

## **Jean Monnet Module: Climate and Green Finance Agenda in EU**

### **Risk management and Control for Green Instruments**

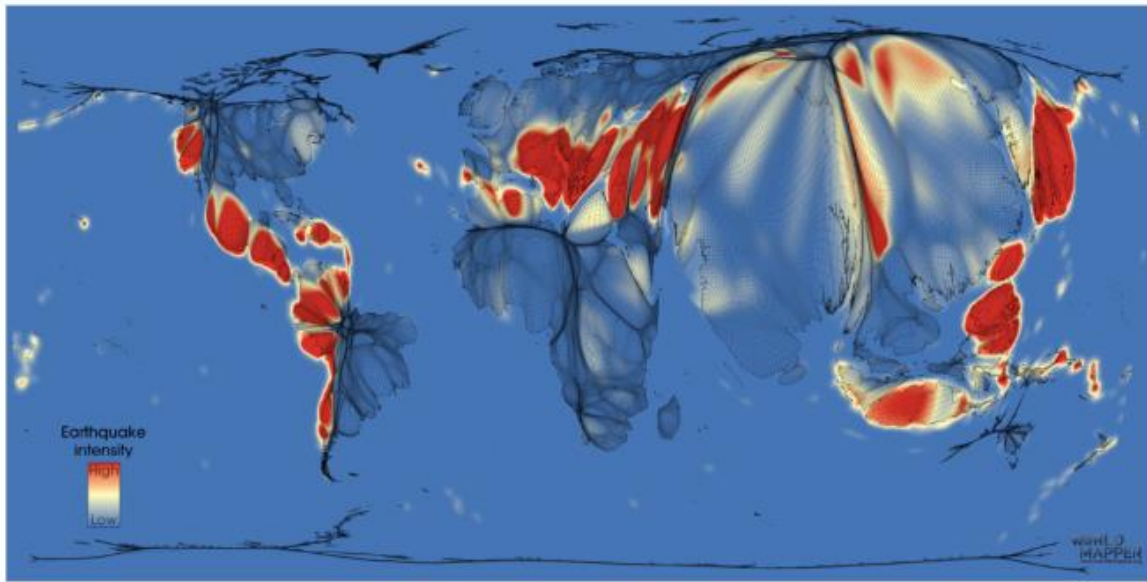
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# Climate risk

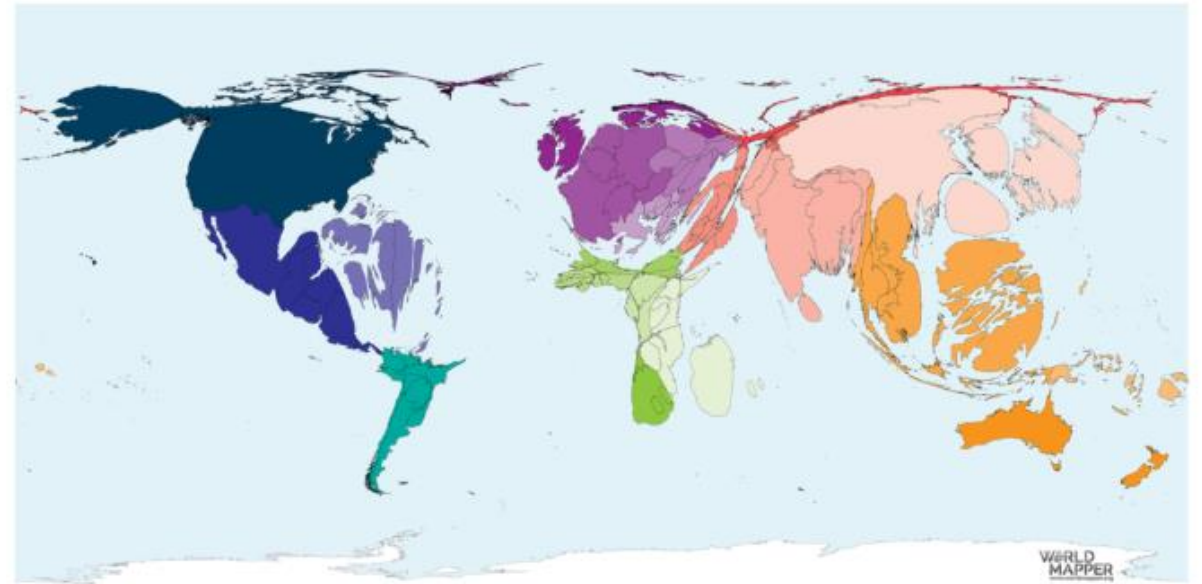
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- Development processes and experiences
- Human activities and decisions
- Disasters
- Globalization
- Urbanization
- Poverty
- Economic Meltdowns
- Technological developments

