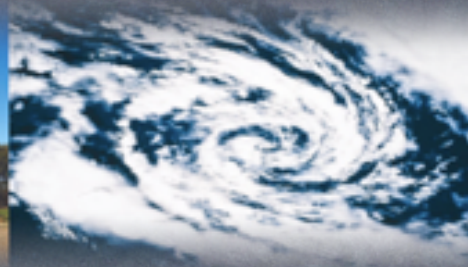
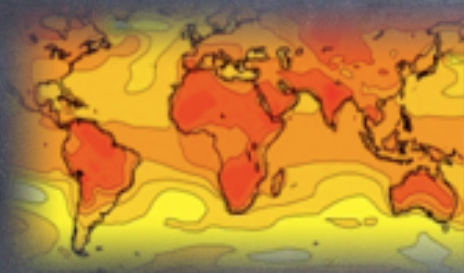


# Economic Impacts of Climate Change in Rwanda



Paul Watkiss, Jane Olwoch,  
Tom Downing, Jillian Dyszynski

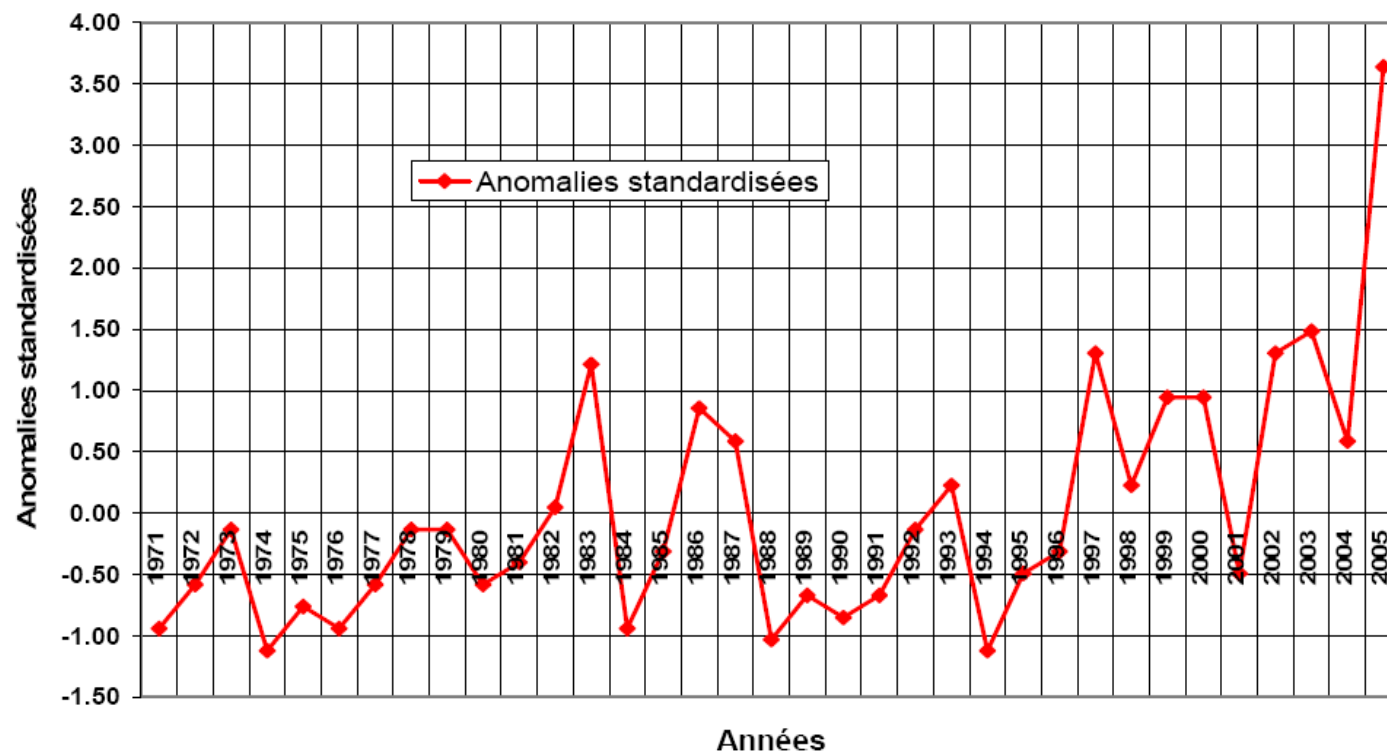
23 February, 2009





# Climate Change and Rwanda

- Rwanda is changing ...economic growth...but vulnerability is increasing ... emissions are rising
- The climate is changing ...observing higher temperatures and changes in frequency, intensity, persistence of extremes (floods and droughts)
- Reports of higher economic costs from these events...which likely to increase further with future climate change
- .... climate change is becoming an economic, finance and planning issue, rather than (just) an environmental issue
- Global climate policy is changing.....and opportunities are emerging. ....CDM and low carbon futures, avoided deforestation and land degradation (REDD), adaptation funds.



abnormalities of absolute annual maximal temperatures registered  
at Kigali station from 1971 to 2005.

