



# Adaptation Assessment and Planning: Identification of Options and Technical Feasibility

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Adaptation Solutions



# Assessing Adaptation Needs and Options

## ACTIVITIES

1. Project  
Screening,  
Scoping

2. Impact  
Assessment

3. Vulnerability  
Assessment

4. Adaptation  
Assessment

5. Implementation  
Arrangements

## STEPS

**Step 13:** Identify all potential adaptation options

**Step 14:** Conduct consultations

**Step 15:** Conduct economic analysis

**Step 16:** Prioritize and select adaptation option(s)



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# Overview of the Presentation

1. Identifying Adaptation Options
2. Conducting Consultations
3. Conducting Economic Analysis of Options
4. Prioritizing and Selecting Adaptation Options
5. Timing of Adaptation Interventions
6. Support and Resources



# 1. Identifying Adaptation Options

The goal of the adaptation assessment is to identify and prioritize the most appropriate and cost-effective adaptation measures to incorporate into the project. These can include:

- Modifications in project location and/or scale
- Modifications in engineering materials and designs
- Alternative technology choices
- Biophysical- and Ecosystem-based measures
- Community-based adaptation
- Policy and Social options (institutional re-design)
- Business-as-usual (“do nothing”)

In many project settings, including large and complex projects, a combination of approaches may be most effective.



# Continuum from Development to Adaptation

## Addressing Drivers of Vulnerability

*Enabling human development:* actions that reduce poverty and vulnerability; increase capability and coping capacity:

- Livelihood diversification
- Literacy and education
- Women's rights
- Community health
- Food security
- Water supply, sanitation

## Building Response Capacity

*Robust systems for problem solving:* actions that build institutional, technical and planning capacity:

- Natural resources management
- Weather data collection, forecasting
- Disaster early warning systems
- Communications systems

## Managing Climate Risks

*Climate risk management:* actions that incorporate climate information into decision-making to reduce risks:

- Climate proofing projects
- Disaster response planning
- Drought-resistant crops; cropping systems
- Robust, adaptive technologies

## Confronting Climate Change

*Addressing climate change impacts:* actions that target specific, anticipated impacts outside of historical experience:

- Relocation due to sea level rise (SLR)
- Coastal defenses from SLR
- Managing Glacial Lake Outburst Floods (GLOF)
- Extra storage to capture glacial melt

“soft”

“hard”



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From McGray et al. (2007) *Weathering the Storm*

# Adaptation Options in Agriculture Sector Projects

## Engineering (Structural) Options

- Material specifications
- Dimension and capacity standards
- Drainage and soil conservation
- Protective engineering structures
- High efficiency irrigation

## Non-Engineering Options

- Water resources management
- Infrastructure operation
- Maintenance planning
- Master planning and land use planning
- Farm operation management
- Environmental management
- Training/capacity building
- Information systems

## Biophysical Options

- Plant breeding
- IPM
- .....

## “Do nothing” Option (wait and see)



# Adaptation Options in Road Transport Projects

## Engineering (Structural) Options

- Corridor location
- Subsurface conditions
- Material specifications
- Cross section and standard dimensions
- Drainage and erosion
- Protective engineering structures

## Non-Engineering Options

- Maintenance planning and early warning
- Alignment, master planning, and land use planning
- Environmental management

“Do nothing” Option (wait and see)



Adaptation Solutions



<b>Water Sector Adaptation Technology</b>	<b>Diversify Supply</b>	<b>GW Re-charge</b>	<b>Extreme Events</b>	<b>WQ Degradation</b>	<b>Storm-water control, capture</b>	<b>Water Conservation</b>
<b>Boreholes/Tubewells as a Drought Intervention for Domestic Water Supply</b>			<b>X</b>			
<b>Desalination</b>	<b>X</b>			<b>X</b>		
<b>Household Water Treatment, Safe Storage</b>				<b>X</b>		
<b>Improving Resilience of Wells to Flooding</b>			<b>X</b>	<b>X</b>		
<b>Water-efficient Fixtures and Appliances</b>						<b>X</b>
<b>Leakage Management, Detection and Repair in Piped Systems</b>				<b>X</b>		<b>X</b>
<b>Post-construction Support for Community-managed Water Systems</b>	<b>X</b>		<b>X</b>	<b>X</b>		
<b>Rainwater Collection, Ground Surfaces— Small Reservoirs and Micro-catchments</b>	<b>X</b>	<b>X</b>		<b>X</b>	<b>X</b>	
<b>Rainwater Harvesting from Roofs</b>	<b>X</b>	<b>X</b>			<b>X</b>	
<b>Water Reclamation and Reuse</b>	<b>X</b>	<b>X</b>		<b>X</b>		
<b>Water Safety Plans (WSPs)</b>			<b>X</b>	<b>X</b>		

