The Economics of Climate Change in Kenya

National launch

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UKaid from the Department for International Development

DEW Point DEVELOPMENT RESOURCE CENTRE ENVIRONMENT – WATER – SANITATION

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Why Climate Change and Why Economics?

- Kenya is changing – high economic growth - but vulnerability is increasing
- The climate is changing - higher temperatures, changes in seasonal patterns, recent floods and droughts
- Global climate policy is changing and opportunities are emerging – new markets, new mechanisms, new funds
- Climate change is becoming an economic, planning and finance issue, not (just) an environmental one
- Against this background – outline potential risks, strengthen the case for adaptation, demonstrate entitlement to adaptation funds

Economics of Climate Change

DFID/DANIDA funded study. Aims were

2. Assess potential impacts and economic costs of climate change

3. Scope the cost and benefits of adapting to these effects over time

4. Assess the opportunities and potential for low carbon growth

- Initial study to investigate all three areas

- Working with local partners (ICAPC, ILRI, Vi-LIFE Programme, CamCo), reporting to national advisory group (NCC ACC), aim to...

  - Inform decision making in Kenya, for different end-users

  - Input to international negotiations, information for national priority setting

Method – a mix of top down, sector and case studies

Local case studies

Bottom-up case studies (local or sub-national)

Synthesis of existing local case study work. Local adaptation signatures to inform local adaptation and capture vulnerability.

Case studies:
- Sea level and Mombasa
- Wildlife and tourism
- Flooding
- Agro-forestry and carbon
- Wind energy

These local stories ground-truth the more aggregated sector analysis

National sectoral studies

National sectoral studies (bottom-up)

Modelling of impacts and economic costs plus costs of adaptation

Impact and Adaptation :
- Coastal zones
- Health;
- Agriculture
- Water resources
- Infrastructure
- Energy
- Biodiversity and ecosystem services

Low Carbon Growth
Detailed analysis of baseline and low carbon options, including potential and costs

National level analysis

Aggregate economic costs (top down)

Integrated Assessment Modelling (IAM)
- Aggregate economic costs of climate change
- Aggregate costs and benefits of adaptation

Aggregated Adaptation Costs
- Analysis of Investment and financial flow analysis
- Scaling to East Africa and Kenya

These provide economy wide assessments and headline values

Overall provides a way to test results, provide information at various levels, for different aims

Existing climate variability already has significant economic costs in Kenya

- Periodic floods and droughts (extreme events) already cause major economic impacts and reduce growth in Kenya

- Well documented floods and droughts.

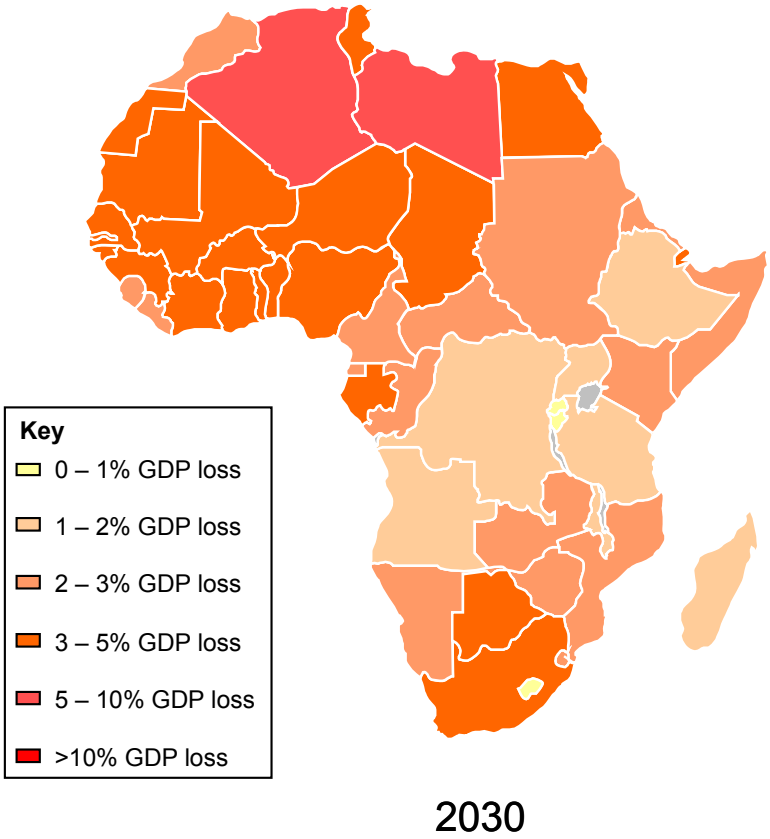
- High economic costs, e.g. $2.8 billion for 98/00 drought, 1.2 billion 97/98 flood. Case study on floods in 2006

- Significant as continued pattern over time, up to $0.5 billion a year, reduce GDP and economic growth, affect livelihoods

- Kenya it is not adequately adapted to deal with existing climate risks

Future climate change will lead to additional economic costs, on top of current impacts

- Africa is predicted to have greater impacts than other world regions, even in short term
- Economic costs are uncertain, but scale of change from aggregated models
- Net economic costs to Kenya (on top of existing climate impacts) minimum of 3% of GDP by 2030 (equiv)
- Noting this excludes future extremes such as floods and all ecosystem effects
- Without global mitigation, impacts in later years will be very severe