Source: NAPA - Data from Meteorological Service/MININFRA

Already  
temperature  
observations of  
a warmer  
climate

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

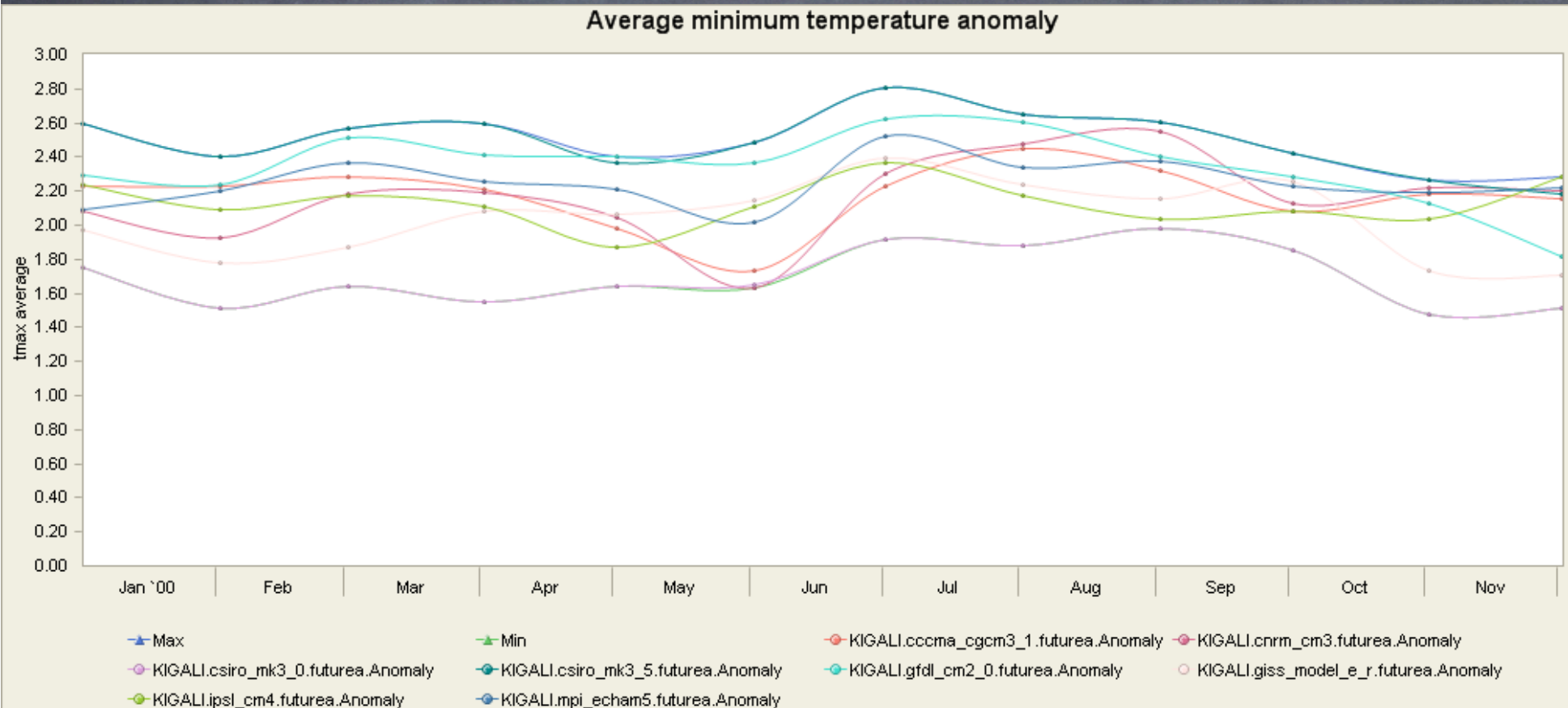
IPCC, SPM, 2007  
[www.ipcc.ch](http://www.ipcc.ch)



