Planning for oil and gas development

Module 3

Content of Module 3

Environmental sensitivity mapping in the context of area-based planning

- What is integrated area-based planning?
- What is environmental sensitivity mapping?
- Methods and data used for sensitivity mapping

Environmental sensitivity mapping in practice

- Sensitivity mapping in the context of oil spill preparedness and response with MESA
- MAGTAP vulnerability map

Environmental sensitivity mapping group exercise

3.1 Environmental sensitivity mapping in the context of area-based planning

Contents

What is area-based planning?

What is environmental sensitivity mapping?

Overarching process

Methods used for sensitivity mapping

Data considerations

What is area-based planning?

Photo credits: Ton Rulkens

What, and why?

Area-based planning is a proactive approach to balancing conservation and sustainable development opportunities through development of a spatial plan.

- Brainport Southeast Netherlands
- Greenport
- Zuidas development
- International city of peace and justice
- (Potential) site for power plant, from 500MW
- (Potential) site for nuclear power plant
- High-voltage power line, from 220 kV
- New high-voltage power line (approximate route)
- Pipeline zone
- Pipeline

- Cultural heritage site on (tentative) World Heritage list
- Natural heritage site on World Heritage list
- Other property or site on (tentative) World Heritage list
- Revised national ecological network on land
- Military restricted zone
- Radar activity
- Military air base
- Military air base with civilian use
- Naval base
- Major military training area and/or artillery range

- Existing offshore wind farm
- Designated area for offshore wind farm
- Potential area for offshore-onshore grid link
- Area with high potential for wind power

Accessible

- Railway station for high-speed/international trains
- Civilian airport of national importance
- Seaport of national importance
- Inland port of national importance

Source: Ministry of Infrastructure and the Environment, 2019

Links to marine spatial planning (MSP)

Identifies the utilization of marine space for different uses, while taking into consideration the preservation, protection and improvement of marine ecosystems.

Guiding principles:
- Integration and coordination with all (legislation, strategies, action plans, etc)
- Transparency, inclusivity and participation (including stakeholders and civil society)
- An MSP is built to include environmental stewardship, social and economic equity and to improve ecological sustainable development.
- An Ecosystem-based approach recognises full array of interactions within an ecosystem, including humans, rather than considering single issues, species or ecosystem services in isolation.

Marine spatial planning in Mozambique

Led by the Ministry of Sea, Inland Waters and Fisheries, this integrated management approach brings together relevant coastal and marine actors to:

- Map the ocean use,
- Coordinate activities among differed uses and interests,
- Decrease potential seas conflict

|	
📅 2022	Develop an appropriate policy and institutional framework to ensure that maritime affairs are addressed in an integrated, inclusive and coordinated manner, allowing the Government to take appropriate measures to deal with illegal practices at sea;
📅 2022	Restore at least 5.000 ha of mangroves through the implementation of a Strategic and an Action Plan for Mangrove;
📅 2025	Adopt Marine Spatial Planning as an effective tool for the implementation of national Blue Economy agenda to achieve ecological, economic, and social objectives;
📅 2025	10% of coastal communities have built climate resilience and are implementing alternative livelihood and sharing experiences

Links to Strategic Environmental Assessment (SEA)

- Systematic approach for mainstreaming and environmental sensitivity into decision-making

- Evaluates environmental, social and economic considerations of policies, plans and programmes

- Provides legal framework for integrated area-based planning

Strategic Environmental Assessment
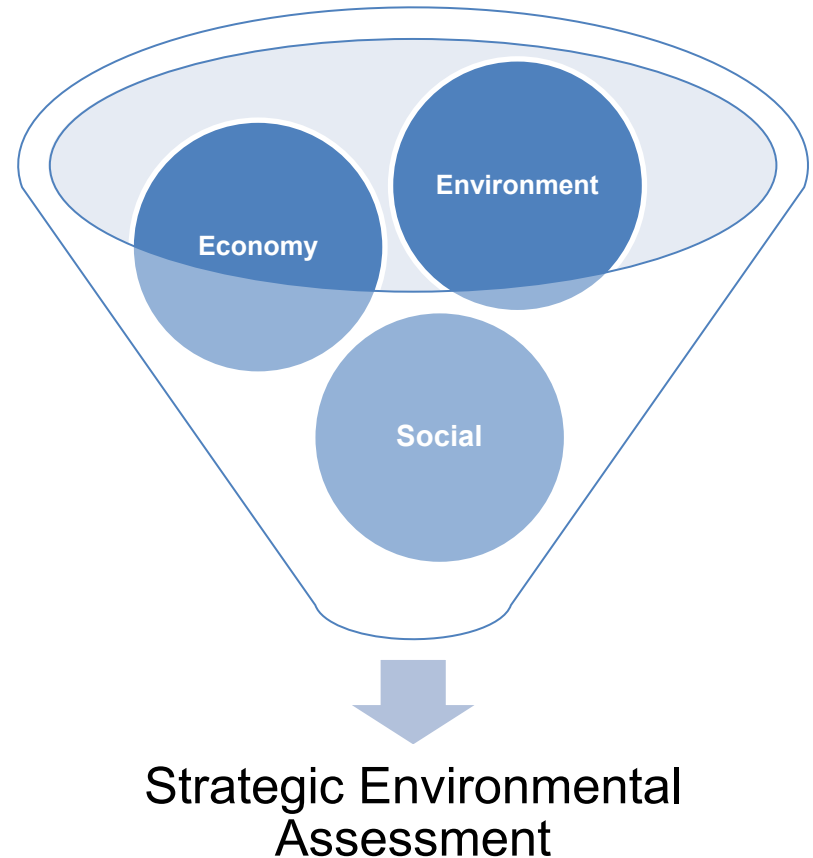
SEA in Mozambique: key objectives

1. Identifying, prioritizing and validating positive and negative, direct, indirect and cumulative, **ESHSS issues and impacts** of onshore and offshore gas sector, at the national, regional and local level.

2. Identifying gaps and overlaps in current institutional arrangements, policies and regulations responsible for **failures to adequately mitigate** negative ESHSS issues/impacts or enhance positive issues and impacts.

3. Proposing **measures to streamline, and reconcile gaps in current institutional arrangements, policies and regulations** so that management of positive and negative ESHSS issues and impacts is improved.

Key messages
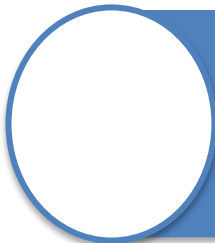
Area-based planning helps define how resources (including oil and gas) can be used sustainably, contributing to multiple national and international goals
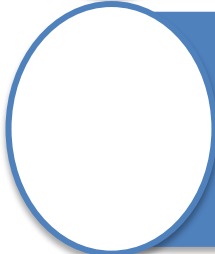
Area-based planning links to marine spatial planning which identifies the utilization of marine space for different uses (including oil and gas)

Area-based planning links to SEAs which integrates social, environmental and economic considerations into decision making and provides a legal framework for area based planning.
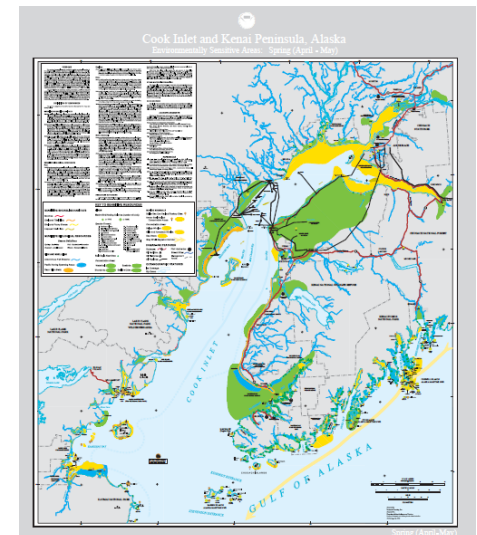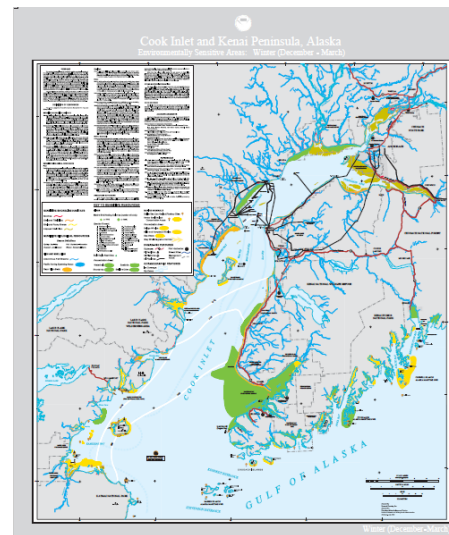
What is environmental sensitivity mapping?

Environmental sensitivity atlases

"An environmental sensitivity atlas is an interactive tool [or map] that displays coastal [marine/terrestrial] areas sensitive to external influences" (Norad)

Key Components

- Spatial tool

- Various approaches

- Can change over time

- Assessment of 'sensitivity'

Intended uses: landscape and project-level
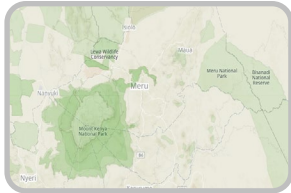
Strategic-level planning for development and conservation

Emergency response planning

Project-level monitoring

Project-level spatial planning

What are environmental assets?

