Adaptive pathways: Little River Basin in Miami

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Deltares
Enabling Delta Life

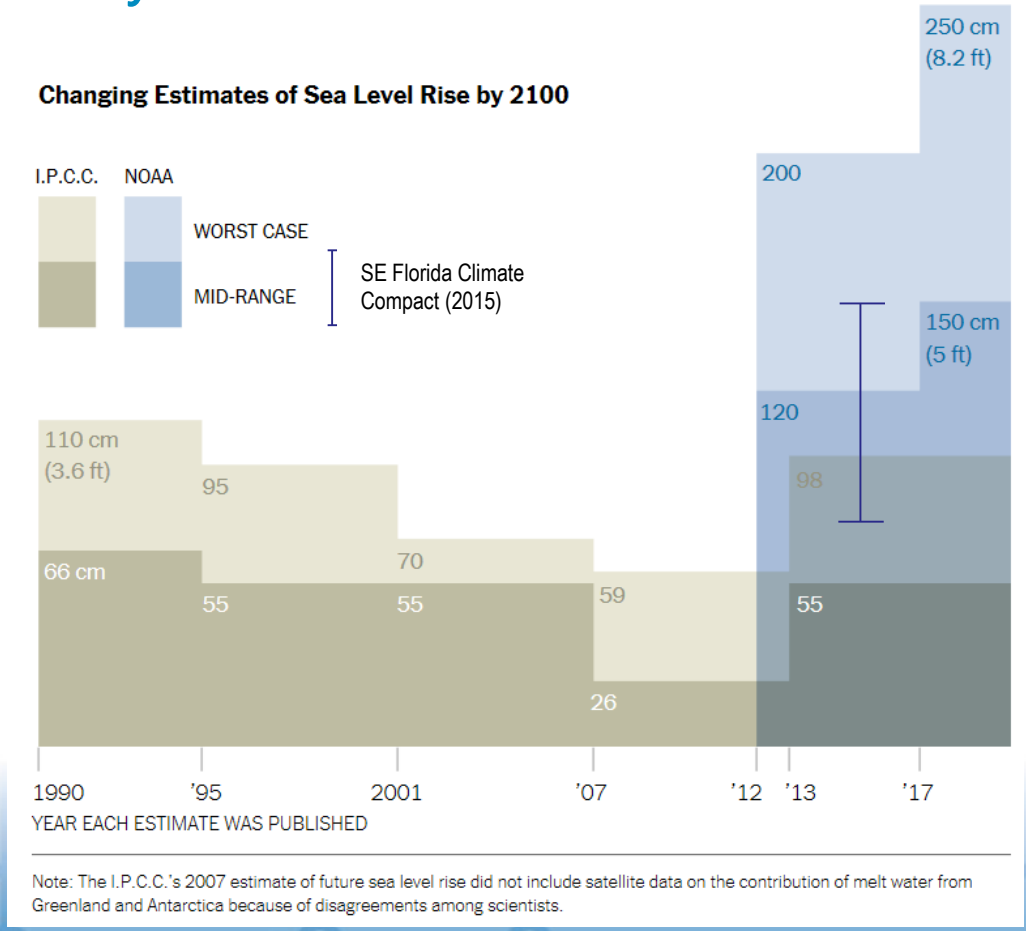
Changing Estimates of Sea level rise by 2100

Larger bandwidth,
Uncertainty increased
→ Deep uncertainty

The New York Times

Rising Seas Will Erase More Cities by 2050, New Research Shows

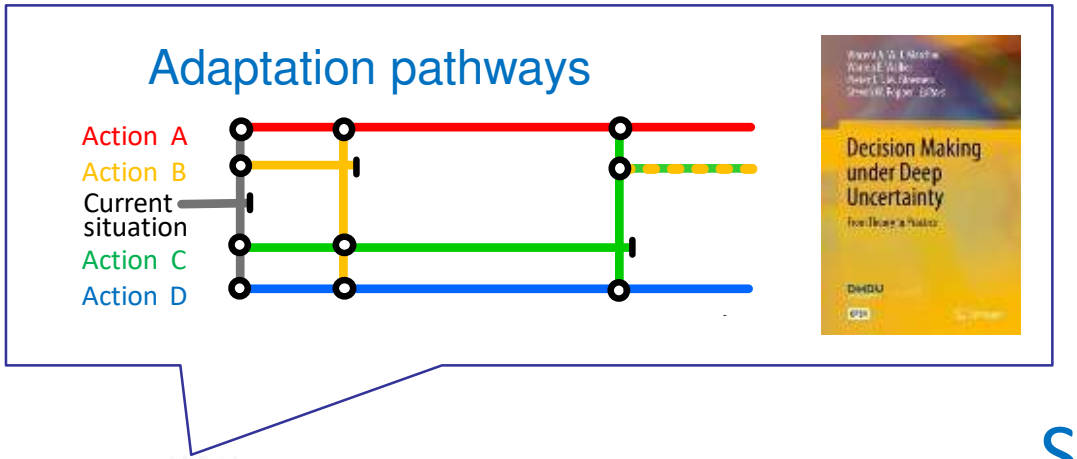
By Denise Lu and Christopher Flavelle Oct. 29, 2019



Adaptive pathways planning using Dynamic Adaptive Policy Pathways (DAPP)

A **systematic framework** to support planning and decision making **under deep uncertainty**:

- What low-regret actions can we take now that contribute to future goals?
- What actions can we postpone? How to prioritize?
- What robust and flexible strategies perform well over a wide range of futures?



