# What Will it Cost to Adapt to Climate Change?

UNFCCC Side Event
June 2009

# Adaptation to Climate Change

## Why?

- Some global CC already "baked-in"
- Development progress threatened/reversed
- Adapt to manage the unavoidable

## How?

- Development – Initiatives that also increase climate resilience;
- Discrete Adaptation – Adaptation is the primary objective;
- Development-not-as-Usual – Re-thinking development initiatives

# Barriers to Adaptation

- Knowledge:
  - uncertainty
  - how to make development plans climate resilient
  - what it will cost to adapt
- Information: Lack of public awareness
- Financial: Lack of availability of funds
- Technological: Lack of availability and access
- Institutional: Limited capacity



# Today's Discussion

Why was the EACC study initiated?

What is the scope of the study?

What have we learned so far?

Upcoming Study Milestones

What will still need to be done?



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# Previous Estimates of Global Cost

- **World Bank (2006):** Annual adaptation costs $9-41 billion per year for a 2-3$^{o}$C increase in temperature.

| Adaptation Costs | = | Baseline Investments | x | % Exposed to Climate Risk | x | % Increase in Costs to Climate-proof Assets |
|---|---|---|---|---|---|---|

- Using same methodology but different parameter values
  - **Stern (2006):** $4-37 billion per year
  - **UNDP (2007):** $5-67 billion per year by 2015

- **UNDP (2007):** 47-109 billion / yr by 2015 includes social protection + disaster response

- **Oxfam (2007):** NGO adaptation projects - at least $50 billion / yr

- **UNFCCC (2007):** First sector-based estimates $28-69 billion / yr by 2030

# Limitations of Existing Estimates

- Range is **wide and uncertain;**
- Few **sector-wide** estimates;
- No climate-proofing **current** stocks
- Lack of an **operational definition**;
- No link to **climate projections**,
- No explicit treatment of **uncertainty**;
- No projected **development baseline, thus no adaptation deficit;**

# Existing Estimates from NAPAs

USD million

| | Bangladesh | Mozambique | Ethiopia | Samoa | Total |
|---|---|---|---|---|---|
| Coastal Zones | 23 | 2 | NA | NA | 166 |
| Disaster Preparedness | NA | 3 | 10 | 5 | 58 |
| Health | NA | NA | 6 | 1 | 33 |
| Infrastructure | 2 | NA | 2 | 1 | 77 |
| Ecosystems | NA | NA | 8 | 0.4 | 112 |
| Tourism | NA | NA | NA | 0.3 | 2 |
| Water Resources | 2 | 2 | 30 | 1 | 170 |
| Agriculture, Forestry, Fisheries | 27 | NA | 2 | 0.3 | 160 |

- **Estimates produced by 40 out of 49 LDCs**
- **Estimates based on stakeholder consultations**
- **Estimates based on priorities to address urgent, short-term adaptation needs**
- **Estimates of total, not annual, costs**

# Economics of Adaptation to Climate Change Study

The governments of Bangladesh, the Plurinational State of Bolivia, Ethiopia, Ghana, Mozambique, Samoa, and Vietnam are working with the World Bank on the **Economics of Adaptation to Climate Change** study. The study is funded by the governments of the United Kingdom, Netherlands, and Switzerland.

## Objectives

## Approach

Estimate total costs of adaptation for developed and developing countries → EACC Global Track

Support country processes to develop climate-resilient development plans and budgets → EACC Country Track



