

Vulnerability Analysis and Risk Management for Water-Related Hazards

PART I: “Socio-economic valuation of risk perception”

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1

Content of PART I: “Socio-economic valuation of risk perception”

1. Introduction to risk valuation
2. Economic approaches to risk valuation
3. The sociological component of risk valuation

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2

Content of “Introduction to risk valuation”

1. Why valuing risk?

2. Value as an input to risk management

- Priorities in allocation of resources
- Cost Benefit Analysis
- Insurance and compensation
- Communication and awareness
- Payments for Ecosystem Services

3. General concerns in valuating risk

- Valuation perspective
- Participants selection
- Gains versus losses
- Time



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3

Content of “Economic approaches to risk valuation”

1. Overview of economic approaches to risk valuation
2. Non-market valuation methods: Revealed vs Stated preference
3. Revealed preferences methods
 - Hedonic price
 - Travel cost
4. Stated preferences methods
 - Contingent valuation
 - Choice experiments
5. Case studies



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Content of “The sociological component of risk valuation”

1. What is risk perception and why it is important for risk management
2. How to measure risk perception within a population
3. Which factors influence risk perception
4. How can sociological and psychological theories help us understanding individuals' risk behaviour
5. Case studies



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Introduction to risk valuation



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1. Why valuing risk?

- Economic valuation helps us understand the short-term and long-term impacts of hazards, allowing for better planning, risk mitigation, and recovery efforts.
- By incorporating values in risk management, we ensure that decisions prioritize the well-being of all, including vulnerable populations who may be less able to recover from the economic shocks caused by water-related.
- **How are values used as an input to risk management?**



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2.1 Define priorities in allocation of resources to mitigate risk

- Economic valuation helps **prioritize risks** by assessing their **expected impacts in monetary terms**.
- Paying attention to values should help to **focus attention and resources** on policies or regulations or behaviors that **address the more serious risks** and on expenditures that are cost-effective in reducing risks, promoting safety, and mitigating losses.
- The insights provided by a valuation study have the advantage of **separating what is most important** – to ourselves, to our community, or state or nation – from what is less important.

Element	Risk Description
Homes and Buildings	Damage to structures, weakening of foundations, loss of belongings.
Roads and Bridges	Erosion of surfaces, collapse of bridges, blockages from debris.
Vehicles	Vehicles swept away, submerged, or severely damaged by water and debris.
Electricity and Power Stations	Power outages, infrastructure damage, electrical hazards.
Water Supply Systems	Contamination of drinking water, disruption of supply.
Sewage Systems	Sewage overflows leading to contamination and health hazards.
Crops	Waterlogging leads to destruction of crops and soil degradation.
Livestock	Drowning or displacement of animals, loss of livelihood for farmers.
Ecosystems	Soil erosion, disruption of plant life, damage to ecosystems.
Wildlife	Loss of habitat, displacement or death of animals.
Human Health and Safety	Risk of drowning, injuries, disease and lack of access to medical care.
Economic Impact	Destruction of businesses and infrastructure.

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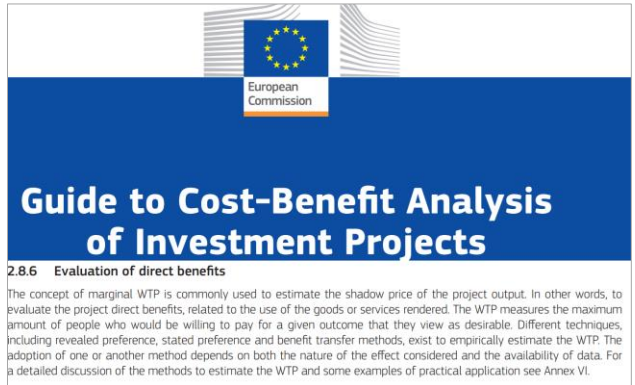


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2.2 Cost-Benefit Analysis of Risk Mitigation Measures

- Economic valuation helps quantify both the **costs of implementing risk reduction** strategies and the **benefits of avoiding losses**.
- This allows for a **cost-benefit analysis**, where decision-makers compare the costs of mitigation actions to the potential economic damages avoided.
- This is critical to determine whether certain risk management investments are worth pursuing.
- It also allow **to compare different risk management plans** to identify the most efficient.



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2.3 Justifying Investments in Preventive Measures

- Prevention is often less visible than recovery: while recovery efforts after a disaster get a lot of attention, prevention is usually harder to justify politically because the benefits are often intangible or hypothetical ("What if a flood does not happen?")
- Valuation makes the case for prevention: **quantifying the avoided costs of disasters** (e.g., reduced flood damage, minimized health risks) provides a solid argument for **investing in preventive measures**. This is essential for making the case to policymakers, funders, and the public.

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2.4 Insurance and compensation

- Economic valuation underpins **insurance pricing**, as it involves assessing the financial value of assets at risk and the probability of hazards occurring.
- This allows insurers to set premiums, and governments to evaluate whether risk transfer mechanisms, such as catastrophe bonds or disaster insurance pools, are viable.
- Post-disaster, economic valuation is used to assess the damage and losses incurred, guiding recovery efforts and **determining fair compensation** for affected populations.
- It also informs reconstruction strategies, **helping prioritize where and how to rebuild** in a cost-effective manner.

[A-Z index of U.S. government departments and agencies](#) > National Flood Insurance Program

National Flood Insurance Program (NFIP)

National Flood Insurance Program (NFIP) provides affordable insurance to property owners and encourages communities to adopt and enforce floodplain management regulations.