Ecological assets

- Natural entities
- Provide ecological functions or services

Socio-economic assets

- Natural or anthropogenic entities
- Provide social, cultural, economic or political value

Common ecological assets

- Assets with protected status

- Areas with biodiversity designations (e.g. Key Biodiversity areas, Alliance for Zero Extinction sites)

- Critical Habitat according to IFC PS6

- Threatened species and ecosystems (e.g. IUCN Red List of Threatened Ecosystems and IUCN Red List of Threatened Species)

- Habitats known to have high biodiversity value

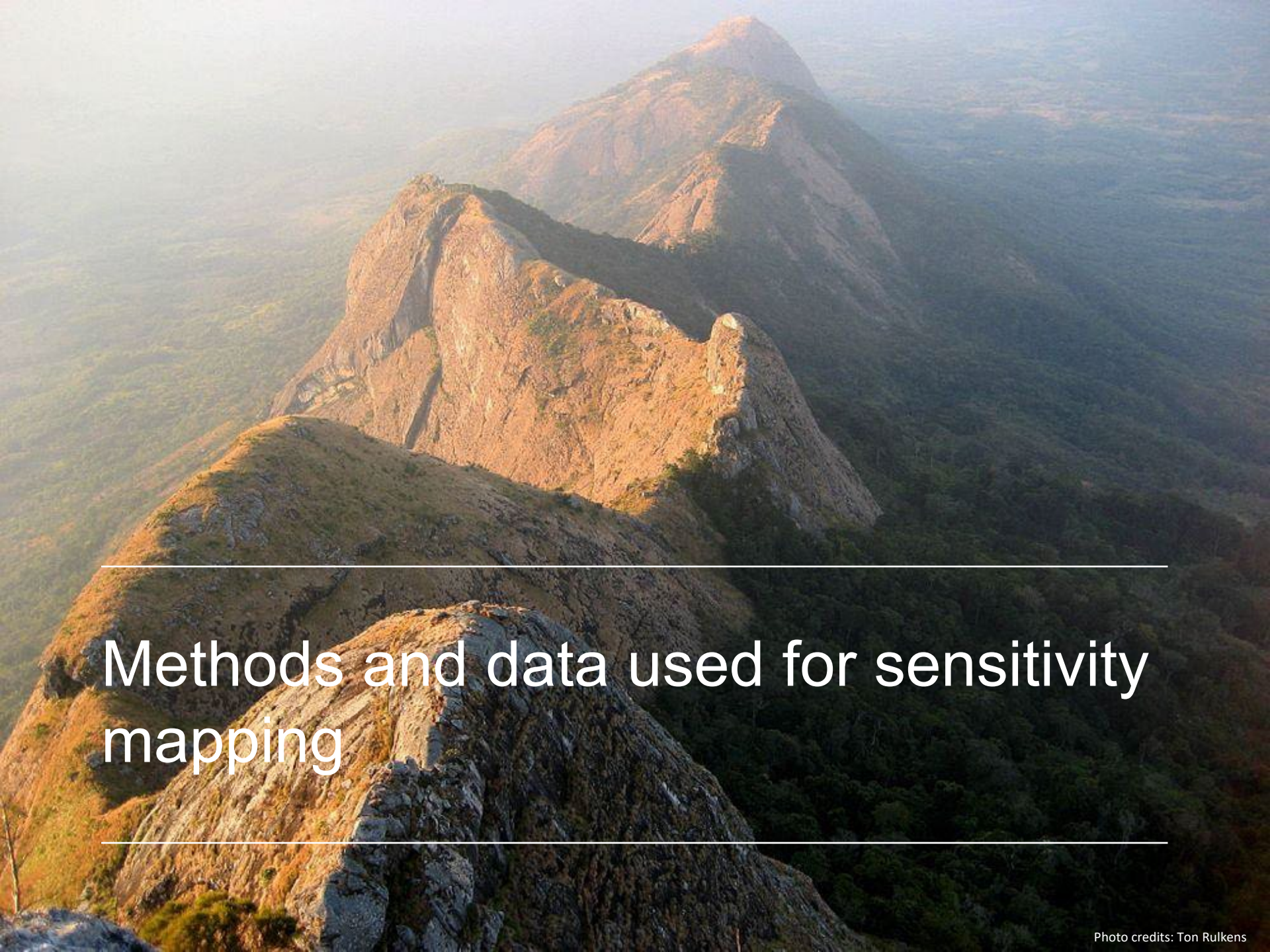- Habitats known to provide ecosystem services

What is "sensitivity"?

VULNERABILITY

EXPOSURE

SENSITIVITY

SUSCEPTIBILITY

IMPORTANCE
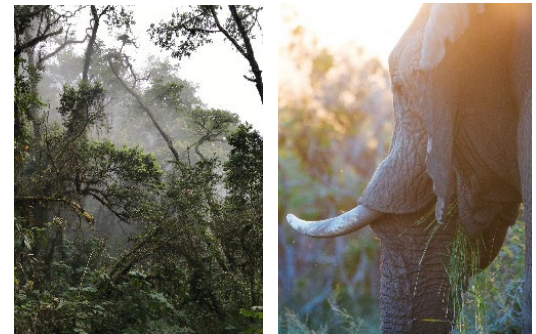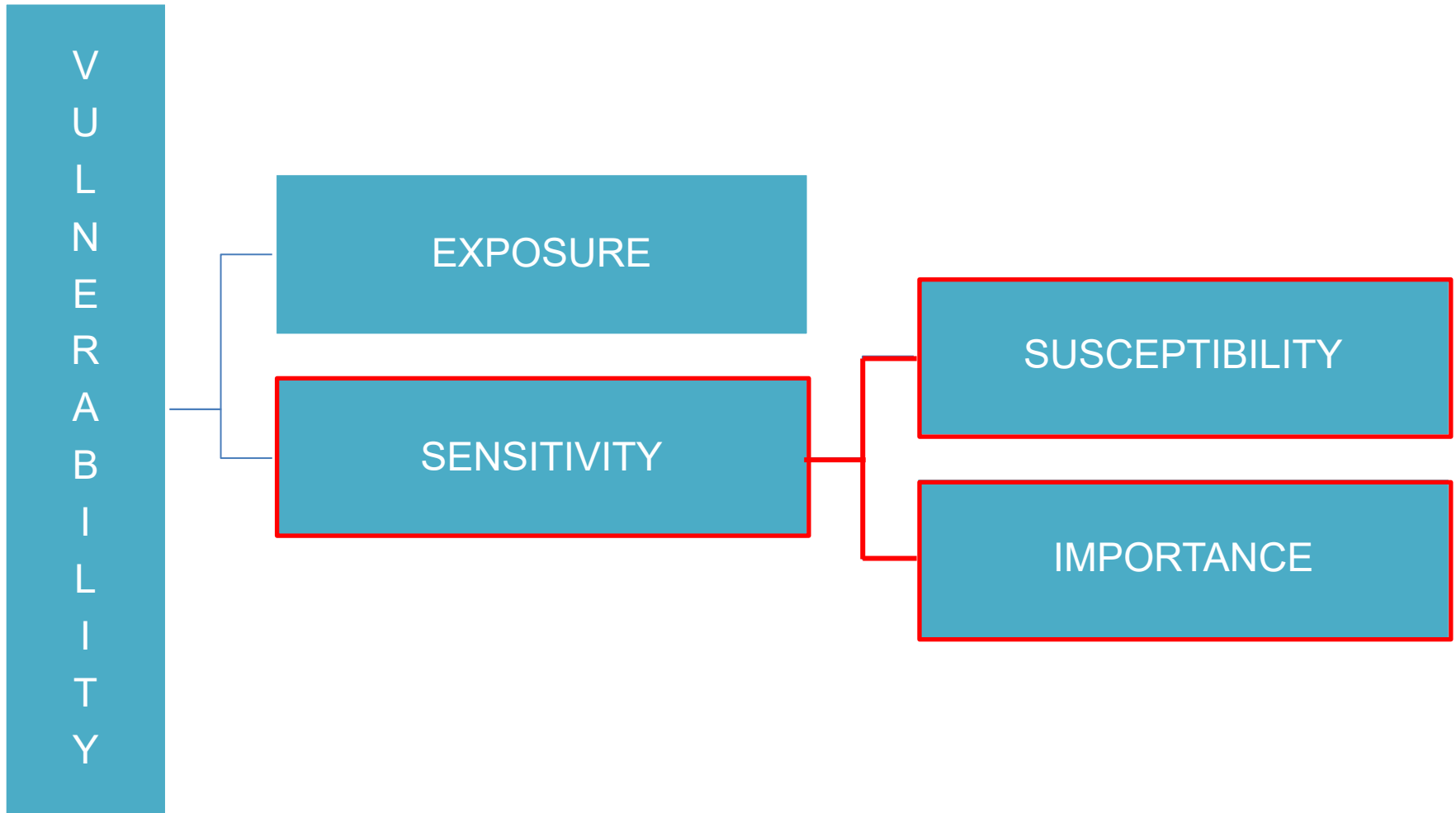
Who is involved?

- Government institutions involved in environmental protection and management and with area-based planning

- Non-governmental organisations

- Universities and other research institutions

- Private owners and managers of biodiversity-rich land

- Industry/private sector

Stakeholder engagement and a participatory process are key to **capture all asset values** and their **contextual importance**.