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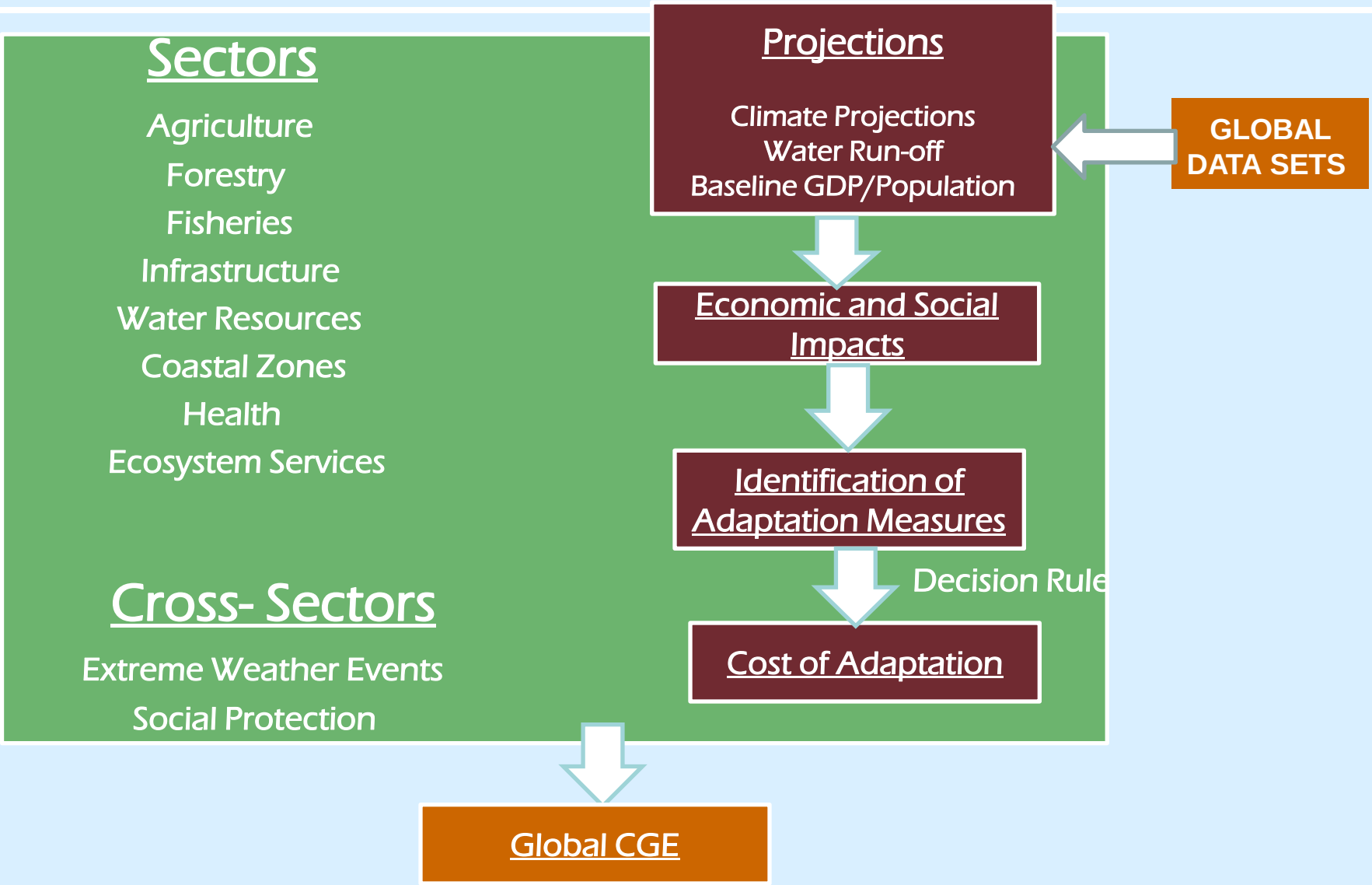