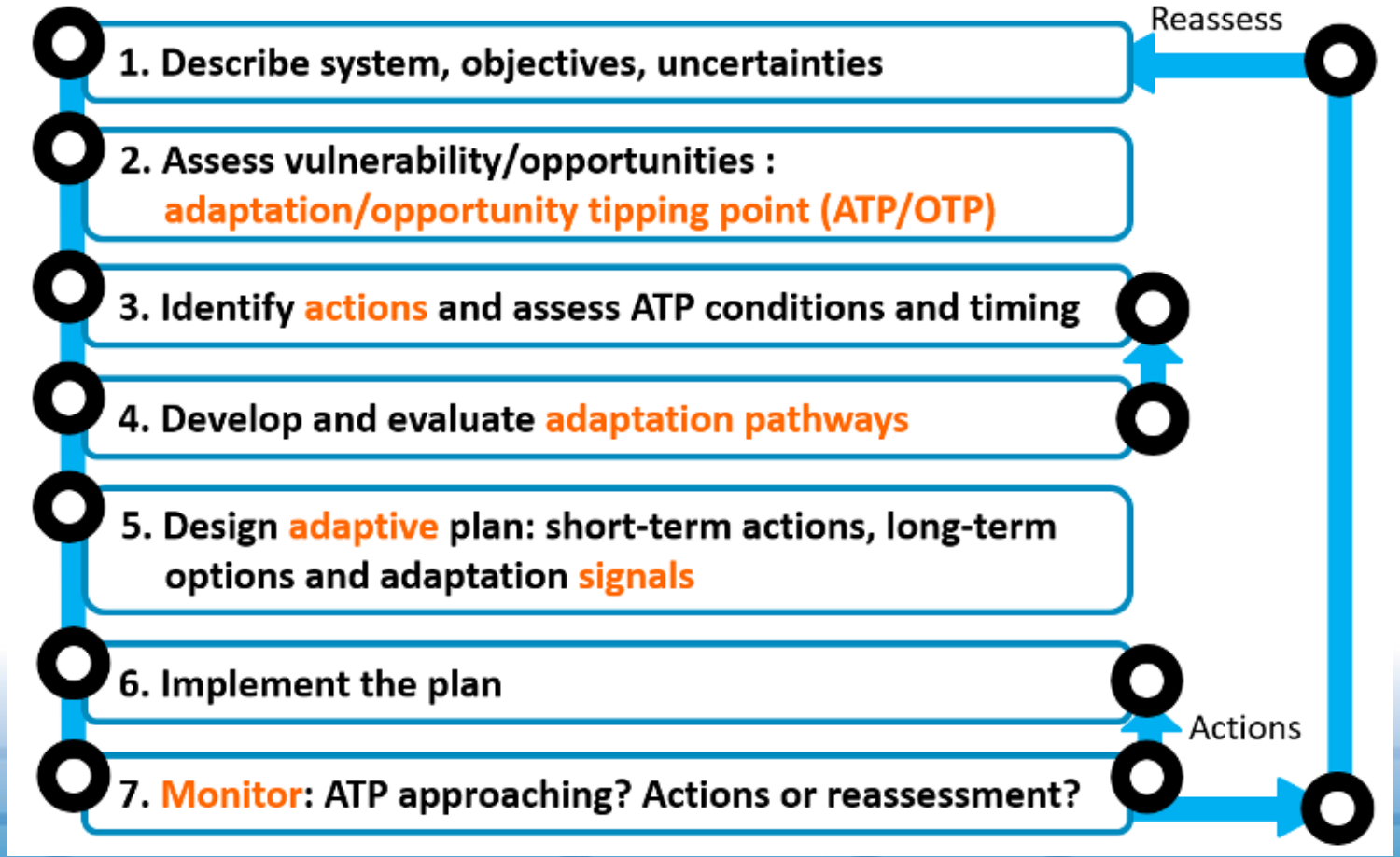
Signals!

