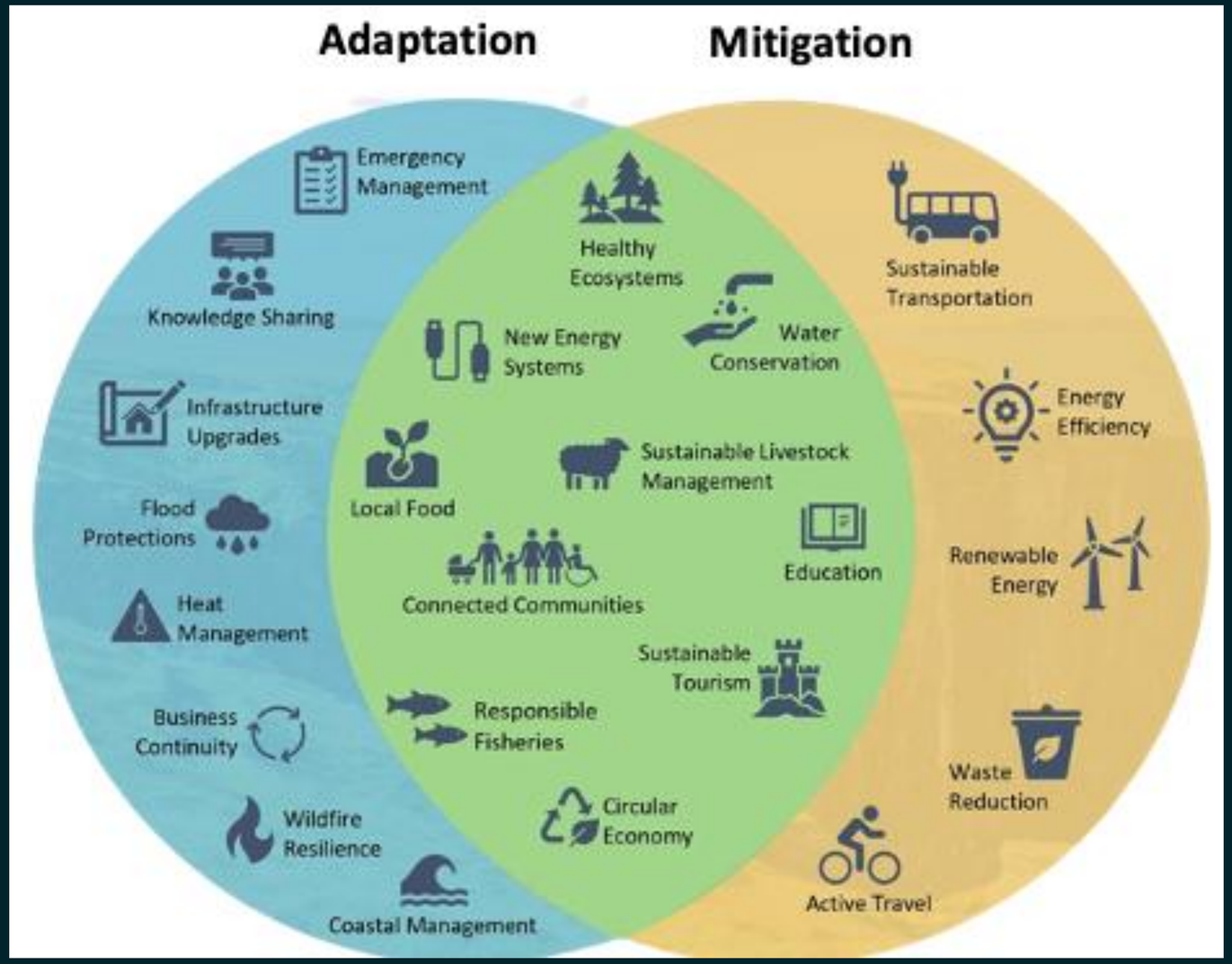
Benefits of adaptation

Methodology and challenges

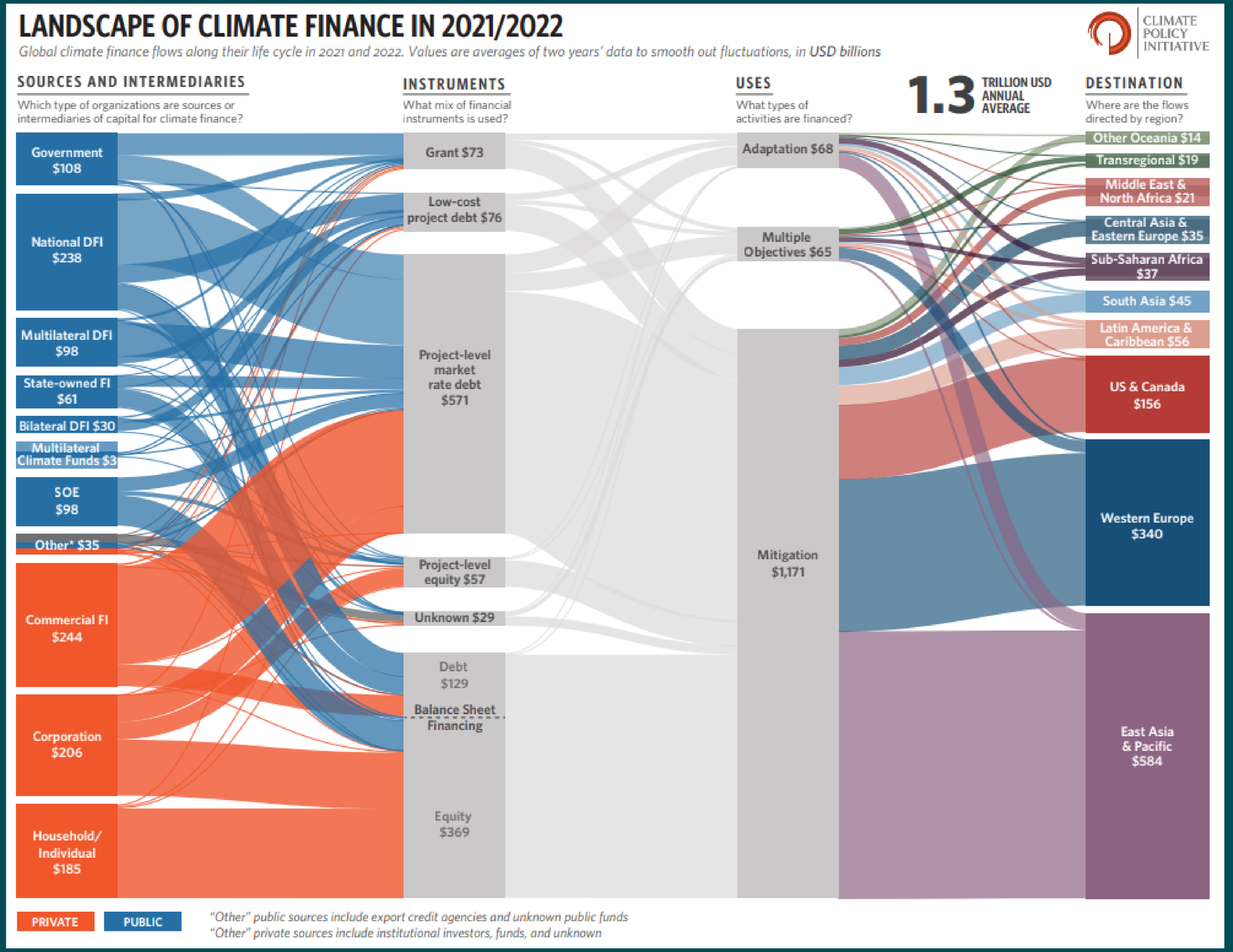
cerac .be

Adaptation & dual use



Climate finance Flows

While adaptation finance has increased in recent years, it still represents less than 10% of global climate investments.