A climate disaster exposure **does not depend** on a country's level of development

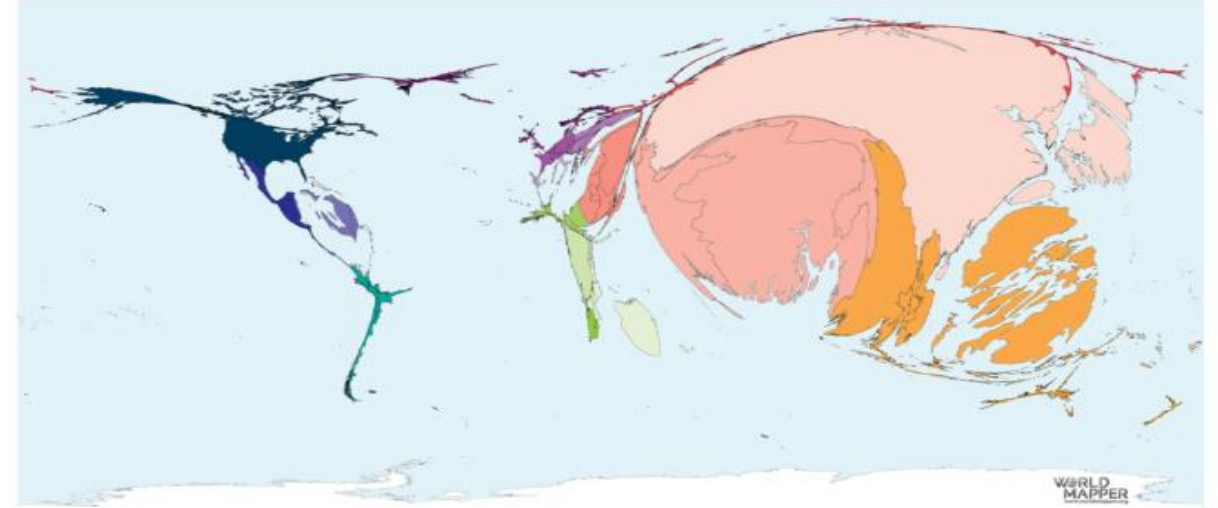
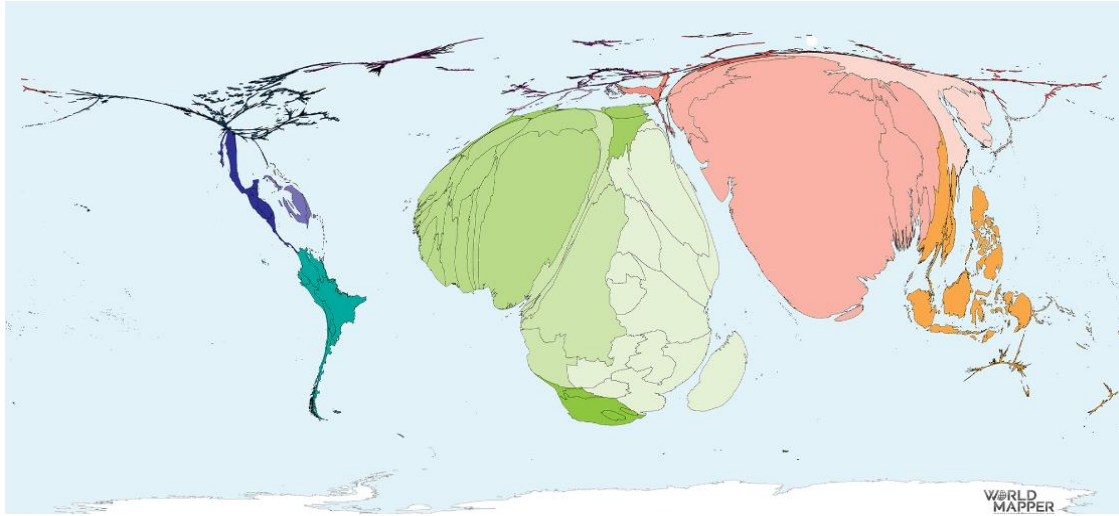


