Input to **AN ENVIRONMENTAL COMPACT FOR UKRAINE**

A Green Future: Recommendations for Accountability and Recovery

by the **High-Level Working Group on the Environmental Consequences of the War**

Assessing Environmental Damage in Ukraine

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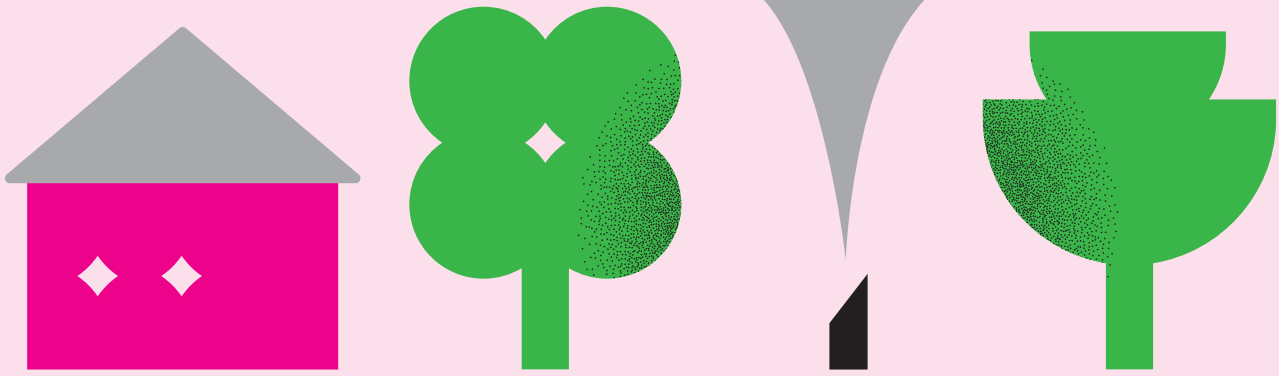

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Conflict and Environment Observatory

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Overview

The intensity and visibility of wartime environmental damage in Ukraine has helped focus attention on who is collecting data, and for what purpose. On the surface, the conflict's consequences are very well documented by historical standards, yet a deeper assessment reveals considerable gaps in the country's capacity for data collection and analysis, which unless addressed, will threaten Ukraine's recovery and accountability goals.

1. Introduction

The environmental consequences of Russia's full-scale invasion of Ukraine are arguably better documented than any conflict in history.[1] The reasons are manifold but include the penetration and utilisation of digital technologies, the accessibility of satellite-derived imagery, and the intensity of the conflict and severity of its environmental harms and risks. Similarly, the conflict's environmental narrative enjoys a far higher profile because of energetic advocacy by Ukraine's government, as well as the activities of domestic and international civil society and international organisations. That it built on existing environmental narratives linked to the previous eight years of conflict in the Donbas region has also helped, as has increasing societal concern and media interest on environmental issues globally, together with Ukraine's focus on accountability for war crimes.

Taken together, these factors are creating expectations around the environmental dimensions of accountability and recovery. Historically and globally, wartime environmental damage and degradation, which are often exacerbated by weakened or distracted governance, has tended to be a low priority, going unaddressed, even where it is detrimental to human and ecosystem health, and to livelihoods and sustainable development. Accountability for conflict-linked environmental harm is underdeveloped, while environmental recovery, and the opportunities it can provide, struggles for attention in the face of economic or humanitarian priorities, which are often framed as competing, rather than complementary objectives.

Environmental data is foundational for accountability. It is also vital for informing recovery and reconstruction planning. Data collection and analysis methods can vary significantly depending on the purpose for which that data is intended to be used. Hence the modalities of collection and analysis warrant consideration. More fundamentally, at present, and in spite of the efforts of numerous stakeholders, substantial gaps remain in Ukraine in what data is collected, by whom and for what purpose. Unless these gaps are addressed, Ukraine may struggle to meet its accountability and recovery objectives.

2. The scope of environmental harm

Spanning frontlines hundreds of kilometres long, marked by high-intensity mechanised conflict with the intensive use of explosive force, and together with nationwide attacks on environmentally hazardous infrastructure, the invasion's environmental consequences have been widespread and profound.

