Interreg
Co-funded by the European Union
NEXT Black Sea Basin

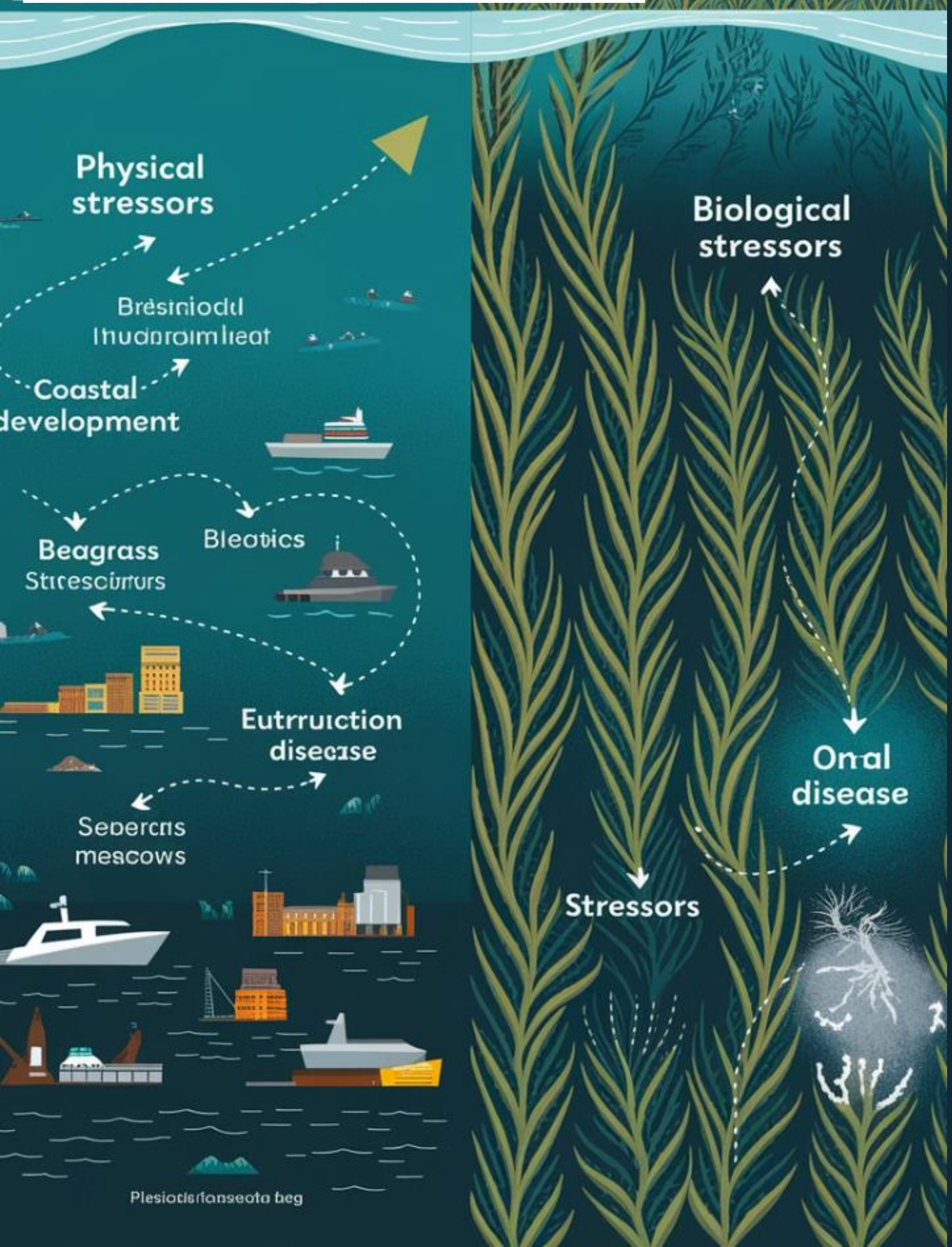
Module 2: Threats to Seagrasses

Seagrasses are a key marine habitat that has been globally declining since the 1930s. The most recent census estimates that 7 percent of seagrass is being lost worldwide per year—equivalent to a football field of seagrass every 30 minutes.

Evaluating the threats to and resilience of seagrass is critical for identifying effective management strategies. The highest impact threats come from urban/industrial run-off, urban/port infrastructure development, agricultural run-off, and dredging. Climate-related threats include increased frequency and intensity of tropical storms, with uncertainty about the impact of rising temperatures and sea level rise.

Şevki Danacıoğlu

Interreg
Co-funded by the European Union
NEXT Black Sea Basin



Natural and Anthropogenic Stressors

Physical Factors

Seagrass meadows face physical stressors including increased temperatures, salinity changes, hypoxia, extreme weather events, sedimentation, and altered wave and current dynamics.

Biological Factors

Biological threats include invasive species, algal blooms, eutrophication, altered grazing patterns, competition, and disease.

