SIXTH ASSESSMENT REPORT
Working Group II – Impacts, Adaptation and Vulnerability

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Impacts, vulnerability and adaptation to sea-level rise

Gonéri Le Cozannet – WGII
Europe (Ch13), Mediterranean Region (CCP4)
Sea-level rise CCB in Ch3
Thanks to our 270 coauthors


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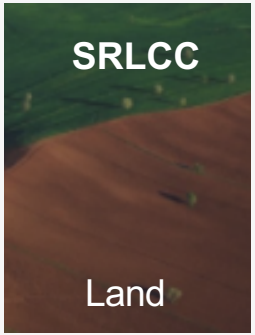
The 6th Assessment Report of IPCC

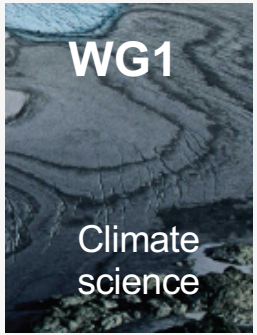
- Intergovernmental Panel on Climate Change
- Most recent and precise synthesis on climate science, climate risks, adaptation and mitigation.
- 721 scientists from 90 countries

www.ipcc.ch

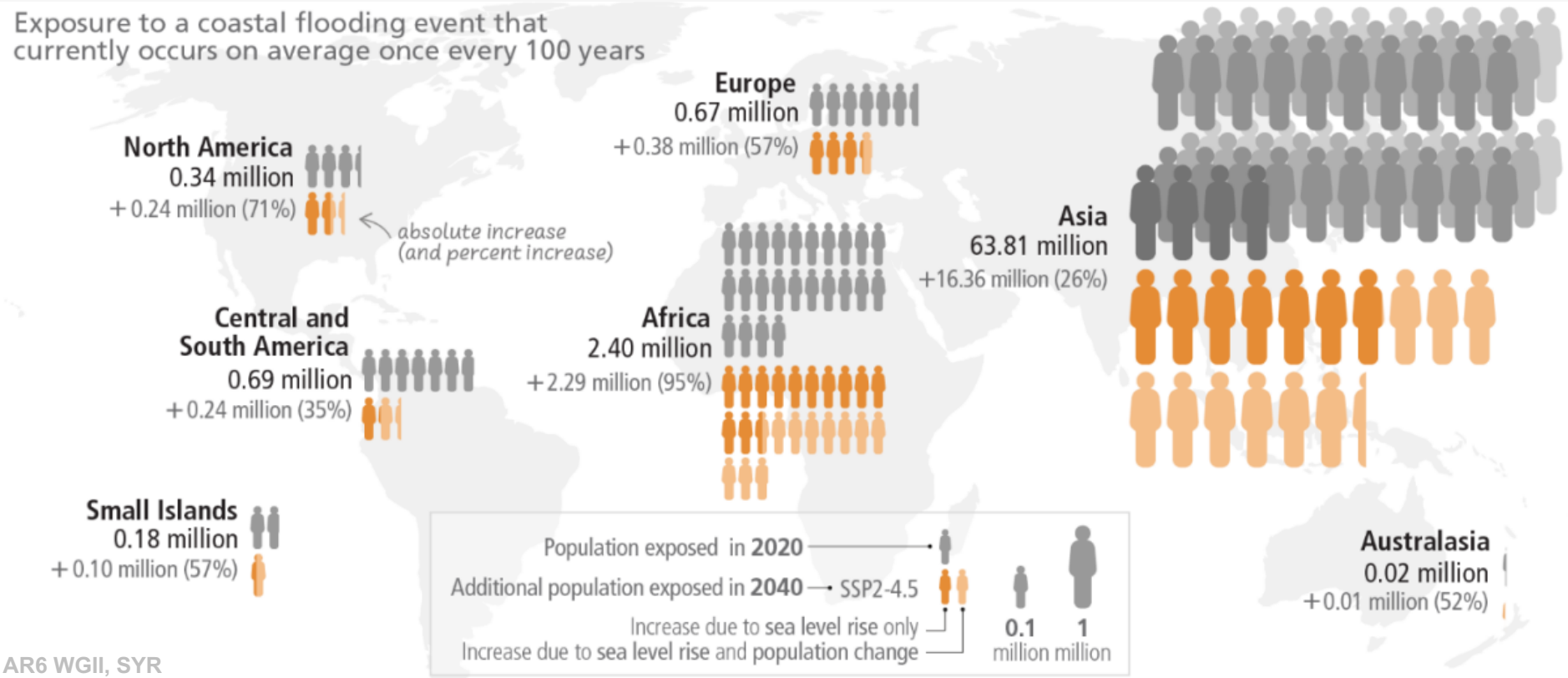
Special Reports



Rapports d'évaluation

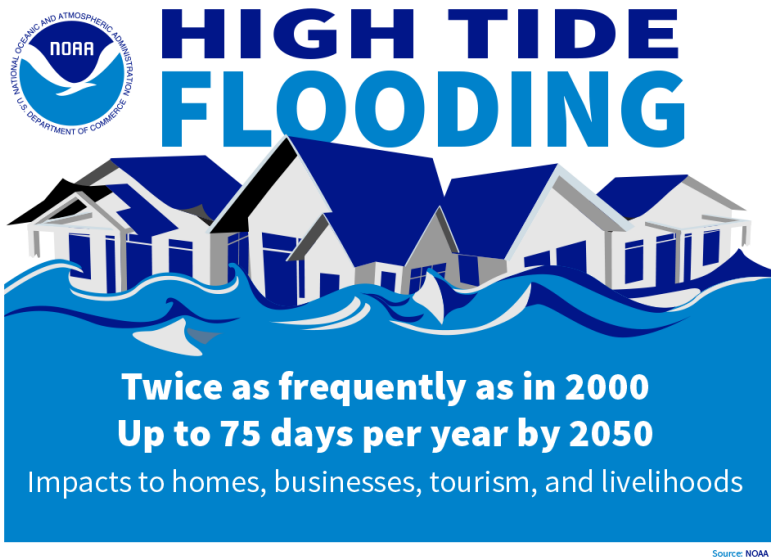


People exposed to coastal flooding in 2020 and 2040 (AR6 SYR)



A most urgent adaptation challenge is chronic flooding at high tide

Source: France Info - MANUEL SILVESTRI / REUTERS



Meters of sea-level rise: reasons of concerns

- Communities living in low-lying coastal areas
- Existential threat for small island states
- Long-living infrastructure: energy, transport, ports, coastal cities…
- Cultural heritage
- Landfills and polluted soils
- Unique coastal ecosystems

AR6 WGII CCP4, Ch13, SPM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OceanImageBank_IshanHassan_02

Such adaptation challenges would occur much earlier under high rates of sea level rise, in particular if low-likelihood, high impact outcomes associated with collapsing ice sheets occur (high confidence).

SPM-C.2.8

SPM-C.2.8

Responses to sea-level rise are more effective if:

High confidence

- combined, sequenced, planned well ahead
- aligned with sociocultural values and development priorities
- underpinned by inclusive community engagement process

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Accomodation in Teignmouth, UK


