Ad Hoc Expert Meeting on

Climate Change Adaptation for International Transport: Preparing for the Future

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Climate change and international transport

Presentation by

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Climate change and international transport

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LISCoAsT – Large-scale Coastal Assessment Tool

Models used
- WW3
- DFLOW-FM
- FES2014
- LisFloodFP

Global multi-hazard road and railway infrastructure exposure

Global Expected Annual Damages (EAD) range from 3.1 to 22 billion US dollars, of which approximately 73% is caused by surface and river flooding.

Many coastal areas show high exposure to risk

Koks et al., Nature Communications (2019)

Global multi-hazard road and railway infrastructure exposure: Dominant hazard per region

Koks et al., Nature Communications (2019)
Global multi-hazard road and railway infrastructure exposure: Country level

Koks et al., Nature Communications (2019)

The right time to talk climate change is now

The Independent, August 2017
Extreme weather could kill 150,000 people each year in Europe by the end of the century, say (JRC) scientists.

The Guardian, today
Huge risk if global warming exceeds 1.5C, warns landmark UN report. Urgent changes needed to cut risk of extreme heat, drought, floods and poverty, says IPCC

CNN, August 2018
Hot deadly summer
Fires in Greece, Sweden and California, heat records across the world (China, Japan, South-Korea, Europe, North America, Middle-East, Africa), drought in northern Europe, Australia, flooding in Japan, India, …
Number of natural loss events worldwide 1980 – 2017

Losses of natural events worldwide 1980 – 2017
Projections of multiple hazards in Europe

Forzieri et al., Climatic Change, 2016

Strongest rise projected in heat and coastal hazard, for droughts in Southern Europe. Cold waves will become less important.
Impact on Europe’s critical infrastructures

Escalating climate hazard damages to critical infrastructures in Europe with global warming.

Uneven regional and sectorial distribution of future losses, adaptation requirements and capacity.

Global projections of drought hazard

Two thirds of global population will experience a progressive increase in drought conditions with warming.
Flood risk is projected to rise in most parts of the world, with impacts increasing with the level of warming. Flood impacts are further shown to have an uneven regional distribution, with the greatest losses observed in the Asian continent at all analyzed warming levels.

Alfieri et al., Earth’s Future (2017)
Dottori et al., Nature Climate Change (2018)

Rising seas and extreme weather

Storm of the century occurs every year by 2050 along most of the tropics
By the end of the century along most of the global coastline

Vousdoukas et al. 2018 Nature Communications
Rising seas and extreme weather

Coastal risk becoming one of the most threatening natural hazard
River floods: 0.04% Europe’s GDP (present) ⇒ 0.1% GDP (future)
Coastal floods: 0.01% GDP ⇒ 0.29-0.86% GDP
(in absolute values increasing by 100 or even 1000 times)

Socio-economic vs Physical drivers

Climate becomes the main driver of rising losses in contrast to historical trends which were dominated by socioeconomic development
THE NEED TO TAKE MEASURES

Decline in vulnerability

Declining global vulnerability to different climate hazards

Formetta et al., Environmental Research Letters (2019)
Global multi-hazard road and railway infrastructure exposure: Benefits of adaptation

Koks et al., Nature Communications (2019)

Benefits of adaptation: Results for Europe
What is really at stake?

- The ocean absorbs >90% of the increase in energy
- Past sea levels under +1.5-2°C were 6-10 m higher than present
- Expansion of sea water per °C of warming is greater at higher temperature and higher pressure

A challenging path ahead...

- 100-1000 times increase in losses due to climate change
- Substantial risk for transport infrastructure
- Coastal hazard to overshadow river flooding
- Adaptation could already mitigate most of baseline losses
- It is inevitable in view of climate change
- Technically feasible but...
- Implementation at global scale can be challenging
- With substantial political, economic, and environmental costs, as well as social justice issues
Thank you very much...


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