Climate Change in the Asia-Pacific: How Countries Can Adapt?

Venkatachalam Anbumozhi

Economic Research Institute for ASEAN and East Asia

Outline

- How costly is climate change to the Asia-Pacific Region?
- What are priority sectors/actions in adaptation/mitigation efforts?
- How can countries adapt to a highly uncertain climate change?
- How much investment is needed to climate-proof development?

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Climate Induced Disasters and Damages

Asia and the Pacific (1980-2009): 38% of global economic losses due to climate related events

Event	People Affected (Million)	Deaths	Economic Losses ($ Billion)	Damages (% of GDP)
2011 Thailand Flood	13	over 680	45.5	13
2011 NE Japan Earthquake	0.3	16,000	204	4
2010 Pakistan Flood	Over 20	Over 1,980	10.1	5.1
2009 Philippine Typhoon	9.3	956	4.4	2.7

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High Stakes for Asia Now

- What if three Thai floods occur in the same year?
  - Food prices could skyrocket
  - Global tourism and supply chains will be derailed
  - Poverty levels may worsen
  - Asia can impact global growth

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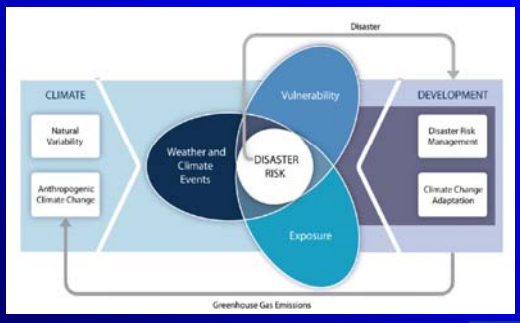
Climate Change has become a Determinant of Development Risk



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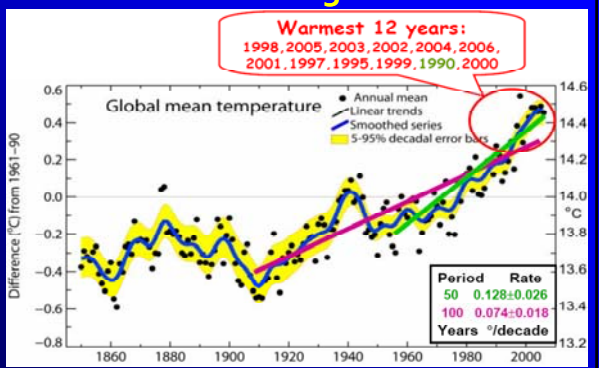
Climate Change Trends



Source: IPCC, 2007

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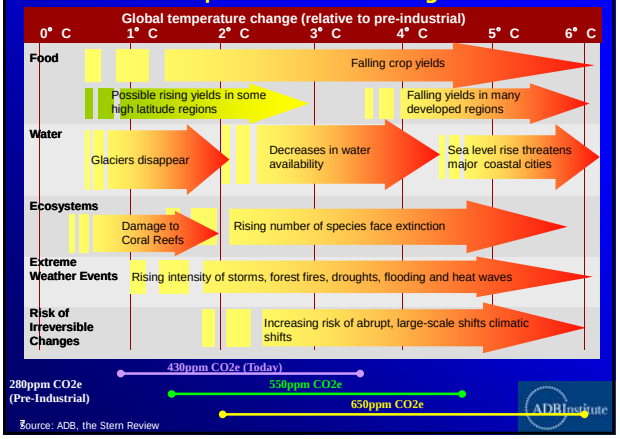
Impacts of Climate Change



Source: ADB, the Stern Review

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Asia Pacific Region is More Vulnerable to Climate Change Impacts

- Climate Change vulnerability Index 2012

Source: Maplecroft 2011

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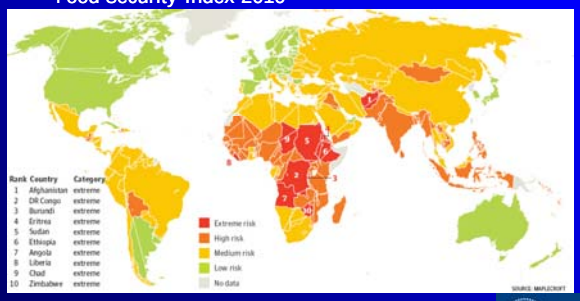
Right now – Climate Change is a Food Security issue for the Asia Pacific Region