Thames Barrier in UK - The Guardan


Renaturation in France - Conservatoire du Littoral

SPM-C.2.5

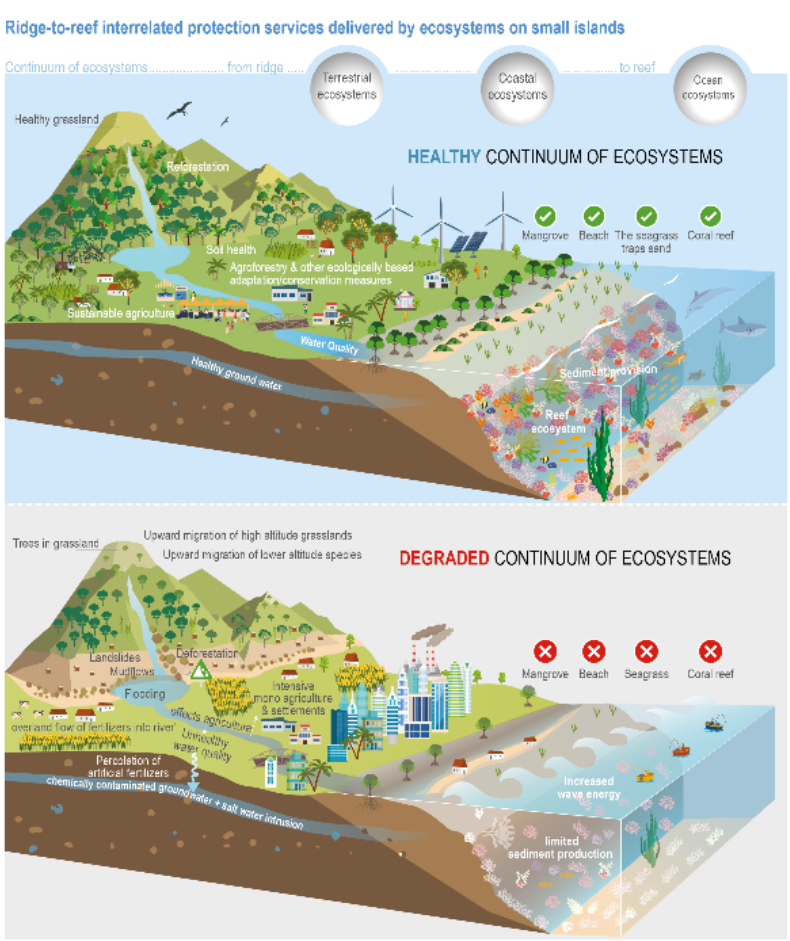
Coastal wetlands protect against coastal erosion and flooding associated to storms and sea-level rise

- Where sufficient space and adequate habitats are available
- Until rates of sea-level rise exceeds natural adaptive capacity to build sediment

Very high confidence

Dune restoration

Posidonia banks



Considering biodiversity and autonomous adaptation in long-term planning reduces risks of maladaptation

