Economic assessment of climate change adaptation options incorporating Bayesian networks: An integrated framework

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Economic assessment of climate change adaptation options incorporating Bayesian networks: An integrated framework

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Purpose

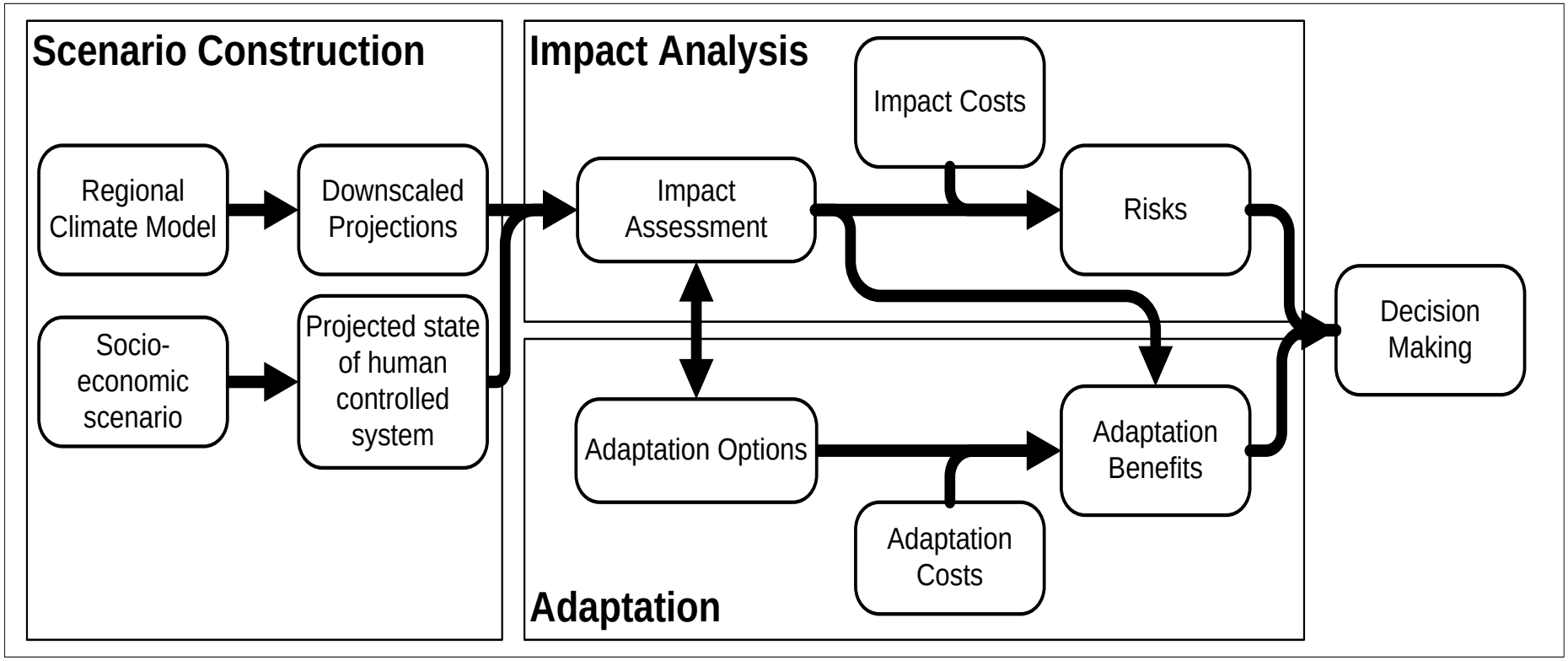
- A framework for climate change adaptation decision making
- Handles complex inter-relationships between impacts and adaptation options
- Flexible structure for applied climate change adaptation decision making.