**Source: TNA (2011), Technologies for Climate Change – The Water Sector. UNEP, GEF**



# Ecosystem-based Adaptation and Co-Benefits

Activity	Adaptive Function	Co-benefits			
		Social and Cultural	Economic	Biodiversity	Mitigation
Mangrove Conservation	Protection against storm surges, coastal erosion associated with sea- level rise etc.	Fisheries and prawn cultivation – local employment and food security	Income generated through mangrove products	Conservation of Mangrove-dependent species	Conservation of carbon stocks (above and below ground)
Forest conservation and sustainable forest management	Maintenance of nutrient and water flow, prevention of landslides	Recreation, culture, shelter	Ecotourism, recreation, sustainable logging	Conservation of habitat for forest-dependent Species	Carbon storage
Diverse agroforestry in agricultural land	Diversification of agricultural production to cope with changed climate	Contribution to food and fuel wood security	Income from sale of timber, firewood, etc.	Conservation of biodiversity in agricultural Landscape	Carbon storage (above and below ground biomass)

Source: Convention on Biodiversity 2009

# Resources, Adaptation Technologies



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ENERGY, CLIMATE  
AND SUSTAINABLE  
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DEVELOPMENT



TNA Guidebook Series



Technologies for  
Climate Change Adaptation  
– Coastal Erosion and Flooding –



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AND SUSTAINABLE  
DEVELOPMENT

UNIVERSITY OF  
Southampton

# Illustration of “hard” vs “soft” options: Ho Chi Minh City Integrated Flood Risk Management

## “Soft” Options:

- Raise homes
- Relocate areas
- Manage ground-water
- Capture rain-water



## “Hard” Options:

- Levees
- Drains
- Existing infrastructure





**Illustration 2 of “hard” vs “soft” options - a comparative analysis of ecosystem-based adaptations and engineering options for Lami Town, Fiji (UNEP, SPREP and partners)**

# Context of Vulnerability, Lami Town

## Vulnerability to Flooding:

- coastal flooding from storm surges or large waves from Suva Harbour
- flash flooding from rapidly rising rivers where hillslopes have been cleared of vegetation
- surface flooding where high rainfall pools in low lying areas

## Vulnerability to Erosion:

- Shoreline erosion during storms from surge, waves, or longshore drift of sediment
- Riverbank erosion risk where rivers flow rapidly through the hills and where the river has been constrained by engineering
- Upslope or inland erosion occurring on hill-slopes, especially after forest clearing.

Source: Lami Town Synthesis Report



# Adaptation Options to Reduce Coastal Vulnerability

## Ecosystem-based options:

- Re-plant mangroves
- Re-plant stream buffers
- Reduce upland logging
- Reduce coral extraction

## Policy and social options:

- Regulating land tenure & informal settlements
- Re-zoning land use
- Re-location of highly vulnerable households
- Flood warning system and mapping



Source: Lami Town Synthesis Report



# Engineering Options to Reduce Coastal Vulnerability

- Reinforce Rivers:
  - Protect river banks
  - Dredge rivers
  - River re-alignment
- Build sea walls
- Increase drainage
- Improve bridges
- Land reclamation
- Storm surge barriers
- Beach replenishment
- Sea dikes
- Elevation of infrastructure



Source: Lami Town Synthesis Report



# Development of Adaptation Scenarios

## Percentage Implementation of Adaptation Options

<b>Adaptation Options</b>	<b>Scenario 1 – Ecosystem-based</b>	<b>Scenario 2 – Emphasis on Ecosystem-based</b>	<b>Scenario 3 – Emphasis on Engineering Options</b>	<b>Scenario 4 – Engineering Options</b>
<b>Re-plant Mangroves</b>	<b>100%</b>	<b>75%</b>	<b>25%</b>	<b>0%</b>
<b>Re-plant stream buffer</b>	<b>100%</b>	<b>75%</b>	<b>25%</b>	<b>0%</b>
<b>Monitoring &amp; Enforcement</b>	<b>100%</b>	<b>40%</b>	<b>20%</b>	<b>0%</b>
<b>Reduce Upland Logging</b>	<b>100%</b>	<b>50%</b>	<b>20%</b>	<b>0%</b>
<b>Reduce Coral Extraction</b>	<b>100%</b>	<b>40%</b>	<b>20%</b>	<b>0%</b>
<b>Build Sea Walls</b>	<b>0%</b>	<b>25%</b>	<b>75%</b>	<b>100%</b>
<b>Reinforce Rivers</b>	<b>0%</b>	<b>25%</b>	<b>75%</b>	<b>100%</b>
<b>Increase Drainage</b>	<b>0%</b>	<b>25%</b>	<b>75%</b>	<b>100%</b>