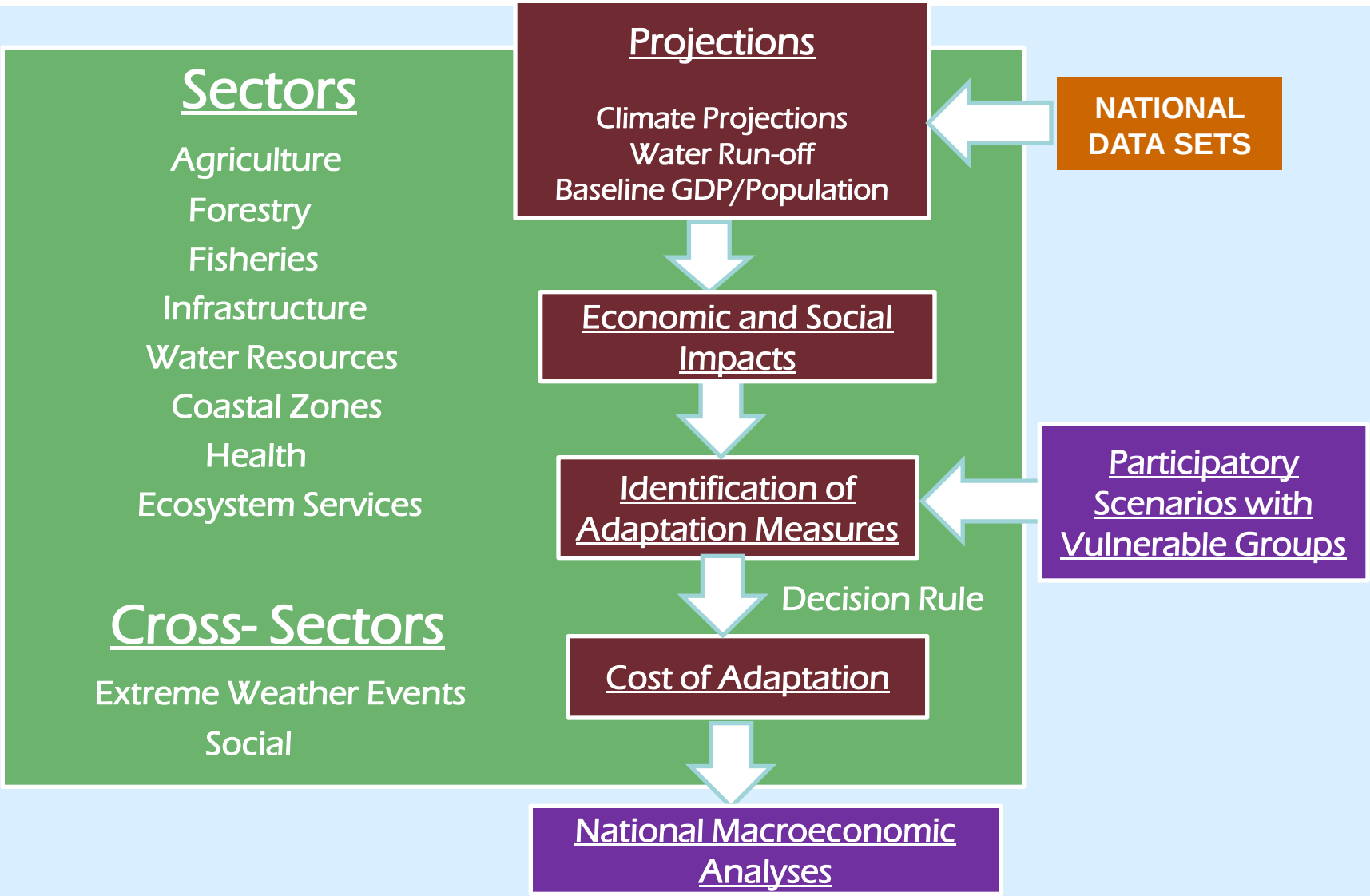
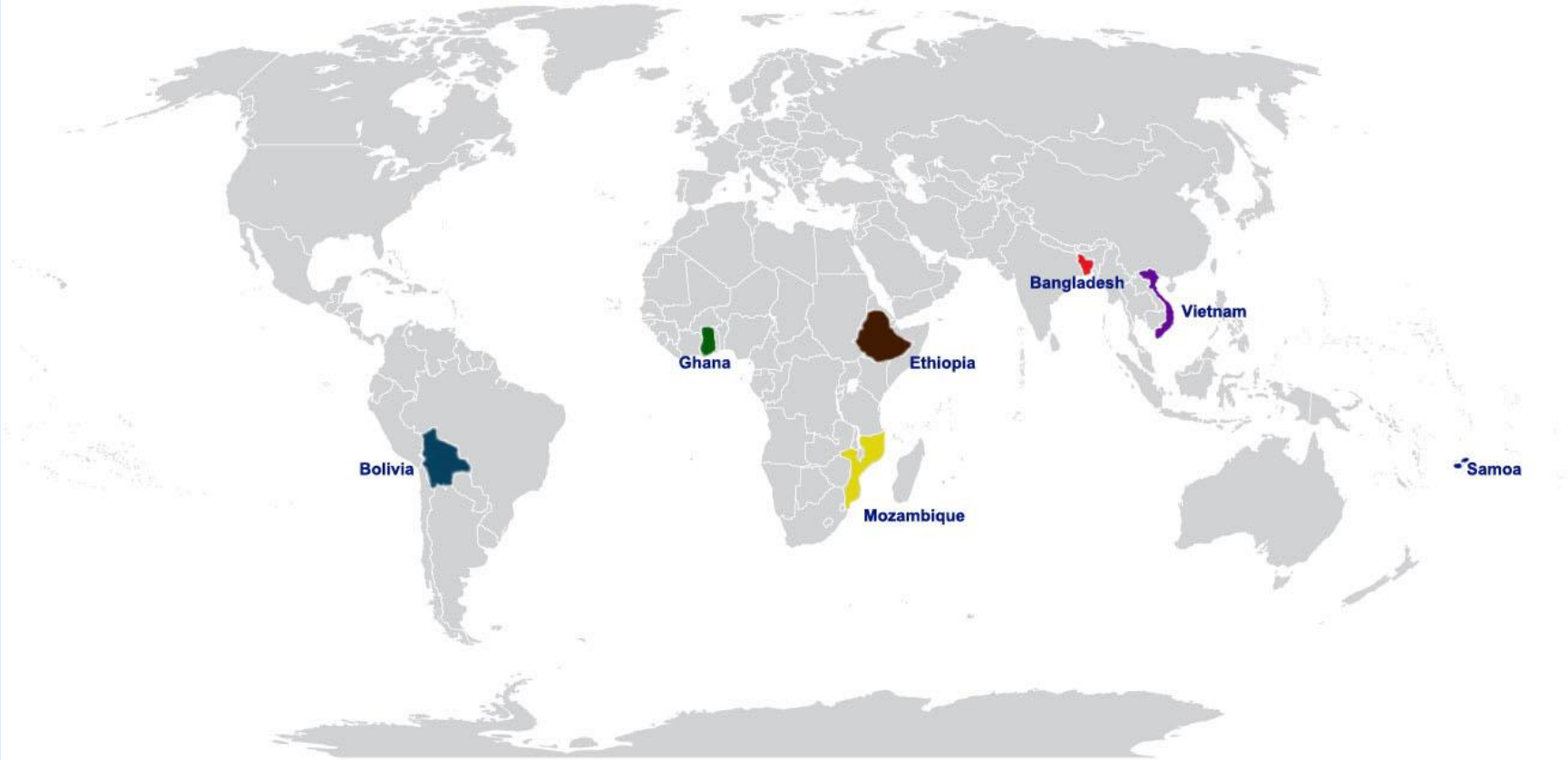
# EACC Global Track



