Economic Impacts of Climate Change Kenya

A reflection and project plan

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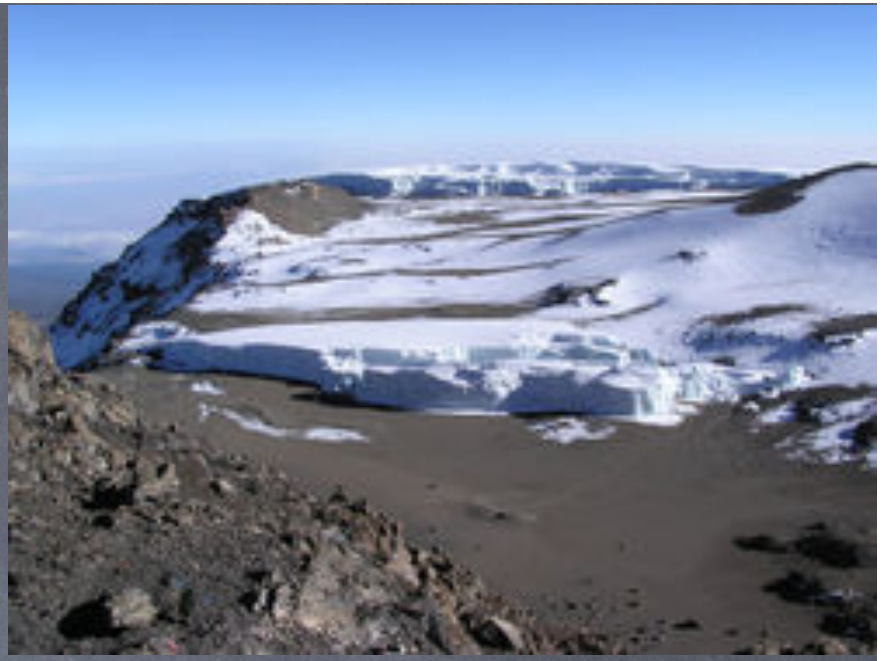
SEI STOCKHOLM ENVIRONMENT INSTITUTE



- I first came to Kenya over 25 years ago...what's new?

