



JRC recent developments in climate risk assessment: PESETA and beyond

Ciscar JC, Feyen L, et al.

ISIMIP-PROCLIAS cross-sectoral workshop 2022
18 May 2022

Green Deal

CLEAN, AFFORDABLE, SECURE ENERGY

CLIMATE ACTION

SUSTAINABLE & SMART MOBILITY

PRESERVING AND RESTORING ECOSYSTEMS & BIODIVERSITY

INDUSTRY FOR A GREEN & CIRCULAR ECONOMY

FROM FARM TO FORK

ZERO POLLUTION

EU AS A GLOBAL LEADER

FINANCING & JUST TRANSITION

MAKING HOMES ENERGY EFFICIENT

R & I



Policy context

2019 The European Green Deal

2021 New EU Strategy on Adaptation

Specific policy support needs (climate resilience)

- Climate risk assessment:
 - EU-wide climate risk assessment (summer 2024)
 - Financial sector (ECB, EBA): asset-level assessment
- Adaptation assessment
 - EU Mission on Adaptation: regional and local focus
- Downscaling of impacts, equity aspects (e.g. social groups)



JRC
PESETA IV
project

Bottom-up/process model approach

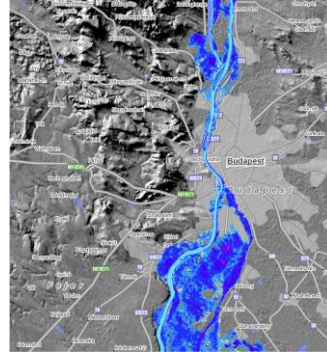
Climate change variables:

Temperature change

Precipitation change

...

Hazard

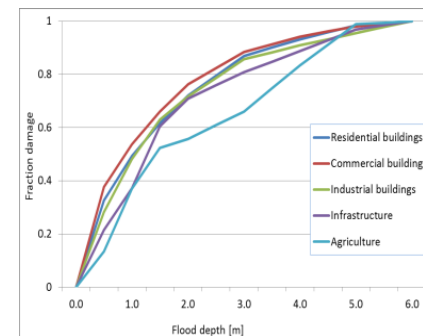


Exposure



Impact

Vulnerability



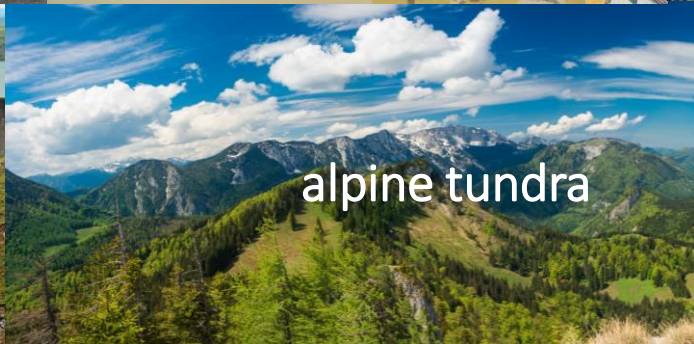
Climate impacts, e.g.:

Yield losses

Economic losses

...