# EACC Country Track



# Seven Case-Study Countries



# Country-Study Sectors

| | Bangladesh | Bolivia | Ghana | Mozambique | Ethiopia | Samoa | Vietnam |
|---|---|---|---|---|---|---|---|
| Agriculture | Yes | 4 crops | Yes | Yes | Yes | | 8 Agro-ecological zones (AEZs) |
| Water | Yes | Yes | Yes | Yes | Yes | Yes | Mekong, Red and Dongnai |
| Infrastructure | | | Hydro power | Hydro power | Hydro power | | Yes |
| Extreme Weather | Yes | | | | Yes | Yes | |
| Coastal | Yes | | Yes | | | Yes | Yes |
| Health | | | | Included in Social | | | |
| Forestry | | | | | | | Yes |
| Social | Yes | Yes | Yes | Yes | Yes | | |
| CGE | Yes | | Yes | Yes | Yes | | Yes |

# Social Component: Why?

To understand the social dimensions of climate change adaptation, and related elements of risk management; resilience; and social protection, through:

- **Focus on local level impacts and responses;**
- **Engagement of vulnerable and disadvantaged groups to understand adaptation in particular contexts and groups;**
- **Institutional and policy reform challenges;**
- **Assessment of existing adaptive capacity;**
- **Building on existing adaptive responses**

# Social Component: How?

## Vulnerability Assessments

- Assess adaptive capacity at household and regional levels
- Qualitative and quantitative assessments ≈ 10 hot-spots per country ≈ 600 households

## Participatory Scenario Development Workshops

- Identify and validate preferred local adaptation;
- Structured discussion through consultation to streamline adaptation into local development plans

# Macroeconomic Component: Why?

To help decision makers in developing countries to better understand and assess the risks posed by climate change in a context of high uncertainty, competing needs and potentially high future costs of adapting to climate change.