- Food Security Index 2010



Source: Maplecroft 2011

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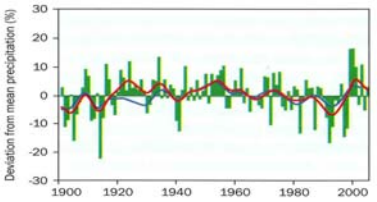
Erratic Rainfall Patterns are facing Asia

Figure 3.2. Annual Precipitation in Southeast Asia (1901–2005)



Note: Mean precipitation (2455 mm) is computed from 1961 to 1990. Green bars indicate annual variations in precipitation. Colored lines highlight decadal variation. The blue line used Global Historical Climatology Network data from the National Climatic Data Center. The red line used data from the Climatic Research Unit.

Source: IPCC (2007).

Heavier rainfalls in wet season; Dry seasons becoming drier

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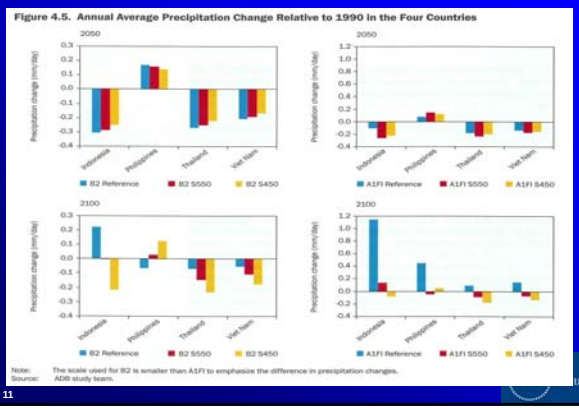
Projected Precipitation Changes in 2050

Figure 4.5. Annual Average Precipitation Change Relative to 1990 in the Four Countries



Note: The scale used for B2 is smaller than A1FI to emphasize the difference in precipitation changes.
Source: ADB study team.

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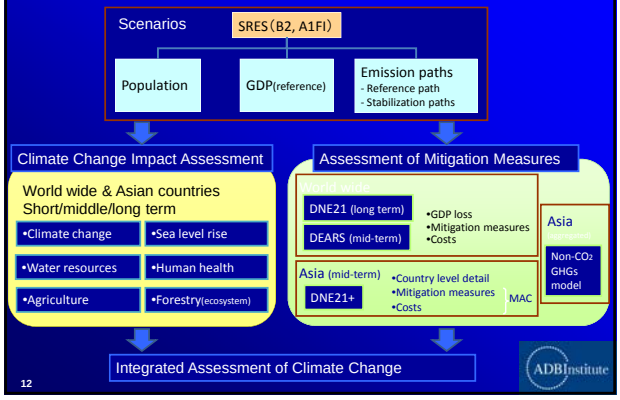
Regional Modeling Framework on CC



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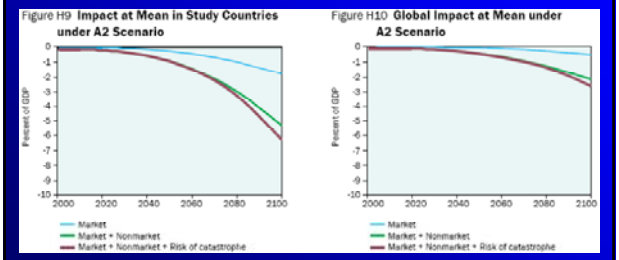
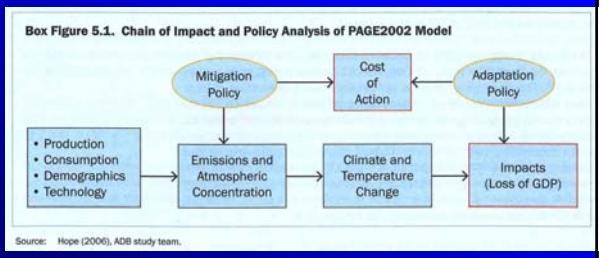
South East Asia could lose 6.3% of GDP by 2100, if non-market impacts and catastrophic risks are also taken into account.



