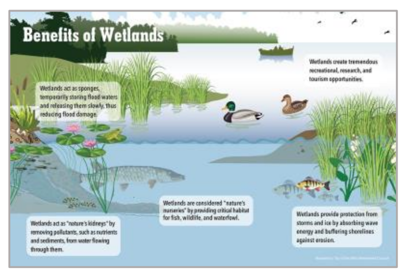
Climate change impacts on coastal zones and wetlands as nature-based solutions for increasing coastal resilience






Prof. Maria Snoussi

Université Mohammed V
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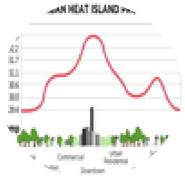
Rabat

Climate change impacts on coastal zones

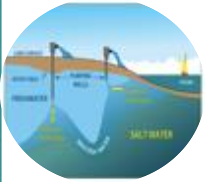
Potential impacts of Climate Change



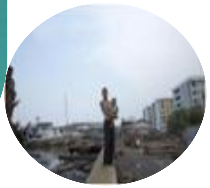
Rising temperature

SLR and storm surges

Coastal flooding & erosion

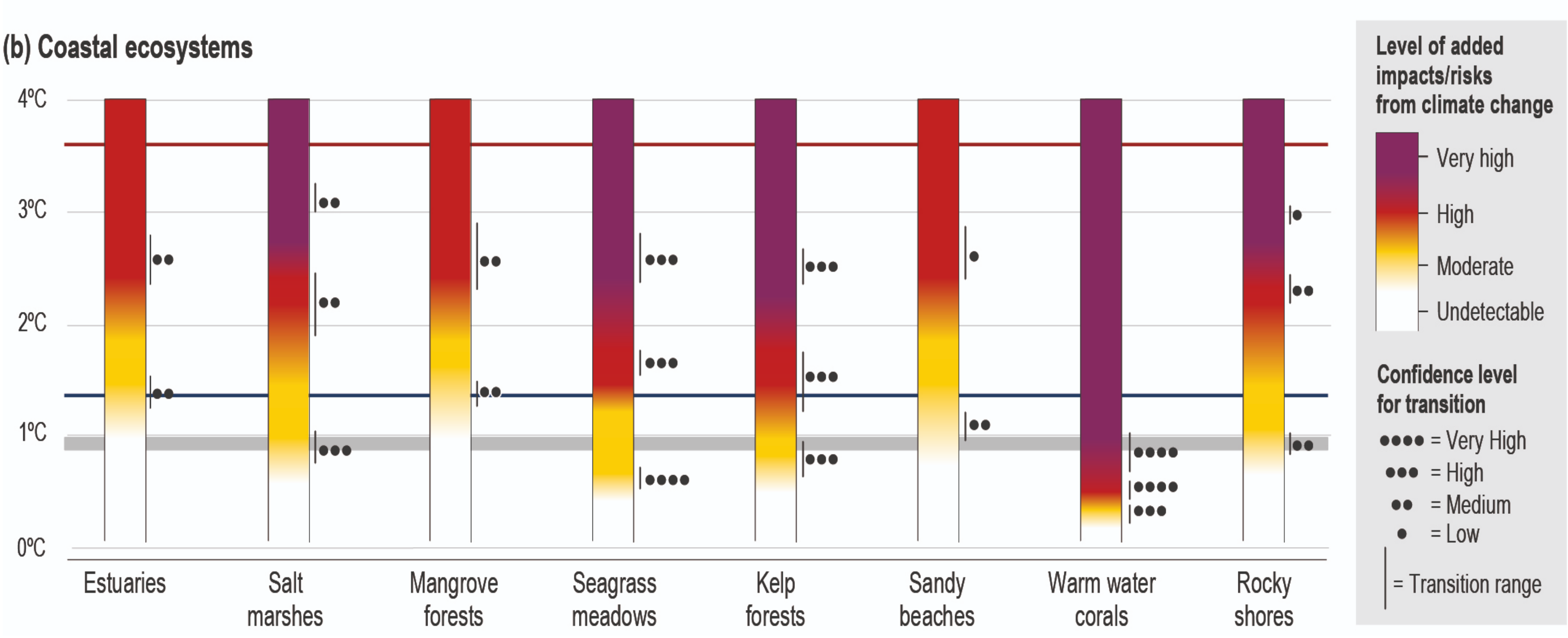


Sea water intrusion



Exposure of population & infrastructures

Impacts of CC on Coastal Ecosystems (IPCC, 2019)



Risk scenarios for coastal ecosystems based on observed and projected climate impacts. Multiple climatic hazards are considered, including ocean warming, deoxygenation, acidification, changes in nutrients, particulate organic carbon flux and sea level rise. (IPCC, 2019)

Impacts of CC on CZ

Climate change and sea level rise

Higher sea levels
Higher sea temperatures
Changes in precipitation patterns and coastal runoff
Changed oceanic conditions
Changes in storm tracks, frequencies and intensities