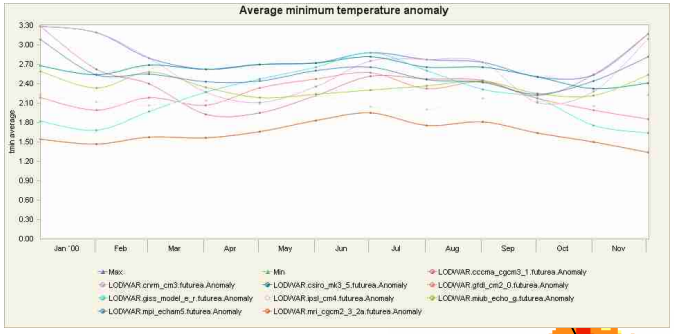


2030

Source FUND National model

Climate projections

- Rising temperatures, 1.5 – 3.5C by 2050s
- Rising sea levels
- Rainfall trends more uncertain, likely increase (on average)
- Changes in extremes –
- possible increase in intensity of heavy rain (flood risk)
- Pattern for drought unclear
- Noting socio-economic change also affect future impacts
- **Uncertainty is not a reason for inaction**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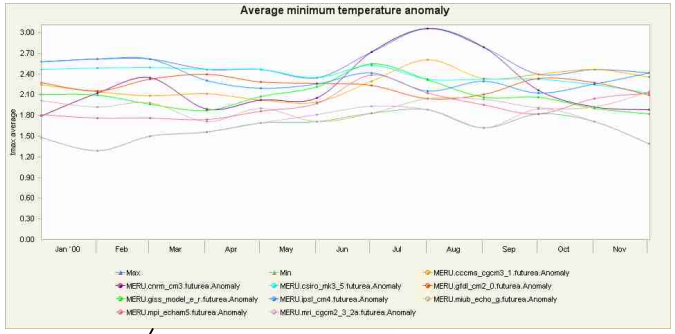
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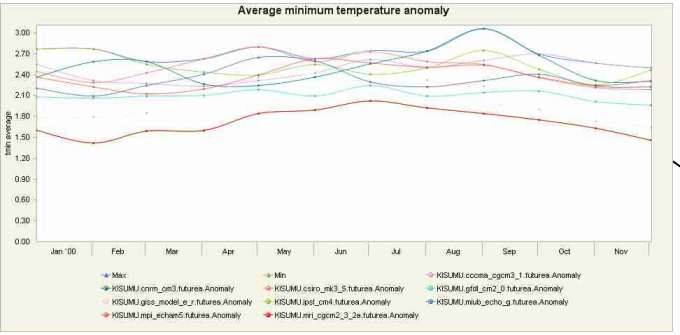
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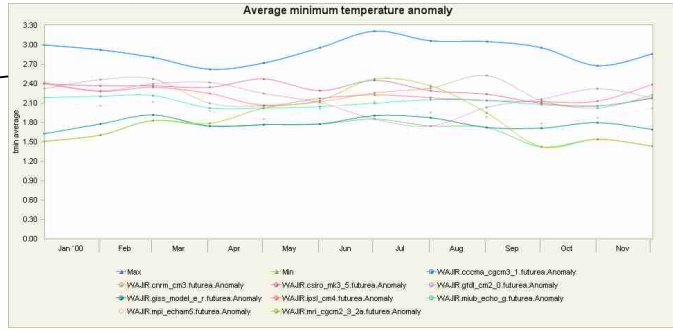
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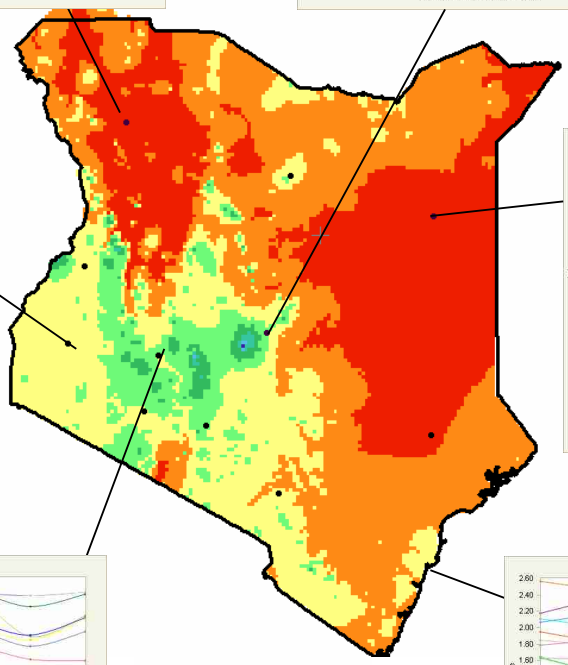

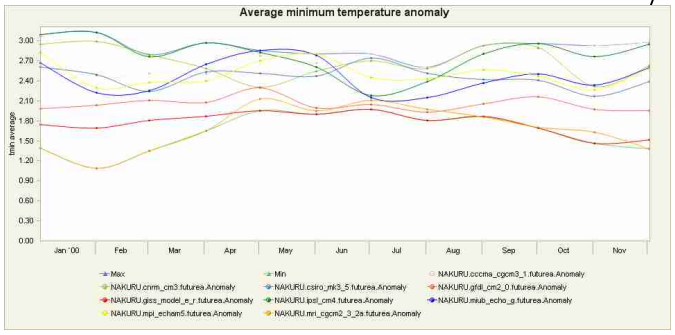
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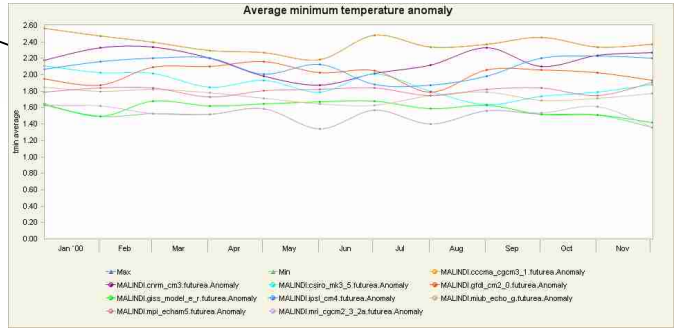
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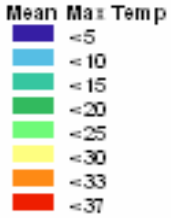
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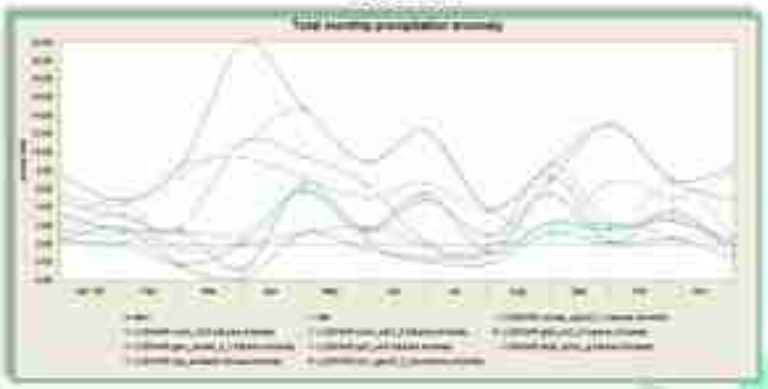

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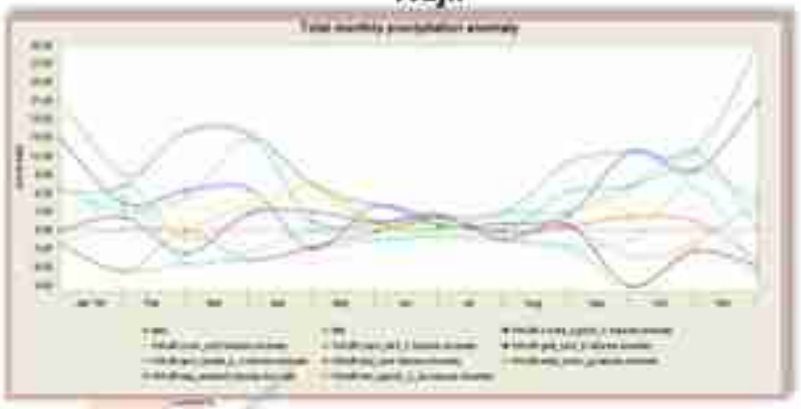

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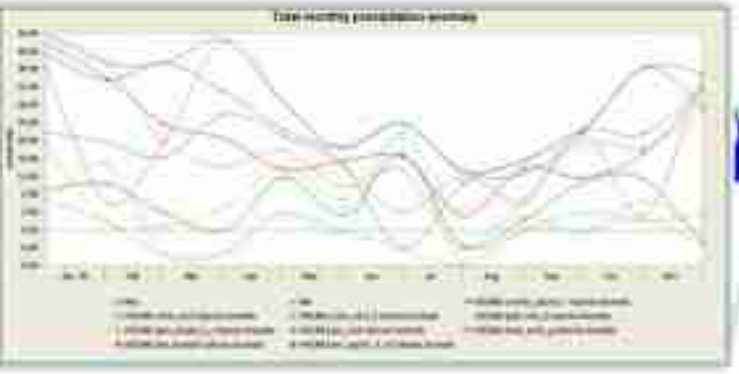

