

Costing natural hazards

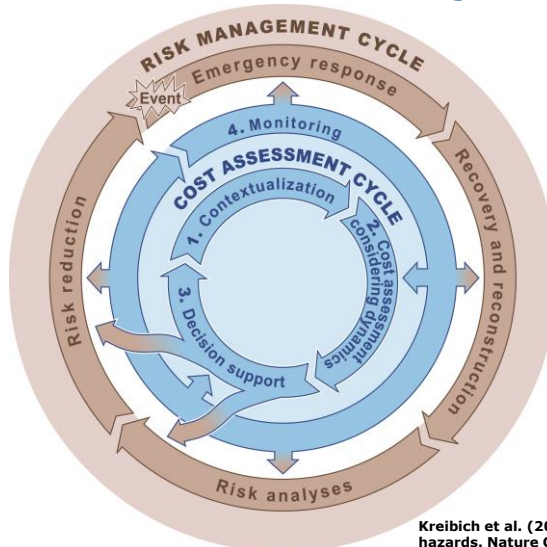
Heidi Kreibich, Jeroen C. J. M. van den Bergh, Laurens M. Bower, Philip Bubeck, Paolo Ciavola, Colin Green, Stephane Hallegatte, Ivana Logar, Volker Meyer, Reimund Schwarze, Annegret H. Thieken



CONHAZ
Costs of Natural Hazards



A vision for integrated cost assessment in natural hazard risk management



Kreibich et al. (2014) Costing natural hazards. *Nature Climate Change*, 4, 303–306