Trends of particular concern include: chemical releases and pollution risks from damaged industrial and energy facilities;[2] the catastrophic and ongoing risks associated with the unprecedented militarisation of nuclear sites; threats associated with air quality and solid waste management from the devastation of towns and cities; the economic and ecological consequences of widespread damage to arable and natural land; the pollution

of water resources and sometimes catastrophic destruction of water infrastructure;[3] pollution and ecosystem disturbance in coastal and marine areas;[4] as well as greenhouse gas emissions and increased vulnerability to the effects of climate change.[5]

3. The data collection ecosystem

It is a perverse irony that armed conflicts impede the collection of environmental data at a time when environmental stress can be at its most acute. As with other fields of conflict monitoring, today, the growth of social media use and increased access to satellite imagery have enabled remote environmental analysis and assessment in near real time. While remotely gathered data does have limitations, it can both guide and be enhanced by field data collection, whether this is undertaken by national authorities, international organisations, or affected communities.[6]

Prior to the full-scale invasion, Ukraine had a relatively well-developed national system for environmental data collection, comprising state and civil entities operating manual and automated systems, including for air, water and soil quality, radiation risks, climate and biodiversity. Events in Crimea and the industrialised Donbas had already posed significant challenges concerning the collection of data and environmental management in these areas.[7]

Since February 2022, the data collection ecosystem has undergone rapid change in response to the conflict. Both state and civil society entities previously engaged in routine environmental work have had to reorient themselves towards the threats being generated by the conflict. In many parts of the country elements of the pre-existing monitoring architecture have been disrupted or altered, with access denied, equipment lost and experts internally or internationally displaced, or drafted.[8] Meanwhile new stakeholders have engaged, including international organisations, NGOs and academic experts. A number of organisations based outside Ukraine, such as partners in wildlife conservation or other environmental projects, and which were engaged in pre-existing activities, have also reprioritized their work.

4. Current data collection stakeholders

As with other fields, the initial response to the full scale invasion was chaotic, and many initiatives evolved organically as entities rushed to engage and assist. At the time of writing, there is a developing trend towards improved coordination and complementarity, but this has some distance to travel. And objectively, in many cases data is and will continue to be collected in isolation or for specific purposes. In common with most areas affected by conflict, the collection of physical data in the field remains limited — in part because of the access, capacity and finance constraints common to such settings.

Broadly speaking, at present the primary stakeholders engaged in collecting data on the environmental impact of the war comprise: the government of Ukraine (the Ministry of Environmental Protection and Natural Resources (MEPNR),[9] specialised bodies and agencies (see below), and the Office of the Prosecutor General), domestic and international NGOs, and various intergovernmental organisations — whether environmental, humanitarian or development-oriented.

To the extent possible, regular monitoring activities continue to be implemented by the various central and sub-national authorities (see table 1). In some regions and cities, a considerable volume of environmental data has traditionally been collected through monitoring networks operated by regional or local authorities. Major industrial enterprises conduct their own emission monitoring too. Environmental statistics are collected and summarised by the State Statistics Service.[10]

Regarding the collection of data on environmental damage from the war, the MEPNR and the State Environmental Inspectorate (SEI) have perhaps the most prominent role among the government bodies.[11] The MEPNR developed and operates a dedicated platform *EcoZagrosa* ("Environmental risk") to also allow the public to submit reports of environmental damage.[12] As MEPNR's operational branch under its direct command, the SEI has been tasked with collecting damage data in the field wherever this is possible. The SEI also assists the Office of the Prosecutor General in data collection for eventual litigation. In many instances, when it comes to major

Table 1. Regular monitoring activities by Ukrainian state authorities.

State authority	Environmental monitoring focus
Ukrainian Hydrometeorological Center operating under the State Emergency Service.	Air and water quality, radiation, hydrological regime of rivers and lakes.
State Agency of Water Resources.	Water quality and hydrology.
Ukrainian Geological Survey.	Groundwater quantity and quality.
State Environmental Inspectorate.	Emissions of polluting substances at the source or enterprise level, including water discharges, soil and groundwater pollution.
State Consumer Protection Service.	Drinking water quality control and food safety.
MEPNR's Department of Nature Protection.	Monitoring of wildlife in protected areas.

cases of damage, the two organisations work in the field together. At the onset of the full-scale invasion, they established an interagency task-force called the joint *Operational Headquarters* at the SEI to coordinate this work. Due to the much extended scope of the SEI's work in response to the invasion, the agency has experienced human and technical capacity constraints around the volume of data it can collect, and how collection and analysis is standardised. This is of course exacerbated by the difficulties, or sometimes impossibilities, the SEI faces in operating in areas close to or behind the front lines.

