



Black Sea SIERRA – Project 101124670

Training Courses



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Piloting session: UkrSCES (Ukraine)

Environmental Damage Assessment of the Marine Environment

from Munitions, Sunken Objects, and War Activities

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War leaves long-lived marine hazards well beyond the active combat phase — and assessment must support recovery, prioritisation and restoration.



SAFE-BS2BKS contributes Baltic–Black Sea screening logic, a training package and an operational Action Plan that help organise evidence under uncertainty.

Core message: marine damage assessment should be evidence-based, staged, and decision-oriented — not just a one-time pollution survey.

Types of war-related objects and remnants posing environmental risks at sea

War-related marine hazards should be screened by object type, condition, environmental setting and likely receptor exposure.

Naval mines & UXO

unexploded ordnance, ammunition remains

direct input
secondary release
transport to shore

Munitions debris

missile / drone fragments, hazardous remnants

direct input
secondary release
transport to shore

Sunken vessels

military and civilian wrecks, fuel and cargo residues

fuel release
corrosion
seabed disturbance

Damaged infrastructure

ports, terminals, wastewater and energy systems

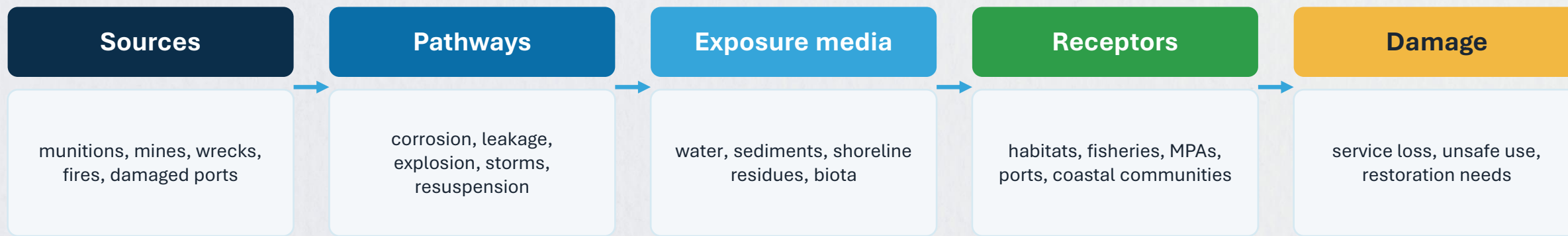
leakage
episodic discharges
coastal transfer

Burnt / submerged materials

hazardous cargo, combustion residues

combustion byproducts
particle deposition
shoreline contamination

Source–pathway–receptor logic helps connect hazardous objects and damaged infrastructure with real environmental damage.