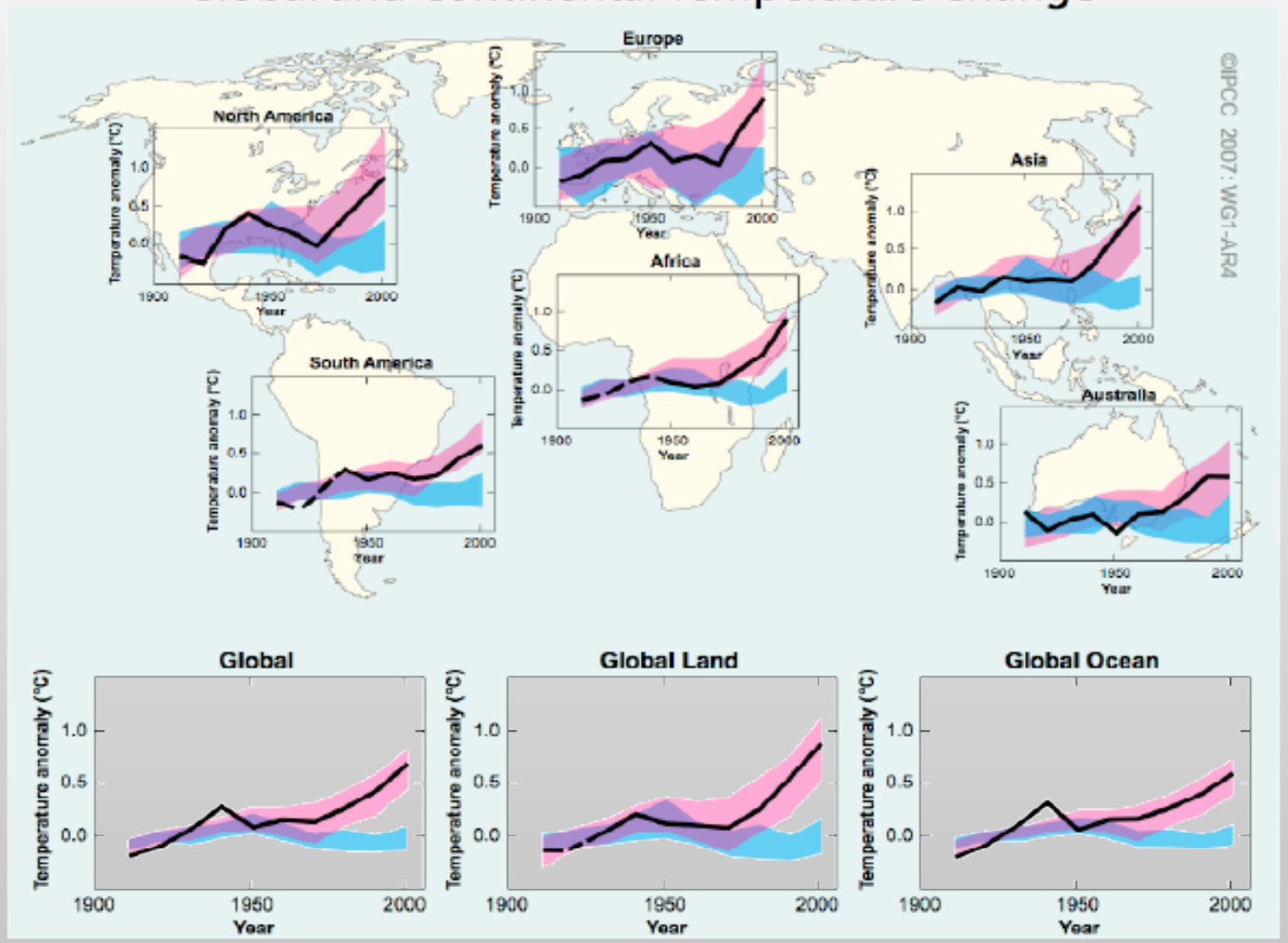
... vulnerability is increasing

... climate is changing

... global policy on climate change is moving quickly

- Kenya absorbs more carbon (through land use) than it emits (combustion): opportunities for CDM and low carbon futures, reduced emissions through avoided deforestation and land degradation (REDD)

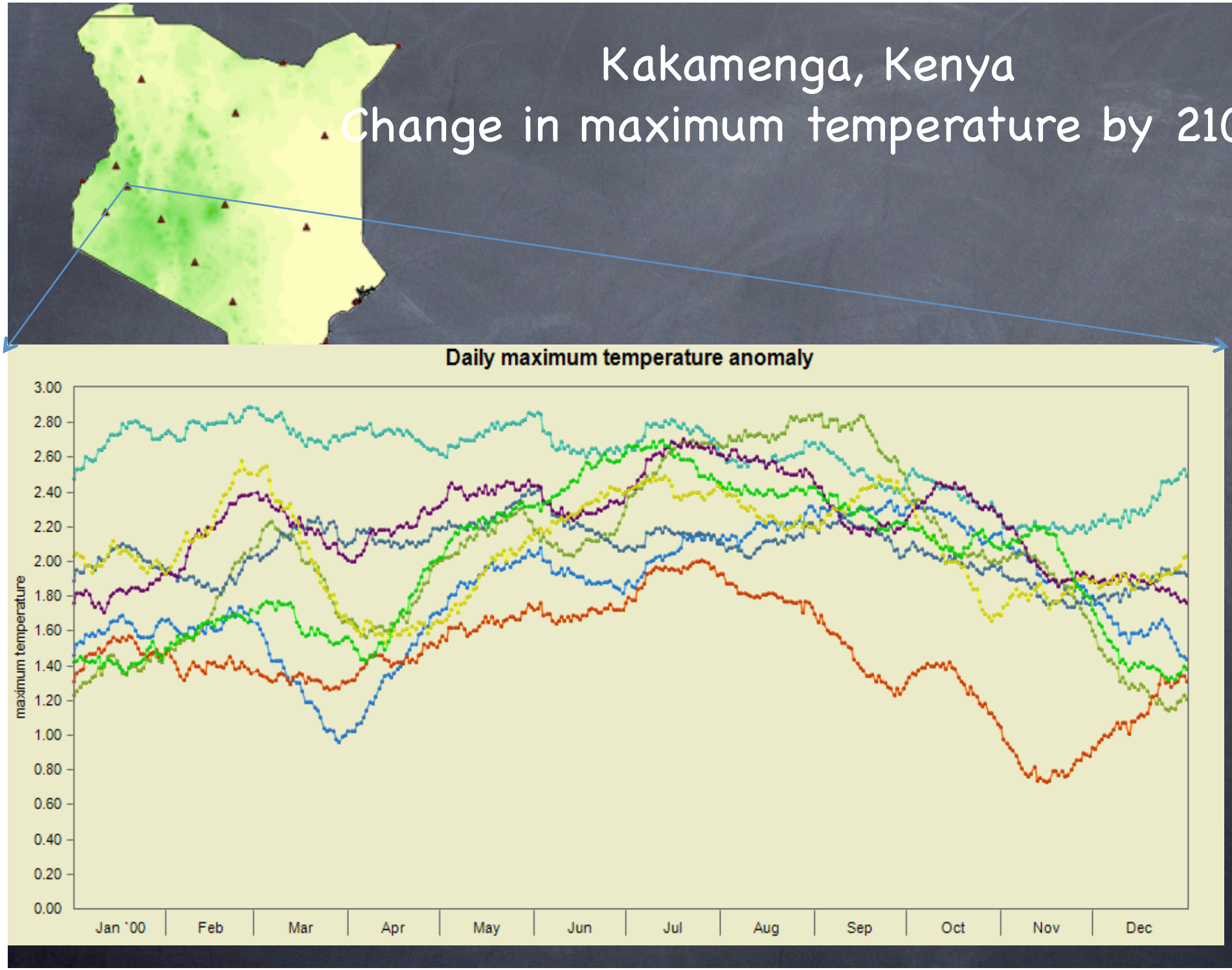
Global and Continental Temperature Change