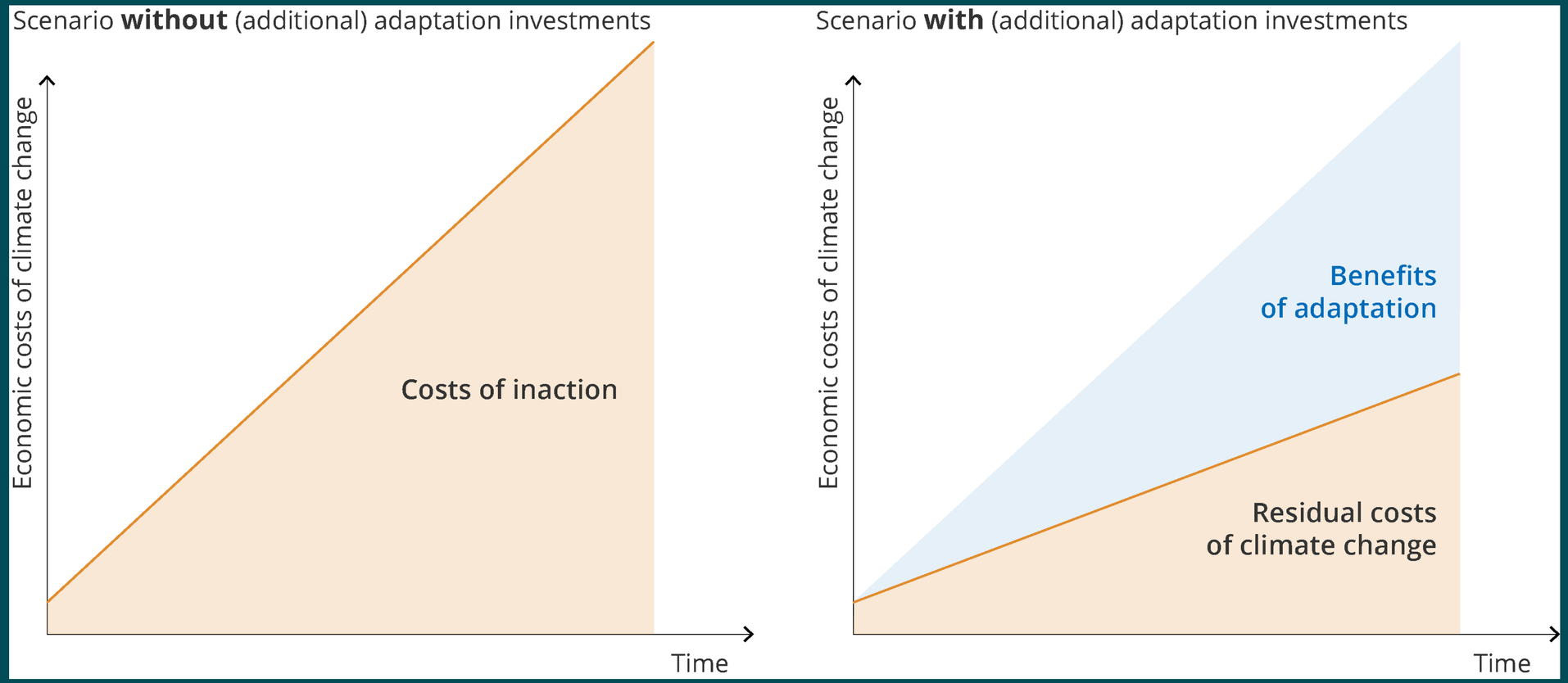


Source : Landscape of climate finance in 2021/2022

Adaptation strategies

Source : Turkelboom F. et al., 2021

Benefits of adaptation



Source : European Environment Agency

Net benefits of adaptation

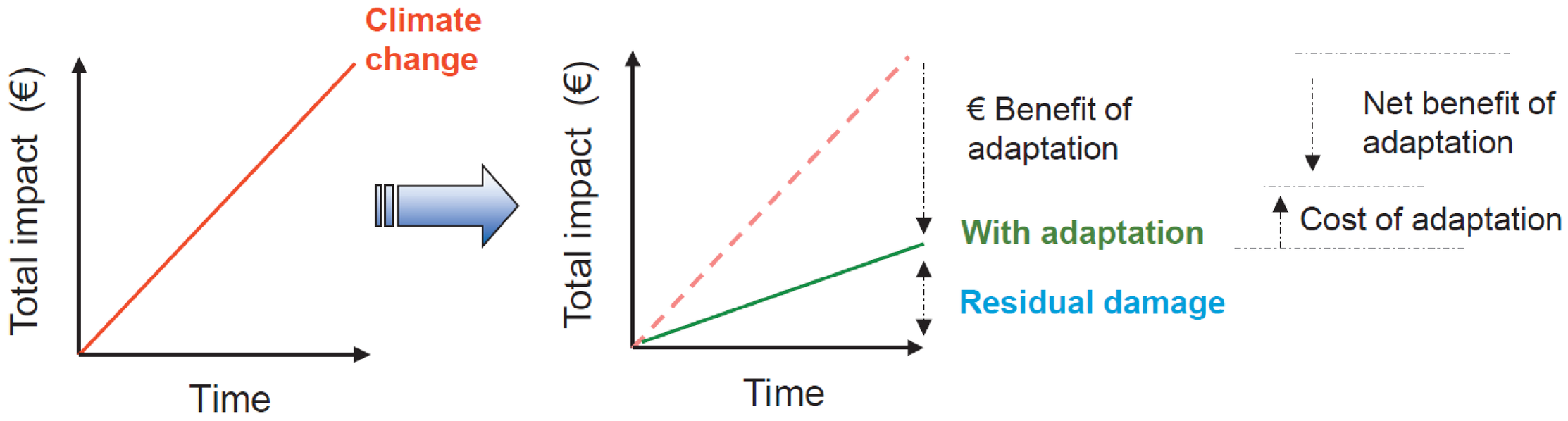
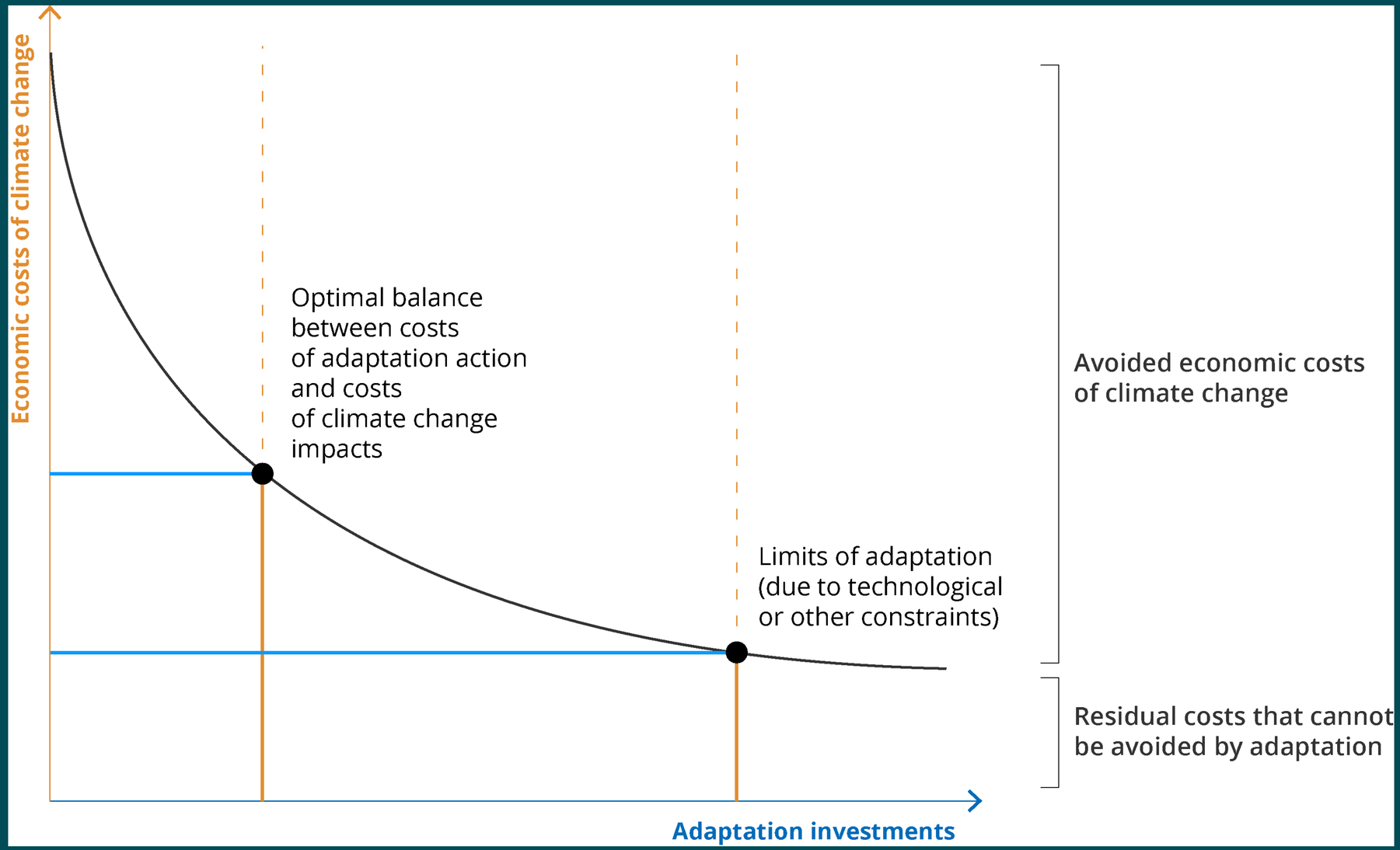


Figure 2. Schematic of the costs and benefits of adaptation

Source: ACCREU technical policy brief, “The economic impacts of Climate Change and the Costs and Benefits of Adaptation in Europe”