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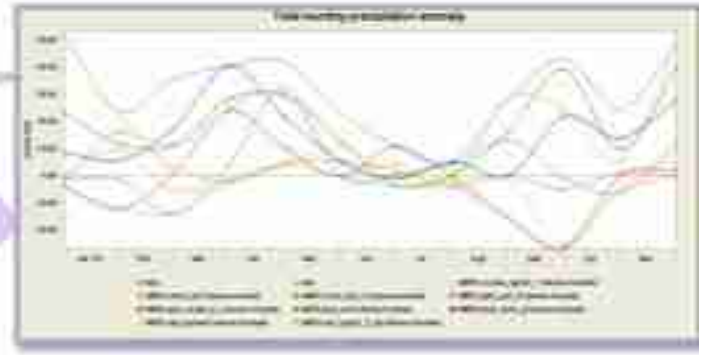

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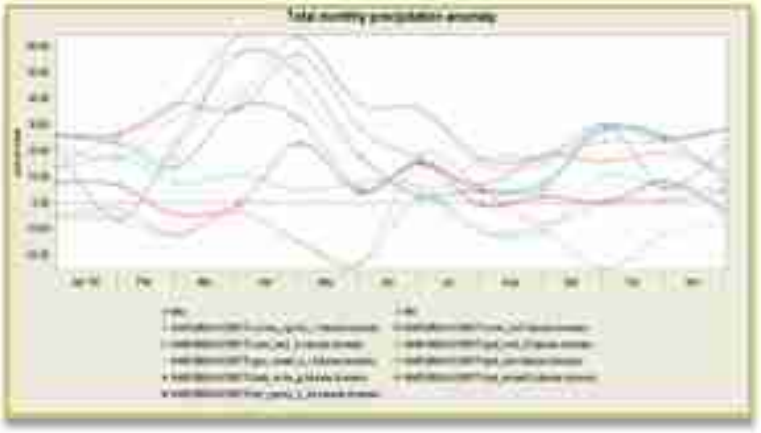
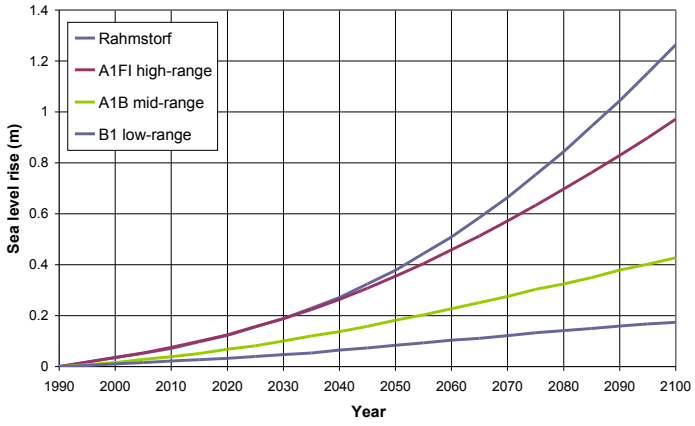
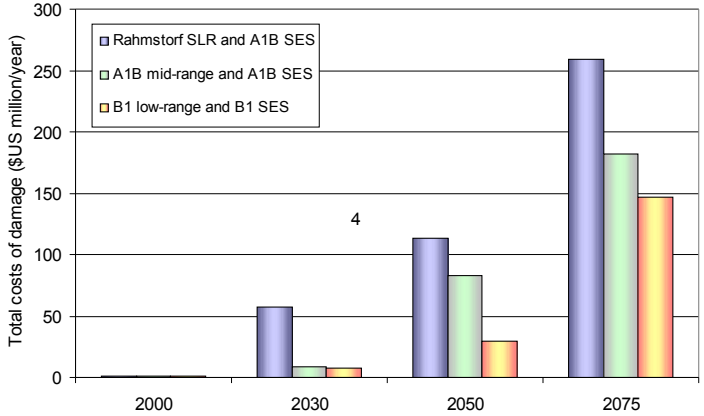


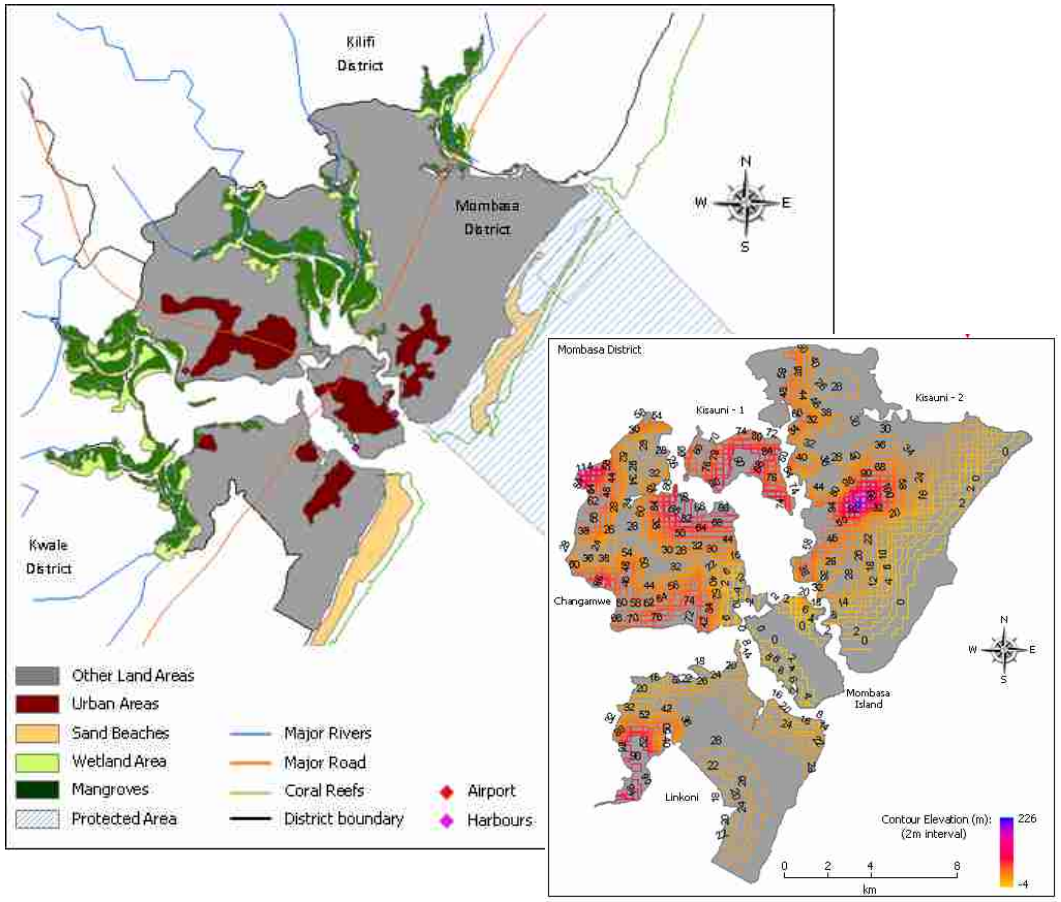
Sea level rise

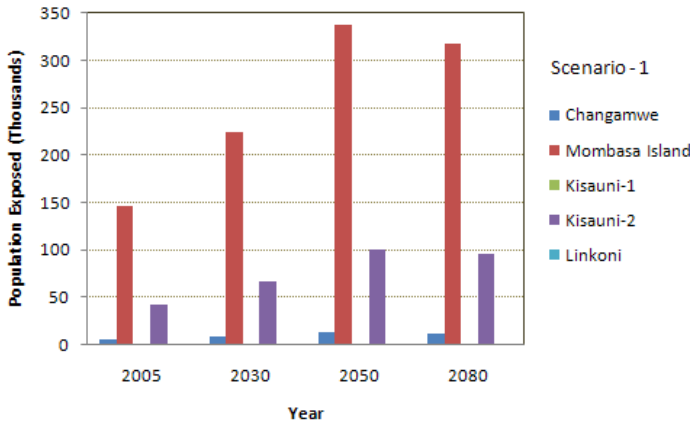
- Risk of flooding, erosion, loss of ecosystems for coasts from sea level rise
- coastal flooding from sea level rise will potentially flood 10,000 to 86,000 people a year by 2030.
- estimated total economic damage costs are $7 - 58 million per year (without adaptation).
- By 2050, these could increase to $31 - 313 million per year