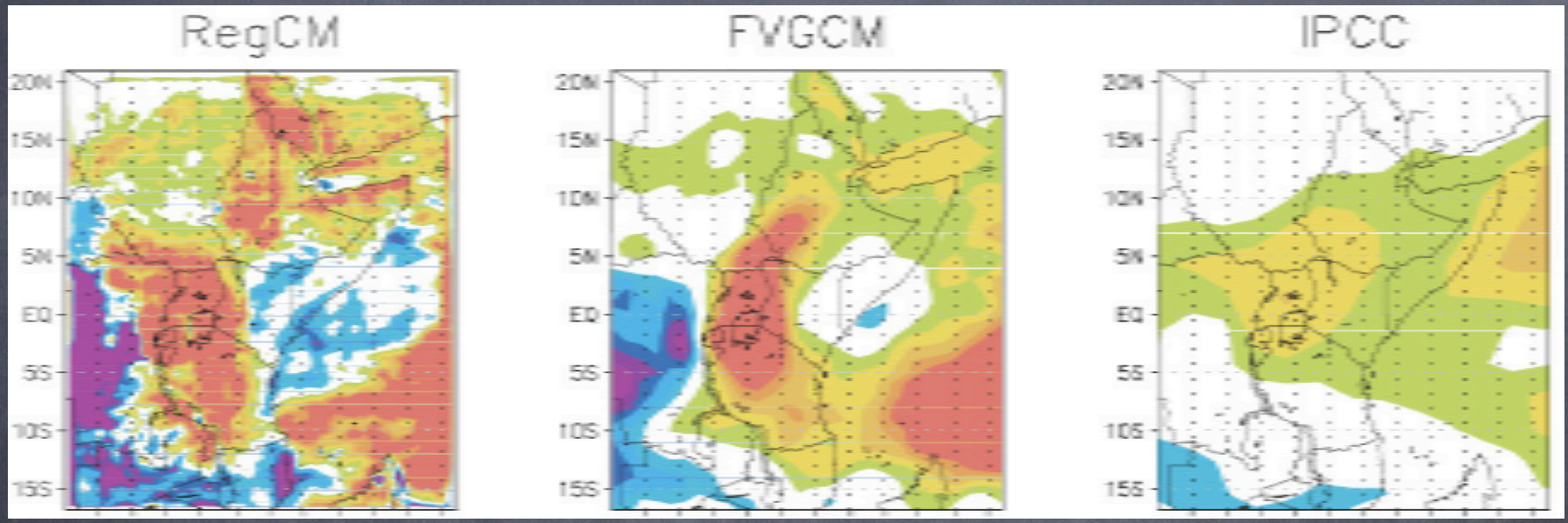
Historical changes can only be explained by including additional greenhouse gas emissions