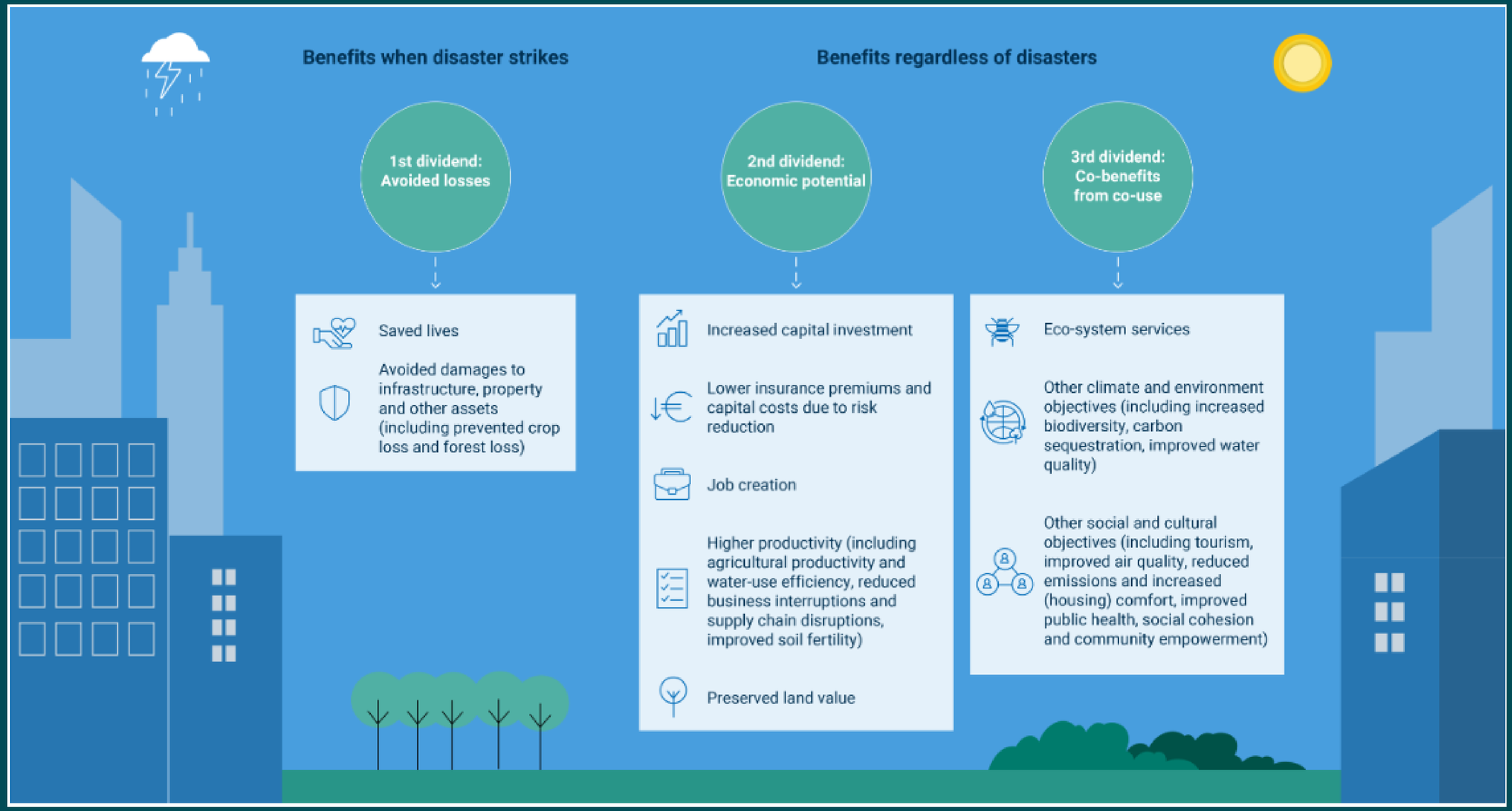
Cost effective adaptation



Source: European Environment Agency

The Triple Dividend approach

- 1st dividend
  Avoided losses
- 2nd dividend
  Induced economic or development benefits
- 3rd dividend
  Additional social and environmental benefits



Source : European Environment Agency

Triple dividends examples

Dividend	Country benefited	Adaptation measure	Effects
1st dividend	 **Denmark**	Copenhagen's cloudburst drainage infrastructure	Should **reduce the risk of flood damages** (ca. EUR800m during the 2011 cloudburst)
2nd dividend	 **The Netherlands**	Robust flood defences	Enabled **sustained business development** and supported **thriving property markets in low-lying areas**
3rd dividend	 **Spain**	Ebro delta wetland restoration	Provides **flood protection** while **supporting biodiversity, fisheries** and **eco-tourism**

Source : European Environment Agency

Cost of inaction

Benefits of adaptation

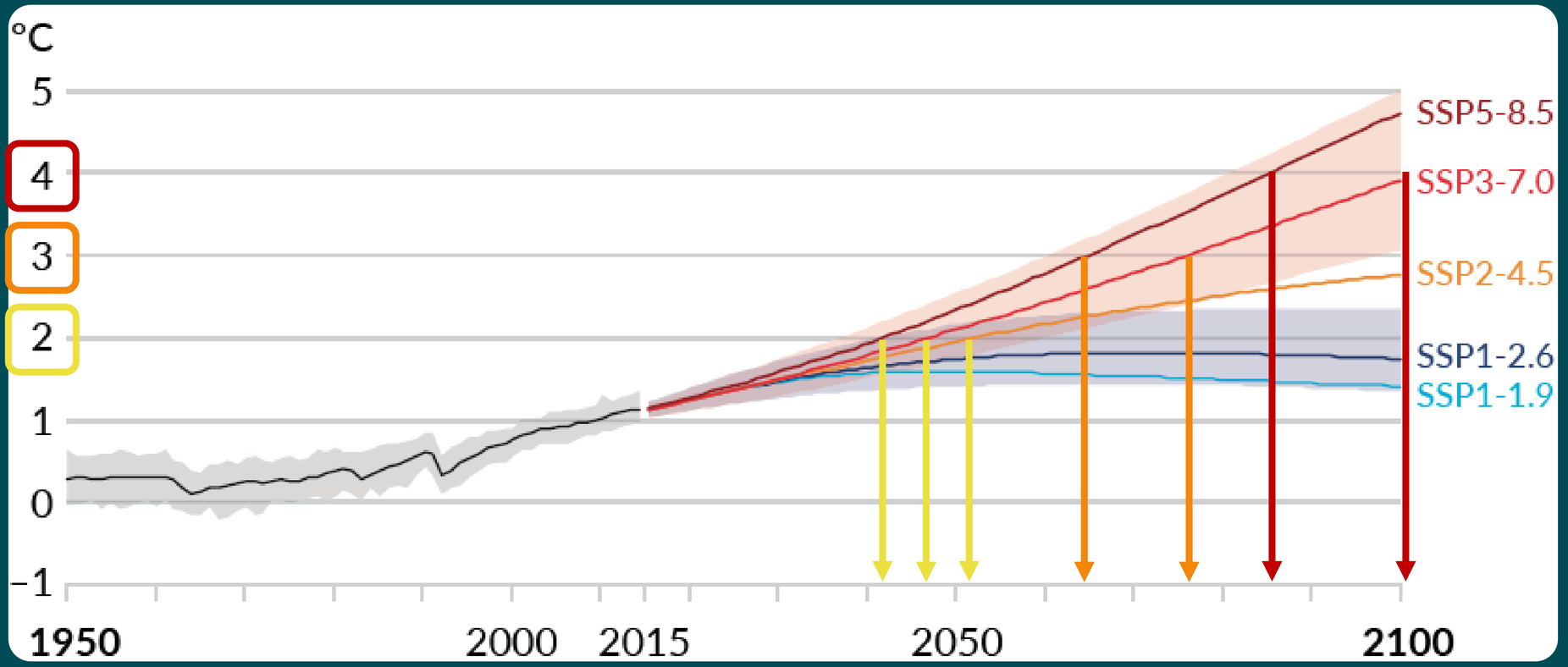
Risk: a definition

- **Climate hazards** Potential occurence of climate-related physical events or trends causing damage or loss.

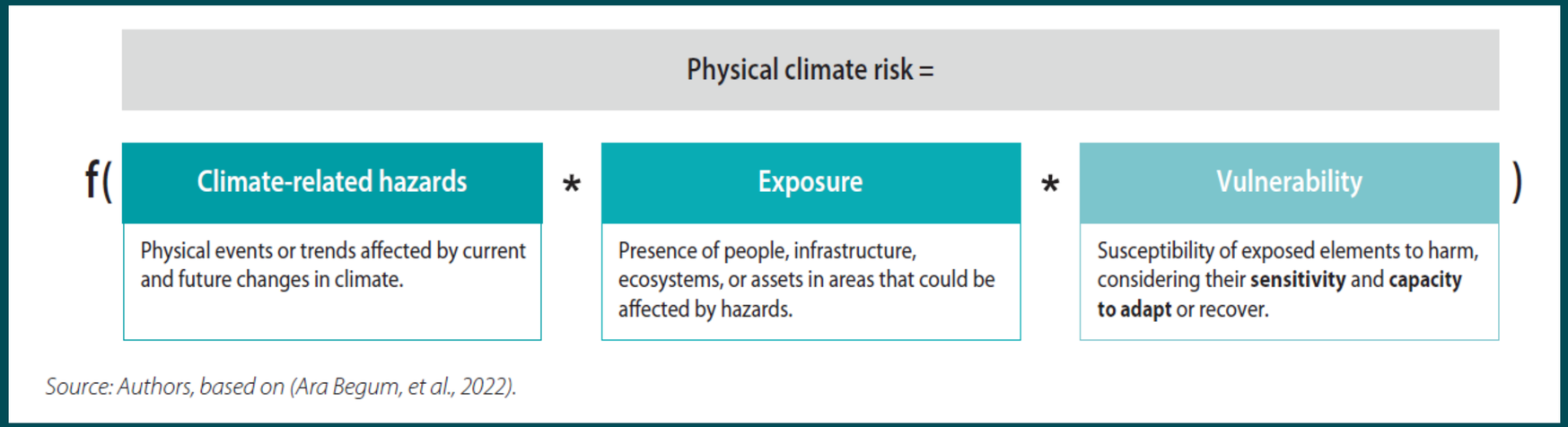
- **Exposure** Presence of people, assets, infrastructure, or ecosystems that could be affected by hazards

- **Vulnerability** Propensity or predisposition to be adversely affected, including sensitivity and capacity to cope or adapt.

Climate scenarios



Elements of physical climate risk



- **Exposure at risk** or **Value at risk**

- **Potential Exposure at Risk (PEAR)** : evaluates the financial exposure of institutions to areas affected by physical climate hazards by capturing the geographic and financial overlap of portfolios with hazard zones.