Many prominent Ukrainian civil society organisations significantly reoriented their work to assess and address war damage. These include: Environment People Law, which had extensive experience in collecting conflict-linked data prior to February 2022;[13] EcoAction, which developed an online damage map and network of volunteers to support it;[14] and Save Dnipro, whose previous work on pollution had led them to develop the SaveEcoBot platform for increasing public access to pollution information.[15] This list is far from exhaustive, and in addition to Ukraine's diverse landscape of environmental NGOs, academic experts have also contributed — including the Kiev School of Economics,[16] together with specialised entities and networks like the Regional Eastern Europe Fire Monitoring Center,[17] and the Ukrainian Nature Conservation Group.[18]

International civil society is also contributing. Zoï Environment Network and the Conflict and Environment Observatory (CEOBS) undertake complementary and increasingly collaborative remote monitoring. Specifically, Zoï Environment Network's *Ecodozor* public platform seeks to capture the breadth of environmentally harmful incidents and likely areal impact,[19] while CEOBS undertakes deep risk analyses of the incidents in its private database, with ephemeral social media evidence archived daily for legal purposes.[20] The humanitarian data platform REACH has published on some incidents,[21] an incident database is also maintained by the Dutch NGO PAX, and thematic data is collected by a range of academic institutions globally. Data collected by the likes of NASA Harvest,[23] and the US government-backed Conflict Observatory includes themes relevant to the environment.[24]

International and intergovernmental organisations have engaged to support data collection. The OSCE has long-standing programmes linked to the environmental dimensions of conflict in eastern Ukraine, and financially supports the work of Zoï and CEOBS, together with other actors. It is also providing technical support to the MEPNR and the SEI. UNEP too provides financial support for NGO-led remote monitoring, as well as in-country capacity-building and support. Data collection and analysis are an increasingly prominent part of the work of the UNDP, including through its Coordination Centre for Environmental Damage Assessment, funded

by Sweden.[25] FAO, the IAEA and the World Bank are also among the many actors gathering data of relevance to the environment, including the assessment of monetary implications of the damage.[26]

While the institutional landscape above is developing organically, there has been a considerable degree of spontaneous bottom-up and lateral interaction and coordination. Concerns over the lack of coordination among international actors have been regularly voiced. In response, a *'comprehensive overview of environmental damage assessments in Ukraine to support coordination between actors, identify needs, and recommend means to support remediation measures to address environmental damage caused by the war in Ukraine'* was undertaken in late 2023 in order to provide an overview of which national and international actors are doing what.[27]

A final point to consider is the balance between incident-based monitoring and the monitoring of trends. Many of the actors mentioned above take an incident-based approach. While focusing on incidents is perhaps unsurprising in areas affected by conflicts, monitoring trends across greater geographical and temporal scales is also important. This might include issues such as forest loss, agricultural abandonment, the growth and distribution of earthworks and craters or the loss of ecosystem services. Several of these issues may also be closely connected to indirect impacts of the conflict, such as changes in environmental governance, demographics and economics.

5. Gaps in data collection

The preceding introduction to some of the key players in the data collection ecosystem is not exhaustive. But even in summarised form it demonstrates its diversity and the potential for duplication of effort, and hence the importance of coordination and purpose. Indeed, the scale of the environmental data response to the full-scale invasion led some experts to observe that the large volume of information was in itself a problem. Yet in spite of the range of actors involved, there remain gaps in data collection that need to be addressed. Below we consider some of the gaps relevant to the Working Group's three priority areas: early response, environmental accountability, and the environmental dimensions of recovery and reconstruction.

5.1 Gaps in data collection for early response

In this context, early response covers the initial steps that can be taken to identify and minimise environmental risks at particular locations, for example conducting a site assessment to determine the actual — as opposed to potential — extent of pollution, and the harm that might be associated with it, whether to people or to components of the environment, like water bodies.

