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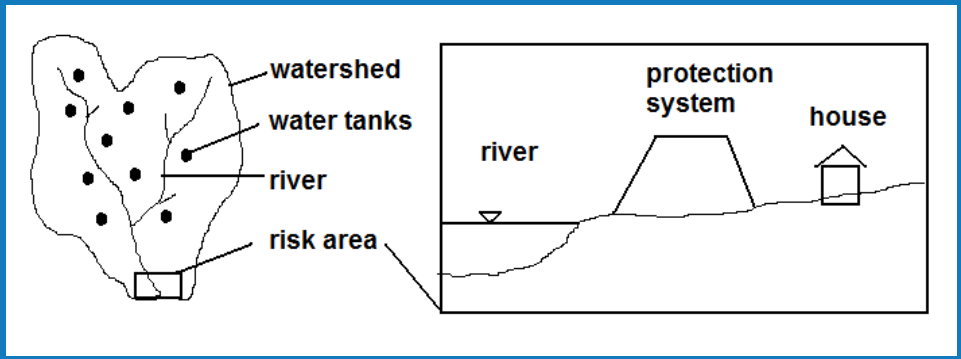

FLOOD RISK CHANGES & FLOOD MAPS

Discharges are expected to increase 20 % by 2070, how much annual benefit of retained m³/water is expected to change?

A: 20 %
B: 80 %
C: Other value

Jari Silander , Mikko Sane and Antti Parjanne
Finnish Environment Institute (SYKE)

Second Nordic International Conference on Climate Change Adaptation to be held in Helsinki on 29-31 August 2012.

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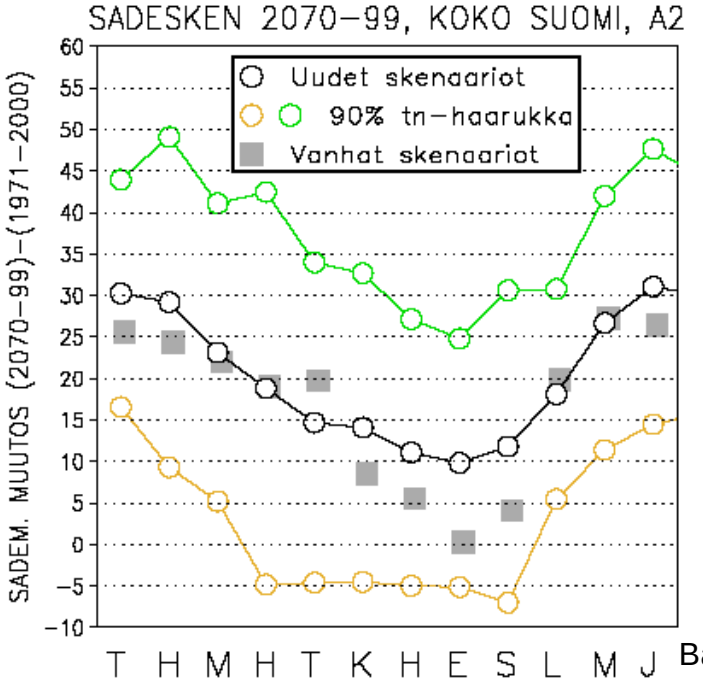
CLIMATE CHANGE – discharge/precipitation

Veijalainen 2012 & Jylhä et. al.

	Annual (%)	Winter (%)	Spring (%)	Summer (%)	Autumn (%)
Finland					
Average	9.9	120	5.4	-31	16
Max	29	170	11	-5.1	49
Min	-1.9	61	-9.8	-47	-3.1

Precipitation change (%)
(2070-2099 w.r.t 1971-2000) (Jylhä)



PRECIPITATION

No completely clear indication of precipitation increase, nationwide data (Tuomenvirta 2004).