SPM-C.4.2

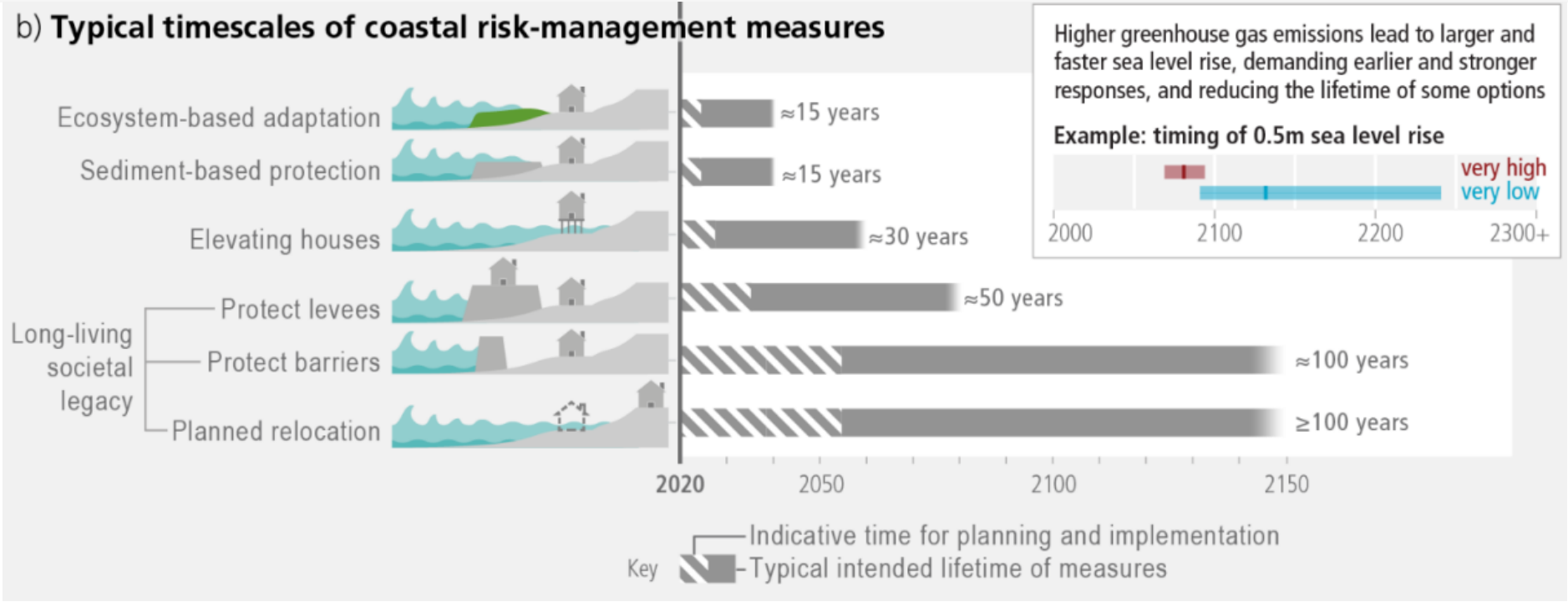
High confidence

Hard defences against flooding

- reduce space for natural processes
- Degrade, replace or fragment ecosystems
- Reduce their resilience to climate change
- Reduce their ability to provide ecosystem services

⇒ A severe form of maladaptation for ecosystems

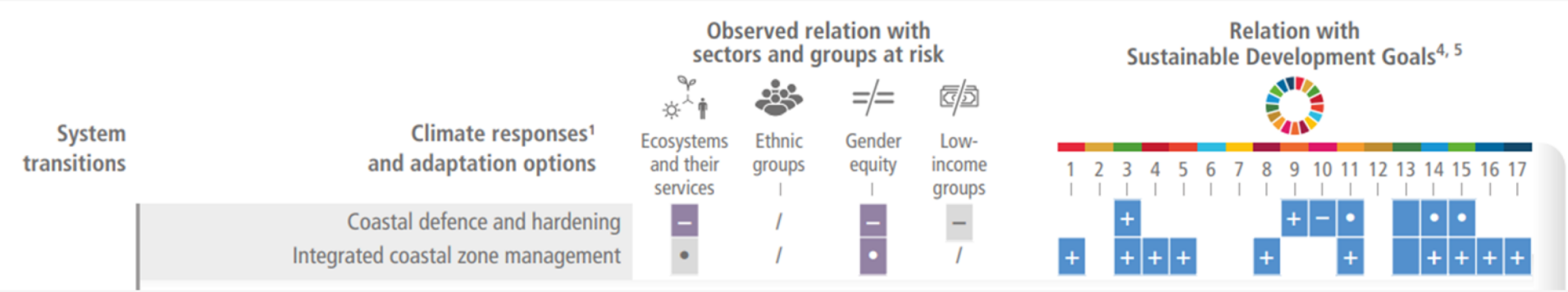
Adaptation capacity and governance to manage risks from projected SLR typically require decades to implement and institutionalize (high confidence)



The future of coasts depends on immediate mitigation AND adaptation actions

- Mitigation, to limit sea-level rise rates, give time to adaptation and preserve resilient ecosystems
- Adaptation to committed impacts of sea-level rise: flooding, erosion, salinization…

While implementing climate policies, more resilient coastal environments can be created



IPCC AR6 SPM; Ch3 CCB SLR

A challenge for us?

New sea-level projections for coastal adaptation

Approaches toward high-end scenarios

- Model-based approaches
  - Limitations: limited understanding of some physical processes
- Expert elicitations relying on mathematical approaches (e.g. Bamber et al., 2019)
  - Limitations: individual expert biases and methodological choices
- Behavioural expert elicitation approaches (e.g., Stammer et al., 2019; van de Wal et al., 2022)
  - Limitations: group biases

None of there approaches are wrong, all have limitations!

