

**2008 CTCI Foundation Fall Environmental
and Energy International Conference
-- Adaptation for Climate Change Conference**



International Development of Risk Assessment Tools for Climate Change

Speaker: Yung-Shuen Shen

**Associate Professor, Department of
Environmental Engineering, Da-Yeh
University**



Content

- **climate change risk**
- **Project cycle and the Vulnerability & Adaptation approach**
- **Tools of Climate Change Risk Analysis**
- **Tool demonstration**
- **Lessons learnt and Conclusions**

Why Risk Assessment Tools for Climate Change?

- Infrastructures are designed (eg. 50 or 100 years...) according to specific “reference” events (i.e. frequency: flood of one hundred years return period)
References on Specific events are currently based on past experience with a stable climate hypothesis.
 - ➔ Climate Change modifies (already now, and much more over the next 50 or 100 years...) the actual risk level and therefore challenges design rules
- There is and will be an increase in unusual climatic events (strength-frequency) caused by climate change; impacts on infrastructures, operations, and the economy at large may be significant, and in some cases more dangerous than many now think.
- Other factors will increase the impacts of unusual climate events. i.e. Urbanisation growth leading to more run-off, increase in trade, “just-in-time” transport, increasing sensitivity of transport users to risks.
 - ➔ A more-in-depth, wider-open and more-systematic Risk Management approach is necessary.

Typical examples of impacts of unusual climate events - 1/3

Stronger Winds



Source : SANEF

December 1999:
Storm in France: winds from 160 to
200 km/h

(GERICI, 2007)

Heat & Drought

Summer 2003:
Forest fire close to A8 motorway
(South of France)



Source : ASF/ Escota

Typical examples of impacts of unusual climate events - 2/3

Rain & Flood

8 July 2001:
A1 motorway flooded (North of France), following very local strong storms



Source : SANEF

Flood in Bulgaria



Typical examples of impacts of unusual climate events – 3/3

Hurricane & Bridges



Photo: J. O'Connor (for MCEER)

US 90 - St. Louis, Mississippi

(GERICI, 2007)

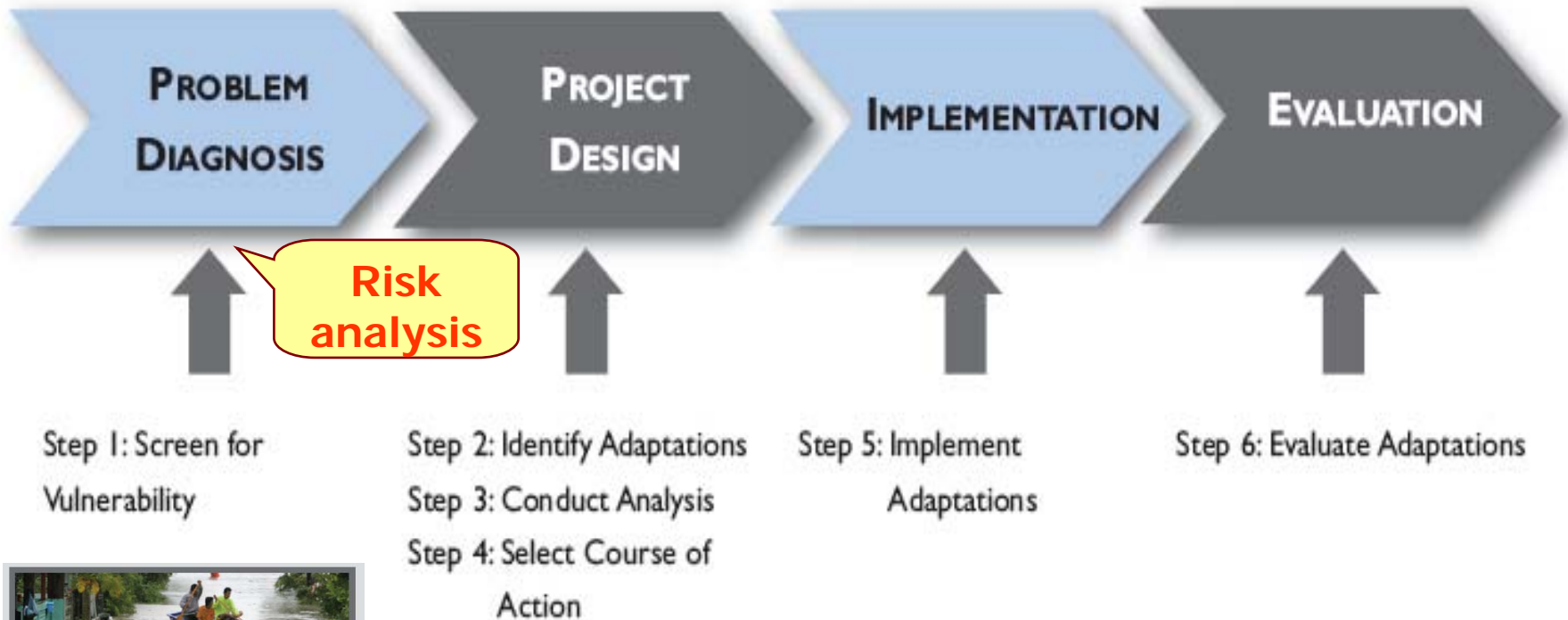
Hurricane & Roads Network



Photo: J. O'Connor (for MCEER)

Many part of Interstate 10 (New Orleans, Louisiana) were underwater. Some ramps were used to support emergency operations

Project cycle and the Vulnerability & Adaptation approach

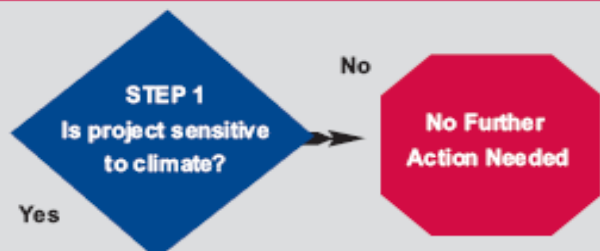


Thai residents walk on a flooded street in the Chon Buri province, about 81 km (50 miles) east of Bangkok, September 14, 2005. The weather bureau warned that the depression from the east coast of Vietnam could cause flooding in some areas of Thailand. REUTERS/Sukree Sukplang SS/mk.

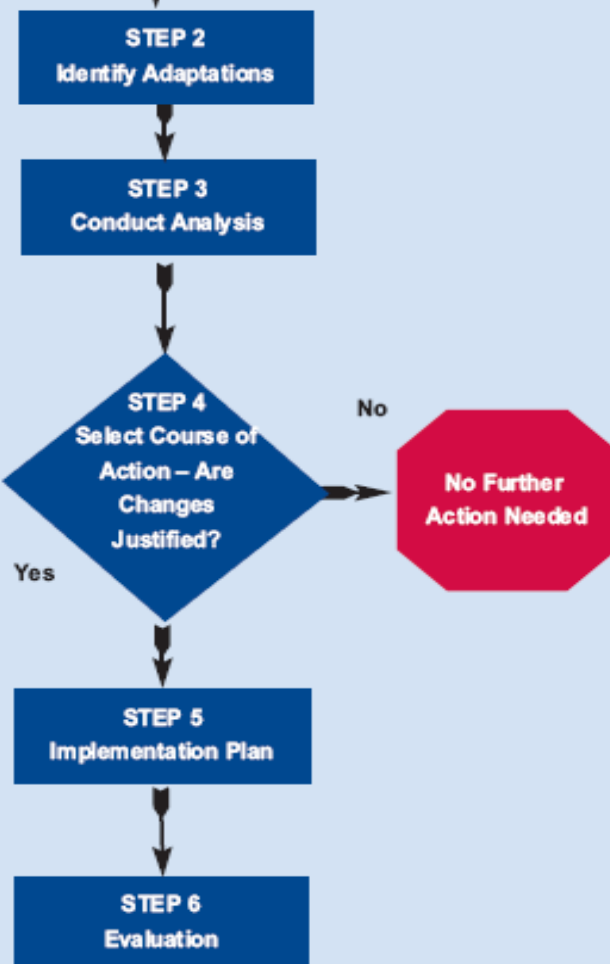
Source: Adapting to climate variability and change -- a guidance manual for development planning, USAID (2007)

PROCESS

Step 1: Screen for Vulnerability



Step 2 – 6 Analysis, Implementation and Evaluation



DEFINITIONS

Step 1 – Screen for Vulnerability Vulnerability Screening is a preliminary assessment of whether climate variability or change could compromise the integrity, effectiveness, or longevity of a project within the planning horizon for the project.

Step 2 – Identify adaptations Work with stakeholders to identify alternative designs or management practices that may enable them to better cope with climate variability and change. The emphasis should be on finding measures that increase resilience to climate change, but still make sense under the current climate.

Step 3 – Conduct analysis Examine the consequences of climate variability and change as well as the effectiveness, costs, and feasibility of adaptations that can reduce vulnerability to climate variability and change.