Outline

- 1.Introduction
  - 1.1 Adaptation in the context of responses to climate change
  - 1.2 Analytical structure
- 2. Scenario construction
  - 2.1. Socioeconomic scenarios
  - 2.2 Climate modeling and climate scenarios
  - 2.3 Future System Scenarios
- 3. Impacts
  - 3.1. Impact Assessment
  - 3.2 Costs
  - 3.3 Risk
- 4. Adaptation
  - 4.1 Identification of Adaptation Options
  - 4.2 Bayesian Network Approach
  - 4.3 Adaptation Costs and Benefits
- 5. Discussion and Conclusions

Introduction

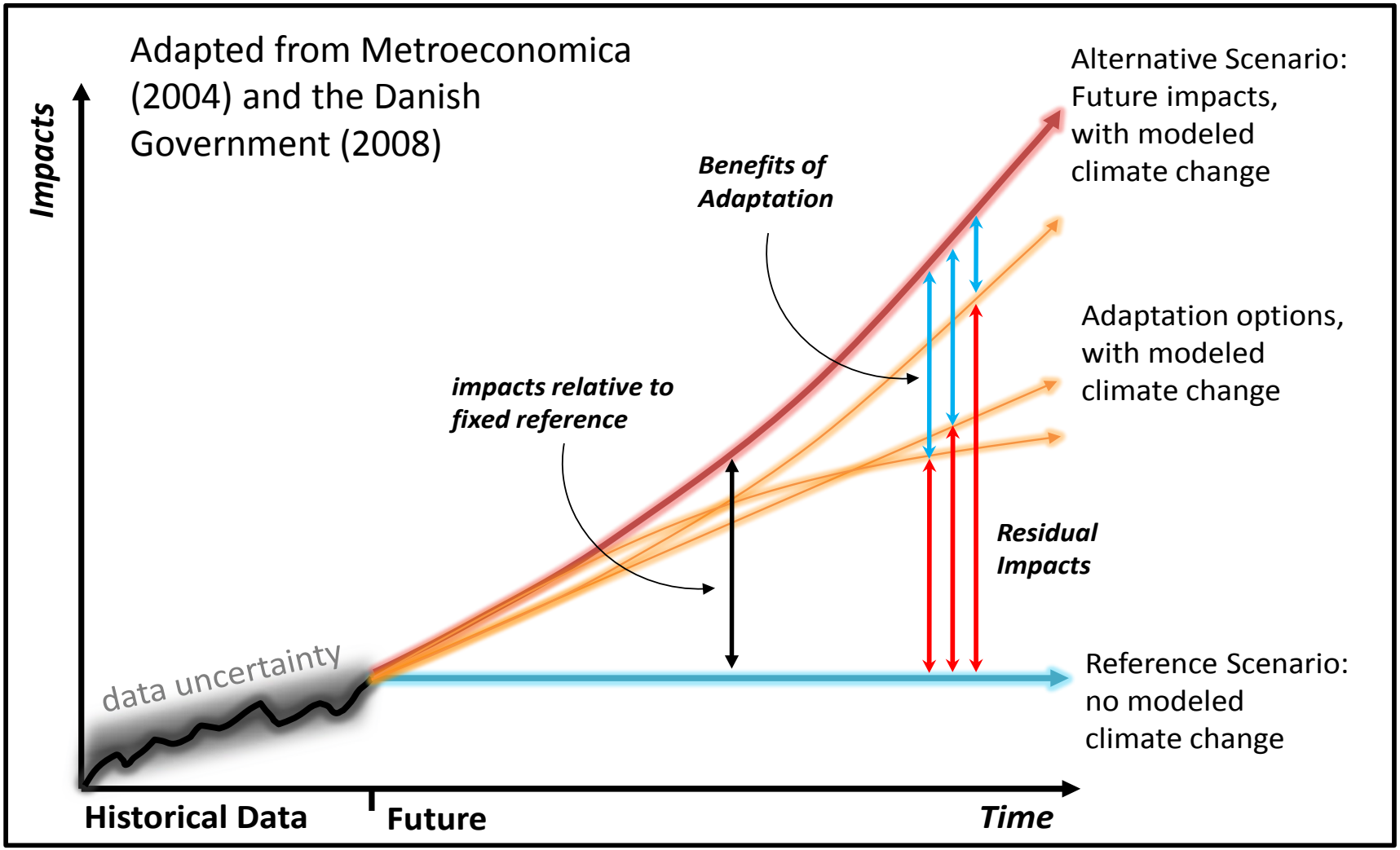
Analytical Structure



Scenarios

- Socioeconomic
  - Question of scale (Global vs. Local)
  - Uncertainty bracketed with scenario analysis
- Climatic
  - Regional climate models
  - Downscaling
- Coupled scenarios

Theoretical scenario development: understanding the risks from climate change and the benefits of adaptation measures.