Methods and data used for sensitivity mapping

Photo credits: Ton Rulkens

Methods for sensitivity mapping

Methods vary in how much of the following they need:

Technical capacity (e.g. GIS skills, processing power)
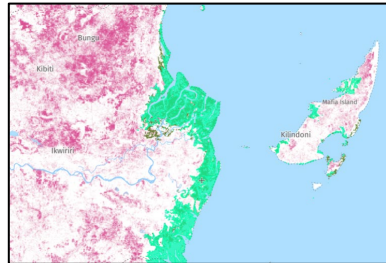
Data inputs

Cost and running-time

National Environment Agency, Norway

Bonn Agreement

Environmental Protection Agency, Ghana

IPIECA
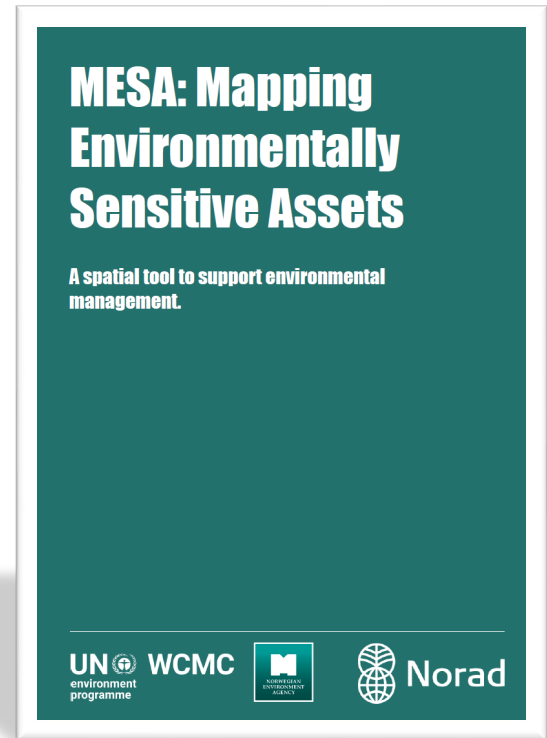
National Environment Management Authority, Uganda

Mapping Environmentally Sensitive Assets (NEA & UNEP-WCMC)

MESA is a **hybrid tool** for sensitivity mapping, developed based on the commonalities identified among other methods.

The tool is packaged as:

- ✓ FME processing file

- ✓ QGIS project file

- ✓ Guidance document

The focus is on oil & gas development, but is **relevant for a range of other sectors** and uses.

MESA: Mapping Environmentally Sensitive Assets

A spatial tool to support environmental management.

UN environment programme · WCMC · NORWEGIAN ENVIRONMENT AGENCY · Norad

Data used for sensitivity mapping
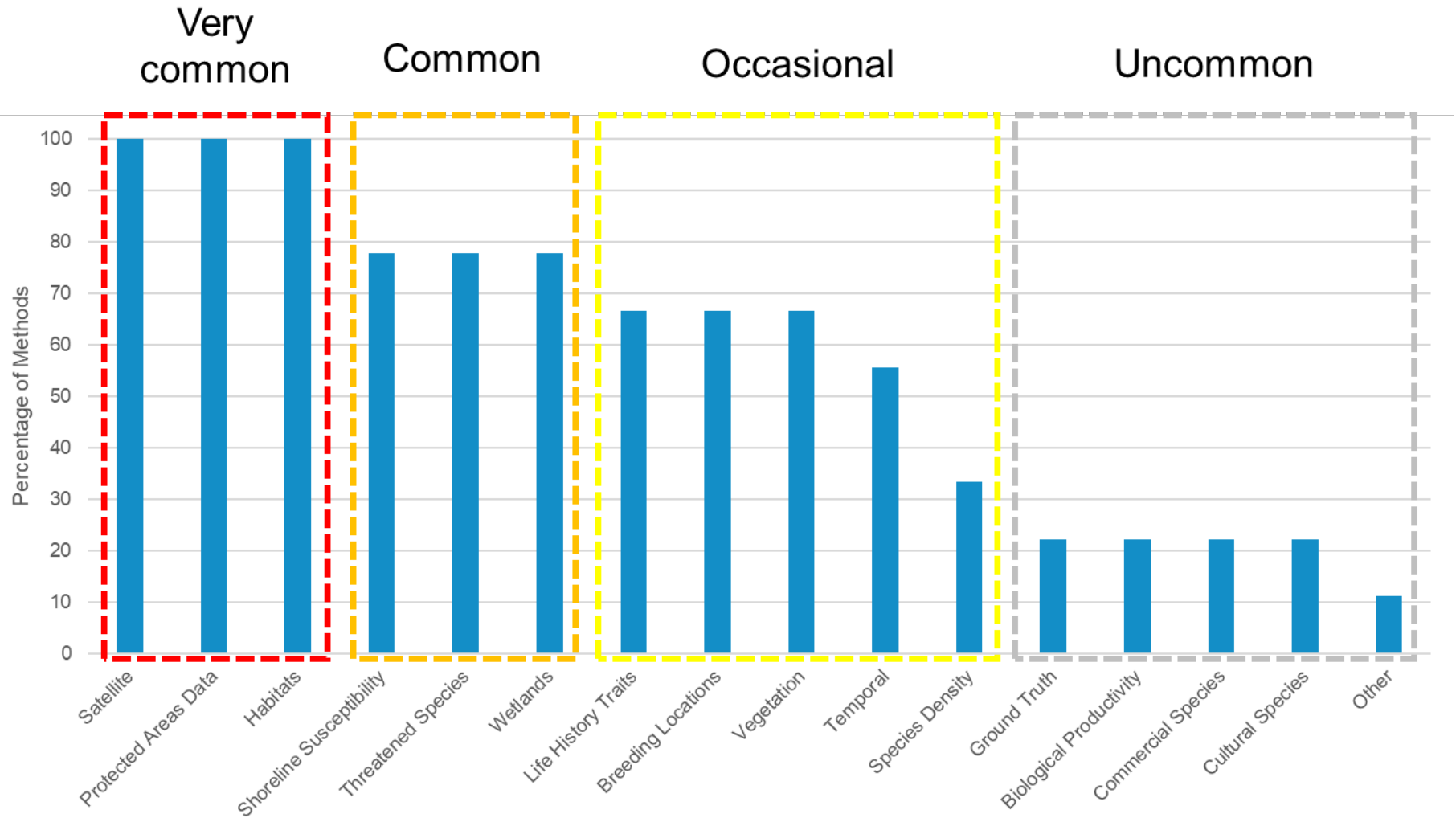
Data management systems

The creation of a data management system will provide three major benefits:

Improvements in visibility and accessibility of data
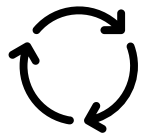
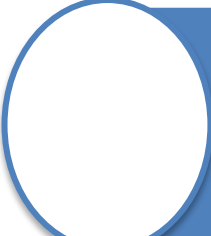Evolving and continuously relevant sensitivity maps based on up-to-date data

Increased transparency further increases credibility leading to greater adoption by stakeholders

Key messages

Environmental sensitivity mapping can form one component of a larger, integrated area-based planning process

Sensitivity mapping highlights sensitivity of ecological and socio-economic assets to specific pressures

Availability and maintenance of relevant data are key for sensitivity mapping and other area-based planning efforts

Improved data collation and management processes are needed in Mozambique

3.2 Environmental sensitivity mapping in practice

Process for developing a sensitivity atlas
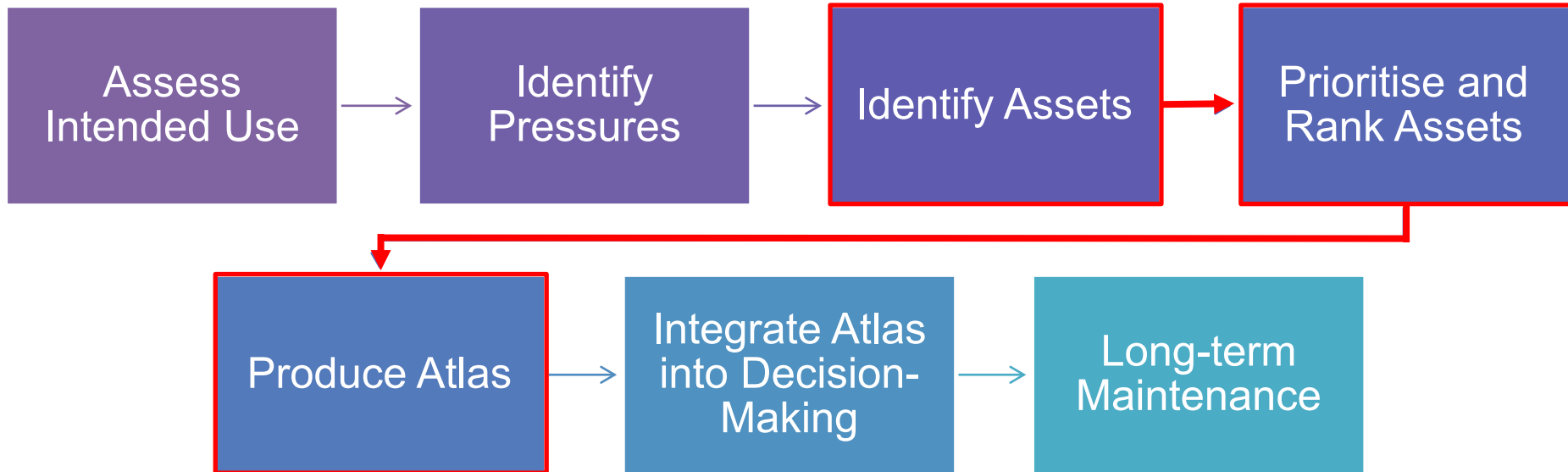
1. Assessing intended use

Identify Objectives

- e.g. Identify key assets to include during a project's EIA process
- e.g. Plan emergency responses to oil spills

Identify realm and scale

- Marine and/or terrestrial areas
- National, regional, or local

Identify the audience

- Public, selected stakeholders, or internal use only

Engage with Stakeholders

- Government institutions, NGOs, Academics, Industry experts

2. Identifying pressures

Pressures will be determined by the intended use of the atlas:

- Atlases for emergency response will likely focus on oil spill, whereas

- Atlases for strategic planning of infrastructure may focus on land-use conversion or degradation.