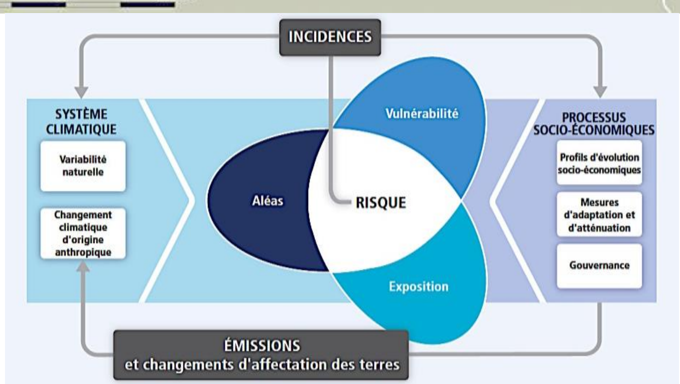
Biophysical Impacts

More extensive coastal inundation
Increased coastal erosion
Saltwater intrusion into freshwater aquifers
Higher storm-surge flooding
Loss of coastal habitat
Displacement of coastal lowlands and wetlands
Shifting species
Harmful blooms /invasive alien species

Socio-economic

Damage to coastal infrastructure,
including that used for transportation and recreation
Increased property loss
Increased risk of disease
Increased flood risks and potential loss of life
Changes in renewable and subsistence resources
Loss of cultural resources and values
Increasing protection costs

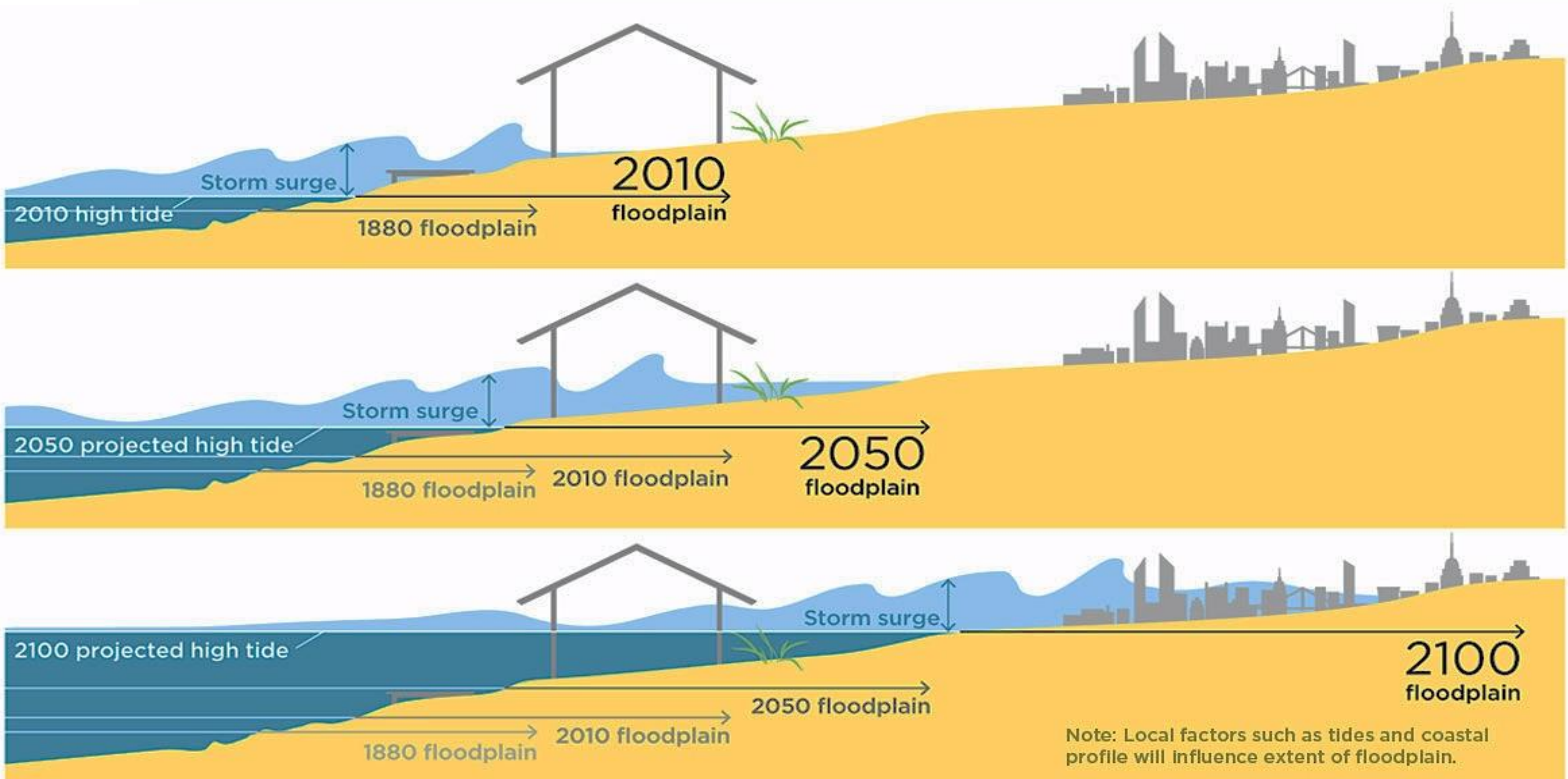
Coastal Risks in the Mediterranean



CRI= f(Hazads x Vulnerability x Exposure)