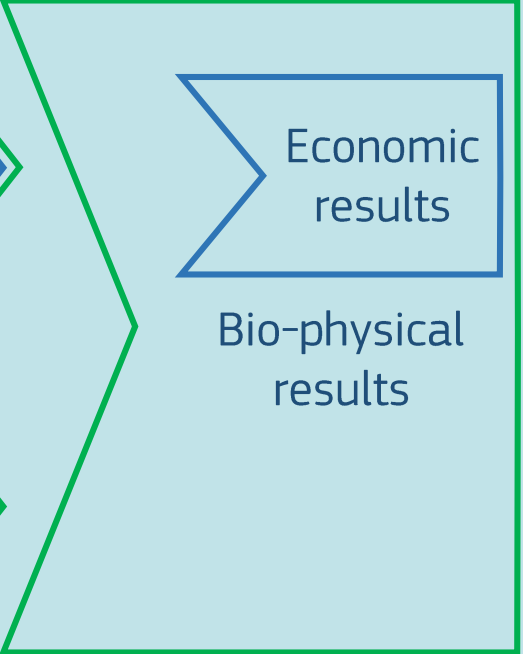
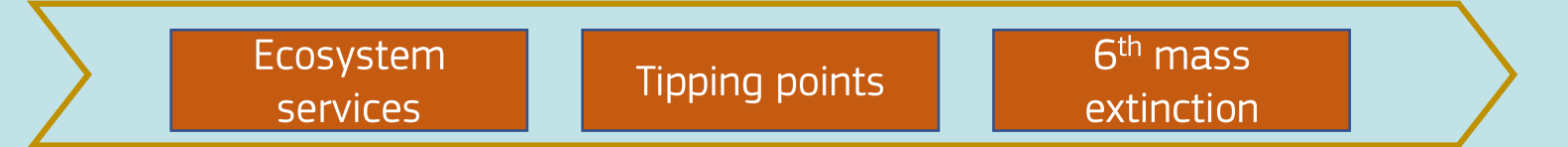
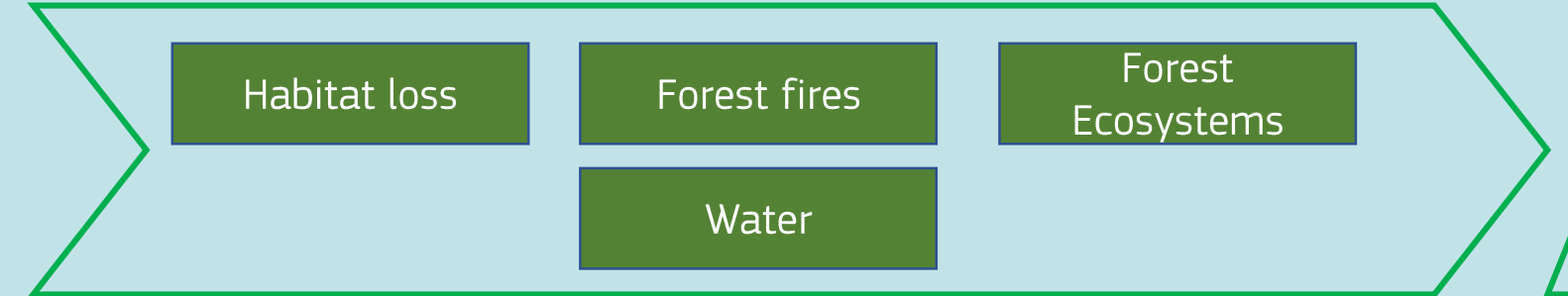
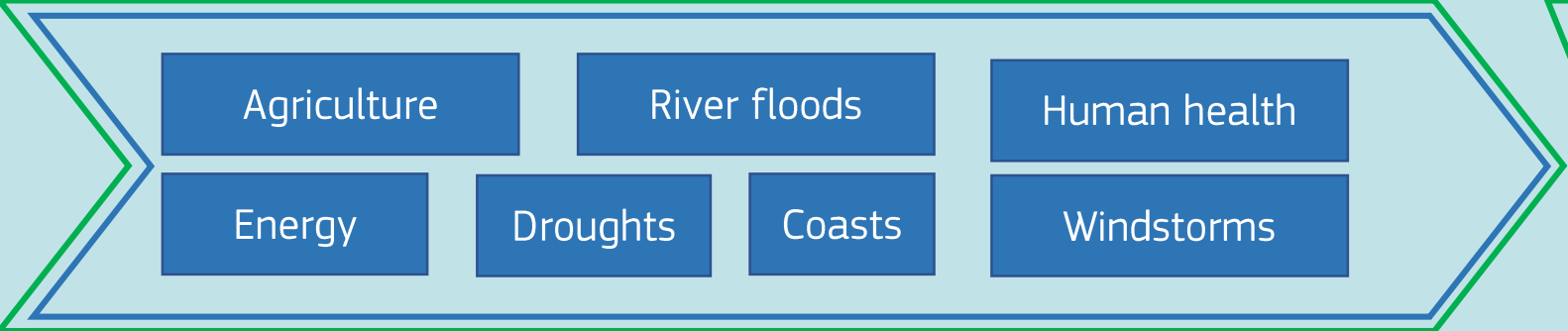
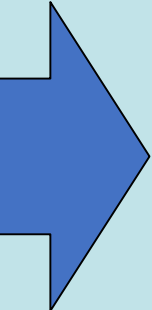
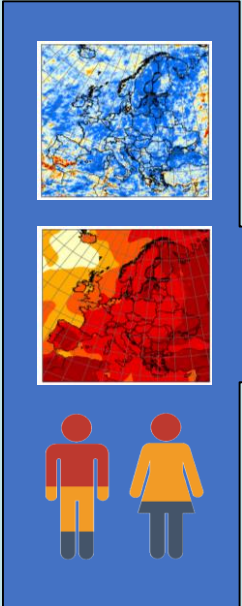
PESETA climate impact categories