Expert consultation and supporting literature will be needed to understand what pressures to incorporate given the intended use.

3. Identifying assets

- Definition of what is an asset will determine the outcome of the analysis.

- The final asset list should be country-specific.

- However, key assets are likely to be incorporated regardless of country.

- List of ecological assets should include (but not be limited to):

  ✓ Areas with protected status and/or biodiversity designations

  ✓ Critical Habitat as defined by IFC Performance Standard 6

  ✓ IUCN Red List of Threatened Ecosystems

  ✓ Areas important for IUCN Red List of Threatened Species

  ✓ Habitats known to have high biodiversity value and/or providing ecosystem services

4. Prioritising and Ranking Assets

Importance

An asset's value either at a global and national or local scale in relation to its rarity, significance, functional and intrinsic value.

Consideration should be given to the assets:

- Irreplaceability (internationally and nationally)
- Threat status (for species or ecosystems)
- Functional value
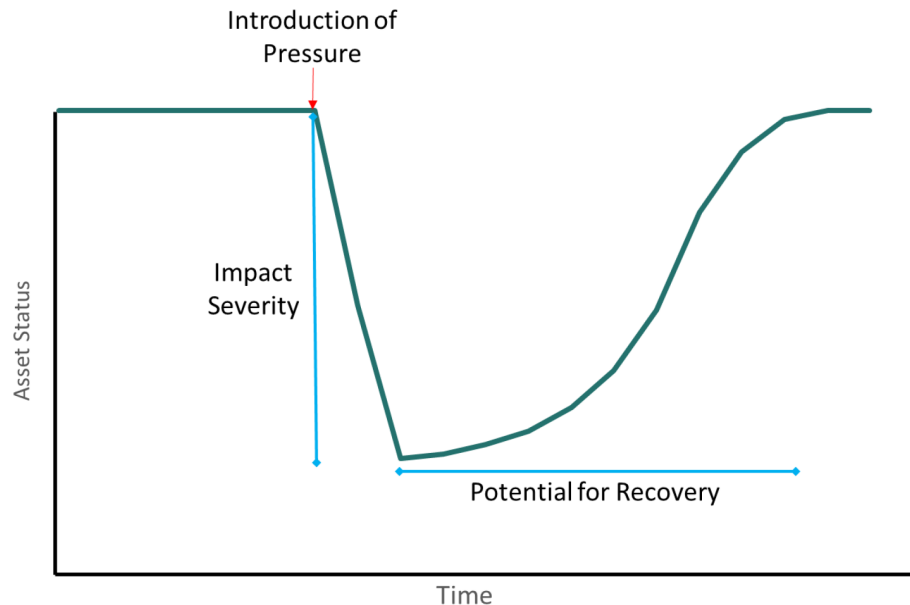- Provision of ecosystem services
- Legal status
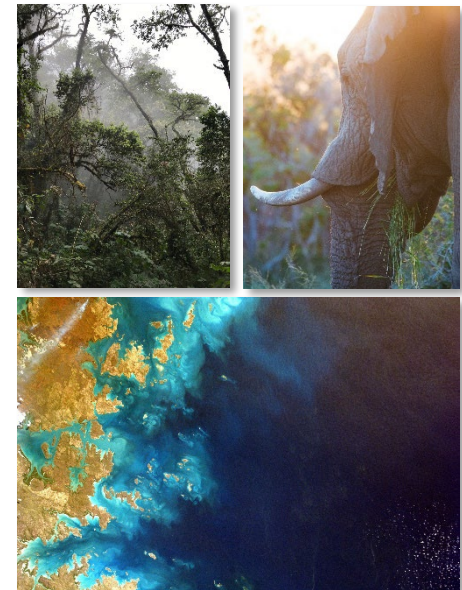
4. Prioritising and Ranking Assets

Susceptibility

The degree to which an asset will be affected by a pressure, based on the predicted severity of the impact and the asset's ability to recover once the pressure has ceased.

Each pressure should be considered separately.

4. Prioritising and Ranking Assets

Environmental Sensitivity =
Asset Importance x Asset Susceptibility

I m p o r t a n c e	Very High					
	High					
	Moderate					
	Low					
	Very Low					
		Very Low	Low	Moderate	High	Very High
		Susceptibility				

5. Producing atlas

The process:

- Accepts a range of GIS file types

- Relies upon FME Desktop

- Can be visualised in GIS software including ArcGIS or QGIS
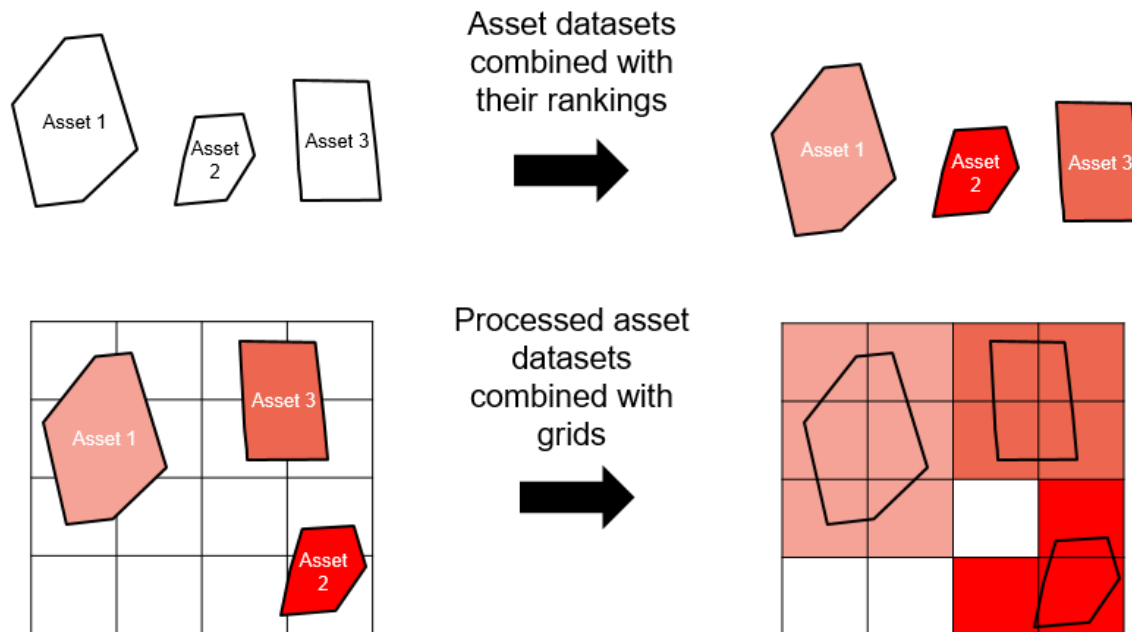
6. Integrating into Decision-making Processes

To integrate properly into decision making there is a need to understand users and their specific requirements.
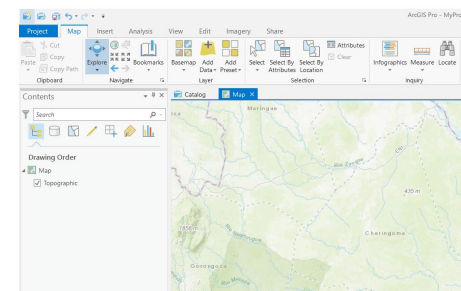
This broadly involves identifying:

