



A VISION FOR OMAN WETLAND DEVELOPMENT

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19/10/2022

DEME GREEN | RESTORING LAND FOR THE FUTURE



Goal of the presentation:

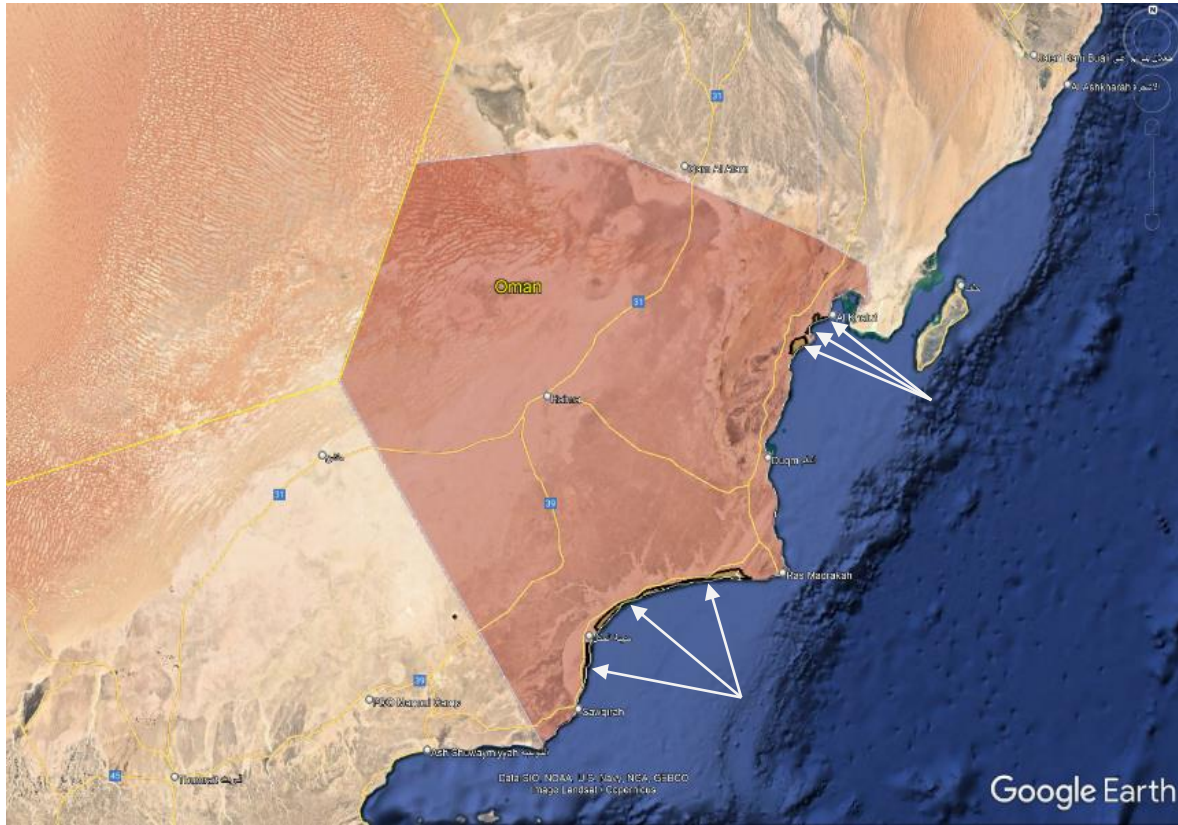
Present the fruit of a collaborative effort launched in the wake of previous Water & Humanity conference

This fruit proposes a vision to develop natural infrastructure at large scale in Oman





From the request from the Oman Environment Authority



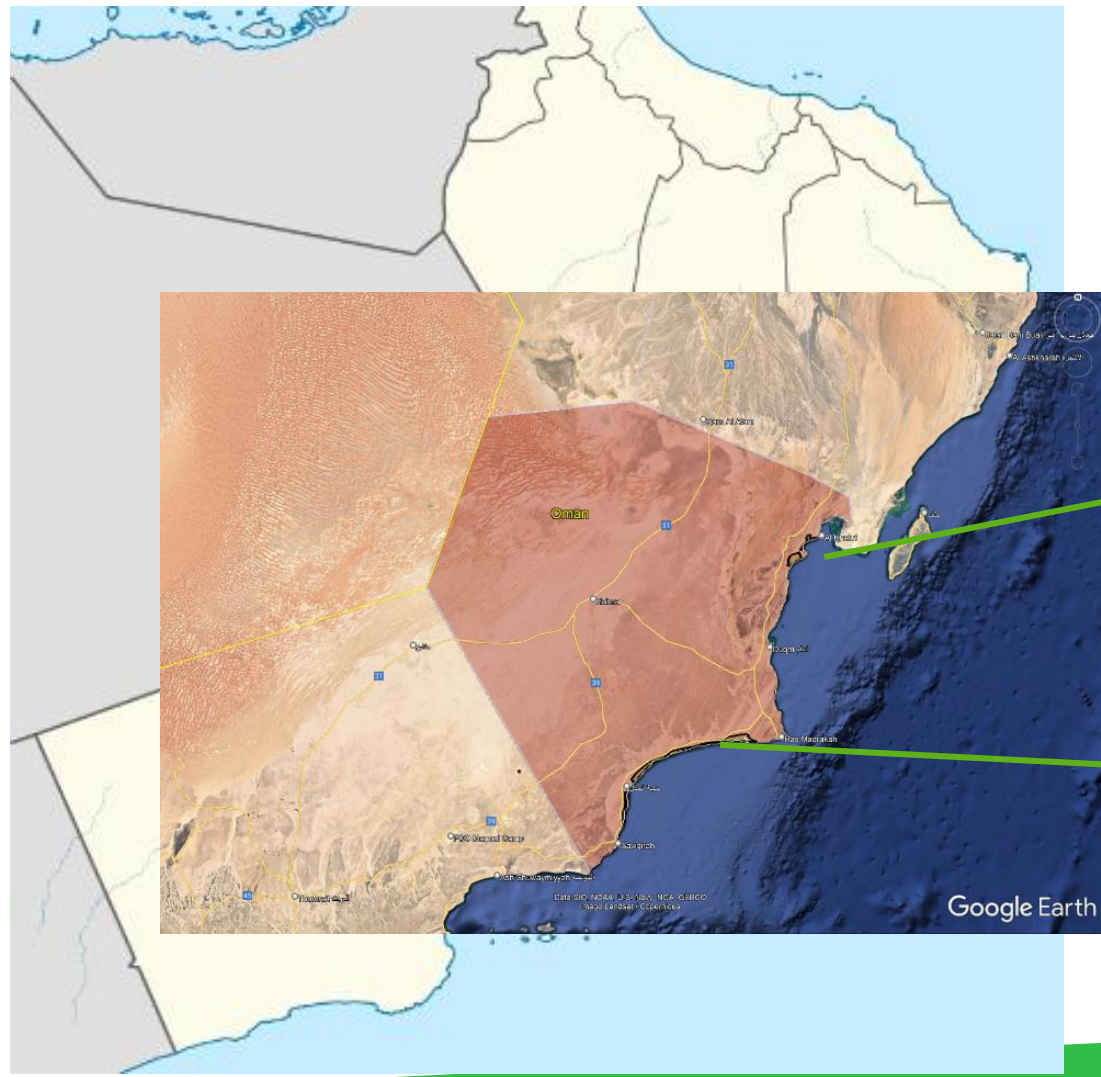
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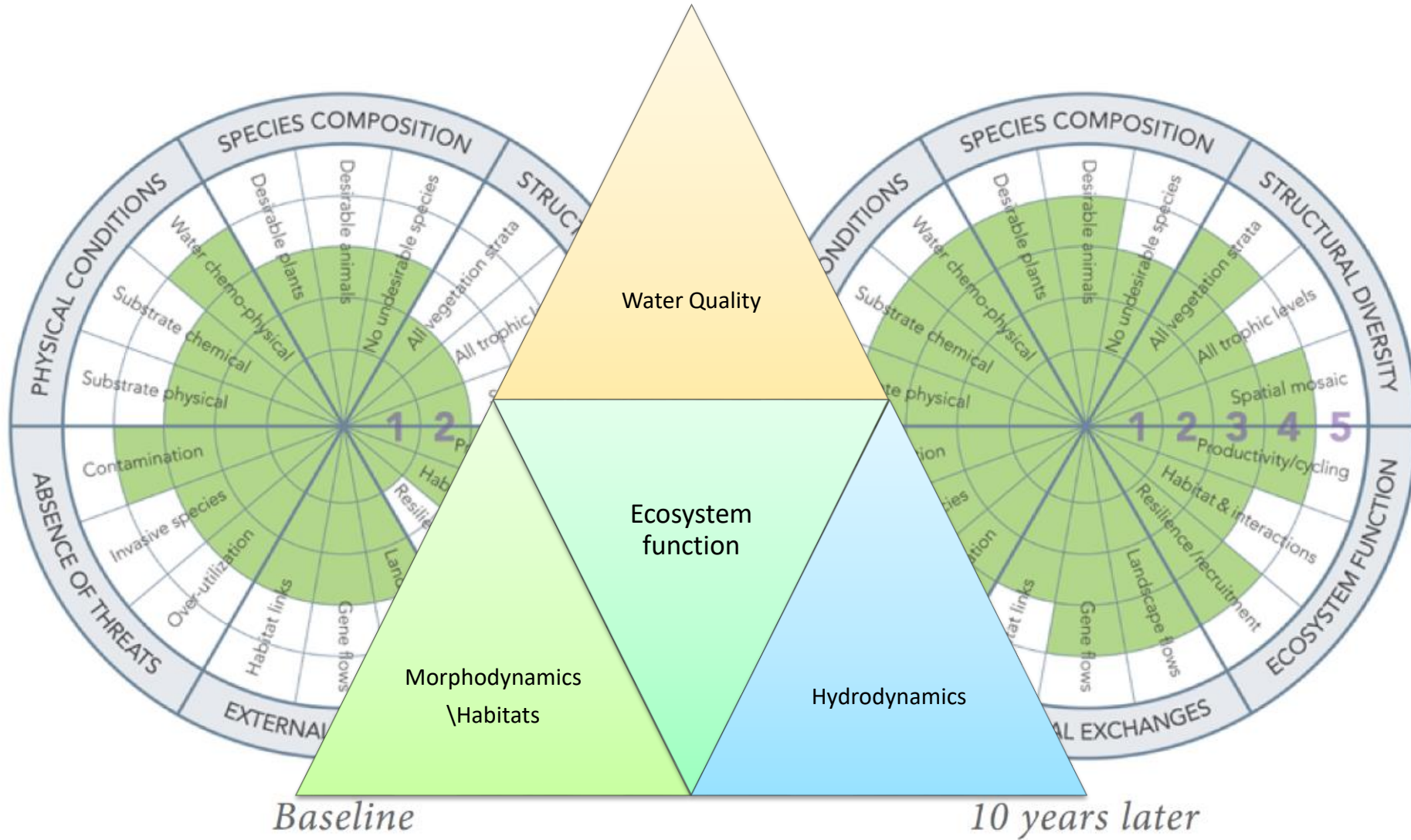
Create coastal lagoons