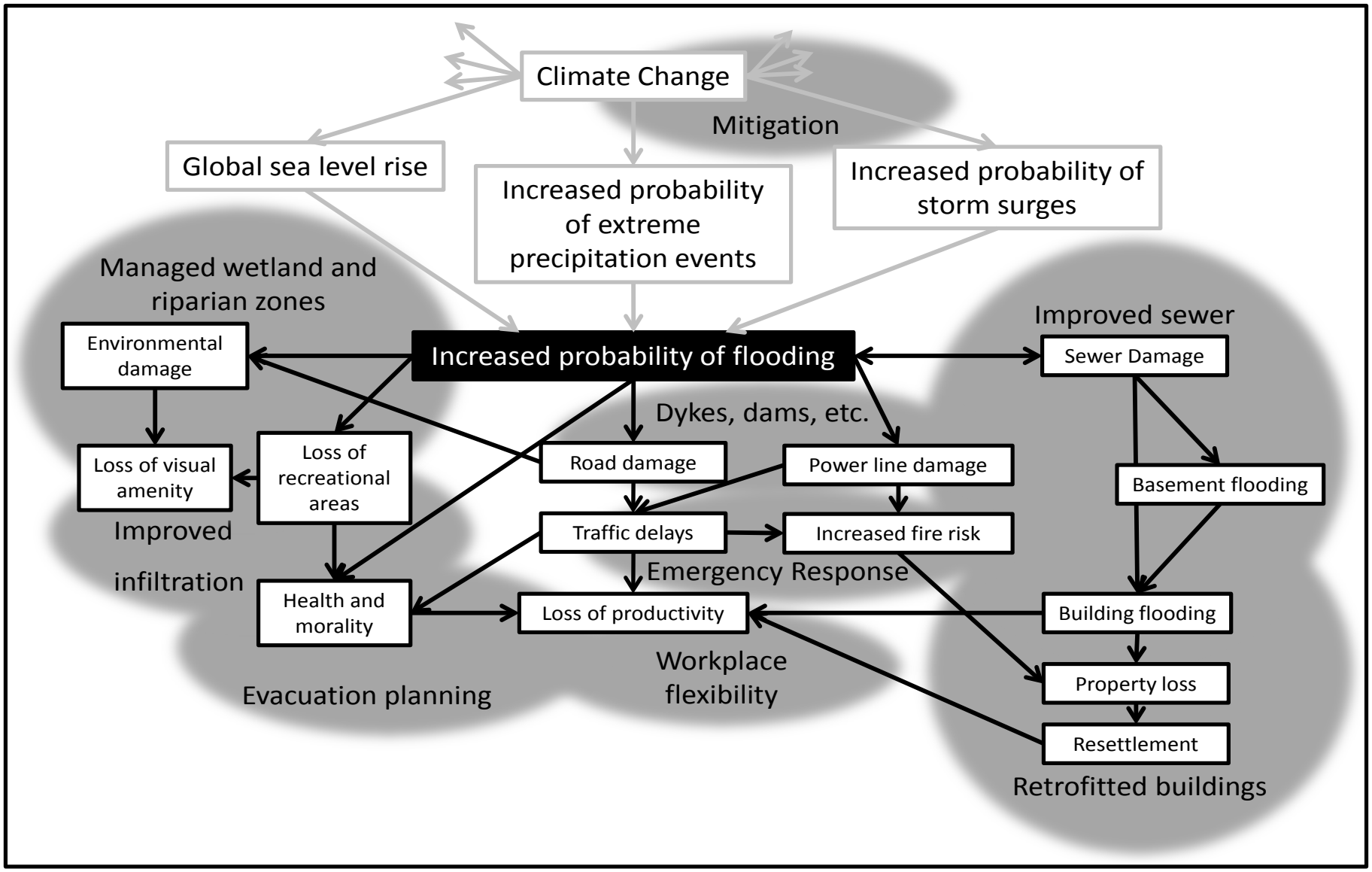
Impacts

- Assessment
  - characterize change in the climate variable or the extreme weather event (intensity, frequency and duration)
  - obtain spatially explicit information on asset exposure and vulnerability
  - develop asset specific thresholds and damage functions
  - quantify of both the physical and economic impacts
- Costs
  - Cost-Benefit-Analysis; Net Present Value with discounting
  - Multi-Criteria Decision Analysis
- Risk
  - probability of an extreme event multiplied by the consequence of an event