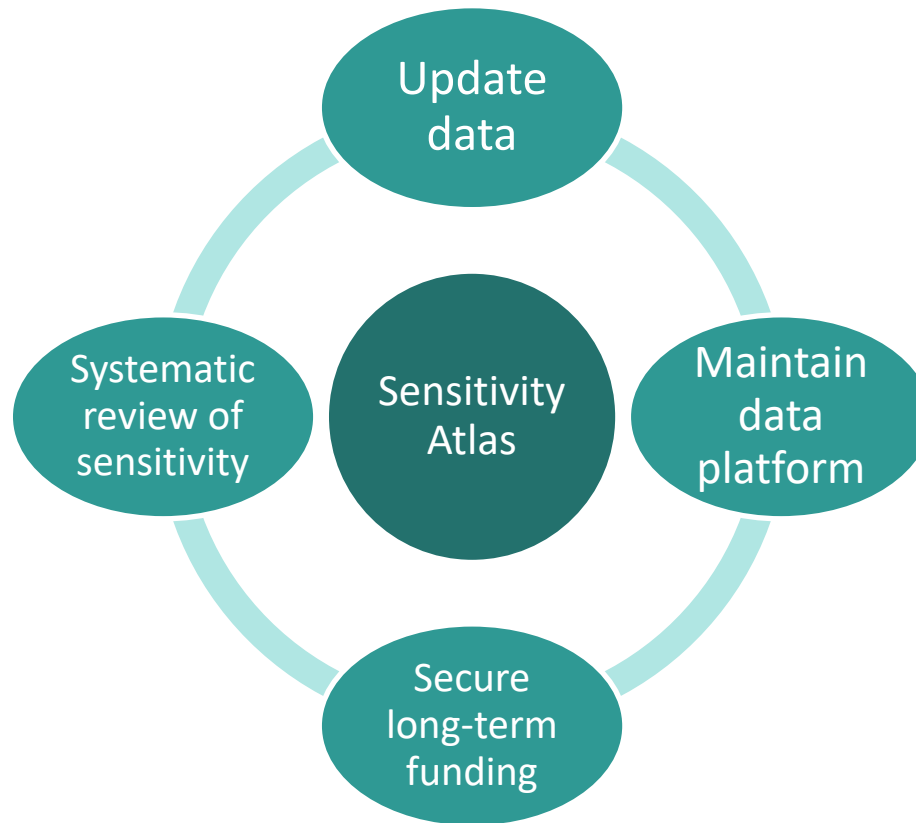**Who are the intended users?**
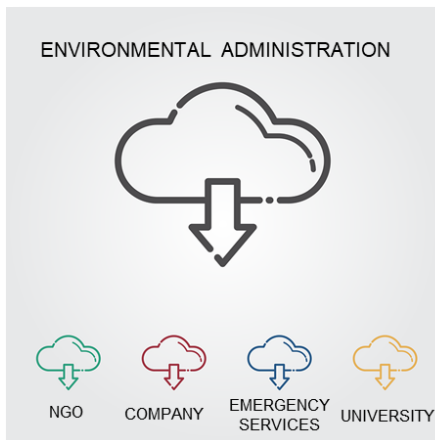
What format do users require the atlas?
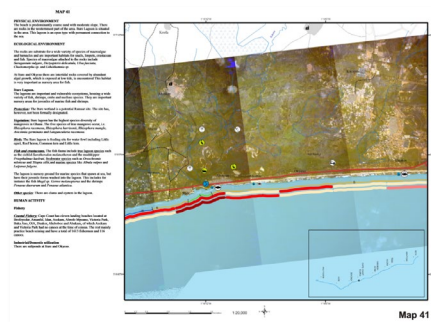
Hard copies for field users

GIS-based for technical users

7. Long-term Maintenance

A sensitivity atlas should be a living entity, constantly able to update as new data becomes available.

Piloting MESA in OfD partners countries

The methodology was demonstrated at a regional workshop in Arusha (Tanzania) in September 2019.

7 OfD partner countries: Ghana, Kenya, Lebanon, Mozambique, Somalia, Tanzania, and Uganda.

Initial feedback was:

- Tool is intuitive to use; and

- It could be more

broadly applicable.

Coastal sensitivity atlas in Ghana

MESA has been applied in Ghana to update their 2004 assessment of coastal sensitivity to oil spills.

1. **Identification of assets**: ecological and socio-economic, with update of underlying datasets

2. **Assessment of importance**: stakeholder consultation and national regulations

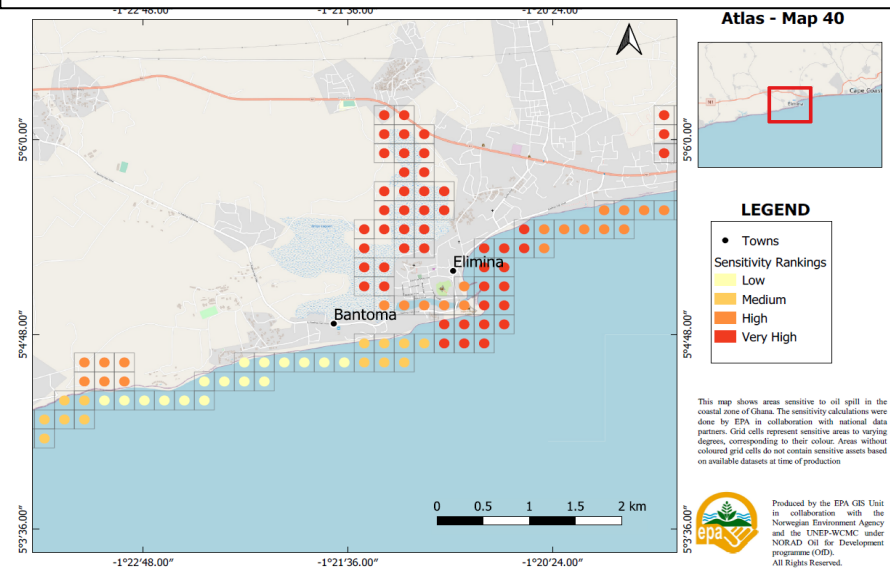3. **Assessment of susceptibility**: impact severity and fate of oil on assets
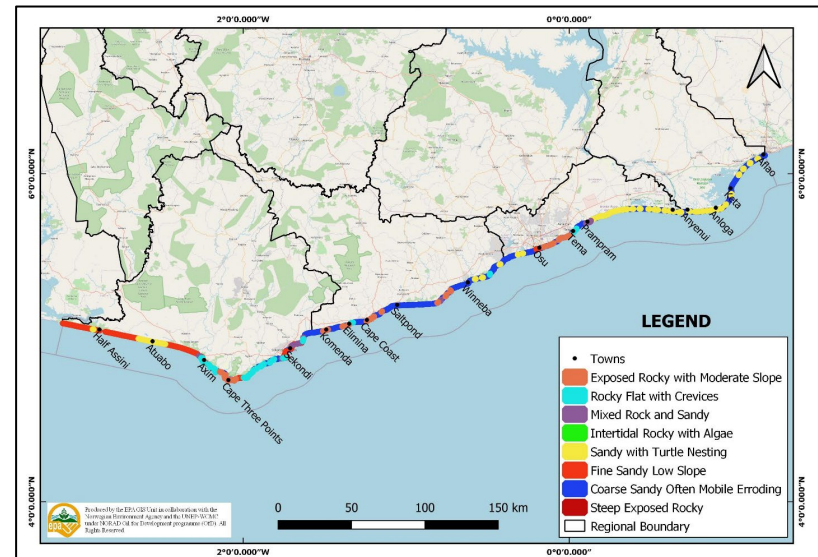
Coastal sensitivity atlas in Ghana

4. **Assessment of sensitivity**: from low to very high

5. **Atlas production:**

- National maps with high-level overview of sensitivity

- Local maps covering all 539km of coastline, with grid cells to be interrogated

- Background information and methodology

Sensitivity mapping in Norway

Photo credits: Ton Rulkens

N58 57' 49,53" Lon=E009 43' 12,05" Alt=8

Sensitivity maps in the Norwegian context

- Sensitivity maps are a tool to prioritize (activity) at acute pollution events.

- The maps should show vulnerable, trheatened and prioritized resources in the coastal areas.

- This allows for prioritisation of efforts to protect resoruces.
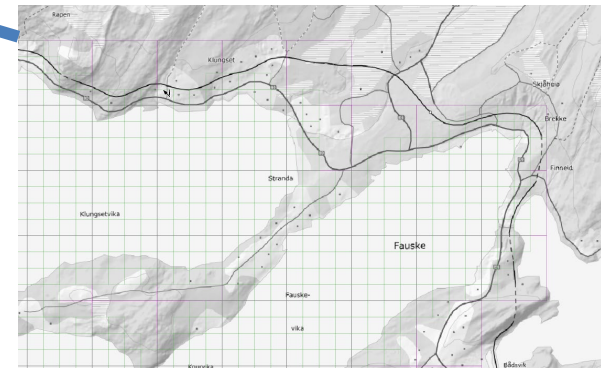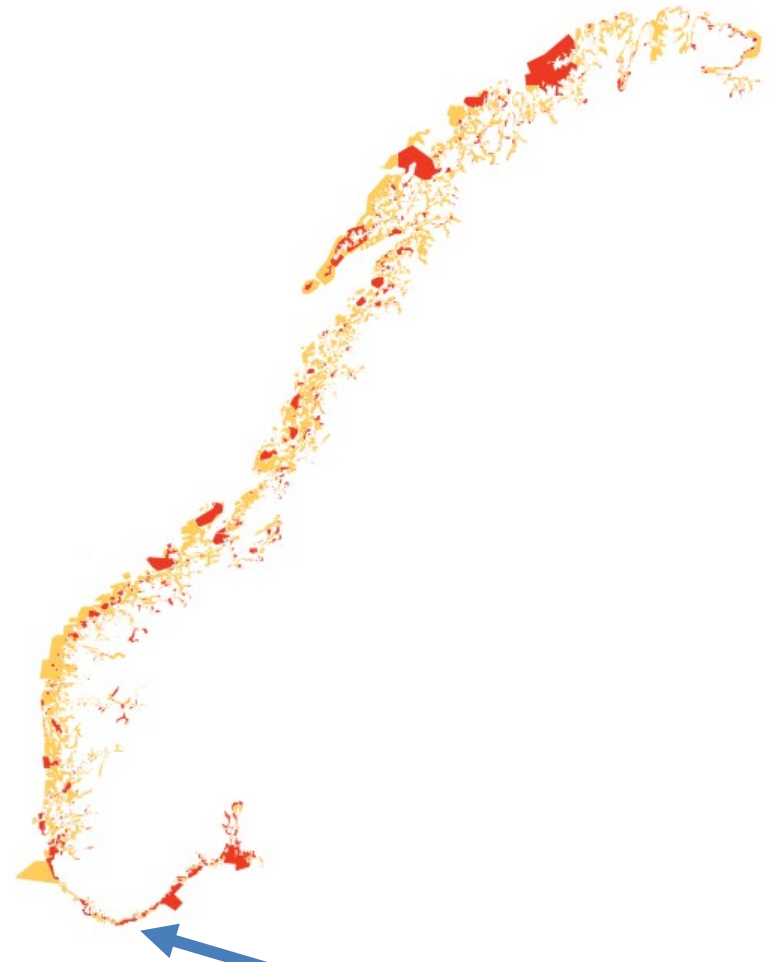
Foto: Full City (Kystverket)