Risk of flooding

Storm Surge and High Tides Magnify the Risks of Local Sea Level Rise



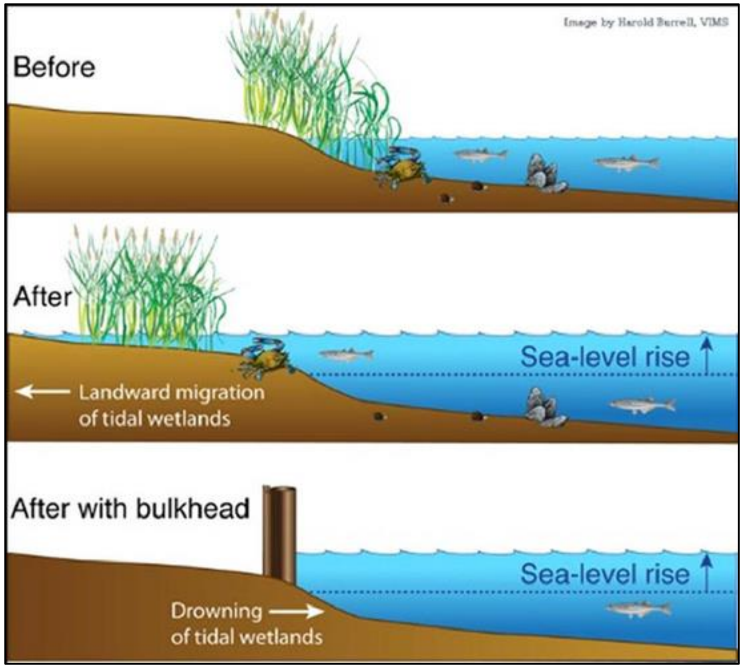
Sea level sets a baseline for storm surge—the potentially destructive rise in sea height that occurs during a coastal storm. As local sea level rises, so does that baseline, allowing coastal storm surges to penetrate farther inland. With higher global sea levels in 2050 and 2100, areas much farther inland would be at risk of being flooded. The extent of local flooding also depends on factors like tides, natural and artificial barriers, and the contours of coastal land.

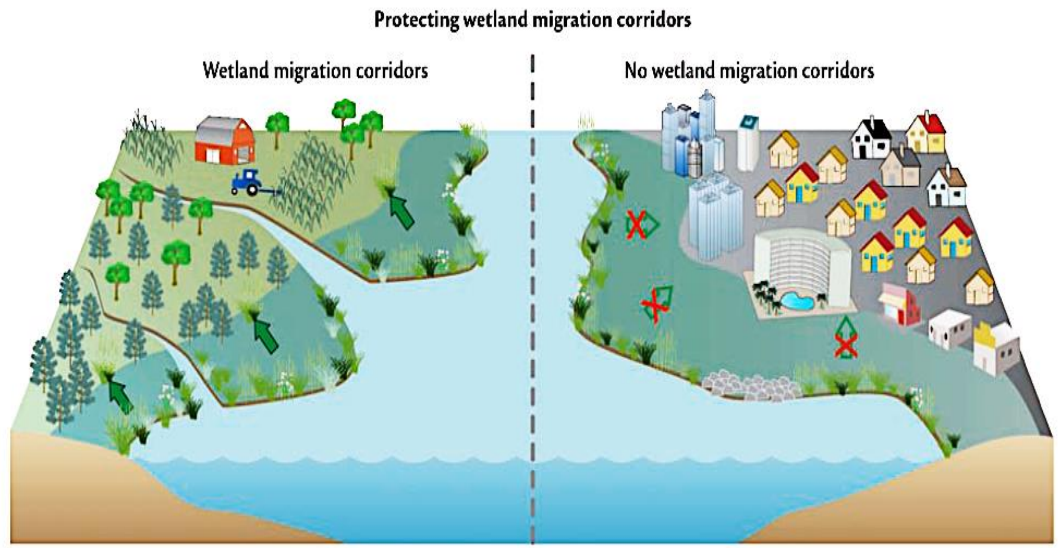
Wetlands & Climate change

(Special Report On The Ocean And Cryosphere In A Changing Climate, 2019)

- Nearly 50% of the pre-industrial, natural extent of global coastal wetlands have been lost since the 19th century.
- Non-climatic human pressures on wetland ecosystems, including overfishing, eutrophication, and invasive species, interact with climate change drivers and affect wetlands composition and structure, with the impacts varying between regions and species
- Globally, between 20−90% of existing coastal wetland area is projected to be lost by 2100, depending on different SLR projections under future emission scenarios.
- Substantial evidence supports with *high confidence* that warming and salinisation of wetlands caused by SLR are causing shifts in the distribution of plant species inland and poleward

Coastal Wetlands as Sentinels of Climate Change





As sea level rises, wetlands may migrate into open spaces such as forests and fields. However, wetlands cannot migrate into areas with man-made barriers such as hardened shorelines and heavy development such as urban, commercial, and residential areas.