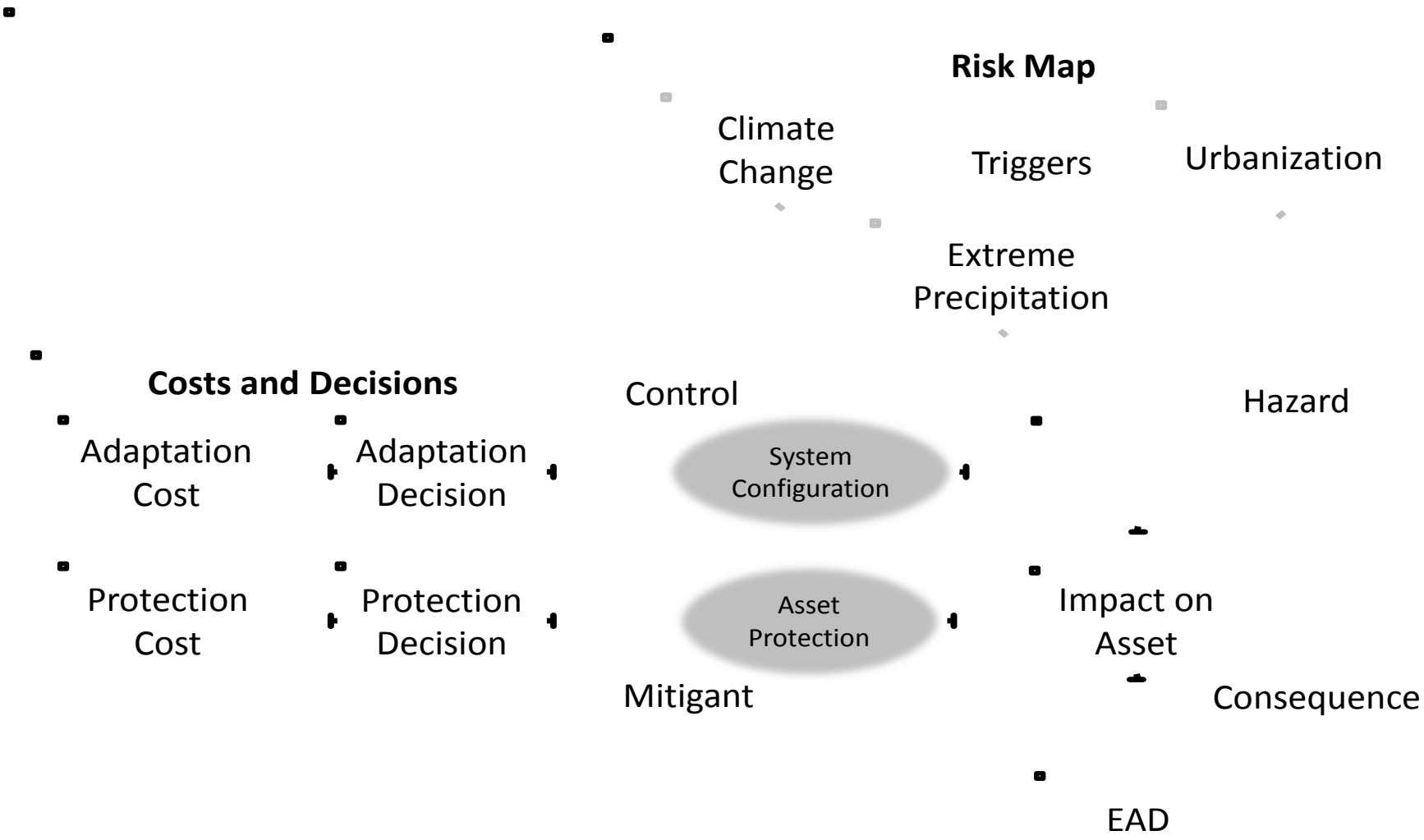
Adaptation Options

- Identification
  - Non-linearity
  - Mapping
- Bayesian Network Approach
  - used to quantify risk in the system
  - determine the probability distribution for each specific impact
  - Static → Dynamic
- Costs and Benefits
  - Priority setting
  - Uncertainty analysis