Summer – one station: No clear trends , possibly a slight decrease in mean intensity (Kilpeläinen 2006)

CLIMATE MODELS

Seasonal variations; Maximum values are expected to increase, more than mean values

Based on the GCM simulations for the IPCC 4AR . .SRES A2 scenario

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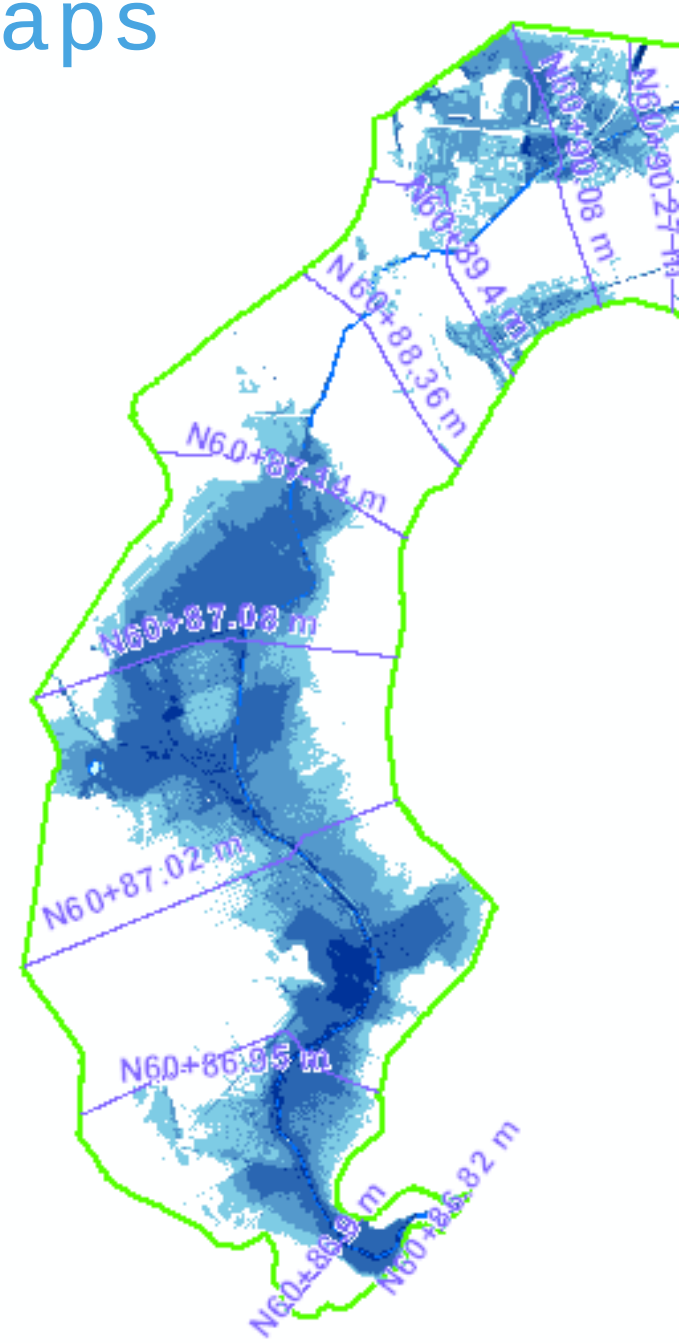
Flood Hazard Maps

- Flood hazard map is defined as a map showing the areas where floods must be taken into account including the probability of flooding and the degree of danger (e.g. water depth)
- Water depth zone classification in Finland: 0-0.5 m, 0.5-1 m, 1-2 m, 2-3 m, over 3 m, flood protected area and water body. Including e. g. borders of the flood mapped areas and water level lines
- At this time flood hazard maps have been produced for about 80 locations in Finland (6/2012)
  - Mostly produced by the ELY centres
  - SYKE maintains the flood information system, inc. this flood hazard zones dataset
  - The dataset inc. fluvial floods and floods caused by the rise in the sea level, several return periods (probabilities)
  - **Open (free) GI-data**, can be downloaded at http://www.environment.fi/oiva