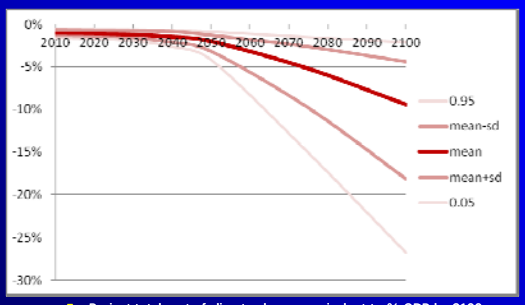
Source: ADB 2009

PAGE2002 Model



- Top down global integrated assessment model developed by Cambridge University
- Model parameters are drawn from IPCC studies
- Estimates GDP loss due to temperature rise under alternative stabilization scenarios
- Cost required for adaptation includes development of new crop varieties, infrastructure etc

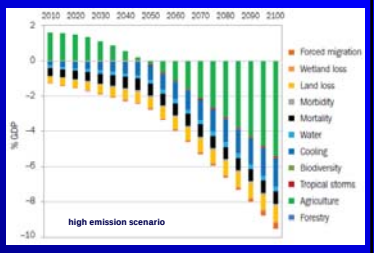
Climate costs in South Asia



- Project total cost of climate change equivalent to % GDP by 2100
- Establish magnitude of "low probability, high impact" event

Climate Change Costs in Pacific Island states

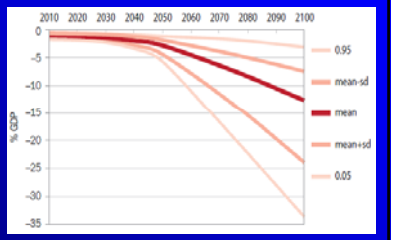
- Major losses are upto 9.5% of GDP in agriculture, and in coastal areas (including land loss and forced migration
- Mortality and morbidity costs are also expected to be significant—mostly due to respiratory disorders, malaria, and deaths from tropical storms



Climate Change Impacts

-Beware of "black swan" (low probability, high impact event)

Stochastic modeling—taking into account climate uncertainties—suggests that "black swan" event could result in catastrophic loss of 34% of regional GDP equivalent



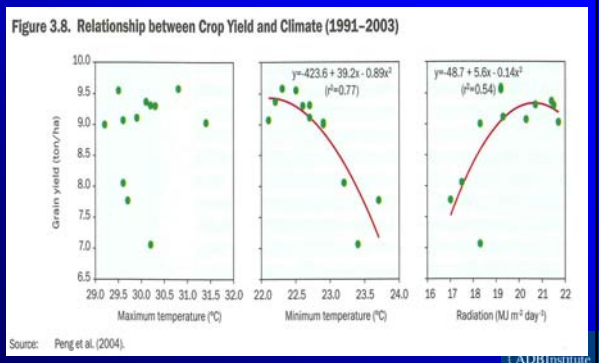
Observed Impacts of Climate Change on Food Production System

Table 3.9. Summary of Observed Impacts of Climate Change on the Agriculture Sector in Southeast Asia

Climate Change	Observed Impacts
Increasing temperature	- Decreased crop yields due to heat stress - Increased livestock deaths due to heat stress - Increased outbreak of insect pests and diseases
Variability in precipitation (including El Niño Southern Oscillation)	- Increased frequency of drought, floods, and tropical cyclones (associated with strong winds), causing damage to crops - Change in precipitation pattern affected current cropping pattern; crop growing season and sowing period changed - Increased runoff and soil erosion caused decline in soil fertility and consequently crop yields
Sea level rise	- Loss of arable lands due to advancing sea level - Salinization of irrigation water affected crop growth and yield

Sources: Boer and Dewi (2008), Cuong (2008), Ho (2008), Jesdapipat (2008), Perez (2008).

Impacts of Climate Change & Crop Yield



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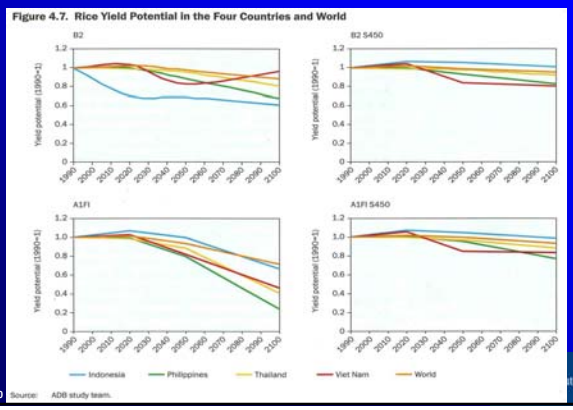
Rice Yield Potential in South East Asia