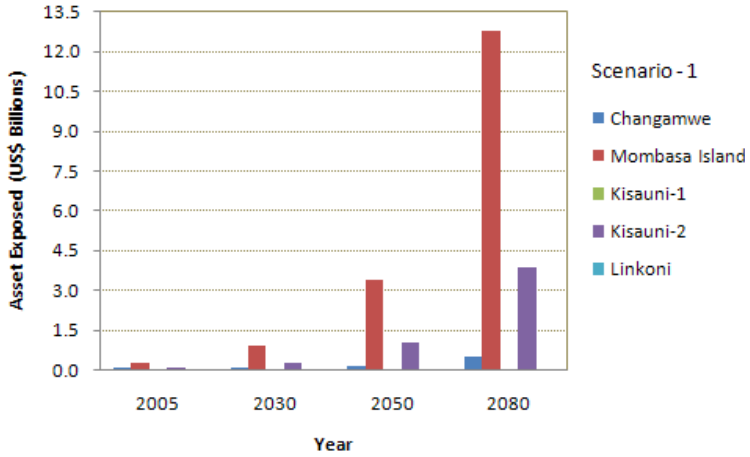




Case study - Mombasa

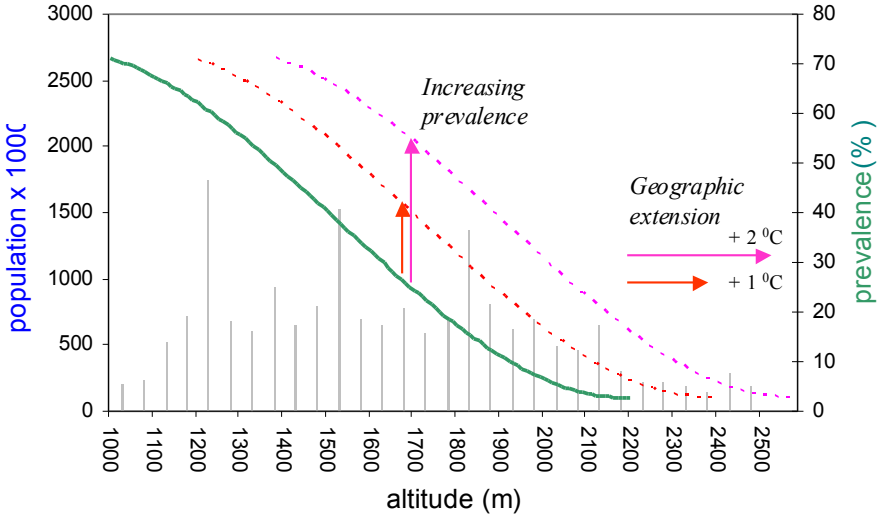






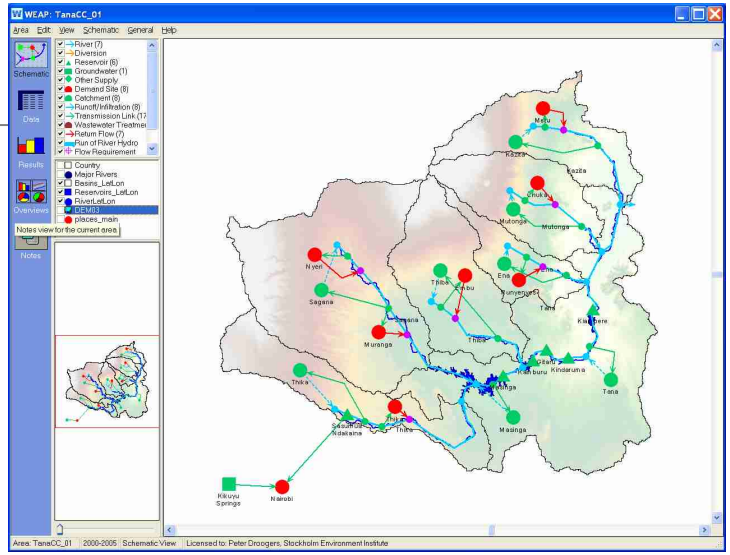
Health

- Potentially large increase in the health burden of malaria in Kenya.
- This arises because a large part of the rural population lives at higher elevations, where the disease is currently restricted by temperature.
- Study work undertaken by LSHTM with altitude risk model
- Whilst uncertain, climate change indicates potential increase in rural population at risk of malaria by up to 90% by the 2050s.
- Direct costs $75 milllion/year, full economic much higher



- Other climate sensitive health burdens will add to this

Water resources



- Water resources a key issue, multi-sectoral
- Very specific – catchment level
- Explored with Tana river
- Economic impact of climate change for this one river basin ranges
- from a benefit of $2 million
- to a cost of $66 million
- for hydropower, irrigation and drinking water across the range of projections

Floods and droughts

- Even without climate change, costs of floods and droughts will increase due to socio-economic change (population, growth) possibly by factor of five by 2030

- A key priority therefore is to increase the resilience of Kenya to cope with these extreme events.

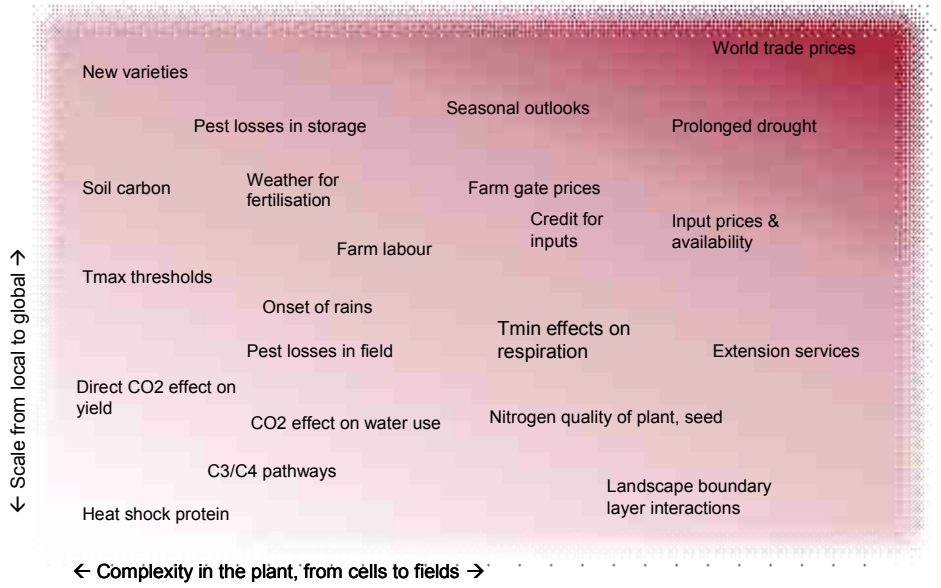
- Climate change is likely to further increase the economic costs of these events.