Source Categories

Threats can be **land-based**, **sea-based** or **climate related**, all of which can affect seagrasses either directly or indirectly.

Interreg Co-funded by the European Union NEXT Black Sea Basin

Land-based Threats

1 Proximity to Human Activity

Seagrasses are predominantly found in shallow coastal waters, placing them in close proximity to areas most heavily used by humans.

2 Agricultural Run-off

Run-off from agricultural regions carries excessive sediments, nutrients, and toxicants like herbicides into seagrass habitats.

3 Urban and Industrial Pollution

Urban and industrial regions contribute contaminants and pulses of reduced salinity that damage seagrass ecosystems.

Interreg NEXT Black Sea Basin
Co-funded by the European Union

Eutrophication and Pollutants

Eutrophication Process

Land-based run-off can indirectly impact seagrass meadows through eutrophication—a state of excessive plant and algal growth caused by nutrients (predominantly nitrogen and phosphorus) in the water.

High-Risk Regions

The threat from pollutants is particularly high in regions with high levels of agricultural activity or urban development. Rivers can transport contaminants for hundreds or even thousands of kilometers.

Long-Term Effects

Sediments can store contaminants for long periods, making the effects far-reaching and long-standing. These threats can recur due to resuspension of sediments through wave energy, reducing light penetration.

Coastal Development Impacts

Land Reclamation

Urban structures built on top of former seagrass habitat permanently and irreversibly remove seagrasses or shade them from light.

Nearshore Development

Developments can shade seagrass habitat and create "coastal squeeze" which interacts with sea level rise to reduce available habitat.

Habitat Conversion

Coastal developments reduce or convert natural shorelines (for example, into rock walls), limiting the space available for seagrasses, saltmarshes, and mangroves to migrate as sea levels rise.

Sea-based Threats

Dredging

Direct physical damage occurs from dredging activities. Dumping of dredge spoil can smother seagrass, while resuspension of fine sediments affects seagrasses tens of kilometers away by releasing contaminants.

Boating

Propellers, moorings, and shipping accidents cause direct physical damage. Boating also creates wave energy that re-suspends sediments and reduces light penetration.

Fishing

Especially trawling, causes direct physical removal of seagrasses. Fishing can alter species composition and grazing regimes, potentially resulting in reduced seagrass biomass.

Interreg
Co-funded by the European Union
NEXT Black Sea Basin

Interreg
Co-funded by the European Union
NEXT Black Sea Basin

Additional Sea-based Impacts

1 Aquaculture

Structures physically displace and shade seagrasses directly. They also cause widespread indirect shading and stress due to increased turbidity, nutrients, contaminants, and potential introduction of exotic species and pathogens.

2 Boating and Fishing

These activities often have acute, localized effects related to direct removal of seagrasses. They also have indirect effects, such as long-term damage caused by oil spills from refueling mishaps and accidents.

3 Altered Grazing Regimes

Fishing can alter the composition of animal species, potentially leading to trophic cascades that cause algal overgrowth or changes in seagrass reproductive processes like seed dispersal.

Interreg
Co-funded by the European Union
NEXT Black Sea Basin

Climate-related Threats

1. Rising Temperatures

Increasing sea and air temperatures can dramatically reduce seagrass extent over short and long timescales, affecting growth and potentially causing mortality during prolonged warming events.

2. Sea Level Rise

Changes in water depth affect light availability and can reduce suitable habitat area for seagrasses, especially in areas with hardened shorelines.

3. Ocean Acidification

Changes in water chemistry may affect seagrass productivity, though responses are difficult to predict and depend on other limiting conditions.

4. Extreme Weather

Increased frequency and intensity of storms and altered rainfall patterns can directly damage seagrass meadows and increase land-based runoff.

Temperature Rise Effects

1 Species Distribution

Changes in grazing animal distribution

2 Pathogen Activity

Increased disease prevalence

3 Edge Populations

Species at range limits most vulnerable

4 Shallow Water Impacts

Extreme warming in shallow areas

Seagrasses near the edge of their distributional range are most at risk from rising temperatures. Temperature rise has already triggered changes in species distribution, causing grazing animals to move from tropical to temperate areas, altering grazing pressure on seagrasses.

Unusually warm temperatures are also associated with the wasting disease that decimated eelgrass across the northern hemisphere in the 1930s. Under rising sea levels, seagrass habitats would naturally migrate to more elevated areas, but colonization could be impeded by unfavorable conditions.

Ocean Acidification Impacts

↑CO_2

Increased Carbon

Rising partial pressure of carbon dioxide (pCO_2) affects marine ecosystems differently.

?

Uncertain Benefits

Insufficient evidence to determine if seagrasses will benefit from ocean acidification.