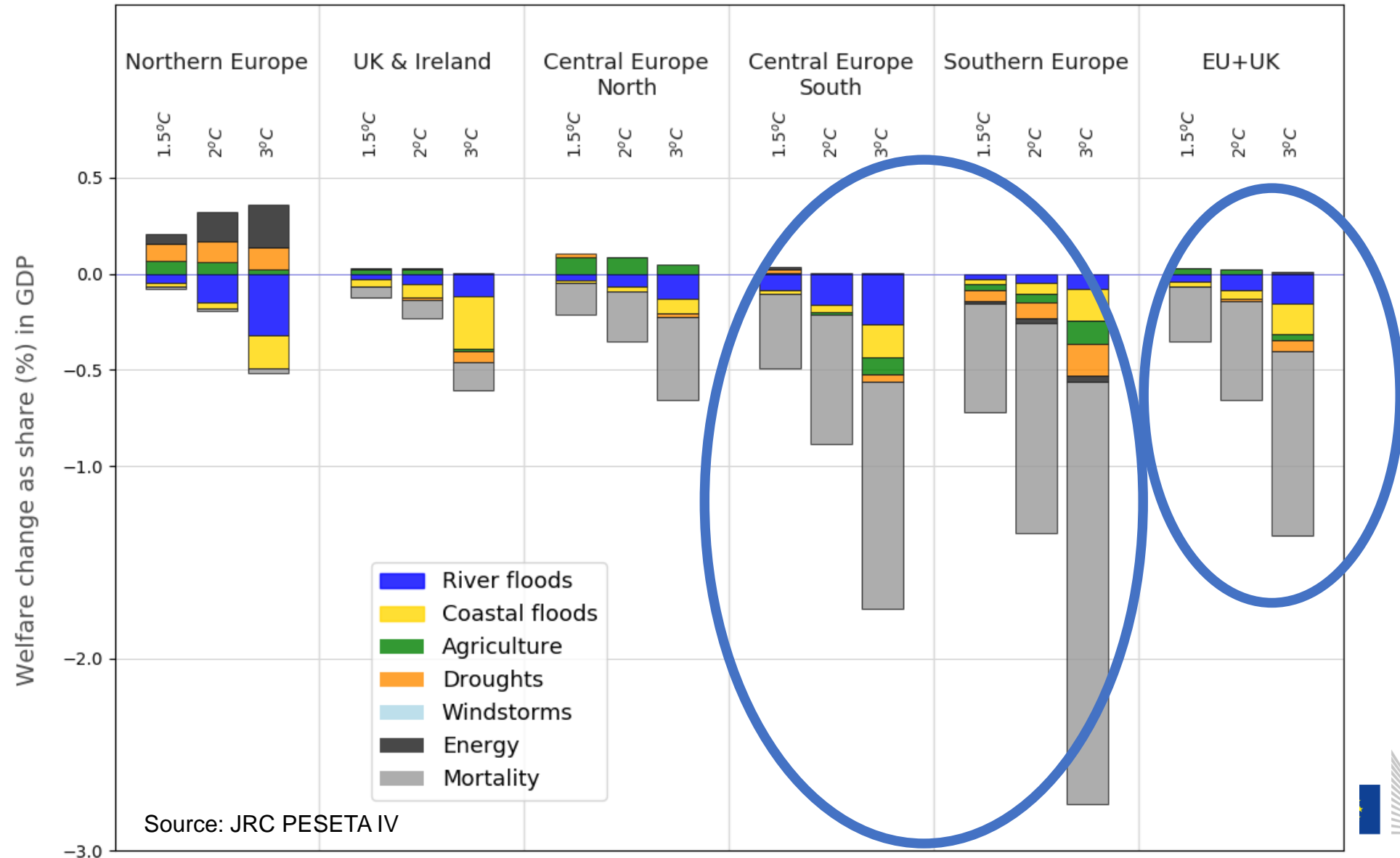
JRC PESETA IV project stages

Climate change and socioeconomic data

Bio-physical modelling



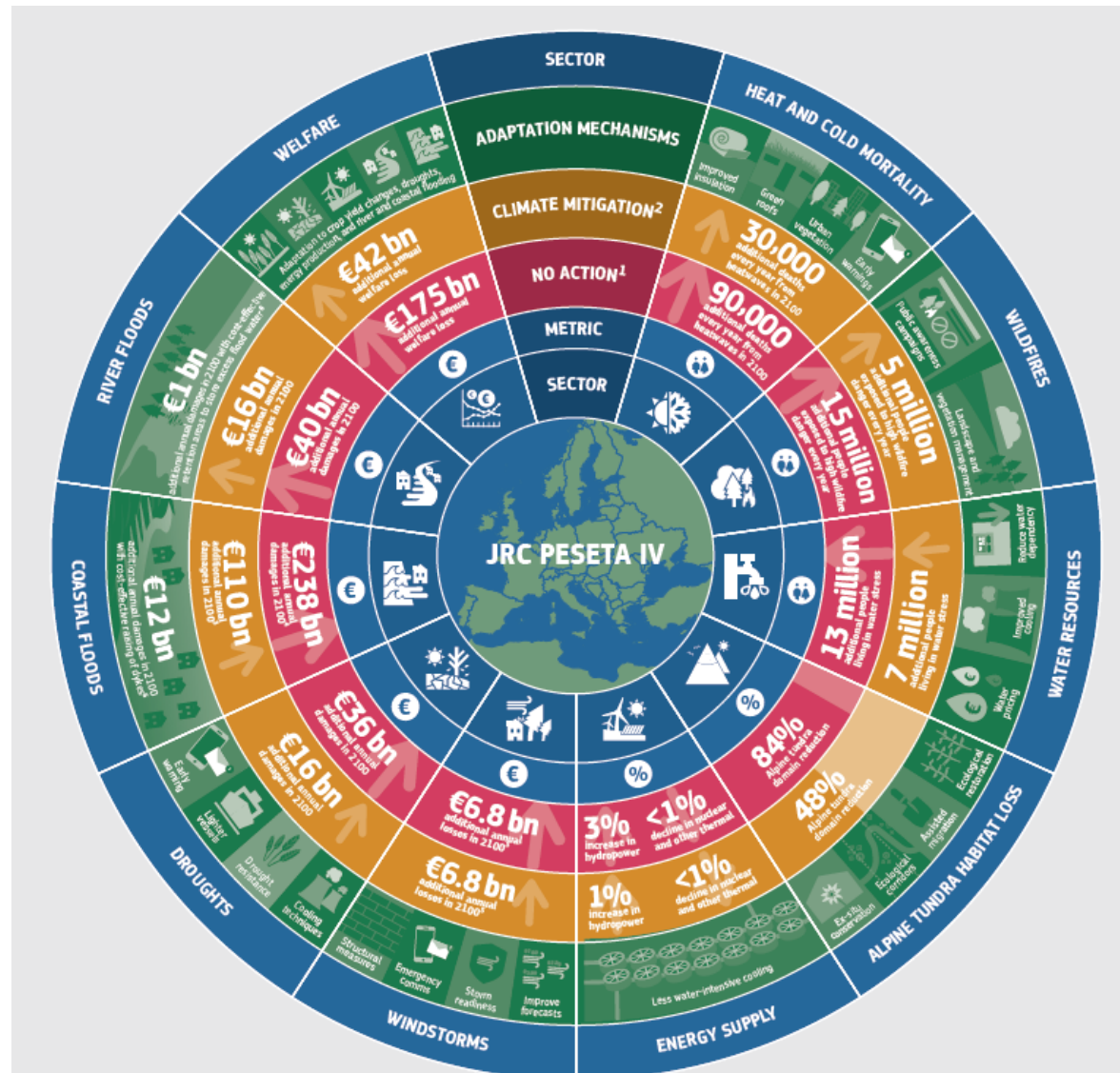
Distribution of Welfare damages, with mortality



Source: JRC PESETA IV

Dissemination

- Technical reports
- Scientific reports



- Infographics
- Summary cards
- [Video](#)

