Climate Water

Bridging the gap between adaptation strategies of climate change impacts and European water policies

Thematic Focus evaluation for **FLOODS**

Topic 2.1.1 – Direct impacts on the life and health of the population and the wealth of the nations

Prepared by Zsolt Jolánkai, P6 GEONARDO

Contributing partners:

- Beáta Pataki of University of Debrecen/VITUKI
- Eva Lantz of University of Vienna
- Géza Jolánkai of University of Debrecen/VITUKI
- Zsolt Jolánkai of Geonardo

13 projects, papers has been processed by the four contributing partners including studies by the IPCC Working Group II and JRC and the main conclusions of Europian floods related projects, e.g. ADAM, PRUDENCE, ENSEMBLES, Tisza River Project

METHODOLOGY:

•Impacts, research needs and adaptation strategies has been collected from the papers, studies.

• The main statements related to imacts of climate change on floods has been picked out from each of the examined documents.

•The processed statements have been analysed and evaluated by the contributing partners, their remarks have been attached.

•A final summary have been prepared, with respect to impacts, research needs and adaptation strategies found

IMPACTS:(*Impacts on floods have been devided to riverine and coastal flooding*)

RIVERINE FLOODING

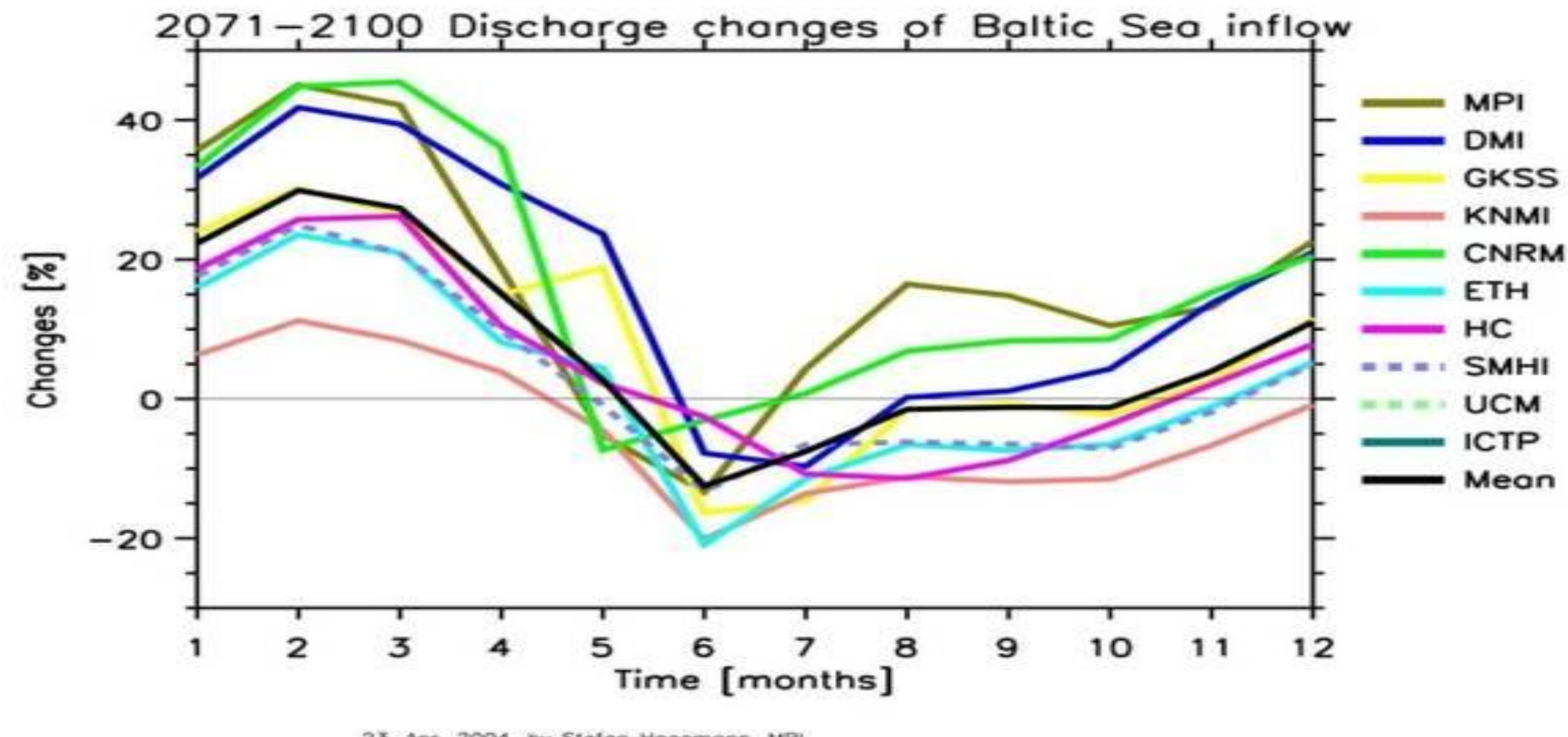
River discharge:

• annual runoff: increase in the Atlantic and northern Europe (9-20% by 2070 A2 and B2 SRES scenarios), decrease in the Mediterranean, central and eastern Europe.