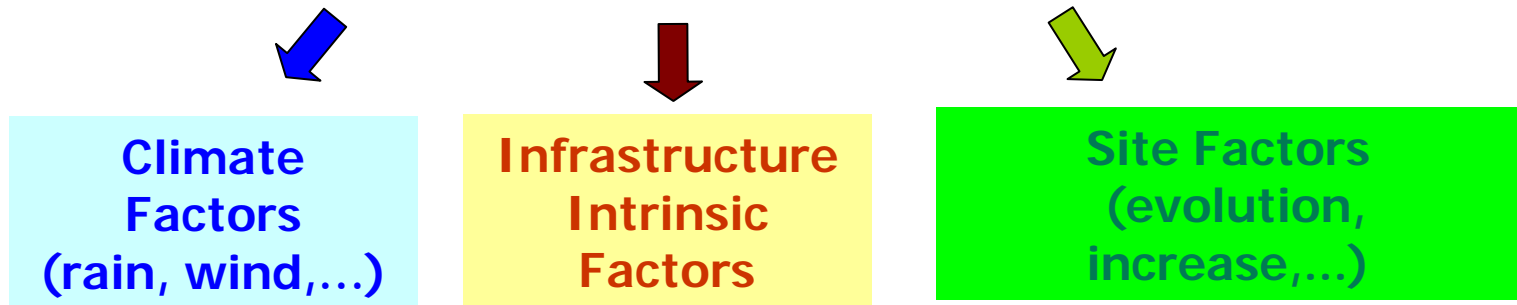
Step 4 – Select course of action Meet with stakeholders to review results of the analysis. Determine if changes in a current project design are required or if a proposed project should feature new adaptations.

Step 5 – Implement adaptations Prepare an implementation plan identifying next steps, responsible staff and organizations, timeline, and resource needs required to incorporate the climate change adaptations into the project.

Step 6 – Evaluate adaptations Evaluate the implementation of adaptations and their effectiveness. Since many adaptations may be due to infrequent, extreme events or long-term climate change, it may be difficult to evaluate effectiveness in a relatively short time period following implementation. But, at a minimum, an evaluation can be done to see if the adaptations were put in place and whether there were problems or excessive costs associated with them.

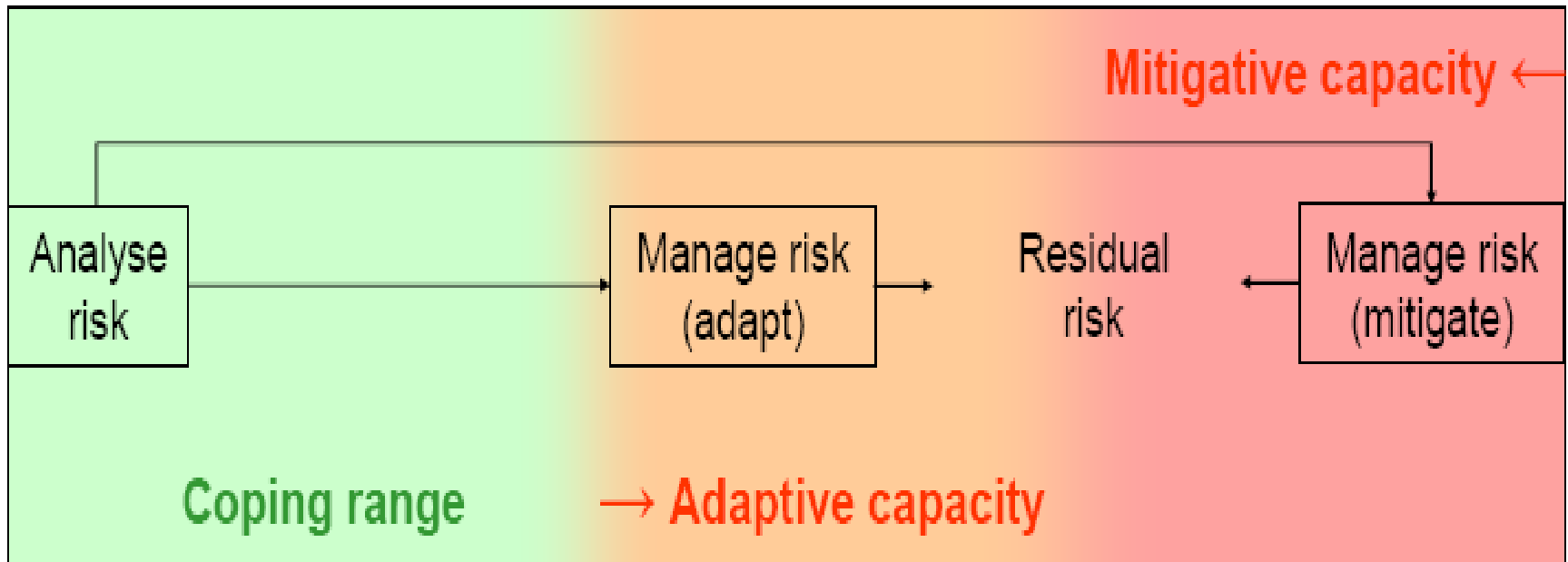


A systematic identification of Risk Factors



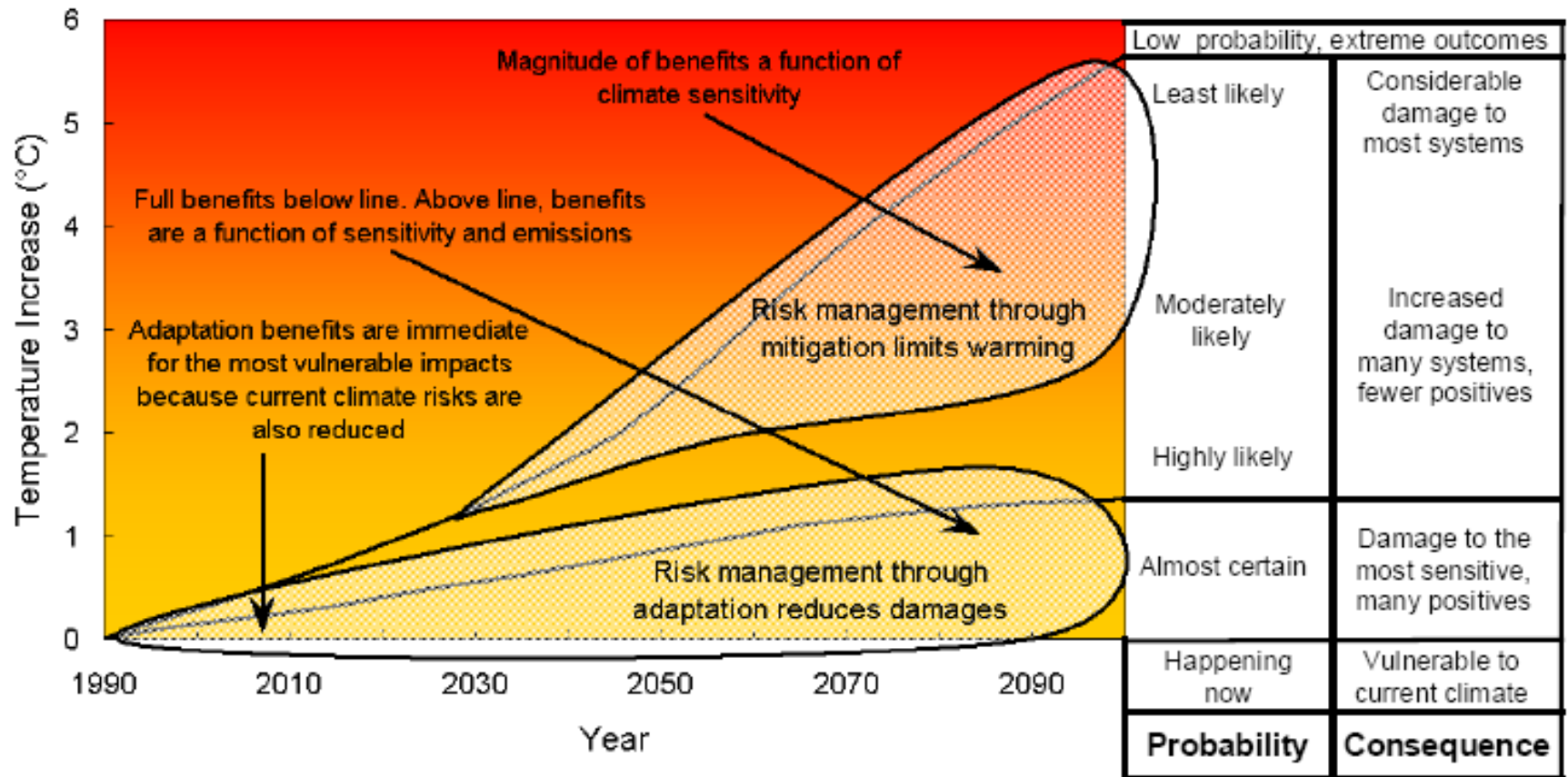
- Assessment of the **Infrastructure sensitivity** (issues at stake)
- Determination of Risk Levels and their **critical thresholds**
- Ability of **continuous adjustment** to Climate Data evolution
- Networking Knowledge and Experience Capitalisation for **sustainable relevance** of both methods and tools


Schematic representing the complementary relationship between mitigation and adaptation