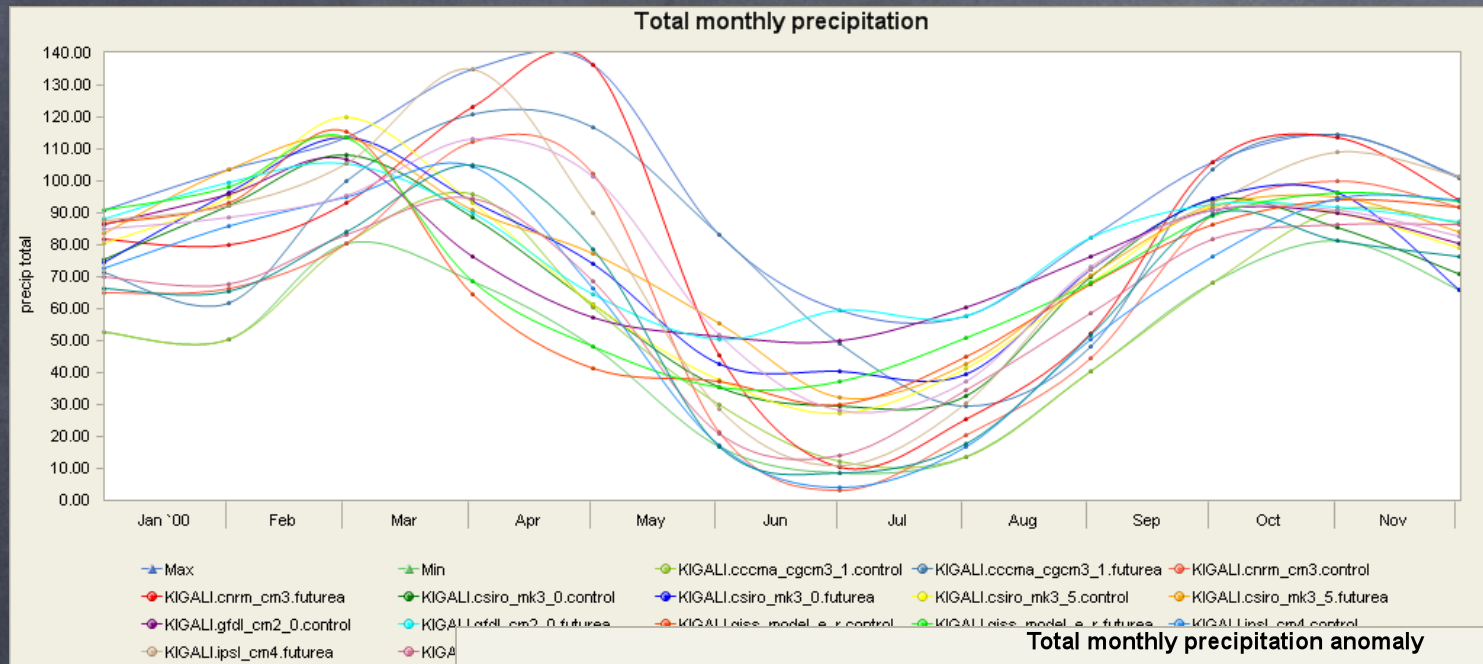
# Kigali – future temperature change

## Change in temperature by 2045–2065 compared to current (1960–2000)

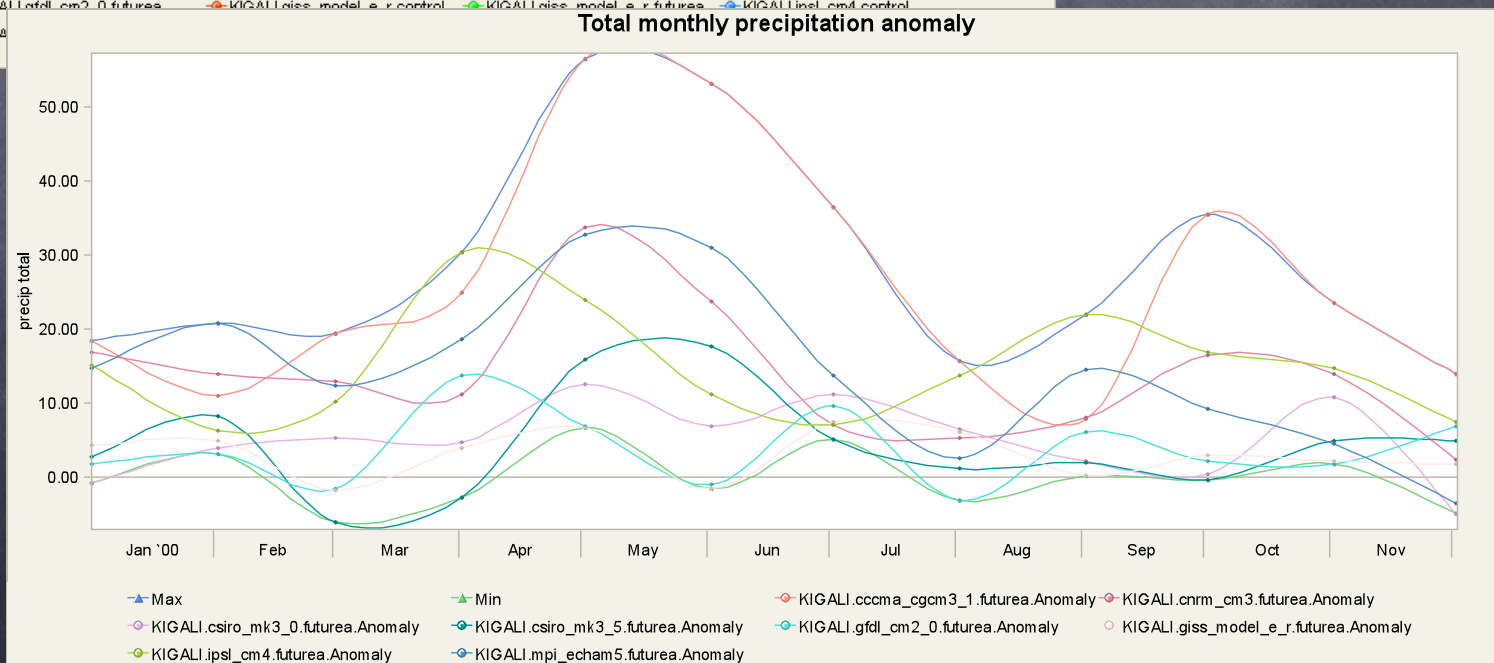
Kigali, Rwanda. Average temperature anomaly



# Kigali – current modelled rainfall



Future  
change  
2045-2060







"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?"

## The demand for information?

- ▶ Different users, different needs



# Economics of impacts of climate change: Aims

- ✓ Assess the potential impacts and economic costs of climate change on key sectors: what is at-risk?
- ✓ Analyse cost and benefits of adapting to these effects over time
- ✓ Assess the opportunities – the potential for low carbon growth, including development benefits and finance options

Led by a national advisory committee, and working with local partners, to...

- ✓ Build national capacity
- ✓ Inform decision making in Rwanda, and Africa for different end-users



# Priorities for impacts & adaptation

- ✓ High vulnerabilities to climate change of the population and sectors of agriculture, water resources and energy
- ✓ High degradation of arable land due to erosion, following torrential regime of rains in Northern regions, Centre/West and floods in their downhill slope;
- ✓ Desertification trend in agro-bioclimate regions of the East and South-East;
- ✓ The lowering of level of lakes and water flows due to pluviometric deficit and prolonged droughts; and
- ✓ Degradation of forests
- ✓ Infrastructure, risks of floods in particular - current variability and also infrastructure associated with future development
- ✓ Energy, and land-use, and low carbon opportunities. Ancillary benefits

