Adaptation Planning for NPS Management Under a Changing Climate

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Adaptation

- Reactive – wait until impacts have occurred
- Proactive – take actions before major impacts have occurred – much research has shown this is generally more cost effective
- Planning must include both natural and built environment
- Must include mitigation

Challenges in Climate Change Management

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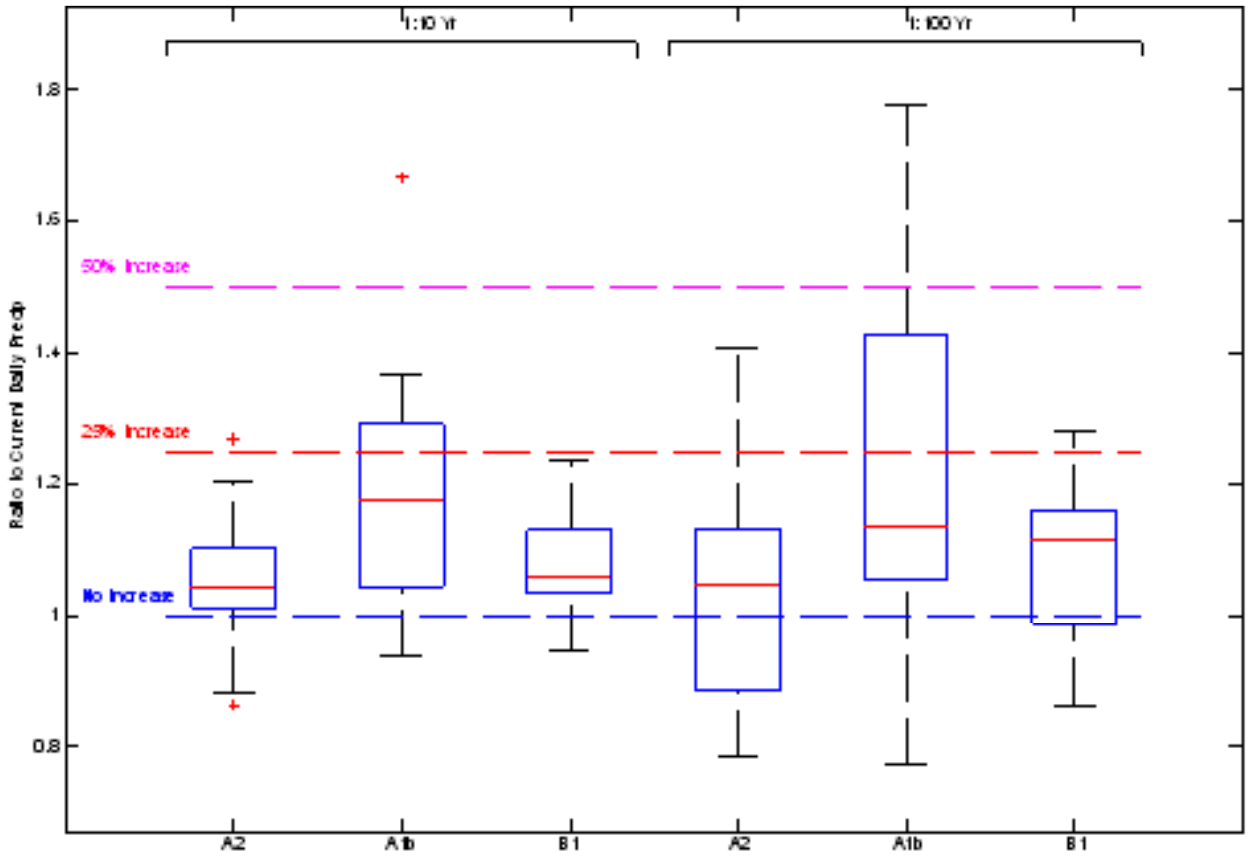
- Difficulty in separating climate change signals from other drivers and variabilities
- Need to consider uncertainties in phenomena previously considered constant
- Deep uncertainties with projections and forecasts
- Climate change uncertainties are numerous and interconnected, and have large spatial and temporal scales
- Must be integrated with other drivers such as population growth, land use change, globalization

(NRC(2009), Lynn Scarlett (2010)