Le Cozannet et al. 2017

DANKE

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SPM-C.2.8

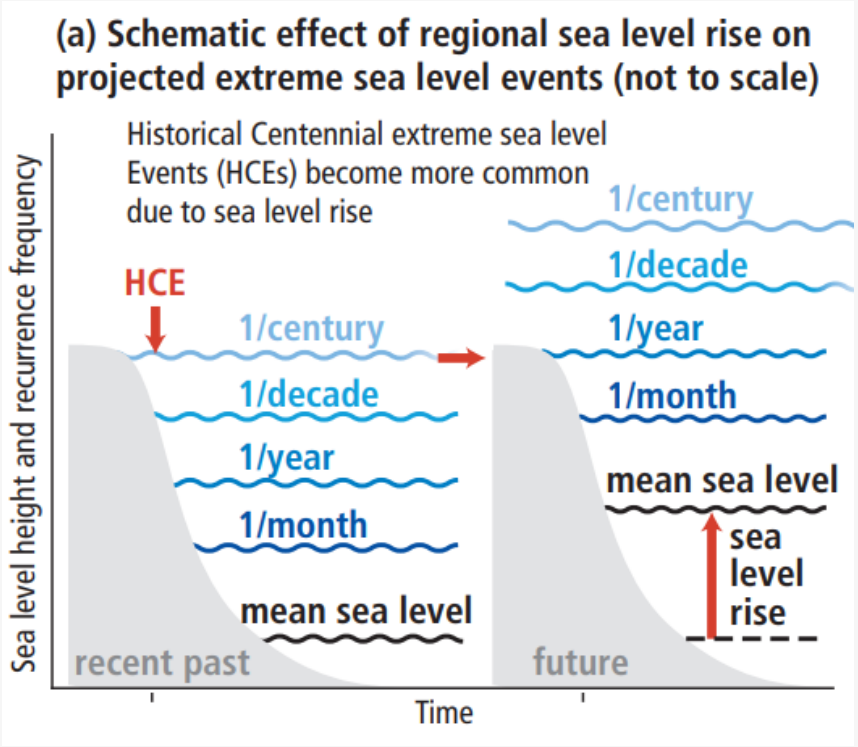
Sea level rise poses a distinctive and severe adaptation challenge

It implies dealing with:

- slow onset changes
- increased frequency and magnitude of extreme sea level events

This will escalate in the coming decades.