Source NAPA, National Communication, other



## How important are these...

- East Africa studies indicate current periodic droughts and floods have significant economic losses – long-term fiscal liability of ~ 1-3% of GDP / year
- Studies indicate African economies could face additional losses from climate change of at least 1-2% of GDP and probably 5-10% or more
- Potential to threaten 2020 Vision objectives and MDG, plus potentially reverse development gains and growth
- Larger impacts in Africa / Rwanda
  - economies rely more on climate-sensitive activities;
  - existing vulnerability, and adaptive capacity reduced by technical, economic and institutional limitations
- Estimate headline economic costs for Rwanda?
- Estimates cost by sector, including market and non-market sectors



# Costing Adaptation Action...

- Studies of the cost of adaptation to climate change
- UNFCCC estimates - \$28 - 67 Billion / year by 2030 in developing countries
- African Development Bank - \$2 to 7 billion / year short-term in Africa
- Emerging evidence.....Few validated studies...
- But potentially large finance flows through Adaptation Fund
  - Estimate costs of adaptation for Rwanda? Information for negotiations



# Outline of the study

- ✓ Assess the aggregate economic costs of climate change, and costs of adaptation (top down) in Rwanda
- ✓ Assess the potential impacts and economic costs at a national level for Rwanda, by sector (bottom-up), and adaptation options (costs and benefits), and low carbon growth finance opportunities
- ✓ Assess key vulnerabilities and hot-spots with local case studies – linking to economics – but considering non-formal economy and adaptation.