Anticipate with adaptive plan

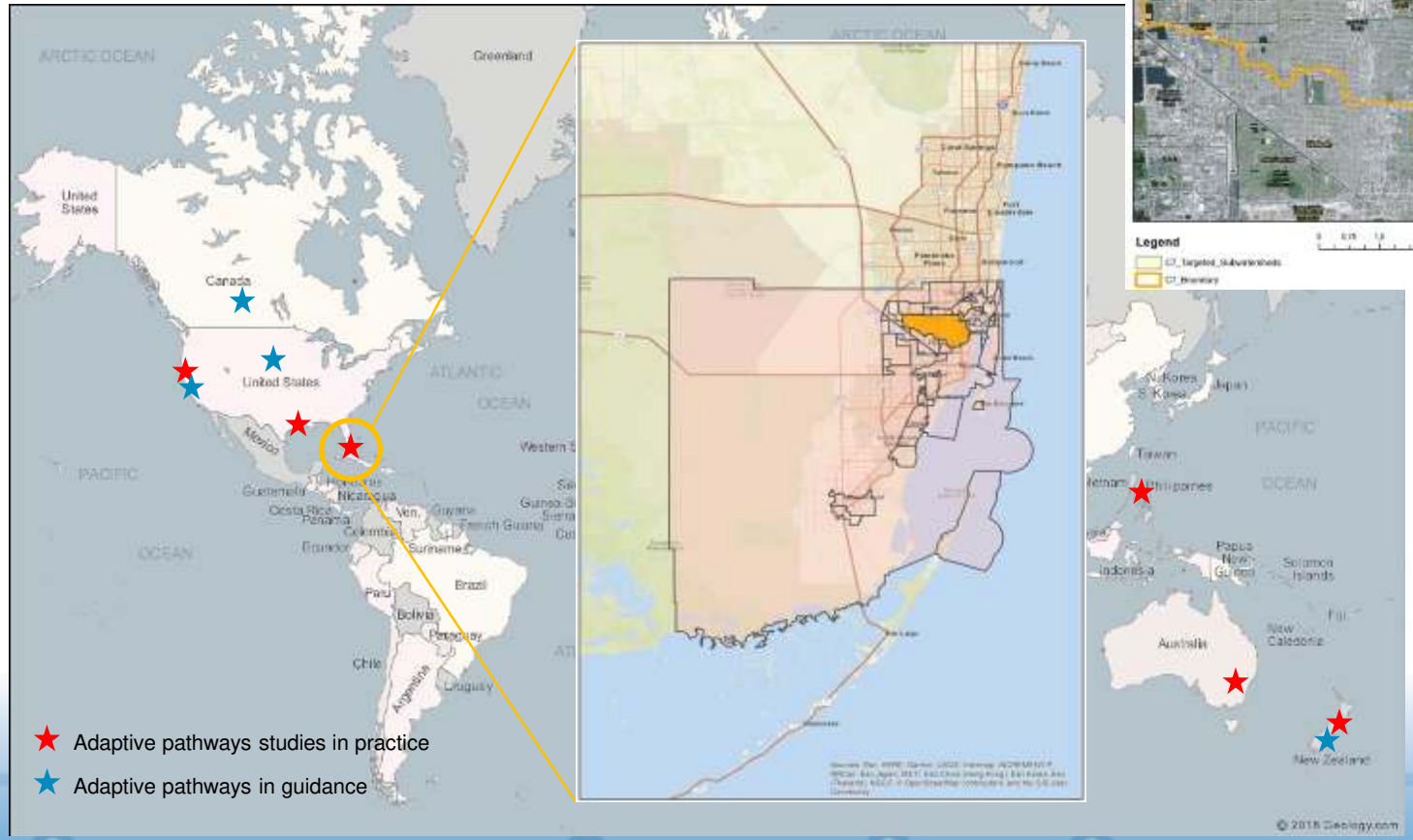
Haasnoot et al. (2013) Glob. Env. Change. 10.1016/j.gloenvcha.2012.12.006 ; www.deepuncertainty.org

Systematic framework of DAPP

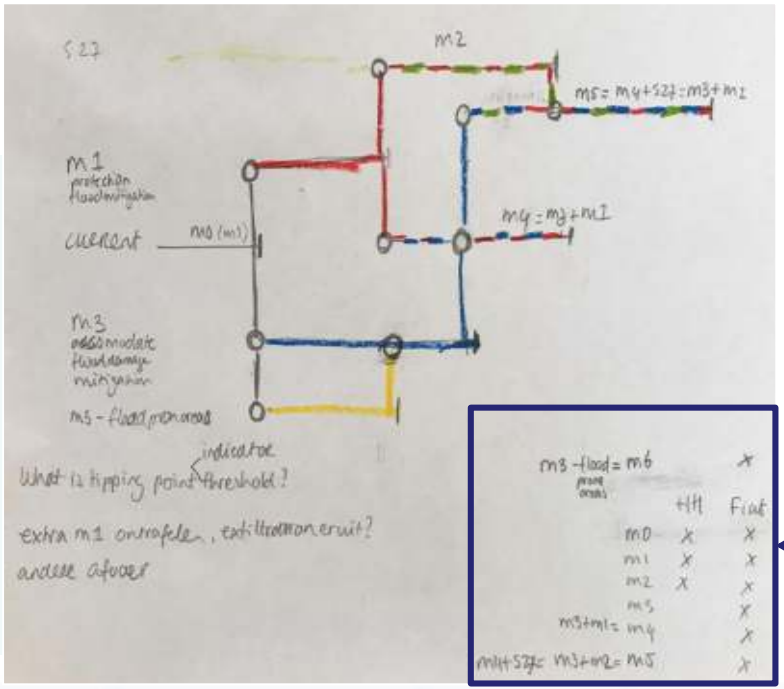
Key features:



Application to Miami C7 basin (2017)



Workshop to explore pathways of narratives



To be modeled

pathways generator tool: http://pathways.deltares.nl

Portfolio of measures

- **M0 –** No action
- **M1** – Local flood mitigation: flood walls, exfiltration trenches, flap gates, and local pumps
- **M2** – Regional flood mitigation: forward pumps at S-27 coastal structure (small & large pumps)
- **M3** - Land-use mitigation: raise roads and buildings to 6, 7 or 8 feet elevation

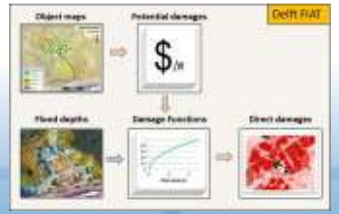
Quantitative analyses

Dynamic Adaptive Policy Pathways (DAPP)

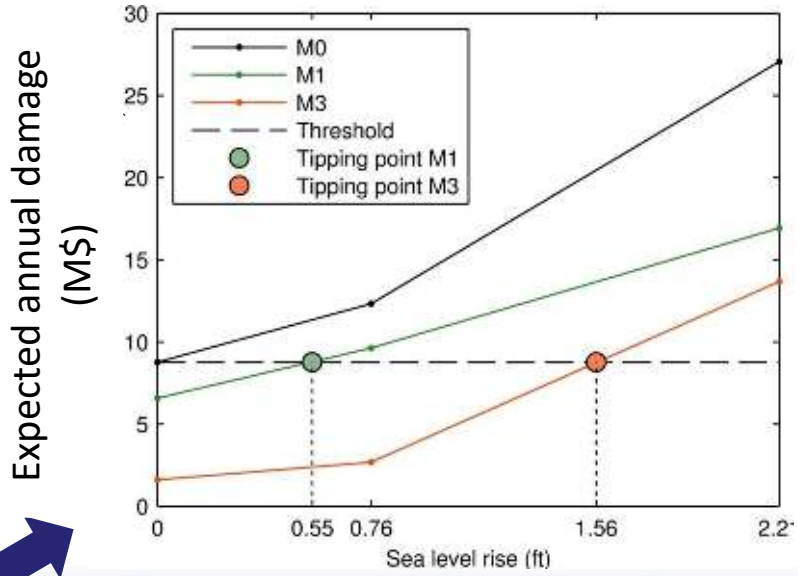
Hydrologic Drivers:
- Rainfall (4x);
- Storm Surge (1/10)
- Sea Level Rise (3x)

Hydrodynamic Model XPSWMM

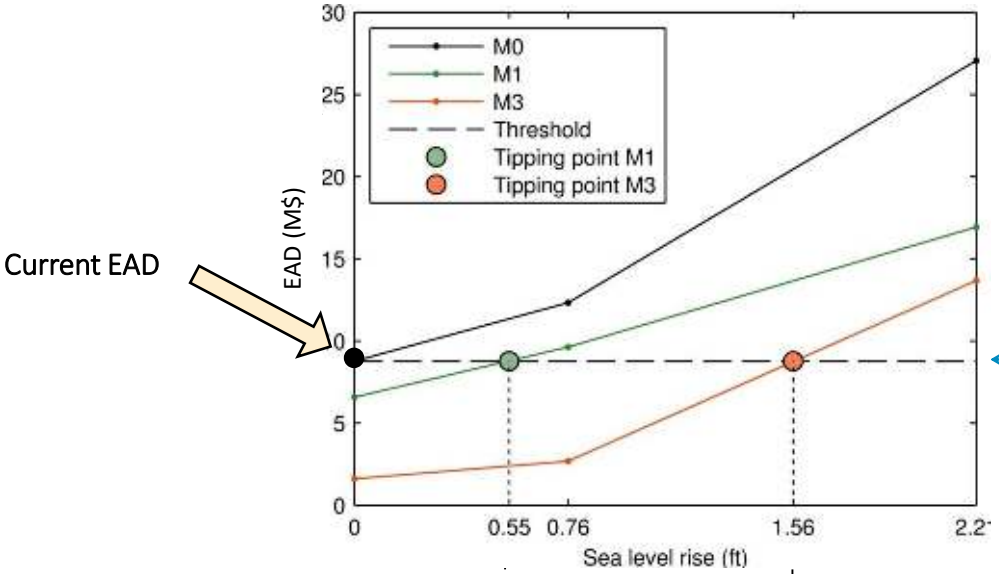
Delft-FIAT



Adaptation Options



Adaptation tipping points



Current EAD

Objective:
Expected annual damage (EAD) should not exceed current levels

Threshold = current EAD

SLR1 → 2065 (0.76 ft)

2045

SLR3 → 2065 (2.21 ft)