**Seismic Risk**

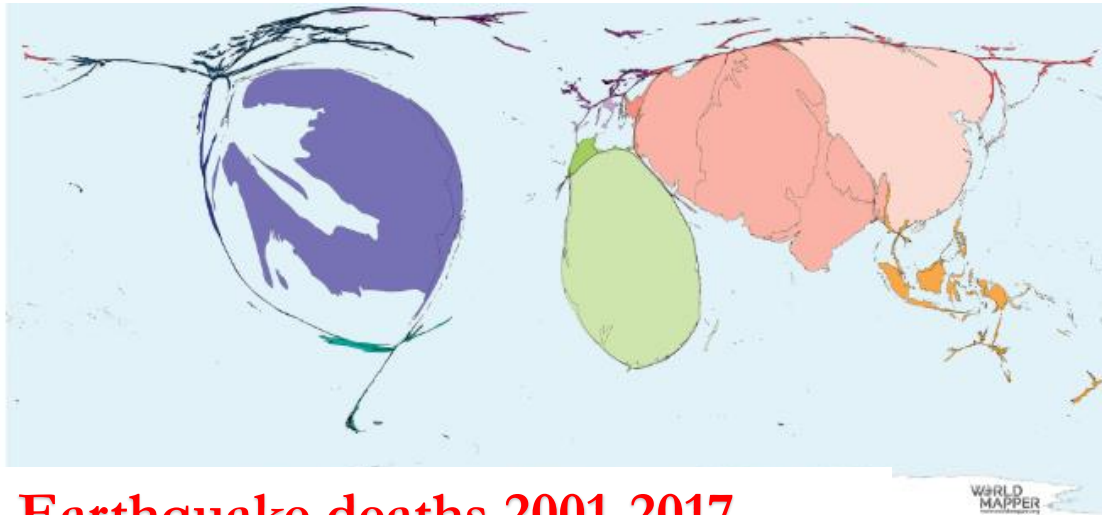


**Storms 2000-2017**

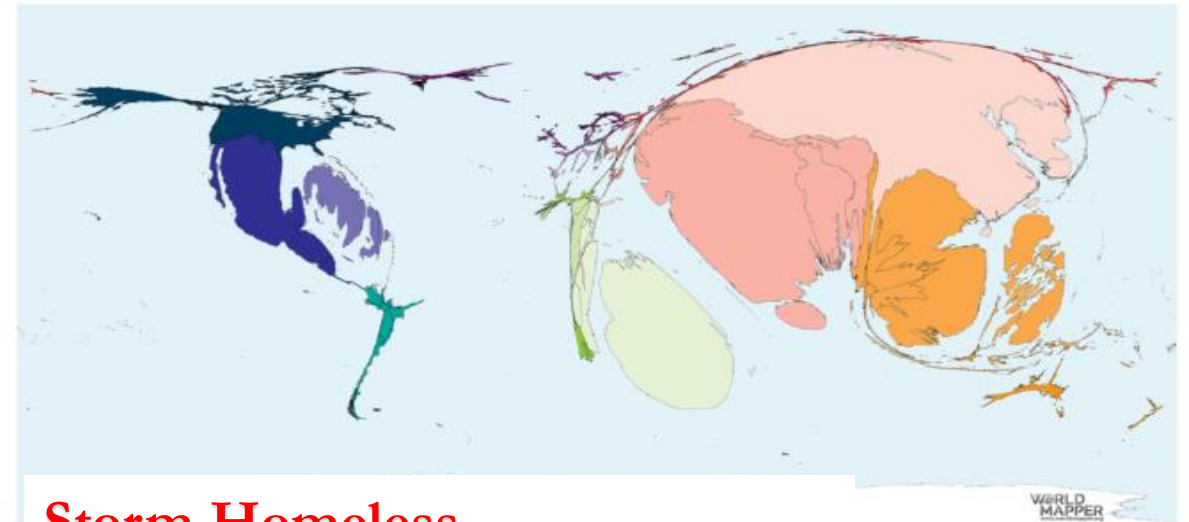
The consequences of a climate related disasters **depend** on the level of development of a country