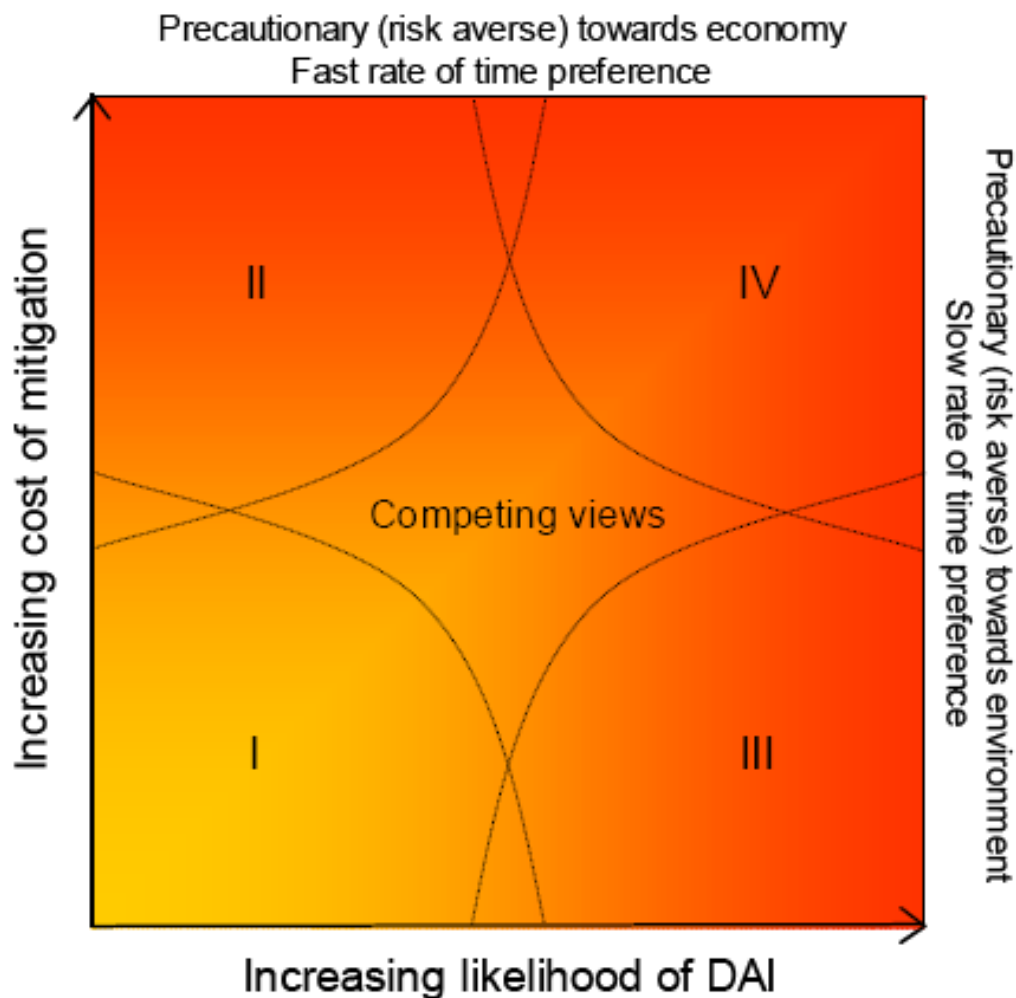
(Jones and Preston, 2006)

The Structure of Climate Change Risks



 Core benefits of adaptation and mitigation
 Probability – the likelihood of reaching or exceeding a given level of global warming
 Consequence – the effect of reaching or exceeding a given level of global warming
 Risk = Probability × Consequence

Matrix linking increasing costs and mitigation and increasing likelihood of dangerous anthropogenic interference (DAI) to four possible strategies for managing those risks.



Strategy I

- Wait and see on everything
- Reduce uncertainty through experience
- Reactive adaptation (min loss/max benefits)
- Modest mitigation – known low cost options

Strategy II

- Wait and see on climate and impacts
- Research economic, tech uncertainty
- Reactive adaptation (min loss/max benefits)
- Efforts to reduce mitigation costs

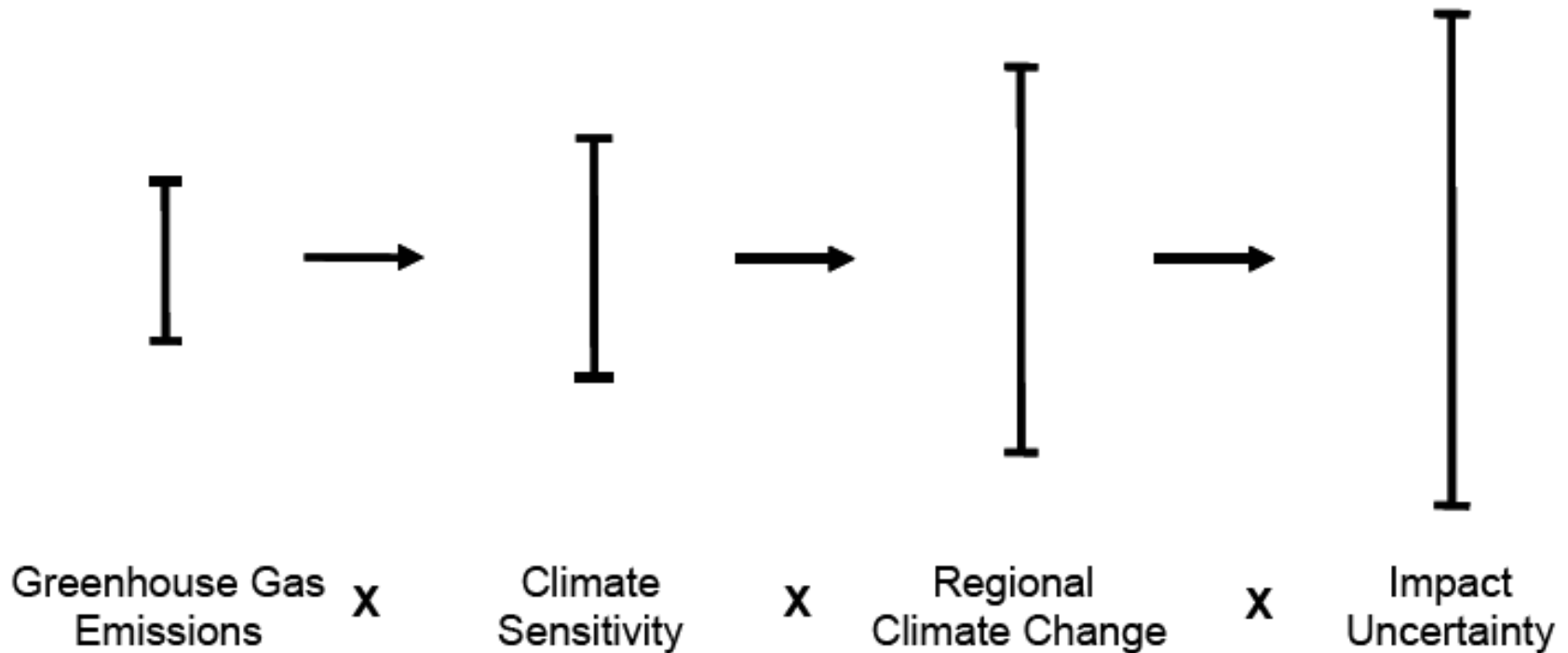
Strategy III

- Act early to stabilise
- Research climate & impact uncertainty
- Anticipatory adaptation
- Strong mitigation – develop low cost options

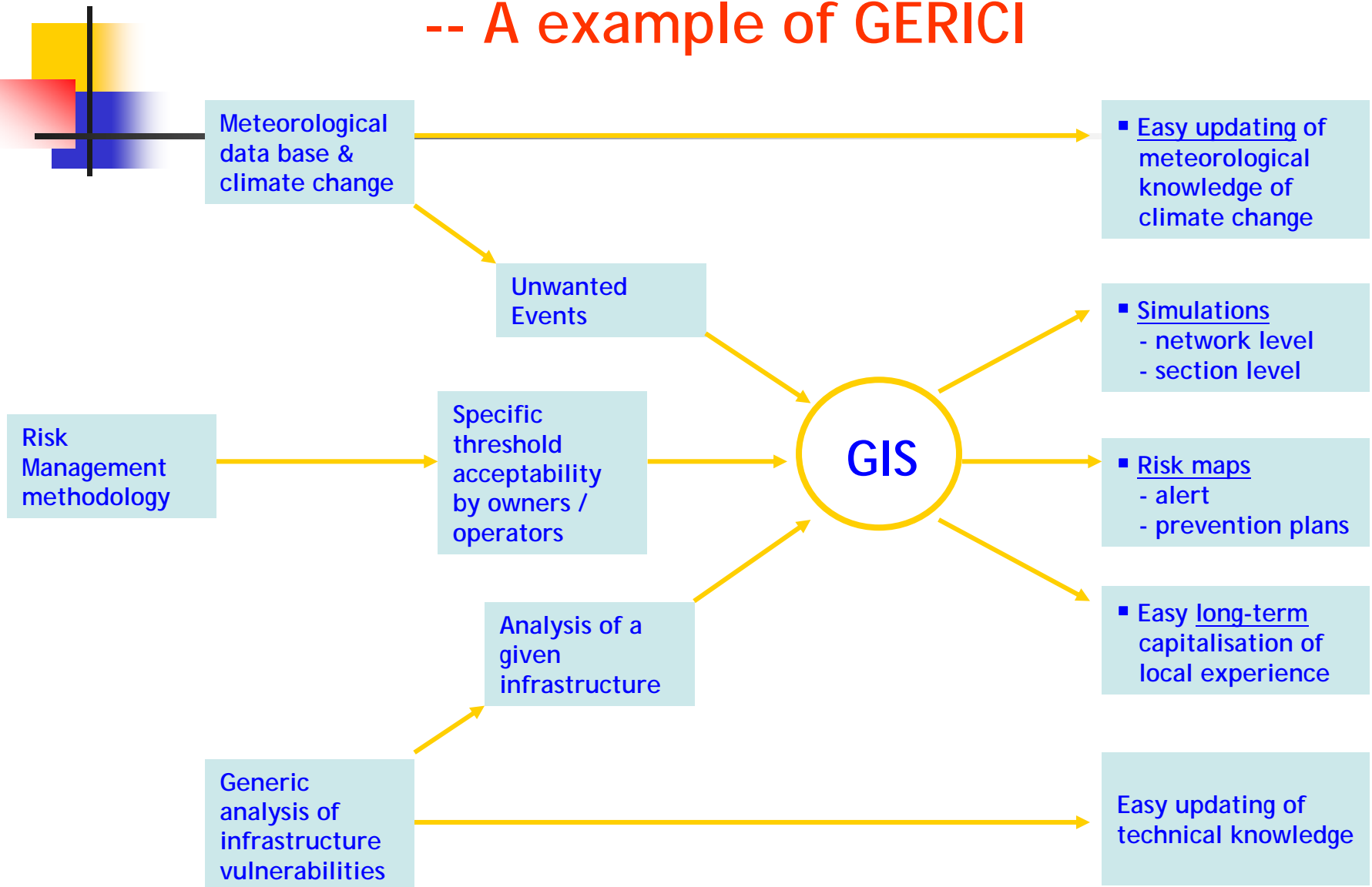
Strategy IV

- Act on everything
- Research everything
- Anticipatory adaptation and cost reduction
- Anticipatory mitigation and cost reduction