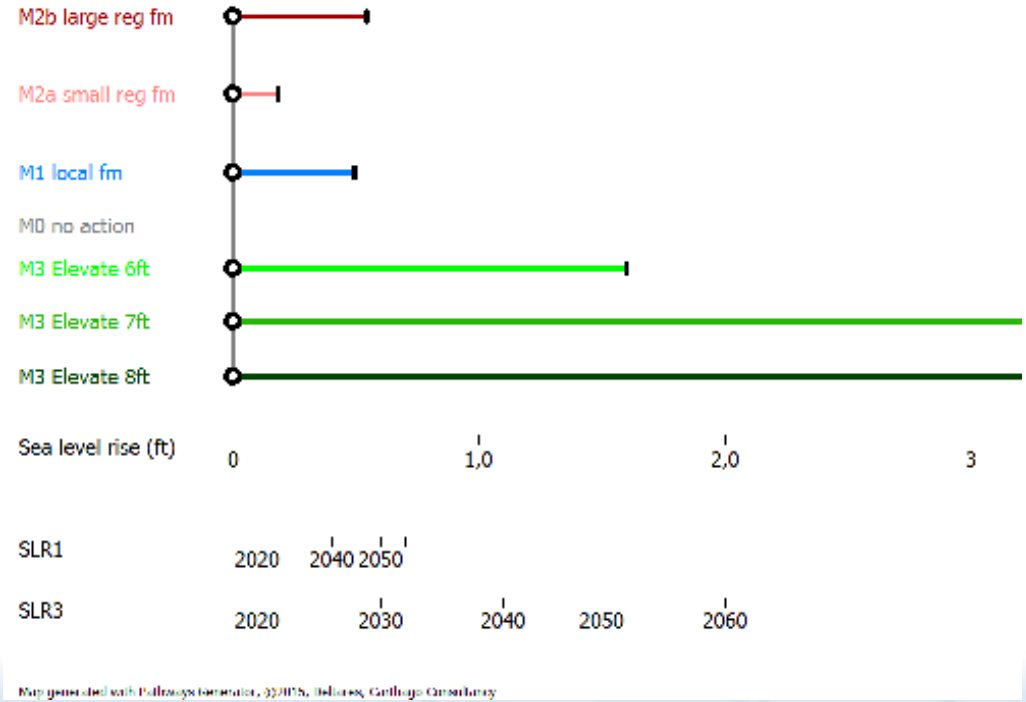
2025

2050

Adaptive pathways

Structural measures

Land use measures



Adaptive pathways

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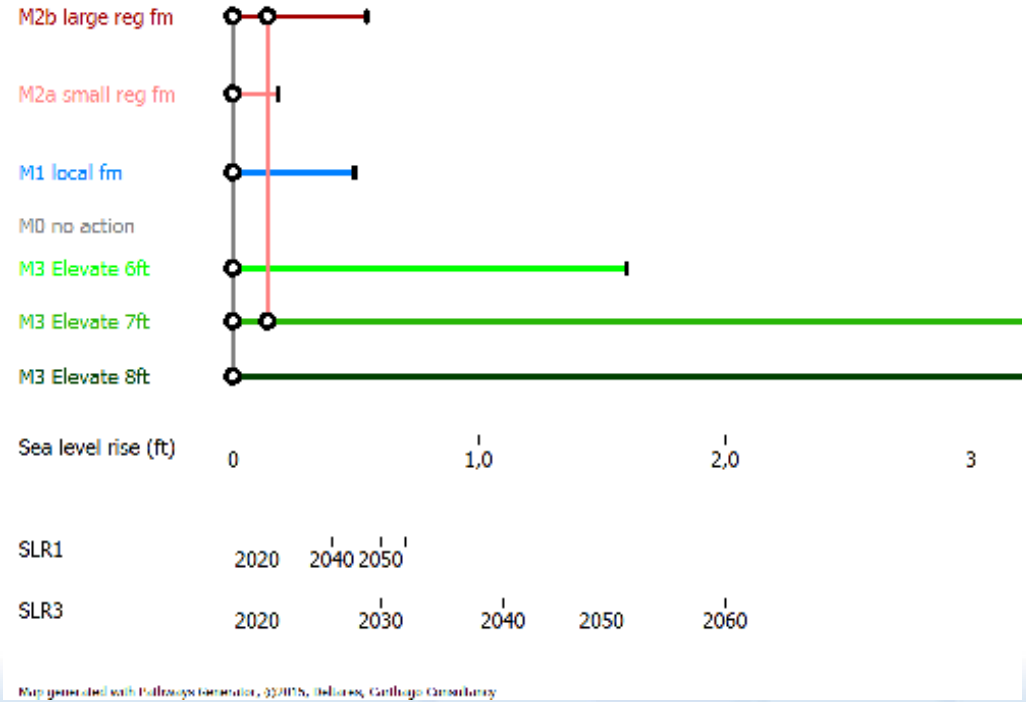