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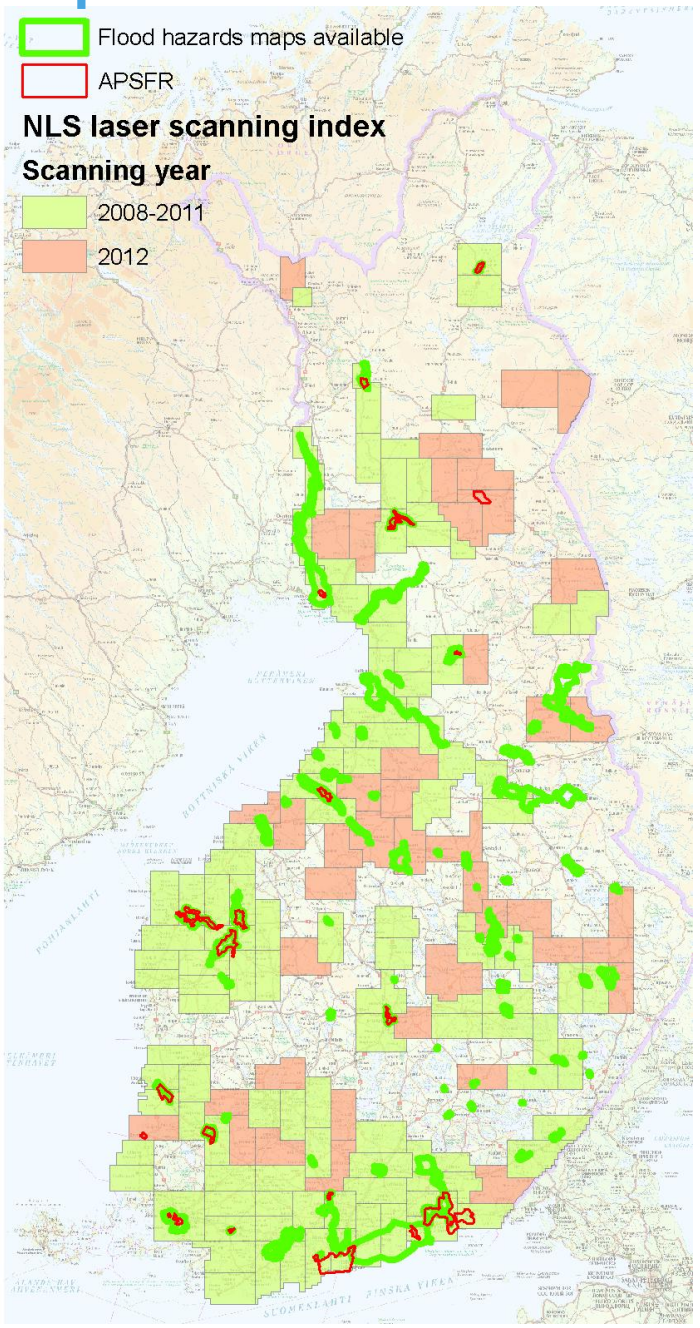
Flood Hazard Maps

- New flood hazard maps are prepared at least for the Areas of Potential Significant Flood Risk (APSFR) (EU Floods Directive)
  - 21 APSFRs in Finland
  - The new national digital elevation model (2 m x 2 m pixel size) based on laser scanning is available for APSFRs, height accuracy < 0.3 m
- More information about flood mapping in Finland www.environment.fi/floodmapping