Schematic Depiction of the Uncertainty Explosion in Climate Change Analysis



Structure of Risk Management Tools for Approach & Results -- A example of GERICI



Adaptation Options Identified for the V&A pilot studies

	HONDURAS	MALI	SOUTH AFRICA	THAILAND
Infrastructure	<ul style="list-style-type: none"> • Construction of groins, sea walls, breakwaters, dams, drainage systems • Sand pumping, river dredging, lining of river channel • Improved design and higher levees • Installation of collectors, storm gates and pumps 	<ul style="list-style-type: none"> • Construction of water gate • Development of food storage facilities • Install rock lines to capture runoff 	<ul style="list-style-type: none"> • Recycling – urban • Reuse – mining • Build dam • Expand well fields 	<ul style="list-style-type: none"> • Water resource development • Construction of weirs
Capacity Building	<ul style="list-style-type: none"> • Improve environmental education • Build staff capacity and infrastructure to implement flood warning system 	<ul style="list-style-type: none"> • Build knowledge and capacity to understand agricultural production stressors • Build capacity in weather forecasting 	<ul style="list-style-type: none"> • Drought/risk management • Hydro-climatic network/monitoring 	<ul style="list-style-type: none"> • Build knowledge and capacity in adaptation • Encourage conservation • Strengthen commodity value chains and find new markets
Policy	<ul style="list-style-type: none"> • Design and implement zoning regulations and building codes • Limit deforestation • Adoption of local policy and ordinance initiatives 	<ul style="list-style-type: none"> • Facilitate access to credit 	<ul style="list-style-type: none"> • Intersectoral reallocation • Reallocation of reservoir yield • Water conservation and demand management (including metering and price structure) • Conjunctive use 	<ul style="list-style-type: none"> • Compensation for flood damages • Regulations to control unsustainable fishery practice • Develop resource management plans at the community level

Source: (USAID, 2007)

Criteria for Analyzing Matrix Adaptations

PILOT STUDY	Effectiveness	Cost	Feasibility	Social/Cultural Feasibility	Assistance Requirements	Adequacy for Current Climate	Speed of Implementation	Consistency with State Policy
La Ceiba, Honduras	√	√					√	
Zignasso, Mali	√	√	√		√	√		
Polokwane, South Africa	√	√	√	√			√	
Songkram River, Thailand			√	√				√

Source: Adapting to climate variability and change -- a guidance manual for development planning, USAID (2007)

Suggested Adaptation Planning Resources

UK Climate Impact Program (UKCIP): UKCIP provides tools and data to support climate change risk assessments and develop adaptation strategies. The program offers climate change and socio-economic scenarios, a framework for making decisions in the face of climate risk and uncertainty, and a methodology for costing the impacts of climate change. Although specific to the United Kingdom, UKCIP's tools and databases of climate change adaptation case studies and adaptation options are relevant and useful for the U.S. <http://www.ukcip.org.uk/>

USAID: Through their Global Climate Change Program, USAID helps developing countries and countries in transition address climate-related concerns. In 2007, USAID published a guidance manual for development planning, *Adapting to Climate Variability and Change*. This manual provides guidance on how to assess vulnerability to climate variability and change, as well as how to design or adapt projects so that they are more resilient to a range of climatic conditions. Specific cases on water, flood, and agricultural management impacts and adaptation options are included. http://www.usaid.gov/our_work/environment/climate/docs/reports/cc_vamannual.pdf

Eldis—Community-Based Adaptation Exchange Program: Eldis is a global services organization specializing in adaptation services in high-risk countries. It offers a database of donors, implementing agencies, academia, and policy organizations involved in adaptation. <http://www.cba-exchange.org>

ICLEI Local Governments for Sustainability: ICLEI is a global services organization specializing in both mitigation and adaptation support to local governments in the U.S. and globally. Through their Sustainable Cities program, ICLEI works with local governments to build resiliency to climate impacts. <http://www.iclei.org>

Queensland Climate Change Center of Excellence (QCCCE): Based in Australia, the QCCCE is a new unit within the state's Office of Climate Change, providing policy advice, information, and scientific data on climate change and impacts. *ClimateSmart Adaptation 2007-12* (put title in italics) is the government's action plan to increase resilience to climate change impacts in key sectors including: water planning, agriculture, emergency services, human health, tourism, finance, and insurance. <http://www.climatechange.qld.gov.au/>

Tools of Climate Change Risk Analysis



THE WORLD BANK



Sharing Climate Adaptation Tools: Improving decision-making for development Geneva Workshop, 11-12 April 2007

*Do not wait; the time will never be "just right."
Start where you stand, and work with whatever tools you may have at your
command, and better tools will be found as you go along.
Napoleon Hill*





Summary of Climate Adaptation Tools

1. **Information generation, databases and platforms**
2. **Computer-based decision tools**
3. **Adaptation/risk management processes**



Summary of Climate Adaptation Tools

1. Information generation, databases and platforms

- Current information generation and database tools provide a wide variety of audiences with climate and vulnerability related information.
- For the most part, the information is open source and provides analysis across a wide variety of sectors and scales. These are **not decision-making tools** but rather provide donors, governments and NGOs with inputs that could be utilised for risk management and adaptation management processes.
- This category ranges from those databases which utilise Global Circulation Modelling (GCM) (eg. PRECIS) as well as general vulnerability and adaptation data (eg. NAPA Platform).

Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms

Tools	More information
<i>PRECIS - Providing Regional Climates for Impacts Studies - UK Met Office Hadley Centre</i>	http://precis.metoffice.com/
<i>Vulnerability mapping and impact assessment – ILRI, TERI, ACTS, CIAT</i>	http://www.dfid.gov.uk/research/mapping-climate.pdf
<i>SERVIR Climate Change Mapping Tool - USAID, NASA, CATHALAC, IAGT</i>	http://www.servir.net/
<i>Statistical DownScaling Model (SDSM) – Environment Agency, UK</i>	www.sdsm.org.uk
<i>Climate Analysis Indicators Tool - WRI</i>	http://cait.wri.org/
<i>NAPA Platform - UNITAR</i>	www.napa-pana.org
<i>Climate envelopes/adaptation risk screening platform (CLEAR) - SEI</i>	www.sei.se/oxford/
<i>Other information generation/database tools: OFDA/CRED International Disasters Database (EM-DAT)</i>	

Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms

Tool	<i>Audience</i>	<i>Screening level</i>	<i>Spatial scale</i>	<i>Training time</i>	<i>Application time</i>	<i>Main data type</i>	<i>Economic analysis</i>
1.a) PRECIS (UK Met Office)	all	Input tool	multi-scale	varying	varying	Quantitative	No
1.b) Vulnerability assessment (ILRI et al)	donors	policy	national	unknown	2-6 months	Quant.	not at present
1.c). SERVIR (USAID, NASA)	all	various	local, regional	none	<1 month	Quant	No
1.d). SDSM (Environment Agency)	gov't, donors, other	project	multi-scale	half-day	<1 month	Quant	No
1.e). CAIT (WRI)	all	programme	national	none	<1 month	Quant	No
1.f). NAPA Platform (UNITAR)	gov't, donors, NGOs	project, programme	multi-scale	none	NA	NA	No
1.g). CIEAR (SEI)	all	various	multi-scale	varying	varying	quant	Yes in future

Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms

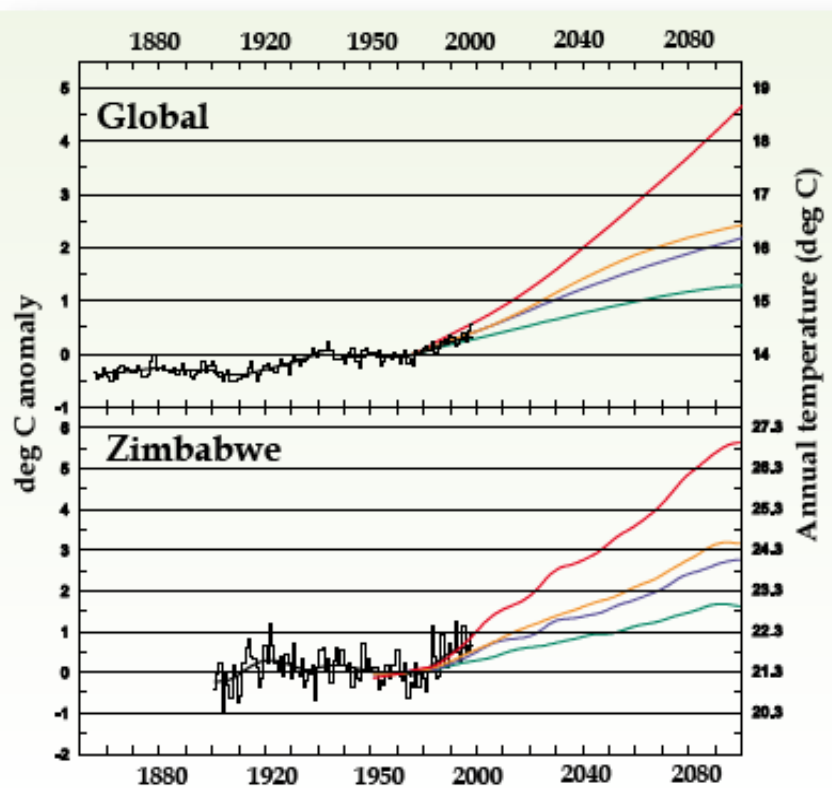
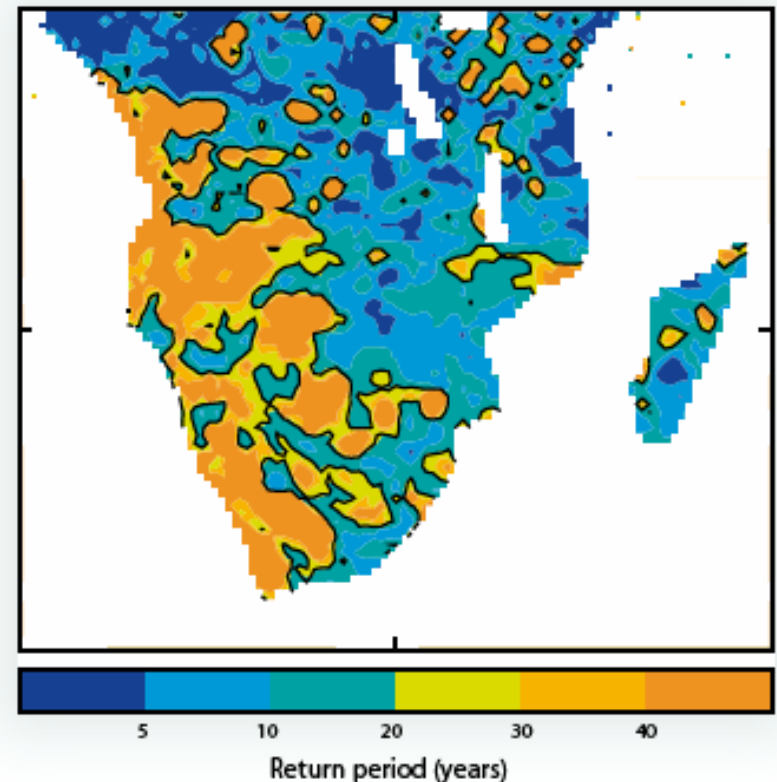


Figure 2: An example of a “simple” climate scenario for communicating to a general audience with limited knowledge of climate change. Shown in this diagram are the observed and model-simulated annual temperature changes to 2100 under four emissions scenarios (represented by the coloured solid lines) globally and for Zimbabwe. The change was simulated by a simple climate model with a medium climate sensitivity (2.5°C) and calculated in relation to the 1961-1990 average. Such scenario information is of particular interest to farmers and nature conservation practitioners alike (adapted from Hulme and Sheard, 1999).



Source: (USAID, 2007)

Figure 3: An example of “sophisticated” climate scenarios. Shown here are the summer rainfall return periods for the 2080s with relation to present-day, one-in-20-year events over Southern Africa, under the IPCC SRES A2 emissions scenario, as simulated by the UK Hadley Centre regional climate model, PRECIS. Values under 20 imply the present-day extreme precipitation event will be more frequent in the future, and vice versa (adapted from Jones *et al.*, 2004).

Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms



Scorecard
Climate change

Argentina
South America


Argentina
South America

Summary – Argentina	Score	Category	Rank
CO ₂ Energy Emissions Index	3.59	High	57/166
CO ₂ Land Use Emissions Index	3.41	High	23/163
Unsustainable Energy Index	5.35	Medium	102/134
Climate Change Vulnerability Index	6.61	Medium	133/166




0 = Highest risk, 10 = lowest risk

CO ₂ from energy use	Country	Regional average
CO ₂ Energy Emissions Index	3.59	4.78
Total CO ₂ emissions (MTCO ₂) 2005*	146.6	72.0
CO ₂ emissions per capita (TCO ₂) 2005*	3.71	2.40
Cumulative CO ₂ emissions (MTCO ₂) 1955-2005*	4,816	1,982
Average annual change in CO ₂ emissions (%) 1990-2005	+3.1	+4.6
Carbon Intensity of growth (TCO ₂ per % GDP) 2005	0.47	0.91
Carbon Intensity of industry (TCO ₂ per % Industrial GDP) 2005	0.31	5.14




Extreme (0-2.5) Medium (5-7.5) High (2.5-5) Low (7.5-10) No data

CO ₂ from land use change	Country	Regional average
CO ₂ Land Use Emissions Index	3.41	3.96
Total CO ₂ emissions from forest biomass (MTCO ₂ /yr) 1990-2005*	121.6	143.7
CO ₂ emissions from forest biomass per capita (TCO ₂ /yr) 1990-2005*	3.18	6.83
Cumulative CO ₂ emissions from land use change (MTCO ₂) 1950-2000*	2,448.1	7,602.8
Total change in forest area (thousand km ²) 1990-2005	-22.4	-53.9
Average annual change in forest area (%) 1990-2005	-0.4	0.0
Carbon stocks in forest biomass (Mt Carbon) 2005	2,411	10,638



Extreme (0-2.5) Medium (5-7.5) High (2.5-5) Low (7.5-10) No data

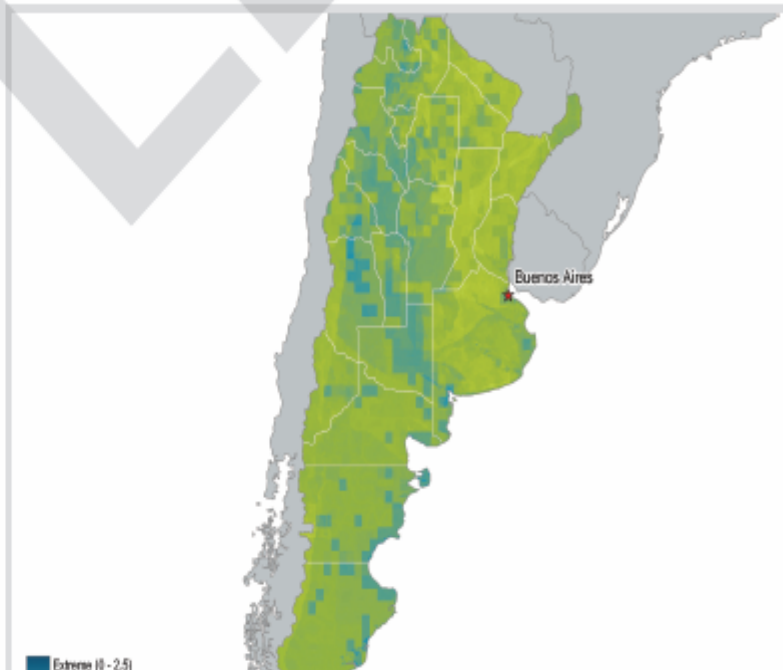
Unsustainable energy	Country	Regional average
Unsustainable Energy Index	6.86	8.16
GDP per unit of energy use (2000 PPP\$ per kgoe) 2005*	7.73	6.57
CO ₂ per unit of energy use (kgoe, per toe) 2005*	2.30	2.12
Share of energy supply: hydro, solar, wind and geothermal (%) 2005*	4.6	14.7
Total primary energy supply (Mtoe) 2005	63.7	35.9
Total energy consumption per capita (kgoe) 2005	1,666	1,160



Extreme (0-2.5) Medium (5-7.5)



* For values of specific locations or regions: climate@maplecroft.com



Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms



The Climate Change Explorer Tool (CCE)

Facilitating an advanced understanding of long-term climate forecasts for screening adaptation strategies and actions.

The Climate Change Explorer (CCE) is a tool that aims to facilitate the gathering of climatological information and its application to adaptation strategies and actions. The CCE packages data access routines with guidance and customized analytical and visualization procedures. It is designed to simplify the tasks associated with the extraction, query and analysis of climate information, thereby enabling users to address issues of uncertainty when devising policies and strategies, and also when implementing actions.

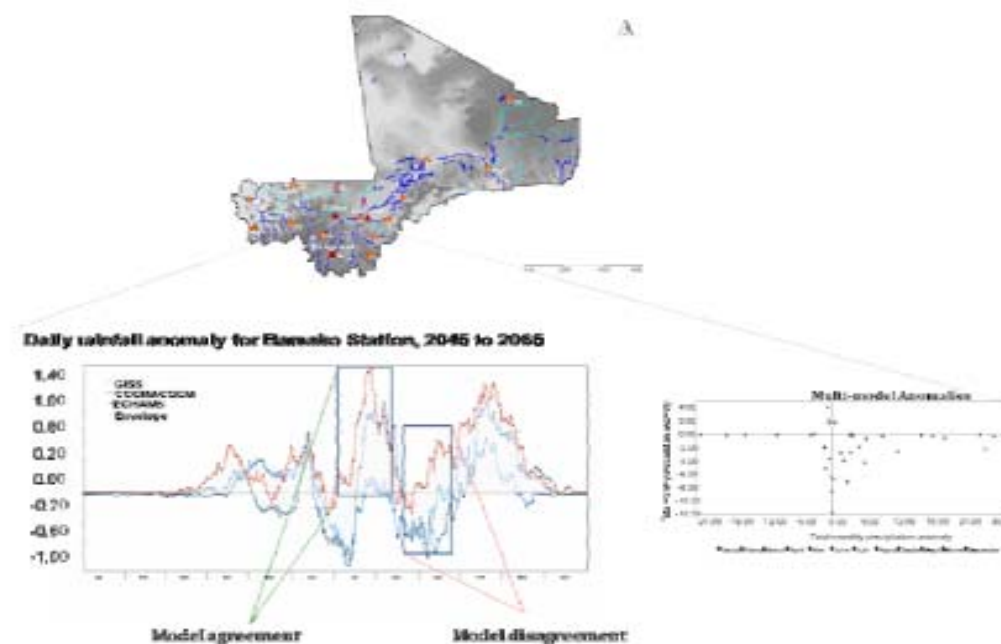


Figure 1: Example Output from the Climate Change Explorer in Mali.