For many sites, physical access remains problematic, due to the proximity to frontlines or the presence of unexploded ordnance. Where safe access is possible, the barriers chiefly relate to war-time administrative limitations — even safe areas may be barred for access for no obvious reasons — and to human capacity. As noted above, the role of the SEI has expanded considerably in response to the full-scale invasion. Their work, along with that of some other government entities tasked with environmental assessment, has become far more technically complex and challenging, requiring new skill sets. For example, many SEI staff do not have access to, or skills in, using satellite remote sensing for prioritising and planning field assessments.[28] Similarly, some pre-existing staff capacity has been lost due to people relocating, being drafted or leaving posts.[29]

Alongside building Ukraine's human capacity for assessment, support is required for its technical capacity. This is particularly the case for ensuring that it has sufficient certified laboratory capacity for rigorously analysing the wide range of pollutants of interest associated with the damage to date. The same applies for other state entities such as protected area authorities, many of which have seen equipment necessary for data collection and analysis looted or destroyed, or repurposed for the war effort. Additionally, networks for the automated monitoring of environmental components need to be restored, where possible, and expanded (see 5.3 below).

5.2 Gaps in data collection for accountability

At the international level, accountability for environmental damage in relation to armed conflicts is underdeveloped, both in terms of criminal liability, and monetary reparations. This lack of precedent means that there is no common international standard for wartime

environmental data collection and retention that can easily be translated to and applied in Ukraine.

And even though equivalent approaches in peacetime are well developed, with formulae for determining costs commonplace, in Ukraine the situation has been complicated by conceptual differences between the function of the environmental liability systems in Western Europe and the US, on the one hand, and Eastern European and Central Asian countries on the other; this heavily influenced the government's accountability priorities during 2022.[30] A further contributing factor is the limited human and technical capacity of the Office of the State Prosecutor for analysing environmental crimes, which has impeded work towards cases under Ukraine's domestic ecocide law.

Another challenge lies in the methodological approach taken to assessing war-damaged sites. Nationally, the SEI currently lacks a standardised methodology that can inform assessments across a range of different facility types, such as industries or water or energy infrastructure. Developing one that meets international standards would be a significant undertaking but would be useful for ensuring consistency. Enhanced coordination and data sharing are also important to reduce duplication of effort, particularly on the domestic level.

Because the precise international avenues through which Ukraine might seek accountability for environmental harm were unclear from the outset of the full-scale invasion, this placed a particular onus on ensuring that data collection, analysis and storage were done well. And because the rules on what will constitute acceptable evidence of harm will be agreed by that future process — together with the approach for monetary valuations — it was, and remains important that evidence gathering and analysis meets international standards with, for example, clear chains of custody. Any data gathered *must* be defensible (see table 3).

However, a requirement from Ukraine's parliament in 2022, and directed at all ministries, led to a strong emphasis on the MEPNR developing domestic methodologies to place a monetary value on the damage, rather than on evidence collection, analysis and storage *per se*. While the methodologies developed to-date have had some use in publicly communicating environmental narratives around the degree of harm,[32] it is unlikely that they will greatly assist a future compensation case unless aligned with international best practice. In this respect, it would be advisable to develop a clear strategy for ensuring that data is collected to recognised international standards, with the aim of it eventually being an integral part of the recently created Hague Register of Damage.[33] Such a strategy should ensure that thought is given to navigating complexities such as distinguishing legacy contamination at sites from pollution linked to the current conflict, and of how the wealth of remotely gathered data can be merged with field data, models, and assessments of the potential risks to human health, to biodiversity, to ecosystem services and to the cultural and amenity value of Ukraine's environment.

This process will be complicated by incomplete baseline data for many facilities. It is a somewhat different situation for the administrations of protected areas, whose staff were obliged to record ecosystem observations and keep "Chronicles of Nature", continuous logs of abiotic and biotic phenomena and anthropogenic influences.

5.3 Gaps in data collection for recovery and reconstruction

Ukraine's environment has sustained damage that will take years and decades to recover from, where this damage is not already irreversible. The war has also changed Ukraine's system of environmental governance. Over the longer term, the demands of EU membership will evolve, changing both governance, and the way that information is handled and used. Nor is public opinion static, and it can reasonably be anticipated that expectations around the government's environmental performance will also grow. The immediacy of the conflict demands attention but so too do questions over the longer-term needs of Ukraine's environmental recovery. The environment is typically a low priority in post-conflict recovery, yet its visibility during this current phase of the conflict holds open the opportunity for Ukraine to do things differently.