<https://ec.europa.eu/jrc/en/peseta-iv>

Dissemination

LETTERS

<https://doi.org/10.1038/s41558-018-0260-4>

nature
climate change

Climatic and socioeconomic controls of future coastal flood risk in Europe

Michalis I. Vourdoukas^{1,2*}, Lorenzo Mentaschi¹, Evangelos Voukouvalas³, Alessandra Bianchi⁴, Francesco Dottori¹ and Luc Feyen¹

Environmental Research Letters

LETTER

Assessing future climate change impacts in the EU and the USA: insights and lessons from two continental-scale projects*

Juan-Carlos Ciscar¹, James Rising², Robert E Kopp³ and Luc Feyen⁴

¹ Joint Research Centre, European Commission, Spain

² The Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science, United Kingdom

³ Institute of Earth, Ocean, and Atmospheric Sciences and Department of Earth and Planetary Sciences, Rutgers University, New Brunswick, NJ, United States of America

⁴ Joint Research Centre, European Commission, Italy

Earth's Future

RESEARCH ARTICLE

10.1029/2019EF001170

Key Points:

- Unique concurrent spring and summer climatic anomalies affected Europe in 2018
- 2018-like droughts could become a common occurrence as early as 2043
- Climate change adaptation strategies for agriculture in Europe cannot count on recurrent water seesaws

Supporting Information:

- Supporting Information S1

The Exceptional 2018 European Water Seesaw Calls for Action on Adaptation

Andrea Toreti¹, Alan Belward¹, Ignacio Perez-Dominguez², Gustavo Naumann¹, Jürg Luterbacher³, Ottmar Cronie⁴, Lorenzo Seguíni¹, Giacinto Manfron¹, Raul Lopez-Lozano¹, Bettina Baruth¹, Maurits van den Berg¹, Frank Dentener¹, Andrej Ceglar¹, Thomas Chatzopoulos², and Matteo Zampieri¹

¹European Commission, Joint Research Centre (JRC), Ispra, Italy, ²European Commission, Joint Research Centre (JRC), Seville, Spain, ³Department of Geography, Climatology, Climate Dynamics and Climate Change, Centre for International Development and Environmental Research, Justus-Liebig University of Giessen, Giessen, Germany,

⁴Department of Mathematics and Mathematical Statistics, Umeå University, Umeå, Sweden



NO-ACTION SCENARIO

Global warming is driving sea-level rise and intensifies coastal storms, resulting in more frequent flooding. If no action is taken, coastal flood impacts will be severe.

year 2100 HIGH EMISSIONS

SEA LEVEL +85 cm
[47 cm – 198 cm]

NOW

2.2 million
PEOPLE EXPOSED
per year

239 billion €
ECONOMIC LOSSES
per year

170-fold increase in economic losses
22-fold increase in exposed population

130 Gt
of CO₂eq
emissions*

25 Gt
of CO₂eq
emissions*

MITIGATION AND ADAPTATION SCENARIO

Mitigation means limiting sea level rise by reducing emissions. **Adaptation** includes all measures to protect coastal communities through nature-based and engineered physical measures.

year 2100 WITH MITIGATION

SEA LEVEL +51 cm
[21 cm – 84 cm]

NOW

552 thousand
PEOPLE EXPOSED
per year

12 billion €
ECONOMIC LOSSES
per year

100 thousand
PEOPLE EXPOSED
per year in present

1.4 billion €
ECONOMIC LOSSES
per year in present

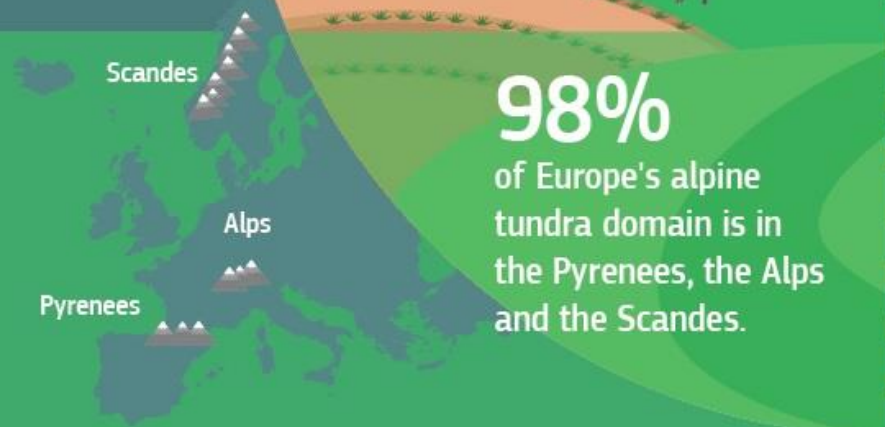
Raising flood defenses
will cost up to 2 billion € per year

95% reduction of economic losses
73% fewer people exposed

*CO₂eq is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential, by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential (definition from Eurostat).