Explosive compounds
and degradation products

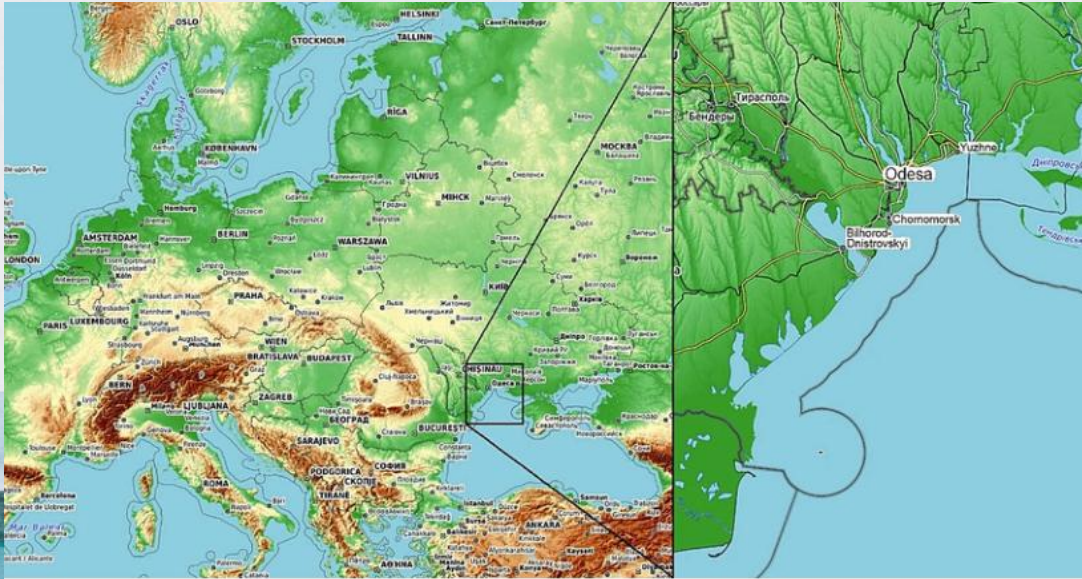
Metals from corrosion
and fragmentation

Fuels, lubricants
and petroleum
hydrocarbons

Combustion byproducts
from fires and explosions

Secondary remobilisation through sediment disturbance, storms and coastal transport should always be considered.

04 Why a standard pollution assessment is not enough



Conflict conditions create multiple overlapping pressures

- Access restrictions reduce sampling coverage
- Direct causality is often difficult to prove immediately
- War amplifies background variability and cumulative stress
- Uncertainty must be managed explicitly and transparently
- A staged damage-assessment framework is more useful than a single survey

Practical lesson from SAFE and Ukrainian case evidence: limited offshore access does not mean no assessment — it means smarter evidence integration.

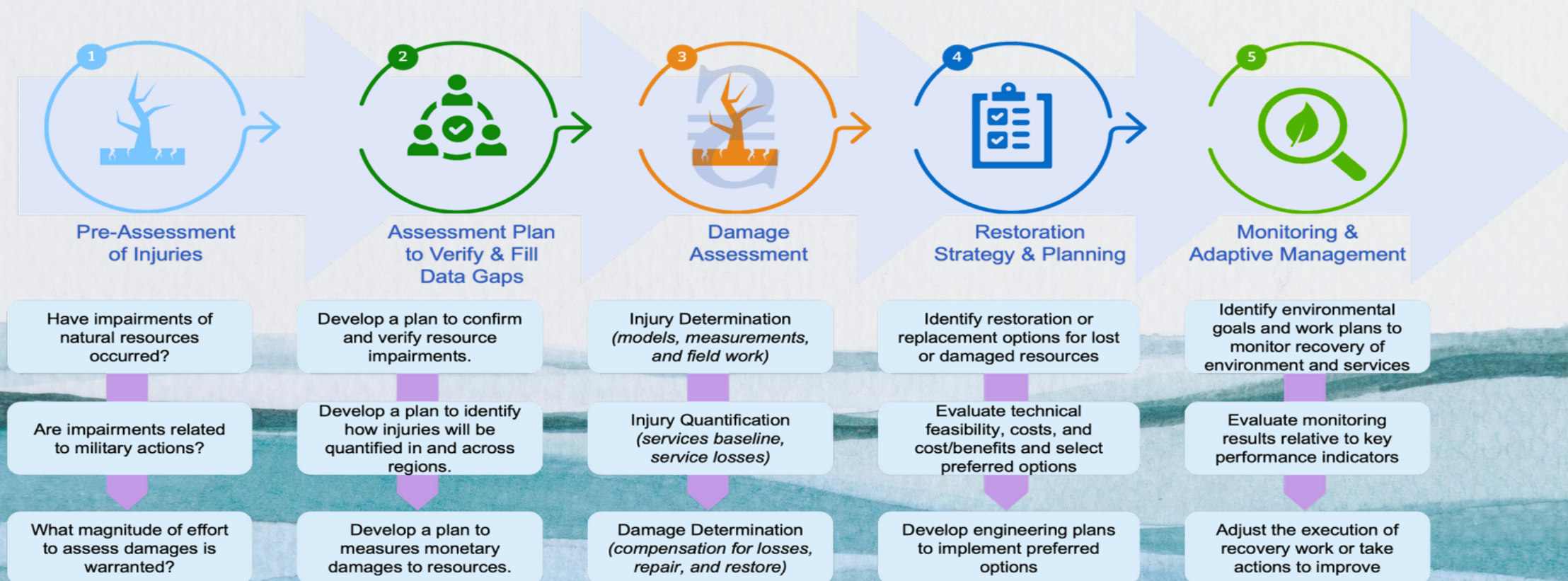
NRDA and ELD come from different traditions, but together they provide a practical framework for war-related marine damage assessment