**World map based on inequality, absolute poverty    Storm Injured 2000-2017**



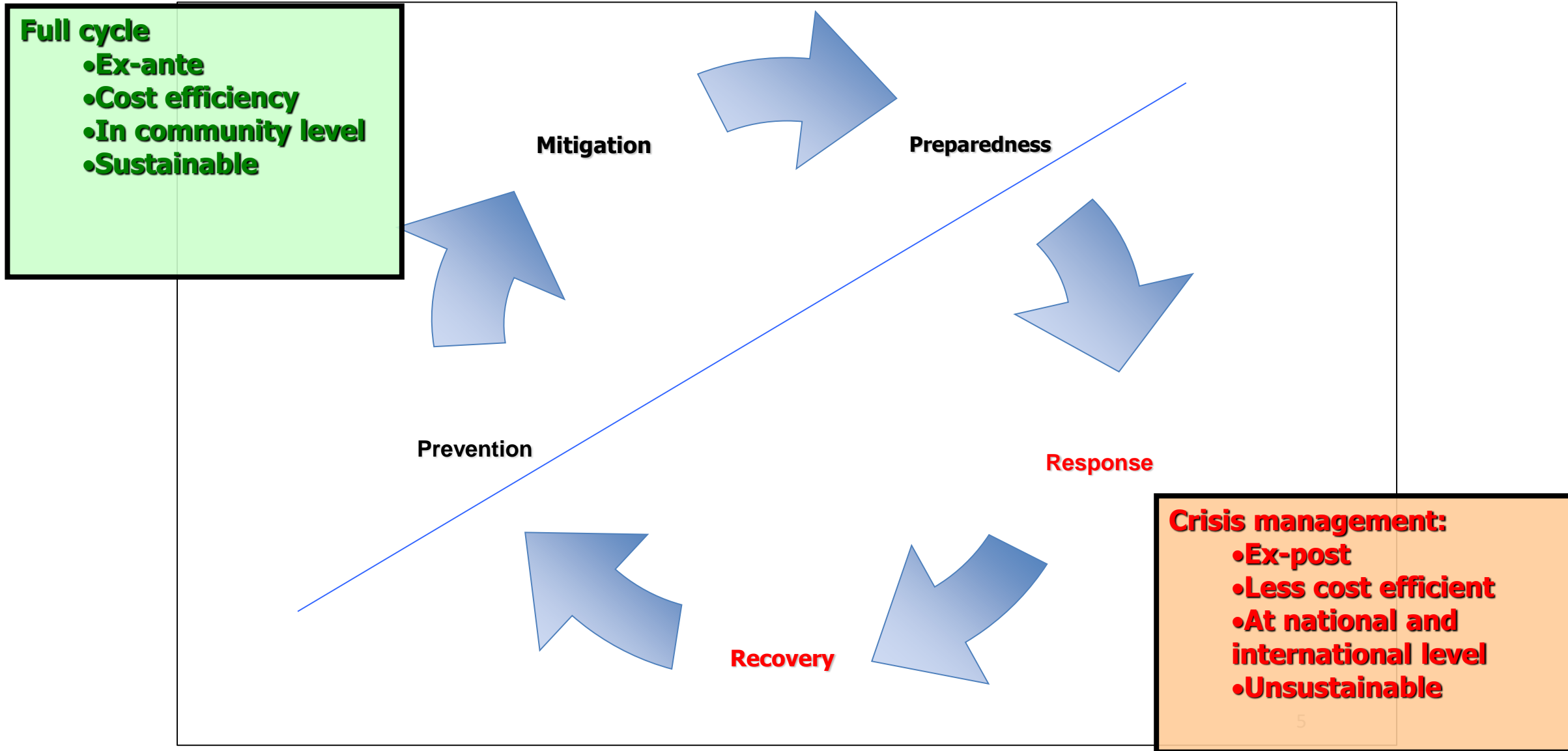
**Earthquake deaths 2001-2017**



**Storm Homeless**



# Risk Management Cycle



# Prevention and mitigation

- Prevention and mitigation strategies should work towards reducing the financial and social costs to communities over time, improving the built environment, and reducing the impact on, and damage to, the environment.
- Investment in disaster risk prevention and reduction enhances the economic, social, health and cultural resilience of people, communities, countries and their assets, as well as the environment.
- The effective prevention of disaster events includes multiple strategies to reduce or remove the impact of hazards and increase the resilience of the community.

# Prevention and mitigation

- Prevention and mitigation strategies should be based on the risk assessment and can be considered in relation to:
- land use planning and building codes
- essential infrastructure
- structural works
- landscape and environment.

# Prevention and mitigation

- hazard specific control activities such as flood levees or bushfire mitigation strategies
- design improvements to infrastructure or services
- land use planning and design decisions that avoid developments and community infrastructure in areas prone to hazards
- community awareness campaigns to increase knowledge of how to prepare for disaster events
- community education programs to build knowledge of the appropriate actions to prepare for and respond to a disaster event
- capital works such as levee bank construction to reduce the impacts of flooding
- resilience activities including partnership building and engagement between sectors
- annual programs (e.g. vegetation management around essential services and essential infrastructure such as power lines).



# Preparedness

## Preparedness

*The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.*

# Preparedness elements

1. Risk assessment	2. Planning	3. Institutional & Legal System
4. Information management & communication systems	5. Early warning systems	6. Resource base (human, material & funds)
7. Response mechanisms & Coordination	8. Exercises	9. Education, Training, Risk awareness,