Central to any longer-term planning is fully understanding the harm today, both in terms of damage already wrought but also in terms of understanding how the trajectory of wartime and recovery policies may impact the

Table 2. Indicative checklist for evidentiary environmental data collection, developed by Industrial Economics Incorporated.[31]

Planning	• Define objectives for collection. • Identify an approach to meet objectives. • Identify quality requirements (how you will know collected data meet your needs). • Define documentation approach (file and sample naming conventions, which drafts and documents to keep). • Lay out process documentation and standard operating procedures. • Define allowable exceptions and the approach to documenting those exceptions.
Data collection	• Document location and time in a standardised way (GPS units ideal, photographs of known markers). • Keep original paper documents (but also scan them). • Keep original electronic copies of photographs and other electronic data, without compression and with associated metadata. • Keep logs/field sheets documenting who went where when and what they did and what they saw. • Annotate logs with corresponding picture and sample identifiers. • Use chain of custody forms to document storage and transfer of physical items. • Encrypt transfers of electronic data to ensure data integrity (and if appropriate, use integrity verification approaches such as checksums).
Data analysis	• Automate whenever possible – well-documented and well-versioned code is the best way to ensure reproducibility and traceability. Use code repositories such as github. • Outputs should always indicate which code version (or model version) and the versions of data inputs that are used. • Readme or other documentation should indicate the approaches taken, the rationale behind each step, and the appropriate references and citations for the work.

Table 3. Chains of custody: Three important components for data defensibility

Data lineage	This includes chain-of-custody, but also the retention of metadata e.g. documenting that photos or drone footage were taken at a specific location on a specific date, and in a specific compass orientation. If date and location is not electronically documented in photographic evidence, it makes it hard to assign confidence to their provenance.
Fieldwork records	Maintain comprehensive records of field work, e.g. photographing GPS units when at a sample location to document the work, as well as who did the field work, etc. While time consuming, this creates a record that refutes arguments over data lineage.
Field data protocols	Field data collection should follow standard protocols, but whose parameters are modified in an agreed and acceptable manner to allow for the unique challenges of documenting the harms of military conflict, such that the results will still be applicable. E.g. sample site locations: if the site is inaccessible due to antipersonnel mines, provide a reasonable basis for selecting an alternative location.

environment in future. This should help inform a comprehensive strategy for restoring and expanding monitoring, and for ensuring the ongoing surveillance of trends.

At present, Ukraine's current observation and analytical capacities are damaged and need to be restored. After the war, more such capacities will be needed and they will need to be aligned with EU requirements and trends. This restoration should include technical support and funding for Ukraine's state system for monitoring atmospheric air, and surface and groundwaters, which will be necessary for Ukraine's compliance with EU Directive 50 on air quality, and the Water Framework Directive. It will also be necessary to understand the changes to Ukraine's land resulting from the war, so support is also needed for land cover mapping to the EU's CORINE standard.[34] And, in alignment with a wider accountability strategy, technical and methodological support will be needed for calculating losses in terms of costs of emissions, discharges, land reclamation, and so on. These data capacity objectives would be greatly facilitated by closer cooperation between Ukraine's national authorities and the European Environment Agency.

Beyond ensuring that the MEPNR and its agencies have the technical and human capacity in place to support the ongoing monitoring of the environment, and the policies that can impact it, public engagement and participation will be key. Ukraine already has an established system that facilitates interactions between NGOs and the government,[35] however this should be strengthened and made more representative and inclusive, including by increasing representation from community and grassroots environmental organisations and activists.

In addition to domestic instruments,[36] public opinion will provide the mandate for an environmental recovery, which would be strengthened by ensuring public participation in it. This should include but not be limited to: citizens' assemblies; transparency in decision-making; and public access to environmental information. Ukraine has already made positive steps on this, launching public access to its National Pollutant Release and Transfer Register in June 2023, as part of its obligations under the Aarhus Convention and its Protocol on Pollutant Release and Transfer Registers.[37] Public participation should also be encouraged in monitoring environmental issues and changes through citizen science. In addition to public engagement, this would also contribute to addressing gaps in the state's capacity for data collection.