"High risk of total local loss is projected under the RCP8.5 emission scenario by 2100 (*medium confidence*), especially if landward migration and sediment supply is constrained by human modification of shorelines and river flows (*medium confidence*)" (IPCC, 2019)

Benefits from Wetlands

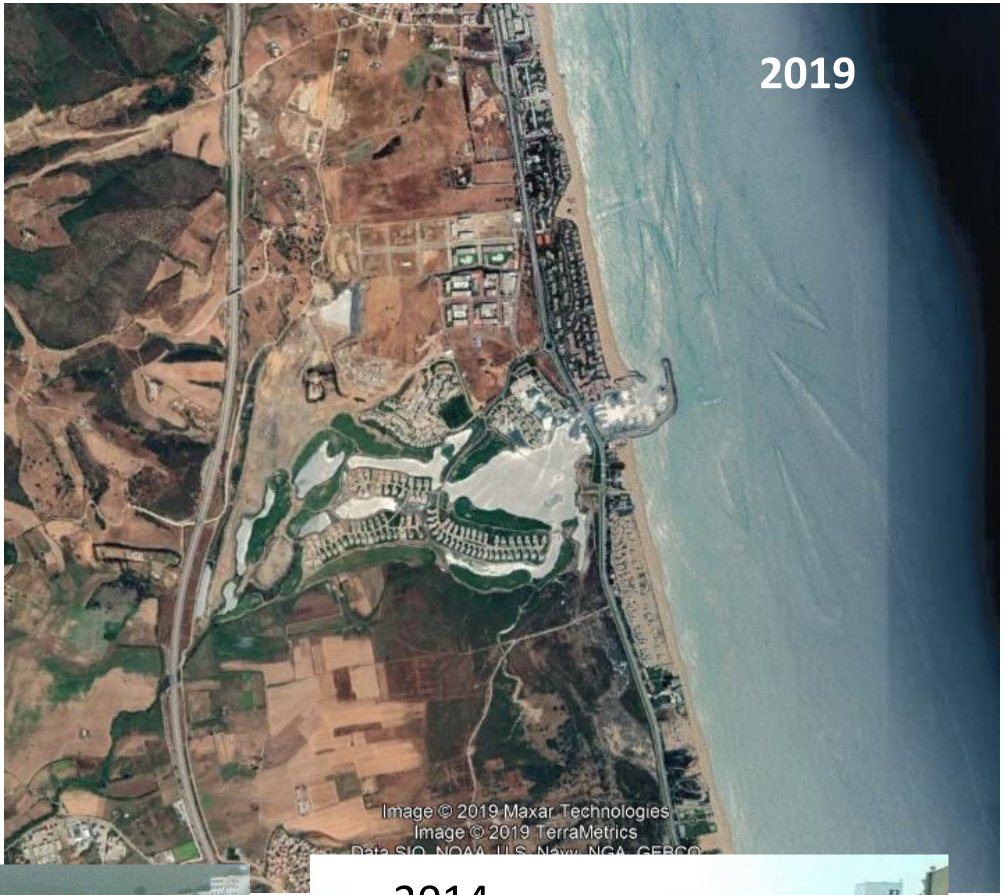
An investment in wetland restoration supports many important benefits, including carbon capture, improved water quality, critical marine habitat, and increased resiliency through storm and flood protection

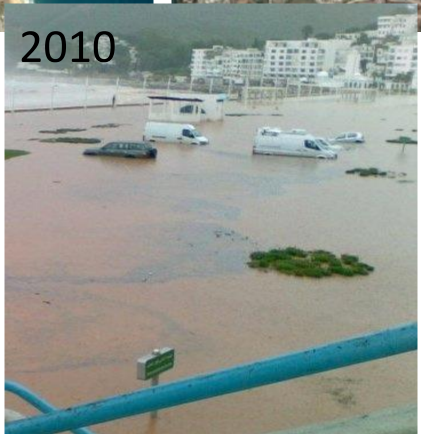
Source: Wetlands International

Wetlands: a natural safeguard against disasters

http://merjasmir.blogspot.com/2011/11/lagune-de-smir-entre-hier-et-aujourdhui.html