Website

[National Flood Insurance Program](#)

Contact

[Contact the National Flood Insurance Program](#)

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2.5 Risk Communication and Public Awareness

- Valuation can help **communicate risks to the public and stakeholders** more effectively.
- Quantifying the potential damages of floods, droughts, or groundwater contamination in terms of **monetary loss makes the risk more tangible** and relatable.
- When individuals and businesses understand the financial impact of hydrogeological risks, they are **more likely to take actions to reduce their own vulnerability**, such as elevating buildings or conserving water.

[Home](#) > [News](#) > \$5 trillion of nature-related economic risks will amplify climate change, says Oxford study

\$5 trillion of nature-related economic risks will amplify climate change, says Oxford study

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- "Nature is not the elephant in the room, it's the huge green scorpion running towards us" - study author.
- Biodiversity loss and environmental degradation generates significant and long-term risks to society, the economy and finance...and risks to global supply chains.
- Potentially catastrophic impacts of climate change and the critical importance of integrating climate and nature in our response to these threats.

Shocks to the global economy related to biodiversity loss and ecosystem damage could cost upwards of \$5 trillion, according to new research from Oxford University, which emerged alongside recommendations from central banks in respect of assessing nature-related risk.

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2.6 Payment for Ecosystem Services and incentives

- Valuation underpins programs that compensate landowners or communities for actions that preserve or enhance ecosystem services, such as watershed protection, which reduces the risk of floods and improves water quality.
- For example, a municipality may pay upstream farmers to maintain forest cover, which reduces flood risks downstream.
- PES schemes encourage sustainable land and water use by monetizing the benefits of preserving natural ecosystems that reduce hydrogeological risks.

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Why is non-market valuation important for risk management?

- Several of the elements at risk are **public goods** and as such they do **not have a market price** which can inform us about their value.
- Non-market valuation methods allow **to estimate the economic value of public goods**, thus providing crucial information for risk management.

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3. General concerns in valuing risk

- We now turn to discuss four fundamental concerns that typically arise during implementation of the more widely used approaches for valuing risk policies. Together, these four considerations form a common set of issues to consider as part of the application of, and choice among, alternative risk valuation methods.
- Although not typically included as part of any specific valuation approach, how each of these issues is handled can have a significant effect on risk valuation results and, in turn, on the selection of a preferred risk management approach.



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3.1. Valuation Perspective

- A first consideration is to identify the preferred perspective of the risk valuation effort.
- One aspect of this question is to determine whether the intent is descriptive, for example leading to an improved understanding of community perspectives on a risk management proposal, or prescriptive, leading to improved actions and activities or decisions.
- A second issue fundamental to the valuation perspective concerns the expectations of the study. Do we want precise quantitative responses rather than values expressed as ranges? Do we want a dollar number to fit into a cost-benefit analysis? Do we want stakeholders to agree on a single best management option? Successful risk valuation efforts typically begin by clarifying this questions and adjusting to them as needed.



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3.2. Participant Selection

- If values determine what matters, then who should be listened to: who will have a voice in the risk valuation process?
- An easy answer is to say that this group should include all those individuals potentially affected by the decision.
- In very localized risk issues, such as rerouting a small stream to decrease property damage from seasonal floods, this inclusive answer works well.



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17

3.2. Participant Selection

- In the usual, more complicated situations, however, the approach may be unrealistic. One reason is that it is often not possible to include all potentially affected stakeholders.
- Many of the actions taken to address local risks are recognized as having national or international implications: for example, the selection of a policy to protect endangered species in Oregon can affect the vacation plans of German or Kuwaiti tourists.
- In such cases, it may be useful to identify a small set of representative stakeholders, who then serve as a voice for, and conduit to, the larger group. Or sample a representative sample of the stakeholders.



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3.3 Gains Versus Losses

- From an economist's point of view, resources have value to the extent that people are willing to make sacrifices of other things in order to acquire them or to prevent their loss.
- These values typically are measured by the maximum that people are **willing to pay (WTP) to acquire or gain something** considered desirable and by the **minimum amount that people would demand to accept a loss (WTA)**.
- Empirical evidence from research by behavioral economists and psychologists strongly supports the notion that **people commonly value losses more highly than otherwise equivalent gains**. Both laboratory experiments and studies of market behavior show that this "endowment effect" typically results in two-fold or higher **disparities between WTP and WTA values**.



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3.3 Gains Versus Losses

- The magnitude of the difference suggests that **risk valuations of the same option may vary substantially** depending on whether the expected change in status is **perceived as a gain** from the status quo or **as a restoration of a loss**.
- As a result, using measures of WTP to assess the value of risk initiatives designed to prevent a loss (e.g., an oil spill) will tend to **bias risk assessments**, discourage the use of mitigation as a remedy for damages, underestimate compensation and liability awards, and result in too few restrictions being placed on activities posing health, infrastructure or environmental risks.
- In the same way, using WTA measures to assess the benefits of gains from risk management option may lead to a biased estimation of values.



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3.4 Time

- Risk management commonly involves decisions about how to take account of impacts occurring over time, including (in some situations) analysis of the consequences of current decisions that will accrue over decades or even centuries.
- The current practice for comparing costs and benefits occurring in different periods is to **weight the importance of future gains and losses using a single interest or discount rate**, although there has been a debate for years about exactly what this rate should be.



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21

3.4 Time

- Much of the more recent debate, however, focuses on suggestions for the use of varying rates depending on the particular circumstances or characteristics of a potential future event or outcome.
- For example, people appear to commonly discount future losses at a lower rate than future gains and to use much higher rates to discount outcomes in the near term relative to those accruing at more distant times.
- Evidence also suggests that individuals may employ different discount rates for different types of goods, for example private versus public resources or financial versus health risks.



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