Source: www.weADAPT.org.

Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms

NAPA

National Adaptation
Programme of Action



UNITAR

- [NAPA Preliminary Work, Draft & Final](#)
- [NAPA Guidance & GEF Information](#)
- [Risk Assessment & Adaptation Resources](#)
- [Expertise / Consultants](#)
- [NAPA Teams-Users](#)
- [Public Website](#)
- [Private Access](#)

2. NAPA workshops technical assistance

Search the Knowledge Base

Type

NAPA Guidance / Technical Assistance PANA
GEF Information / Information FEM
NAPA document Analysis / Analyse
Pictures UNOSAT

[Unselect](#)

Language / Langue

English / Anglais
French / Français
Portuguese / Portugais

[Unselect](#)

Status / Statut

COP Decision
LEG guidance
Technical Assistance

[Unselect](#)

by Content

Text contains:

in Field:

Submit

Search the Knowledge Base!

Entries

View	▲ Entry Name ▼	▲ File ▼	▲ Type ▼	▲ Language / Langue ▼	Description
------	----------------	----------	----------	-----------------------	-------------

Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms

NAPA-PANA Knowledge base - 1. NAPA documents, preliminary, Drafts, Final - Microsoft

http://www.napa-pana.org/private/modules/knowledgebox/external/index.php?kbid=6

檔案 (F) 編輯 (E) 檢視 (V) 我的最愛 (A) 工具 (T) 說明 (H) 繁體轉換 繁 簡 圖 書 標 籤 網 頁 (P) 工 具 (O)

1. NAPA documents, preliminary, Drafts, Final

Search the Knowledge Base

Country

- Afghanistan
- Angola
- Bangladesh
- Benin
- Bhutan
- Burkina Faso
- Burundi
- Cambodia
- Cape Verde
- Central African Republic
- Chad

Unselect

Document Type

- PROJECT PROFILE
- FINAL NAPA DOCUMENT
- PREPARATION EXPERIENCE
- DRAFT NAPA DOCUMENTS
- PRELIMINARY WORK
- TRACKING PROGRESS
- EXPERT COMMENTS
- UNOSAT MAP
- LEG COMMENTS
- ADDITIONAL DOCUMENTS

Unselect

Thematic Area

- Water Management and Harvesting
- Water Quality and Health
- Food Security / Crop Varieties
- Sustainable Rural Livelihoods
- Forest Conservation and Management
- Rangeland rehabilitation, Animal Breeding, Development of Fodder Crops, Fisheries
- Energy Conservation and Promotion of renewable energies
- Biodiversity Conservation
- Human Health / Malaria
- Tourism Industry

Unselect

by Content

Text contains: in Field:

Submit

Entries

```
ERROR: /home/www/693768d232008bf1b8ef75591b7a62e6/web/private/includes/db_adodb.php(61): Error executing:
SELECT * FROM ( `kb_fields` ) WHERE id = 22

Backtrace:
0 /home/www/693768d232008bf1b8ef75591b7a62e6/web/private/includes/db_adodb.php:61 dprint('/home/www/693768d232008bf1b8ef75591b7a62e6/web/private/includes/c
SELECT * FROM ( `kb_fields` ) WHERE id = 22
')
1 /home/www/693768d232008bf1b8ef75591b7a62e6/web/private/includes/db_connect.php:93 db_exec('SELECT * FROM ( `kb_fields` ) WHERE id = 22')
2 /home/www/693768d232008bf1b8ef75591b7a62e6/web/private/includes/db_connect.php:67 db_loadhash('SELECT * FROM ( `kb_fields` ) WHERE id = 22',array (
))
3 /home/www/693768d232008bf1b8ef75591b7a62e6/web/private/classes/dp_class.php:96 db_loadobject('SELECT * FROM ( `kb_fields` ) WHERE id = 22',class kbmodule
var $_tbl = 'kb_fields';
var $_tbl_key = 'id';
var $_error = '';
var $_query =
class dbquery {
var $query = NULL;
var $table_list = NULL;
var $where = NULL;
var $order_by = NULL;
var $group_by = NULL;
var $group_by = NULL;
```