International Humanitarian Law provides a broader wartime context, while SAFE-BS2BKS supports screening and prioritisation under Black Sea conditions

Step 1 — Desktop pre-assessment

Before field deployment, organise existing evidence to define baseline conditions, suspected hotspots, receptors and verification priorities.

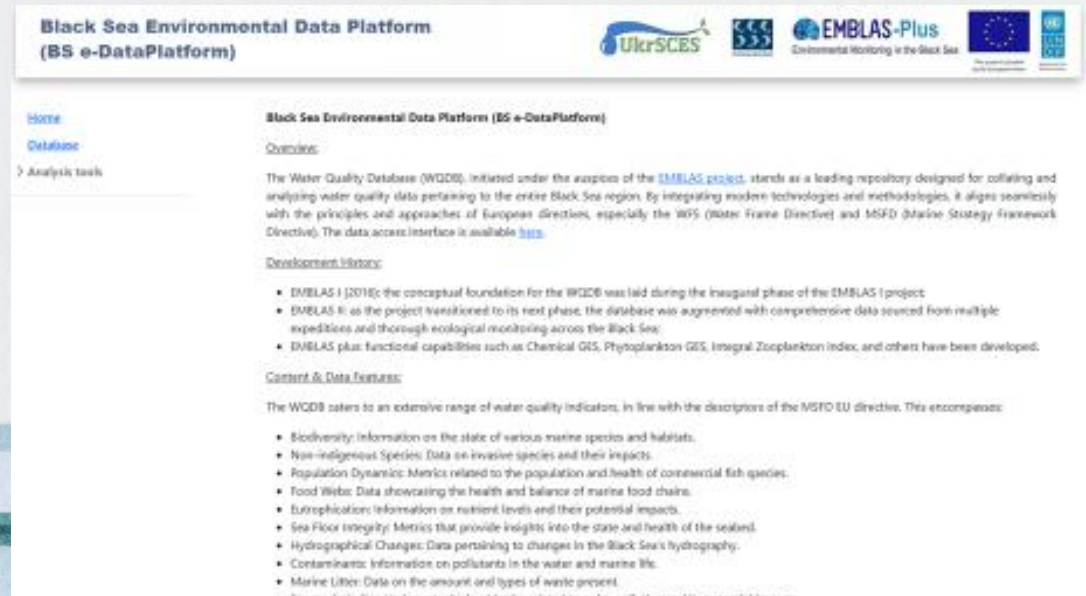


Preliminary priorities: compile data → define baseline → identify damaged resources → map hotspots → set verification needs.

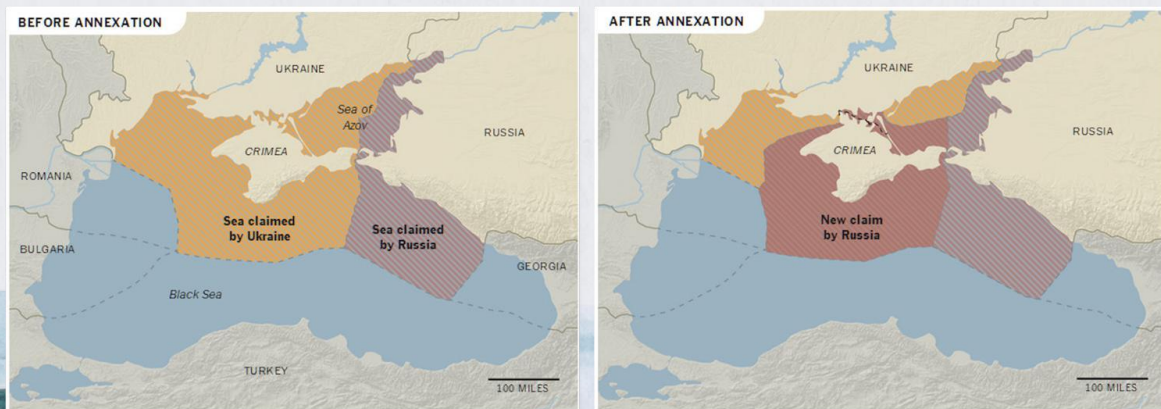
Desktop screening should combine historical, environmental, operational and conflict-related sources, then organise them into a conceptual site model.