Adaptive pathways

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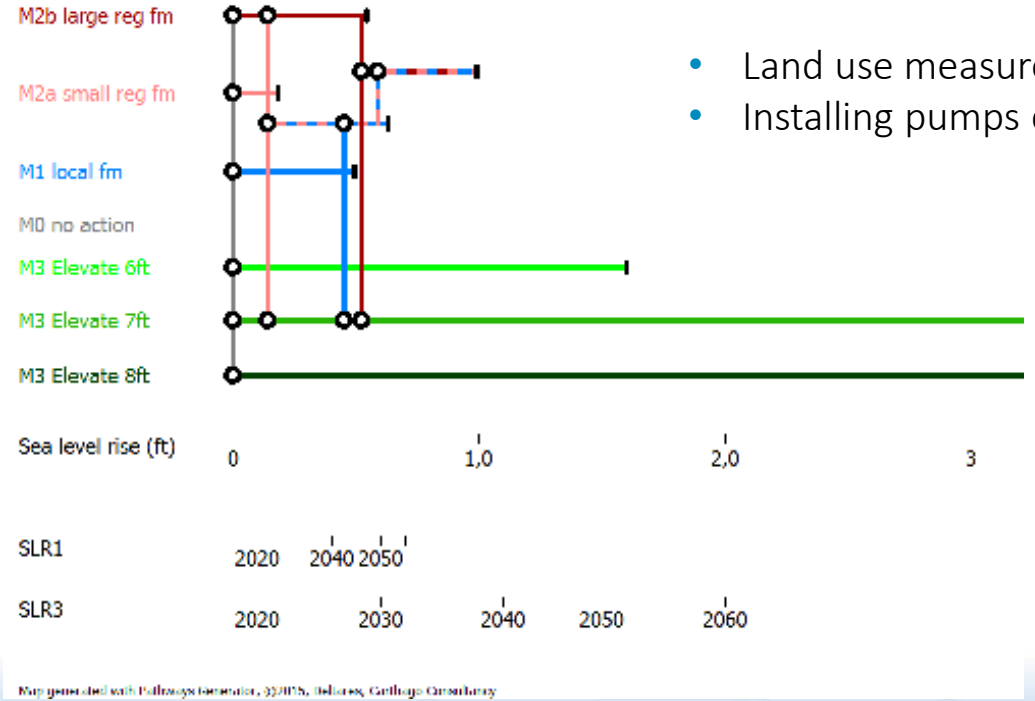
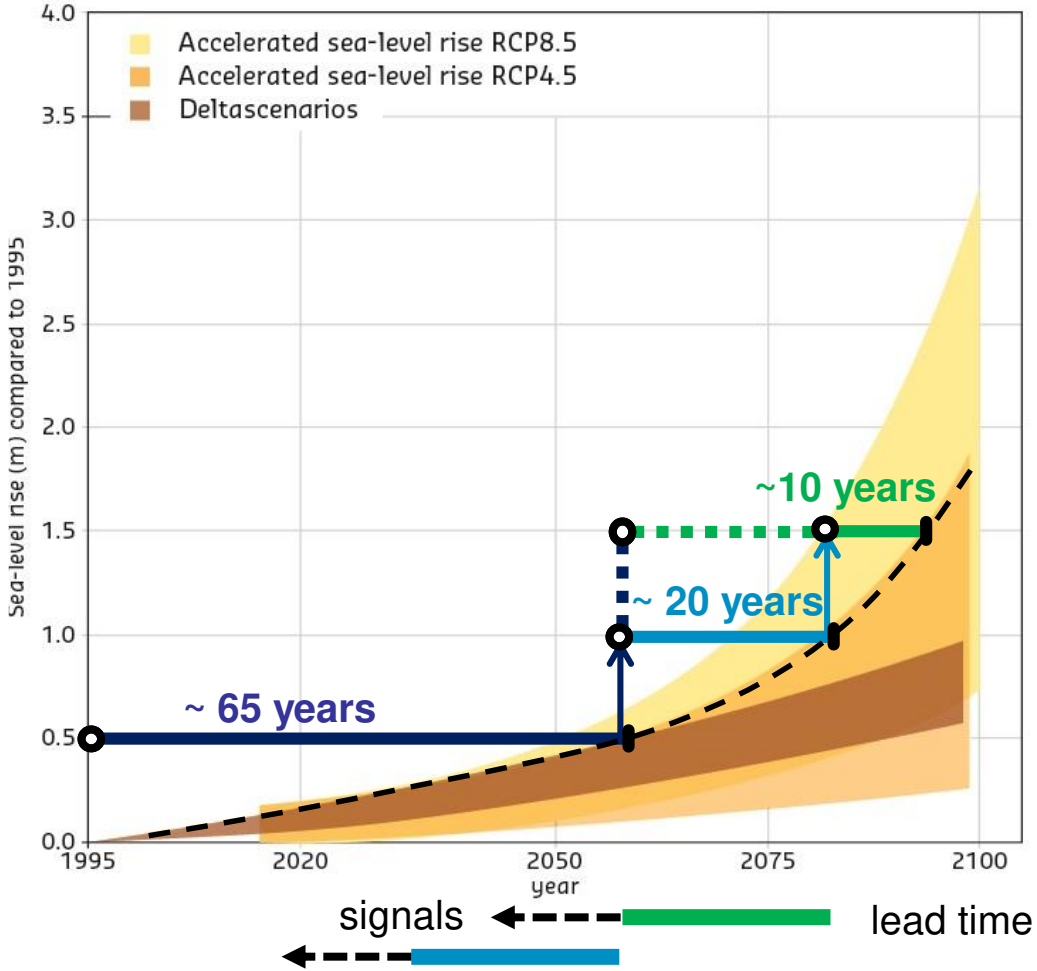


- Land use measures are needed in the end
- Installing pumps can buy some time.