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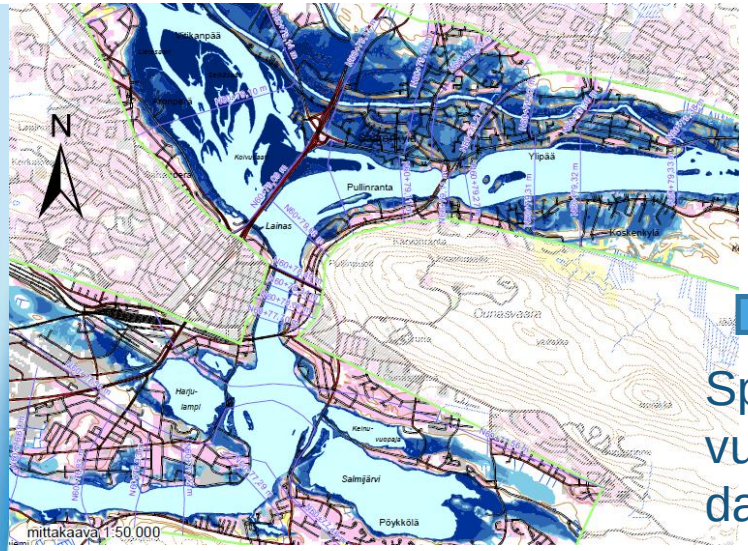
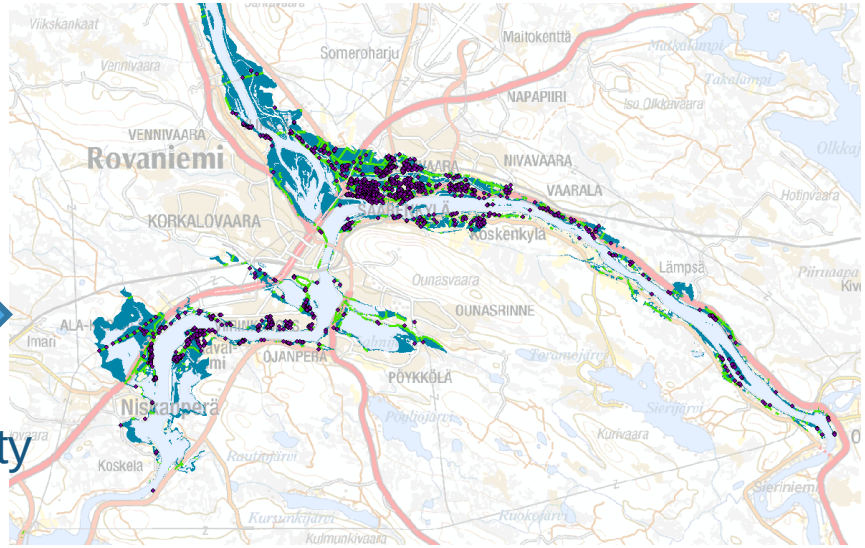