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With Climate Change by 2050

Yield

- Rice 14-26%
- Wheat 32 – 44%
- Maize 2-5%
- Soybean 9 – 18%

Price

- Rice 29-37%
- Wheat 81-102%
- Maize 58-97%
- Soybean 14-49%

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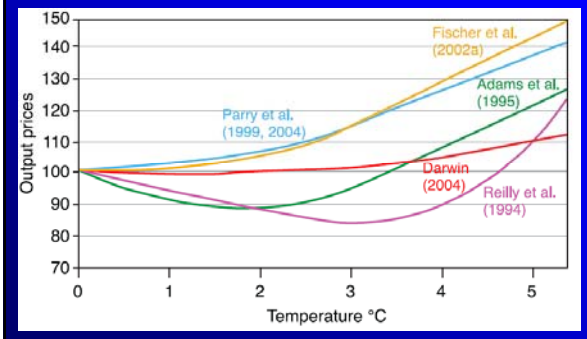
Influence of Climate Change on Cereal Prices



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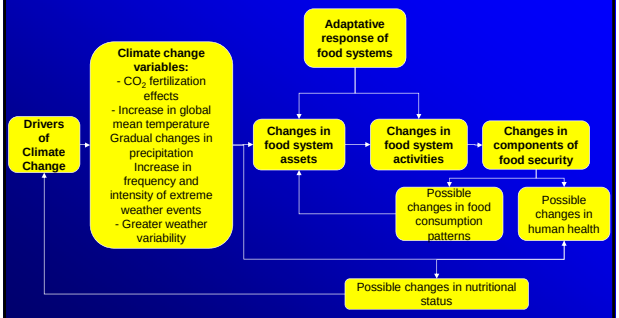
Climate change variables and its impacts on food security



Source: FAO 2008

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Adaptation– What is Available?

Practice	Scale	Reactive/Proactive	Planned/Autonomous	Example
Adjustment of cropping calendar and pattern	Local	Reactive	Autonomous	Widely used
Changes in management and farming techniques	Local	Reactive	Autonomous	Widely used
Use of heat-resistant varieties	Local/ Sub-regional	Proactive	Autonomous	Widely used
Diversified farming, inter-cropping, crop rotation	Local	Proactive	Autonomous	Widely used
Utilization of SOI in designing cropping strategy	Local/ Sub-regional	Proactive	Planned	Indonesia
Implementation of index-based insurance	Local/ Regional	Proactive	Planned	Thailand, Viet Nam
Development of early warning systems	Local/ Regional	Proactive	Planned	Philippines, Thailand, Viet Nam
Improvement of irrigation efficiency	Local	Reactive	Planned	Viet Nam

Source: ADB 2009

Adaptation is reactive & autonomous so-far!

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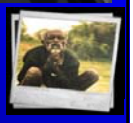
Adaptations – What is available?

- **Private**
  - Alter crop species and verities
  - Alter livestock species and breeds
  - Alter timing of planting and harvest
  - Multiple cropping season
  - Rehabilitation of on-farm structures
  - Change land use
- **Public**
  - Plant and animal breeding
  - Public awareness and extension
  - Insurance schemes and conditional cash transfers
  - Modernization of irrigation systems



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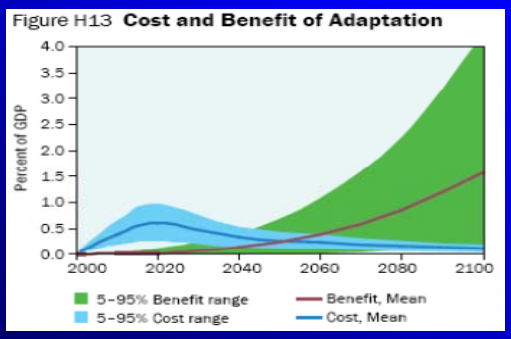
Adaptation for Food Securiy makes economic sense



Source: ADB 2009

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Barriers to Mainstreaming Adaptation

Mainstreaming – the way climate change and food security issues are brought are incorporated into sectoral planning

Why not mainstreaming?