- Many of the projections indicate a change in heavy precipitation events for Kenya.

A number of models suggest a 10% - 50% increase in intensity for 1 in 10 year and 1 in 100 year rainfall events

Source Shongwe et al (2009)

Agriculture

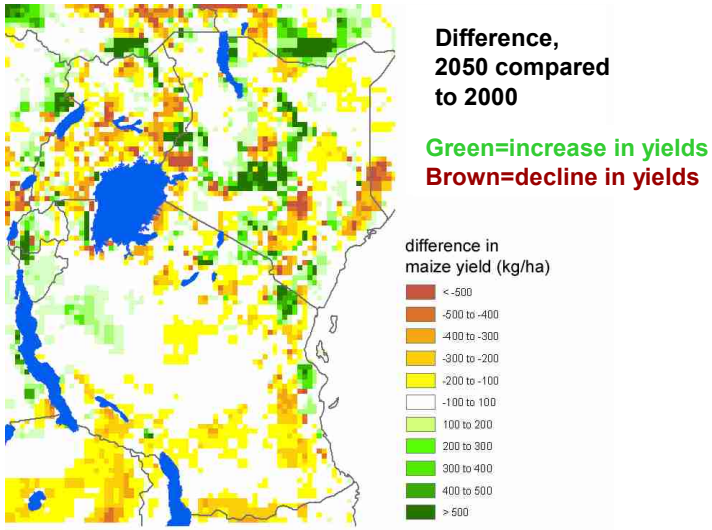


- Agriculture affected by wide of climate parameters, economic change and issues

- Predicted effects depend on projections model used and crop type

- Some models predict yield reduction and economic costs

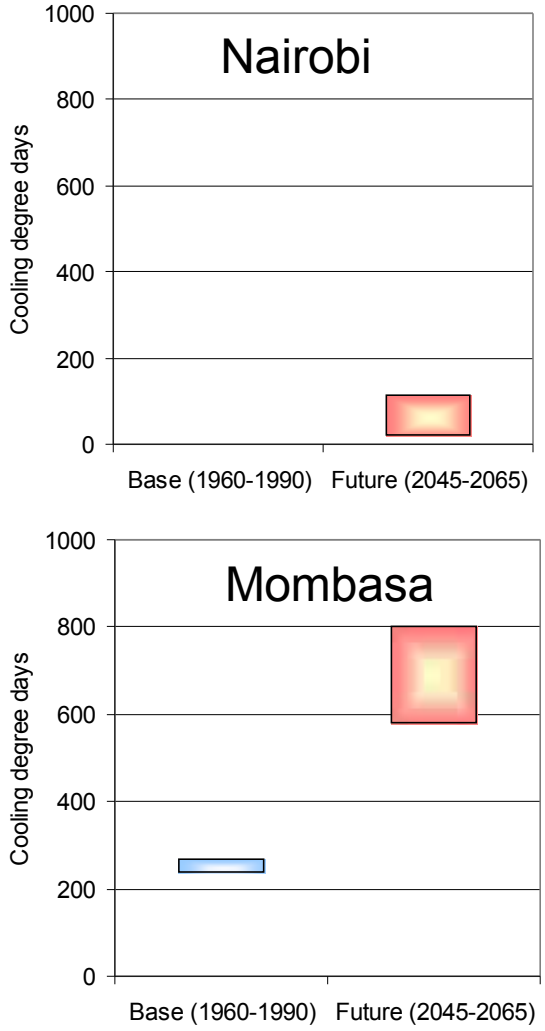
- Others predict more modest effects, even potential benefits (medium term)



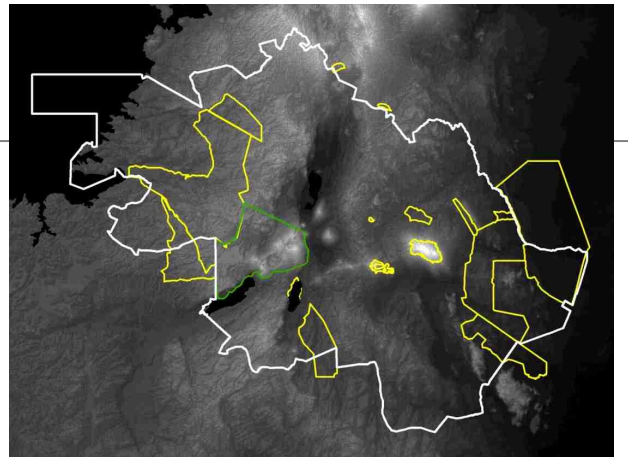
- However, do not adequately take into account extremes, pests and disease, etc – remains a key priority sector because of importance to GDP and livelihoods

Energy – supply and demand

- Key concern for energy supply are extreme events and hydro
- Key concern for energy demand is from higher temperatures and cooling demand
- The study has assessed the potential cooling burden from climate change
- Relation to building comfort levels and equipment (IT)
- Projections shows significant effects by the 2050s (as existing temperate climate) and issue for future building design, e.g. cooling demand Mombasa +300%



Ecosystem services



- Ecosystems provide multiple benefits to society, which in turn have economic benefits
- These are known as ‘ecosystem services’
- include provision of food, supporting services, regulatory services including flood protection and recreational and cultural services.
- Ecosystem services are integral to the Kenyan economy and underpin over large proportion of GDP, export earnings, etc, as well as sustaining a very large proportion of the population.
- There are many stresses on these systems already and climate change will add to these pressures.
- Number of case studies to explore

Sector analysis

- **Show economic costs could be large across many sectors**
- **Strong distributional effects by regions and groups**