- **Incentives to policy makers to streamline adaptation into development planning**
- **Creation of climate-resilient investment plans for few countries**
- **Better understanding inter-sectoral links and feed-back mechanisms of impacts and actions in various economic sectors**
- **Quantify the distributional impacts of Climate Change**

# Macroeconomic Component: How?

**Mixed Integer Programming (MIP) Model**

**Policy tool for developing climate-resilient national plans and budgets**

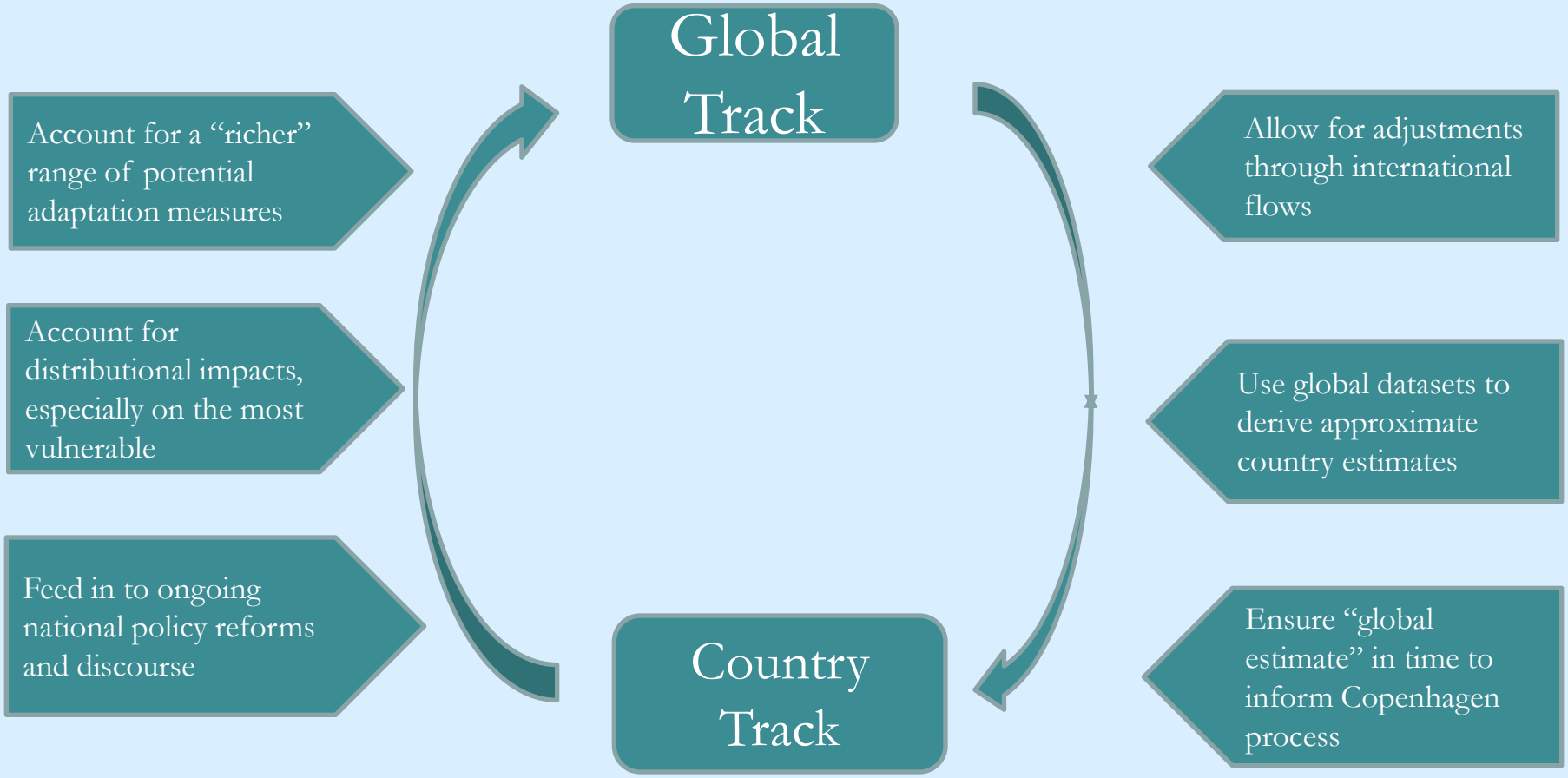
- **Prioritize investments across sectors**
- **Sequence investments over time**
- **Select robust investments to account for climate uncertainty**