Source: Lami Town Synthesis Report



# Resources for Identifying Adaptation Options

Resource	URL	Uses	Products
Technology Needs Assessment (TNA): UNEP, GEF, partners	<a href="http://tech-action.org/">http://tech-action.org/</a>	Guidance in process, technology, finance and other resources	Guidebooks, national studies, databases, resources
WeAdapt: SEI and partners	<a href="https://weadapt.org/">https://weadapt.org/</a>	Identify, support adaptation good practices	Guidance materials and resources; case studies
Asia Pacific Adaptation Network (APAN): ADB, MoEJ, USAID, SEI, UNEP, IGES	<a href="http://www.apan-gan.net/adaptation-practices">www.apan-gan.net/adaptation-practices</a>	Identify, support adaptation good practices	Guidance materials and resources; case studies; adaptation technology database
Asian Development Bank (ADB)	<a href="http://www.adb.org">www.adb.org</a>	Climate risk management of investment projects, adaptation planning	Guidelines for Climate Proofing: Agriculture, Transport, Energy; case studies

# Summary, Discussion Points

- **Adaptation approaches and strategies are highly context-specific (location, sector, type and magnitude of impacts, socio-economic context, ...)**
- **A range of adaptation approaches is often available for any given project, encompassing both “hard” (engineering and technology-based) and “soft” (biological, management, social and policy) options**
- **In many project settings, hard and soft approaches can be complimentary**
- **There is a growing case study literature that can support the identification and selection of adaptation options**



## 2. Conducting Consultations

The identification of adaptation options will require inputs from a range of stakeholders. Conducting roundtable consultations provides useful input for the process of identifying and appraising the whole range of adaptation options.

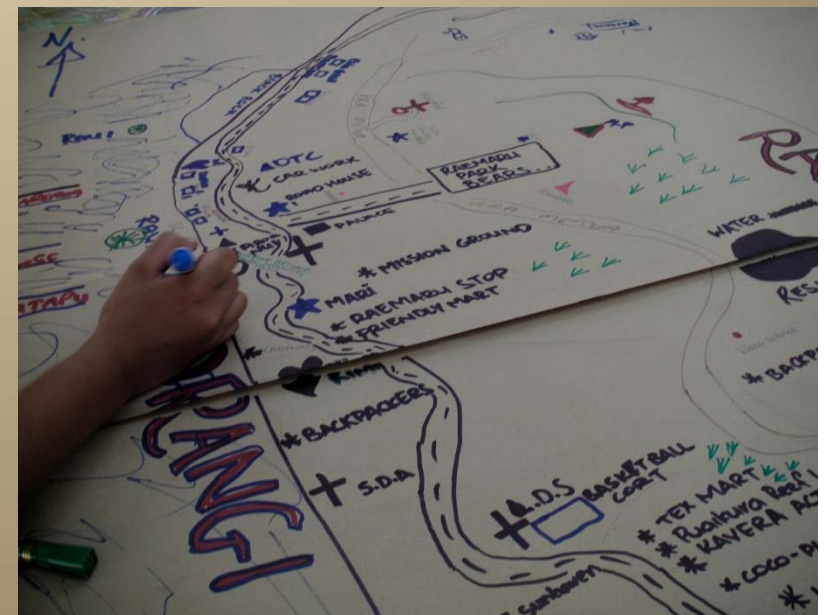
In many adaptation frameworks, including Robust Decision-Making (RDM) using the XLRM approach, stakeholder consultation is an essential step in which the performance metrics are agreed upon. Metrics are the goals and performance standards used to evaluate the effectiveness of a particular set of policies, and to compare options.

More generally, stakeholder consultation is required to ensure that any adaptation option or intervention chosen is acceptable to the community of stakeholders, who are in most cases the intended beneficiaries of the project.



# Illustration: Participatory Mapping to Support Adaptation and Disaster Risk Management

- Members of communities at-risk conduct participatory mapping to identify (i) locations of cultural, economic and ecological significance; (ii) locations historically vulnerable to flooding, landslides
- This information complements, and improves spatial information developed from conventional mapping and RS
- In addition, community ownership of the project – and likely success of interventions – are greatly increased



# Benefits of Stakeholder Consultations

1. Provides a proactive approach to adaptation and risk management and produces a constituency with greater interest and participation
2. Adaptation is everyone's business – stakeholder consultation ensures that adaptation is not simply a technical interventions
3. Community-based adaptation planning can identify frequently overlooked traditional practices and resources management options that have considerable value as adaptation and disaster risk management measures
4. Discussing, debating, and problem-solving produces communities that are better able to organize for change and to internalise the knowledge being generated through technical processes at the project or sectoral level.
5. Community-level risk assessment can raise awareness on specific risks affecting the community and households in a manner that could not be achieved through broader national outreach programs.