Adaptation to high-end or accelerated SLR

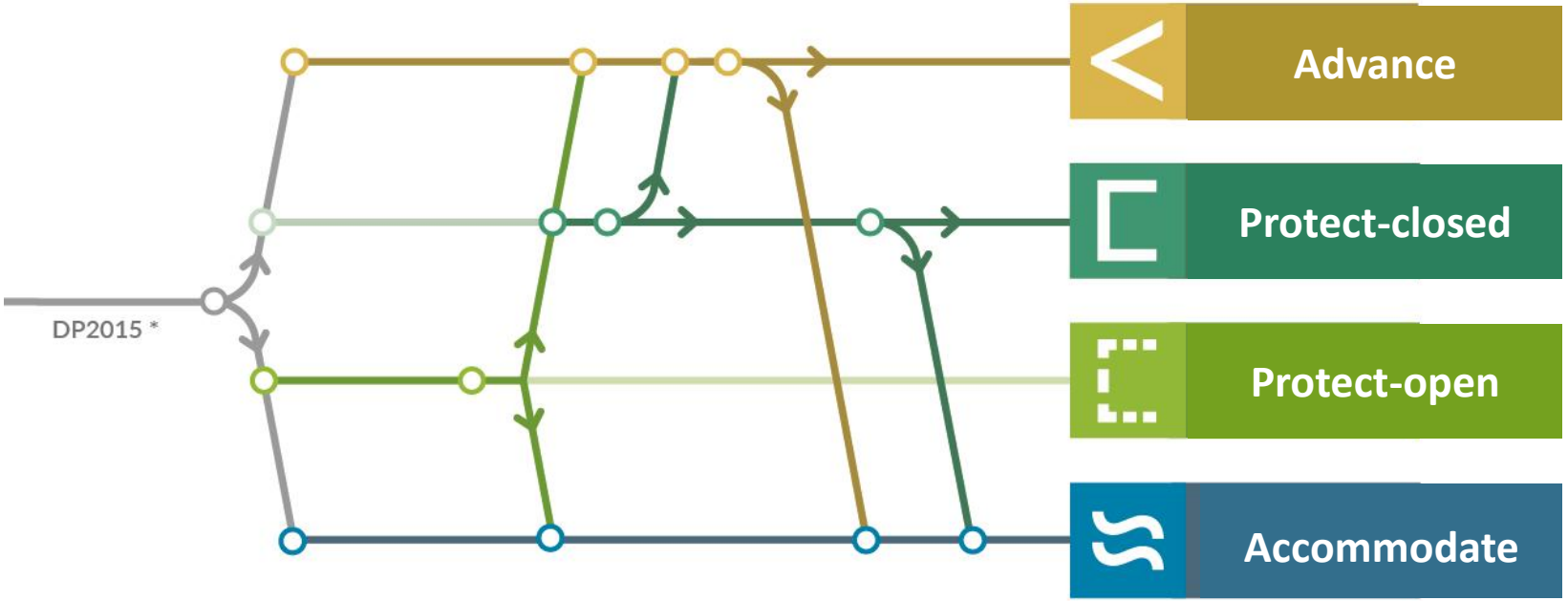
Limits due to rate of change?

Functional life time of investments decreases:

adapt faster or larger

Haasnoot et al. 2019
https://doi.org/10.1088/1748-9326/ab666c

Solution space to high-end sea-level rise

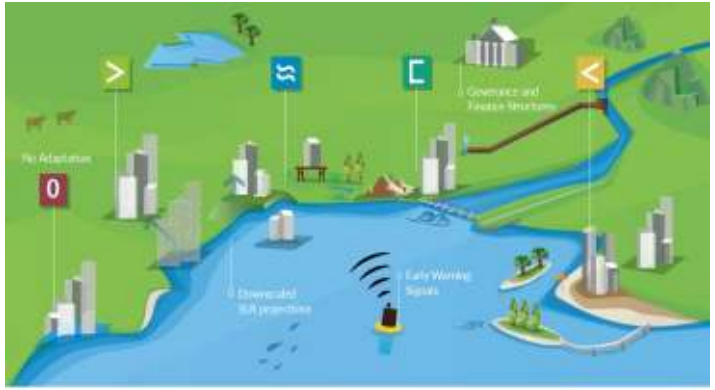


*) deltabeslissingen en voorkeursstrategieën uit Deltaprogramma 2015.