- Uncertainties in climate science
- Limited public awareness
- Limited structural & non-structural measures
- Weak human resources
- Weak public & private finance
- Adpating to Climate Change is too costly

Knowledge Gap

Capacity Gap

Finance Gap

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A Reality Check – CCA Education & Research

- Lack of Modelling skills – most research & educational activities undertaken are on a short term basis. Hardly long term planning is thought of to continue develop solutions to solve the problems.
- Inadequate monitoring & evaluation – Keen on activities but not enthusiastic in monitoring the impact of research & education.
- In adequate communication skills – For eg, downscaling the climate forecast at sub-regional level and communicating with decision makers.
- Lack of effective networking, experience sharing, dissemination skills.
- Inadequate leadership, governance & management capacities – undefined roles of team members and accountability.

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Evolving Role of Universities in the CCA Knowledge Network

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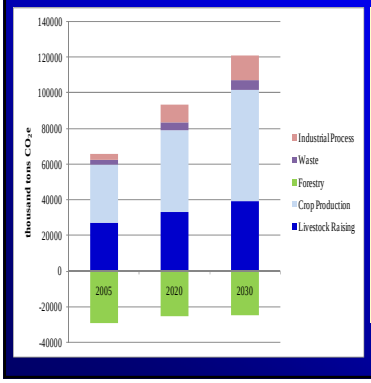
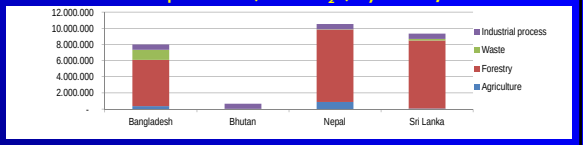
GHG Mitigation also Matters for Agriculture

Total GHG emissions in selected South Asia countries



- Net GHG emission was estimated to increase from 36.3 Mt CO_2e in 2005 to 96.5 Mt CO_2e in 2030 at a compounded annual growth rate of 4%.
- Crop production had the dominant share in 2005 and 2030 at 49.8% and 51.5% respectively.
- Forestry had sequestered 29.3 Mt CO_2e in 2005 and 24.9 Mt CO_2e in 2030

GHG abatement potential (tons CO_2e) by sector, 2020



Incremental abatement cost of options by sector in 2020

Agriculture		Forestry		Waste		Industrial process	
Options	US$/ton CO_2e	Options	US$/ton CO_2e	Options	US$/ton CO_2e	Options	US$/ton CO_2e
Urea-molasses multi-nutrient blocks	13.51-14.66	Conservation of existing carbon sink	0.58-194.79	Recycling	1.18-5.48	Post combustion CCS in cement production	139.05-155.78
Urea-treated straw	43.66-45.99	Expansion of carbon sinks	14.71-642.96	Composting	0.42-1.98	Oxy-combustion CCS in cement production	137.24-153.74
Multiple aerations	3.01-25.03						
Two-times drainage	15.72						

A Continuum of Climate Change Adaptation Measures

Adaptation focus: **Vulnerability reduction** → **Response to impacts**

Benefit in the absence of CC: **100 %** → **0 %**

Example:

- CHINA: Providing farmers drought tolerant varieties & training for water saving methods
- INDIA: Teaching officials to collect climate data and integrate in their planning decisions
- FIJI: Coastal zone protection with vegetative buffers like mangroves
- BANGLADESH: Constructing shelters in response to frequent cyclones

Type: **Non-structural** → **Structural**

Strategies for Adaptive Capacity Building

SECTORAL ADAPTIVE CAPACITY

Stakeholders:

- *Policy Makers & Planners*
- *Knowledge institutes*
- *Community organizations*
- *Private companies*
- *Development partners*