Locations of potential wetland development



Ecological Restoration



1. Hydrodynamic and morphology
2. Topography
3. Soil fertility & freshwater availability

Mimicking Nature

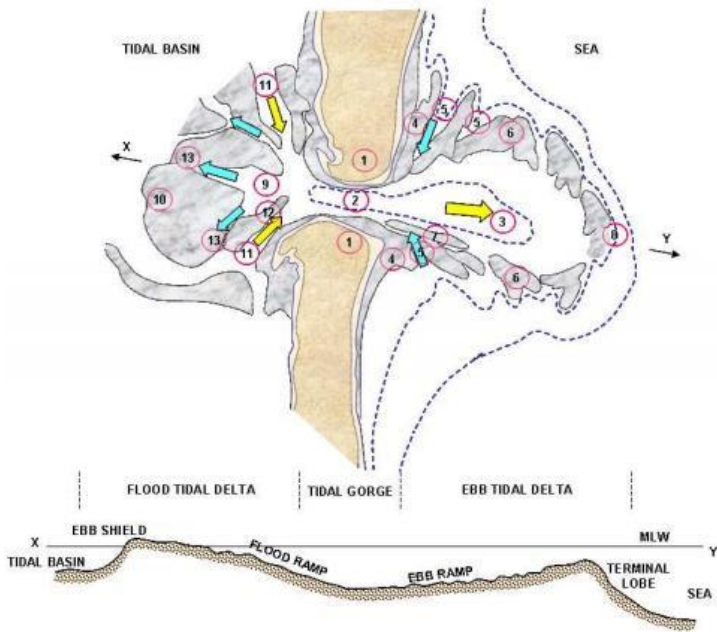


Inlet stability defined by the r factor:

$$r = P / M_{tot}$$

P = Tidal prism (m^3)

M_{tot} = Yearly gross littoral drift (m^3)



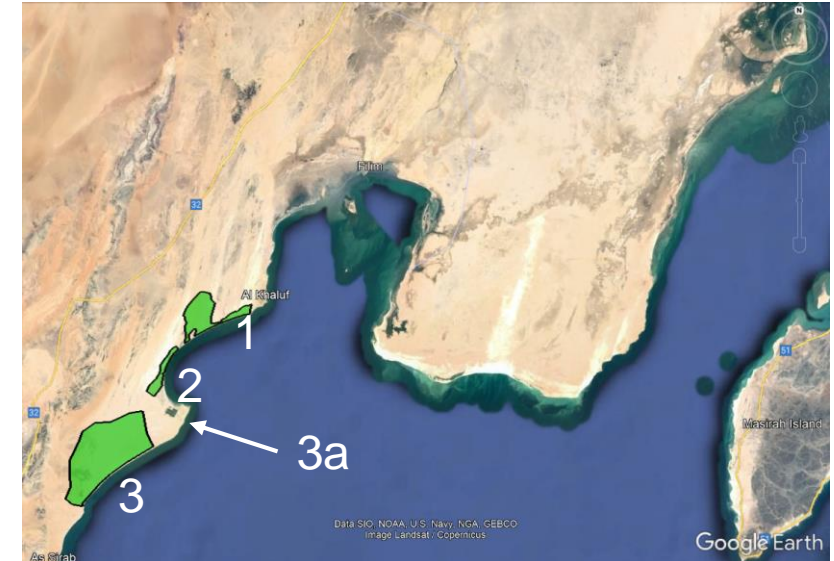
r	Stability	Bypassing type	Dominant process
$r < 20$	Poor	Bar bypassing, Spit formation	Wave
$20 < r < 50$	Poor	Bar bypassing	Wave/Tide
$50 < r < 150$	Fair to good	Bar and flow bypassing	Tide/Wave
$r > 150$	Good	Flow bypassing	Tide



Site selection

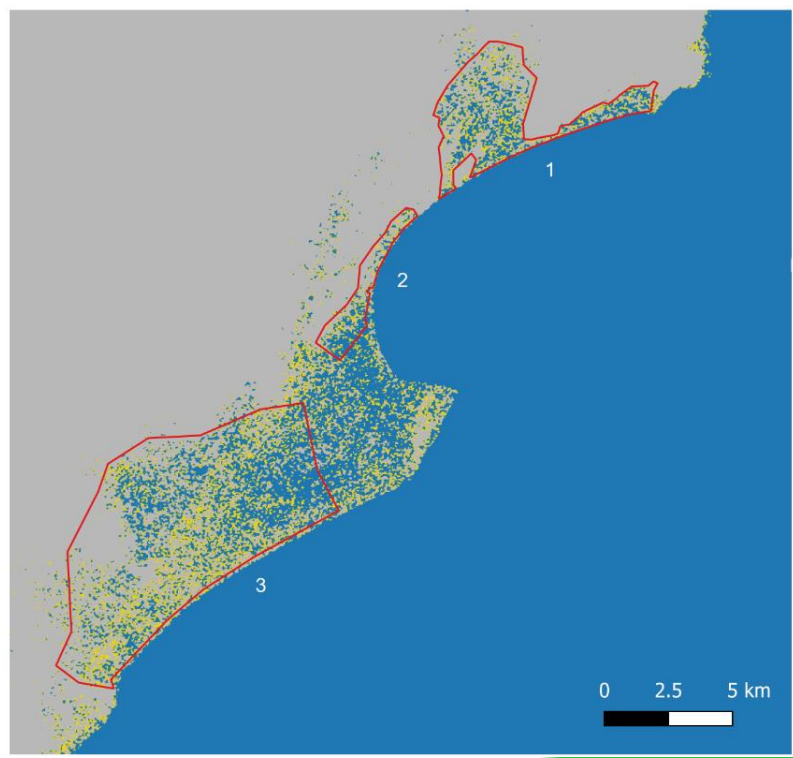
1. Hydrodynamic and morphology
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Wetland name (numbering from North to South)	$r = P/M_{tot}$	Stability	Bypassing	Dominant process
1, موقع مخلوف مقترح	28	Poor	Bar bypassing	Wave/Tide
2, موقع بنتوت شمال,	15	Poor	Bar bypassing, Spit formation	Wave
3, موقع جنوب بنتوت,	80	Fair to good	Bar and flow bypassing	Tide/Wave
3a (shrimp farm)	169	Good	Flow bypassing	Tide
4, هيتام-مقترح ذرف	142	Fair to good	Bar and flow bypassing	Tide/Wave
5, غديسر -هيتام,	21	Poor	Bar bypassing	Wave/Tide
6, فيصد -غاوي,	29	Poor	Bar bypassing	Wave/Tide
7 (Wetland Development Zone Salalah)	2	Poor	Bar bypassing, Spit formation	Wave