6. Recommendations

To the Ukrainian government, with support from international partners, and in active partnership with Ukrainian environmental stakeholders:

- Support the development of skills, methodologies and capacities for environmental monitoring and assessment in Ukraine, and provide material and financial resources for this work. In particular, improve the integration of remote and field data collection and analysis, and deepen collaboration with domestic and international data collection actors. The scope of monitoring and assessment should bridge both incidents and trends, and be sufficient to inform both urgent interventions, and longer term remediation programmes.

- Develop a comprehensive strategy for data collection and preservation for accountability purposes, which is based on international best practice, and ensure that evidence is integrated into the Hague Register of Damage.

- Create a strategic environmental monitoring plan by mapping out monitoring and analytical needs over the period covering recovery, reconstruction and EU alignment, and begin to build the required capacity. This should address both human capacity, and the infrastructure to support it, as well as automated monitoring networks, and be designed to encompass nationally relevant environmental trends, public and community participation, and regional and international obligations.

Endnotes

1. CEOBS (2022), Sustainable recovery? First sustain interest in Ukraine's environment: https://ceobs.org/sustainable-recovery-first-sustain-interest-in-ukraines-environment

2. CEOBS and Zoï Environment Network (2022), Ukraine conflict and environment briefing - Industry: https://ceobs.org/ukraine-conflict-environmental-briefing-industry

3. CEOBS and Zoï Environment Network (2022), Ukraine conflict and environment briefing - Water: https://ceobs.org/ukraine-conflict-environmental-briefing-water

4. CEOBS and Zoï Environment Network (2022), Ukraine conflict and environment briefing - the coastal and marine environment: https://ceobs.org/ukraine-conflict-environmental-briefing-the-coastal-and-marine-environment

5 Initiative for GHG Accounting in War (2023), Climate damage caused by Russia's war in Ukraine: https://climatefocus.com/publications/climate-damage-caused-by-russias-war-in-ukraine

6. Weir, D., McQuillan, D. & Francis, R.A. Civilian science: the potential of participatory environmental monitoring in areas affected by armed conflicts. *Environ Monit Assess* 191, 618 (2019). https://doi.org/10.1007/s10661-019-7773-9

7. OSCE (2017), Environmental Assessment and Recovery Priorities for Eastern Ukraine: https://www.osce.org/files/f/documents/4/3/362566_0.pdf

8. For example, the Siverskyi Donets Water Basin Administration has been the key authority responsible for monitoring and managing water resources in eastern Ukraine. A number of staff have been internally displaced, or moved overseas, although a majority of specialists have remained in situ, and continued to perform their duties.

9. Міністерство захисту довкілля та природних ресурсів України: https://mepr.gov.ua

10. For a comprehensive overview of pre-war environmental monitoring and data management in Ukraine, see for example: https://zoinet.org/wp-content/uploads/2018/02/enpi-seis_country_report_ukraine_final.pdf; for the pre-2022 overview of official environmental monitoring in the Donbas see: https://zoinet.org/product/east-ukraine-5y-fighting

11. Державна екологічна інспекція: https://dei.gov.ua

12. ЕкоЗагроза: https://ecozagroza.gov.ua/about

13. Екологія-Право-Людина: http://epl.org.ua

14. Ecoaction, interactive map of potential negative environmental damage caused by russian aggression: https://en.ecoaction.org.ua/warmap.html

15. SaveEcobot, about: https://www.saveecobot.com/en/static/about

16. The Kiev School of Economics calculates damage from military operations, including damage from emissions of pollutants into the air and damage to land for the purposes of monetary valuation.

17. Regional Eastern European Fire Monitoring Centre, about: https://nubip.edu.ua/en/reefmc

18. Ukrainian Nature Conservation Group, about us: https://uncg.org.ua/en/about-us

19. The Ecodozor.org platform was inspired and informed by Zoï's pre-2022 work with the OSCE and MEPNR to monitor environmentally-relevant incidents in the war in the Donbas, specifically the Donbas Environmental Information System (DEIS): https://ecodozor.org.

20. CEOBS archives its digital data with the German NGO Mnemonic https://mnemonic.org/en/about, Mnemonic is dedicated to archiving, investigating and memorialising digital information documenting human rights violations and international crimes.