IPCC, SPM, 2007
www.ipcc.ch

Kakamenga, Kenya
Change in maximum temperature by 2100



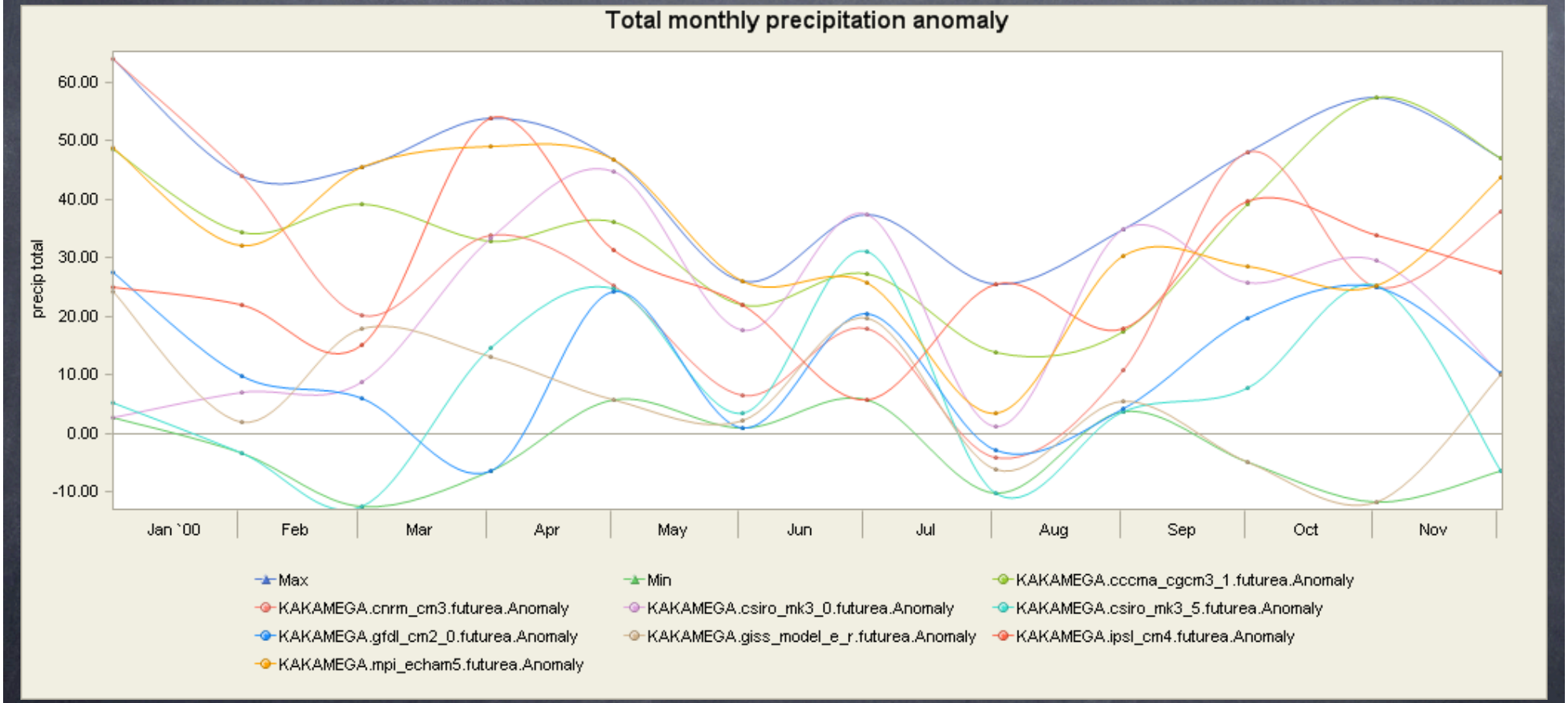
Regional rainfall change: OND by 2100



Average change by 2100 (A2: 2071-2100 average minus RF: 1961-1990 average)
Left: Regional model ReGCM3 run
Centre Average of two model runs from climate model FvGCM
Right: Average of eight IPCC climate models

Source: AEA 2008

Kakamega, Kenya
Scenarios of rainfall change



from V & I to A

- current Vulnerability...(baseline)
  - Multi-stressor vulnerability (e.g., poverty map)
  - Target population, sector, region
  - Cost of present climate disasters
- Impacts...(social cost of carbon)
  - What-if', scenarios of future climate impacts against a reference projection
- Adaptation...(ensemble of analyses)
  - Planning and implementing adaptation strategies and measures
  - Economic adjustments to climate impacts and adaptation strategies and measures
  - Liability for damages?

"I need to protect my business. How will I be affected by a changing climate? What are the risks? What are the opportunities?"

"The droughts are getting longer. Our community is suffering. How can we learn from other peoples' experience of how to cope?"

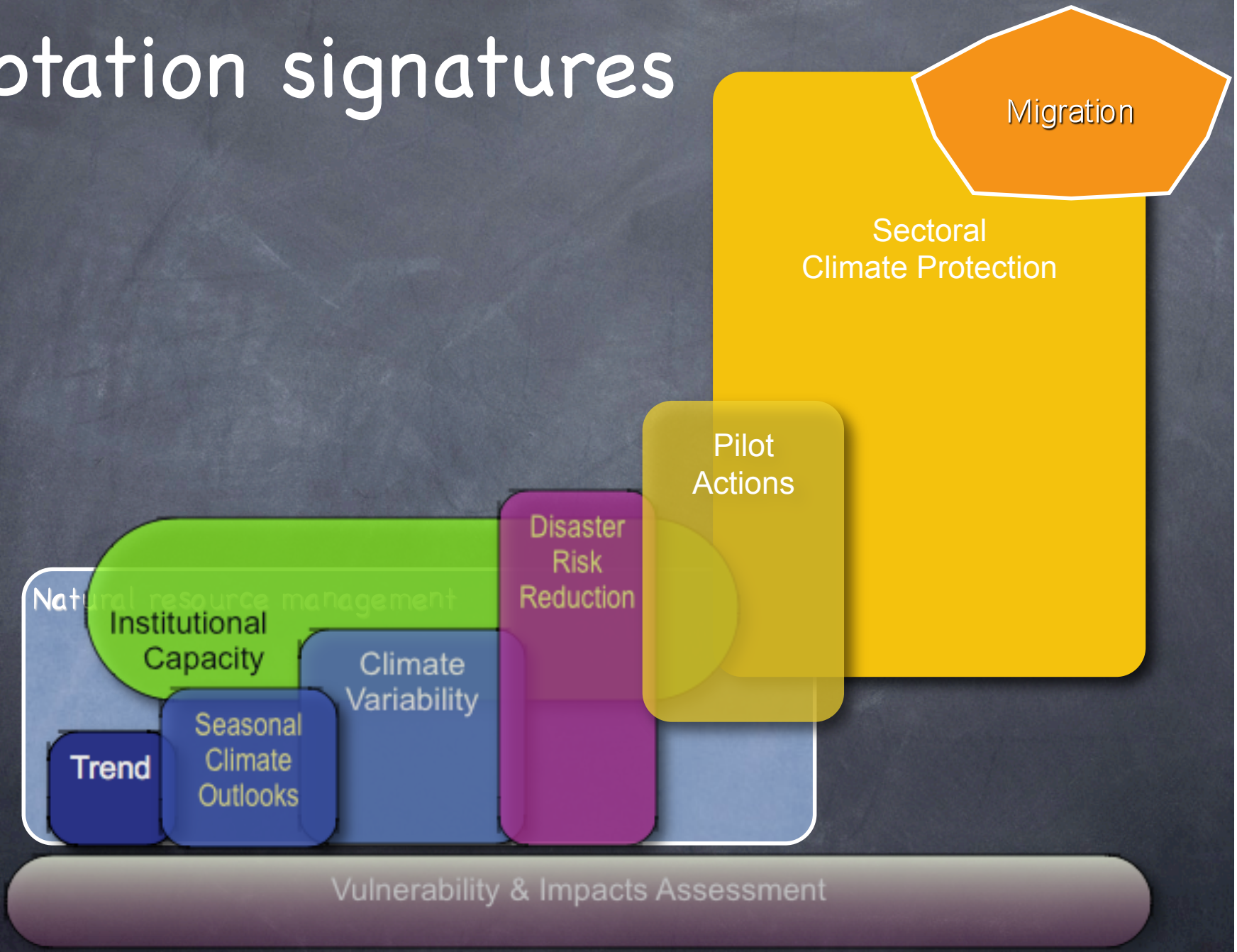
"The recent floods destroyed our crops. I see the climate is changing. How do I produce enough food for a growing family?"