- **Normalised Exposure at Risk (NEAR) :** estimates the financial losses that institutions might face if borrowers are unable to fulfill their loans obligations due to the destruction of their physical assets by a natural disaster.

Source : Leveraging physical climate risk data, NGFS (September, 2025)

Digital twin Paris

Figure 4: Hazards and buildings

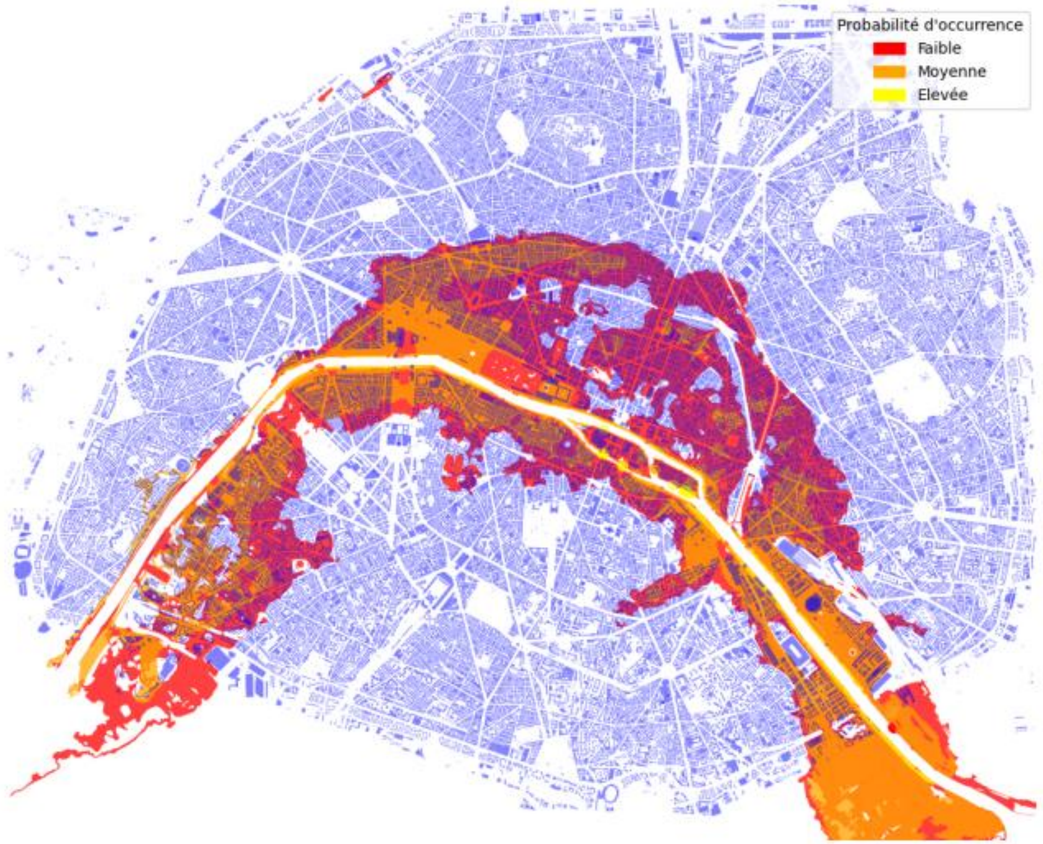


Figure 5: Buildings and Production sites

- Data on firms and establishments
- Data on loans
- Data on historical floods

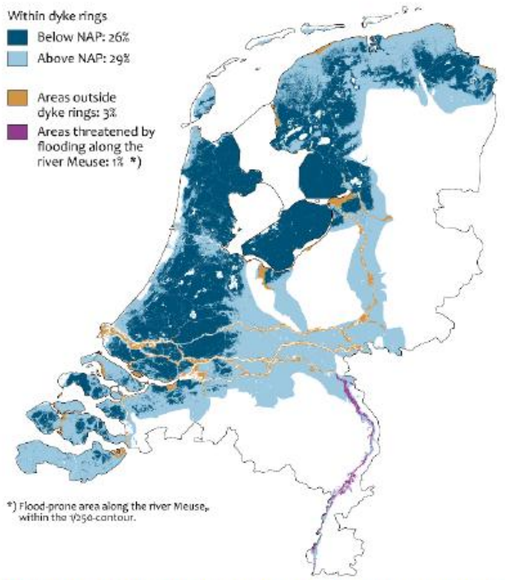
Source: Digital twins for bridging climate data gpas: from flood hazards to firms' physical assets to banking risks

The Netherlands
Floods, country level

Figure 1. The Netherlands: Physical Climate Risks

Nearly 26 percent of the surface in the Netherlands is below the sea level.

Flood-prone Area and Area below Sea Level



Note: NAP (The Amsterdam Ordnance Datum) is a benchmark for measuring sea levels in most of Europe.

Source: PBL.

The Water Act sets the flood probability standards for primary defenses.

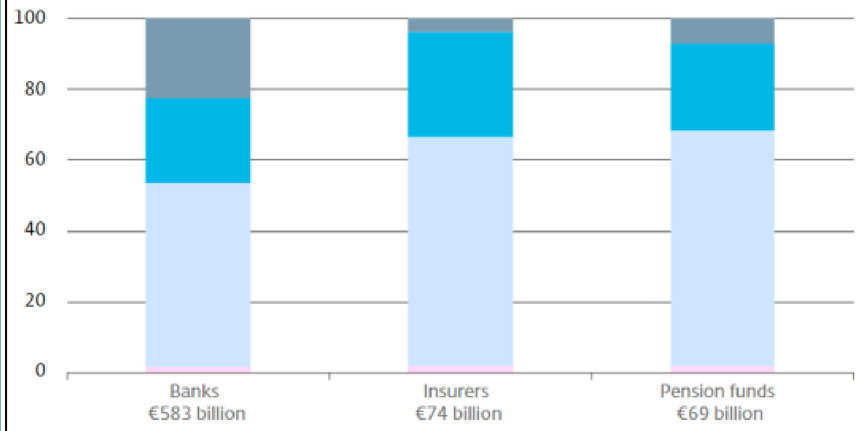
Maximum Permissible Flood Probabilities

Source: The Netherlands Centre for River studies (NCR).

Figure 2. The Netherlands: Dutch Financial Sector's Exposure to Physical Risks

Most Dutch financial institutions' domestic real estate exposures are in areas prone to flooding, giving rise to physical risks.

Flood Risks and Real Estates in the Netherlands



Source: DNB.

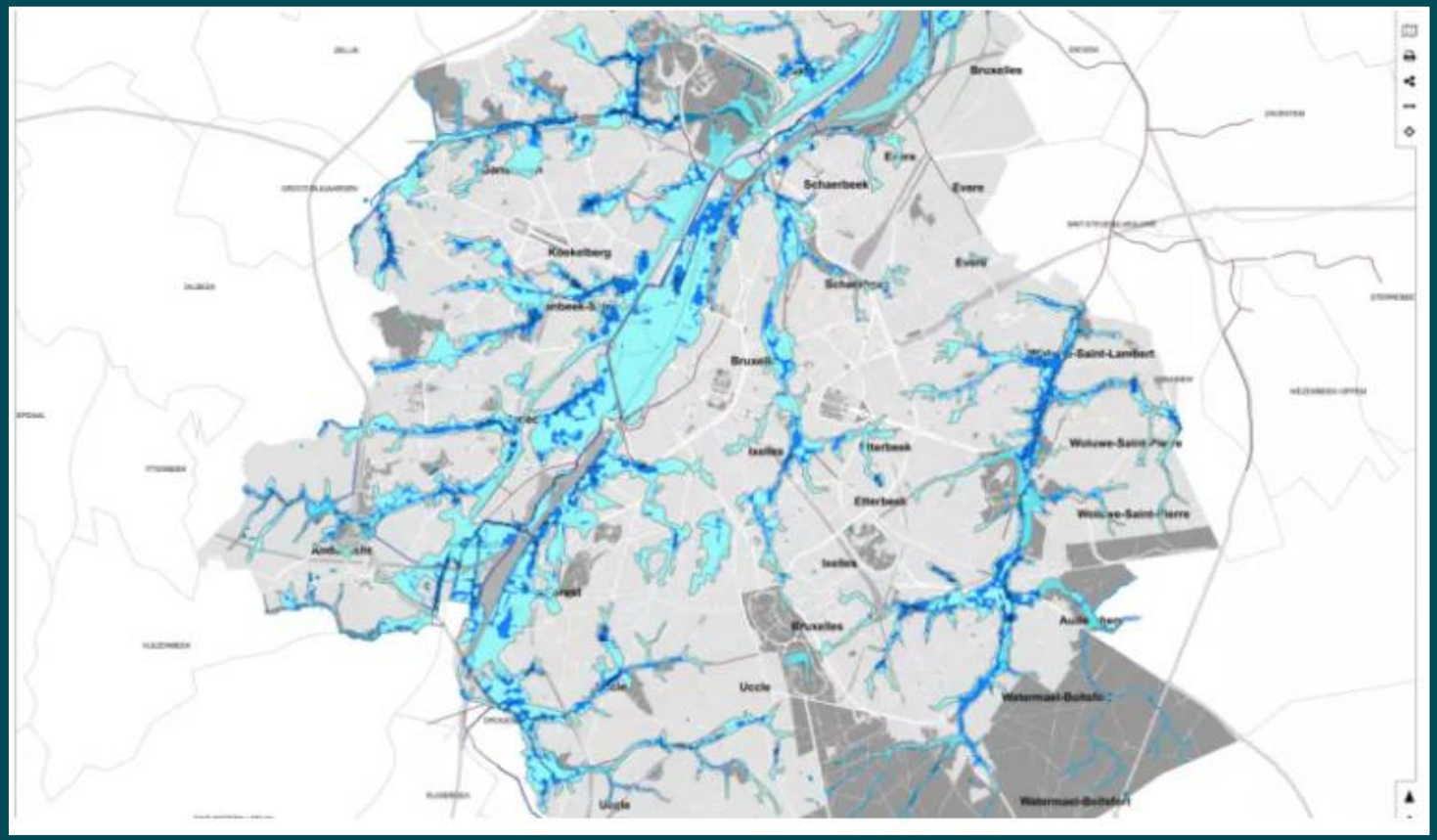
Note: The chart reports the percentage of domestic real estate exposures of banks, insurers, and pension funds by location. Locations that can be affected by flooding include areas which are not protected by flood defense systems (outside the dikes) and areas protected by primary defense.