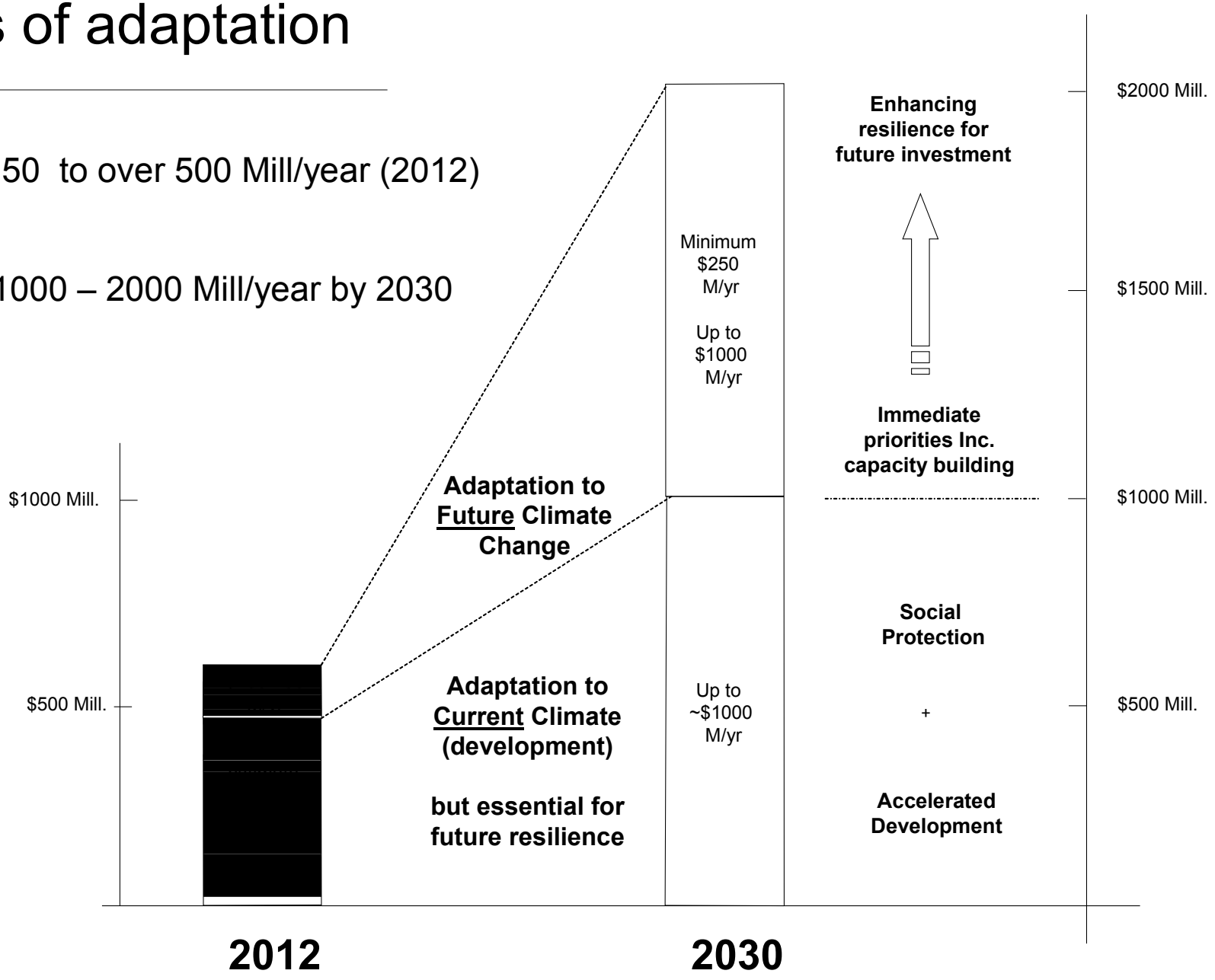
Adaptation

- Adaptation can reduce the economic costs of climate change but it has a cost
- Interest in how large these costs will be……
- Top-down aggregated estimates of the costs of adaptation. Four categories of adaptation have been identified.
- *Two of these are development activities and are targeted towards the large economic costs of current climate variability*.
- 1) addressing the current climate variability and 2) increasing social protection.
- *The second two are associated with tackling future climate risks*
- 3) building adaptive capacity and 4) enhancing climate resilience.

Costs of adaptation

Costs of $150 to over 500 Mill/year (2012)

Rising to $1000 – 2000 Mill/year by 2030



Adaptation signatures

Study also assessed bottom-up costs of adaptation by sector, with case studies

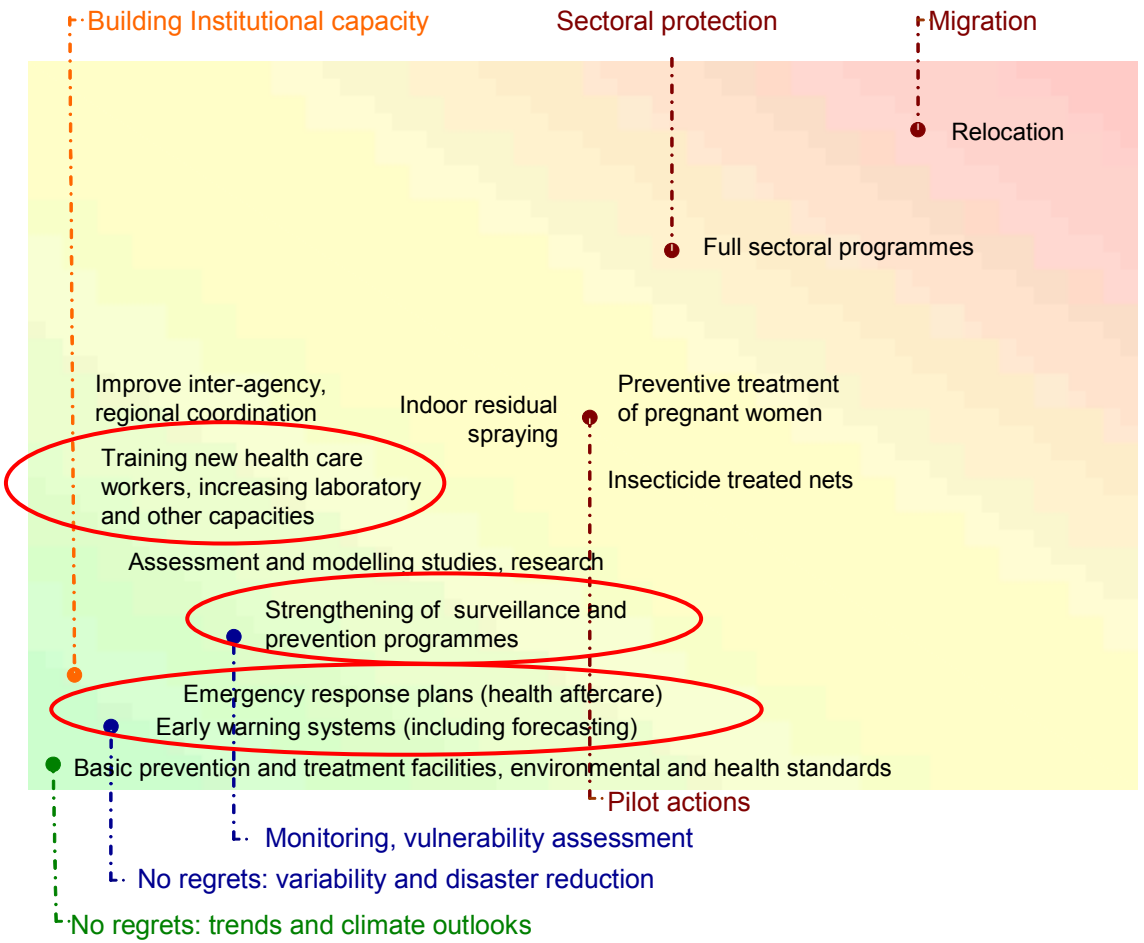
Focus on early priorities that make economic sense, given uncertainty

- Building adaptive capacity;
- Focusing on win-win, no regret or low cost measures (justified by current climate conditions or involving minimal cost);
- Encouraging pilot actions to test promising responses; and
- Identifying those long-term issues that require early pro-active investigation (though not necessarily firm action).

Used adaptation signatures – provide an economically rationale order of priority

Health

- In the health sector, the potential costs of adaptation to address the potential increasing burden were considered based on treatment and prevention costs.



Sectoral assessments

- Sea level rise – adaptation costs and benefits
- Tana river – adaptation, as well as water sector investment
- For floods, analysis of potential options and case studies
- Consideration of energy (cooling)
- In the agricultural sector, estimates are provided to illustrate the scale of effort that may be required and some of the urgent priorities.
- Case study on agro-forestry, sustainable land use management, agro ecological zones, wildlife

Overall

- Sectoral costs re-enforce top down estimates, show high benefits of adaptation, need to address current climate and future effects
- Large number of immediate priorities areas and no regrets options identified
- E.g. strengthening of effective surveillance and prevention programmes for health
- E.g. capacity building to strengthen meteorological data, analysis and forecasting for seasonal outlooks (agriculture) and extreme events (flood risk)
- E.g. early warning and disaster risk reduction, risk mapping and screening.
- Pilot actions identified across all sectors plus promising options for sectoral scaling

Low Carbon Growth

- Following a low carbon development pathway could provide significant economic opportunities for Kenya, and is strongly in its own self-interest.