"I need to coordinate adaptation planning within my department. How do we develop a policy framework and strategies to reduce vulnerability on the ground?"

What is the demand for information?

- Different users, different needs
- Specific outcomes
- Learning from each other, and by doing

Adaptation signatures



Economics of impacts of climate change: Aims

- ☑ Assess the potential impacts of climate change on key sectors: what's at-risk?
- ☑ Analyse the cost and benefits of adapting to these effects over different timescales
- ☑ Assess the potential for low carbon growth, including development benefits and finance options

And to use this assessment to...

- ☑ Build national capacity
- Inform decision making in Kenya, Africa and internationally

DFID Department for International Development

DEW Point Development Resource Centre Environment – Water – Sanitation

SEI Stockholm Environment Institute

Priorities for impacts & adaptation

- ✓ Health
- ✓ Agriculture
- ✓ Water
- ✓ Energy (hydro and bio) (low carbon growth)
- ✓ Transport
- ✓ Tourism
- ✓ Wildlife (ecosystem services)
- ✓ Forestry
- ✓ Conflicts under changing climate in arid and semi-arid areas
- ✓ Infrastructure
- ✓ Tipping points and migration

- National Communication, NCCACC, others

costing action…

Study	Cost of Adaptation	Regional coverage	Time frame	Sectors
World Bank (2006)	$ 9 to 41 billion/year	Developing countries	Present	
Stern Review (2006)	$ 4 to 37 billion/year	Developing countries	Present	
Oxfam (2007)	At least $ 50 billion/year	Developing countries	Present	
UNDP (2007)	$ 86 to 109 billion/year	Developing countries	2015	
UNFCCC (2007)	$ 28 to 67 billion/year	Developing countries	2030	Agriculture, forestry, fisheries, water supply, health, coastal zones, infrastructure
UNFCCC (2007)	$ 49 to 171 billion/year	Global	2030	Agriculture, forestry, fisheries, water supply, health, coastal zones, infrastructure

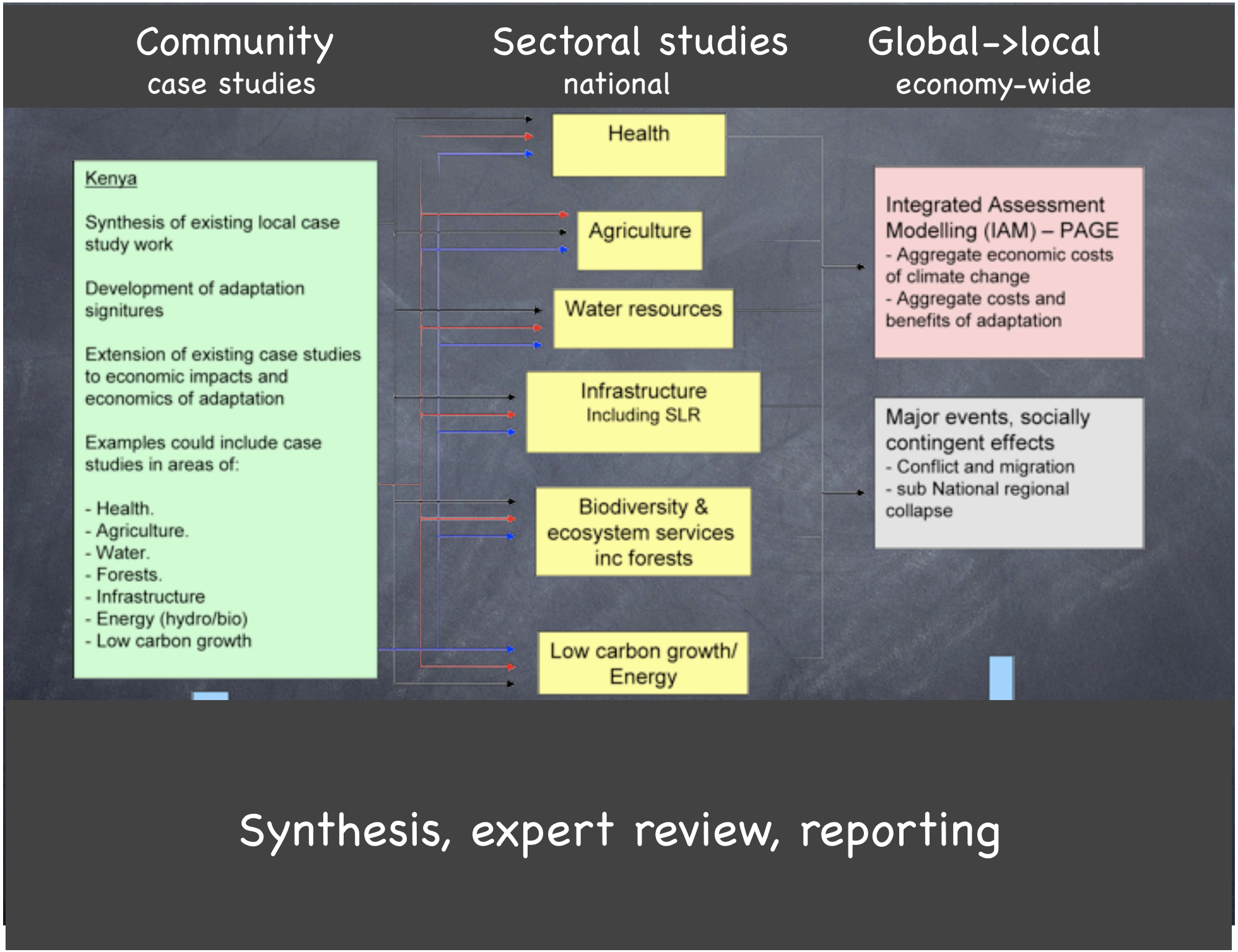
Estimates of the cost of adaptation to climate change