完成 網際網路 100% 我的電腦 星期日

Summary of Climate Adaptation Tools

-- 1. Information generation, databases and platforms



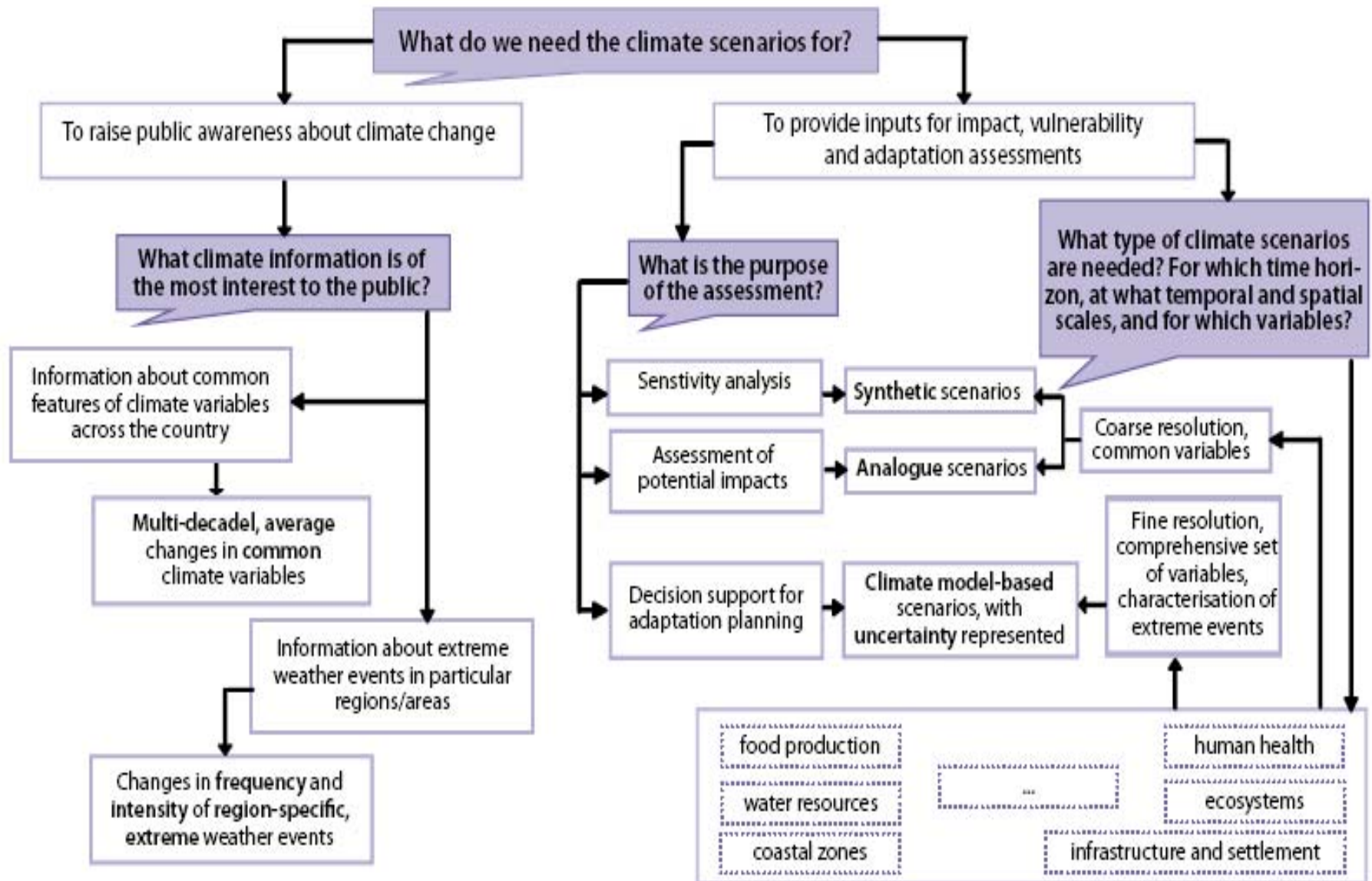
Guidance on the Development of

REGIONAL CLIMATE SCENARIOS

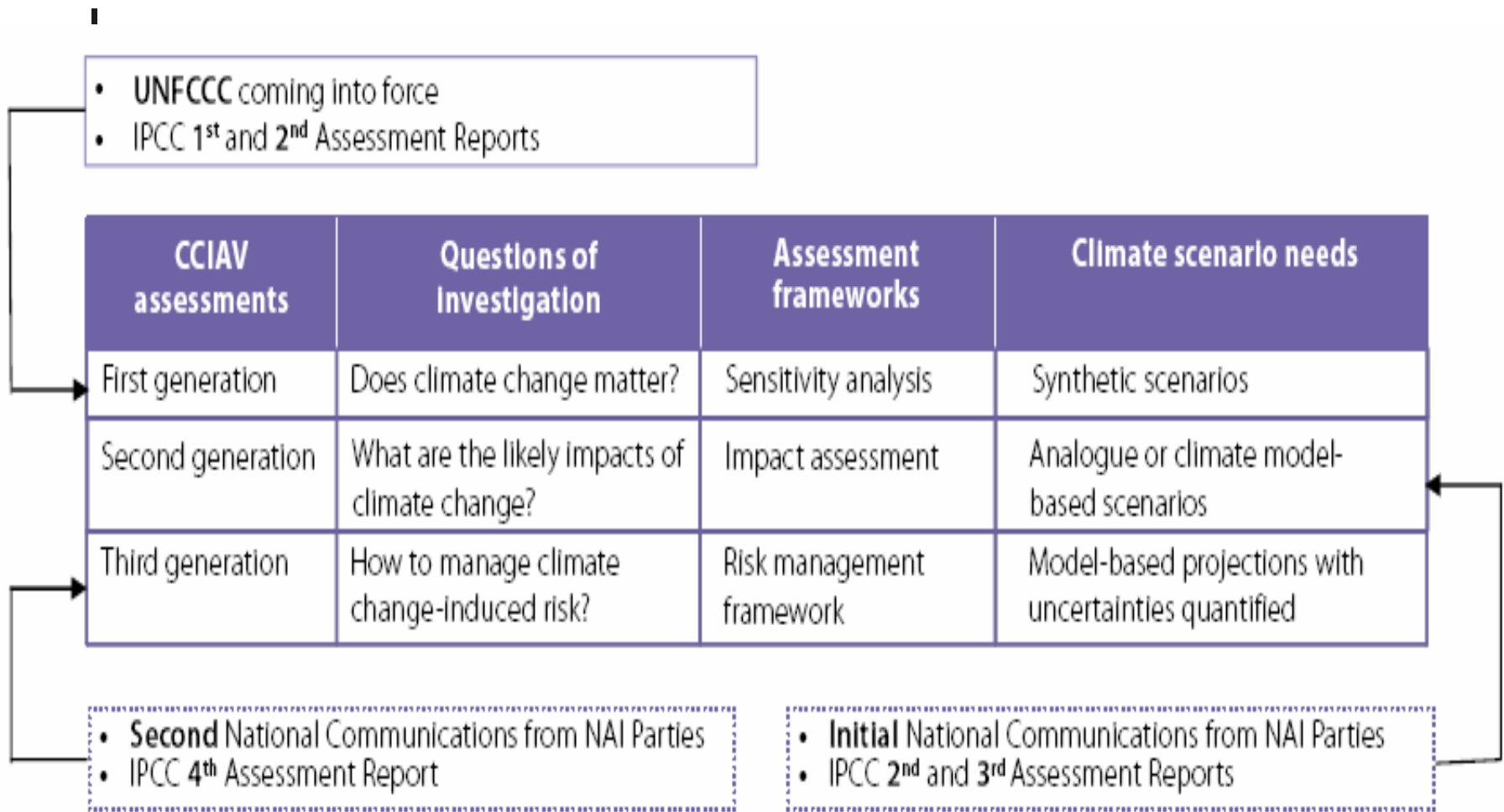
for Vulnerability and
Adaptation Assessments

<http://www.napa-pana.org/private/modules/knowledgebox/external/index.php?kbid=8>

Questions to consider for identifying the needs for climate scenario information within the framework of national communications



Summary of Climate Change Impact, Adaptation and Vulnerability (CCIAV) assessments and their requirements for climate scenario data



CCIAV: climate change impact, adaptation and vulnerability



Summary of Climate Adaptation Tools

-- 2. Computer-based decision tools

- Computer-based decision tools are primarily intended to assist donors to identify climate related risks and adaptation options based on project/programme inputs.
- These tools typically include social vulnerability information and assist donors in establishing priorities as well as include economic analysis as part of the decision-making process.
- These tools are designed to incorporate various forms of data as well as inputs from various stakeholders.
- Whereas CRiSTAL is aimed at project-level decision-making, the SEI platform will be applicable across scales.
- The advantage of these models is that they allow programme staff to easily navigate the platform and are thus more hands on, relying less on “expert advice”.



Summary of Climate Adaptation Tools

-- 2. Computer-based decision tools

Tools	More information
<i>CRiSTAL – IISD, IUCN, SEI, Intercooperation</i>	www.iisd.org/security/es/resilience/climate_phase2.asp
<i>ADAPT - World Bank</i>	www.worldbank.org/climatechange
<i>Adaptation Wizard – UK Climate Impacts Programme (UKCIP)</i>	http://www.ukcip.org.uk/resources/tools/adapt.asp
<i>Country Database – UNDP-GEF</i>	Database restricted to users of UNDP intranet.

Summary of Climate Adaptation Tools

-- 2. Computer-based decision tools

Tool	<i>Audience</i>	<i>Screening level</i>	<i>Spatial scale</i>	<i>Training time</i>	<i>Application time</i>	<i>Main data type</i>	<i>Economic analysis</i>
2.a).CRiSTAL (IISD/ IUCN/SEI/Intercooperation)	all	project	local, regional	1 hour	<1 month	Qualitative	not at present
2.b). ADAPT (World Bank)	all	project	local, regional	none	<1 month	Qual	No
2.c). Adaptation Wizard (UKCIP)	all	various	multi-scale	none	<1 month	Quant and qual	Yes
2.d). UNDP Country database	Country offices	Project	National	20 minutes	<1 month	Quant and qual	No

Summary of Climate Adaptation Tools

-- 2. Computer-based decision tools

CRiSTAL 3.1

Community-based Risk Screening Tool: Adaptation and Livelihoods

Livelihoods and Climate Change

In its Fourth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) concluded that the globally averaged surface temperatures increased $0.74 \pm 0.2^\circ\text{C}$ between 1906 and 2005. This trend is expected to persist, with a 1.8 to 4°C warming predicted for the current century. (1) Warming will vary by region and be accompanied by significant changes in local precipitation, sea level rise and changes in the frequency and intensity of some extreme events. Yet these impacts will not be distributed or felt uniformly, as those "with the least resources have the least capacity to adapt and are the most vulnerable." (2)



Juergen Blaser, Intercooperation

Climate change will thus impact natural and human systems to alter the productivity, diversity and functions of many ecosystems and livelihoods around the world. For poor natural resource-dependent communities, climate change may compound existing vulnerabilities. Settlement on marginal or unstable lands already heightens exposure to climate hazards. Heavy dependence on ecosystem services places their welfare at the mercy of environmental conditions. As the availability and quality of natural resources decline, so does the security of their livelihoods. Limited resources and capacities for responding to stresses such as floods and droughts constrain their ability to meet basic needs and move out of poverty.

With climate change impacts already being observed, there is an urgent need for adaptive response measures. For the poor, this must start with actions that reduce current vulnerabilities and increase adaptive capacity so they can face the longer-

Summary of Climate Adaptation Tools

-- 2. Computer-based decision tools

CRiSTAL • IISD, IUCN, SEI, Intercooperation

What are the climate-related hazards, impacts and coping strategies in your project area?

Enter the main climate-related hazards that affect your project area, their associated impacts, and the primary coping strategy for each impact. To view definitions of "hazard", "impact" and "coping strategy", place your cursor over the word. To see examples of hazards, impacts and coping strategies, place your cursor over the associated text box.

If the answer to either "Is the strategy working?" or "Is the strategy sustainable?" is no, enter an alternative coping strategy.

Hazard 1:

	Impact	Coping strategy	Is the strategy working?	Is the strategy sustainable?	Alternate coping strategy	Notes
1:	<input type="text"/>	<input type="text"/>	<input type="text" value="yes"/>	<input type="text" value="yes"/>	<input type="text"/>	<input type="text"/>
2:	<input type="text"/>	<input type="text"/>	<input type="text" value="yes"/>	<input type="text" value="yes"/>	<input type="text"/>	<input type="text"/>
3:	<input type="text"/>	<input type="text"/>	<input type="text" value="yes"/>	<input type="text" value="yes"/>	<input type="text"/>	<input type="text"/>