AWARENESS RAISING

Step 1: Building Scientific understanding & Capacity

TARGETTED COMMUNICATION

Step 2: Targeted information & training for Policy makers and planners

PILOT INVESTMENTS

Step 3: Pilot activities involving governments, private sectors &CBO

MAINSTREAMING

Step 4: Building lessons to policy to make adaptation part of BAU

Year: 0 1 2 3 4 5 6 7

Financing the Adaptation Measures

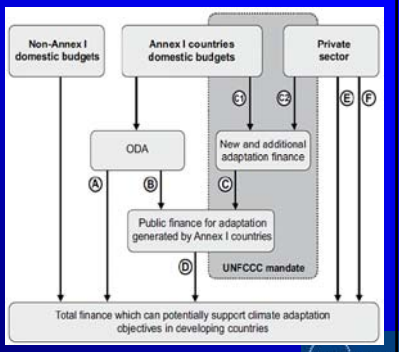
2010 - 2050

$ 168 – $ 201 billion

$ 4.9 – $ 5.8 billion/year

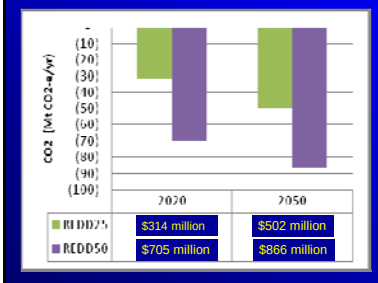
- research & development
- Modernizing Irrigation systems
- Strengthening Food Markets

60% Addnl budget



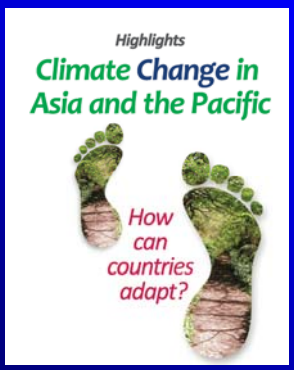
Source: SEI 2011

Potential revenue from REDD



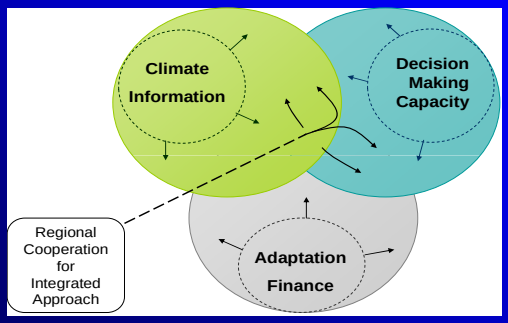
- Large potential for generation of carbon credit and co-benefits through REDD in Asia
- Assuming $10/tCO2e for carbon price, $866 million per annum could be gained by 2050 from reducing deforestation rate by 50% in PNG

ADBI Initiative - Adaptative Capacity Program



http://www.adbi.org/book/2012/12/01/4825.climate.change.asia.pacific.countries.adapt/

Adapting to Climate Change and Achieving Food Security



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Climate Change: How Countries Can adapt?

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Climate Change: How Countries Can adapt?

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Summary

- Climate change could result in catastrophic losses of up to 6 - 12 % of regional GDP
- Main staple food and commercial crops will suffer under future climate change (erratic precipitation, temperature rise and extreme weather events)
- Adaptation to climate change under cascade of climate uncertainties is a tremendous challenge to agricultural sectoral planning.
- Adaptations in agricultural sector are mostly reactive so far. The current level of adaptation is still inadequate and there is an urgent need for staged approaches.
- Aggressive global mitigation will reduce adaptation needs and uncertainties.
- Substantial incremental investment is required until 2050 to help the region adapt to high climate change impacts and maintain economic growth

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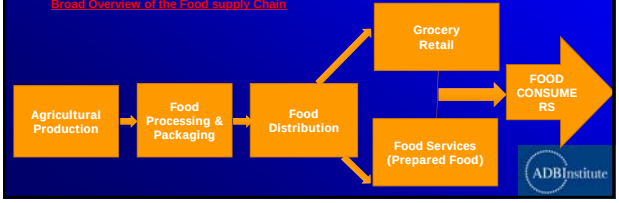
Macro Areas of CC Disaster Impacts on Global Supply Chains

- **Impact to Suppliers:** economic costs (or benefits) and disruptions generated to the economic unit that produce the basic or intermediate component of products
- **Impact to Infrastructures:** includes all the disruptions affecting the trader companies or the infrastructure used for transport or for electricity and water supply
- **Impact to consumers:** includes all the direct and direct costs generated on final consumers

Broad Overview of the Food supply Chain



Thankyou

Reach us at:

Economic Research Institute for ASEAN and East Asia (ERIA)
ASEAN Secreteriat Lt. Mezzanine
70 Jl. Sisingamanaraja, Jakarata Seletan 12110
Indonesia

Tel : +62-21-726-2991 | Fax : +62-21-7278-9006

Email : v.anbumozhi@eria.org | Website : www.eria.org

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