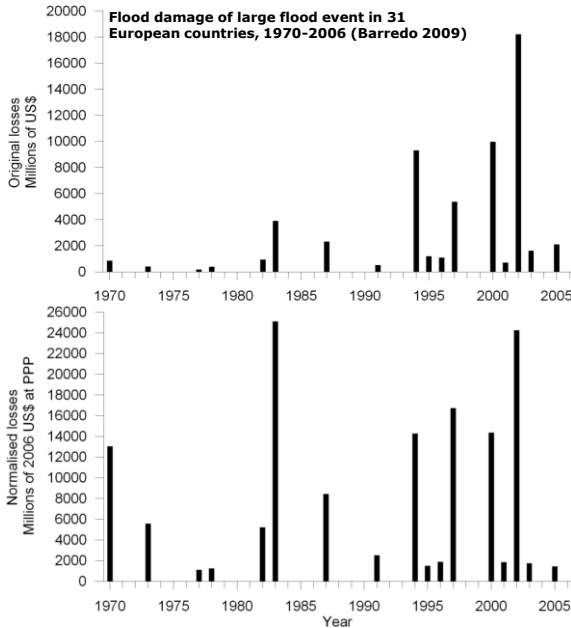


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Costs of Natural Hazards

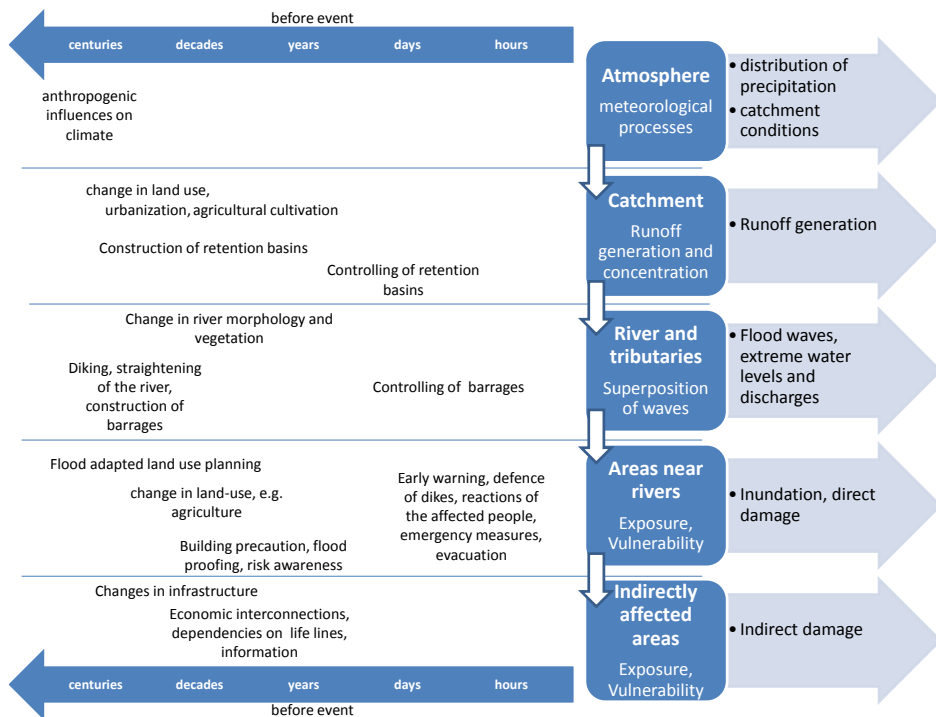
Heidi Kreibich: Costing natural hazards



Increasing flood damage



- normalised flood losses considering changes in population, wealth, and inflation at the country level; adjusted losses for purchasing power parities (PPP) remove inter-country price differences
- no detectable sign of climate change in normalised flood losses in Europe; observed increase in original flood losses driven by societal factors



Risk management for efficient adaptation

- Flood damage and risk was increasing and is expected to increase further
- Detection and attribution of changes as well as projections for the future are difficult
- Risk management in a changing system under high uncertainty



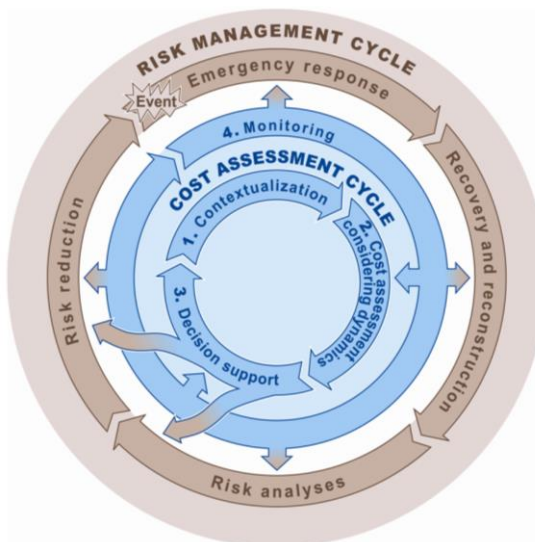
Costs arise in all phases of the risk management cycle and need to be comprehensively assessed

		Tangible costs	Intangible costs
Damage costs including recovery costs arise during and after an event, as well as during the recovery phase	Direct costs	<ul style="list-style-type: none"> Physical damage to assets: <ul style="list-style-type: none"> - buildings - contents - infrastructure 	<ul style="list-style-type: none"> Loss of life Health effects Loss of environmental goods
	Business interruption costs	<ul style="list-style-type: none"> Production interruption because of destroyed machinery 	<ul style="list-style-type: none"> Ecosystem services interrupted
	Indirect costs	<ul style="list-style-type: none"> Induced production losses of suppliers and customers of companies directly affected by the hazard 	<ul style="list-style-type: none"> Inconvenience of post-flood recovery Increased vulnerability of survivors
Risk mitigation costs arise due to emergency response, planning (including risk analyses), and risk reduction	Direct costs	<ul style="list-style-type: none"> Design and set-up of mitigation measures Operation and maintenance costs 	<ul style="list-style-type: none"> Environmental damage <ul style="list-style-type: none"> - due to development of mitigative infrastructure - or due to a change in agricultural practices
	Indirect costs	<ul style="list-style-type: none"> Induced costs in other sectors 	

Costing problems

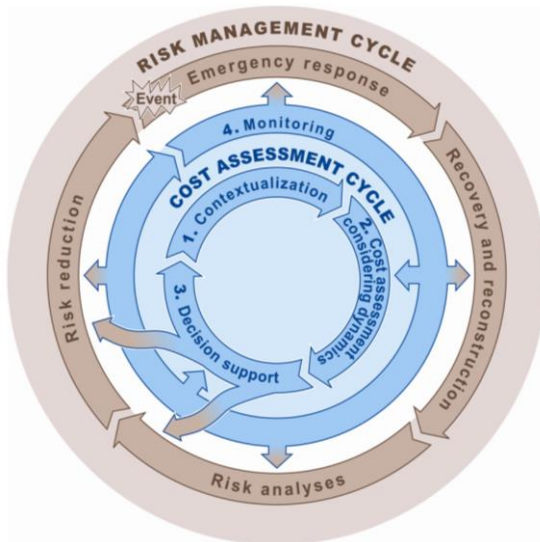
- More Validations need to be undertaken, Uncertainties need to be communicated to decision makers and the public
- Main focus on modelling direct economic costs, gap in assessing “intangibles”
- Need for validated, systemic approaches
- Incorporation of mitigation measures into damage models necessary
- Homogenised methods for trans-boundary risk assessments needed
- More emphasis on data collection in all phases of risk management