Source: DNB Financial Stability Report (2021).

Source: IMF country report N°. 24/169 – Technical note on climate risk analysis

Specific Challenges
Belgium

- Different methodology per regions
- Return periods
- Lack of harmonization
- Division of competences
- “Cadastre” instead of precise grid with items (NL) or digital solution (Paris)
- Etc.



Source: environnement.brussels

Flood damage estimation

The Deltares methodology of the Netherlands, also known as the Standard Method 2017, is employed to estimate flood damage and casualty.

This methodolgy was used to establish the water safety standards that were legalized as of 1 January 2017 (Slager and Wagenaar, 2017)

$$Damage_s = \sum_{i=1}^{N} \alpha_{is}\, n_{i,s} S_i$$

where

- $\alpha_{i,s}$: damage factor of category i given a certain water depth
- $n_{i,s}$: number of objects or m^2 in category i affected by floods
- S_i : maximum damage per object or m^2 in category i affected by floods
- N : total number of categories

Source : Financial sector assessment program, technical note on climate risk analysis (IMF, June 2024)

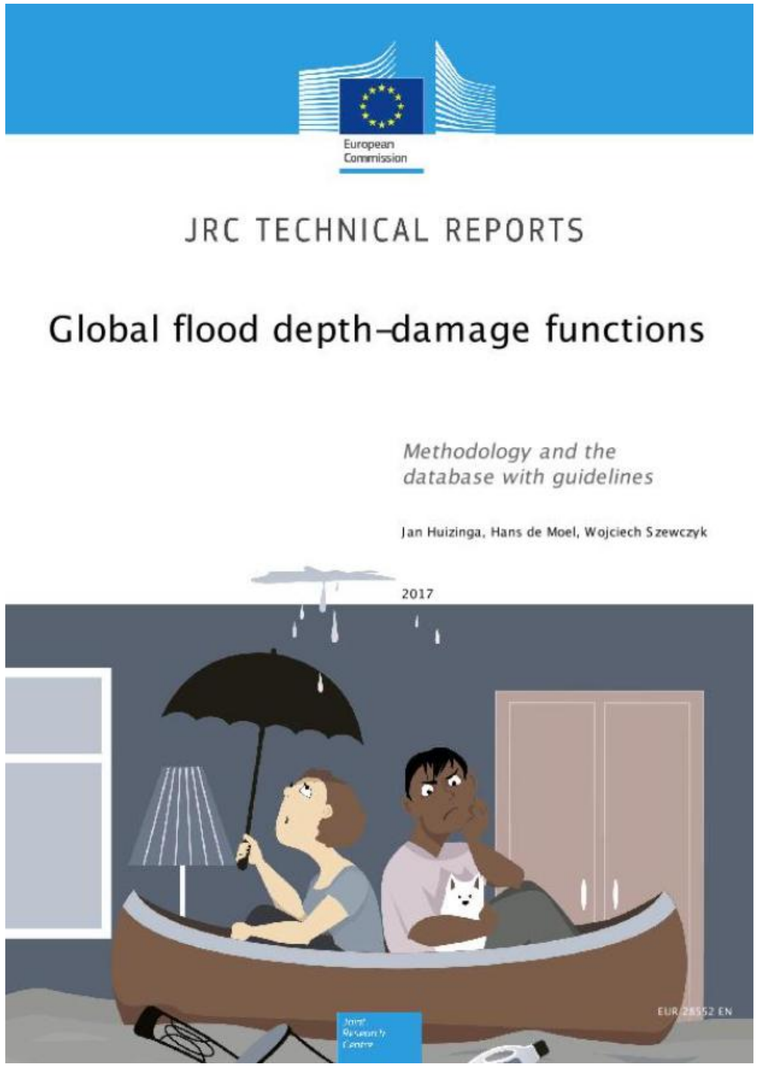
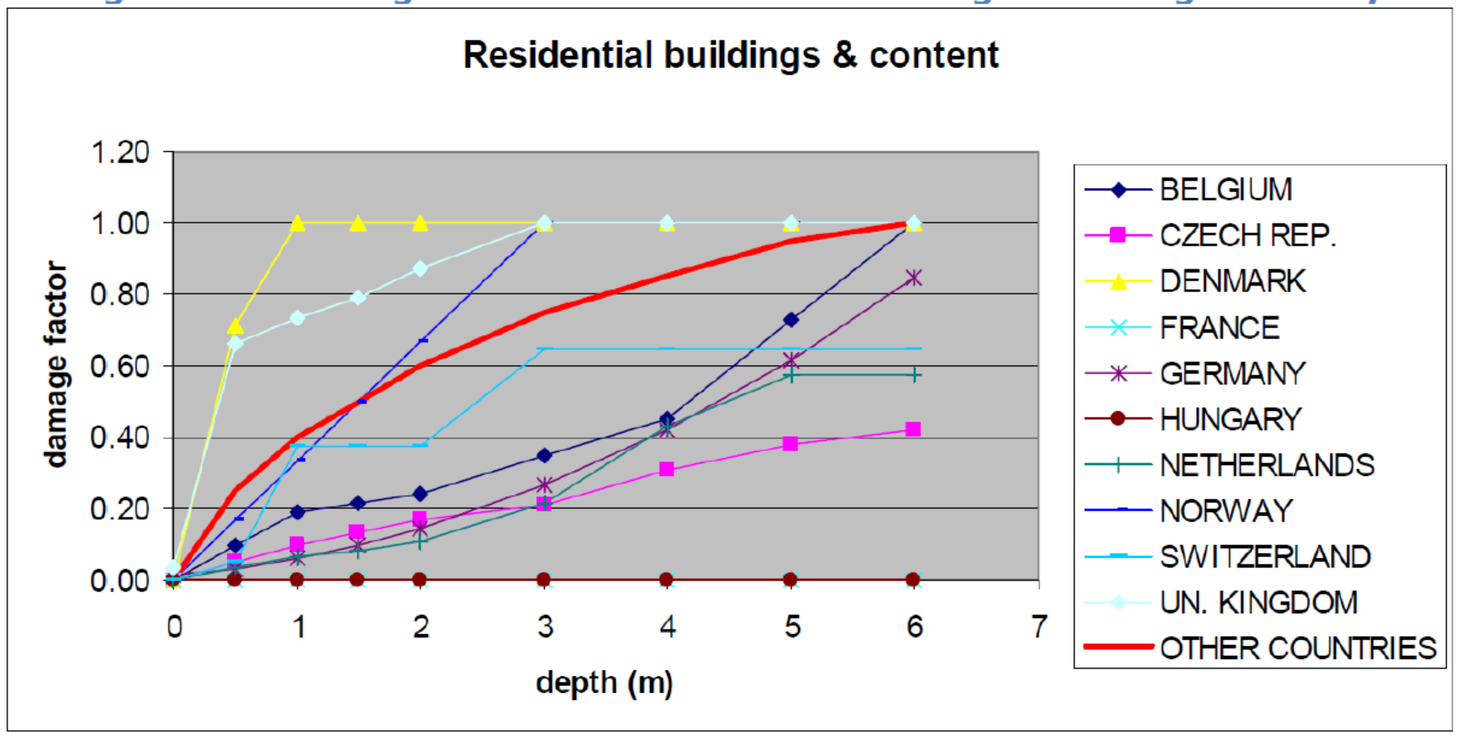
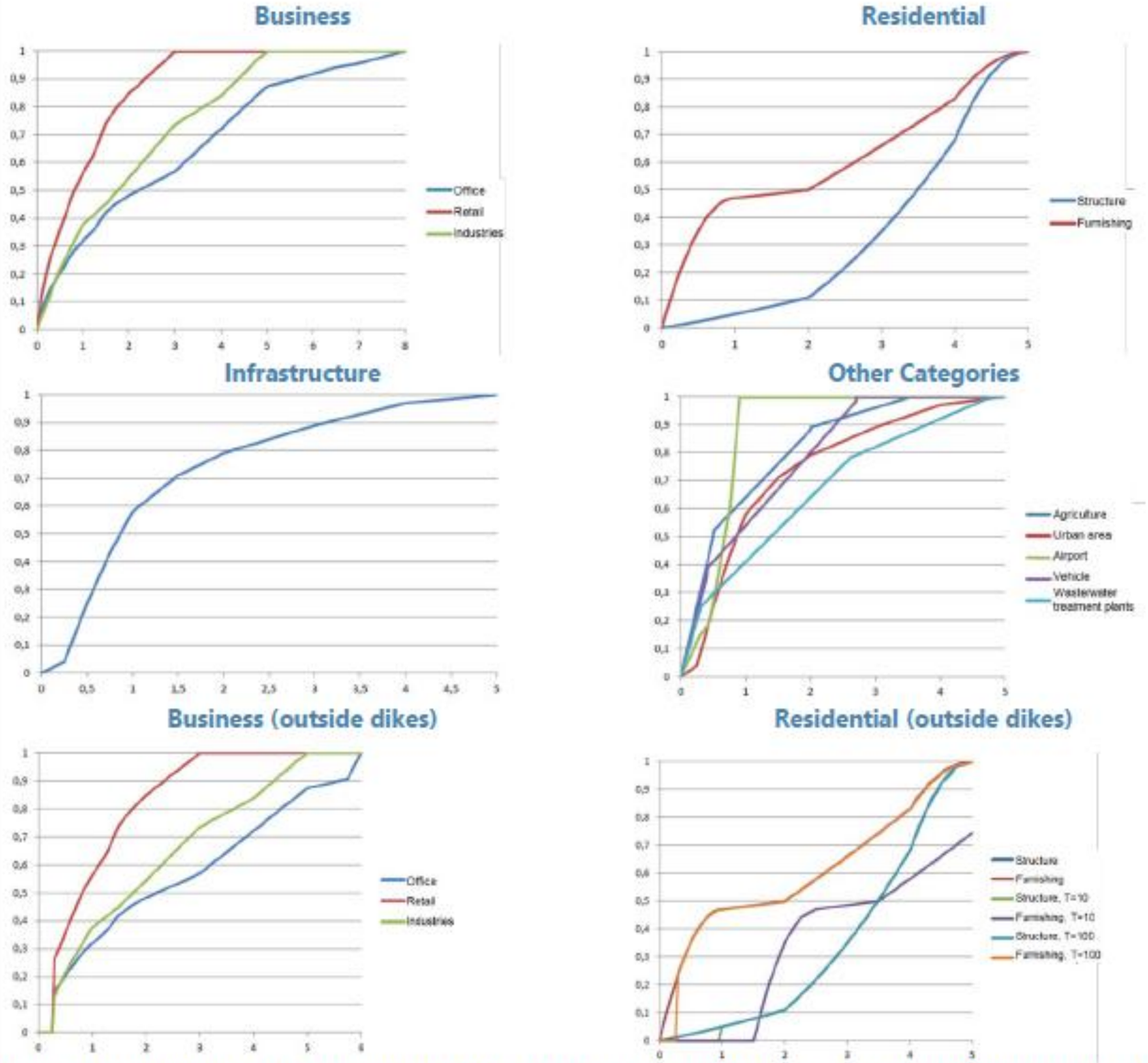