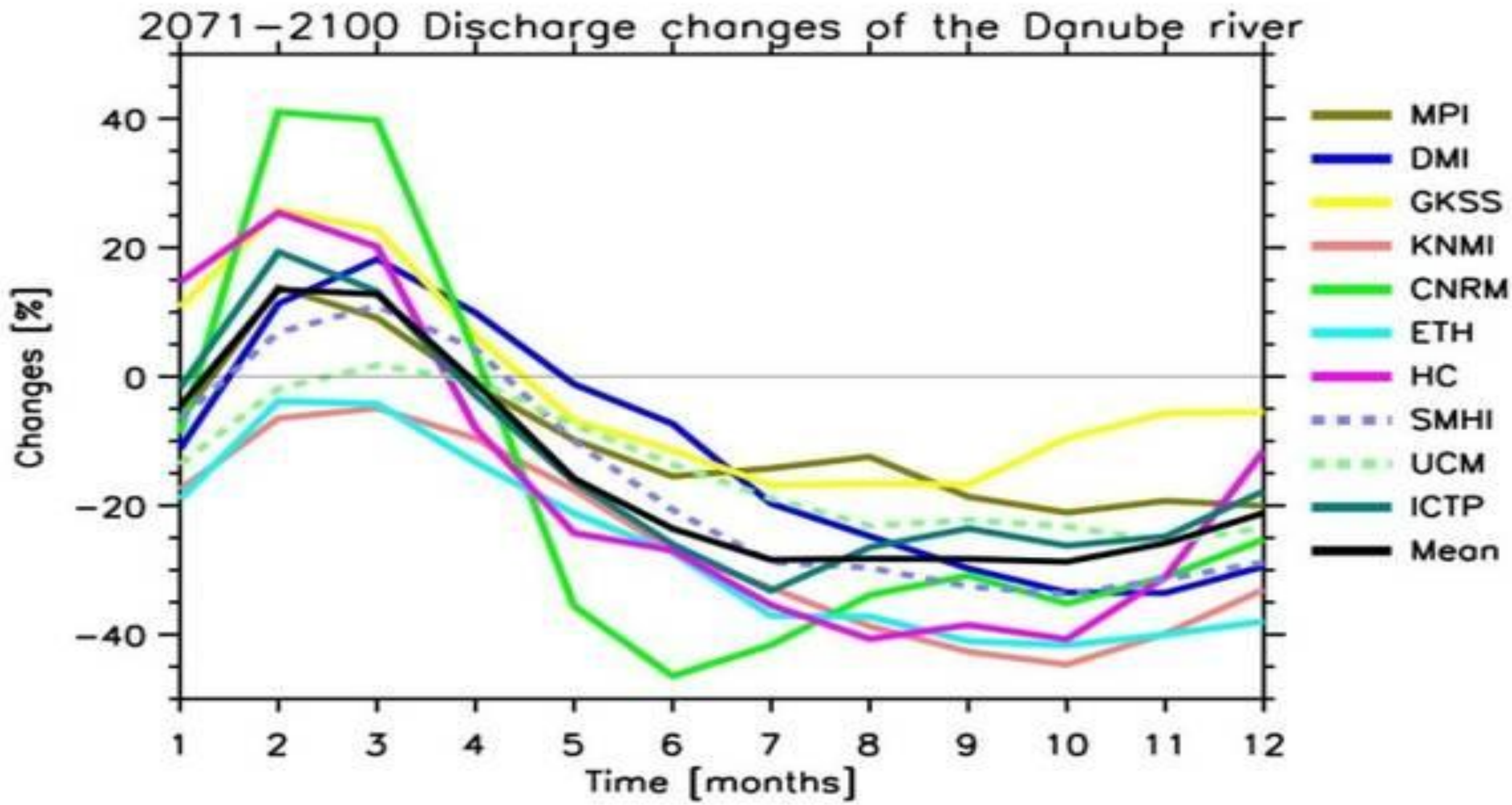
•increase of winter flow and decrease of summer flow of the central and eastern European rivers

•glacier retreat in the Alps—>Initial increase of summer flow, decrease later (50-80%!)

- Inflow to Baltic Sea – regional model ensemble (PRUDENCE)
- Increase of river discharge by up to 20% in winter and early spring in the Baltic Sea catchment