Site selection

1. Hydrodynamic and morphology
2. Topography
3. Soil fertility & freshwater availability



Legend

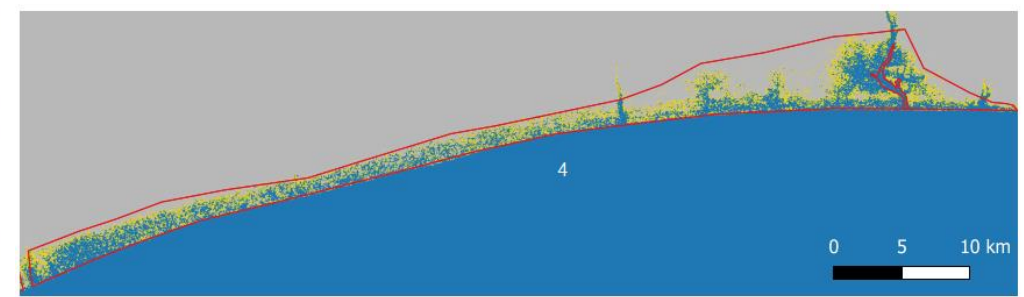
□ Potential wetland sites

Elevation

- ≤ 3.0
- 3.0 - 5.0
- 5.0 - 653.0

Elevation class areas (ha)

Index	Name	Area	<3m	<5m
1	North	1885	597	963
2	Mid	535	179	278
3	South	6684	2190	498

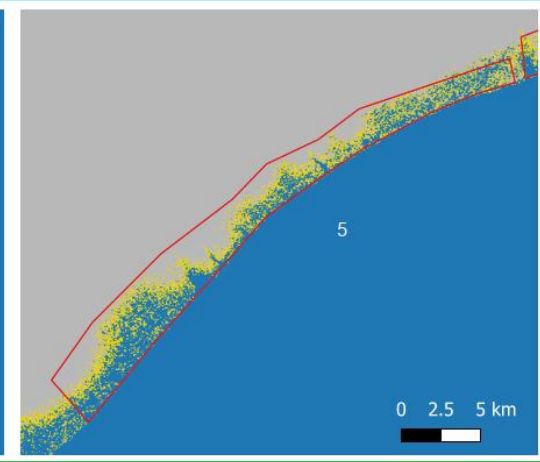
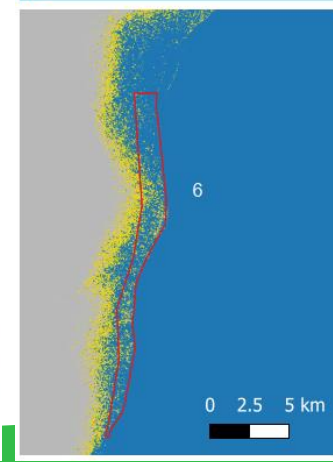


Legend

□ Potential wetland sites

Elevation

- ≤ 3.0
- 3.0 - 5.0
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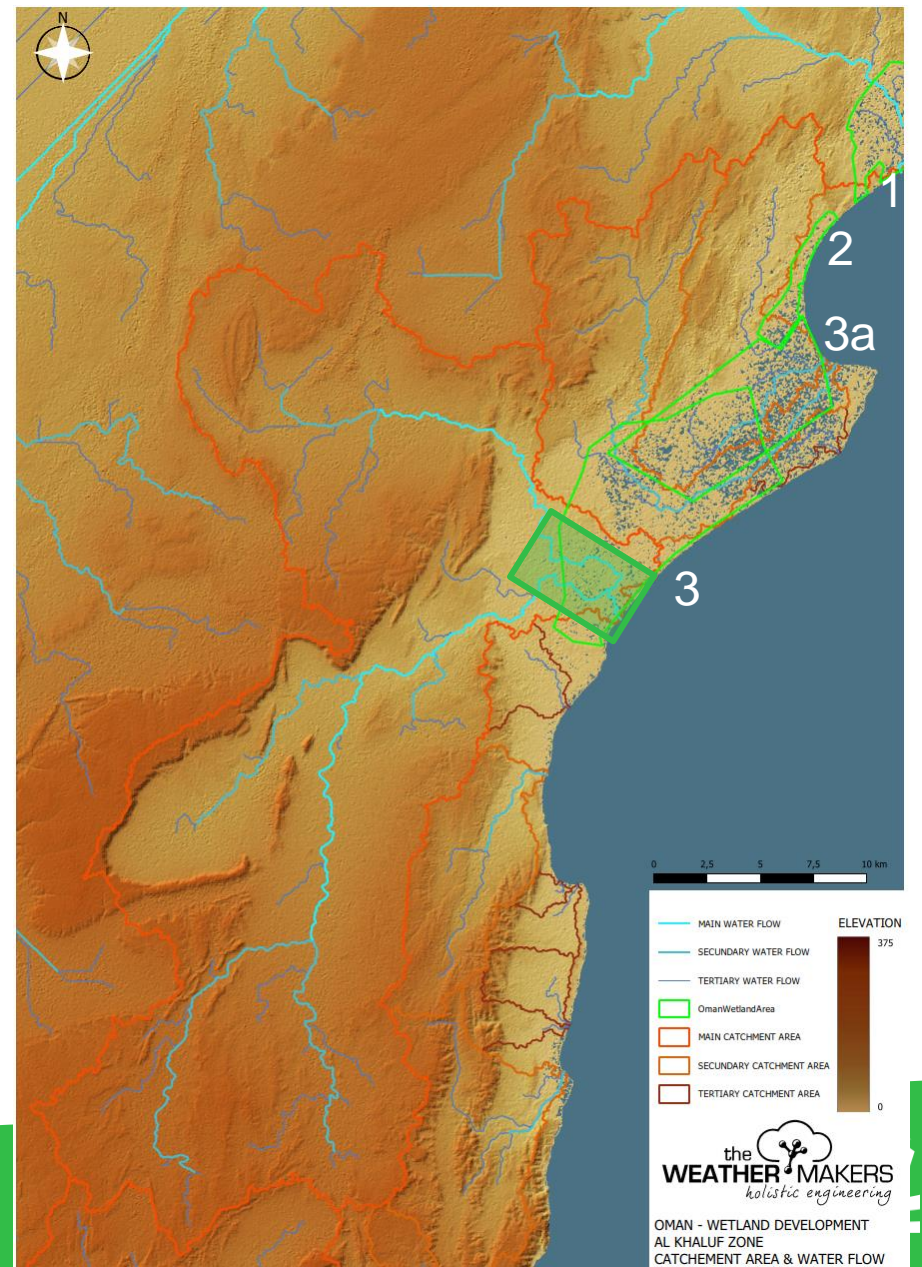
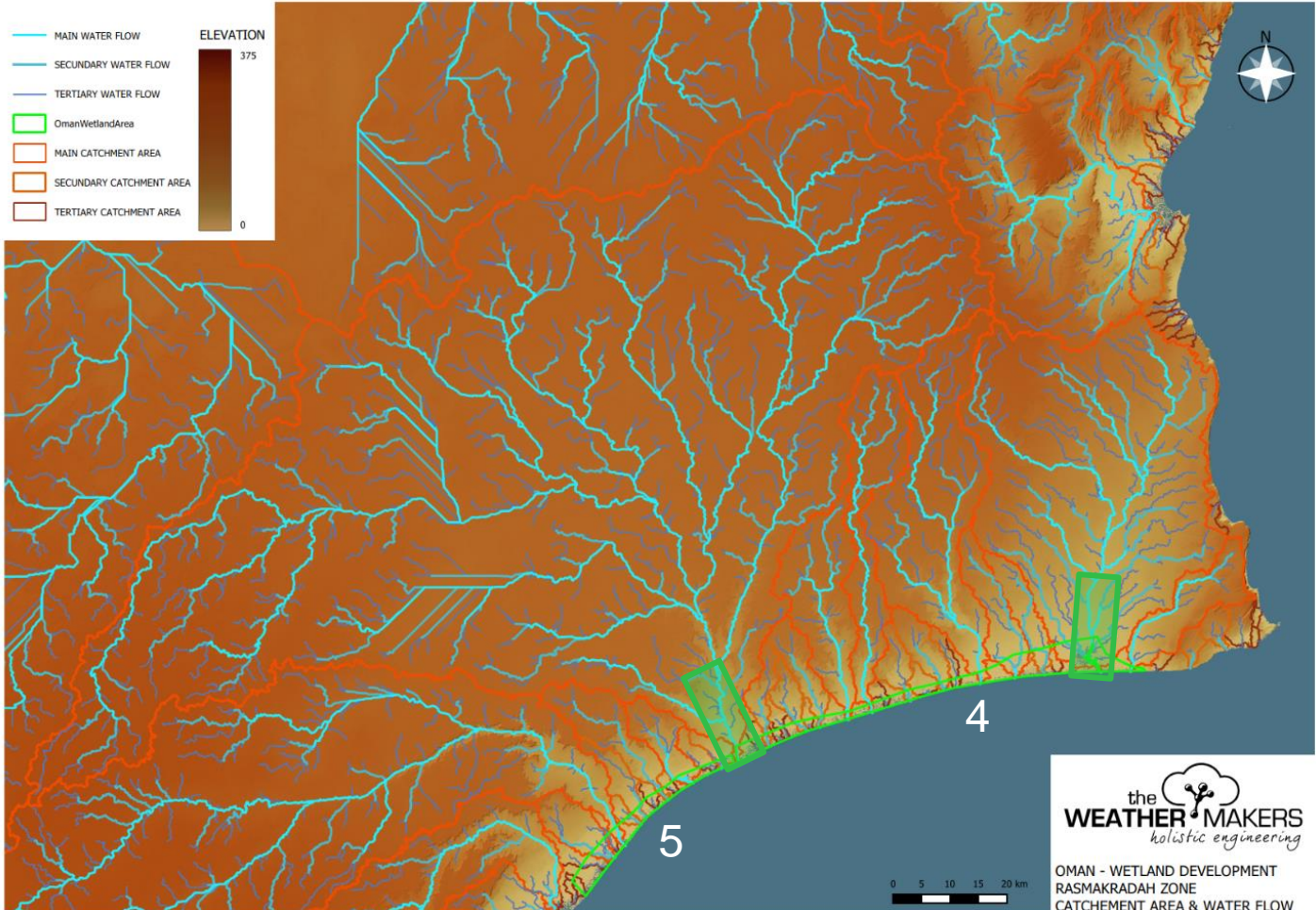
Elevation class areas (ha)