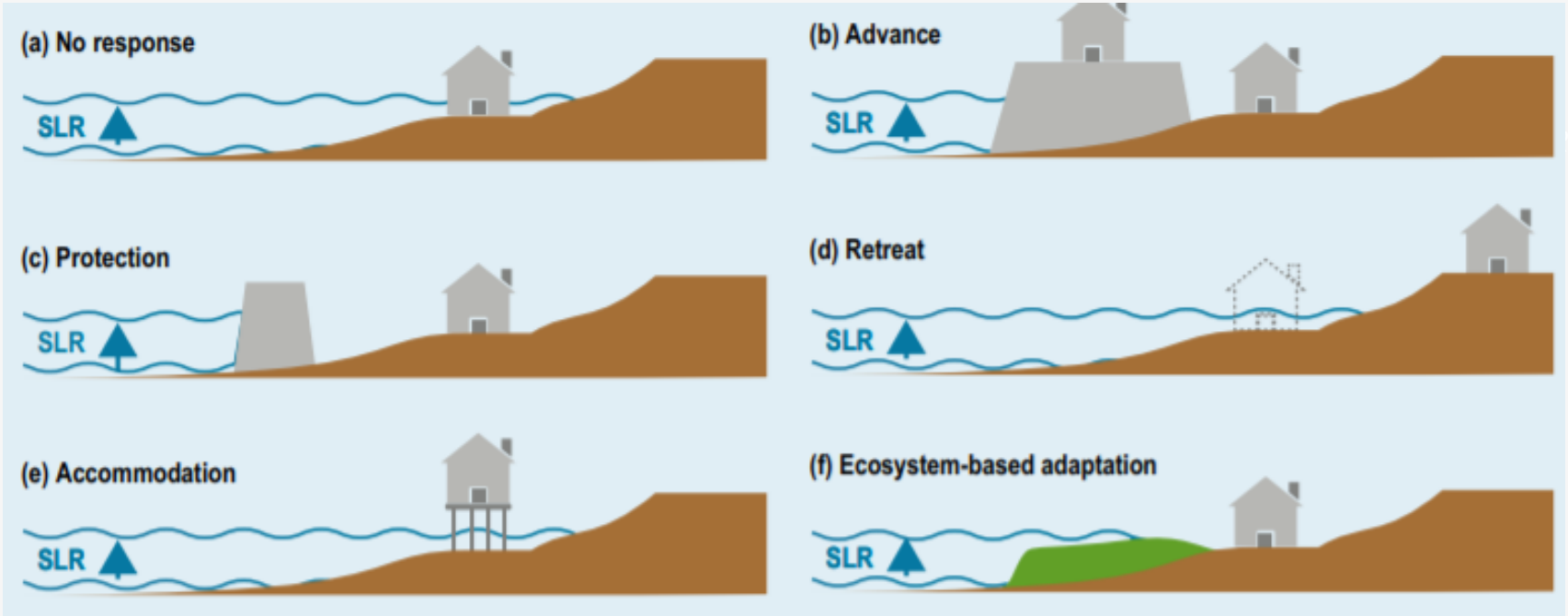
High confidence



SPM-C.2.8

Responses to ongoing sea level rise and land subsidence include protection, accommodation, advance and planned relocation

Coastal impacts of SLR can be avoided by preventing new development in exposed coastal locations



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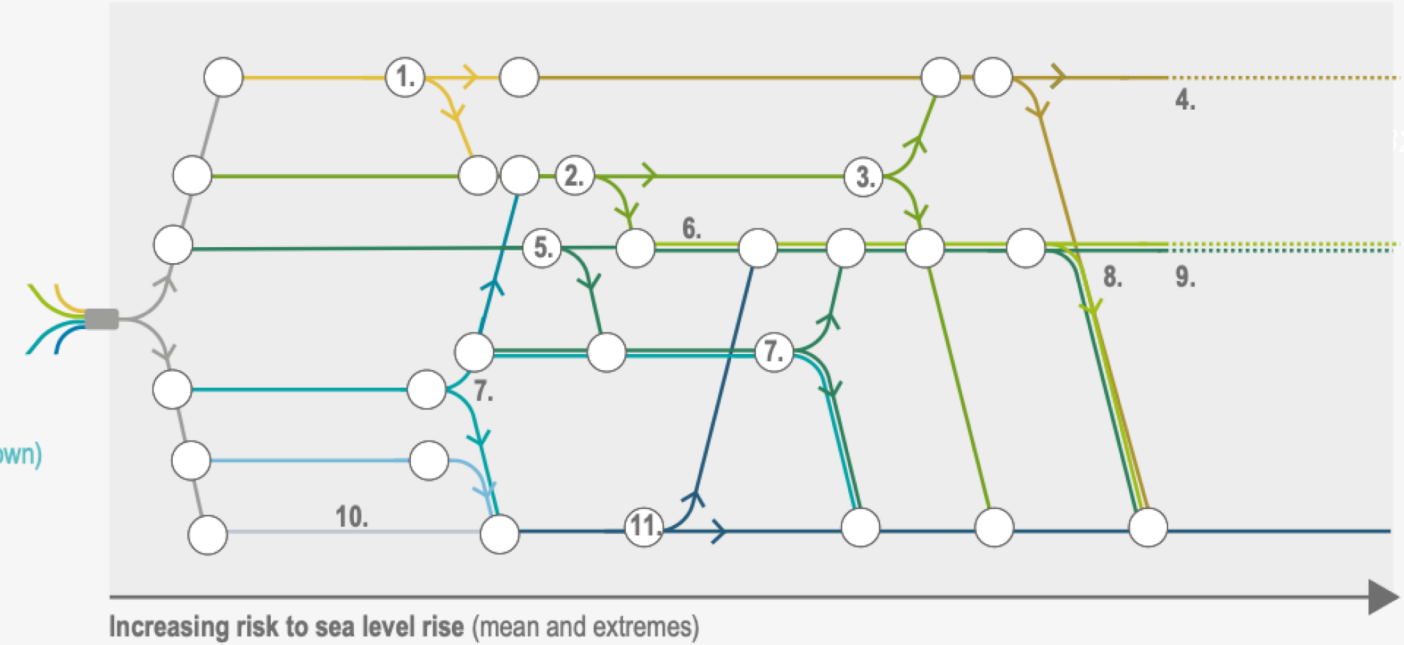
AR6 WGII SPM, SLR CCB