↓

Downregulation

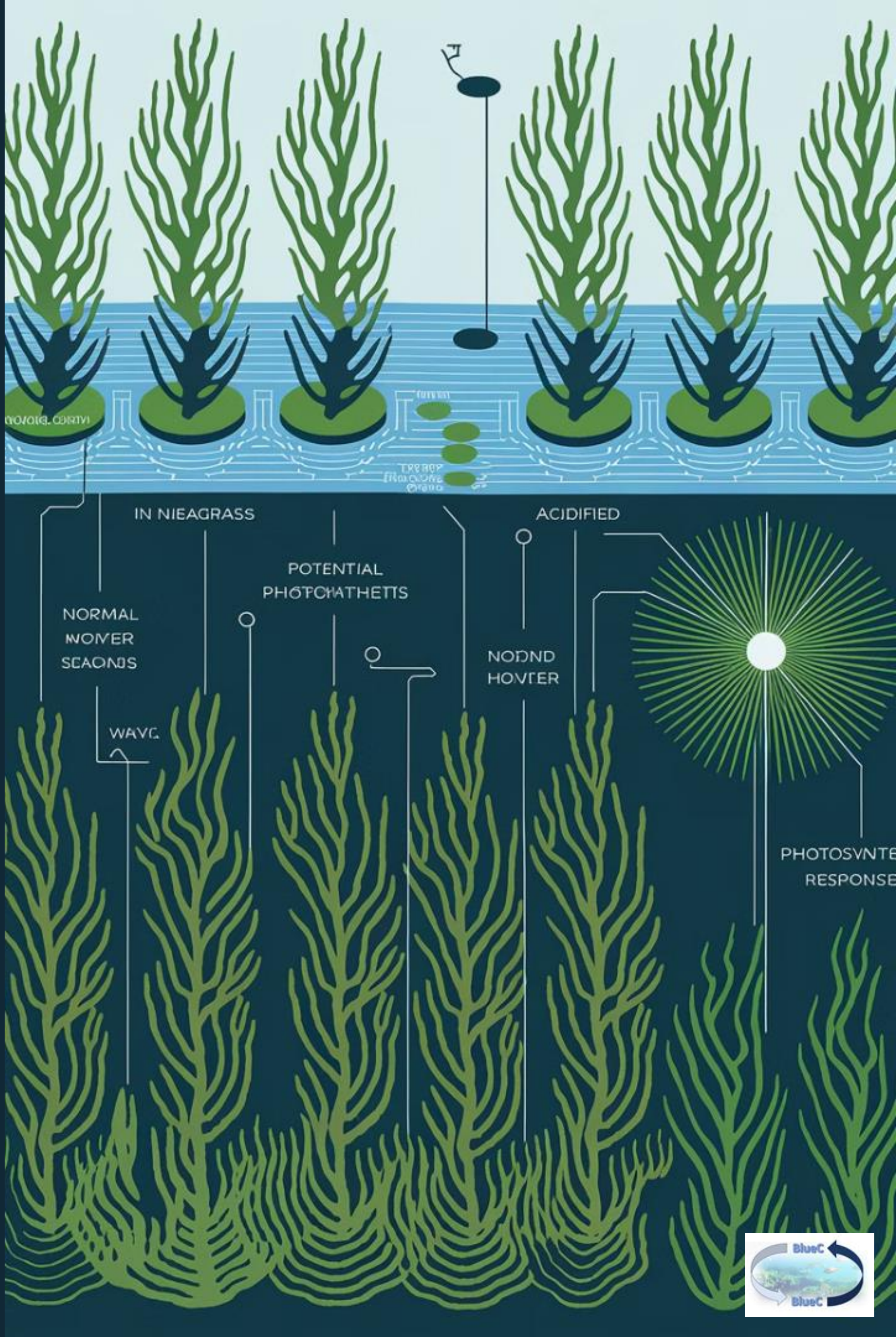
Short-term productivity gains may not persist in the long term.

≠

Variable Conditions

Inshore fluctuations in pCO_2 are highly variable compared to offshore areas.

Seagrasses' capacity to respond to increasing pCO_2 depends on other limiting conditions, such as light availability. There can be downregulation in the response to pCO_2, so short-term productivity gains observed in experiments may not be realized long-term. The high variability of inshore pCO_2 fluctuations adds further complexity to predicting future responses.



Interreg
Co-funded by the European Union
NEXT Black Sea Basin

Extreme Weather Events

1 Increasing Intensity

Climatic events including hurricanes, cyclones, and extreme rainfall are likely to become more intense in the future, though regional variations will occur.

2 Direct Physical Damage

High water energy associated with cyclones can directly uproot seagrass and mobilize seedbanks, leaving modified seascapes vulnerable to recalcitrant degradation.

3 Far-reaching Impacts

Land-based run-off and pollutant loads from extreme events can have far-reaching and long-lasting effects on seagrass ecosystems.

4 Management Solutions

Promoting diverse seagrass communities and reducing chronic threats may make meadows less vulnerable to extreme events.