21. REACH Initiative: https://www.reach-initiative.org/what-we-do/news/ukraine-crisis-supporting-humanitarian-response-in-and-outside-ukraine-with-the-right-data-and-information-products

22. PAX, conflict and environment: https://paxforpeace.nl/what-we-do/programmes/conflict-environment

23. NASA Harvest is NASA's Global Food Security and Agriculture Consortium: https://nasaharvest.org.

24. U.S. Department of State-sponsored Conflict Observatory: https://hub.conflictobservatory.org/portal/apps/sites/#/conflict-observatory

25. UNDP (2023), New coordination center to assess environmental impacts of the war on Ukraine: https://www.undp.org/ukraine/press-releases/new-coordination-center-assess-environmental-impacts-war-ukraine

26. See for example the KSE Institute's cooperation with the Office of the President of Ukraine, the Ministry of Economy, the Ministry of Reintegration of the Temporarily Occupied Territories, and the Ministry of Infrastructure of Ukraine's Damaged in UA platform: https://damaged.in.ua/about

27. The study is in response to the Nicosia Environment for Europe Ministerial Conference, which requested UNECE, UNEP and OECD to review and coordinate the various environmental assessments.

28. UNEP is supporting CEOBS to help integrate this into UNEP's capacity building work for field sampling campaigns, the first workshop was held in September 2023.

29. According to a SEI self-assessment (unpublished), by mid-2023 all its regional departments in the east of Ukraine had lost at least 25% of staff or equipment, while most of them throughout the country experienced significant operational obstacles or partial loss of control over areas under their responsibility.

30. In countries in Eastern Europe, the Caucasus and Central Asia 'environmental liability regimes are focused on assessing environmental damage for purposes of monetary compensation (essentially serving as a penalty) rather than on correcting the damage, limiting its impacts, and preventing further damage. Competent authorities must rely on methodologies for assessing damage that are largely theoretical in nature.' For more see OECD (2012) Liability for environmental damage in Eastern Europe, Caucasus and Central Asia: Implementation of good international practices: https://www.oecd.org/env/outreach/50244626.pdf

31. Industrial Economics Incorporated is a US-based consultancy with extensive experience on environmental economics and damage valuations: https://indecon.com

32. For discussion on some of the limitations of the valuation methodologies, see Andriy Demydenko and Eugene Stakhiv (2023), Towards An Acceptable Accounting of Ukraine's Post-War Environmental Damages: https://voxukraine.org/en/towards-an-acceptable-accounting-of-ukraine-s-post-war-environmental-damages

33. CoE (2023) Council of Europe Summit creates register of damage for Ukraine as first step towards an international compensation mechanism for victims of Russian aggression: https://www.coe.int/en/web/portal/-/council-of-europe-summit-creates-register-of-damage-for-ukraine-as-first-step-towards-an-international-compensation-mechanism-for-victims-of-russian-aggression

34. See Copernicus, CORINE land cover: https://land.copernicus.eu/en/products/corine-land-cover

35. Public councils held under the auspices of the central and local authorities are opportunities for civil society to influence environmental decision-making. Introduced in 2004, their growing effectiveness has been contingent on the introduction of more transparent administrative mechanisms. Such councils operate under the MEPNR as well as under sectoral and local authorities. The councils have continued to operate during the period of martial law, but with some restrictions on membership and access, in accordance with this August 2022 decree: https://www.kmu.gov.ua/news/uriadom-vrehulovano-pytannia-funktsionuvannia-hromadskykh-rad-pid-chas-voiennoho-stanu

36. For example, since 2022 the "Programs of Comprehensive Restoration for Regions and Communities" have included the assessment of the pre-war environmental situation; assessment of the local resources for recovery; analysis of adverse impacts on the environment and infrastructure; analysis of the territory cleanup needs, including mine action and soil rehabilitation; suggestions as to the infrastructure restoration; suggestions on environmental protection and conservation activities, as well as relocation of specific enterprises: https://zakon.rada.gov.ua/laws/show/1159-2022-%D0%BF#-Text

37. UNECE (2023) Ukraine introduces mandatory reporting by enterprises on greenhouse gas emissions and other pollutants using UNECE legal tools: https://unece.org/media/press/379727