Index	Name	Area	<3m	<5m
4	North-East	19239	6751	11093
5	Middle	9807	3374	5836
6	South-West	4262	3452	4156



Site selection

- 1. Hydrodynamic and morphology
- 2. Topography
- 3. Soil fertility & freshwater availability



Site selection

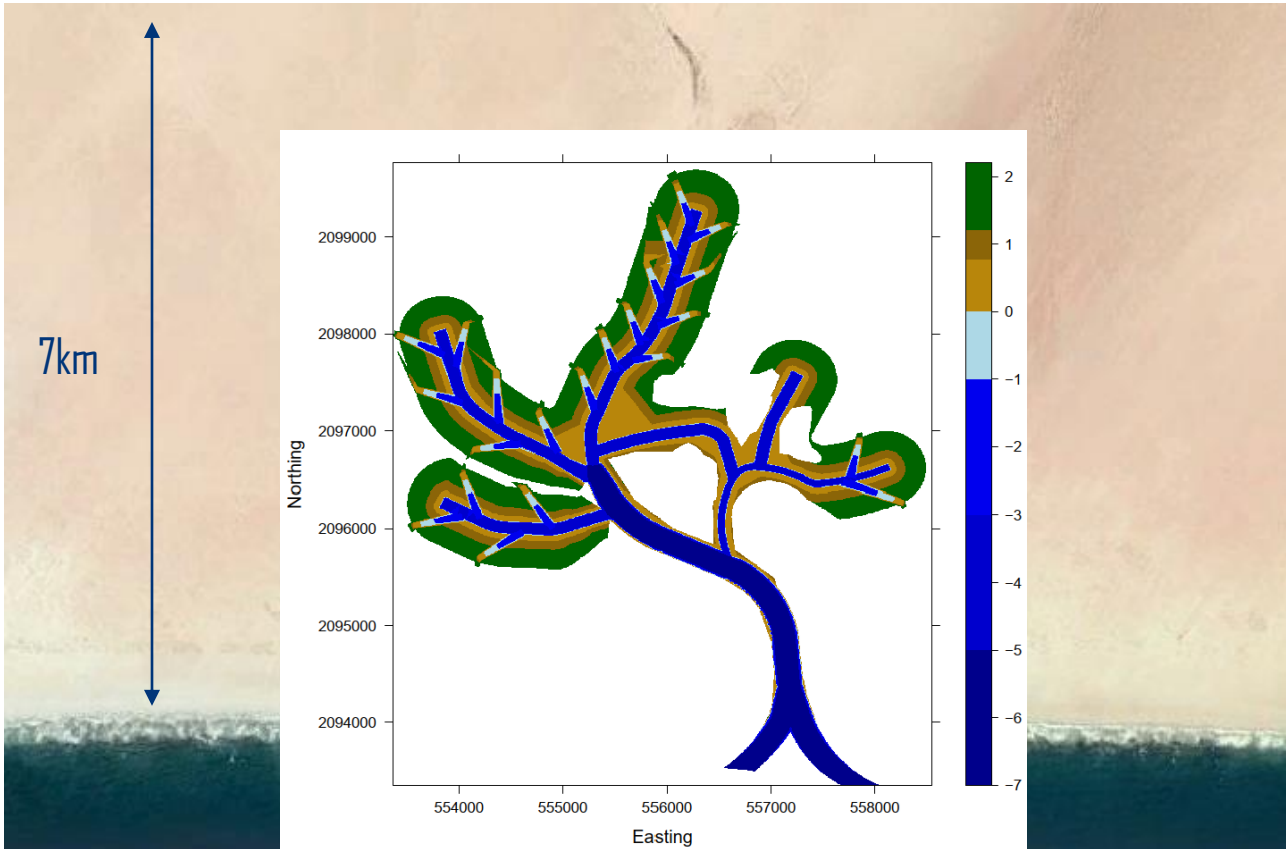
Conclusion

1. Hydrodynamic and morphology
2. Topography
3. Soil fertility & freshwater availability

Area	Inlet stability	Topography	Soil fertility and freshwater availability
1	Low	Low	Low
2	Low	Low	Low
3	High	High	Medium
4	High	High	High
5	Low	High	High
6	Low	High	Low
Dhofar	Low	High	High



Conceptual design



Marshlands

Mangroves

Tidal flats

Seagrass meadows

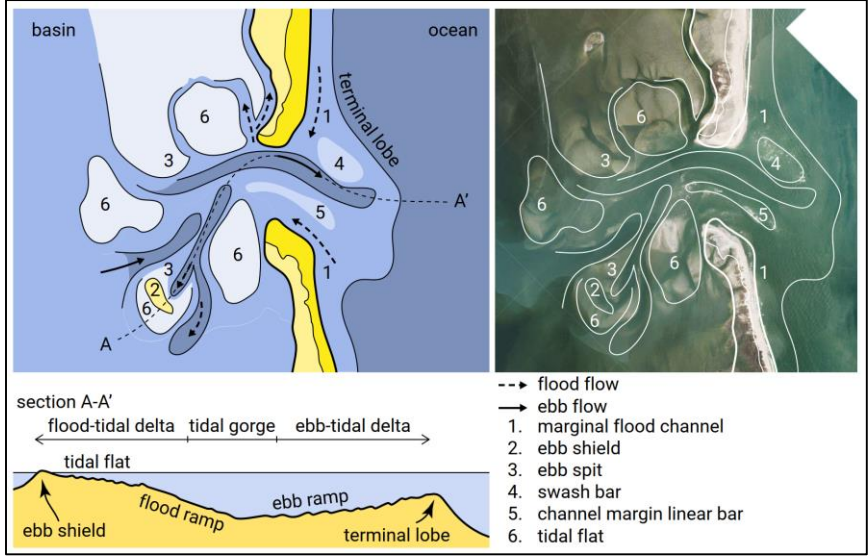
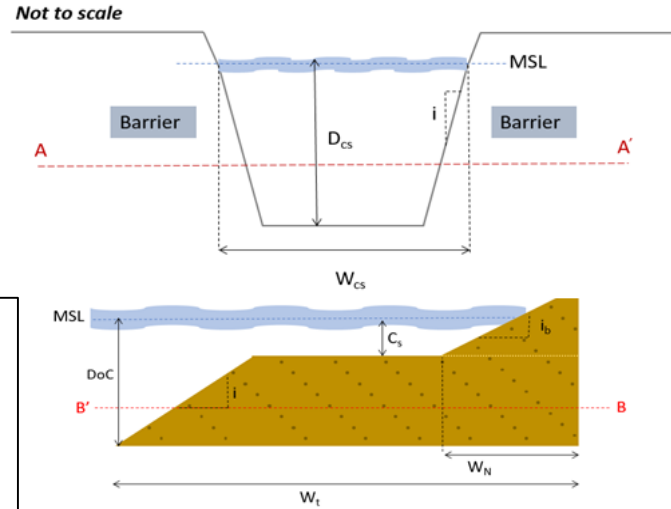
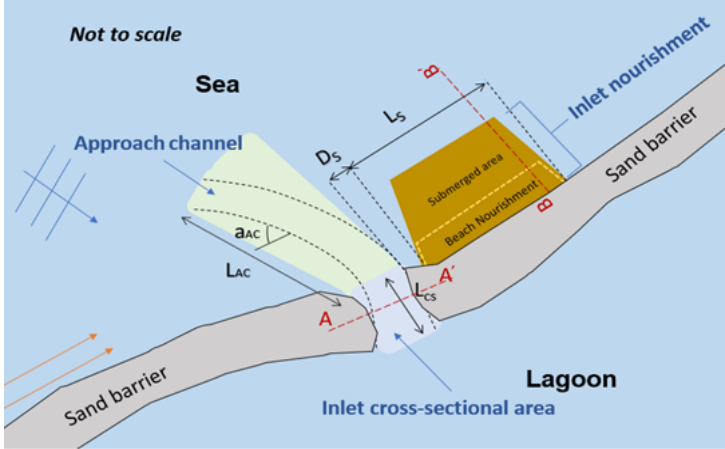