- Important because of drive to be a middle income country

  - future economic growth could ‘lock-in’ Kenya into high emissions path, reduce opportunities for capturing finance in the future and also leading to economic, environmental impacts

- Potential to implement no regret (win-win) low C measures which further enhanced by potential for carbon credits

- Co-benefits from reducing energy imports, enhancing energy security, improving air quality and health, reducing pressures on natural resources, and could help achieve poverty reduction and economic development. Potential adaptation funding synergies.

Wind Development in Northern Kenya
Largest wind development in Africa, 300 MW, near Lake Turkana, potentially meeting 30% of Kenya's current electricity needs, at low marginal cost. Part financed by carbon credits.

Geothermal in the Rift Valley (Olkaria)
Extension of geothermal, with additional 276 GWh/yr, which will displace electricity produced by fossil-fuel-powered plants equivalent to 150,000 tCO_2e per year, and develop local community benefits. CDCF will purchase emission reductions

***Micro hydro**. Community micro-hydro project in Kenyan village of Mbuiru, north of Nairobi*

Sustainable agriculture land use management (SALM) practices
Kisumu. Nutrient management, soil and water management and agroforestry. Adaptation and mitigation benefits.

Bamburi Biomass energy project
Alternative fuels in the process of cement manufacturing. Reduced emissions from use of biomass from trees, coffee, rice and coconut husks to fire its kilns instead of coal.

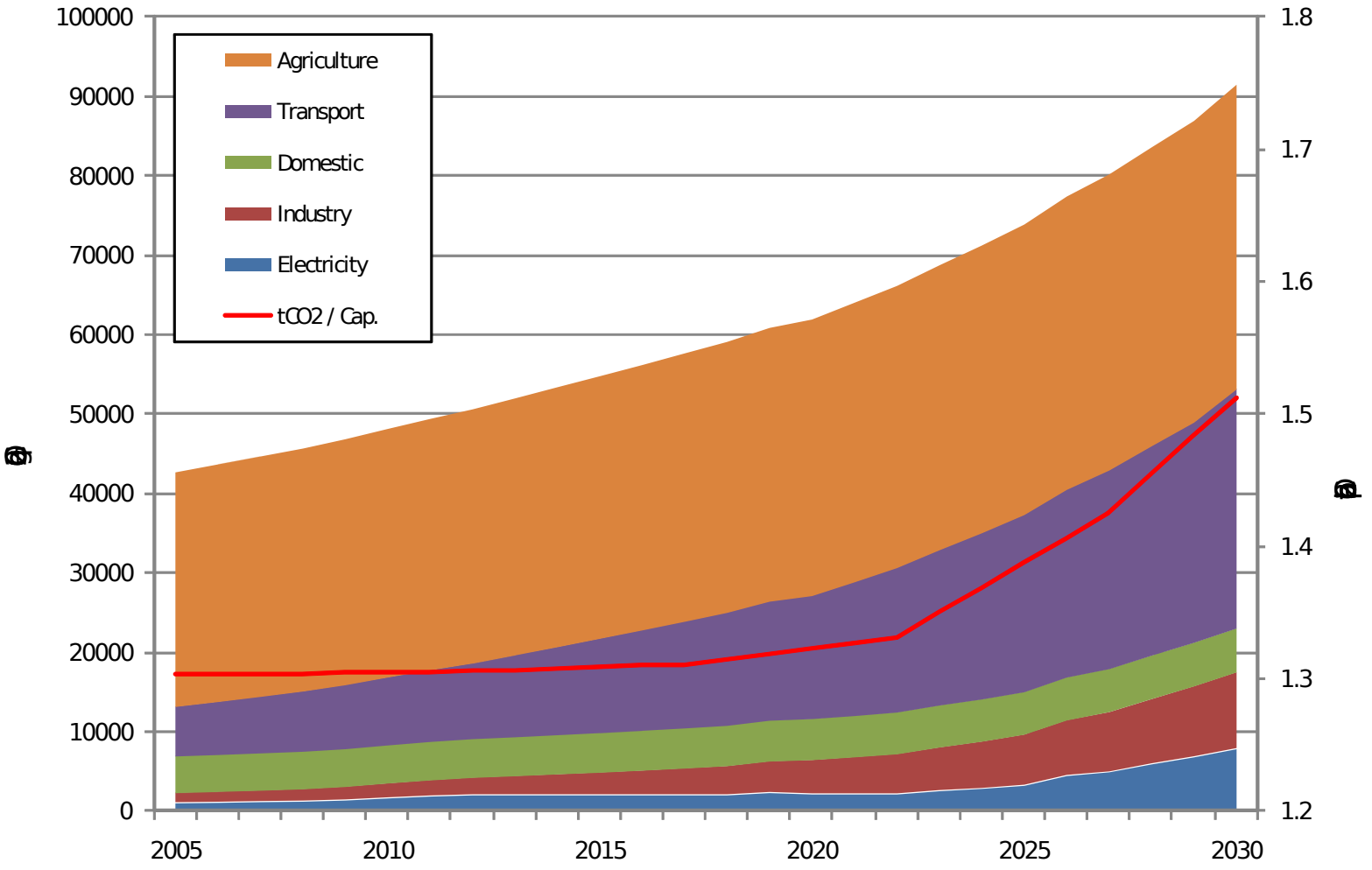
Efficient Cooking Stoves
Efficient biomass stoves for institutions and small and medium-scale enterprises. Reduce wood use, reduced emissions.

Biofuels
Jatropha plantation provides fuel to replace diesel in off-grid generator replacement and also provides fuel for local lamps

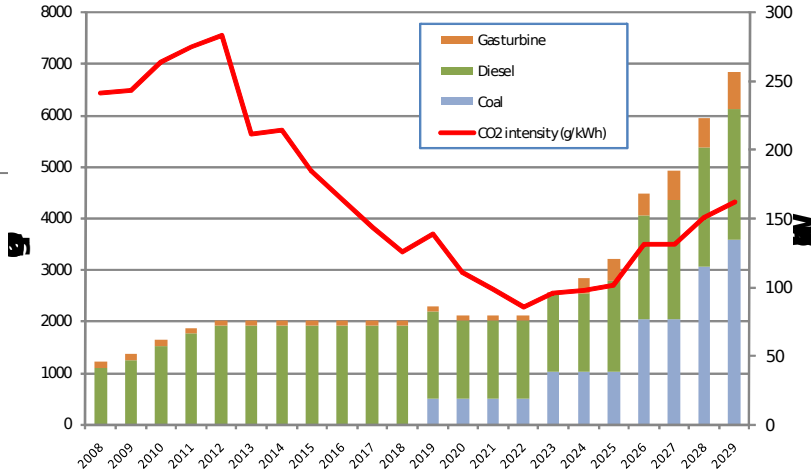
Energy Efficiency for Industry
KAM/MID. Enhanced energy efficiency in SMEs. Awareness raising, training, energy auditing, financial barrier assessment, demonstration projects, network, and a energy award scheme