Figure F-3: Damage factor for residential buildings including inventory.



Damage functions
Floods

Figure 5. The Netherlands: Damage Function for Direct Damage



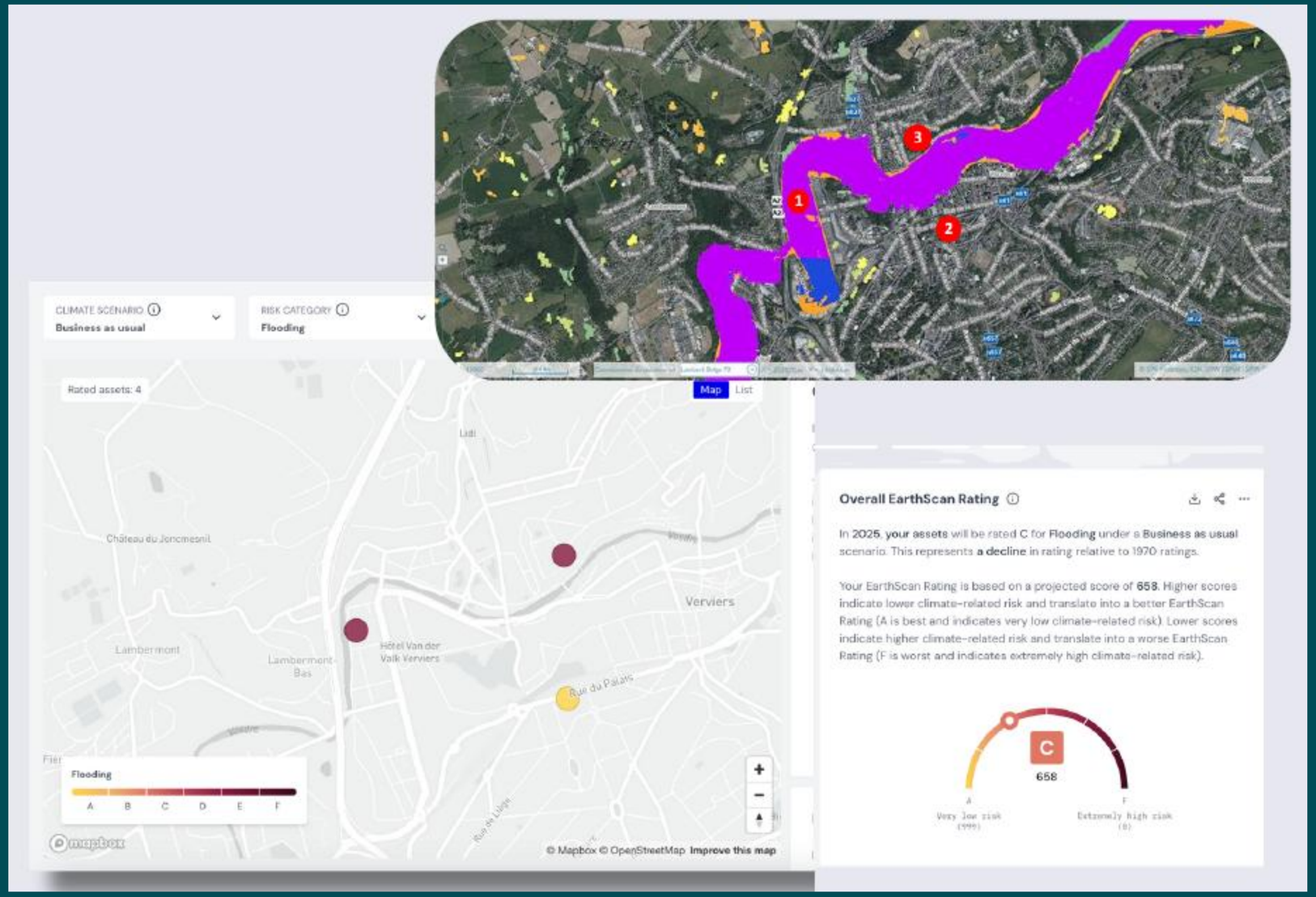
Note: The horizontal axis is water depth(m) and the vertical axis is damage factor. The damage functions for residential real estate outside dikes are differenciated by return periods (T=10 and T=100).

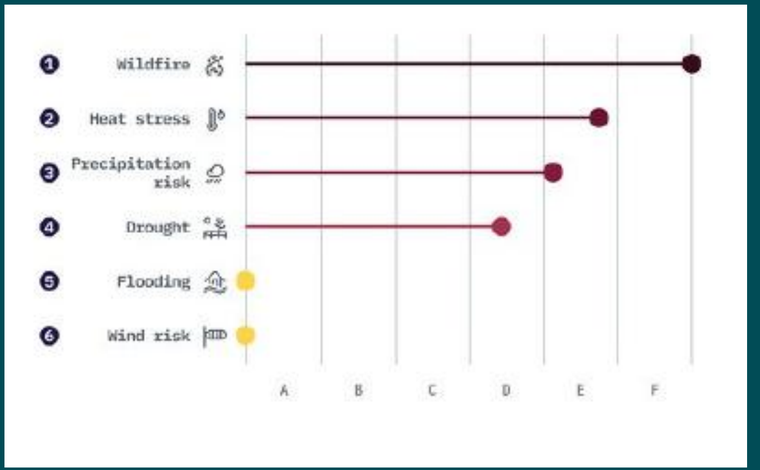
Source: Butcher and Wagenaar (2017).

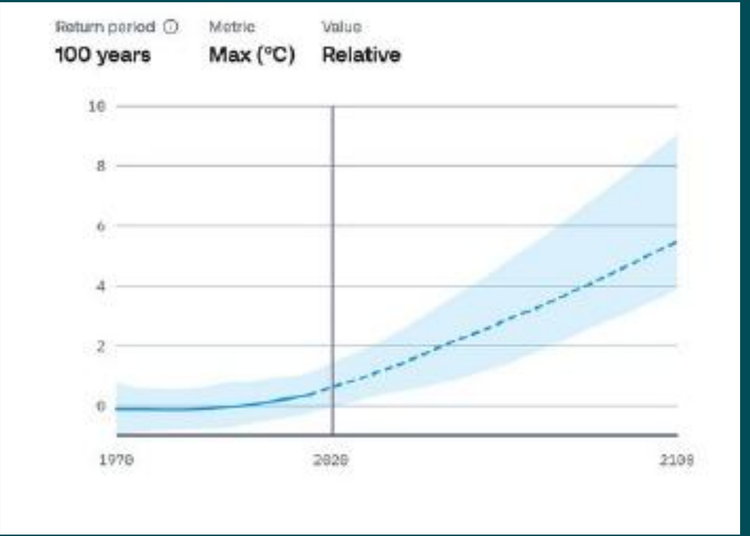
Some variables
Floods

- $P_{x,y,s}$ = probability of event x in year y in climate warming scenario's
- $h_{r,x}$ = the flood height in mm in region r per climate event x
- MV_r = the average value of houses per m2 in region r
- $A_{r,x}$ = the area in m2 in flood zone of event type x in region r
- PAA_h = percentage of assets affected per unit of flood height in mm
- MDD_h = mean damage degree of assets in percent per unit of flood heigt in mm
- Regions r covered are either statistical / administrative area or per hydrological basin.
- Years y considered are between 2025 and 2080.
- $AdE_{r,y}$ = damage reduction from adaptation through decreased exposure
- $I_{r,\ y\ =}$ the cost in real euros 2024 of the adaptation investment strategy
- $Mc_{r,\ y}$ is the maintenance cost off the adaptation investments