Source:  
Abrahamsson, 2018

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Plans are useless, but planning is  
indispensable.

Dwight D. Eisenhower

# Response and recovery

- The aim of response operations is to save lives, protect property and make an affected area safe. Accordingly, response is the operationalisation and implementation of plans and processes, and the organisation of activities to respond to an event and its aftermath.
- The need for recovery may arise from a range of disaster events, including natural and non-natural disasters such as floods, cyclones, bushfires, acts of terrorism and major health emergencies, as well as animal and plant diseases.
  - human and social
  - economic
  - environment
  - building
  - roads and transport.

# “Investing” in the environment

- Governments protect the environment in a number of ways
- Laws and regulations
- Environmental standards for production
- But how much should we spend on environmental protection?

# Investing'' in the environment

- Depends on balance of benefits and costs
- We should decide whether  $\text{benefits} > \text{costs}$



# Costs & benefits of environmental protection

- Cost-benefit analysis (CBA)
- Decision making tool to identify investments
- E.g. building new roads, hospitals or schools
- But also: to spend on environmental protection e.g. water quality standards, or protected areas
- Do benefits outweigh costs?

# Challenges.....

- What challenges do we face in measuring costs and benefits ?
- A hospital : costs?
- But what are the benefits ?
- A school: costs/benefits?
- A new road: costs/benefits?
- Protecting an existing wetland: costs/benefits?
- The environment : non-market impacts

# The environment : non-market benefits

- Most environmental projects deliver non -market goods e.g. biodiversity, clean environments, good health
- These are non-market goods
- Fish, timber, drinking water – these are market goods – e.g. prices exist to value them

# The environment : non-market benefits

- To conduct CBA of environmental projects we need to estimate value of non-market impacts
- Environmental economics: much focus on environmental valuation
- Later we will consider how to value non market impacts
- Now how to organise a CBA