- Danube catchment: river discharge decrease/increase



23. Apr. 2004, by Stefan Hagemann, MPI

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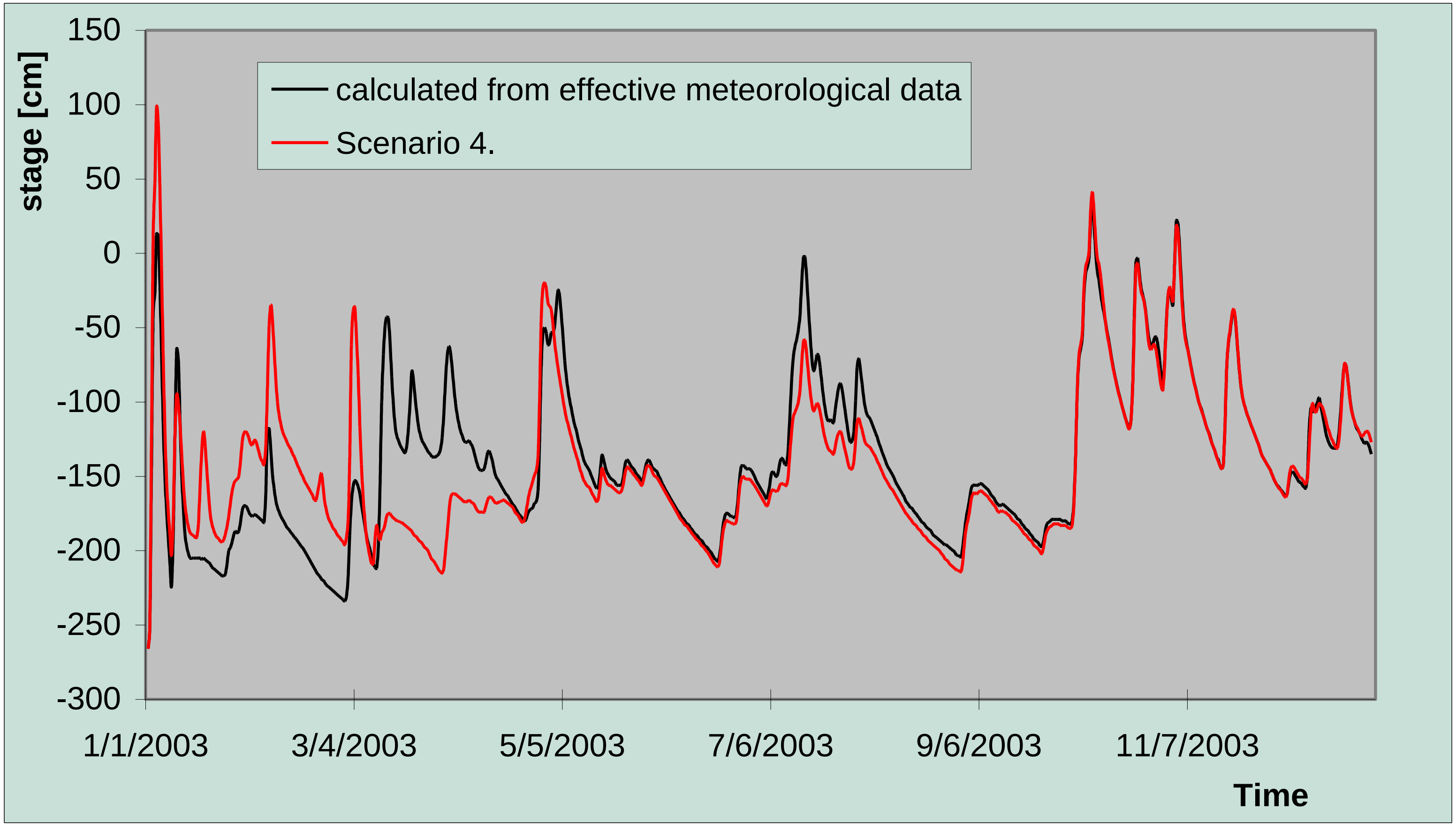
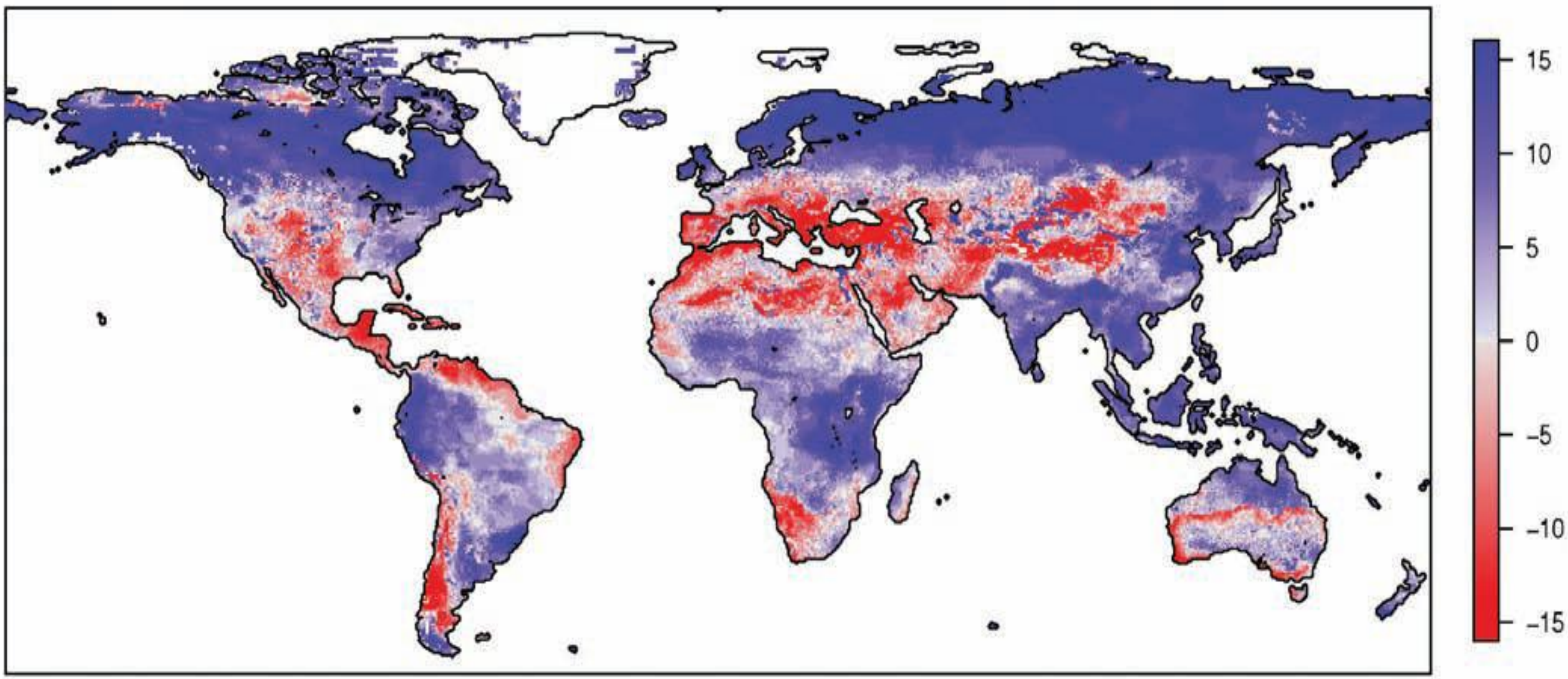
Scenario 4 analysis for the Tisza River by *TAPI-DLCM* model



- +1°C→ further 10-15% increase of river runoff in the north and decrease in the south (ensemble runs)



Flood risk:

•Increase of winter flood risk by 2020 in northern Europe

•Increasing risk of floods in N, C and E Europe

•Increasing risk of flash floods across all Europe

•Risk of snowmelt floods shifts to wintertime

•Increase of 100 years return level of river discharge in north-eastern Europe

•Increasing volume of floods (Reservoirs)

•Trend of extreme river floods?’60-’80,’80-’00. Portugal, UK

•Positive trends in UK. Higher spatial variability of change in flood frequency.