Summary

- Pathways open decision space, identify path-dependencies and overcome policy paralysis
- Tipping points identify under what conditions and when to act
- Monitoring to detect signal if adjustment or additional actions are needed
- Assessment modes: model-based, expert, participatory pathways

Corona-investments: mitigate, avoid, anticipate



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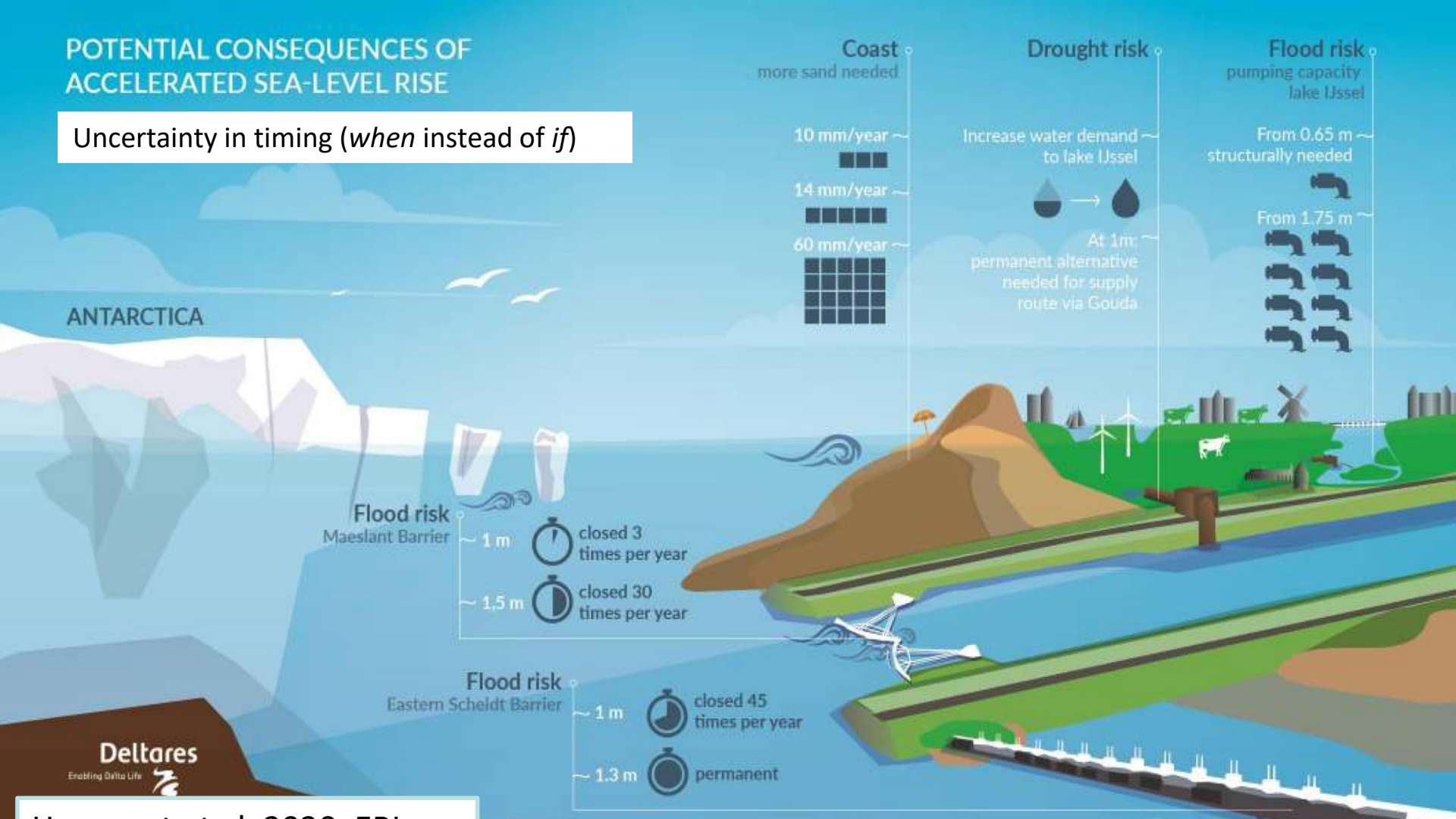
POTENTIAL CONSEQUENCES OF ACCELERATED SEA-LEVEL RISE
Uncertainty in timing (*when* instead of *if*)
Coast
more sand needed
10 mm/year
14 mm/year
60 mm/year
Drought risk
Increase water demand to lake IJssel
At 1m: permanent alternative needed for supply route via Gouda
Flood risk
pumping capacity lake IJssel
From 0.65 m structurally needed
From 1.75 m
ANTARCTICA
Flood risk
Maeslant Barrier
1 m
closed 3 times per year
1,5 m
closed 30 times per year
Flood risk
Eastern Scheldt Barrier
1 m
closed 45 times per year
1.3 m
permanent
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