Emerging evidence…
Few validated studies…
Inconsistent assumptions…
Incomplete coverage…

Sector	Investment Flow	Proportion in developing countries
Agriculture, forest and fisheries	$14 billion/yr	
Water resources	$11 billion/yr	80% in developing countries
Coastal Zones	$11 billion/yr	Around 50% in developing countries
Human health	$5 billion/yr	All in developing countries
Infrastructure	$8 to 130 billion/yr	Public and private financed infrastructure
TOTAL	$49 to 171 billion/yr	$28 – 67 in developing countries

Adaptation framework: An ensemble approach

- Recognise outcomes of (economic) analyses are highly sensitive to assumptions and uncertainty and need to be grounded in local experiences
- Use a suite of tools and methodologies. Illustrative case studies exploring communities' climate exposure and resiliency capacity, seated within sectoral integrated impact assessment, and complemented at macro-scale with aggregated economic assessment
- Consider both market and non-market costs
- Consider physical impacts as well as economic metrics, i.e. health or ecosystem services poorly captured in existing studies and in economic valuation
- Distributional (inequality) aspects are important, particularly for informal economy (e.g., rural livelihoods)


Community
case studies
Sectoral studies
national
Global->local
economy-wide
Kenya
Synthesis of existing local case study work
Development of adaptation signitures
Extension of existing case studies to economic impacts and economics of adaptation
Examples could include case studies in areas of:
- Health.
- Agriculture.
- Water.
- Forests.
- Infrastructure
- Energy (hydro/bio)
- Low carbon growth
Health
Agriculture
Water resources
Infrastructure
Including SLR
Biodiversity & ecosystem services inc forests
Low carbon growth/ Energy
Integrated Assessment Modelling (IAM) – PAGE
- Aggregate economic costs of climate change
- Aggregate costs and benefits of adaptation
Major events, socially contingent effects
- Conflict and migration
- sub National regional collapse
Synthesis, expert review, reporting

Timeline

- November 2008
- January 2009
- May-June 2009
- July-September 2009
- December 2009
- Inception visits
- Briefings, expert workshop, contracts
- Interim reporting to African ministerial meetings, SBSTA

Outputs: fact sheets, software & data sets, reports all are available for partners to use!

Q & A

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- following slides were not used in the public presentation...

Kenya – 1st national communication

Key vulnerable sectors

- Water
- Agriculture
- Energy
- Transport
- Tourism
- Wildlife
- Health

Priority projects GHG inventories, climate change awareness raising and education, climate change mitigation and adaptation in the energy and transport sectors, promotion of adaptation and mitigation in the tourism and wildlife sectors, the health and public safety sectors, as well as in the coastal zones.

Kenya – Emissions

- Wood fuel caters for more than 70% of Kenya's total energy demand.
- The most significant GHG emitted from the energy sector in 1994 was CO_2, amounting to 4522.45 Gg.
- Emissions largely came from fossil fuel combustion. The other gases emitted were CO (1645.256 Gg), CH4 (148.144 Gg), NOx (46.723 Gg) and N2O (1.309 Gg).
- Kenya is a net absorber of CO2 through land use change and forestry, absorbing about 2,275 Gg of CO2 per year.