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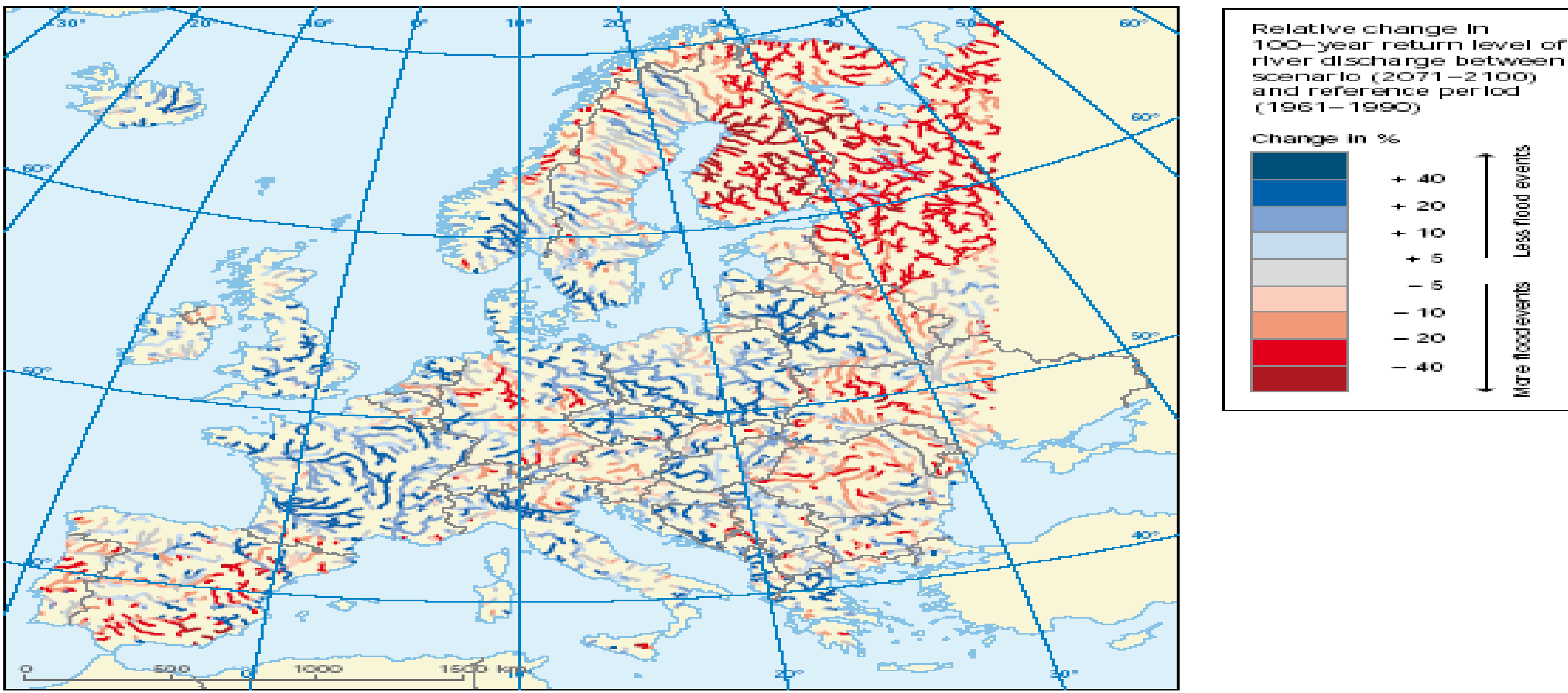
Change of 100-year return level of river discharge (2070-2100)

Map 5.25 **Projected change in 100-year return level of river discharge between 2071–2100 and the reference period 1961–1990**



Note: Simulations with LISFLOOD driven by HIRHAM — HadAM3H/HadCM3 based on IPCC SRES scenario A2.

Source: Dankers and Feyen, 2008b.

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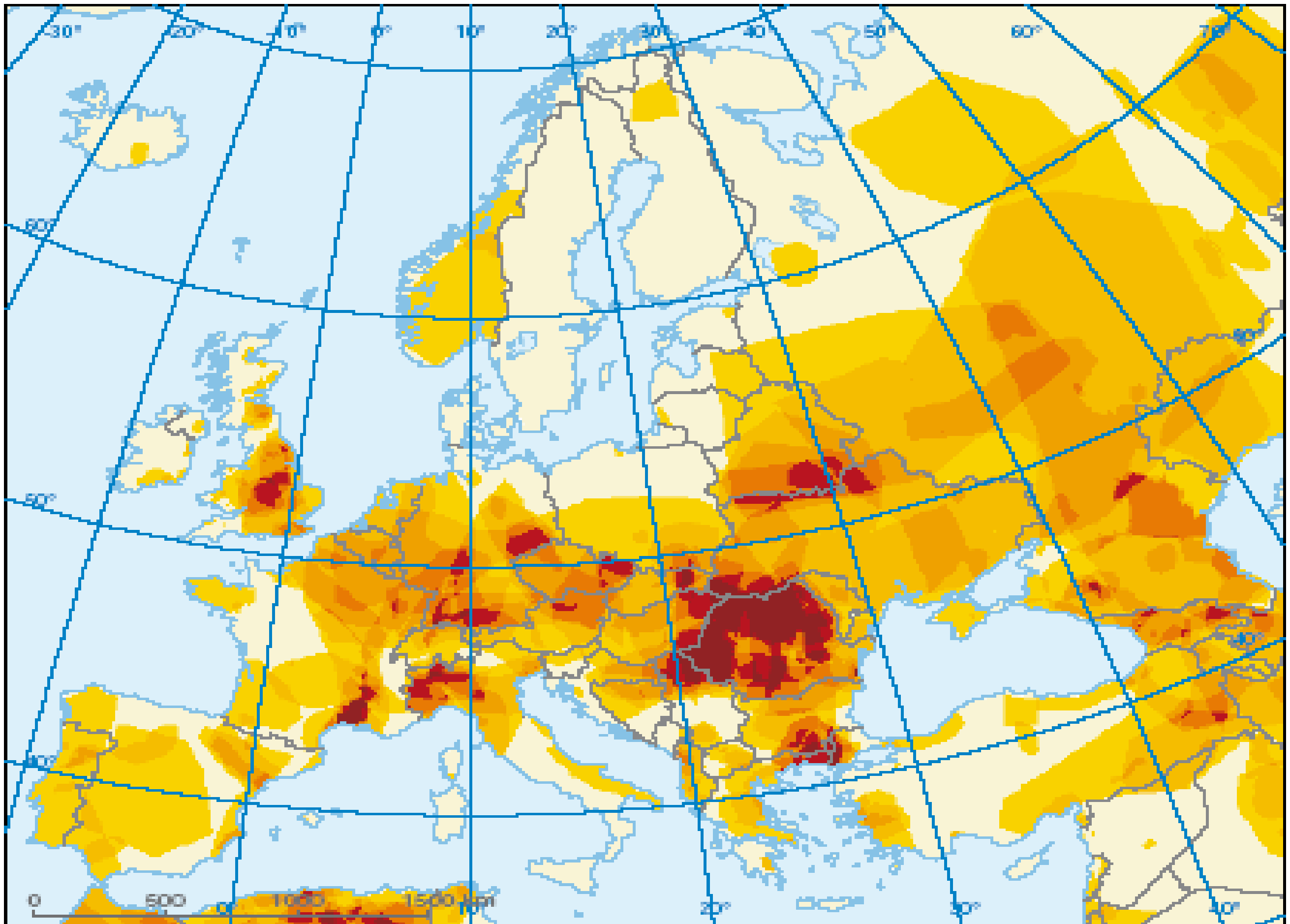
Map 5.24 Occurrence of flood events in Europe 1998–2008