Conceptual design

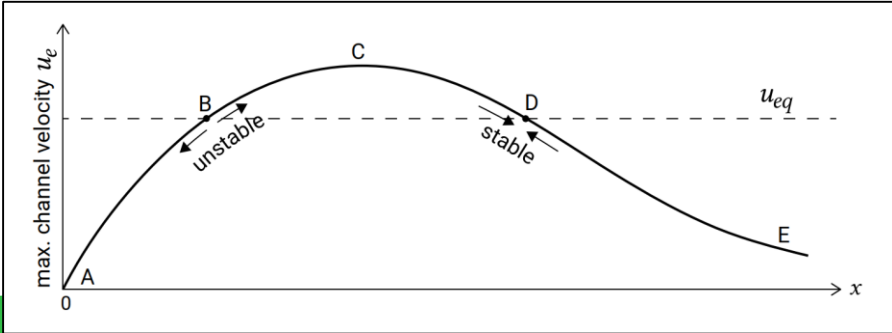
Tidal inlet

Mimicking Nature

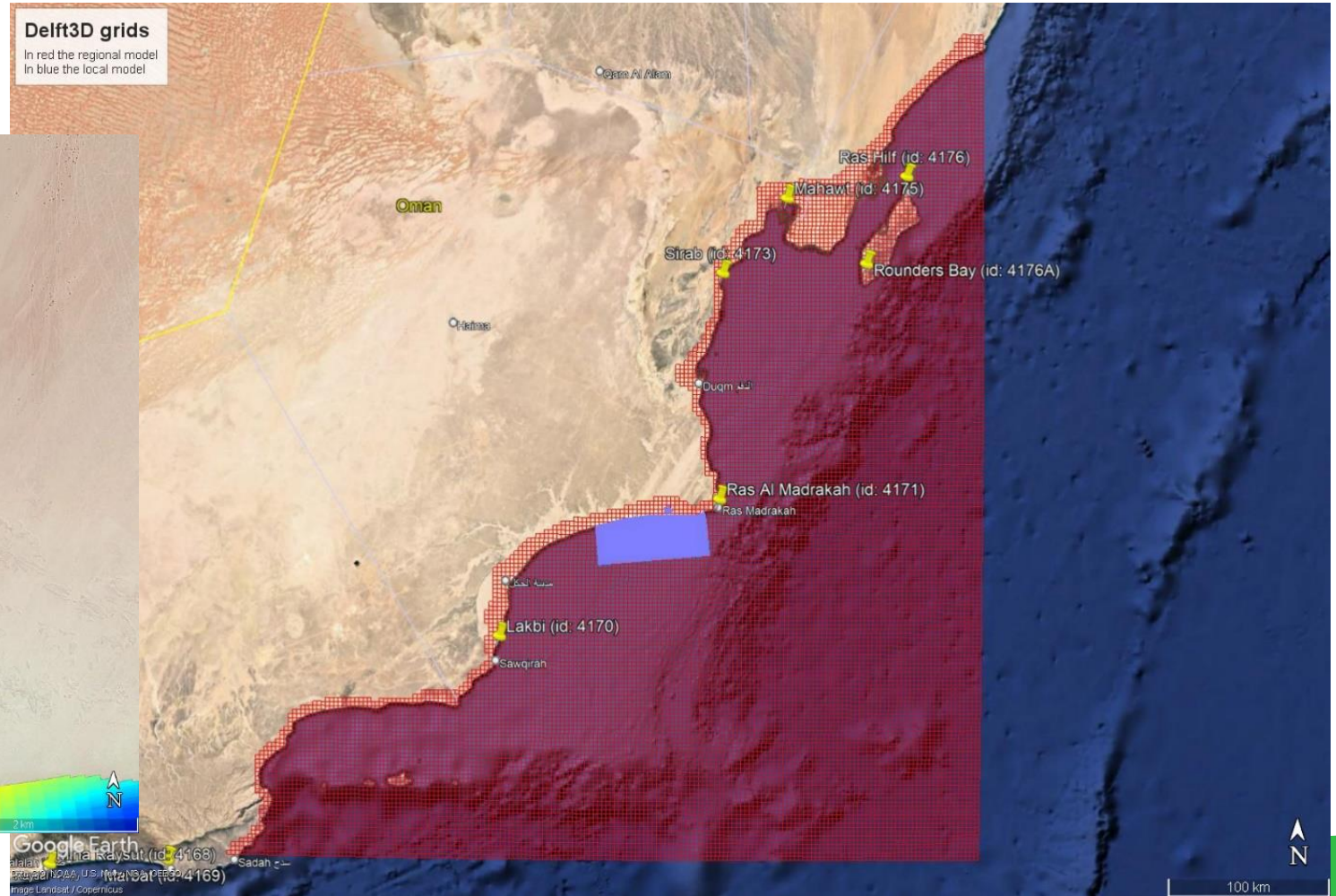
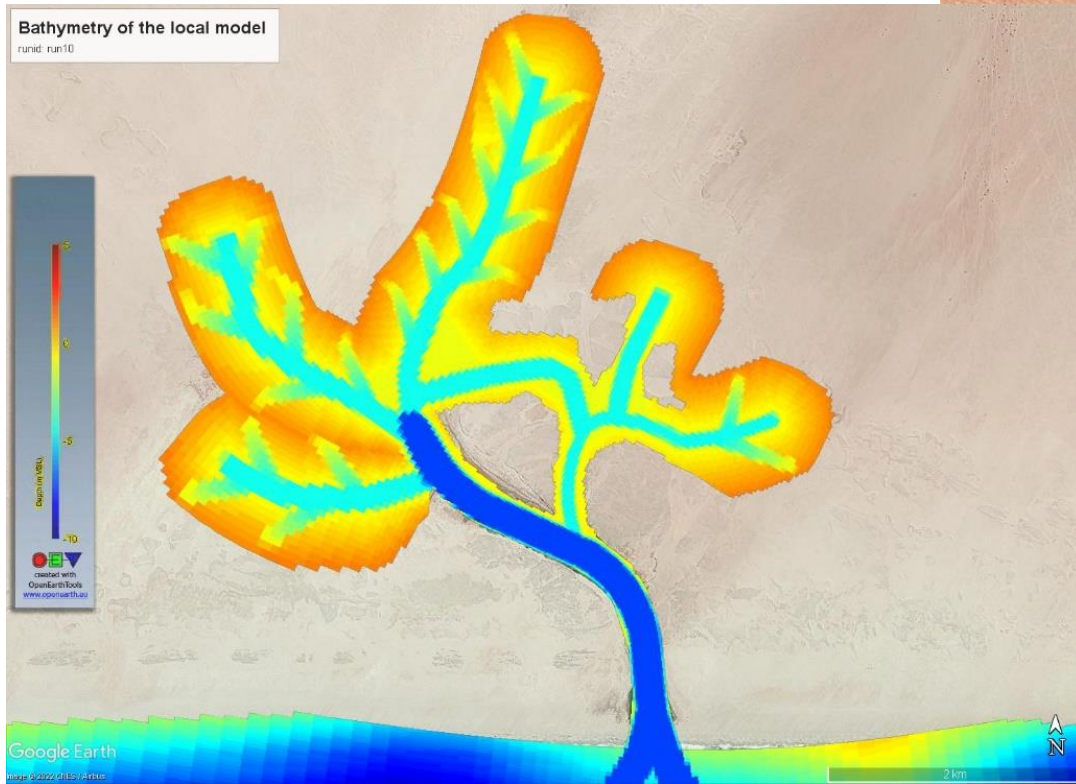
- Applying soft solutions
- Curved (approach) channel(s)
- Triangular shaped cross-sectional area
- Deeper channels
- Inlet Nourishment