**Computable General Equilibrium (CGE) Model**

**Policy tool to assess country wide effects (GDP, trade-balance, etc) of sectoral CC damages and actions**

- **Impacts of CC on individual sectors spread to other sectors**
- **Impacts of CC and adaptation to vary by level of household incomes**

# Linkages between Two Tracks





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# Operational Definitions of Adaptation Costs

| Adaptation Level | Definition |
| --- | --- |
| Restoring Welfare | **Minimum cost of adaptation actions to restore welfare:**<br>• **Infrastructure --- Restore level of services;**<br>• **Agriculture --- Restore nutritional levels.** |
| Optimal Adaptation | **Minimum cost of adaptation actions where cost-benefit ratio ≤ 1, plus the residual damage.** |
| Resource Constraint | **Cost of adaptation actions implemented under the with-CC scenario that would not have been under the without-CC scenario, plus residual damage.** |

# Infrastructure

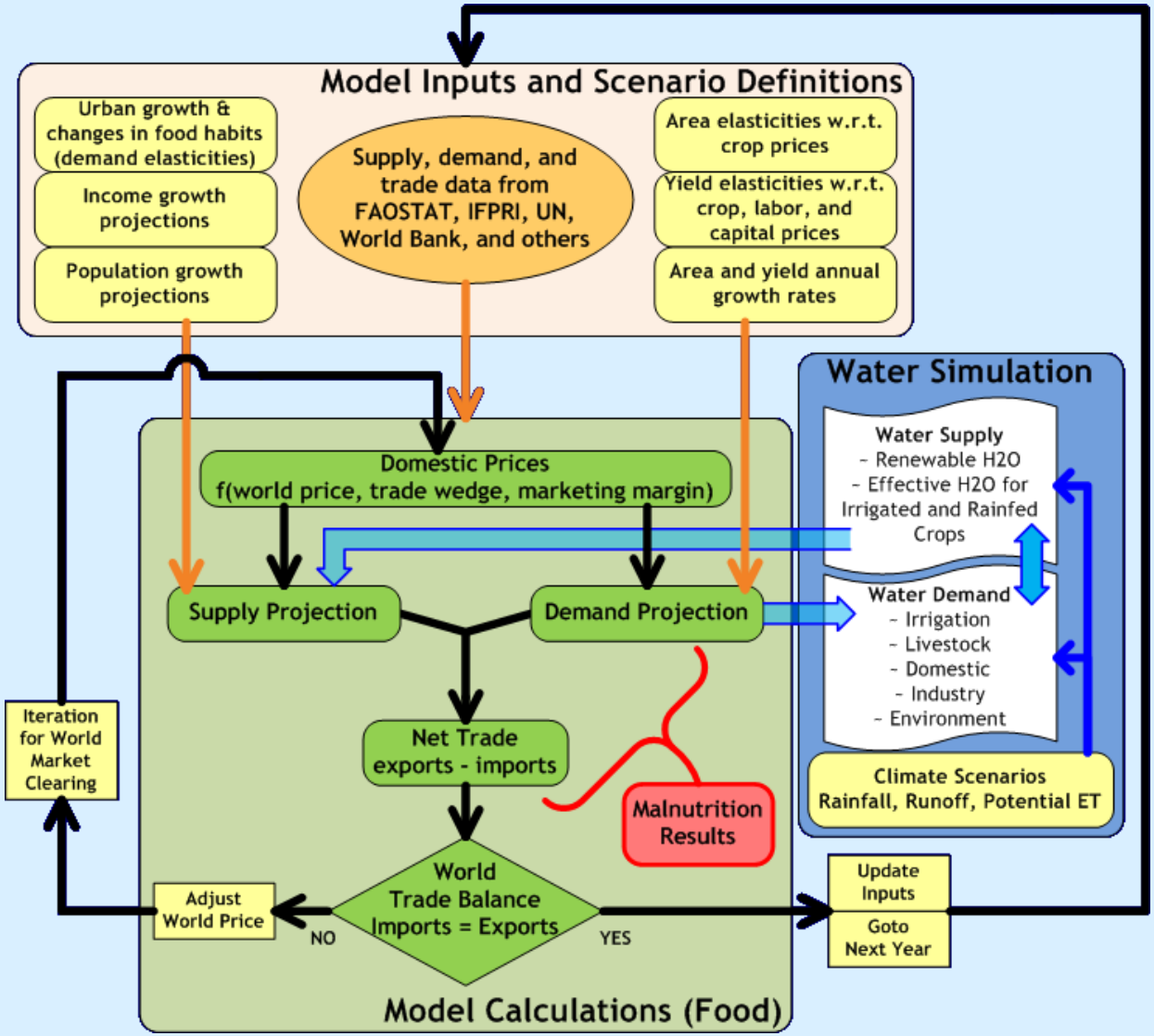
- **Infrastructure considered:**
  - **Transport**
  - **Energy**
  - **Water and Sanitation**
  - **Urban**