Example of Climate Change Uncertainties

Figure 9 Annual Relative Change in Daily Precipitation for 2050 in Somerville



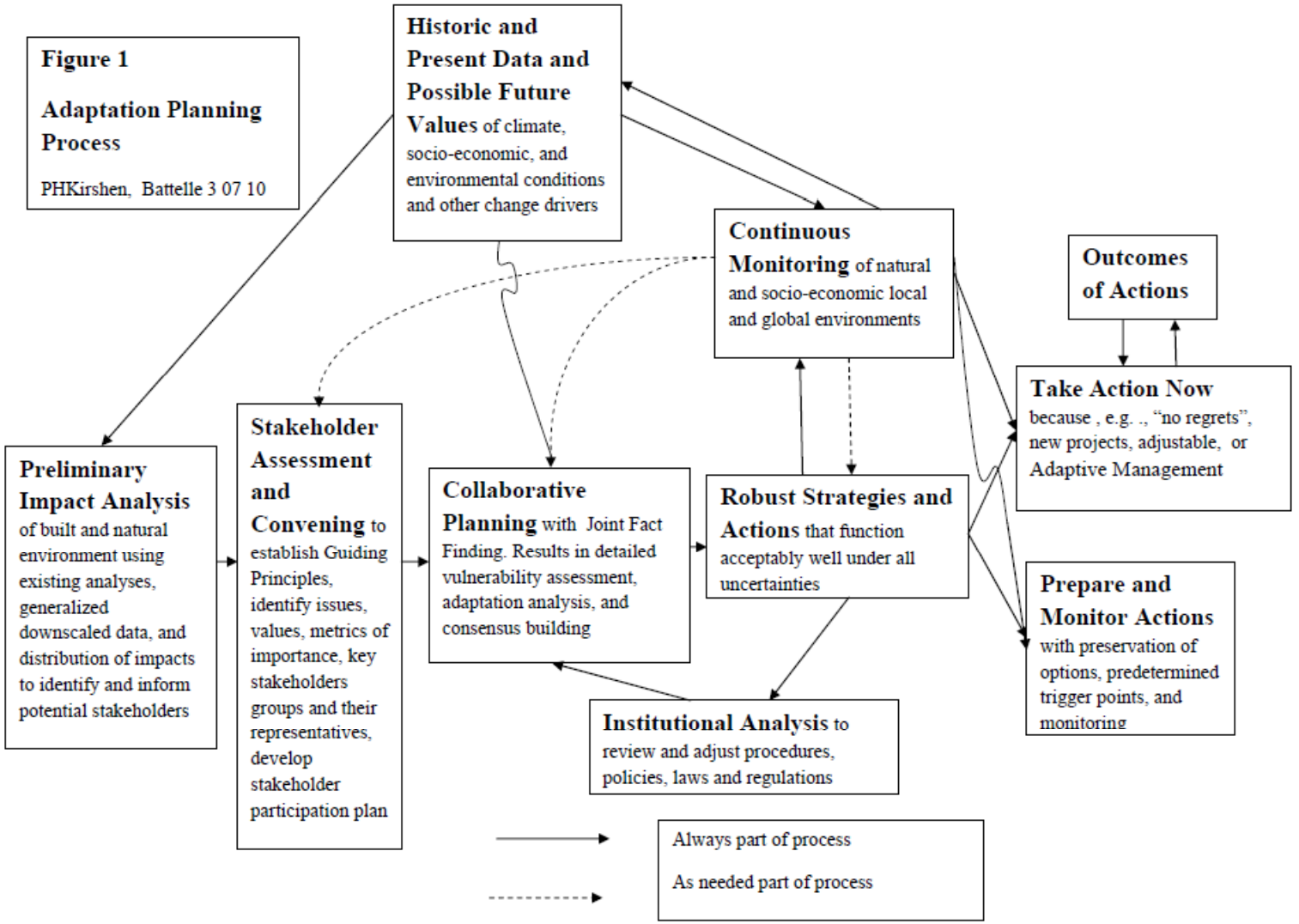


Figure 1
Adaptation Planning Process
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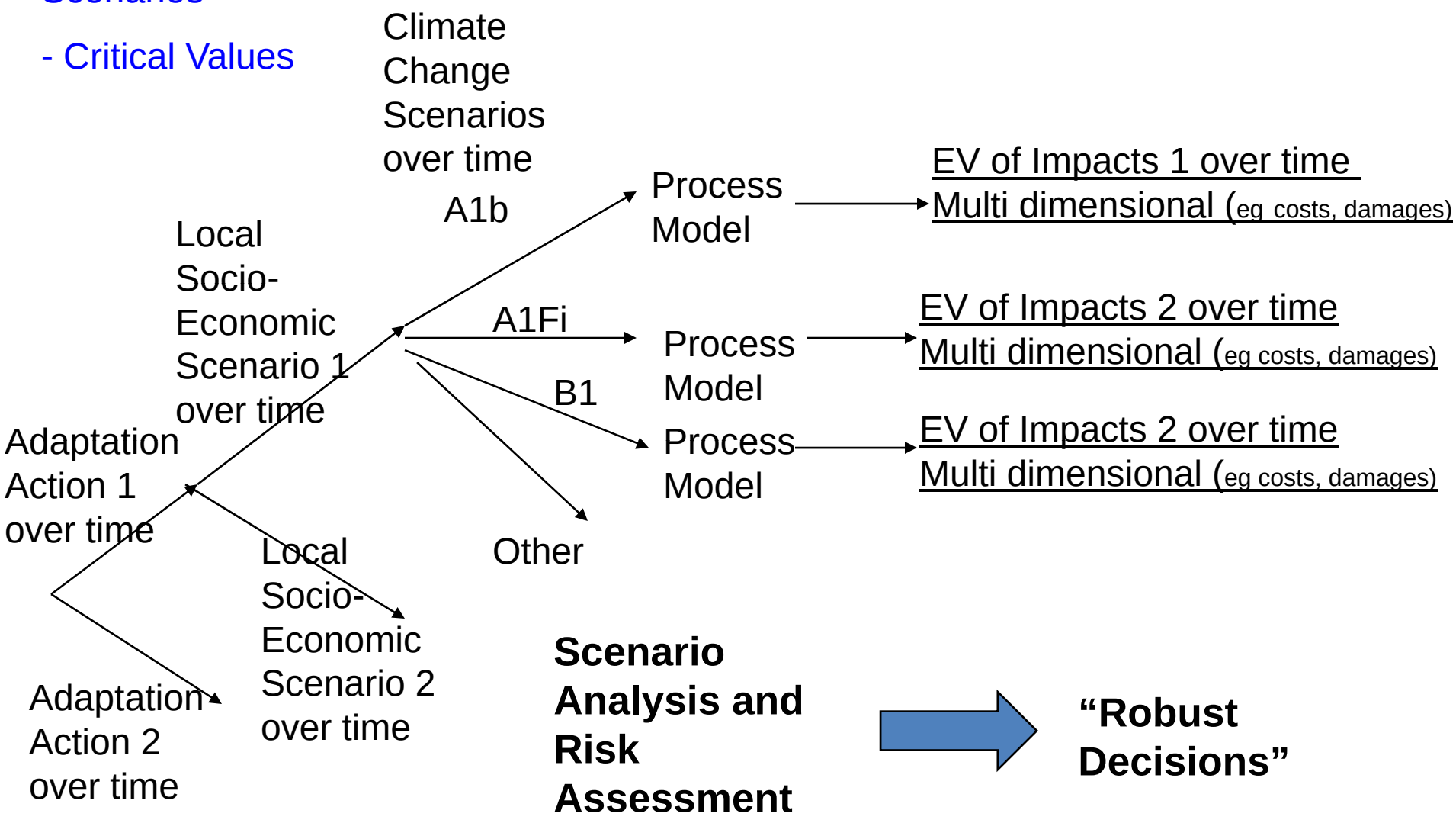
Historic and Present Data and Possible Future Values of climate, socio-economic, and environmental conditions and other change drivers
Continuous Monitoring of natural and socio-economic local and global environments
Outcomes of Actions
Take Action Now because , e.g. ., "no regrets", new projects, adjustable, or Adaptive Management
Preliminary Impact Analysis of built and natural environment using existing analyses, generalized downscaled data, and distribution of impacts to identify and inform potential stakeholders
Stakeholder Assessment and Convening to establish Guiding Principles, identify issues, values, metrics of importance, key stakeholders groups and their representatives, develop stakeholder participation plan
Collaborative Planning with Joint Fact Finding. Results in detailed vulnerability assessment, adaptation analysis, and consensus building
Robust Strategies and Actions that function acceptably well under all uncertainties
Prepare and Monitor Actions with preservation of options, predetermined trigger points, and monitoring
Institutional Analysis to review and adjust procedures, policies, laws and regulations
Always part of process
As needed part of process