Core data inputs

- Monitoring databases and historical marine observations
- Remote sensing and satellite products
- Bathymetry, habitat and sediment maps
- Wreck and infrastructure inventories
- Fisheries, protected area and coastal-use data
- Conflict event records and impact reports
- National and regional environmental institutions



SAFE result: BS e-DataPlatform and monitoring metadata help preserve methods, units, QA/QC, access limitations and uncertainty.



Pre-assessment should end with a defensible shortlist of hotspots for verification.

Why baseline matters

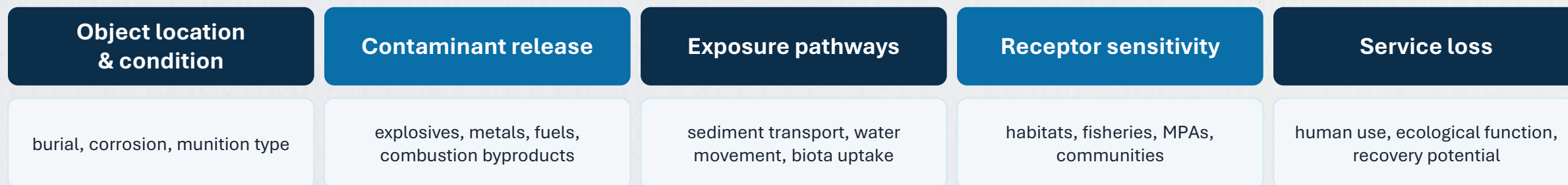
- Pre-war monitoring and reference areas support interpretation
- Baseline helps separate wartime damage from long-term variability
- Reference conditions should include ecological services and human uses

Hotspot mapping logic

- suspected wrecks, mine zones and hazardous debris
- damaged ports, fuel-release areas and contaminated shoreline sectors
- link sources to pathways, receptors and exposed services

09 Step 2 — Identifying data gaps and verification needs

After desktop screening, the main task is to verify the most decision-relevant unknowns rather than attempt full coverage everywhere.



Prioritise gaps by risk, feasibility and decision relevance

- areas requiring field confirmation
- poorly documented contaminants, habitats or services
- safety and access restrictions
- evidence most needed for next action

Verification outcomes

- observation
- targeted monitoring
- additional survey
- precautionary restrictions
- detailed assessment

10 Field investigations under post-conflict constraints

Field work should validate the conceptual site model with safe, targeted and spatially representative evidence.

Targeted sampling

- water and sediment
- where feasible, biota
- shoreline residues and debris

Support tools

- remote sensing
- geospatial tools
- visual observations
- incident and stakeholder records

Constraints and requirements

- safety and access limits
- reproducible methods
- QA/QC and metadata
- spatial representativeness