## 4. Prioritizing and Selecting Adaptation Options

Adaptation options selected for implementation in the project must be scientifically sound, socially beneficial, and economically viable. In prioritizing and selecting adaptation options, the following general considerations apply:

- Effectiveness in achieving adaptation objective(s)
- Technical feasibility (in the project context)
- Economic feasibility (analysis of benefits and costs)
- Social acceptability
- Ancillary benefits (dis-benefits)
- Opportunities for synergies with national, sectoral priorities

In a specific project setting, one or more of these factors may be given greater weight, reflecting stakeholder consensus



# Approaches Used in Selecting Adaptation Options

- **Benefit-Cost Analysis (BCA):** Provides framework for organizing information about the consequences of alternative adaptation options. Widely used; many guidance materials available.
- **Cost Effectiveness Analysis (CEA):** primary use of CEA is to identify the lowest cost option to achieve a specified adaptation objective
- **Multi-Criteria Analysis (MCA):** used in situations where some project costs and/or benefits cannot be measured in monetary units. Adaptation options can be scored against multiple criteria selected by consensus.
- **Robust Decision-Making (RDM):** useful in the face of significant uncertainty (e.g., future climate) and complex decision environments (although often high data requirements)
- **Expert Judgment:** flexible and widely used; but subjective



# Example - Checklist for Evaluating Adaptation Options

## Policy and Institution:

- Consistency and relevance with adaptation in national and sector policy
- Acceptability by implementing agency (e.g., agriculture extension)
- Technical capacity of institution to implement adaptation options
- Physical capacity of institution to implement adaptation options
- Financial capacity of institution to implement adaptation options

## Socio-Economic:

- Acceptability by the community
- Sustainability of adaptation
- Probability of success in increasing adaptive capacity
- Financial and technical affordability
- Economic returns

## Environmental:

- Applicability and compatibility with local area farming system
- Soil characteristics
- Land use
- Water availability
- New pests and diseases





# Strategies to Manage Uncertainty

When impact assessment establishes that future conditions are highly uncertain, adaptation strategies that manage uncertainty should be given priority:

- ***No-regrets Strategies***: those that generate net benefits independent of how, or whether climate change occurs (but benefits might be greater under CC)
- ***Low Regrets strategies***: those for which climate change readiness can be introduced at low costs.
- ***Win-win strategies (co-benefits)***: those which provide net benefits in other areas or sectors while also reducing vulnerability to climate change
- ***Robust strategies***:<sup>1</sup> those that can be demonstrated to perform acceptably under a wide range of conditions – e.g. less specialization, more diversification