The case of SMIR Wetland, Morocco



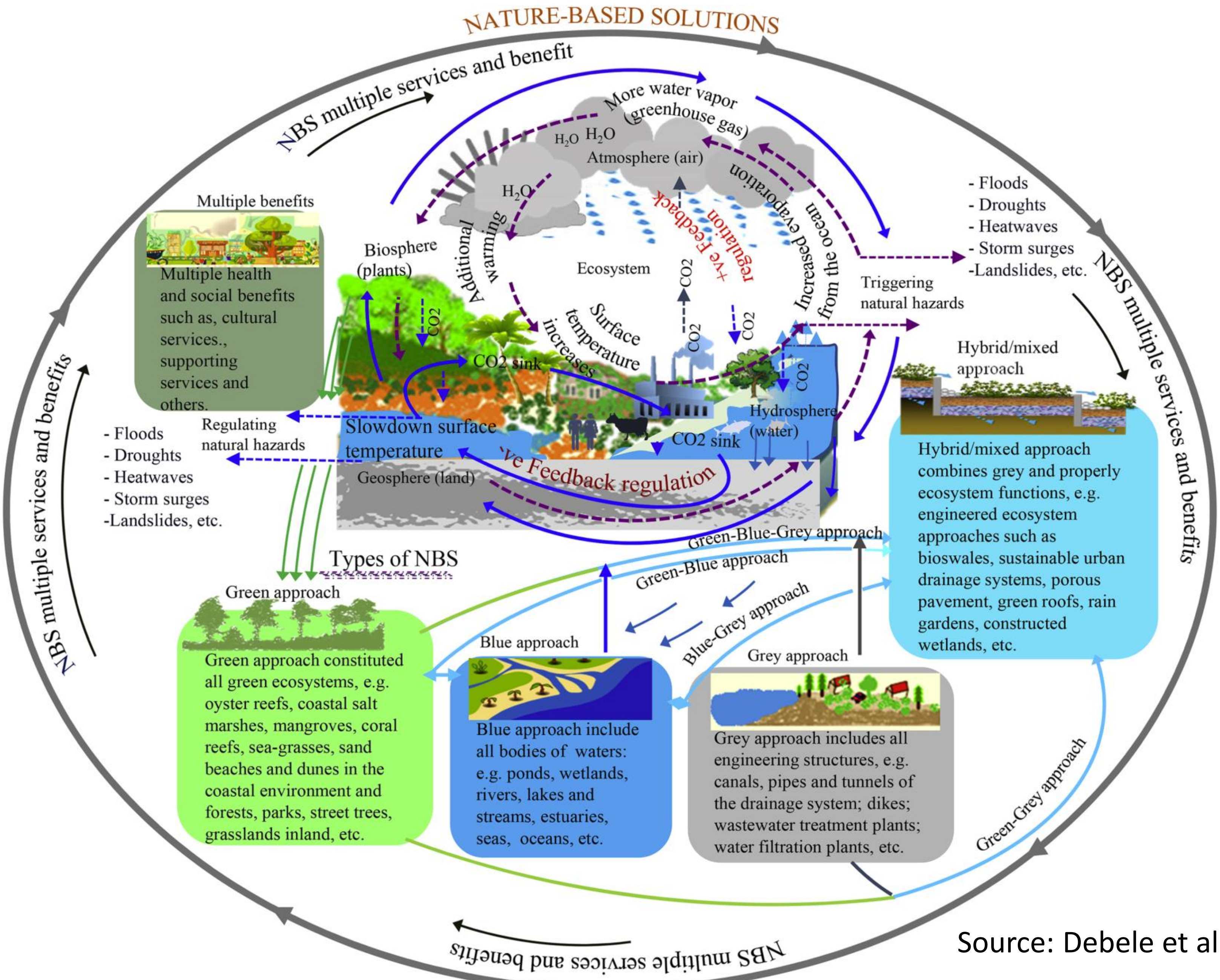



Tetouan City
Mediterranean Sea
Oued Martil
0
1 mi


Crue de l'oued Martil

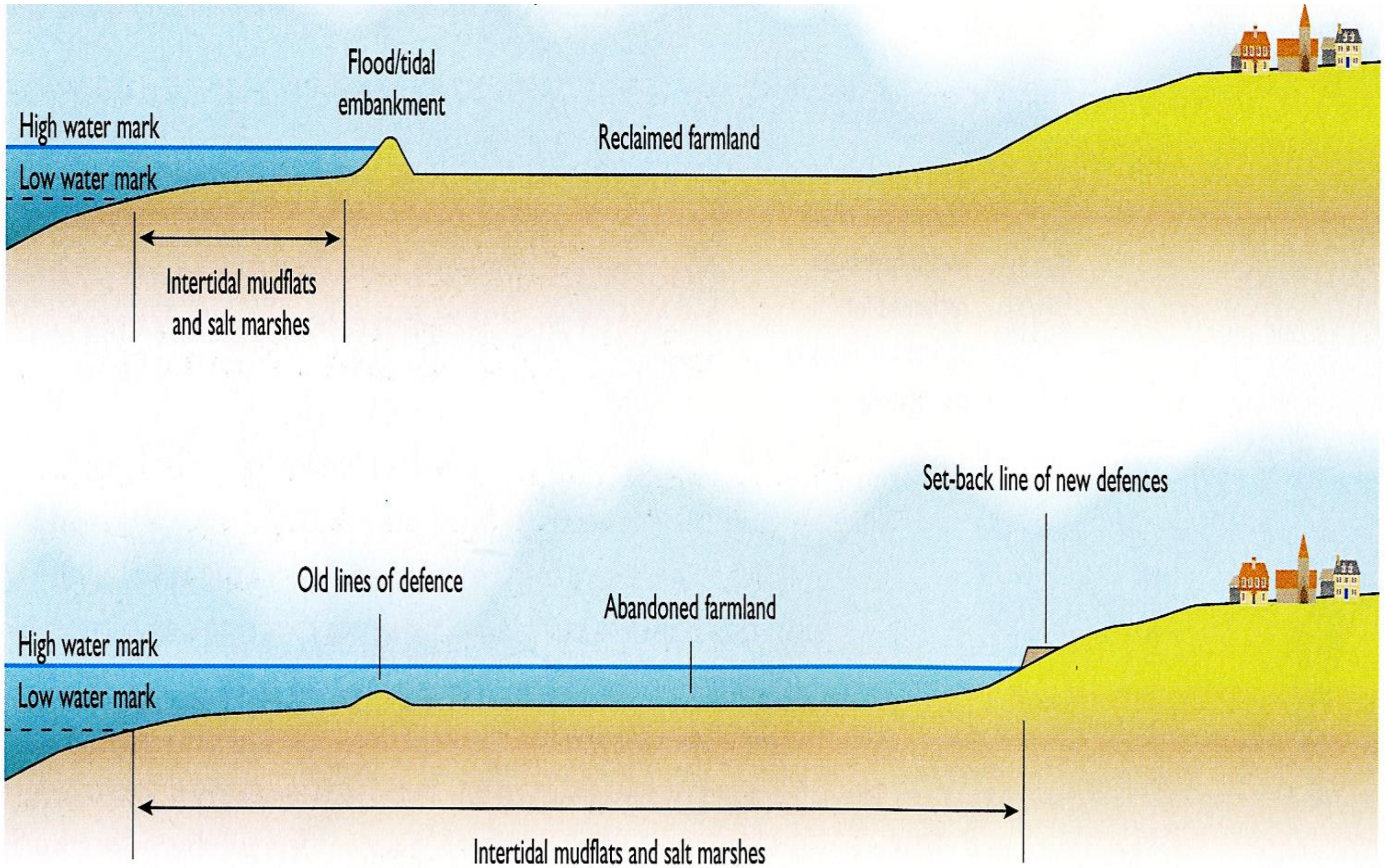

Aménagement des rives

Nature as the inspiration for climate solutions

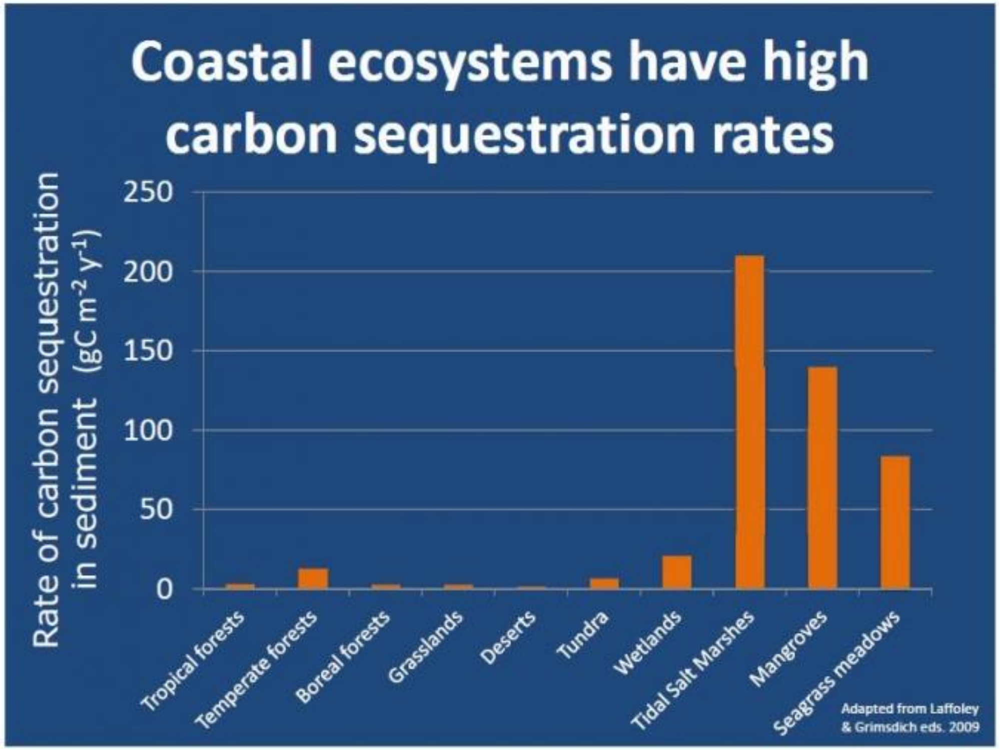