Processing outputs?
(250 m grid squares)

10.315.288 grid squares with detailed information generated

Up to 21 assets represented in one grid cell

Up to 7 data sets represented in one grid cell
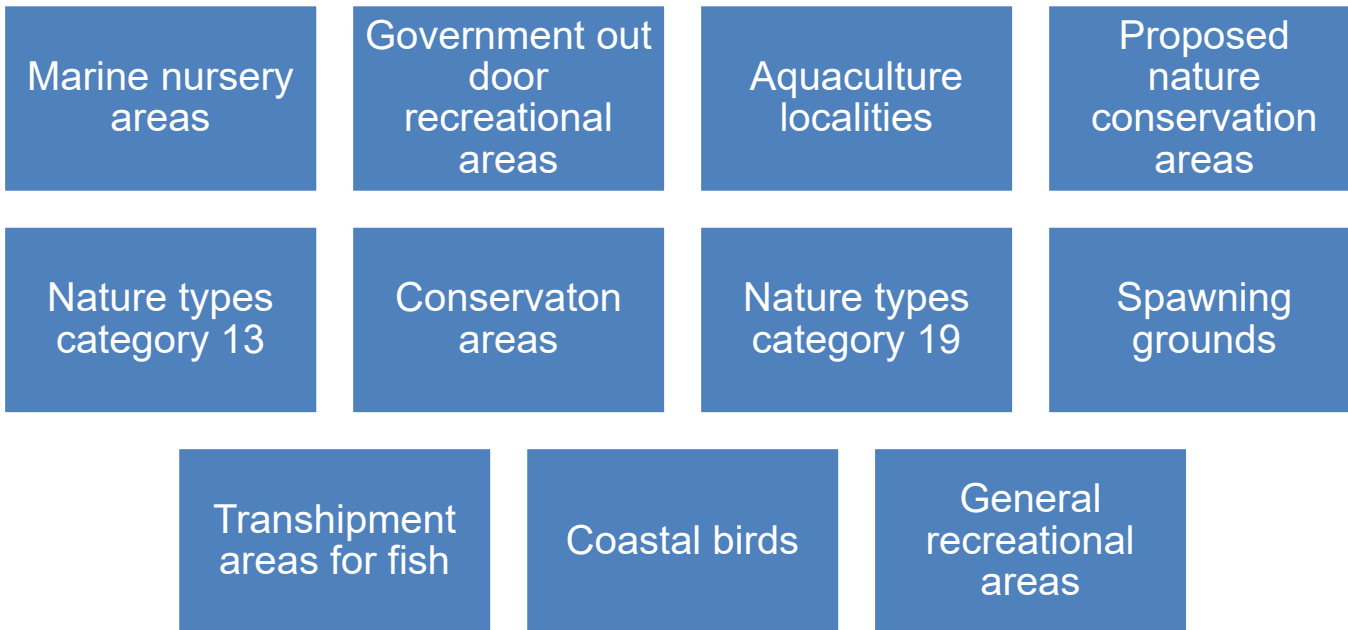
Full analysis each month based on new data

3 resource categories

Nature based industry and activity

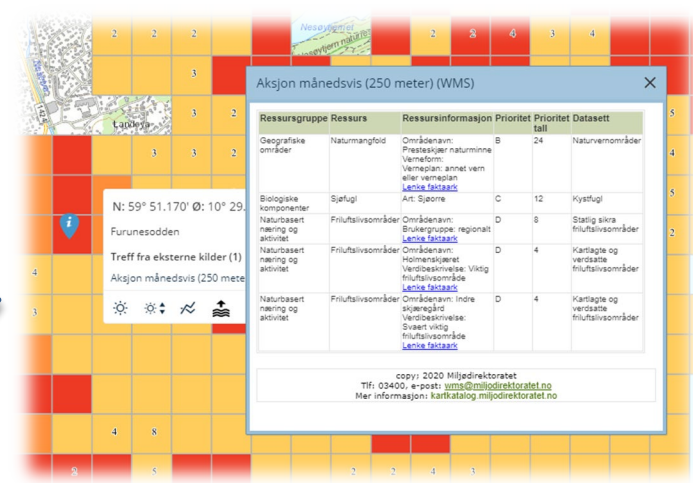Biological components

Geographical areas

11 data sets

Marine nursery areas	Government out door recreational areas	Aquaculture localities	Proposed nature conservation areas
Nature types category 13	Conservaton areas	Nature types category 19	Spawning grounds
Transhipment areas for fish	Coastal birds	General recreational areas	

65 asset categories in the three data sets

Havhest (Fastlandet)	Gråhegre	Grågås	Horndykker	Storjo	Polarmåke	Storskarv	Kvinand	Tyvjo	Kortnebbgås
Dverggås	Sædgås	Fisk og fiskebestander	Lomvi	Ringgås	Krykkje	Storspove	Alke	Gulnebblom	Praktærfugl
Knekkand	Alkekonge	Toppskarv	Ismåke	Fiskemåke	Knoppsvane	Smålom	Bunnsamfunn	Siland	Teist
Botaniske verdier	Storlom	Stellerand	Lunde	Svartand	Islom	Polarlomvi	Rødnebbterne	Tjeld	Stokkand
Svartbak	Skjeand	Småspove	Sildemåke	Dvergdykker	Havsule	Sangsvane	Sjøorre	Gravand	Laksand
Toppand	Gråstrupedykker	Gråmåke	Sabinemåke	Sjøfugl	Fjæreplytt	Brunnakke	Ærfugl	Våtmark	Strandtyper

Geologiske verdier	Naturmangfold	Akvakultur	Friluftslivsområder	Låssettingsplasser

- Processed once a month since March 2020
- Takes 72 hours to process

Geoprosessering – data flow with processing

- Access to data
- Generalisation
- Prioritisation
- Huge amounts of data
- Processing
- Sharing

Practical use

Operation manual for vessels involved in pollution control

Guidelines for response plans

-The map contributes to the first, critically important responses being well quality assured. The service also provides a good basis for planning actions against acute pollution in the longer term, and it is an important tool in emergency preparedness against acute pollution, says director of The Norwegian coastal administration Einar Vik Arset
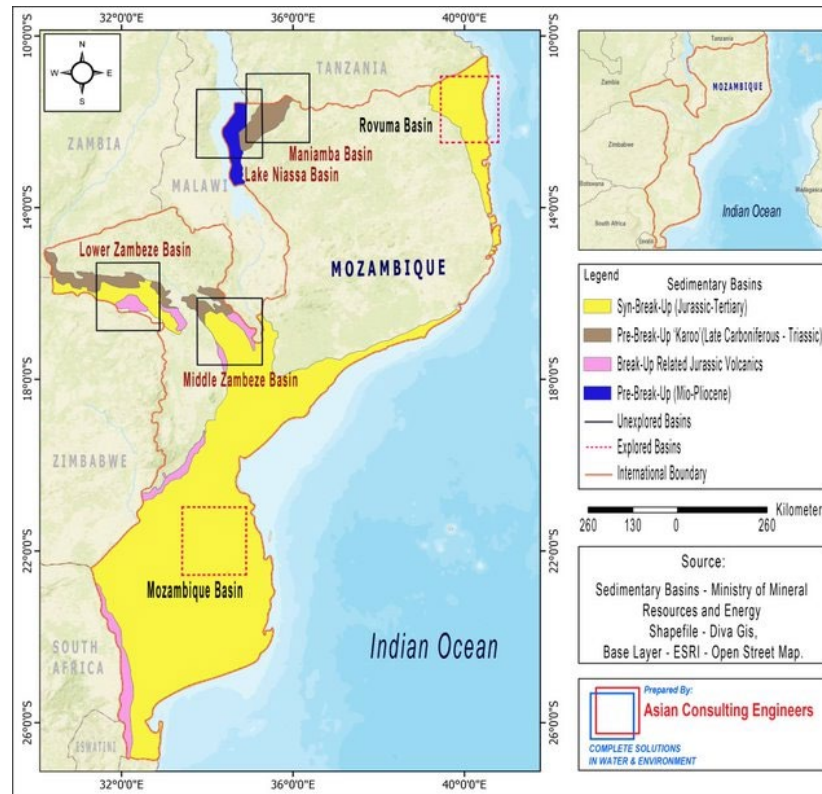
MAGTAP vulnerability map