- **Infrastructure adaptation costs arise from**
  - **Climate proofing = cost of construction due to changes in design standard, + changes in maintenance costs – PRICE EFFECT**
  - **Changes in the demand for services: electricity for cooling, roads due to changes in economic structure, coastal protection due to SLR – QUANTITY EFFECT**

# Emerging Results: Infrastructure

- Changes in adaptation costs due to changes in demand are significant, perhaps comparable to climate proofing;
- Costs of retrofitting existing infrastructure greater than maintaining new infrastructure;
- Adaptation costs affected by changes in the range of precipitation and temperature, not by changes in temperature or precipitation averages

# Agriculture



# Emerging Results: Agriculture

- **Adaptation costs are the investments in irrigation, ag. extension, and roads needed to restore levels of nutrition (a) with or (b) without trade restrictions;**

- **Preliminary results suggest that:**
  - **Removing <u>trade barriers</u> reduces the cost of adaptation;**
  - **<u>Autonomous adaptation</u> goes far in reducing impacts;**
  - **The <u>carbon fertilization</u> effect reduces impact; need better understanding;**



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Scope of the study

Lessons to date

## Upcoming Study Milestones

What still needs to be done

# Study Milestones

- **Global Team Meeting with Sector Peer Reviewers – June 8 and 9;**
- **Country Teams Workshop – June 18 and 19;**
- **In-country Consultations – September / October;**
- **Global and Country Reports – October;**
- **Study Release – October / November;**
- **Presentation at COP 15 in Copenhagen – December**



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# Some Priority Knowledge Gaps

- Implications of adaptation for **national public expenditure budgets** (includes social safety net programs) and **long-run growth**
- Possible types of **innovative financial instruments** to generate resources for adaptation
- Overcoming **barriers** to climate resilient development
- How to put into practice **ecosystem-based** adaptation?
- How to adapt to **catastrophic/irreversible** events? And what will be the costs?

# Putting Knowledge into Practice

- EACC is still a **first cut** exercise, deepening economic knowledge, proposing a **methodology**. Exercise forced understanding of key issues, including **definition!**
- Work with countries to build on **NAPAs** and to **integrate** adaptation measures into **PRSPs** and long-term sectoral development plans;
- Use study findings to strengthen **public awareness** about adaptation to climate change
- Inform decision makers
- Minimize uncertainty through scientific knowledge

# Thank You!