Flood events, 1998–2008

Number of events

- 1
- 2
- 3
- 4
- 5
- > 6

Source: Based on data from Dartmouth Flood Observatory (http://www.dartmouth.edu/~floods/).

River flood damage:

• Increase of magnitude and frequency of river floods of River Po, Danube, Gharrone, Rhone, Loire→EAD to increase in central, wewstern and eastern Europe

•Decrease of extreme river discharges in north-eastern Europe EAD also decreases

•Increase of total EAD for EU27:6 to 18, 14 billion EUR (by 2100)

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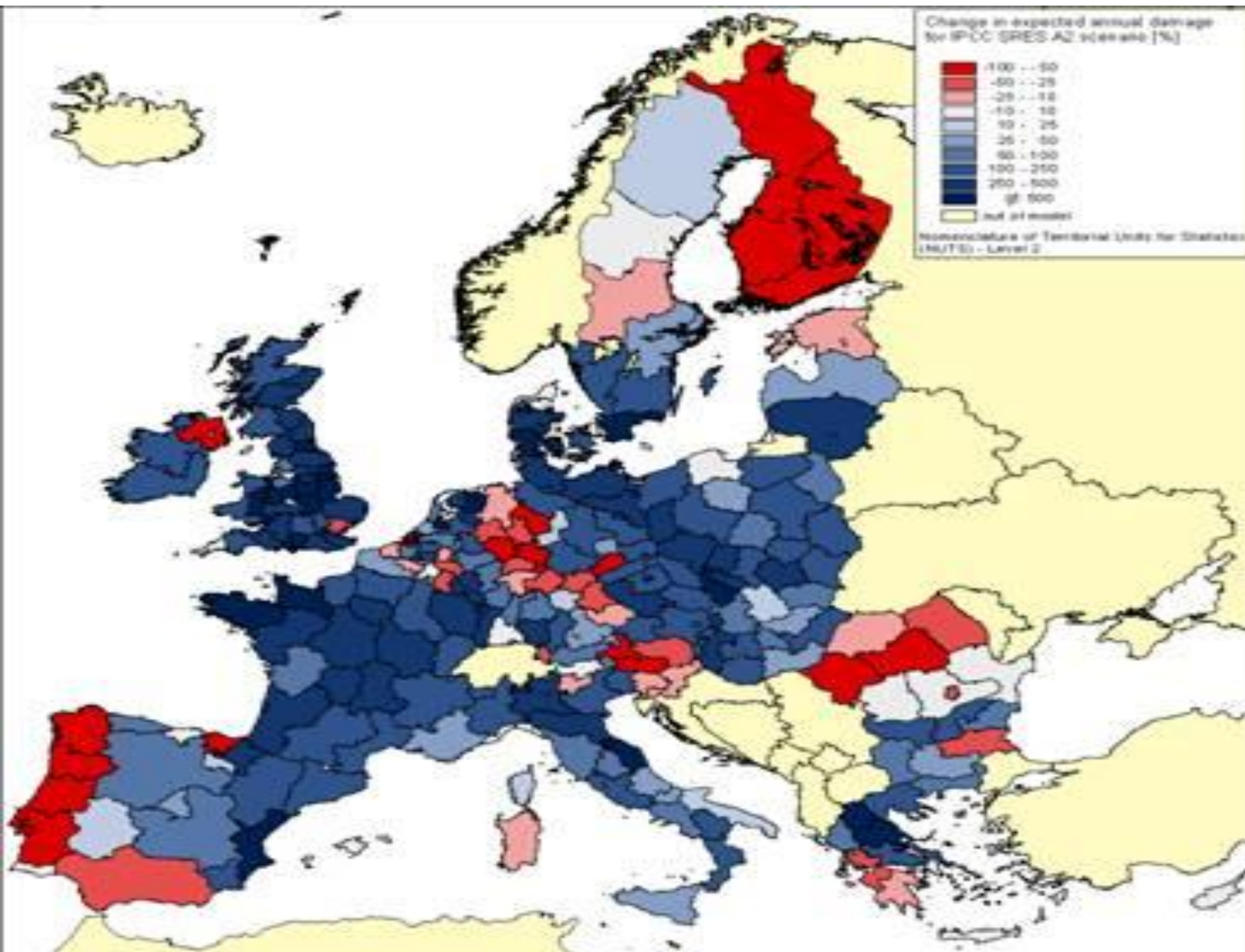
Change in annual flood damage (IPCC SRES A2)



Change in expected annual damage for IPCC SRES A2 scenario [%]