And to use this to provide

- ✓ Lines of evidence
  - ✓ input to international negotiations
    - ✓ information for national priority setting
      - ✓ local narratives and storylines to highlight real issues



# Community

# Sectoral studies down

# Aggregate-top

Synthesis of existing local case study work

Local adaptation signatures to inform local adaptation and capture vulnerability

Extension of existing case studies to consider the economic impacts and economics of adaptation

Examples likely to include case studies in areas of:

- Health.
- Agriculture.
- Water.
- Forests.
- Infrastructure
- Energy (hydro/bio)
- Low carbon growth

These local stories ground-truth the more aggregated sector analysis

Health

Agriculture

Water resources

Infrastructure

Biodiversity &  
ecosystem services  
inc forests

Low carbon growth/  
Energy

Integrated Assessment  
Modelling (IAM)

- Aggregate economic costs of climate change
- Aggregate costs and benefits of adaptation

Potential for major and  
socially contingent effects

- Conflict and migration
- sub-national collapse

case studies

national

economy-wide

The combined evidence across the framework provides the economic costs of climate change and the costs and benefits of adaptation, to provide information for national priority setting and as input to international negotiations



# Adaptation signatures

Costs





# Timeline

- February 2009 – national advisory committee meeting and study launch
- March/April – local partners, data collection
- April – integrated assessment and costs of adaptation analysis (top-down) – with results ready for African ministerial meeting in May
- June 2009 – AMCEN
- July–September 2009 – bottom-up results, re-iteration (aggregate)
- December 2009 – COP 15



# Questions

- Comments on methodology
- Local partners
- Existing studies
- Potential local case studies



# Thank you

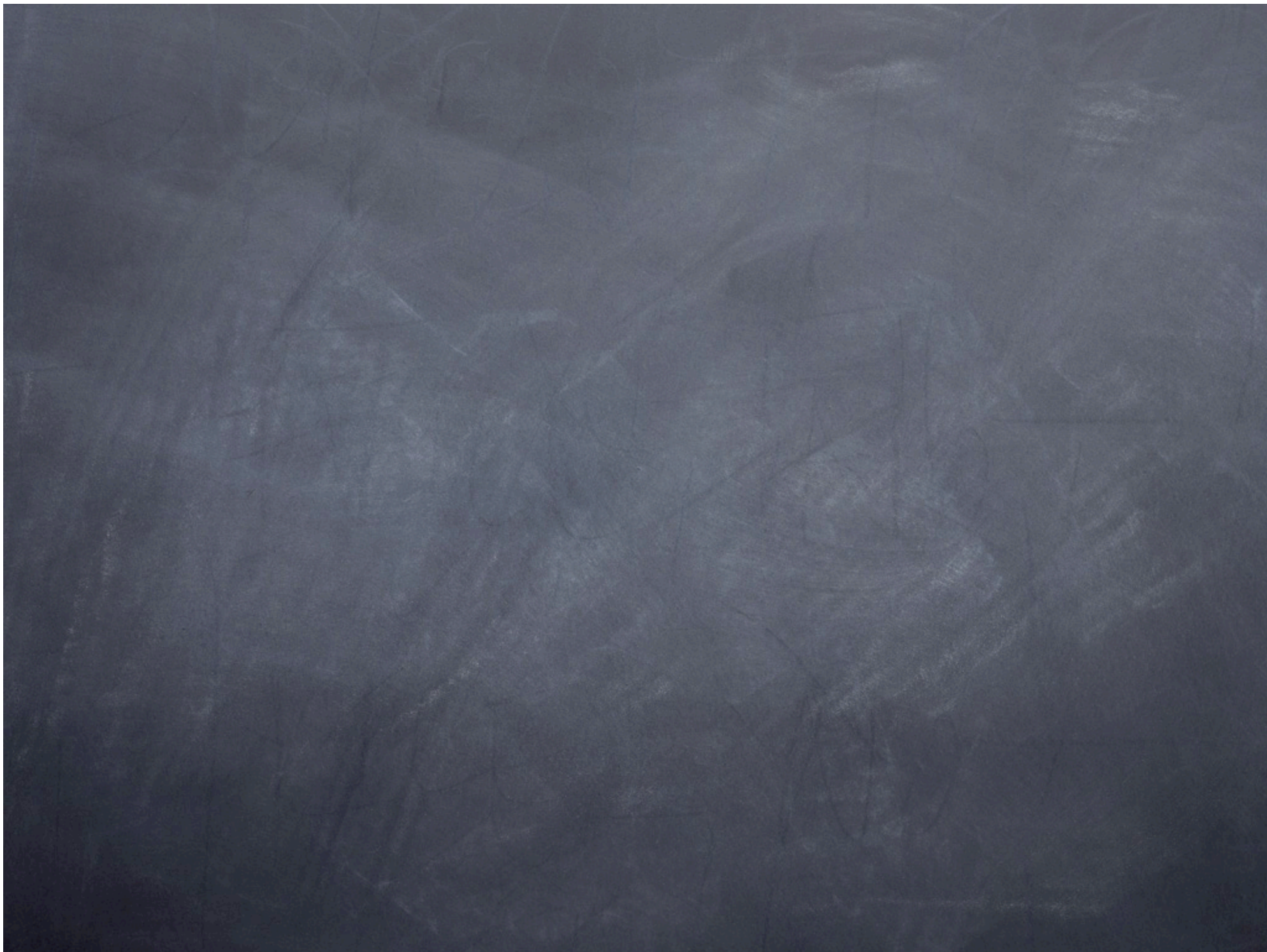
[Jane.Olwoch@up.ac.za](mailto:Jane.Olwoch@up.ac.za)