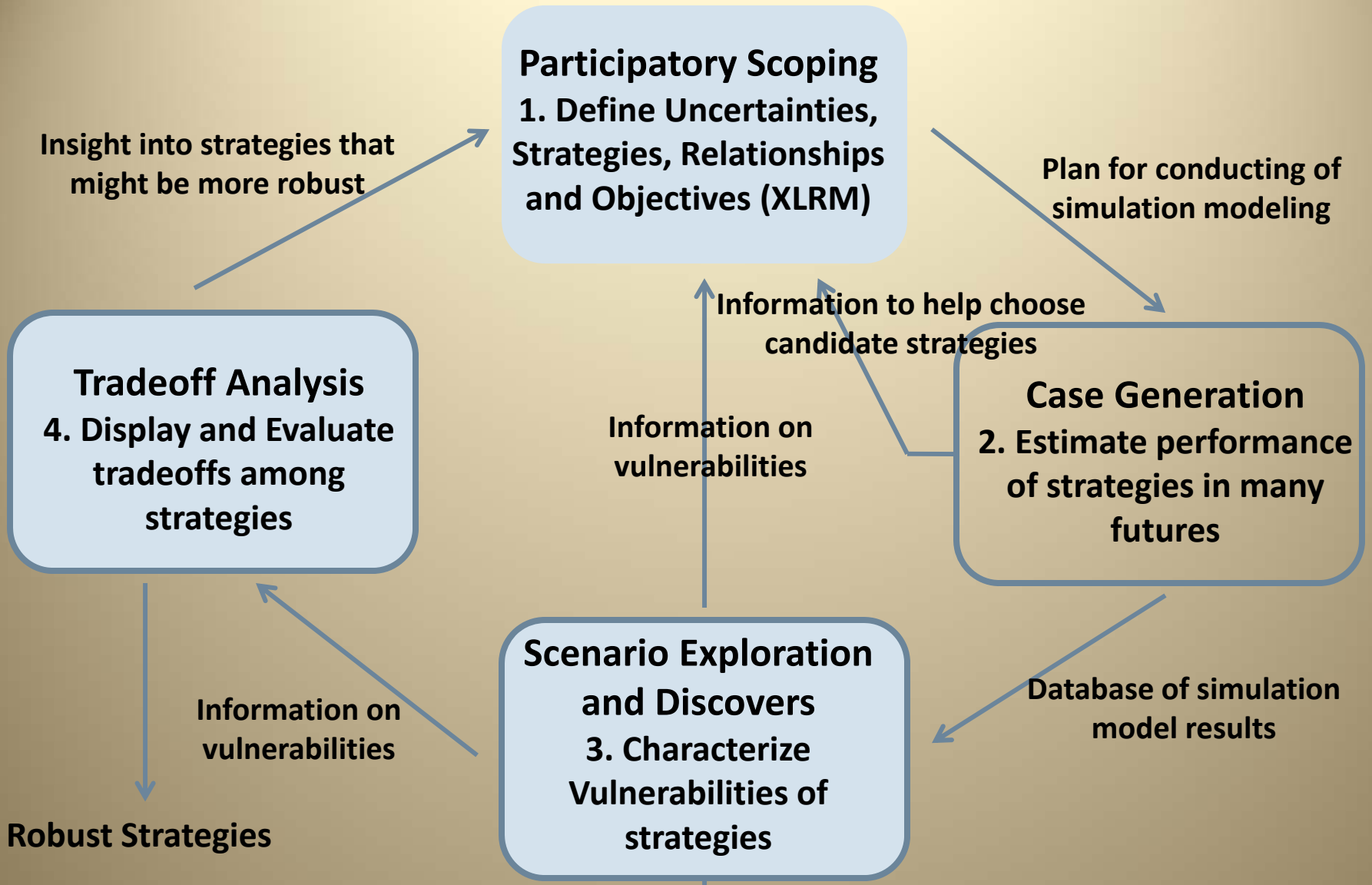


<sup>1</sup> lots of simulation typically required to establish robustness

# Adaptation Strategies in the Water Sector

Adaptation Measure	Regrets	Cost	Technical Difficulty
<b>Supply Side:</b>			
Diversification of sources	Low	High	Medium
Construct additional storage	Medium-High	High	Medium
Watershed management, source protection	Win-Win	Low	Low
Advanced water treatment (recycling, desal)	Low	High	Medium
Reduce non-revenue water	Low	Medium	Medium
<b>Demand Side:</b>			
Metering	Low	Low-Medium	Medium
Low-use appliances	Low	Medium	Medium
Consumer behavior change	Low	Low	Low