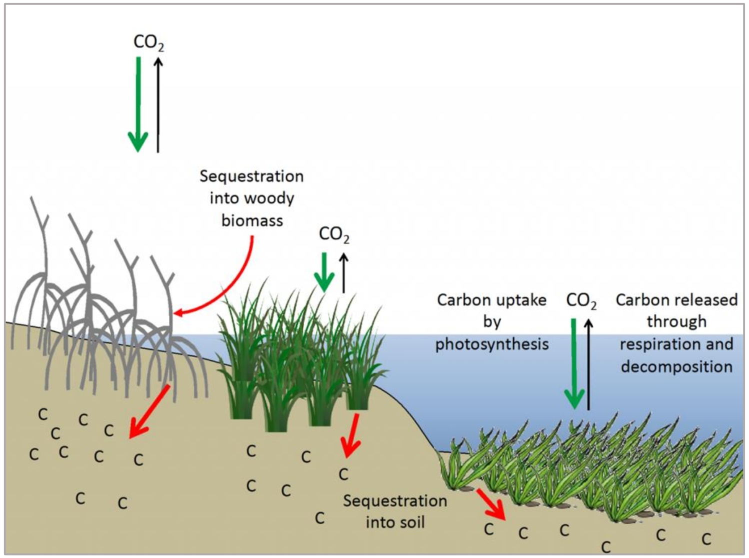
Source: Debele et al. 2019

Managed Retreat



Coastal wetlands & Blue Cabon





MAPPING OCEAN WEALTH

COASTAL BLUE CARBON

Coastal wetlands – seagrass meadows, salt marshes and mangroves – provide one of the most effective natural solutions for carbon capture and long term storage on the planet.