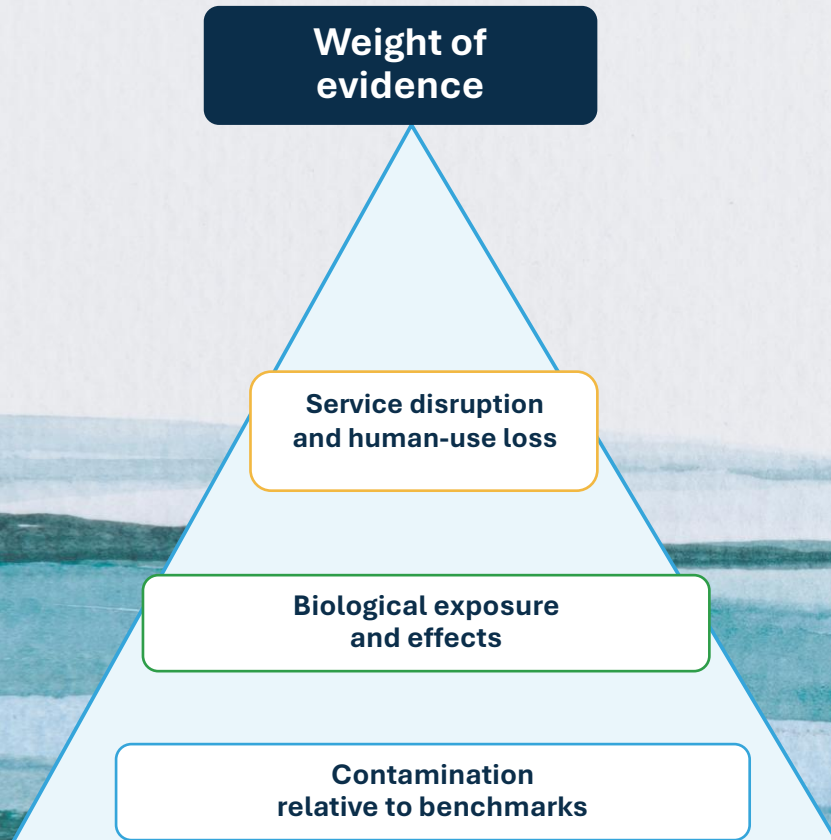
Background

Hotspot

Gradient

SAFE result: risk-based station typology and temporal tiers help make every sample more diagnostic under restricted access.

Ecological injury is not only about contaminant concentration; it is about loss of function, use and recovery potential.



What may be lost

- habitats and benthic integrity
- fisheries and seafood-related services
- biodiversity and ecological function
- recreation, navigation and other human uses

Assessment should move from pollutant presence to service impairment: contamination + ecological effects + service disruption.

Restoration priorities should balance ecological urgency, human safety, feasibility and cost, while distinguishing primary and compensatory restoration.

Primary restoration

- restore injured resources
- reduce continuing service loss
- focus on ecological recovery and safety

Compensatory restoration

- offset interim losses
- apply equivalency / valuation
- balance ecological and social benefits

Restoration-priority matrix

Ecological / social value

Priority restoration

Staged action

Protection /
restrictions

Observation /
later action

Feasibility / safety

13 Monitoring, restoration, and adaptive management

Post-conflict marine recovery requires phased implementation: monitoring should verify persistence, recovery or recontamination over time.

Emergency

rapid response to visible pollution or suspected release

what happened and what should be sampled now?

Short-term

track persistence, redistribution and secondary sources

is the pressure continuing or moving?

Long-term

test recovery, trend change and action effectiveness

is the ecosystem recovering?

Adaptive management cycle: monitor → evaluate → adjust actions → update priorities and risk maps.

SAFE result: temporal tiers help avoid confusing episodic pulses with long-term ecosystem change.

War-related marine damage is multi-source, persistent, and spatially complex.