Source: World Bank (2006) internal document



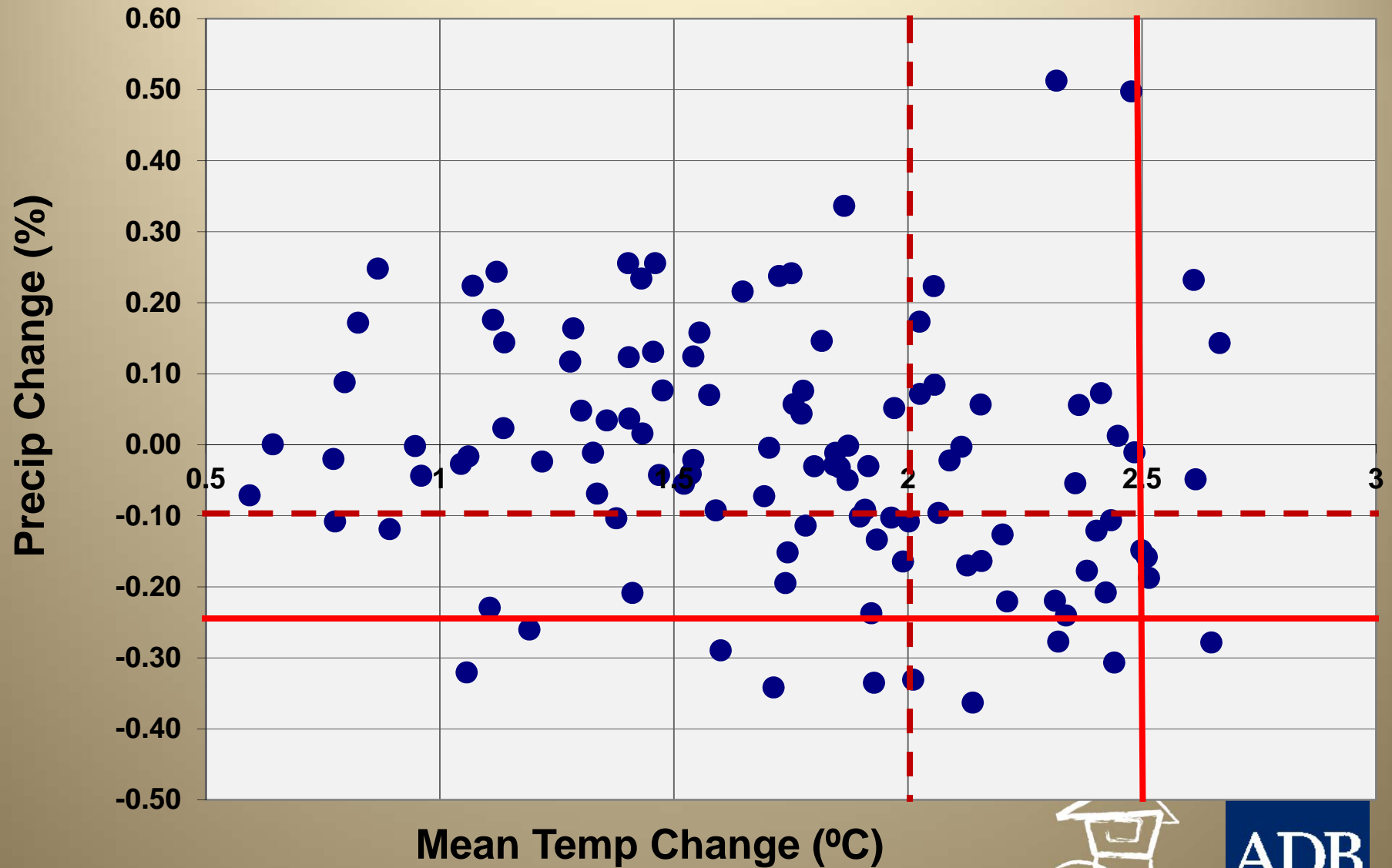
- deliberation
- analysis
- both

Scenarios that illuminate vulnerability



## Robust Decision-Making ( RDM) using XLRM

# Example - RDM and Critical Thresholds



Source: [http://gdo-dcp.ucllnl.org/downscaled\\_cmip\\_projections/](http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/)



# 5. Timing of Adaptation Interventions

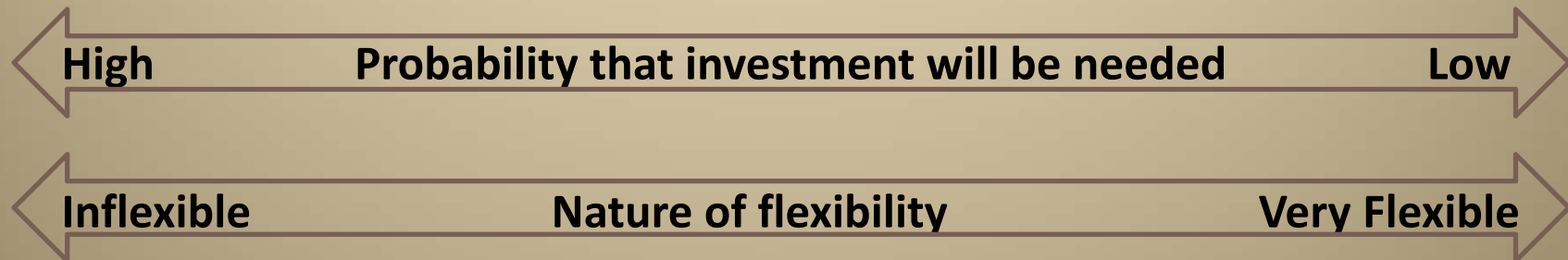
A menu of climate-proofing decisions:

**Type 1:  
Invest  
Now**

**Type 2:  
Be ready and  
invest later if  
needed**

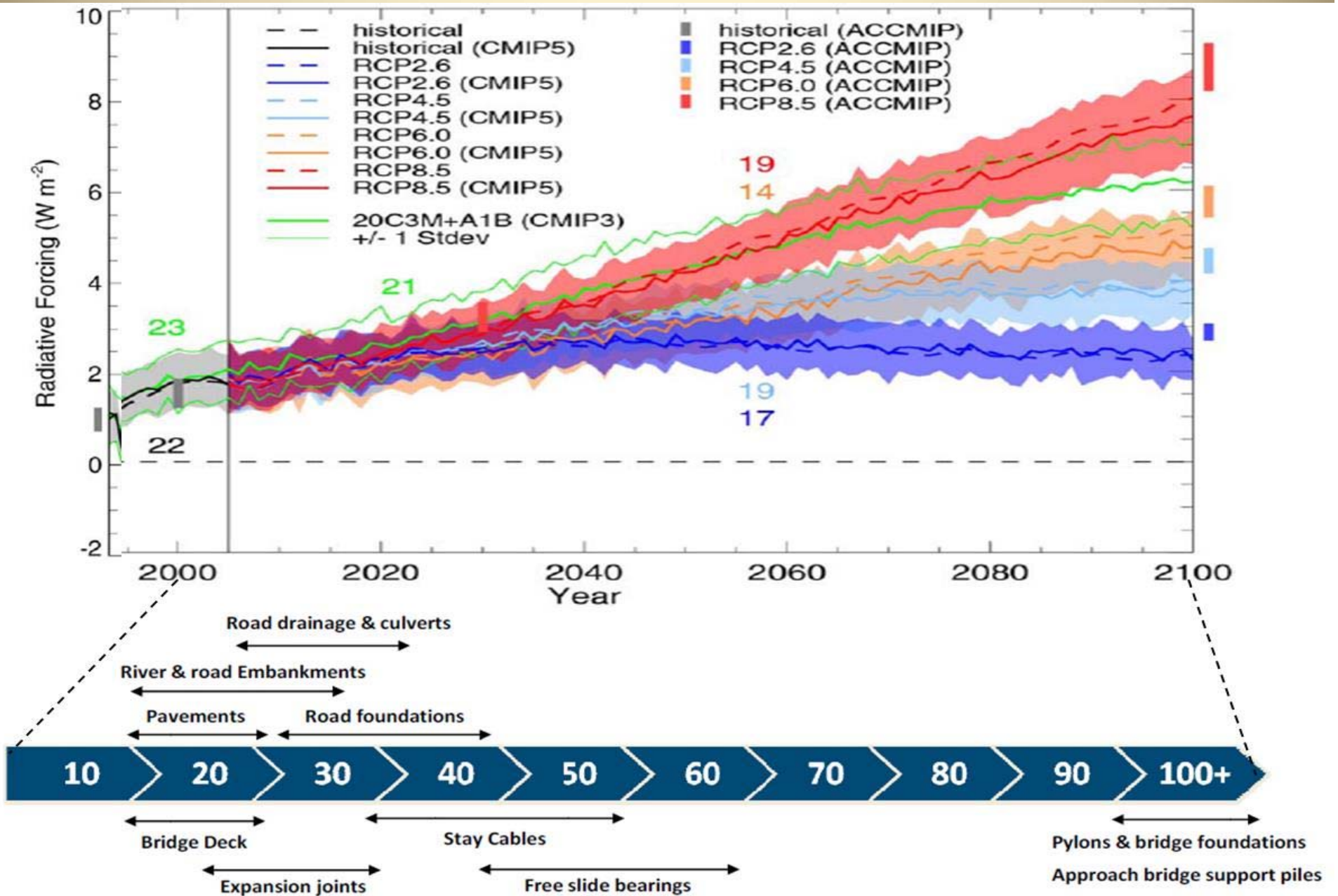
**Type 3:  
Do nothing and  
invest later if  
needed**

Important determinants:



- It is not always necessary to act now; although it is important to assess now!

# Timing of Adaptation Interventions



## 6. Support and Resources

Source	URL	Resources
Nairobi Work Programme (UNFCCC)	<a href="http://unfccc.int/adaptation/knowledge_resources/databases/items/6996.php#NWP">http://unfccc.int/adaptation/knowledge_resources/databases/items/6996.php#NWP</a>	Databases on tools and methods, best practices, case studies (including EBA); others
Convention on Biological Diversity	<a href="https://www.cbd.int/ecosystem/sourcebook/">https://www.cbd.int/ecosystem/sourcebook/</a>	Database of case studies emphasizing biological, agro-ecological and ecosystem-based Adaptation
Adaptation Learning Mechanism (UNDP)	<a href="http://undp-alm.org/explore">http://undp-alm.org/explore</a>	Adaptation project profiles
PROVIA (UNEP, SEI & partners)	<a href="http://www.unep.org/provia/">http://www.unep.org/provia/</a>	Framework, guidelines
Asia Pacific Adaptation Network (APAN): ADB, MoEJ, USAID, SEI, UNEP, IGES	<a href="http://www.apan-gan.net/adaptation-practices">www.apan-gan.net/adaptation-practices</a>	Guidance materials and resources; case studies; adaptation technology database
WeAdapt: SEI and partners	<a href="https://weadapt.org/">https://weadapt.org/</a>	Guidance materials and resources; case studies



[Crodgers.consultant@adb.org](mailto:Crodgers.consultant@adb.org)

More information and literature available at:

<http://www.adb.org>





# Internal Resources

## ADAPTATION Technical Resources

### Guidance Documents

Guidance Notes for Integrating Climate Change Adaptation  
Guidance Notes on Economic Analysis of Adaptation Projects  
Guidance Notes on Climate Data and Scenarios  
...