# Stages of CBA

- Definition of Project
- Identification of project impacts
- Physical quantification of relevant impacts
- Which impacts are economically relevant? .
- Monetary valuation of relevant effects
- Discounting the cost and benefit flows
- Applying the Net Present Value Test
- Sensitivity Analysis

# Definition of Project

- CBA and climate change
- We should treat adaptation investments like other projects
- Adaption investments are a cost
- But they mean we avoid impacts
- In other words they provide benefits

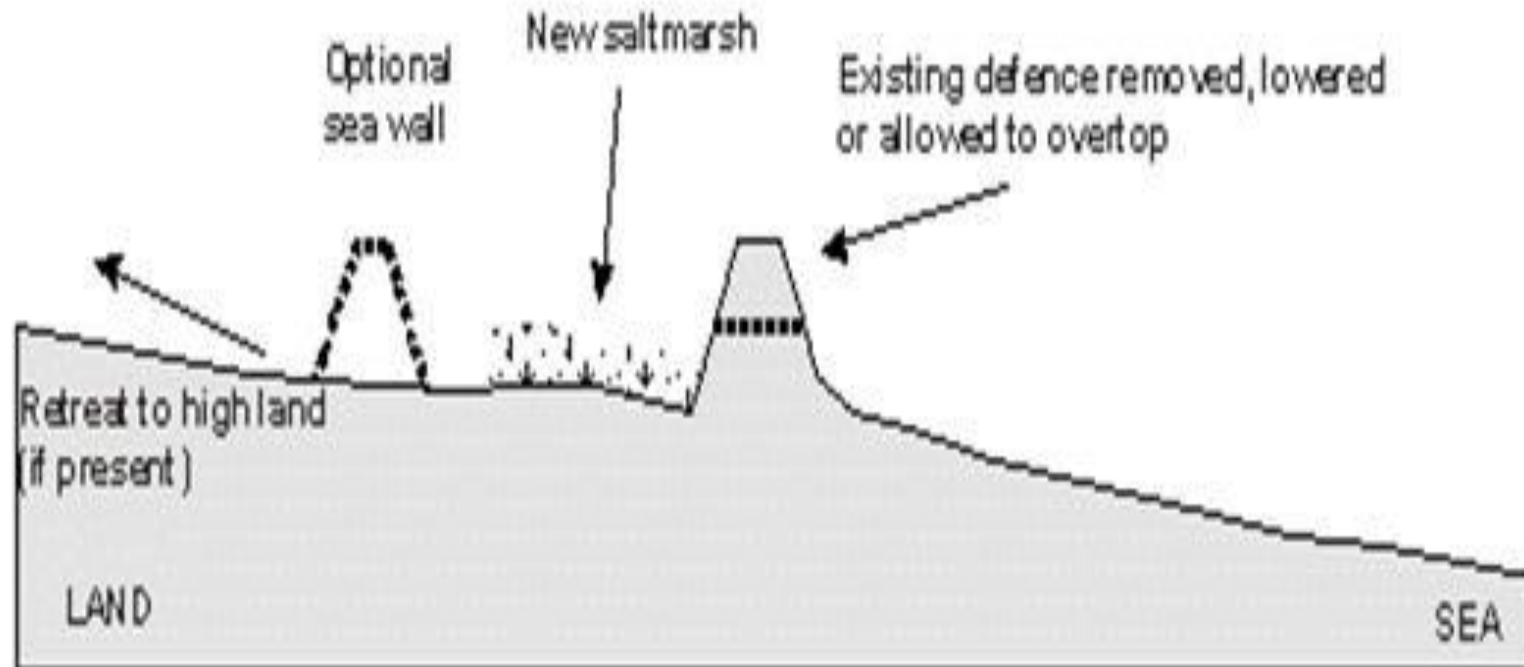


# Definition of Project

- For a given cost how big are the benefits of an adaptation ?
- Let's look at managed realignment of coastal defences
- Suppose we are considering a project that has a life of 10 years

# Managed realignment

Landward restoration of saltmarsh



# Identification of project impacts

- Costs of moving sea defences
- Costs of managing land around existing defence
- Loss of some land and productive possibilities - e.g. loss of agricultural production

# Identification of project impacts

- Benefits
  - Reduction of damaging floods
  - Creation of new wildlife habitats
  - Recreational visits
- 
- So, are benefits > costs ?