Alpine tundra in Europe in a changing climate

Present



98%
of Europe's alpine
tundra domain is in
the Pyrenees, the Alps
and the Scandes.

The domain is projected
to shrink by
84%
across Europe in a
3 °C warming scenario.

Future

The treeline is projected to move vertically upwards by up to 8m every year in a 3 °C warming scenario.

Tundra area loss

Region	Global temperature increase		
	1.5 °C	2 °C	3 °C
Alps	-36%	-50%	-75%
Scandes	-50%	-61%	-87%
Pyrenees	-74%	-91%	-99%

The projected changes affect vital ecosystem services, such as the provision and regulation of freshwater from melting snow. They also diminish valuable habitats, biodiversity, and recreational uses such as skiing.

Limitations

- Uncertainty
- Coverage of climate impacts
- Spatial downscaling (regional, local, asset)
- Costly running of bottom-up models
- Multi-hazard covariates; integration
- Outreach and communication

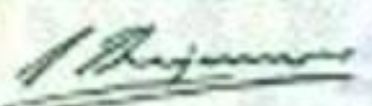
BANCO DE ESPAÑA

CINCO
PESETAS

DE CURSO LEGAL
MADRID,
22 de Julio de 1954

ALFONSO X

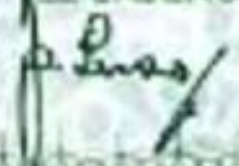
EL GOBERNADOR



EL INTERVENTOR



EL CAJERO



5

5

5

5

New, on-going developments

Europe

- Uncertainty: Include 4C warming level; focus on range of impacts (stochastic approach)
- Coverage: new categories of climate impacts
 - Labour productivity, Transport infrastructure
 - Revisit extreme temperature impacts (city-level)
 - Tourism, Energy demand
 - *Air pollution*
 - *Pandemic risk*
- Downscaling: Regional perspective (DG REGIO)
- Costly running: Statistical emulators (similar to the EPA FrEDI approach)
- Communication

Global: coast, river floods, droughts

Integration of impacts (inspired by CIRA categories)

Agriculture	Energy	Built environment
Crop productivity	Cooling and heating demand	Damage from river flooding
Damages from drought	Solar, wind, hydro	Damage from coastal flooding
Damages from river flooding	Nuclear, thermal	Damage from drought subsidence
Damages from coastal flooding	Losses from drought	Damage from windstorms
		Exposure critical infrastructures
		Exposure cultural heritage

Transport	Ecosystems	People
Heat impacts rail&road	Mediterranean and Alpine	Exposure (floods, fire, T, air, ...)
River flood impacts infrastructure	Shift eco-domains?	Mortality (T, air, storms?, flood?)
Coastal flood impacts infrastructure	Fires	Labor productivity
Navigation impacts drought	Windthrow	
	Insect outbreaks	
	Sandy beaches (erosion)	

Thank you !

JRC PESETA IV Team

L Feyen, JC Ciscar, S Gosling, D Ibarreta, A Soria, A Dosio, G Naumann, S Russo, G Formetta, G Forzieri, M Girardello, J Spinoni, L Mentaschi, B Bisselink, J Bernhard, E Gelati, M Adamovic, S Guenther, A de Roo, C Cammalleri, F Dottori, A Bianchi, L Alfieri, M Vousdoukas, I Mongelli, J Hinkel, P Ward, H Costa, D de Rigo, G Libertà, T Houston Durrant, J San-Miguel-Ayanz, JI Barredo, A Mauri, G Caudullo, G Ceccherini, P Beck, A Cescatti, J Hristov, A Toreti, I Pérez Domínguez, F Dentener, T Fellmann, C Elleby, A Ceglar, D Fumagalli, S Niemeyer, I Cerrani, L Panarello, M Bratu, J Després, W Szewczyk, A Matei, E Mulholland, M Olariaga