IA based software solutions

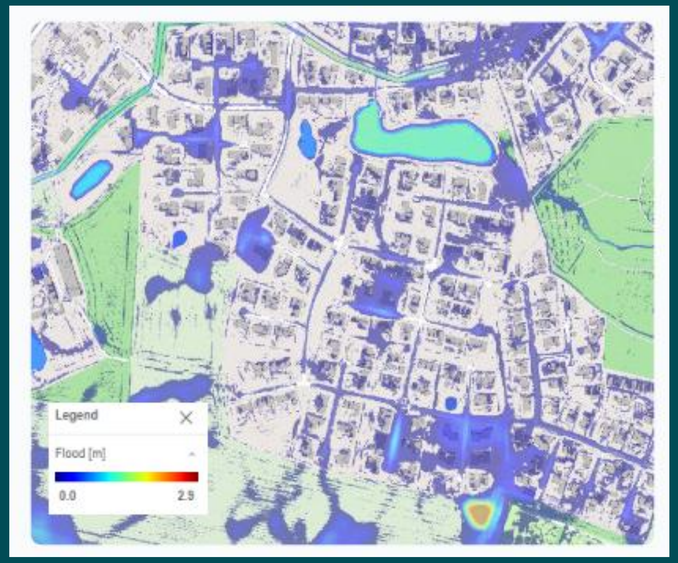






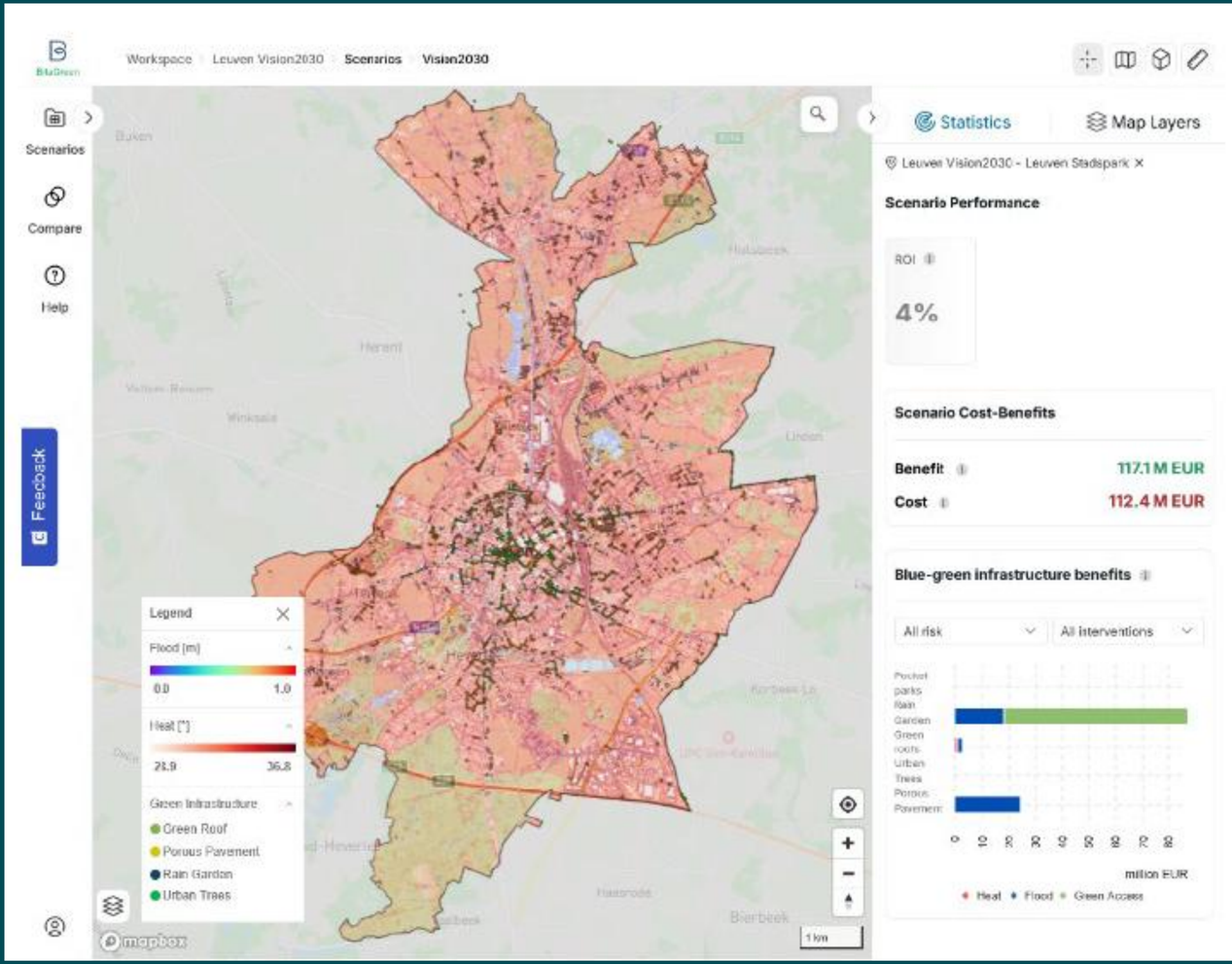
Source: Mititga solutions

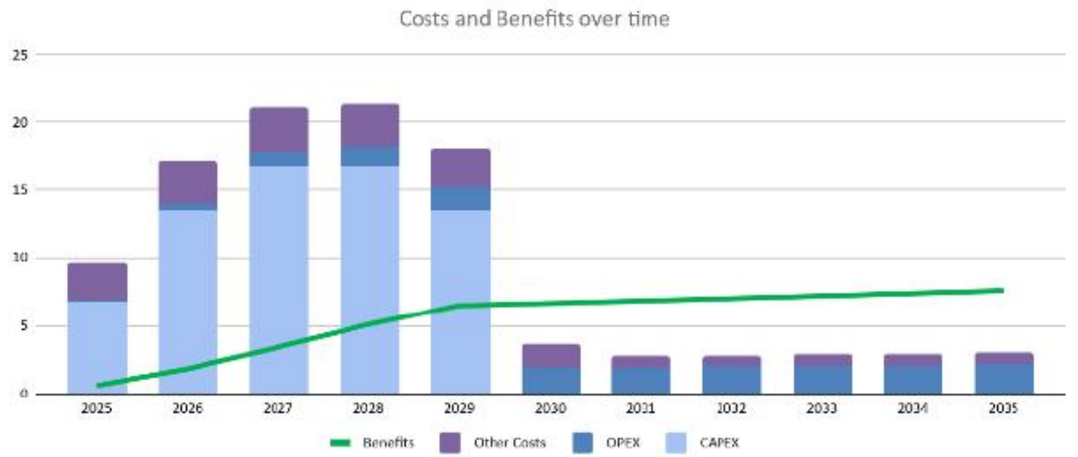
Localized adaptation



Source: Bitagreen

Investment case





SUMMARY	
Metric	Value (M EUR)
Total Costs (Nominal)	159.73
Total Benefits (Nominal)	201.30
Total Costs (PV @ 3.5%)	124.10
Total Benefits (PV @ 3.5%)	124.29
Net Present Value (NPV)	0.19
Benefit-Cost Ratio (BCR)	1.00
Payback Year	2044
IRR	3.52%

Source: Bitagreen

Investment case

SOURCES OF FUNDS

Source	Amount (M EUR)	% of Total	Type
EIB Climate Framework Loan	40	42%	Debt
Flemish Climate Adaptation Fund	15	16%	Grant
Municipal Climate Resilience Bond	12	13%	Debt
VLIF Environmental Subsidy	10	11%	Grant
AB InBev (Private)	5	5%	Equity
EU Programs	8	8%	Grant
De Watergroep	2	2%	Partnership
Other (grants, in-kind)	3	3%	Grant
TOTAL SOURCES	95	100%	

FINANCING SUMMARY

Total Debt	52	55%
Total Grants/Equity	43	45%
Debt Ratio		55%
Grant Leverage Ratio		1.21

USES OF FUNDS

Use	Amount	% of Total	Notes
NbS Implementation (CAPEX)	67.20	70.9%	NBS as detailed above
Operations & Maintenance (5-yr)	4.53	4.8%	Phase 1 OPEX
Governance & Administration	1.5	1.6%	Program unit, management
Monitoring, Evaluation & Learning	1.5	1.6%	Sensors, data systems, reporting
Partnership & Knowledge	8	8.4%	KU Leuven, innovation fund
Liability & Insurance	5	5.3%	Environmental liability, performance
Contingency Reserve	7.0	8.0%	Unallocated
TOTAL USES	95	100%	

REVENUE PROJECTIONS

Revenue Stream	2026	2027	2028	2029	2030	2035	2040	2045
Stormwater Fee	0.6	0.9	1.1	1.2	1.2	1.5	1.8	2.1
Municipal Climate Tax	0.4	0.5	0.7	0.8	0.8	1	1.2	1.4
Provincial Transfers	0.5	0.5	0.6	0.6	0.6	0.7	0.8	0.9
Cost Savings (avoided)	0.1	0.2	0.3	0.4	0.5	0.8	1	1.2
EU Co-funding	0.8	0.8	0.8	0.4	0	0	0	0
Other Revenues	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5
TOTAL REVENUE	2.6	3.2	3.7	3.6	3.3	4.3	5.2	6.1