	-100 - -50
	-50 - -25
	-25 - -10
	-10 - 10
	10 - 25
	25 - 50
	50 - 100
	100 - 250
	250 - 500
	gt 500
	out of model

Nomenclature of Territorial Units for Statistics (NUTS) - Level 2

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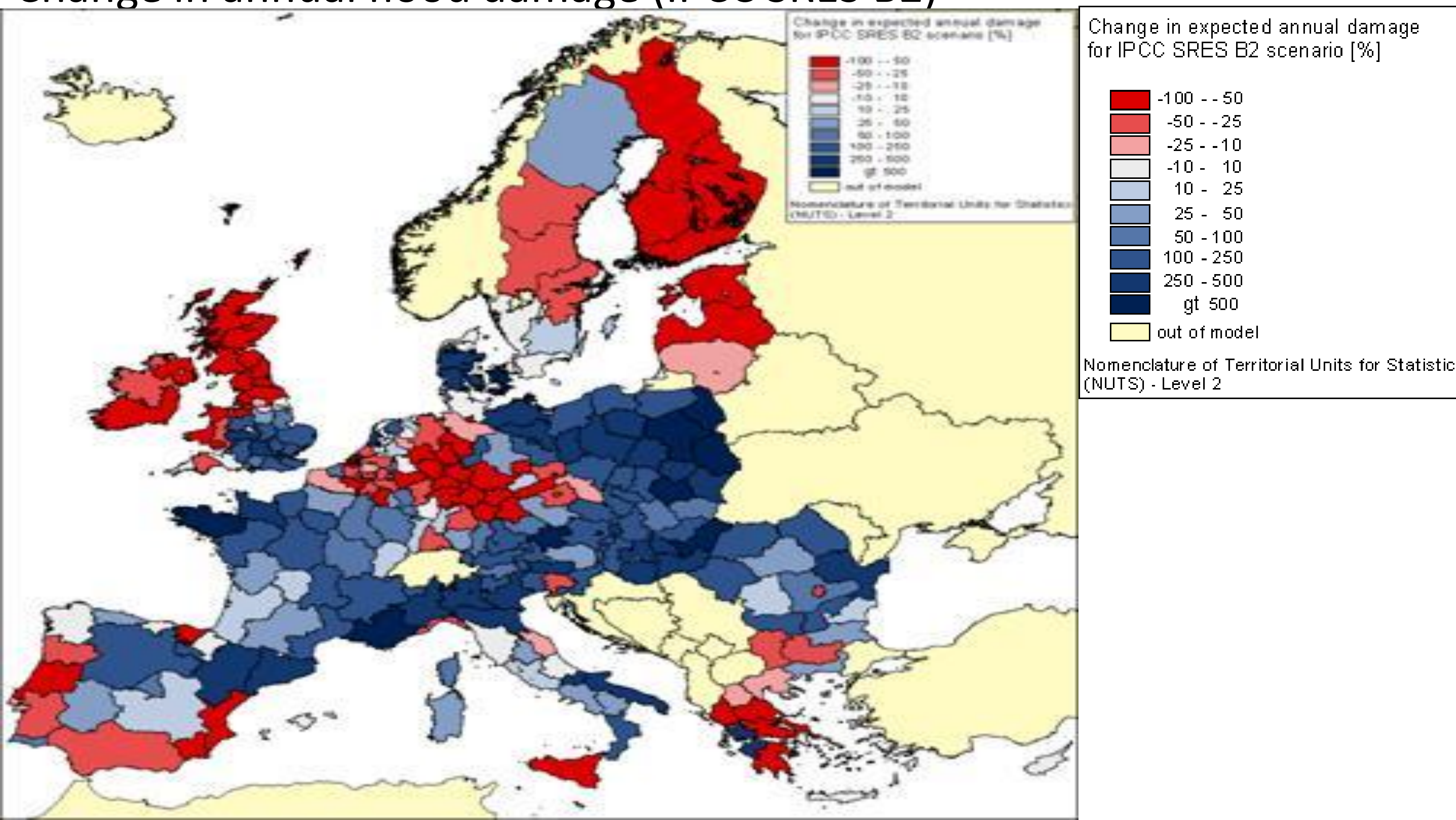
Change in annual flood damage (IPCC SRES B2)