Phase 1: Contextualization



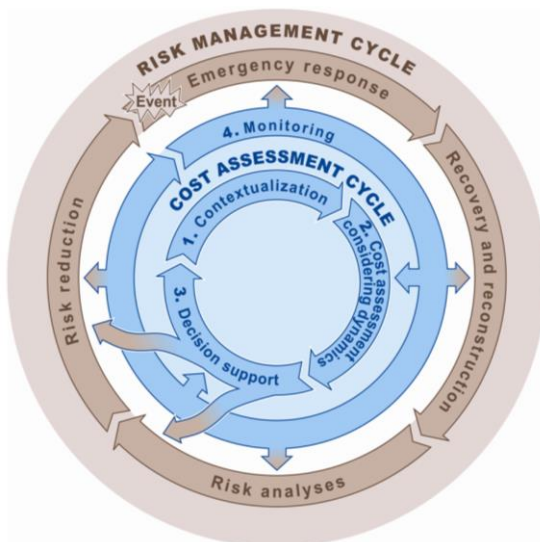
- Aim and scope of the assessment and the relevant hazards are defined.
- System boundaries, such as spatial scale and time horizon are identified.
- The relevant cost categories are defined on the basis of preliminary assessments or expert judgments.
- Potential risk mitigation strategies can be identified through an open dialogue with relevant stakeholders.

Phase 2: Cost assessment considering dynamics



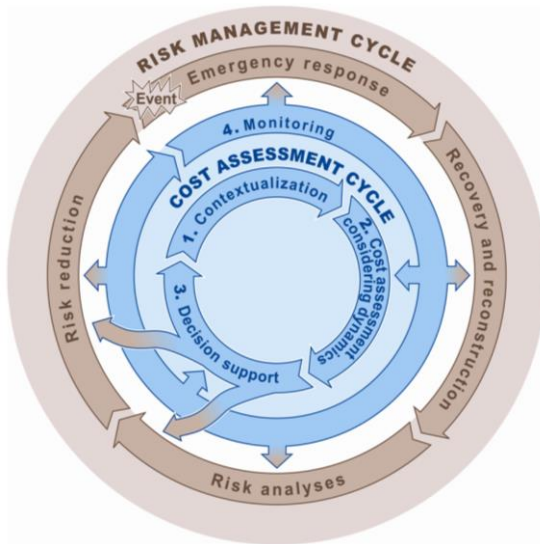
- Cost assessment is conducted for all relevant costs (identified in phase 1).
- Potential changes in future cost estimates based on scenarios are described, and their influence on the evaluation of risk mitigation measures (phase 3) is assessed.
- Uncertainties pertinent to the dynamic scenarios are quantified, clearly communicated, and taken into account in the decision-making process.

Phase 3: Decision support under uncertainty



- Cost assessment figures are integrated in decision-support frameworks, such as cost-benefit analysis, multi-criteria analysis, or robust decision making.
- When decision makers feel that uncertainties are too high to make a decision, more precise cost estimates need to be achieved (return to phase 2).
- Alternatively, additional criteria, like robustness, flexibility, and the precautionary principle can be considered

Phase 4: Monitoring



- Continuous monitoring should be put in place by the responsible authorities.
- Damage is recorded in the aftermath of natural hazard events. Expenditures for risk reduction are collected continuously.
- It should be verified regularly whether such new insights are leading to necessary adjustments in the decision context of risk management (phase 1).
- Updated cost estimates (phase 2) are used for a new evaluation of risk mitigation strategies (phase 3).

Summary

- A better understanding of the total costs, is needed to accomplish efficient risk management of natural hazards.
- The cost assessment cycle involves the continuous monitoring of costs, thus enabling the early detection of inefficient risk mitigation strategies.
- A close link between the cost assessment cycle and the risk management cycle guarantees integrated cost assessment and supports improved decision making for more efficient risk management.
- Making better, more efficient decisions will gain even more importance in view of global environmental change.

COMMENTARY:

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The proposed 'cost assessment cycle' is a framework for the integrated cost assessment of natural hazards.