DEBT SERVICE COVERAGE RATIO

Metric	2026	2027	2028	2029	2030	2035	2040	2045
Total Revenue	2.6	3.2	3.7	3.6	3.3	4.3	5.2	6.1
Total Debt Service	2.05	2.05	2.05	3.14	3.14	3.14	3.14	2.09
DSCR	1.27	1.55	1.80	1.15	1.05	1.37	1.66	2.92
Target DSCR	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Status	OK	OK	OK	BELOW	BELOW	OK	OK	OK

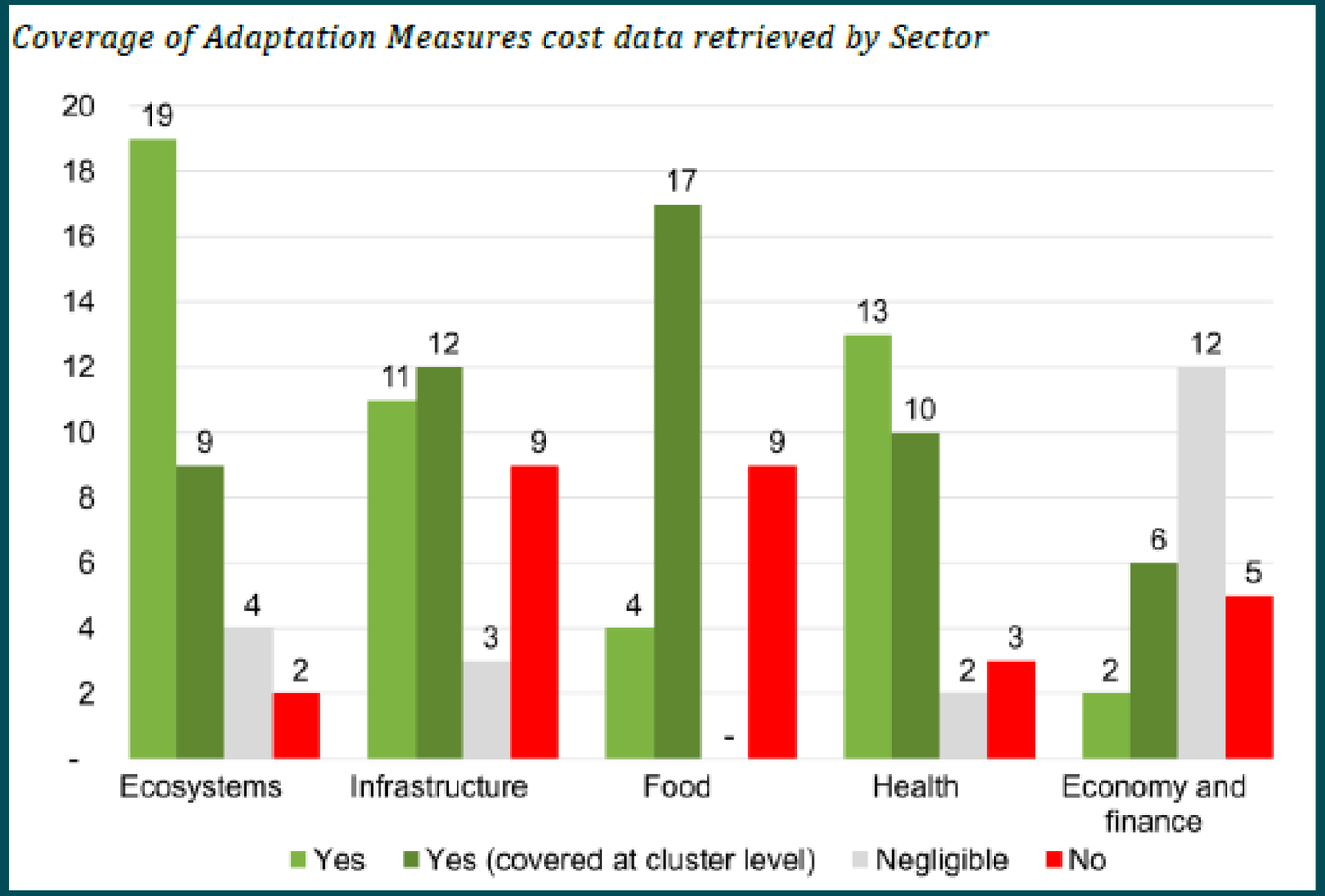
Source: Bitagreen

January, 2025

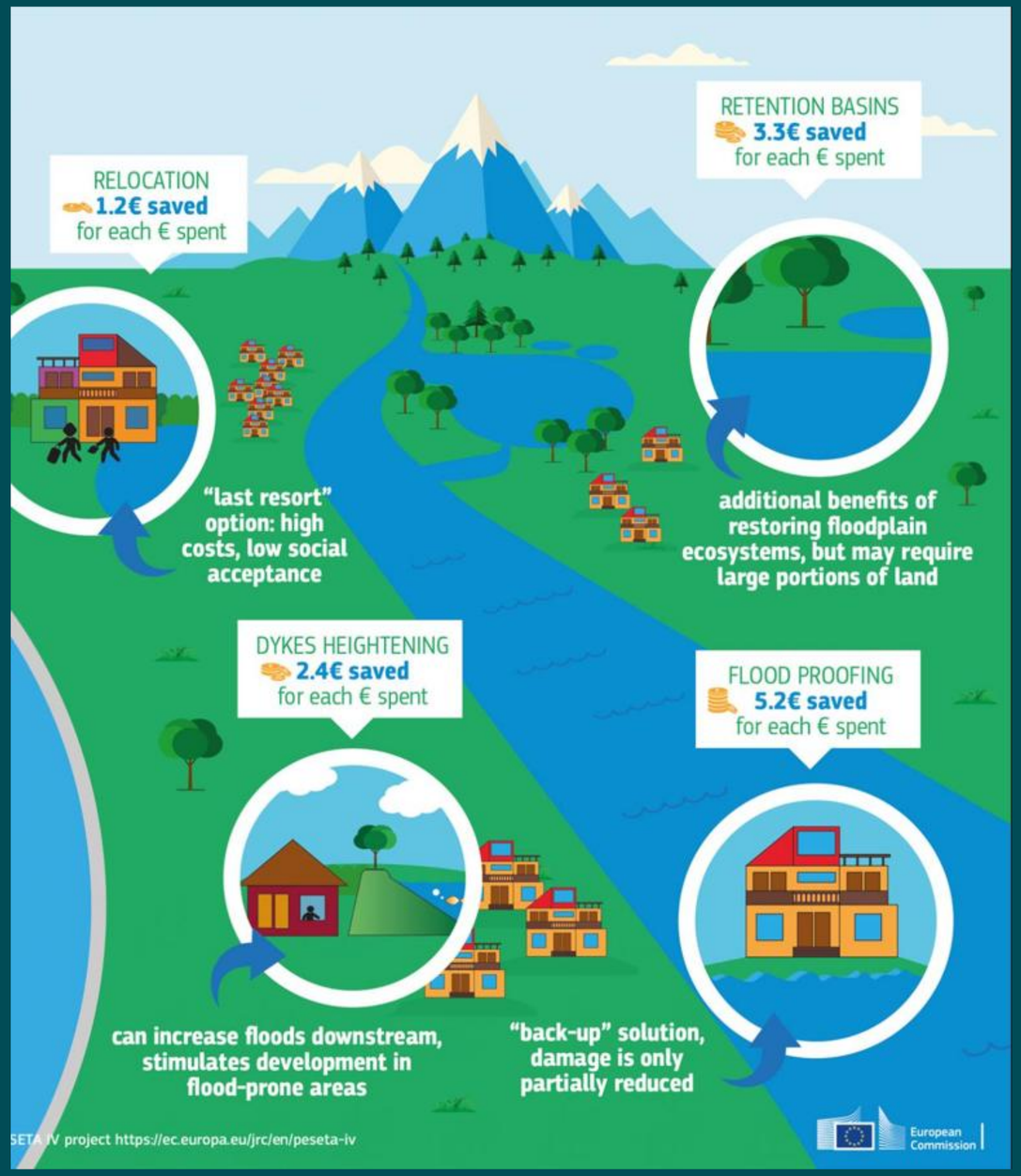
Adaptation investment needs - EU

Recent synthesis work (CMCC, drawing on JRC PESETA IV and COACCH) cites ~€35–56 bn/yr estimated adaptation needs now, rising to ~€80–120 bn/yr to address climate risks associated with the 2°C warming scenario and ~€175–200 bn/yr if temperatures increase by 3–4°C for the EU; meanwhile, the European Investment Bank (EIB) reports a much broader €35–500 bn/yr range estimated from existing studies.


European Commission
Assessment of EU and Member States Adaptation Investment Needs
Study on the macro-economic impacts of the climate transition
January 2026


Coverage of Adaptation Measures cost data retrieved by Sector
20
18
16
14
12
10
8
6
4
2
-
19
9
4
2
11
12
3
9
4
17
-
9
13
10
2
3
2
6
12
5
Ecosystems
Infrastructure
Food
Health
Economy and finance
Yes
Yes (covered at cluster level)
Negligible
No

Aggregate level
National, european



Source : Peseta IV, JRC

Thank you
for your attention

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