News from the Evil Empire



Full scale war against Ukraine

- Common understanding by Ukrainians



Full scale war against Ukraine

- Attitude to “peace talks” and “peace plans”





What will be the war ending

Full scale war against Ukraine

- Desired final



Orazio Gentileschi (1563-1639)
**“Public Felicity Triumphant
over Dangers” (1625)**

Louvre, Department of
Paintings, room 716, INV. 6809

Full scale war against Ukraine

- Anticipated outcome (idealistic view)



https://news.online.ua/karta-mira-bez-rossii-nabiraet-populyarnost-v-seti_n831660/

Full scale war against Ukraine

- Anticipated outcome (also okay)



<https://49000.com.ua/mir-bez-rossii-v-seti-nabraet-populyar/>

Full scale war against Ukraine

- Anticipated outcome (most likely)





Instead of conclusions

Thanks to all the Nordic countries for continuing support in our epic battle against the Evil Empire!



Remember the cost
Ukrainians have paid and
continue to pay fighting
fascism and ruscism



Слава Україні – Glory to Ukraine