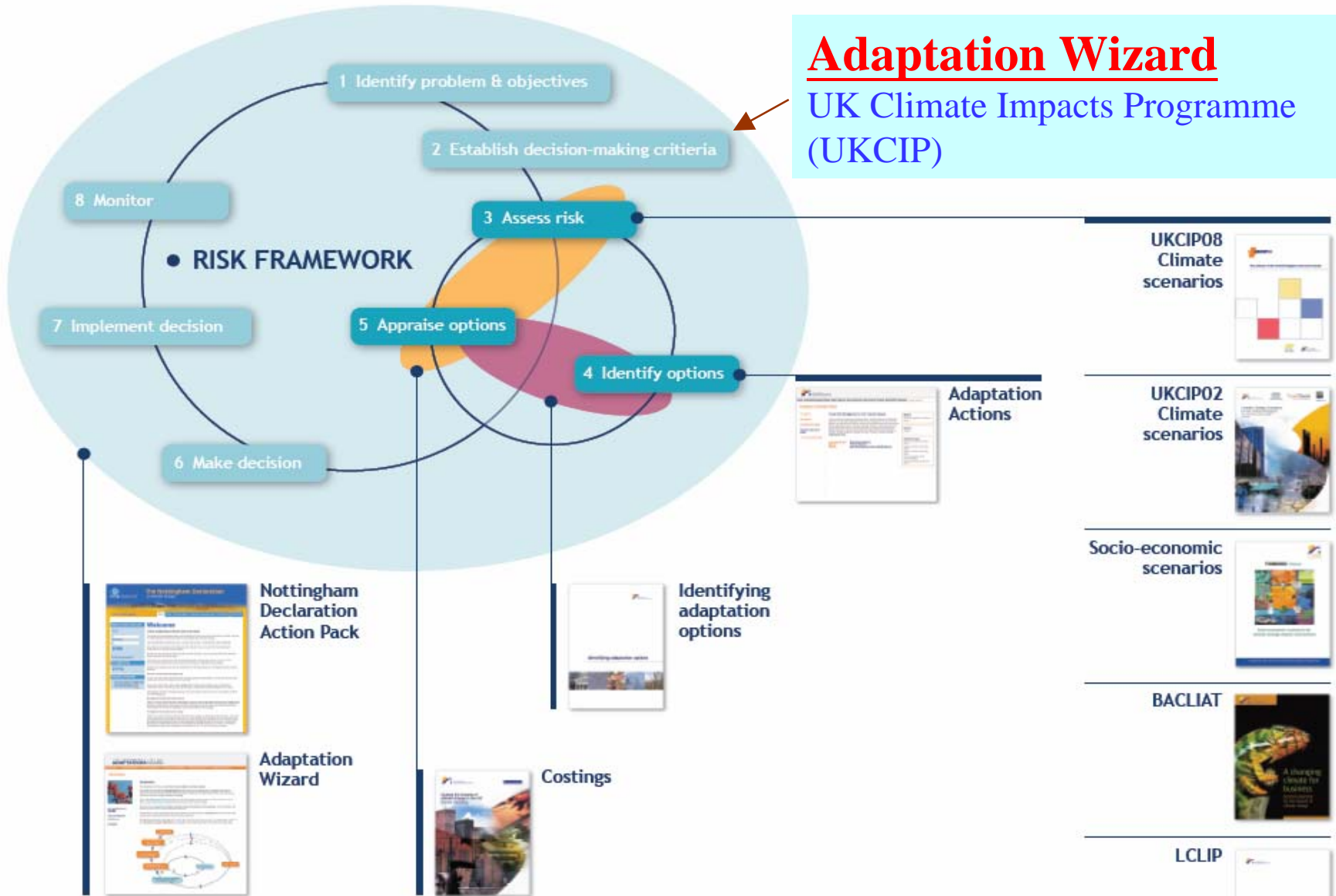
Hazard 2:

	Impact	Coping strategy	Is the strategy working?	Is the strategy sustainable?	Alternate coping strategy	Notes
1:	<input type="text"/>	<input type="text"/>	<input type="text" value="yes"/>	<input type="text" value="yes"/>	<input type="text"/>	<input type="text"/>
2:	<input type="text"/>	<input type="text"/>	<input type="text" value="yes"/>	<input type="text" value="yes"/>	<input type="text"/>	<input type="text"/>

Summary of Climate Adaptation Tools

-- 2. Computer-based decision tools

Adaptation Wizard UK Climate Impacts Programme (UKCIP)





Summary of Climate Adaptation Tools

-- 3. Adaptation/risk management processes

- Adaptation/risk management processes include those tools which have been developed by specific international aid agencies intended to screen projects/programmes and/or develop policy priorities.
- As a result, they are tailored toward the specific decision-making processes of the donor organisation.
- Typically these processes rely on expert advice from their respective climate change departments or outside consultants. They tend to rely more heavily on qualitative inputs while also incorporating climate science information.
- Some tools incorporate economic analyses where the information is available or where applicable.
- On the whole, these processes take longer than computer-based decision tools but are more thorough in their analysis, providing tailored recommendations for disaster risk reduction and adaptation.

Summary of Climate Adaptation Tools

-- 3. Adaptation/risk management processes

Tools	More information
<i>Climate quick scans - DGIS, The Netherlands</i>	www.nlcap.net
<i>Preparedness for Climate Change - Red Cross/Red Crescent</i>	www.climatecentre.org
<i>Climate Change Adaptation Guidance Manual - USAID</i>	www.ids.ac.uk/climatechange
<i>Opportunities and Risks of Climate Change and Disasters (ORCHID) - IDS</i>	www.ids.ac.uk/climatechange
<i>Integration of climate risks into country programming - UNDP</i>	UNDP Intranet only
<i>Other paper-based/process tools:</i>	http://www.proventionconsortium.org/?pageid=32&projectid=1

Summary of Climate Adaptation Tools

-- 3. Adaptation/risk management processes

Tool	<i>Audience</i>	<i>Screening level</i>	<i>Spatial scale</i>	<i>Training time</i>	<i>Application time</i>	<i>Main data type</i>	<i>Economic analysis</i>
3.a). Climate quick scans (DGIS)	donors	project, programme	multi-scale	none	<1 month	Qual	No
3.b). Preparedness for Climate Change (Red Cross/Crescent)	NGOs	programme, policy	National	none	> 6 months	Qual	No
3.c). Climate Change Adaptation Guidance Manual (USAID)	donors	policy, project	local, regional	-	2-6 months	Quant and qual	not at present
3.d). ORCHID (IDS/DFID)	donors, NGOs	programme	regional, national	none	2-6 months	Qual	Yes
3.e.) CCA/UNDAF Guidance (UNDP)	Country offices	programme	National	none	>6 months	Qual	No

Resources of Climate Change Risk Analysis Tools

- Adaptation Learning Mechanism (ALM): one of the most famous website <http://www.adaptationlearning.net/resources/tools.php>



PARTNERS



- ABOUT THE PROJECT
- ADAPTATION RESOURCES >
 - Resource Overview
 - Country Profiles
 - Case Studies
 - Lessons Learned
 - Guidance & Tools
 - ALM Resource Search
 - Links
- LATEST NEWS
- COLLABORATION
- CONTACT

ADAPTATION RESOURCES

Guidance and tools

The ALM shares guidance and tools for developing and implementing adaptation initiatives. Below is a list of materials available for immediate download or online browsing.

User submissions of relevant resources are welcome and encouraged. Please **contact us** to share guidance and tools, or recommend a resource that you find particularly useful in your work. In addition, national teams and others with completed adaptation planning phases are encouraged to submit **case studies** to the ALM.

SPOTLIGHT

Adaptation project profile: Eritrea

Adapting Livestock Management to Climate Change in the North-western Lowlands of Eritrea (UNDP-GEF case study). [DOWNLOAD >](#)

Tools and resources

Many summaries from: *Sharing Climate Adaptation Tools: Improving decision-making for development* workshop report, sponsored by the Institute for Development Studies (IDS), The World Bank, and the International Institute for Sustainable Development (IISD)

COMPUTER-BASED

CRISTAL • IISD, IUCN, SEI, Intercooperation

This project-based tool is aimed at numerous users and is currently being piloted for Nicaragua, Mali, Tanzania and Sri Lanka in sectors such as agriculture, water resource management, infrastructure, and natural resource management. The tool requires detailed project inputs and vulnerability data. The tool delivers vulnerability and livelihood profiles as

Tool Demonstration

Q53

f_x

CRiSTAL 3.1

Community-based Risk Screening Tool:
Adaptation and Livelihoods

Livelihoods and Climate Change

In its Fourth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) concluded that the globally averaged surface temperatures increased $0.74 \pm 0.2^\circ\text{C}$ between 1906 and 2005. This trend is expected to persist, with a 1.8 to 4°C warming predicted for the current century. (1) Warming will vary by region and be accompanied by significant changes in local precipitation, sea level rise and changes in the frequency and intensity of some extreme events. Yet these impacts will not be distributed or felt uniformly, as those "with the least resources have the least capacity to adapt and are the most vulnerable." (2)



Juergen Blaser, *Intercooperation*

Climate change will thus impact natural and human systems to alter the productivity, diversity and functions of many ecosystems and livelihoods around the world. For poor natural resource-dependent communities, climate change may compound existing vulnerabilities. Settlement on marginal or unstable lands already heightens exposure to climate hazards. Heavy dependence on ecosystem services places their welfare at the mercy of environmental conditions. As the availability and quality of natural resources decline, so does the security of their livelihoods. Limited resources and capacities for responding to stresses such as floods and droughts constrain their ability to meet basic needs and move out of poverty.

With climate change impacts already being observed, there is an urgent need for adaptive response measures. For the poor, this must start with actions that reduce current vulnerabilities and increase adaptive capacity so they can face the longer-

CRiSTAL 3.1

Livelihoods and Climate Change

How does CRiSTAL help you do this?

IISD, IUCN, SEI-US and Intercooperation have developed CRiSTAL (Community-based Risk Screening Tool - Adaptation & Livelihoods), a decision-support tool that helps communities, project planners and managers to:

- Systematically understand the links between local livelihoods and climate;
- Assess a project's impact on livelihood resources vulnerable to climate risk and important to coping;
- Devise adjustments that improve a project's impact on livelihood resources central to adaptive capacity

To do this, CRiSTAL is divided into two modules:

1. Module 1: Synthesizing information on climate and livelihoods
2. Module 2: Planning and managing projects for climate adaptation

The first module is designed to help you collect and organize information on the climate and livelihood context of the project area. The second module will then use this information to help you analyze how a project affects local vulnerability and adaptive capacity, providing a basis for devising project adjustments that foster adaptation to climate change. Module 1 must be completed in order to use Module 2.





Lessons learnt and Conclusions

- Specific design rules of infrastructure **must change**. The concept of a “design-basis-event” based on a “return period” (ten-year rainfall, 100 year-flood, etc.) was very useful but is now dangerous. The hypothesis of a stable climate is now incorrect.
- **Risk-analysis approach** is necessary and the knowledge of the cost-sensitivity of a given infrastructure to climatic condition levels (i.e. winds) is necessary to make sound decisions.
- Appropriate **networking and knowledge capitalisation** are keys. The emergence of new climatic events with possible large impacts demands a wide and very-well-organised networking is needed to avoid errors occurring twice.
- Taiwan’s government and academic institutions can aggressively develop or adopt useful and well-designed **climate adaptation tools** for assessing local climate change issues and preparing adapting strategies.



**Thank you for
your attention!**