Priorities proposed at Nov. NCCACC mtg

- Health
- Agriculture
- Water
- Energy (hydro and bio)
- Forestry
- Costing of impacts of conflicts over water and pasture under changing climate in Arid and Semi-Arid areas was also identified as an issue that the study should focus on.
- Also other themes encouraged (see report) in terms of influencing policy

Other Potential Priorities

- Infrastructure, risks of floods in particular - current variability and also infrastructure associated with Vision 2030 of ‘middle income country’, but also SLR
- Ecosystem services extended beyond forestry to include wildlife / tourism, other
- Low carbon growth (energy) particularly co-benefits and opportunities
- Tipping points, e.g. migration scenarios

Proposed high level approach

- Combine top-down and bottom-up approaches, at different aggregation levels, different lines of evidence (methods)
- Method 1: Top-down aggregated economic analysis
- Information on likely costs of climate change, costs and benefits of adaptation, costs and benefits of mitigation. Some level of overall economy wide effects
- Method 2: Bottom-up case study level studies on impacts and adaptation/mititation. Local in-country studies to build the evidence base, consider vulnerability assessment (but economic perspective).
- Information in relation to livelihoods and the economy, ability to meet strategic objectives, implications for poverty alleviation and pro-poor growth.
- Method 3: Sectoral analysis to connect cases and aggregated analysis (impacts and economics) at national scale
- Build up a message for policy makers and different stakeholders from the bottom up, combined with the more aggregated estimates

Outputs

- Deliverables (D2.1): report outlining climate and socio-economic projections (Jan/Feb).
- Deliverables (D2.2): Initial output of results for Copenhagen COP 15 (March).
- Deliverables (D2.3, 2.4, 2.5): A report for each country (June/July):
- Deliverables (D2.6: A regional report, highlighting the regional impacts and policy implications (Aug/Sep).