Flood hazard map

Spatial vulnerability data



Flood risk map

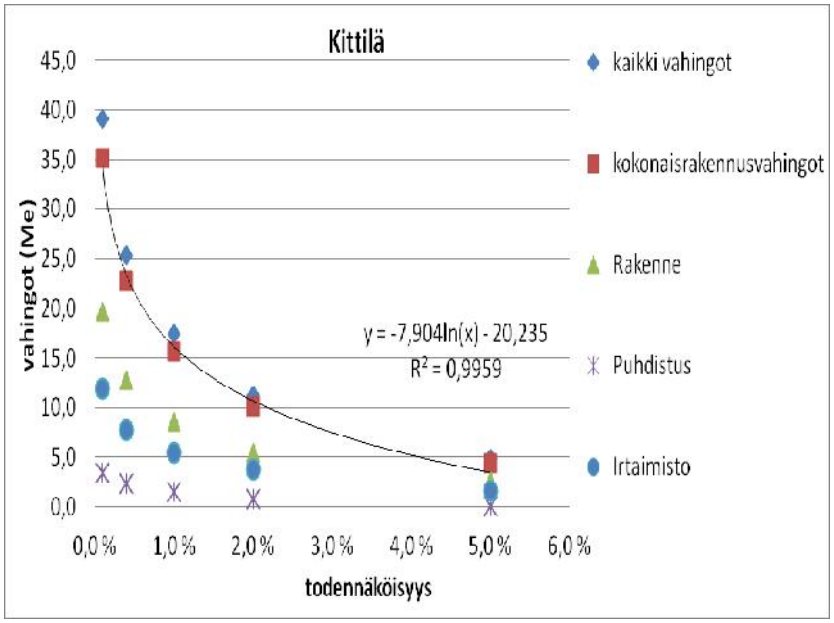
prizing

Value for damages

Riviotsikot	Sum of kokonaisvahingot
Asuinrakennukset	113,3824537
Liike- ja toimistorakennukset	23,76125422
Vapaa-ajan asuinrakennukset, saunat ja talousrakennukset	7,64198
Teollisuus- ja varastorakennukset	7,008005481
Hoitoalan rakennukset	3,000051926
Maa-, metsä- ja kalatalouden rakennukset	1,741913333
Opetusrakennukset	1,272945952
Liikenteen rakennukset	1,138724269
Kokoontumisrakennukset	1,051306667
Muut rakennukset	0,23568
Pelastustoimen rakennukset	0,12955
Energiantuotannon ja yhdyskuntatekniikan rakennukset	0,108126835
Kaikki yhteensä	**160,4719924**
Liikennekatkosta aiheutunut lisäaika ja sen arvo	0,90
Liikenneinfrastruktuurille aiheutunut vahinko	3,434352143
Pelastustoimen kustannukset	12,13
Vahingot ajoneuvoille	11,52
Yhteensä	188,46

Combine different flood risk scenarios

Damage-probability function



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How to estimate flood risk damage costs:

- For public services, economic activities and properties:
  - Direct evaluations by market prices, replacement values etc..
- For human safety and health, environment and cultural heritages: there are no prices at market. Other approaches need to be used:
  - Contingent valuations (willingness to pay)
  - Hedonic prices
  - Etc..
- All this we need to do for different repeat periods and water level situations

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Assessment of benefits

- Benefits of flood control = Costs of avoided damages compared to doing nothing
- Benefits for adaptation = Costs of avoided damages compared to no-adaptation
  - Reducing the probability of flood (repeat period) and/or water level rise produces benefits
  - Benefits achieved by a certain measure can be calculated when we know damage costs by different repeat periods/water levels

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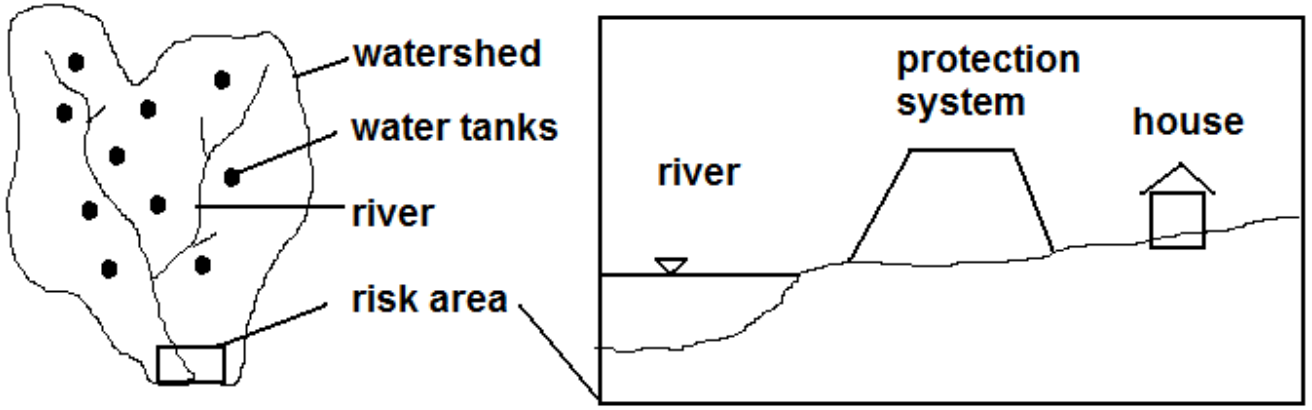
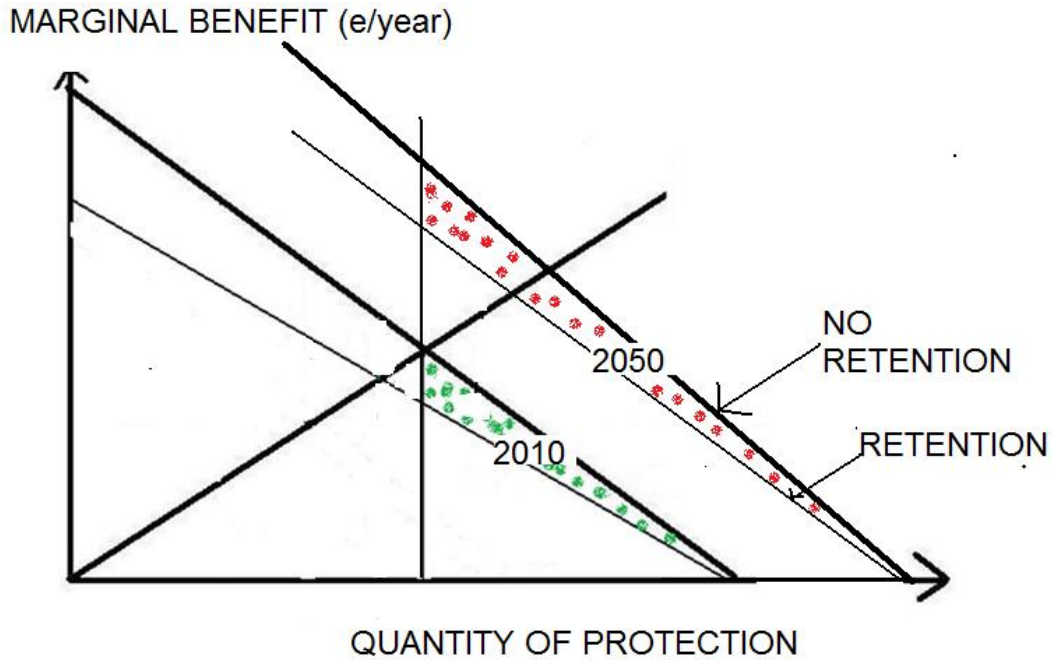
CLIMATE CHANGE & CHANGE OF RISK - water retention