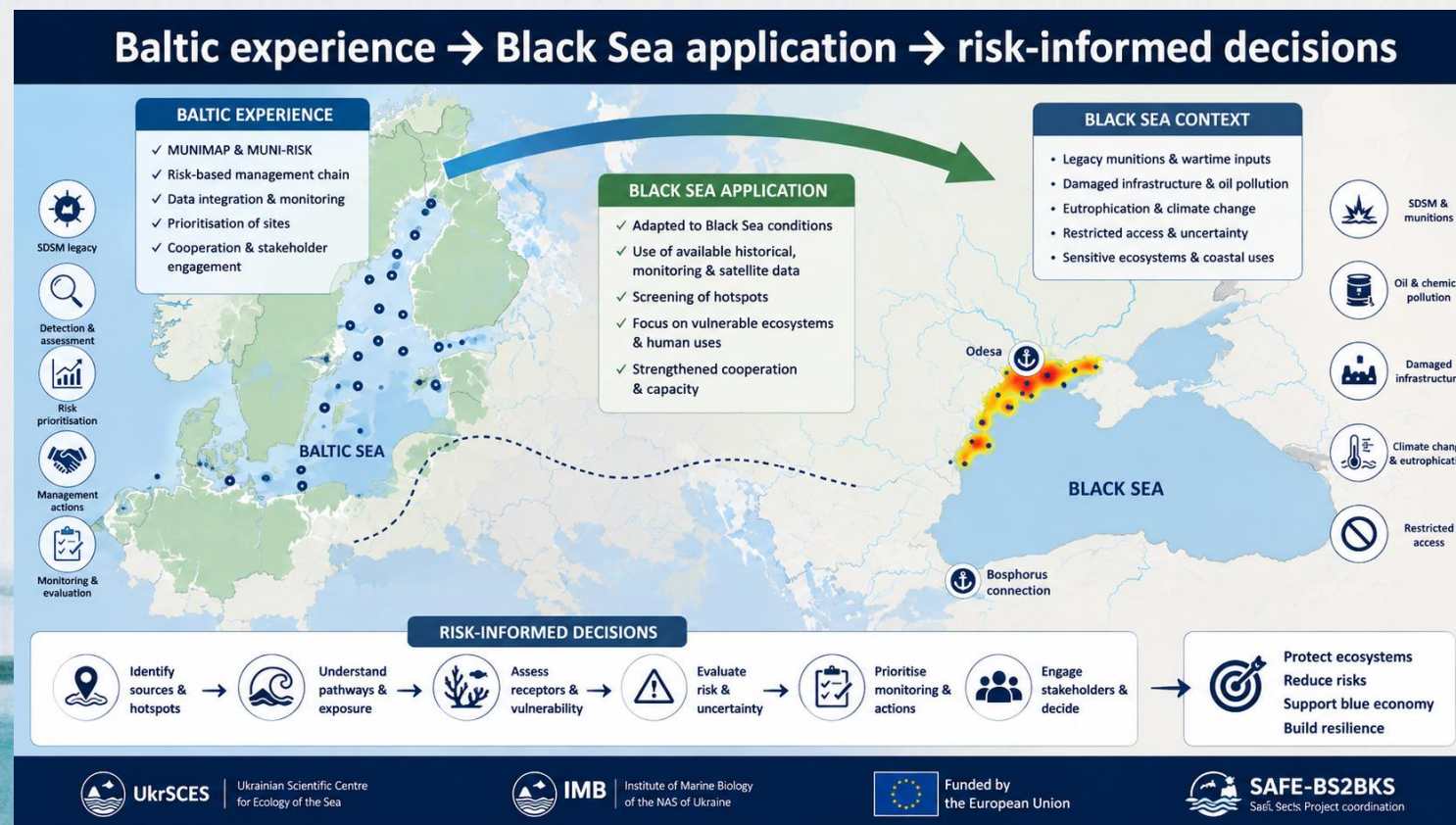
A staged framework is essential: pre-assessment, verification, damage assessment, restoration.

NRDA and ELD can be combined into a practical marine assessment logic.

Restoration planning should focus on ecosystem service recovery, not only contaminant removal.

Long-term monitoring and adaptive management are necessary after the active impact phase.

SAFE-BS2BKS already contributes practical Black Sea tools: training package, Action Plan, risk screening and Baltic–Black Sea transfer logic.



Lecture context: Black Sea SIERRA training course, informed by SAFE-BS2BKS results and Black Sea case evidence



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Thank you for your attention!

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