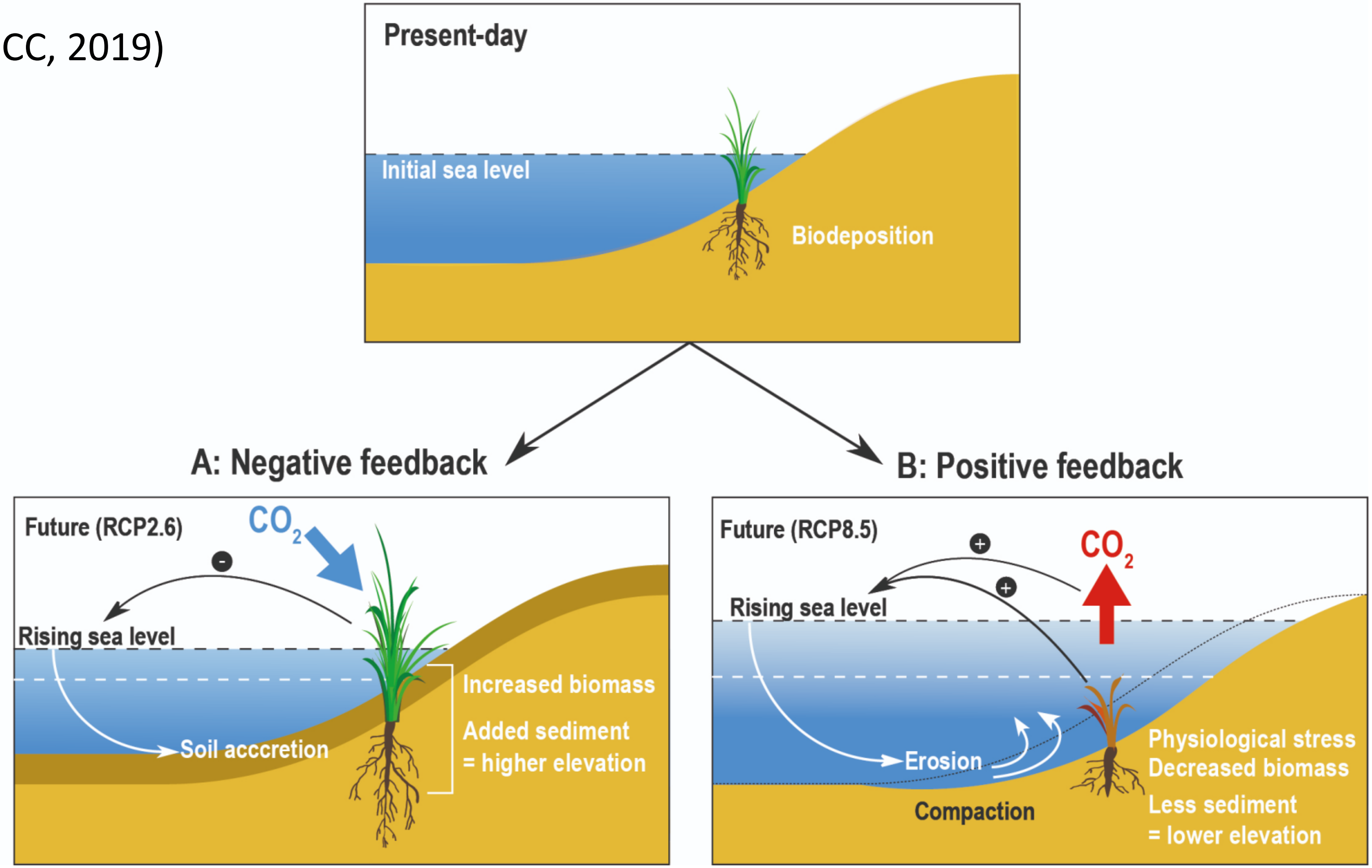
Policymakers, industry and coastal practitioners should begin now to preserve and restore coastal wetlands because of their climate mitigation and market potential for the benefit of local communities and economies.

Mapping Ocean Wealth demonstrates what the ocean does for us today so that we maximize what the ocean can do for us tomorrow.