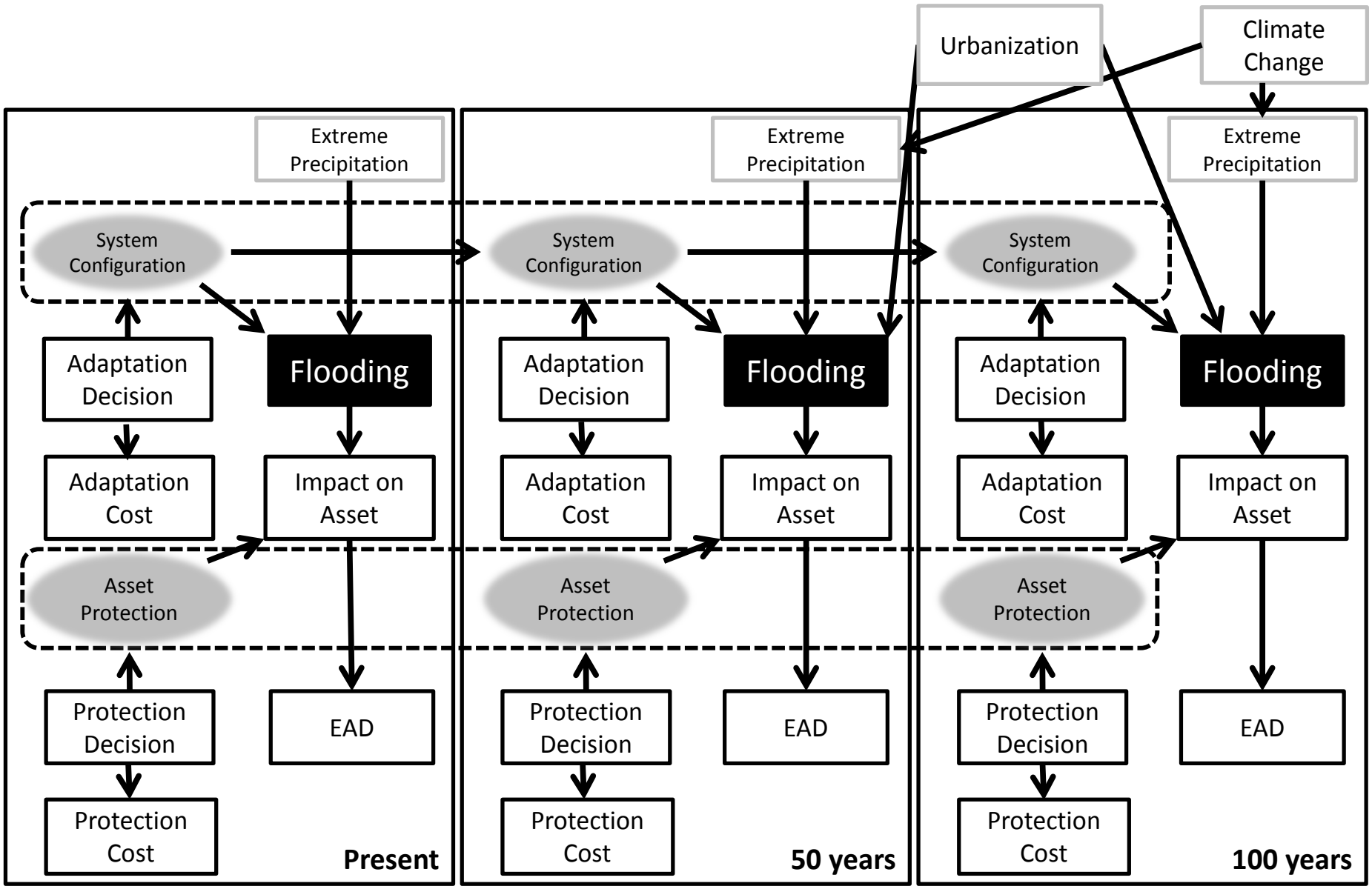
Linkages of impacts due to climate change for an urban area with adaptation options



A static ID for urban flood risk assessment



Dynamic ID for urban flood risk assessment under non-stationary conditions



Discussion and Conclusions

+ The main strength of the BN approach is the ability to represent complex dynamic systems and the inter-linkages between various nodes in the system.

- complex set of input data required for the analysis & can only deal with continuous values in a limited manner, and these types of variables are common in environmental assessment.

Status

- Submitted May 31, 2013
- One review completed
- Editor requested other reviewer names

Upcoming

- Transportation Analysis of Copenhagen