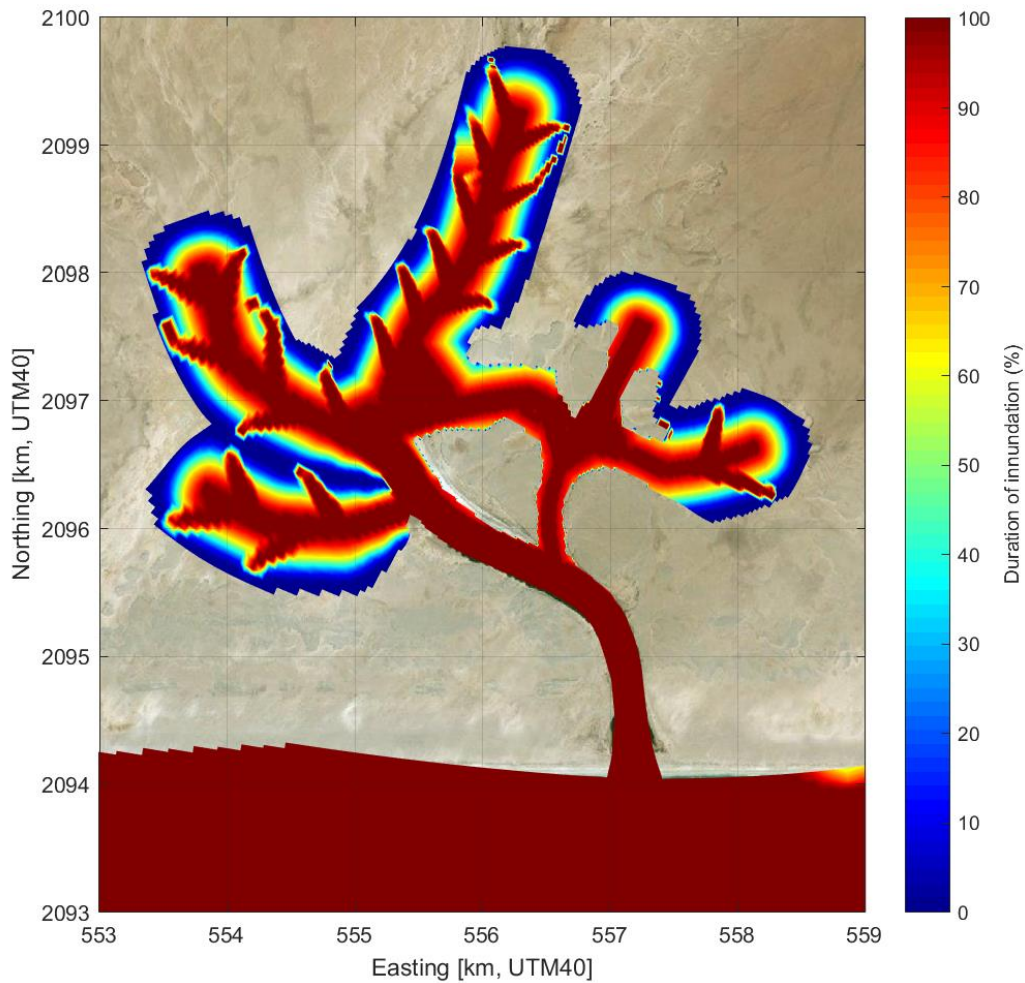
$$u_e = \frac{\pi P}{A_e T}$$



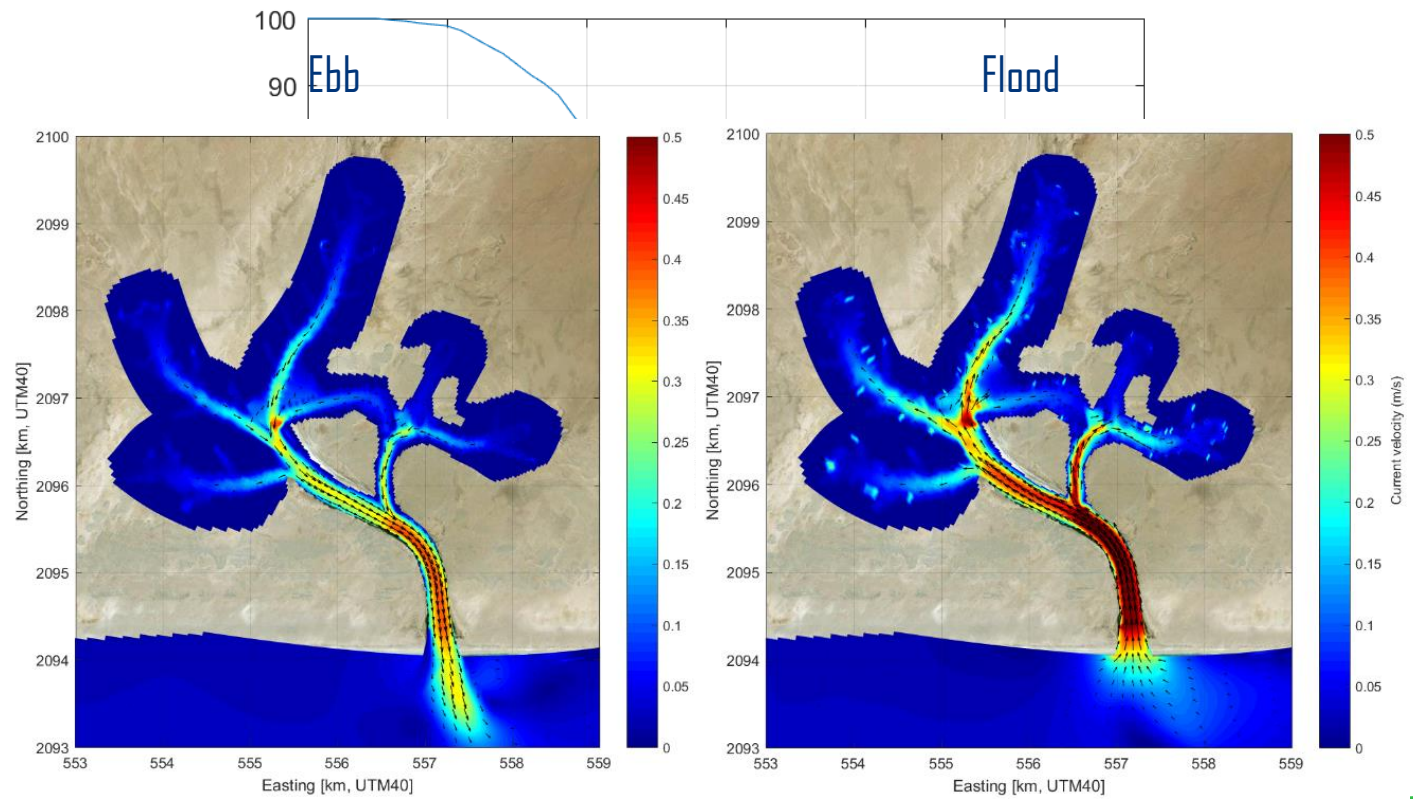
Delft 3D hydrodynamic model



Inundation time

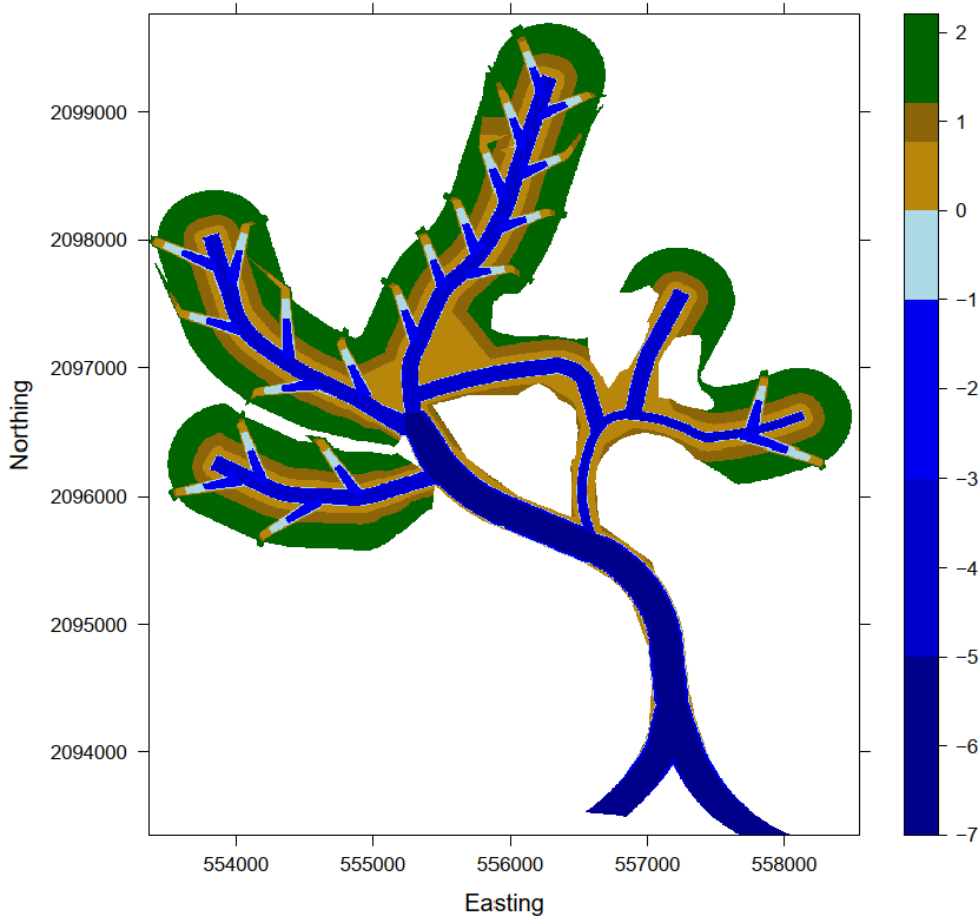


Currents



Hydrodynamic modelling

Habitat suitability

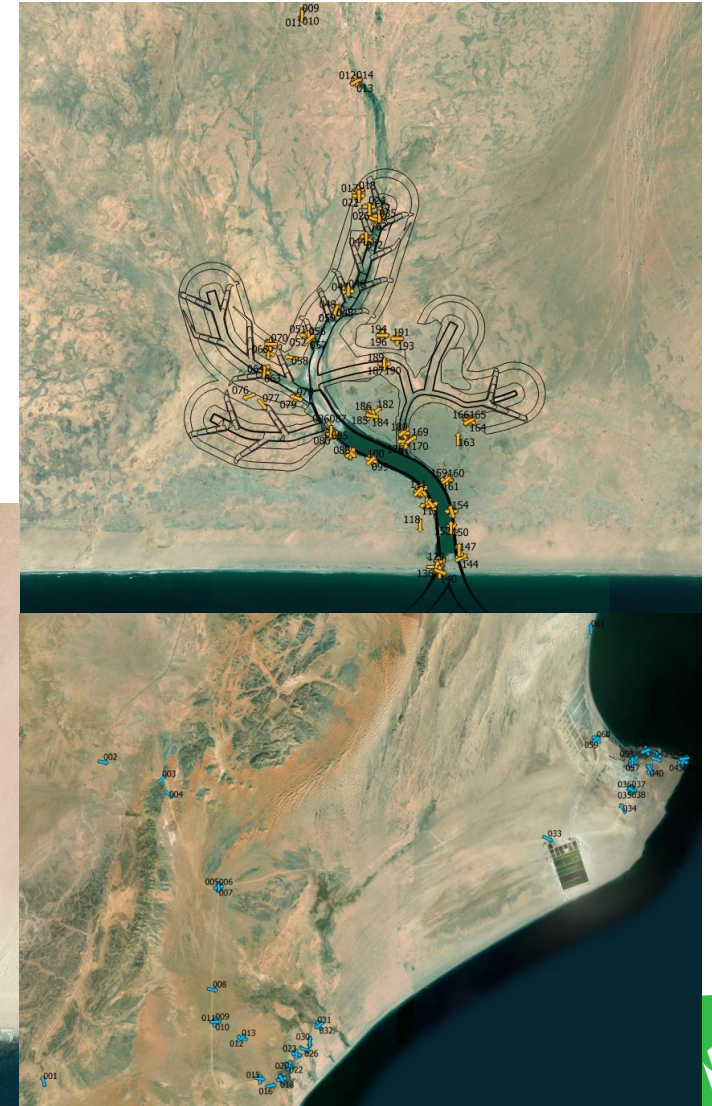
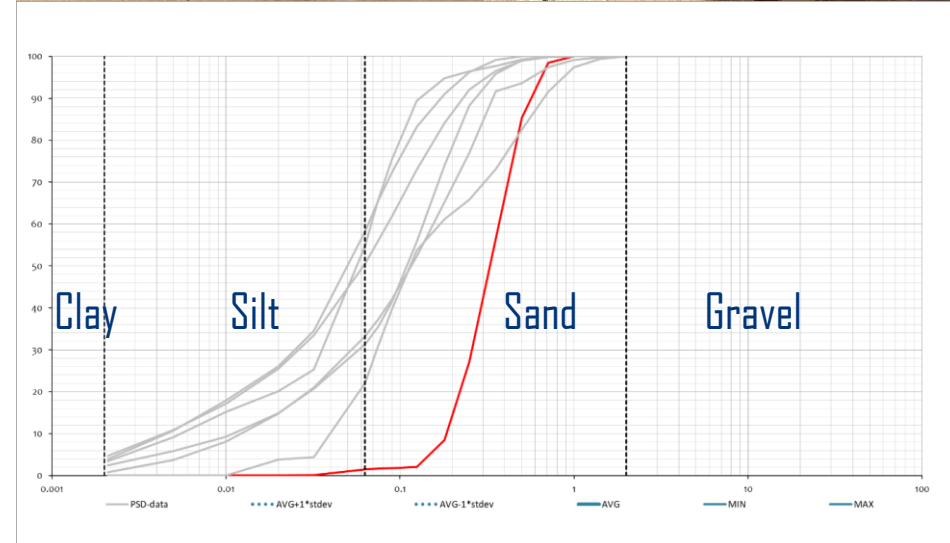


- **30%** of the coastal lagoon can host **mangrove**
- **32%** Intertidal **mudflats**
- The area shallower than the mangrove will host marshlands
- The deeper area should be suitable to host seagrass meadows



Preliminary site investigation

- Visit in Quwayrah (Area 4) & Al Kaluf (Area 3)
- Georeferenced pictures (habitat (fauna, flora) baseline, reality check,...)
- Soil samples and lab testing (PSD, fertility,...)



Preliminary watershed characterization



Freshwater volume per year