Societal choices and actions implemented in the next decade determine the extent to which medium and long-term pathways will deliver higher or lower climate resilient development (high confidence)

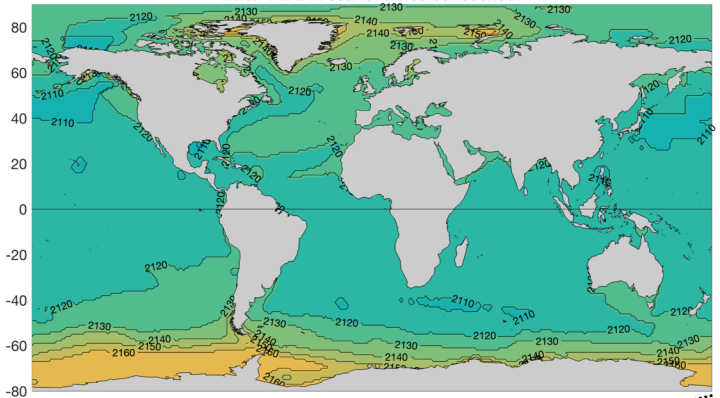
SPM-D.5

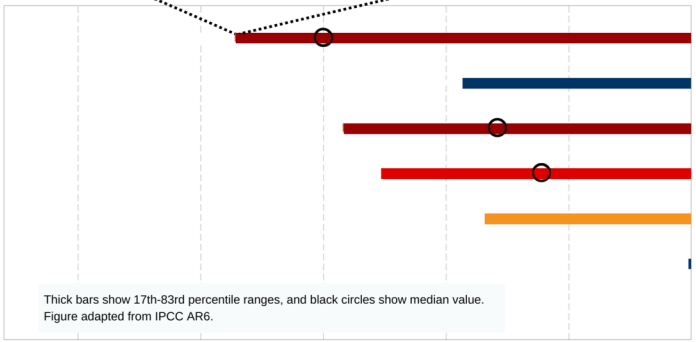
(a) Generic adaptation pathways for coastal cities and settlements to sea level rise

Generic strategies	Examples of specific measures
Advance	New seawards land claim above sea level
Protect	Sea walls, levees, storm barriers
	Wetlands, mangroves, coral reefs
Accommodate	Wet and dry proofing built environment
	Floating structures (experimental, not shown)
Retreat	No build zones
	Planned relocation



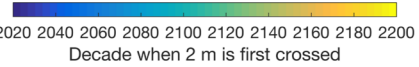
Policy Brief: when will a rise of 2m in sea-levels occur?
How might we adapt?





Year by which a rise of 2.0 m above 1995-2014 is projected

Early potential occurrence of a 2-m rise of regional sea-level rise assuming very high greenhouse gas emissions (SSP5-8.5) and initiation of ice-sheet collapse



First year of the decade in which a 2m relative sea-level rise is exceeded in different regions around the globe, based on the 83rd percentile of SSP5-8.5 projections. Local subsidence may cause an earlier exceedance in some cities.

Shared Socioeconomic Pathway (SSP) scenarios	Temperature anomalies in °C	Initiation of ice-sheet collapse
		On Off
SSP5-8.5	4.8 (3.6-6.5)	
SSP1-2.6	2.0 (1.3-2.8)	
SSP5-8.5	4.8 (3.6-6.5)	
SSP3-7.0	3.9 (2.8-5.5)	
SSP2-4.5	2.9 (2.1-4.0)	
SSP1-2.6	2.0 (1.3-2.8)	
SSP1-1.9	1.5 (1.0-2.2)	

Mean surface air temperature anomalies in 2081-2100 relative to 1850-1900: average and very likely range (data from IPCC AR6 Table 4.2)

- At 1,5°C, the sea-level commitment is 2 to 3m over the next 2 millennia
- A collapse of large ice-sheet regions in Antarctica can not be excluded, even below 2°C
- The likelihood of ice-sheet collapse increases with warming
- A rapid onset of these processes could result in 2m sea-level rise in the early 2100's.