Photo credits: Ton Rulkens
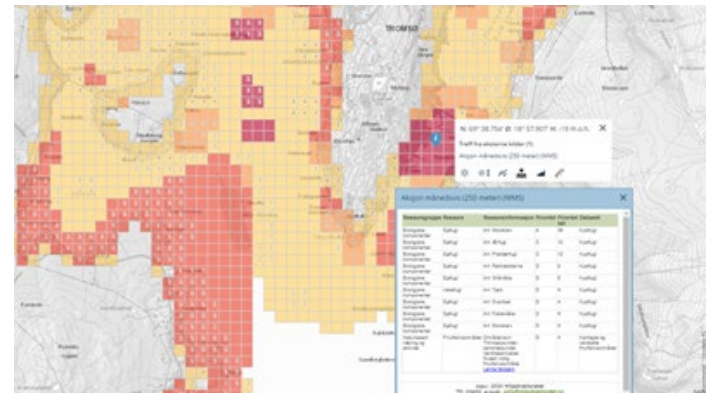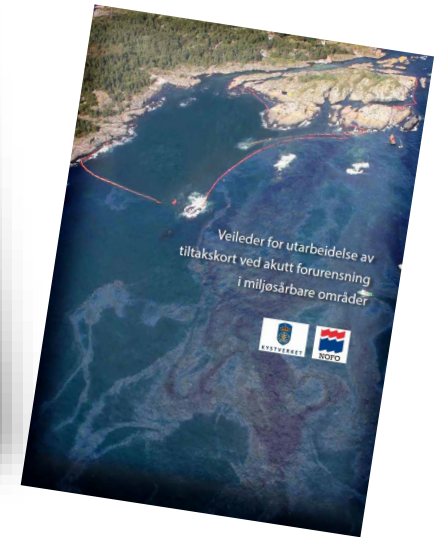
The Mining and Gas Technical Assistance Project (MAGTAP) Vulnerability Mapping

- Identify and map areas that are vulnerable to environmental risks related to oil and gas exploration and production operations (vulnerability mapping)

3.3 Environmental sensitivity mapping group exercise

Environmental sensitivity mapping exercise

Context:

The National Petroleum Agency is looking to establish new concession blocks for oil and gas activities. However, the Agency wants to first establish what are the potential environmental risks associated with accidental oil spills within those concession blocks.

Aims:

- Assess the importance of different ecological assets.
- Map out the sensitivity of ecological assets to oil spills.
- Identify potential priority areas within potential concession blocks.

Ecological assets

Asset A
Coral reef, part of a Key Biodiversity Area but with no formal protection status, providing fish nursing ground on which the local fishing community relies.

Asset B:
Mangrove forest, with no formal protection status, providing protection to a local village from extreme weather events.

Asset C:
Sand beach, with no formal protection status, providing nesting sites for a threatened turtle species.
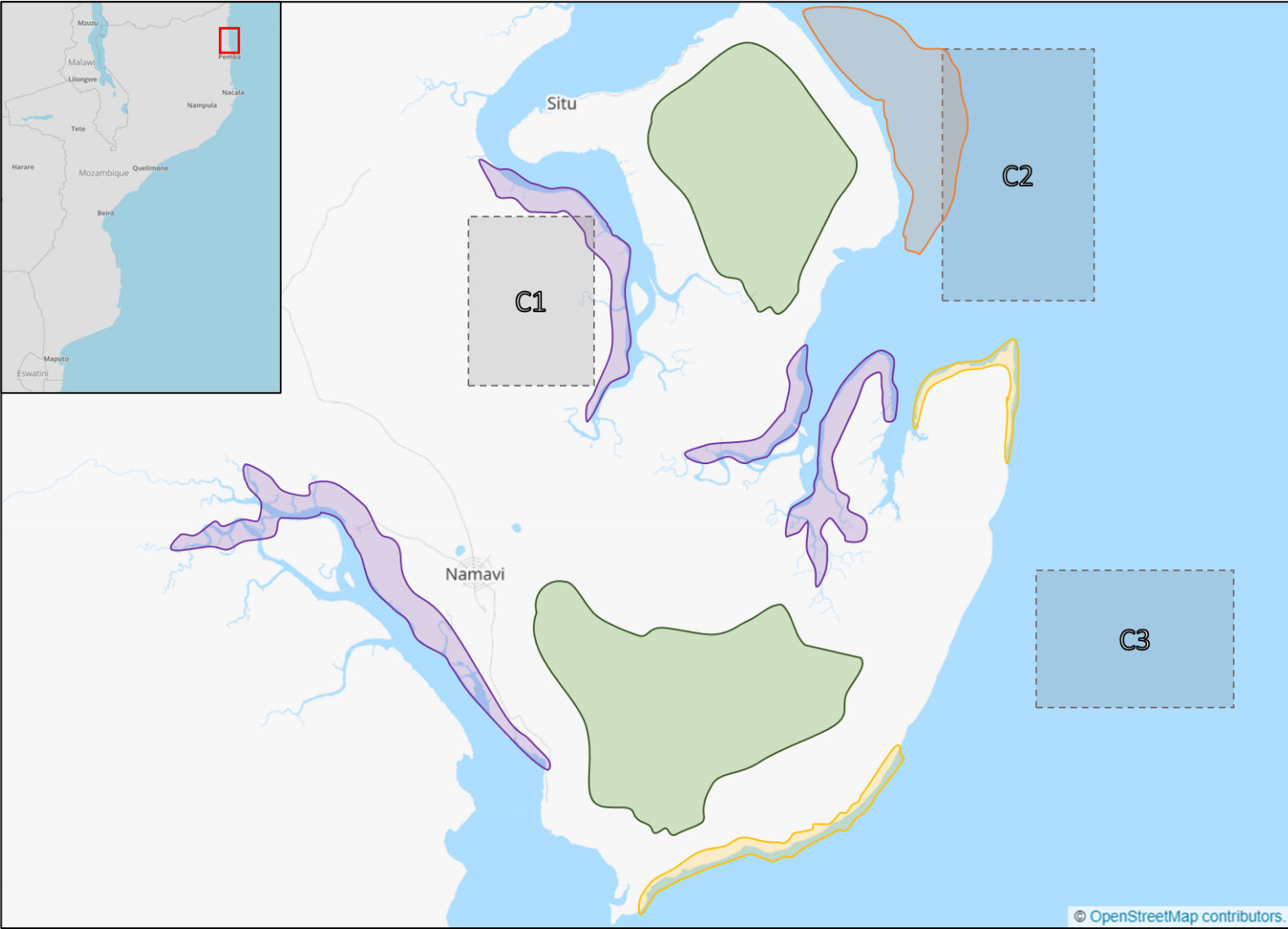

Asset D:
Coastal forest designated as National Park, supporting at least one threatened species.
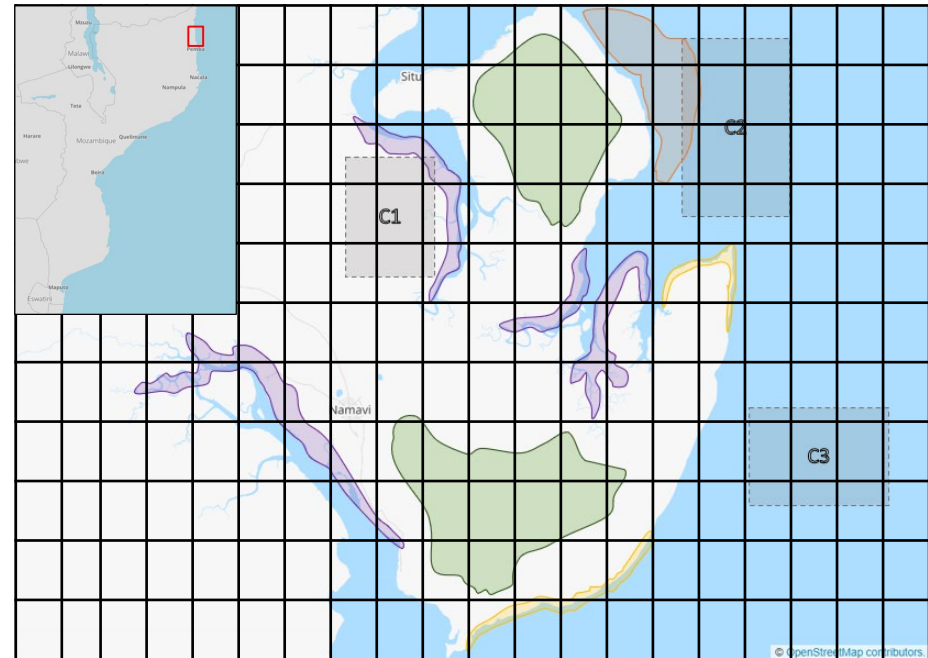
Legend

- (A) Coral reef
- (B) Mangrove forest
- (C) Sand beach (turtle nesting sites)
- (D) Forest (National park)
- C1 — Concession block

Part 1: Importance ranking

1. Based on the information provided, rank the importance of each of the ecological assets between 1 (Very low) and 5 (Very high). More than one asset can have the same importance rank.