# Physical quantification of relevant impacts

- Investment costs –e.g. labour & materials
- Costs of foregone agricultural production
- Land purchase or simply the value of foregone crop revenues

# Physical quantification of relevant impacts

- Benefits:
- Biodiversity ?
- Fish catch (quantity \* price)
- Fewer flooding episodes (avoided cost)
- Recreational visits? (quantity of visits \* value)



# Which impacts are economically relevant?

- Translate the prices and quantities into values that can be entered into a spreadsheet as a cost or benefit
- E.g. annual increased fish catch
- Before  $600 \text{ tonnes} * \$40/\text{tonne} = \$24000$
- After forecast  $750 * 40 = 30000$
- Benefit  $= 30000 - 24000 = 6000$

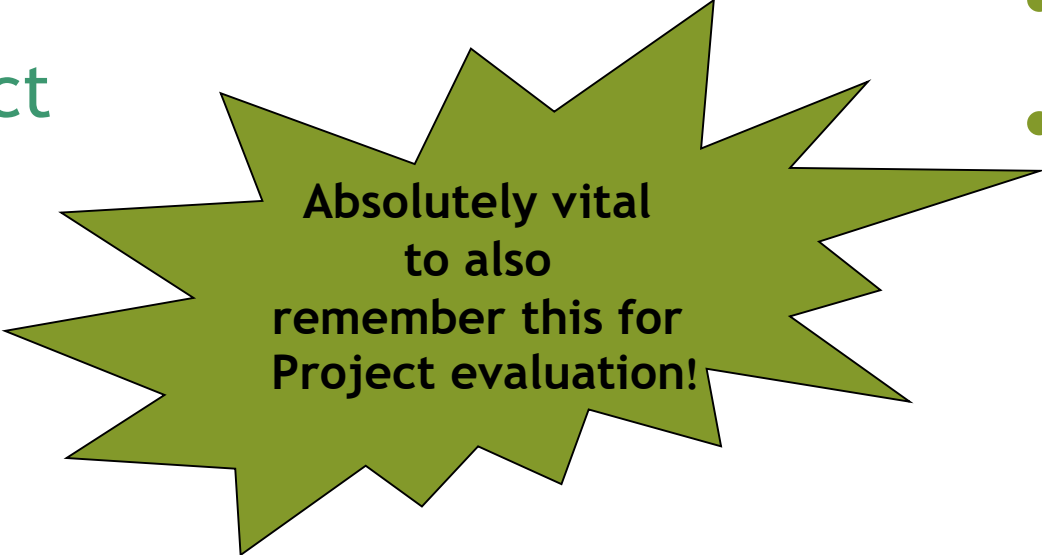
# Measures of Economic Viability of Projects

- Net present value;
- Internal rate of return:
  - IRR;
  - ERR.
- Benefit/cost ratio;
- Simply put it is the financial value of the benefit divided by the financial cost.
- Benefit
- Cost

# Decision Rule

- $NPV < 0$
- $B/C < 1$
- reject the project
- And/or  $IRR < i$
- Reject project

- $NPV > 0$
- $B/C > 1$
- accept the project
- And/or  $IRR > i$
- Accept project



**Absolutely vital  
to also  
remember this for  
Project evaluation!**

# Sensitivity Analysis

# Sensitivity Analysis

- Apply to all projects with quantified benefits and costs
- Involves recalculating project results for different values of major variables and combinations of variables.
- In essence, sensitivity analysis proposes "what if" scenarios by manipulating certain variables to determine minimum and maximum values of the analytic measures.
- Sensitivity analysis has the advantage that it can take into account not only risks, but also, to some extent, unmeasurable uncertainty.
- In this way, the CBA becomes more robust concerning any challenges to its original assumptions.