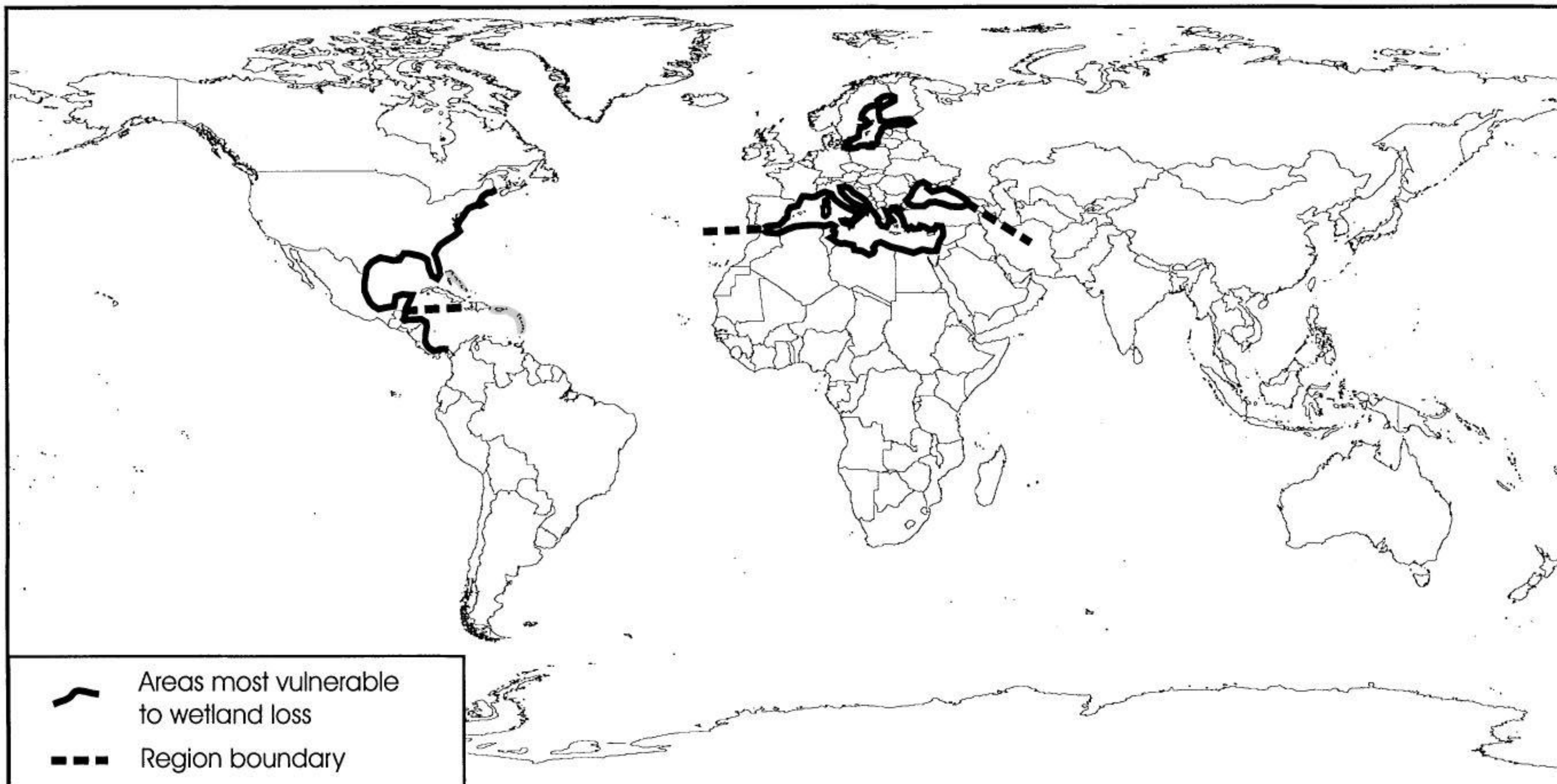


Impacts of flooding on human health:

- Floods come second only to drought/famine in causing direct mortality.
- Accounts for more then half of the people affected by natural disasters
- Flooding industrial plants, waste storage fac. →chemical contam.
- Structural damage→oil in water→toxic hydrocarbon to air
- Diseases

COASTAL FLOODING

AREAS MOST VULNERABLE TO COASTAL WETLAND LOSS



(b) Wetland loss

COASTAL FLOODING

Impacts on coasts:

Flooding, land loss, salinization of groundwater, destruction of built infrastructure and buildings.

- Baltic and Arctic regions: higher risk of tidal surges and sea-level rise
- Medditterranian and Black-sea regions: sea-level rise increases the damage by storm surges and tsunamies
- 1.6 million people more effected each year by coastal flooding in Europe by 2080
- Up to 20% of coastal wetlands can dissappear by 2080.