2. The ecological asset map should be numbered accordingly, reflecting the importance rank of each grid cell based on the ecological assets it overlaps with.
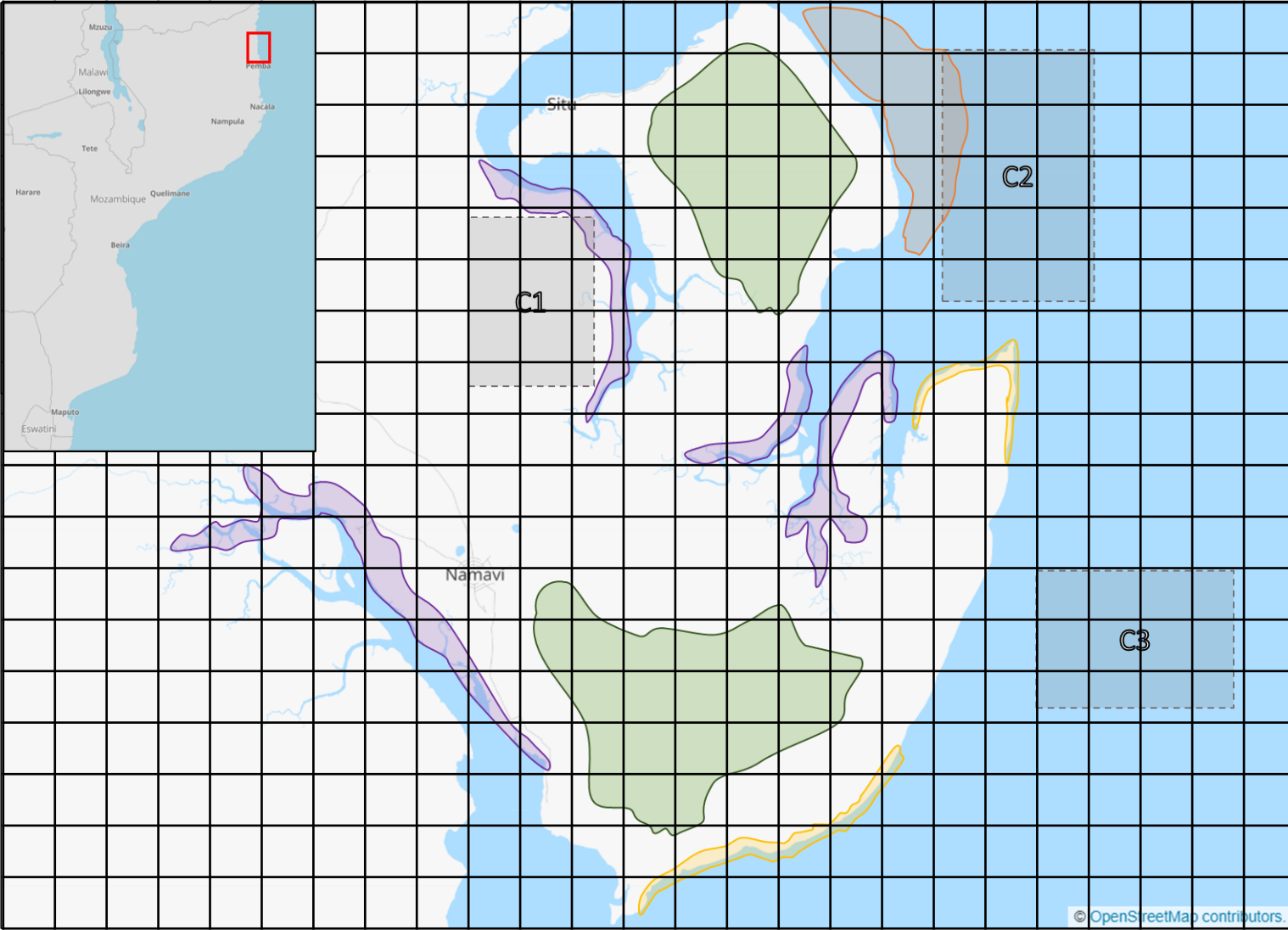
Legend

(A) Coral reef

(B) Mangrove forest

(C) Sand beach (turtle nesting sites)

(D) Forest (National park)

C1 Concession block

Importance ranking

1 Very low
2 Low
3 Medium
4 High
5 Very high

© OpenStreetMap contributors.

Part 2: Sensitivity ranking

1. Using the susceptibility rankings provided (see table 1) calculate the sensitivity ranking of each asset to oil spills.

- Sensitivity is calculated by:
  Susceptibility + Importance (see table 2)

Asset	Susceptibility ranking
A	2
B	5
C	3
D	4

Table 1: susceptibility rankings

2. Colour the sensitivity map accordingly. Each grid cell should include the sensitivity rank based on the ecological assets it overlaps with.

- Identify which concession blocks may have high environmental risks with it. Discuss which blocks may need to be identified as priority areas for further environmental studies, and why.

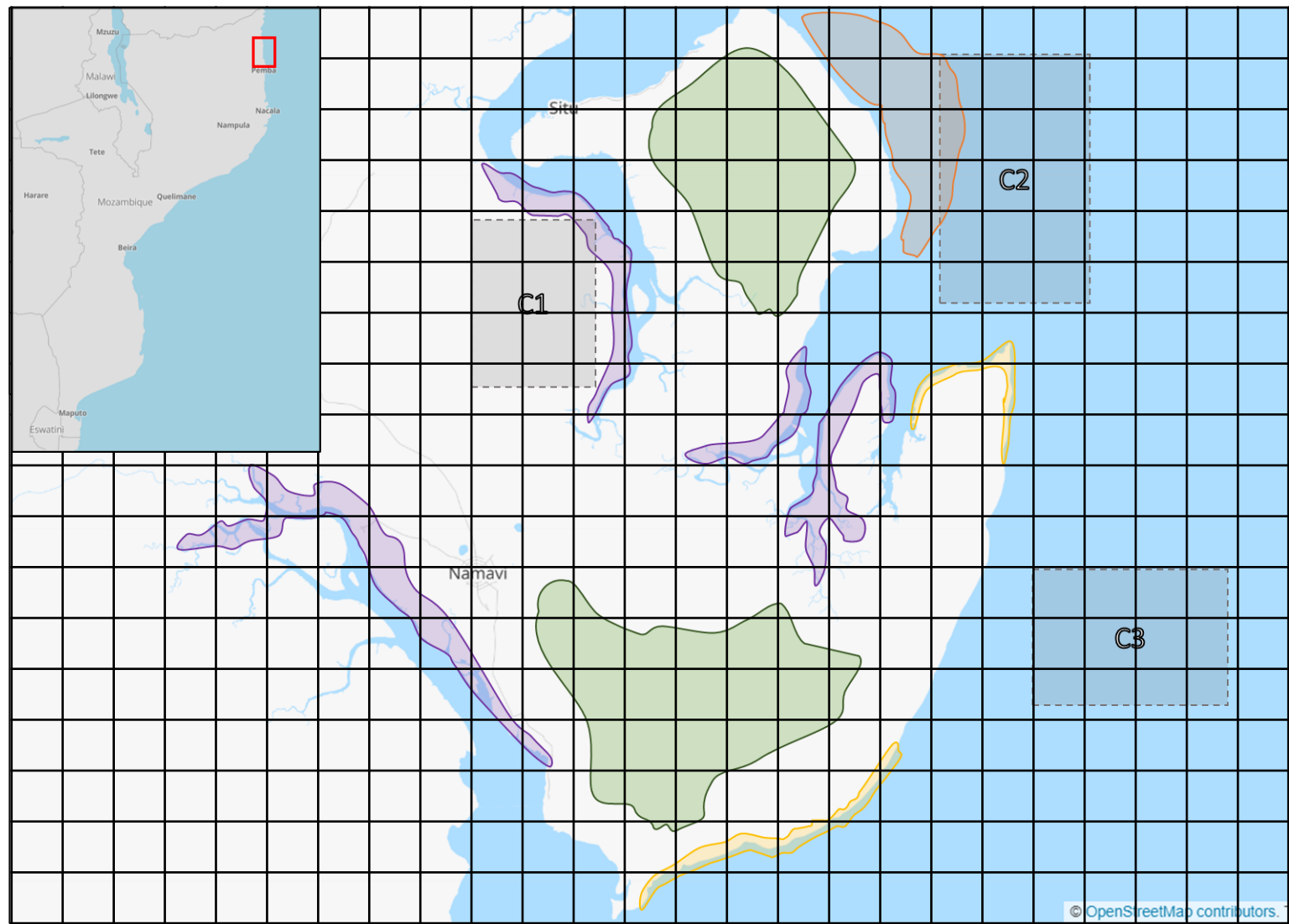| Importance		Very Low	Low	Medium	High	Very High
	Very High	5	10	15	20	25
	High	4	8	12	16	20
	Medium	3	6	9	12	15
	Low	2	4	6	8	10
	Very Low	1	2	3	4	5
		Very Low	Low	Medium	High	Very High
		Susceptibility				

Table 2: sensitivity matrix

Legend

- (A) Coral reef
- (B) Mangrove forest
- (C) Sand beach (turtle nesting sites)
- (D) Forest (National park)
- C1 Concession block

Sensitivity ranking

Importance	Very High	5	10	15	20	25
	High	4	8	12	16	20
	Medium	3	6	9	12	15
	Low	2	4	6	8	10
	Very Low	1	2	3	4	5
		Very Low	Low	Medium	High	Very High
				Susceptibility		

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Part 3: Report back

1. Each group presents their importance map and their sensitivity map.

2. Compare the different priority areas identified for further environmental studies. Discuss the assumptions that have led to any differences between each group.