### General Technical Documents and Knowledge Products

Sector Briefings  
Regional Briefing Notes  
Technical Notes  
...

Agriculture  
Energy  
Health  
Transport  
Urban Development  
Water Supply and Sanitation

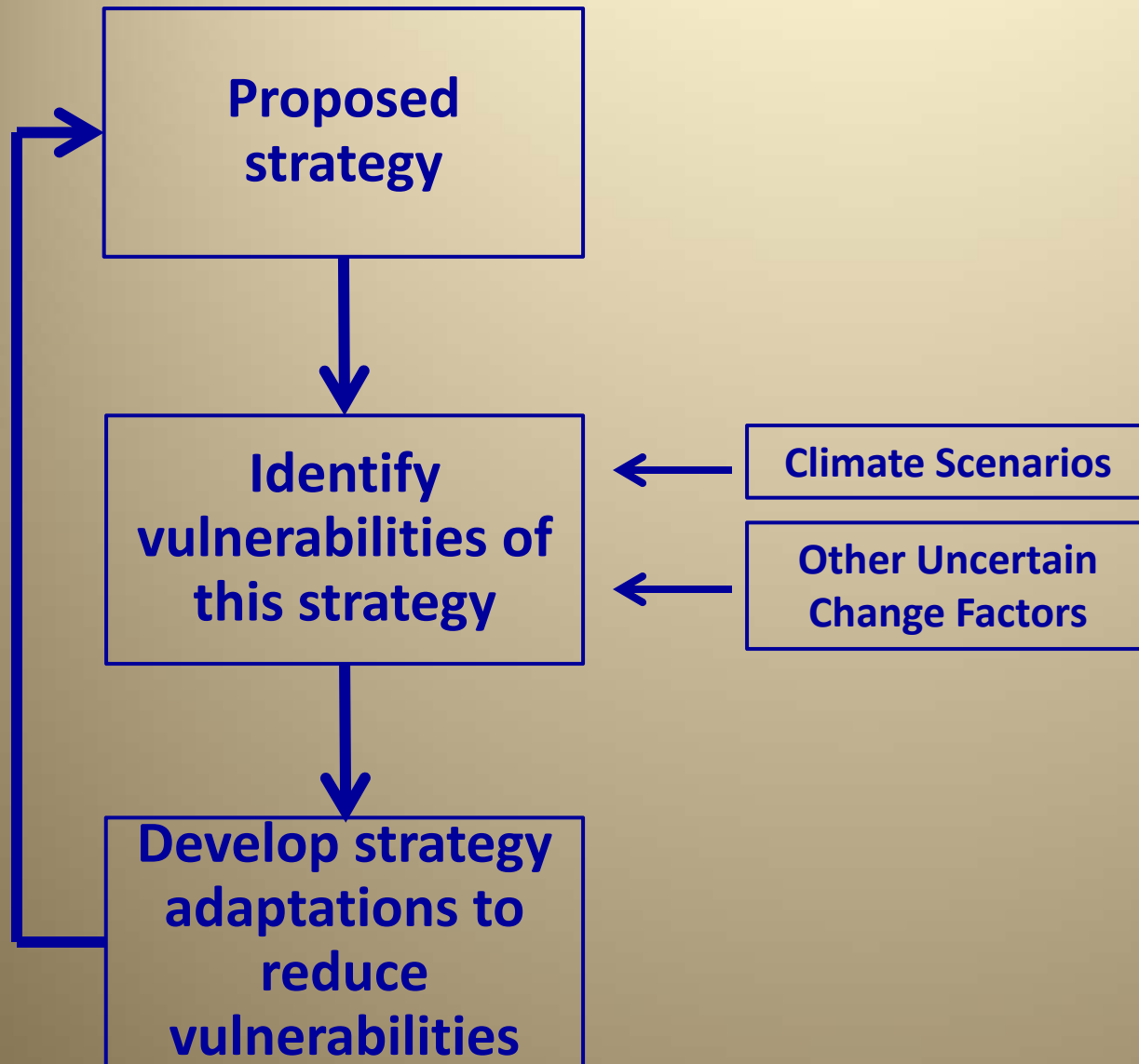
Central and West Asia  
East Asia  
Pacific  
South Asia  
Southeast Asia

Agriculture  
Energy  
Transport  
...

### Data and Tools

Awareness for Projects  
Regional Climate Projections Consortium and Data Facility  
...

# Robust Decision-Making



1. Start with a proposed strategy
2. Use multiple model runs to identify conditions that best distinguish futures where strategy does and does not meet its goals
3. Identify steps that can be taken so strategy may succeed over wider range of futures