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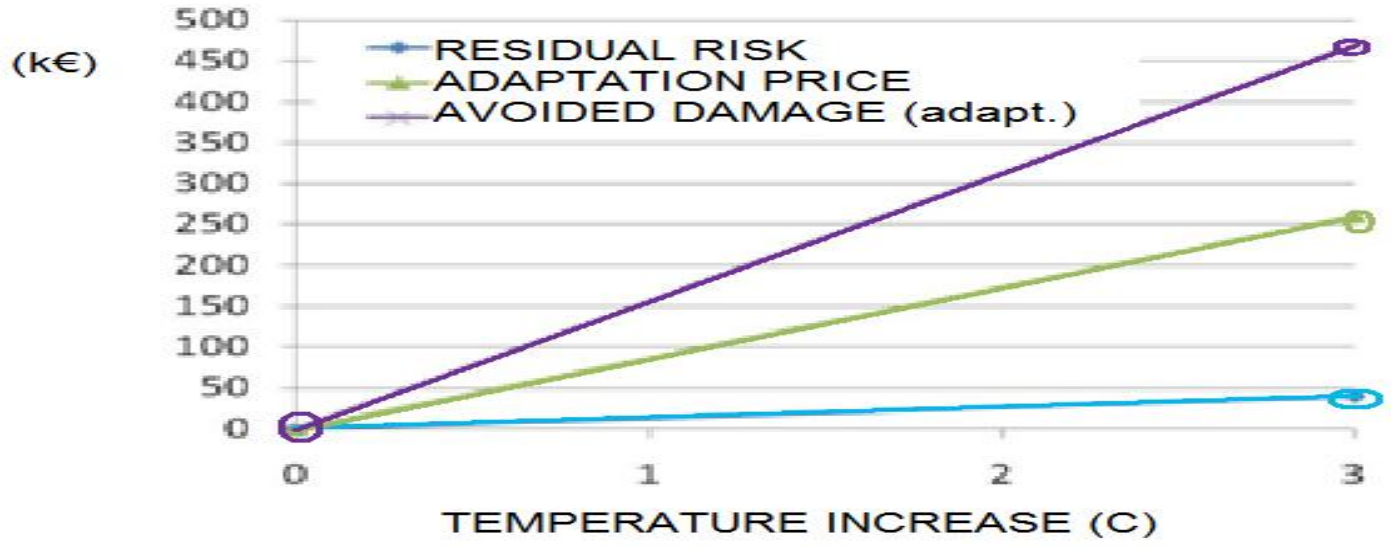
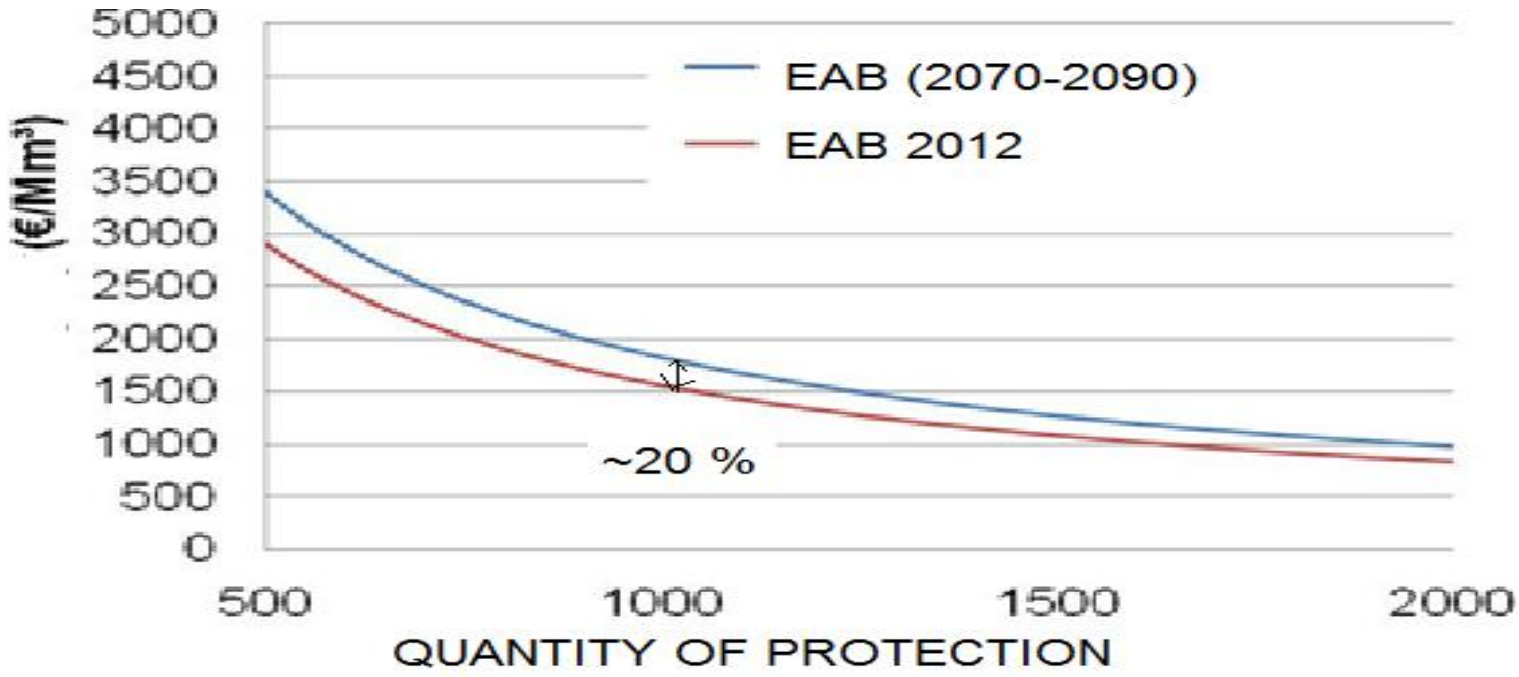
CLIMATE CHANGE & CHANGE OF RISK





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CONCLUSIONS

- Flood maps & GIS-system provide good basis for risk analysis
- CE-adaptation provide excellent opportunity to check efficiency of current protection systems.
- Water retention benefits are expected to increase ~ increasing discharges.
- Loss (DWL) over time seems to be a convex function, providing some time for adaptation(increasing discharges).
- For a comparison, the same risk assement methodology is needed

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