Year	Annual Precip mm	Annual discharge for C 0.25 in m3	Annual discharge for C 0.05 in m3
2010	54	24.455.423,00	4.891.085,00
2011	99	44.656.615,00	8.931.323,00
2012	6	3.103.269,00	620.654,00
2013	51	23.052.462,00	4.610.492,00
2014	7	3.202.962,00	640.592,00
2015	34	15.704.654,00	3.140.931,00
2016	3	1.466.654,00	293.331,00
2017	8	3.690.692,00	738.138,00
2018	17	8.017.962,00	1.603.592,00
2019	81	36.884.077,00	7.376.814,00
Average	36	16.423.477,00	3.284.695,20

Technical proposal

A. Hydraulic dredging

B. Dry-Earth Moving

C. Habitat propagation





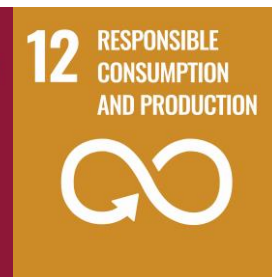
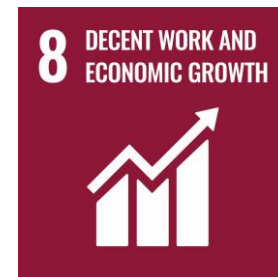
Oman 2040 vision: Ecological Systems that are **Effective**, **Balanced** and **Flexible** to Protect the **Environment** and Sustain its **Natural Resources** in Support of the **National Economy**.