Kenya is already introducing low carbon options

But development will double emissions by 2030

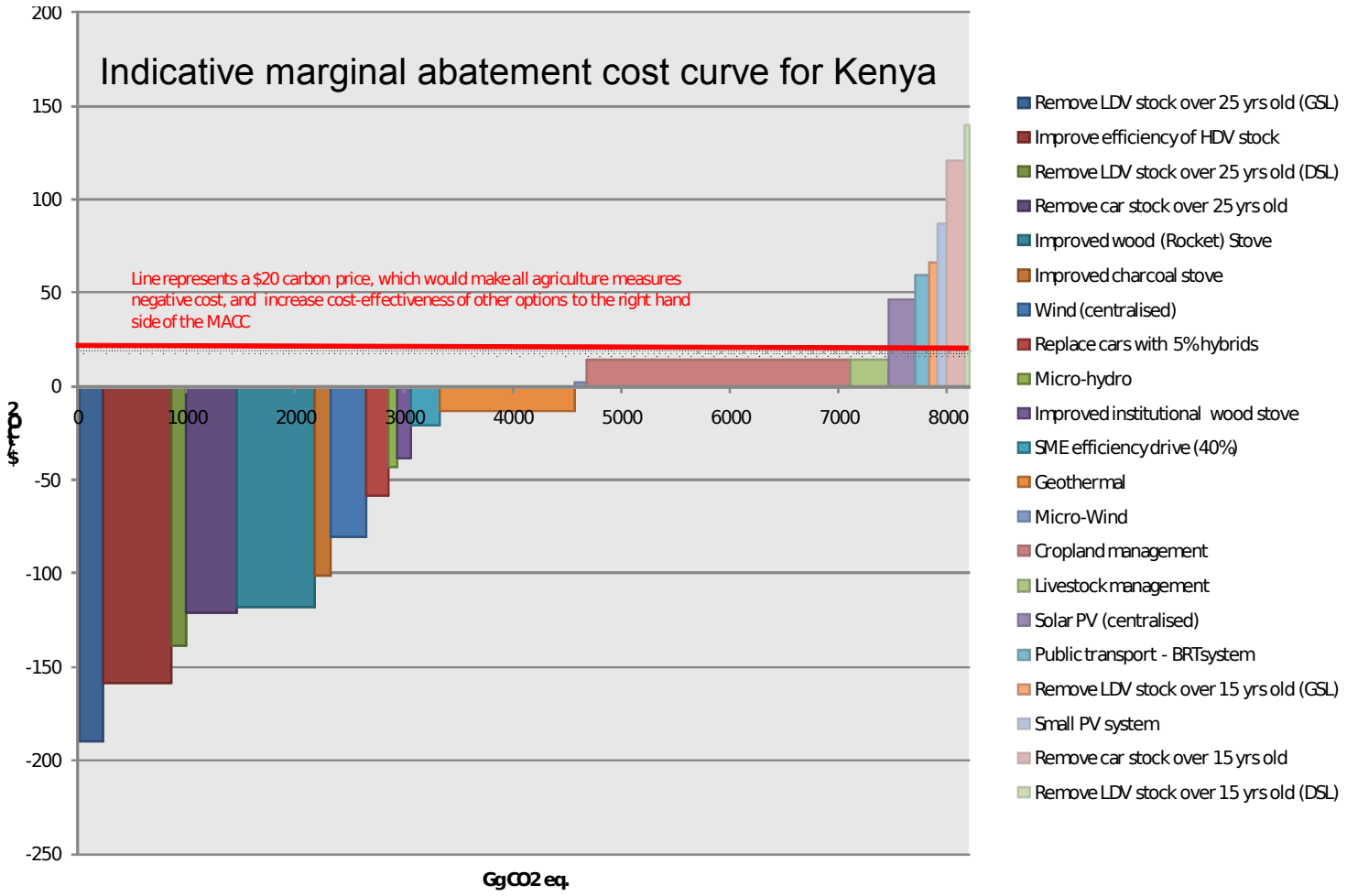


Examples



- Electricity sector
  - looked at future development, low carbon
- Transport - fastest growth in energy emissions, urbanization trends
  - Looked at low carbon options
  - Noting Nairobi – congestion, fuel imports, poor air quality
- Agriculture - plans for agricultural intensification will increase emissions
  - Lower carbon options include cropland management, grazing land management and pasture improvement, livestock management.

Kenya can reduce GHG at negative cost



- Low carbon options actually save money and have wider co-benefits (fuel imports, air quality) – win win (no regrets) - example fuel efficiency

Conclusions

- Existing climate variability has significant economic costs in Kenya
- Future climate change will lead to additional economic costs
  - High economic costs projected, on top of existing impact
  - Significant in terms of GDP
- Access to significant adaptation funds is justified, though also requires tackling existing climate variability.
  - Access to funds requires the development of new institutions
- Low carbon growth offers economics, social and environmental benefits

Recommendations

- ‘Get ready and act now’
- Continued policy support to provide wider analysis and more detail for emerging priorities
- Includes costing for adaptation and low carbon – identify priorities – provide a firm basis for future funding (markets and adaptation funds)
- International finance requires a national strategy
- Priorities to advance early priority areas but also to build capacity institutionally to handle potential flows and finances
- Consideration of climate resilient growth and low carbon development in sectoral plans, national plans and even future vision

Adaptation Strategies	Priority Actions
Immediate needs & capacity building	• Expanded research assessment into effects, adaptation and economics. Early capacity building and early warning systems • Develop national climate change strategy including knowledge management and screening of sectoral and regional plans for climate risks and adaptation opportunities. Include in national policies. Build into long-term vision (e.g. Vision 2030) • Prepare plans for a national adaptation authority or facility to improve sectoral coordination, link to international finance, and support private sector. Enhance links between adaptation and low carbon.
Climate resilience	• Climate resilient strategies, objectives and targets for immediate concerns (for example, linking cross-sectoral climate monitoring with exposure, impacts and adaptation actions; knowledge management; health and vector-borne disease responses; drought and flood risk screening for new projects) • Develop prototypes of sectoral actions (pilots) and pathways for scaling up to cover all vulnerable regions and populations
Social protection	• Protect vulnerable livelihoods and strengthen existing social protection programmes, expanding the coverage to consider climate change.
Accelerated development	• Adapt existing development projects to include 'no regret' measures to reduce climate risks and opportunities to develop adaptive capacity • Scale up successful prototypes to sectoral development plans

Mitigation Strategies	Recommended Actions
Low-Carbon Growth (LCG)	• Full analysis of baseline projections, low carbon options, costs and potential for prioritisation and development of strategy for mechanisms. • Develop national strategies to mainstream LCG in planning. Build into long-term vision (e.g. Vision 2030), including potential effects from international action. • Facilitate carbon finance opportunities in voluntary and compliance carbon markets (VCM, CDM) • Prioritize agriculture, transport and electricity generation low carbon measures, considering short-term opportunities but also longer-term areas where potential 'lock-in' and identify alternatives. Improve sectoral co-ordination. • Look for synergistic adaptation – low carbon project opportunities, e.g. agro-forestry and sustainable land-use
Climate resilience & co-benefits	• Climate risk screening of low carbon growth pathways • Explore opportunities in case studies of major low carbon strategies such as geothermal, biofuels and on-farm carbon management and how they might be scaled up to achieve both reductions in future emissions and adaptive development.