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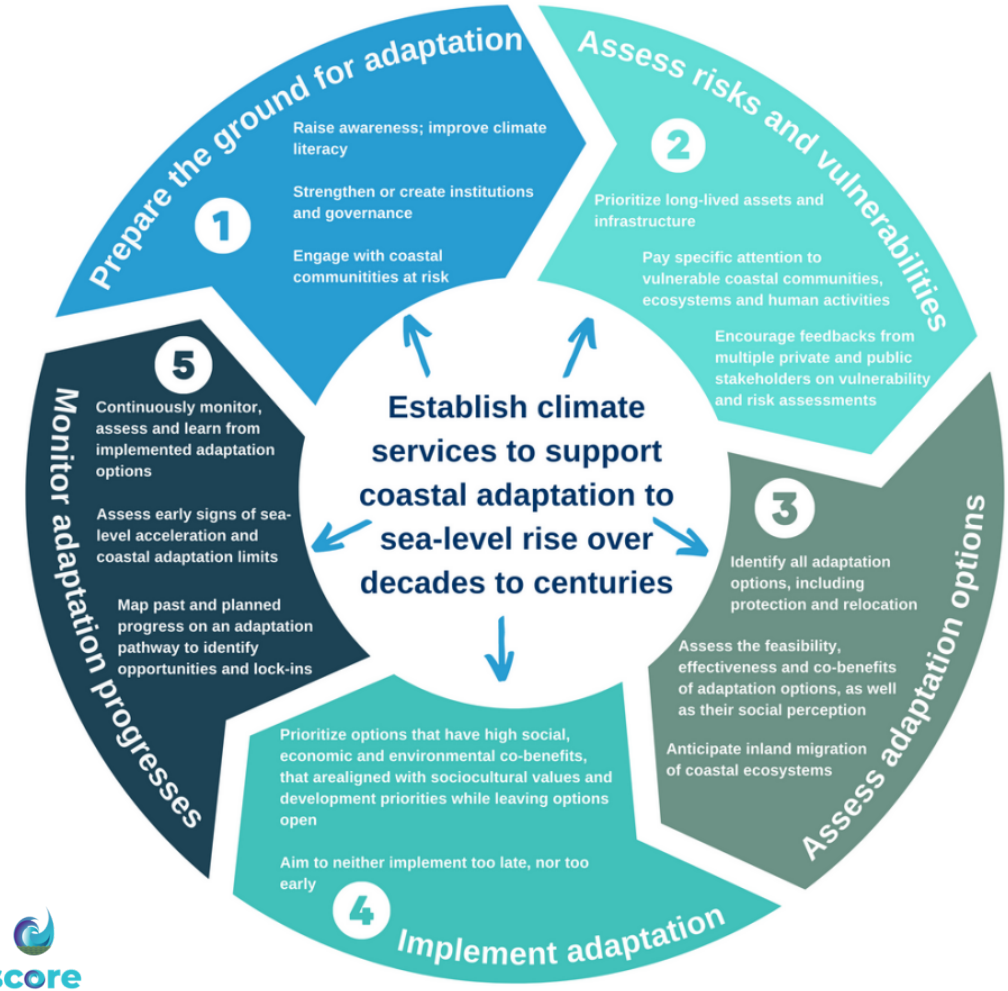
Policy Brief: when will a rise of 2m in sea-levels occur?
How might we adapt?

- Coastal adaptation is essential in addition to mitigation
- We need to start planning now, accepting uncertainty and thinking short- and long-term: 2050, 2100 and beyond
- Recognize the choices we face and the diverse pathways we might follow

Link to the Policy Brief:

Think strategically: develop a shared vision for coastal areas?



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