Benefits of coastal wetland development

Mapping of Strategic Directions to SDGs
For Oman vision on ecological systems



Source: Oman Vision 2040 - Preliminary Vision Document



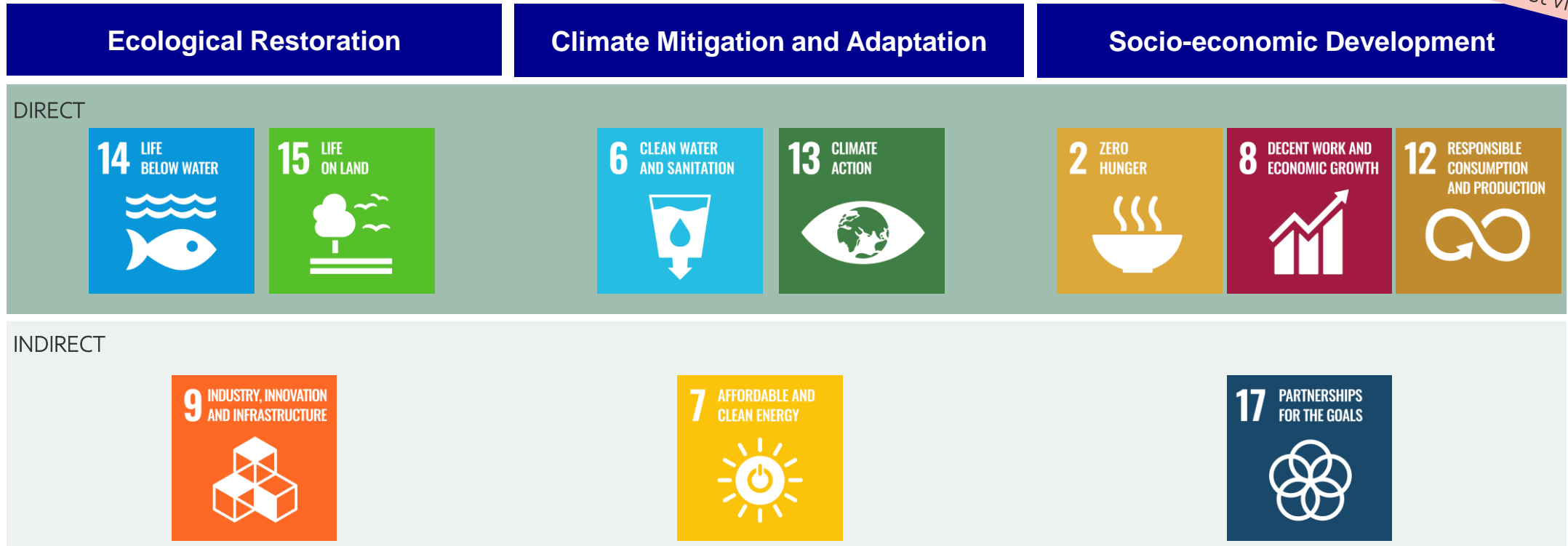
Oman project: Impacts – SDG Mapping



show how the project can contribute to the SDGs and helps Oman reach its target

3 Impacts categories

First vision



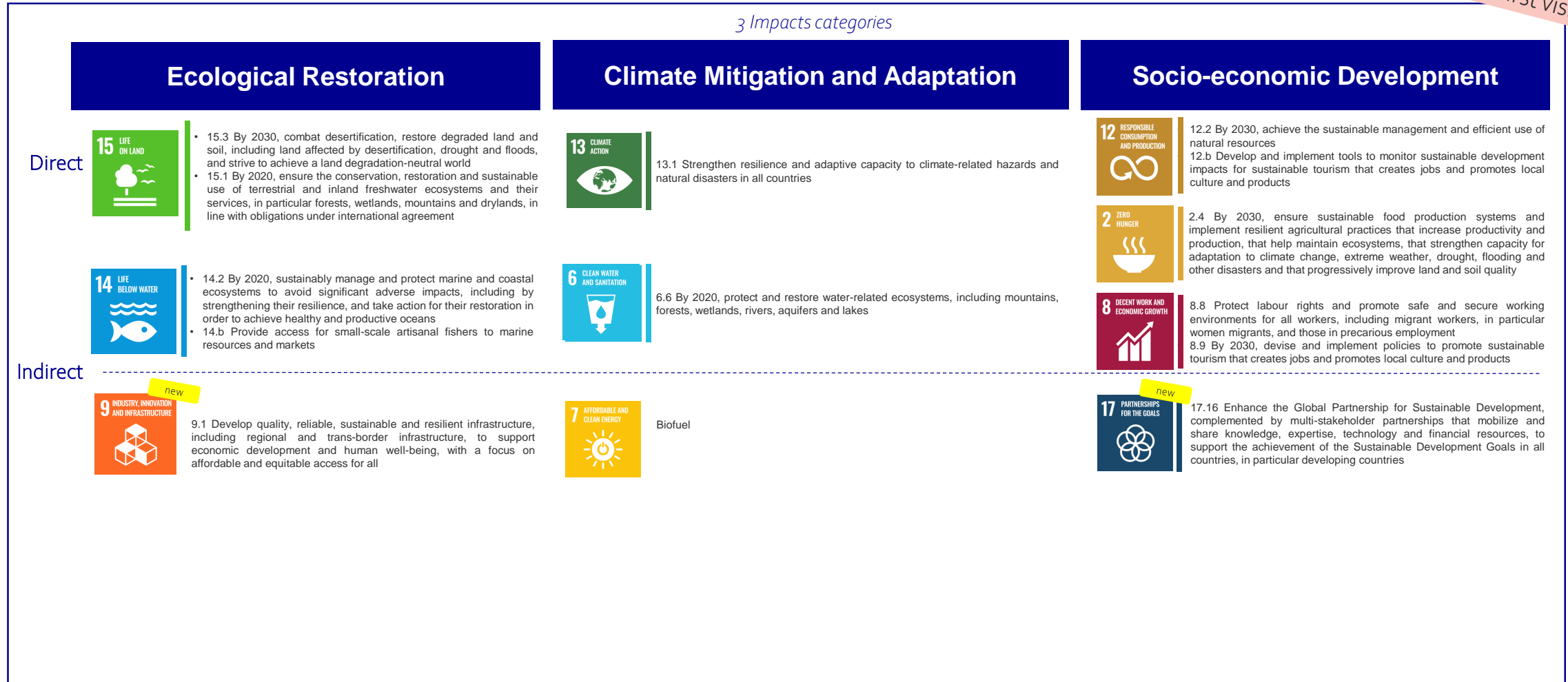
Oman project: Impacts – SDG Mapping



show how the project can contribute to the SDGs and helps Oman reach its target

First vision

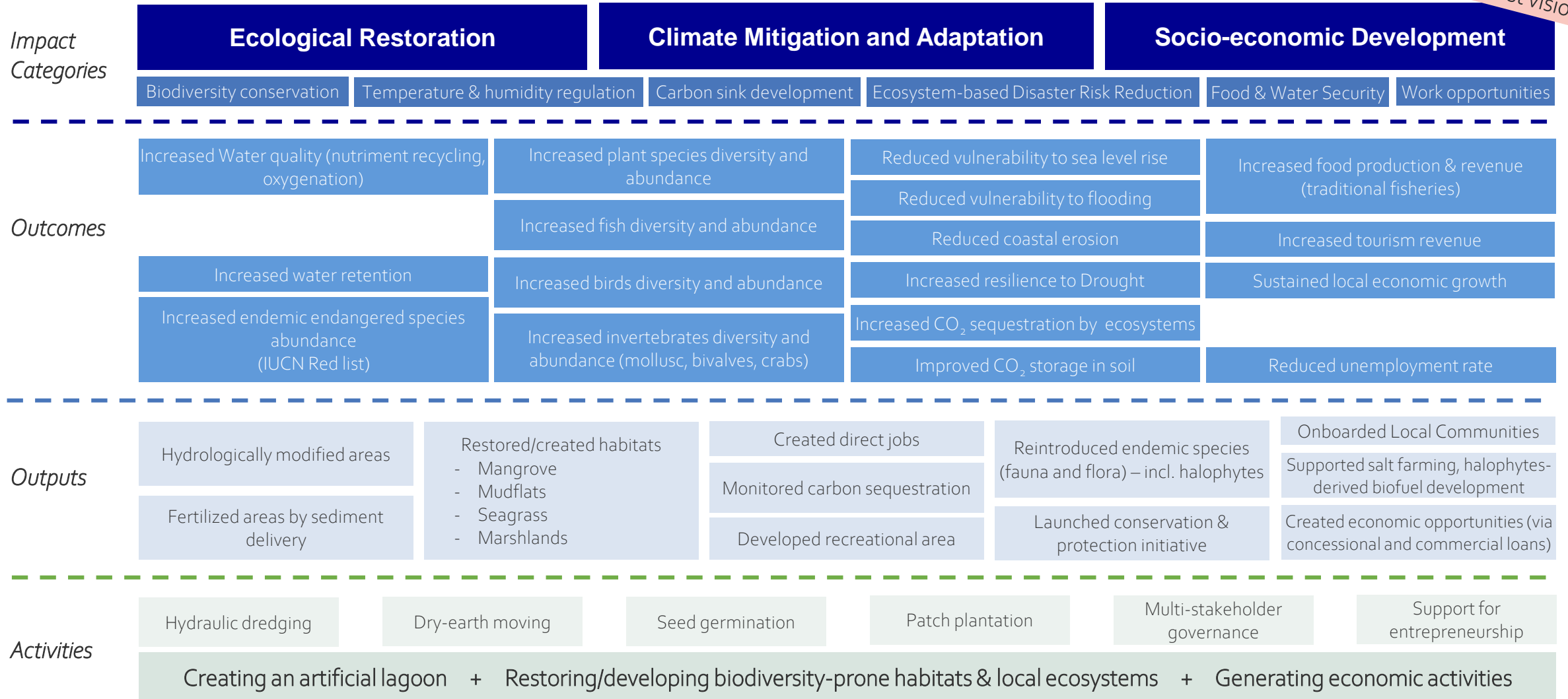
3 Impacts categories



Oman project – Theory of change – Work in progress



First vision



- It looks feasible to develop large coastal areas suitable for mangrove growth
- Optimal result achieved when fully functional coastal lagoons are developed
- There are multiple potential locations
- A thorough feasibility study is a logical next step
- A Public Private Partnership shall be created
- Such PPP would qualify to attract very competitive green financing



Thank you

Let's make it happen together!



Feasibility study

Data acquisition

- Site investigation
- Remote sensing

Design

- Preliminary design for zones with high potential

Hydrodynamic modelling of new designs



Data acquisition
2nd site investigation

**Hydrody
morphologi**



Figure 3-1. Principle scheme of Pro-active Adaptive Realisation (PAAR)



Water level

Currents

Salinity

Nutrients

ECO TOURISM

Business case and commercial proposal

Stakeholders' engagement strategy



Thank you

Let's make it happen together!





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