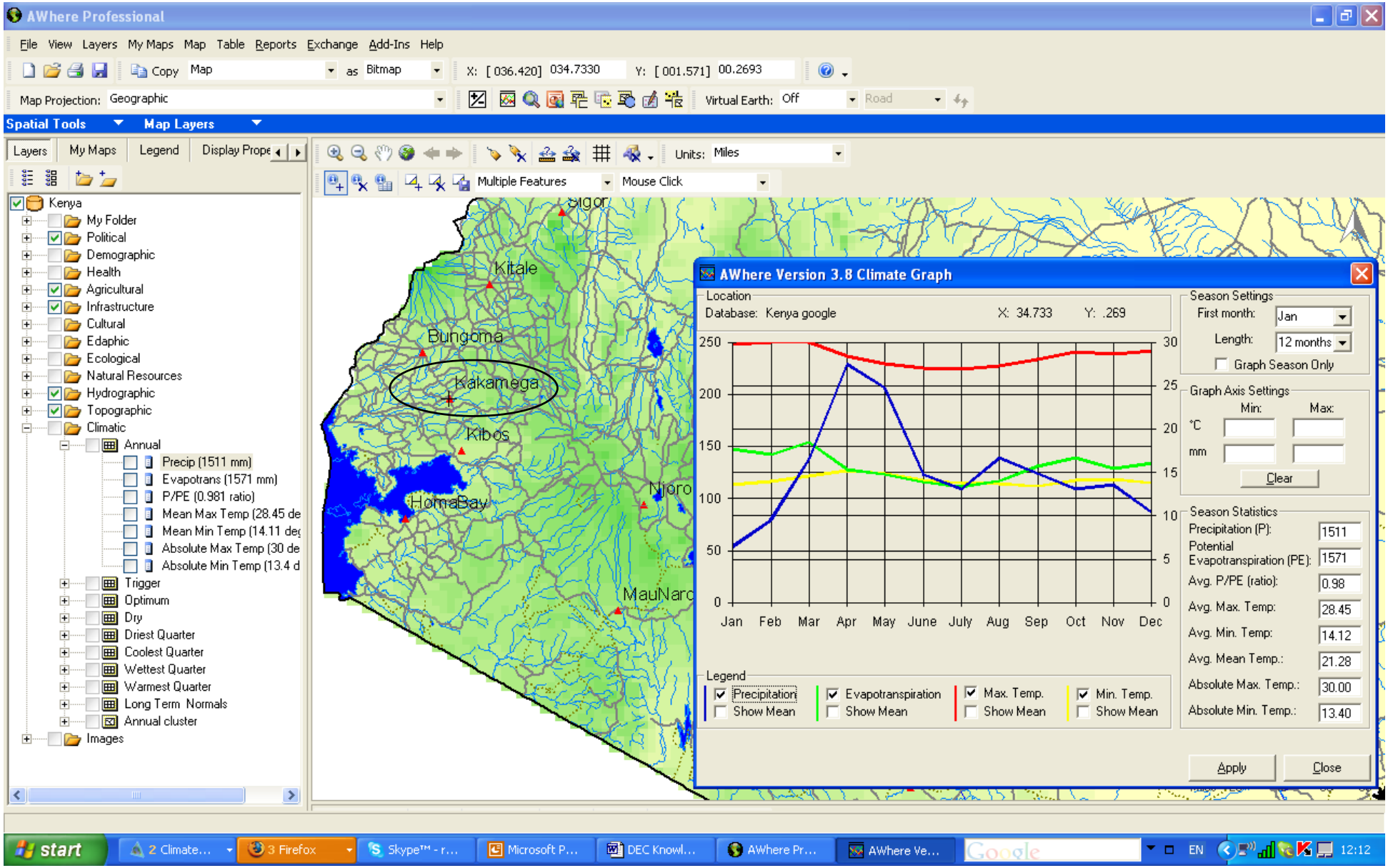
Study Aims and Stakeholders

- OCC Stern team: Aggregated regional and national economic costs of climate change, and low carbon economy (mitigation) costs and benefits for East Africa - input to Regional Economics of Climate Change Studies (RECCS – 'mini-Sterns')
- National Government, sub-national policy makers, DFID/Danida In country: Detailed information on the impacts and economic costs (physical units and monetary values) of CC adaptation in each country, to help prioritise in-country considerations for tackling climate change. Demonstrate potential for low carbon growth and benefits (mitigation analysis), including ancillary benefits
- Country negotiators: Aggregate regional costs of adaptation, to help inform discussions of level of adaptation funding, for input to African finance ministerial and African environmental ministerial meetings (March and June respectively) and help inform the negotiating position for Copenhagen (December)
- Local, prioritisation for donor funding: Information on local adaptation actions on the ground, including building adaptive capacity. Possibly analyse DFID/DANDIDA investment and climate proofing?
- Civil society: Real capacity building in-country, partnership project with analysis by local teams

Detailed proposals

- Key Tasks
- Climate scenarios and impact assessment
- Method 1: Top down integrated assessment
- Method 2: National sectoral Studies
- Method 3: Local case studies
- Policy recommendations, communication and dissemination

Awhere software – baseline (observed) climate graph for Kakamega, Western Kenya



Detailed sectoral proposals

- Health – impact based, e.g. global burden of disease, with valuation. Local case studies on vector borne. LSHTM (Kovats) + local partners
- Agriculture – FAO CropWat model (Stanford/NCAR) + local case studies including subsistance agriculture. SEI + local partners. Possible AERC seasonal forecasting case study.
- Water - Global Water System Partnership Digital Water Atlas, plus case study Arid and Semi-Arid Lands (Kenya)
- Infrastructure * – SLR using DIVA plus local case study (Tyndall [Nicholls] + Awuor); Flood risks - analogue approach (Hunt) for infrastructure
- Biodiversity and ecosystems. Focus in particular on forest.
- Energy. Focus biomass/land-use, hydro resources. Low carbon growth

Detailed top-down proposals

- Integrated analysis. Regional PAGE
- Tipping points? Migration and conflict. Sub-national regional collapse?

Local Case Studies

- A) synthesis
- B) extend existing studies to economics (e.g. Sakoi study of seasonal forecasting)

Dissemination and Communication

- Communication document now finalised
- In-country advisory groups meeting in mid January
- Launch events in each country in late January
- African milestones: finance, environment
- COP/MOP milestones: SBSTA, Copenhagen

The Link between Aims and Methods

Study aim strongly influences the method of choice. IPCC (WGII, Chap 2) outlines

- Synthesis - as with IPCC itself
- Impact assessment - links climate (scenarios) with sector specific impacts
- Integrated assessment - integrated modelling (often top-down), sectorally linked
- Risk assessment - (events) uses probabilistic data + risk criteria (tolerable risks)
- Vulnerability assessment – focus existing socio- and economic vulnerabilities, e.g., NAPAs in East Africa
- Stakeholder/participatory - direct participatory approaches
- Economic valuation studies have used Impact Assessment/Integrated Assessment

Key Aspects of Methods

	Strengths	Weaknesses
Synthesis	Reflect outputs from a range of studies	Limited by availability of the current information, lack of consistency.
Impact Assessment	Sophisticated analysis of range of impacts. Easiest to apply valuation.	Less focus on current impacts and near-term adaptation.
Risk Assessment	Probabilistic approach allows likelihoods of impacts.	Extra complexity can significantly increase resources.
Vulnerability Assessment	Considers existing socio-economic conditions and decision-making	Lack of common metrics makes cross-sectoral and valuation difficult.
Integrated Assessment	Increased recognition of indirect and cross-sectoral links.	Extra complexity may increase resources. Less transparent.
Stakeholder	Stronger elements of building adaptive capacity and raising awareness	Not consistent and scientifically robust evidence base covering all impacts and sectors

Adaptation framework contd.

- Recognise that the value of information is in making a decision, rather than employing specific approaches CBA, RA etc in own right. Economics is important, whether implicit or explicit (e.g. costs of adaptation)
- Include communication tools, shared information and participatory techniques - exploring synergies, conflicts and raising awareness.
- Consider adaptation a process of social and institutional learning, for specific contexts
- ★ Producing adaptation outcomes and processes that are robust against wide range of future situations (the ground adaptive capacity). This applies as much in economic terms.
- ★ Effective adaptation equips people and institutions to cope with a wide range of contingencies. Learning is achieved through re-assessment.
- ★ Aim to integrate climate change and adaptation in 'good enough' practice in risk management that promote resiliency over high risks, high rewards strategies.

Mitigation framework

- Balancing priorities: Affordable energy for development (DFID) and low carbon growth (Stern)

- Focus on development co-benefits to address potential conflict and reality of immediate development needs