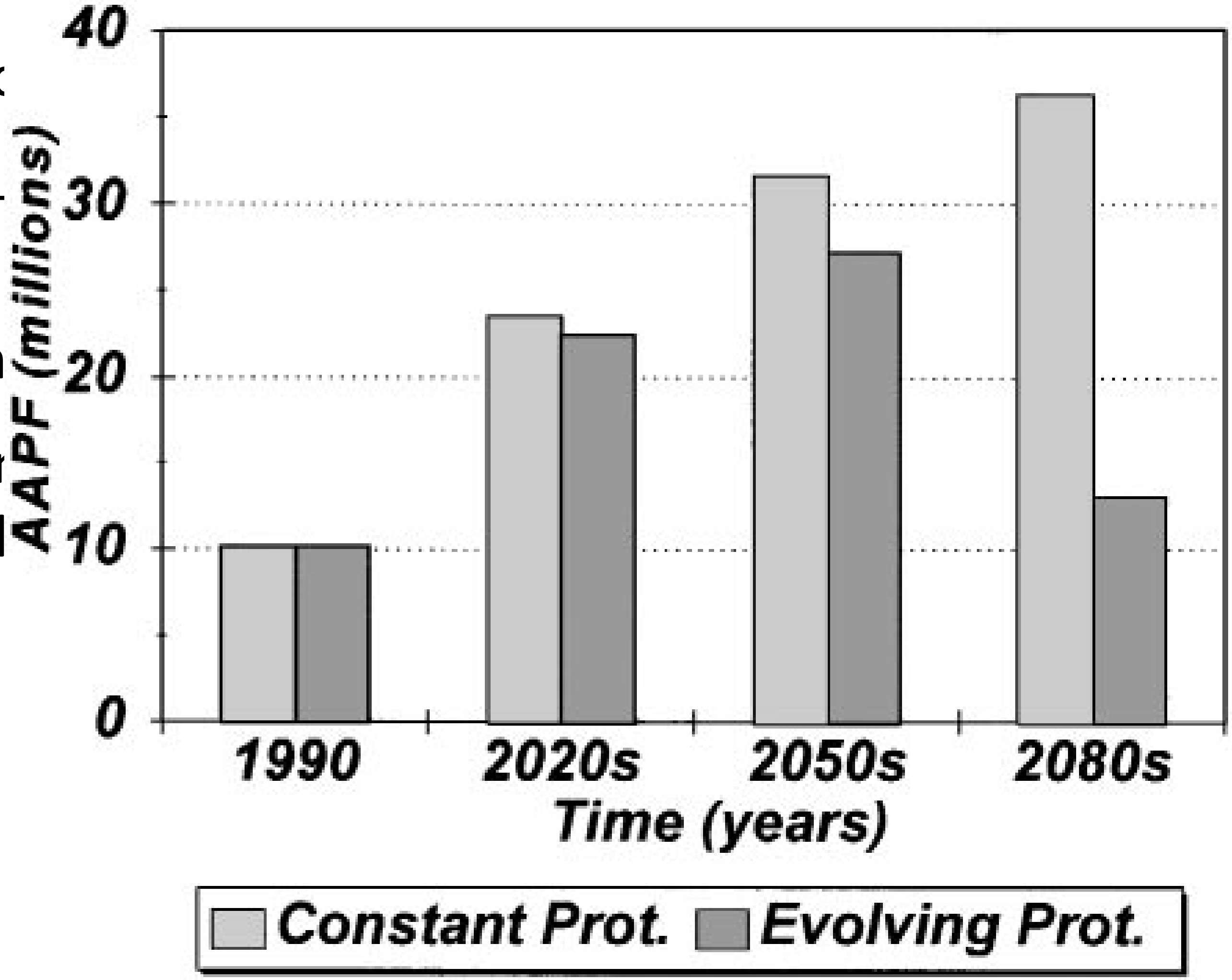
COASTAL FLOODING

Impac

•For 1 flooded could

•Num by 25%

•The r increasing popul



Remarks on impacts

River flooding:

- Coarse spatial resolution of climate projections→uncertanities
- Effects of land use change is as significant as change of precipitation regarding river discharge estimations
- The frequency and intensity of convective storms cannot be projected accurately
- Normalized flood losses of recent decades doesn't show an increasing trend
- Due to model uncertainties, low resolution and lack of historical data, flood damage estimates should be treated with caution

Remarks on impacts

•The sensitivity of change in water runoff to the change in temperature is significant therefore the accuracy of models should be increased as much as possible, especially, if adaptation strategy and planning would be based on model projections.

•The uncertainties coming from downscaling GCM results can be significant.

Coastal flooding:

•The methods used to estimate losses and damages in coastal regions are difficult to validate

Adaptation strategies mentioned:

•Combination of structural and non-structural flood defense strategies

•Cleaning and maintenance of flood channels

•Basin wide international agreements for water management

Coastal flooding:

•Managing coastal lowlands (e.g. reduce GW withdrawal)

•Cost-benefit analysis suggest widespread protection rather than abandoning populated areas against landloss

Research needs identified:

- Further runoff modelling with better spatial resolution and improved GCM downscaling methods
- Whidespread use of ensamble model runs is needed
- Revision and improvement of the parametrisation of rainfall-runoff models
- High spatial and temporal resolution scenarios and modelling for the Alpine area
- Future impact assessments should focus on integrated approaches

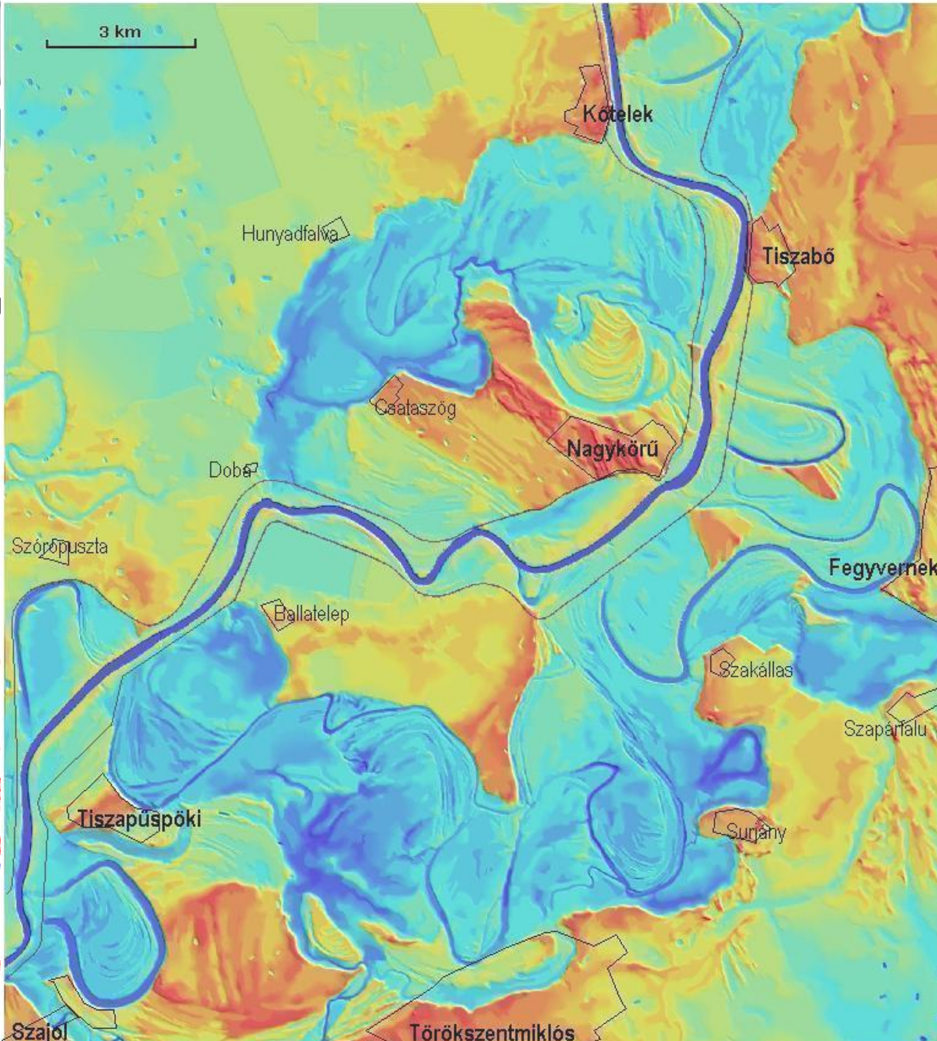
Research needs identified:

•Research of wetland response to sea-level rise at a range of scales (and the linkages between)

•Global scale: improve spatial res. of coastal topology and distribution of population

•Improved flood damage data collection

Excess w... ...ilot in Project ADAM



Fact...

- Tisz...
- Exc...
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- Solu...
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- Trar... eco-... eme...

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GEONARDO STATE-OF-THE-ART AND BEYOND

Flash flood in Hungary, May 2010