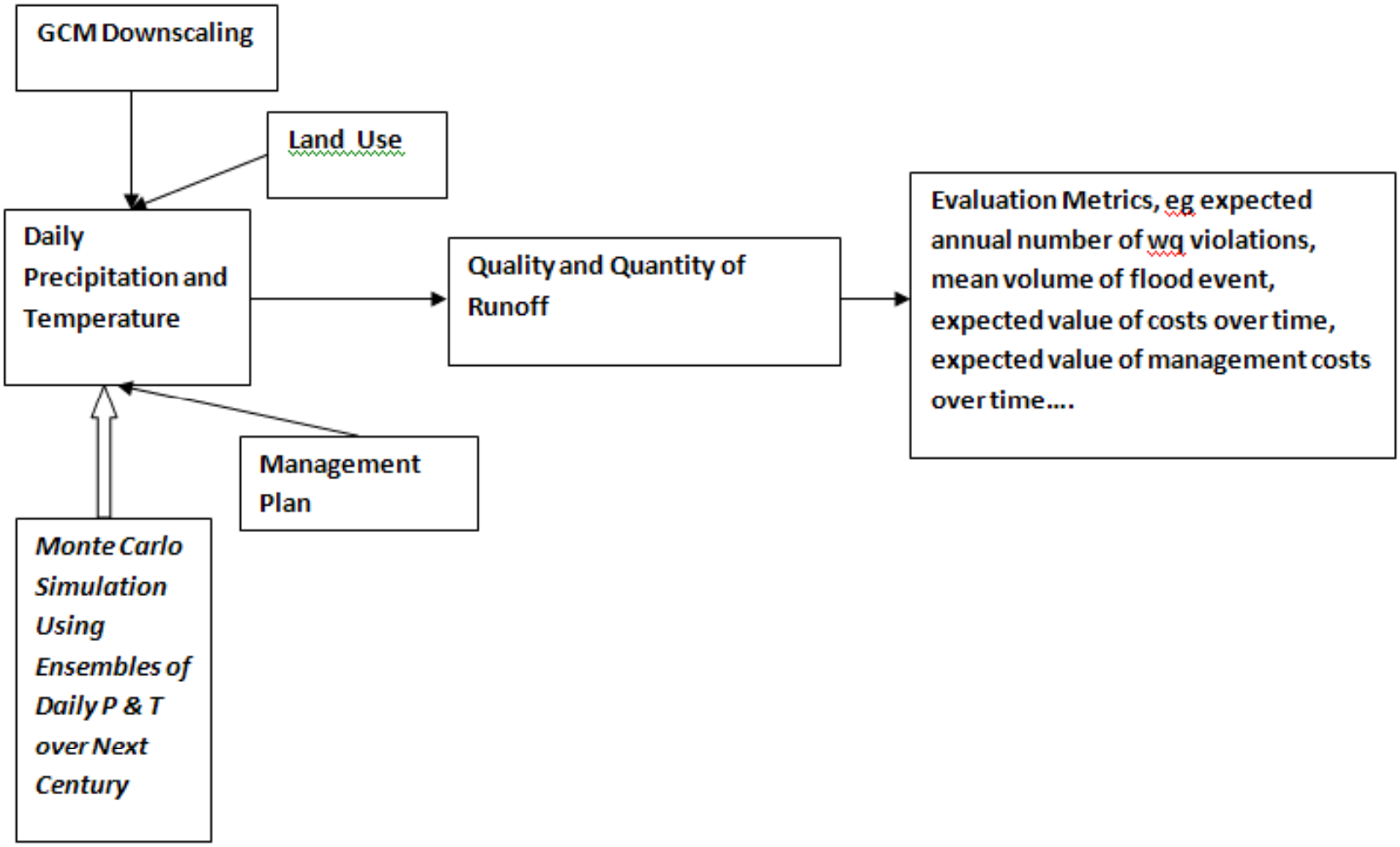
Variations:

- Backward Scenarios

- Critical Values

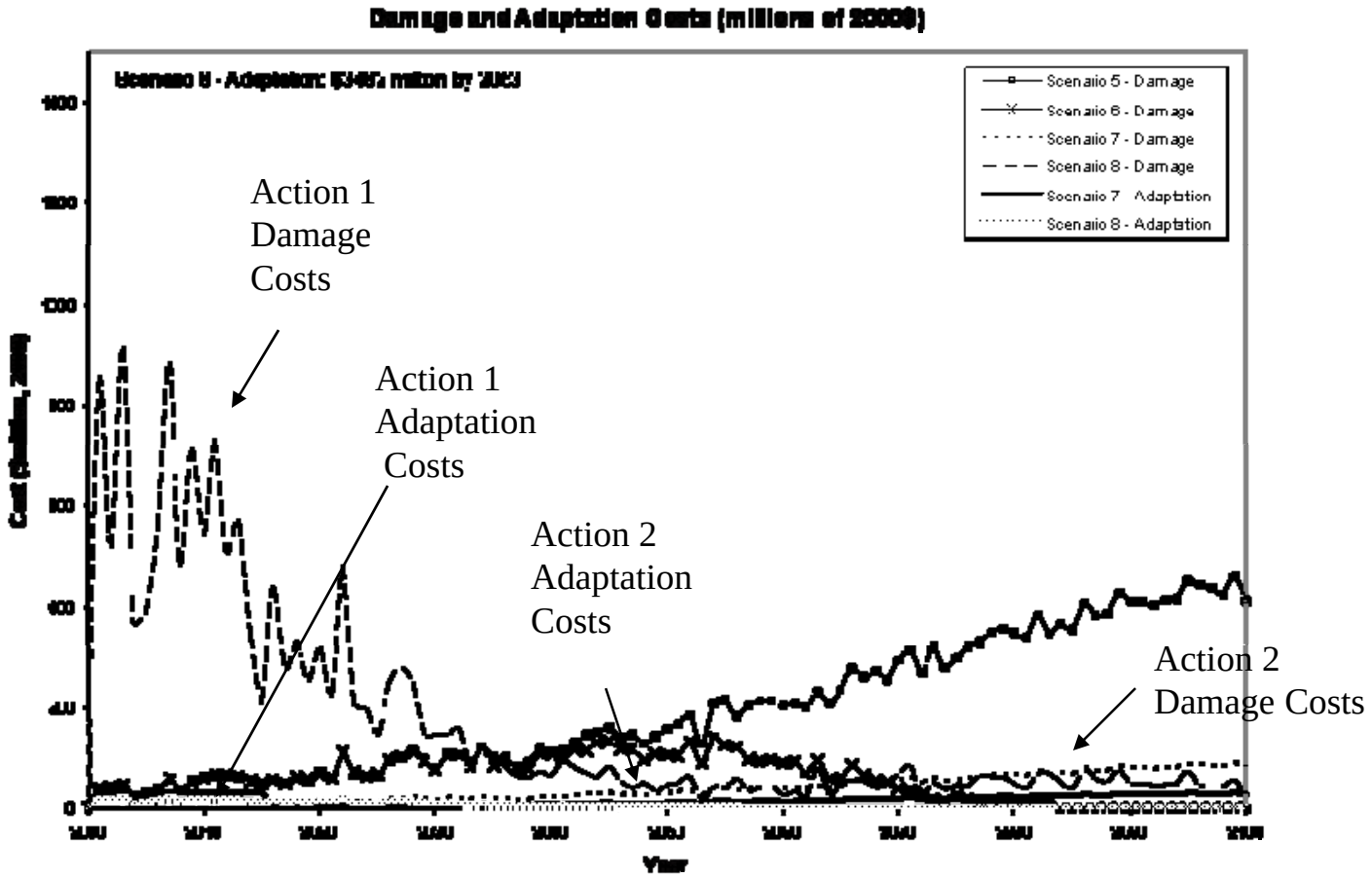
Decision Framework





Example of Risk Analysis

Example of Temporal Impacts



Example –Community is investigating use of local and regional BMPs for storm water management under present and future climates

Local: On-Site Retention, porous pavement, rain gardens, on-site detention

Regional: Stormwater ponds, riparian buffers, constructed wetlands, infiltration galleries

Metric: Total Expected Value Construction, OMR , and Damage Costs

Summary

SCENARIO	COST ($millions)	COST ($millions)
	2030	2070
Do-Nothing – no climate change	4	8
Do-Nothing – Low Scenario; Precipitation increases 10 % by 2070 climate change	6	14
Do-Nothing – High Scenario; Precipitation increases 15 % by 2070 climate change	7	20
Regional – no climate change	2	6
Regional – Low Scenario	3	10
Regional – High Scenario	4	15
Local – no climate change	3	6
Local – Low Scenario	4	8
Local – High Scenario	7	14

- Do Nothing is worst under all scenarios
- Regional Best to 2030
- Local Better to 2070

Total Expected Value, Present Value Construction, Maintenance, and Damage Costs ($million)

Some Research Needs

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- Narrowing uncertainties in climate change projections both in time and space
- Developing applicable decision analysis techniques
- Developing flexible infrastructure for adjustable adaptation
- Role of ecosystems services in protecting the built environment under climate change and protection of ecosystems
- Developing institutions that can take a long-term view of a problem such as climate change
- Incorporating stakeholders into the process

On Going Projects

- Management of Urban Drainage under Climate Change
- Adaptation of Coastal Communities in New England to Climate Change
- Environmental Justice and Adaptation
- Local Decision Making Training in Adaptation
- Joint Adaptation Planning of the Built and Natural Environments

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Thank you