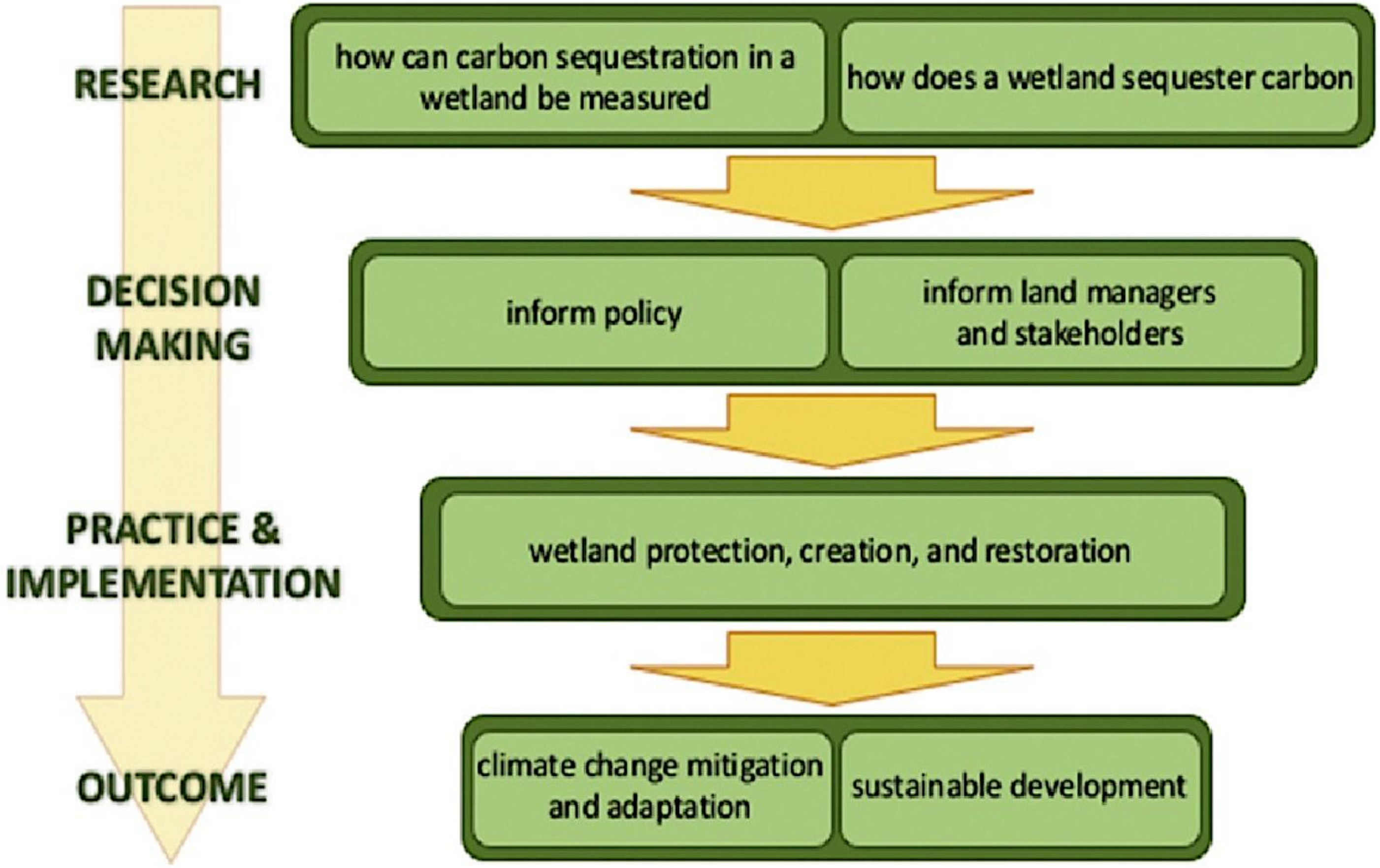
oceanwealth.org @ocean_wealth

The Nature Conservancy
Protecting nature. Preserving life.

(IPCC, 2019)



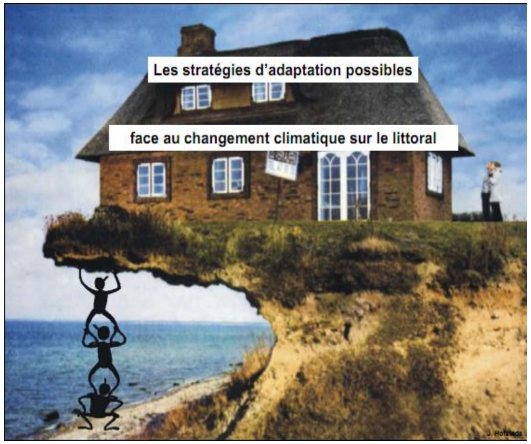
Biogeomorphic climate feedbacks involving plant biomass, sediment accretion and inundation that control the response of vegetated coastal ecosystems to rising sea levels. (A) Under high rates of soil formation plants are able to offset gradual sea level rise (SLR) and may produce a negative feedback by increasing the uptake of atmospheric CO2. In addition, below ground root production contributes to the formation of new soils and consolidates the seabed substrates. (B) Under low rate of soil formation, and when SLRs exceed critical thresholds, plants become severely stressed by inundation leading to less organic accretion and below ground subsidence and decay, producing a positive feedback by net CO2 outgassing. This figure does not consider landward movements, controlled by topography and human land-use.

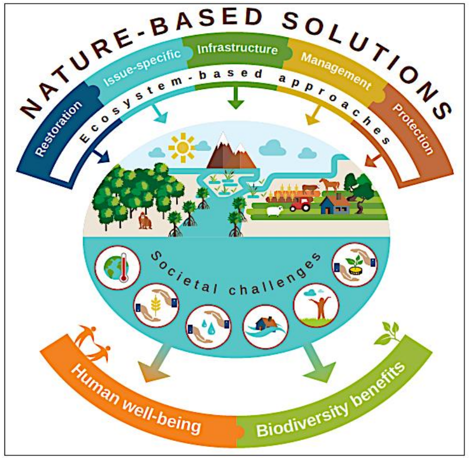


Source: Villa & Bernal, 2017

Pour conclure…

- Les services et bénéfices fournis par les ZH sont plus que jamais essentiels dans notre lutte contre le CC
- Nécessité d'investir dans la réhabilitation et la protection des ZH pour faire face au CC
- Promouvoir les solutions basées sur la nature en les combinant avec des actions non techniques (planification, alerte précoce, assurance…)






Thank you very much for your attention!