[paul\\_watkiss@btinternet.com](mailto:paul_watkiss@btinternet.com)

Climate change explorer with all Kigali data can be downloaded from  
weadapt [www.weadapt.org](http://www.weadapt.org)









# from V & I to A

- current **V**ulnerability...(baseline)
  - ✧ Multi-stressor vulnerability
  - ✧ NAPA and 1<sup>st</sup> NC
    - ✧ Extend to CC and economics – cost of present climate disasters and trends
- **I**mpacts...(future impacts and economic cost of climate change)
  - ✧ What-if', scenarios of future climate impacts against a reference projection
  - ✧ Information for national planning
  - ✧ Include a low carbon growth scenario (finance opportunities)
  - ✧ Identify local hot-spots and issues of national and international concern
- **A**daptation...(ensemble of analyses)
  - ✧ Planning and implementing adaptation strategies and measures
  - ✧ Economic adjustments
  - ✧ Extend existing cost estimates in NAPA priorities – and build case for adaptation fund flows – move to a financial analysis



## Community

## Sectoral studies

## Aggregate (global)

Synthesis of existing local case study work

Local adaptation signatures to inform local adaptation and capture vulnerability

Extension of existing case studies to consider the economic impacts and economics of adaptation

Examples likely to include case studies in areas of:

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# Adaptation Economics...what to do in the face of high future uncertainty

## 1. Prepare to adapt by building capacity

- Research
- Awareness
- Policies
- Monitoring

## 2. Alter existing plans to manage climate risks and take advantage of new opportunities

- Urgent and high priority
- Win-win, Low cost
- Existing frameworks
- Disaster responses

## 3. Implement adaptation actions

- Cost-effective/Cost benefit analysis
- Additional criteria-existing frameworks
- Modify infrastructure
- Alter processes



# 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 (ecosystem services)
- 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)



# Timeline

- November 2008 – inception visits
- January 2009 – study proposal put to donor and accepted
- February 2009 – advisory committee and study launch
- End of February – identification of key information needs
- March – agree local partners
- March– April – data collection and discussion
- April – May – integrated assessment and costs of adaptation analysis
- May 2009 – aggregate (top-down) results (African ministerial meeting)
- June 2009 – AMCEN
- July–September 2009 – bottom-up results, re-iteration (aggregate)
- December 2009 – COP 15

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



# Progress

- Started on aggregate economic cost of climate change for East Africa commissioned. Using PAGE model – links to Stern review
- Collecting information on bottom-up and top down estimates of costs of adaptation – likely investment flows for Rwanda
  - These are on track for delivery in mid May (for AMM)
- Setting up national sectoral analysis – drawn up international teams, now starting discussion with local teams
- Identified early list of case studies, flood and drought effects, energy, etc – drawing together guidance for case studies and identifying local partners
- Outline for national and local studies, and partners, finalised end March