

# Climate Change

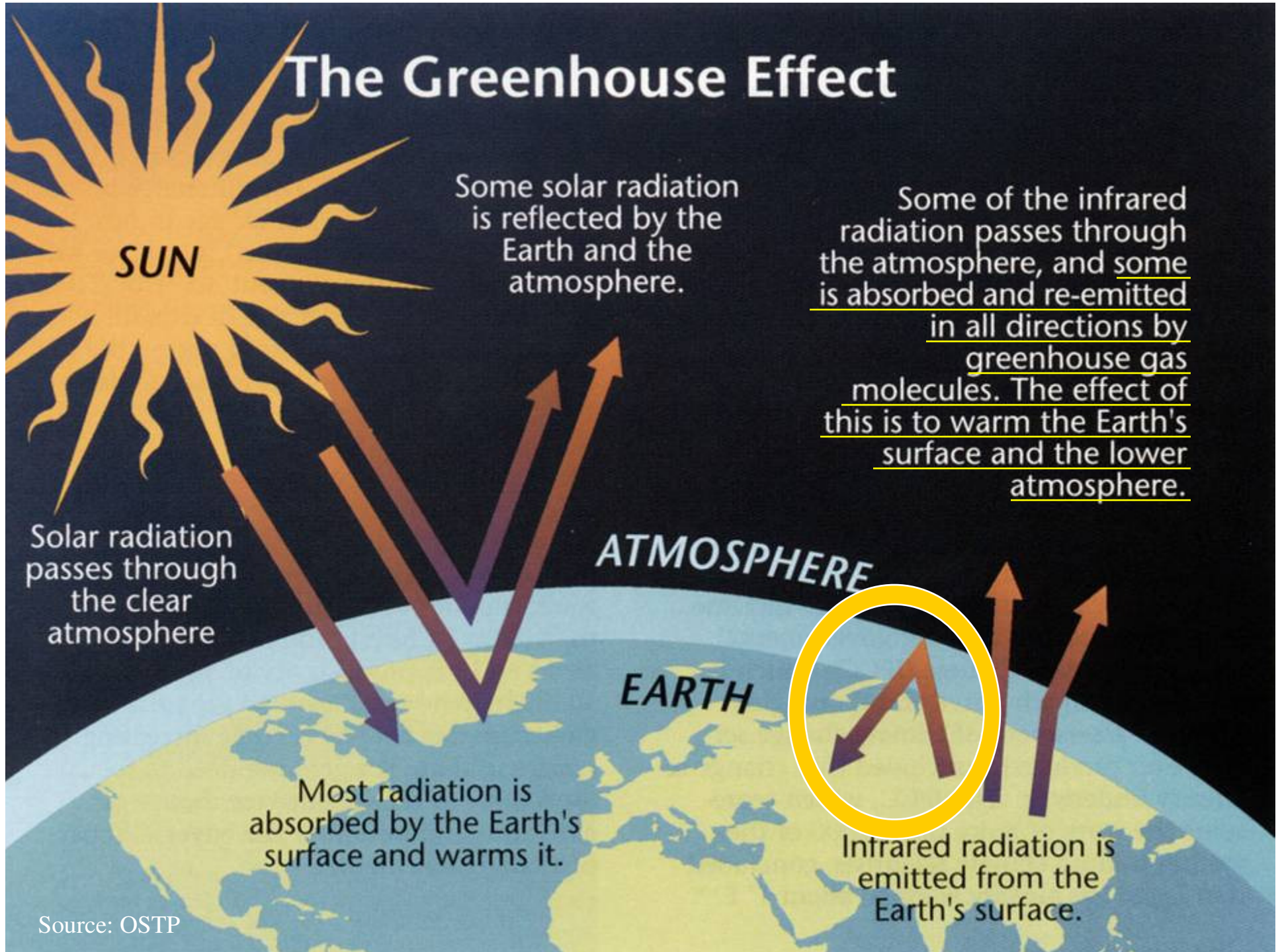
## Background

*The views expressed in this paper/presentation are the views of the author and do not necessarily reflect the views or policies of the Asian Development Bank (ADB), or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy of the data included in this paper and accepts no responsibility for any consequence of their use. Terminology used may not necessarily be consistent with ADB official terms.*

The logo of the Asian Development Bank (ADB), consisting of the letters "ADB" in a white serif font on a dark blue square background.

ADB

# The Greenhouse Effect



Some solar radiation is reflected by the Earth and the atmosphere.

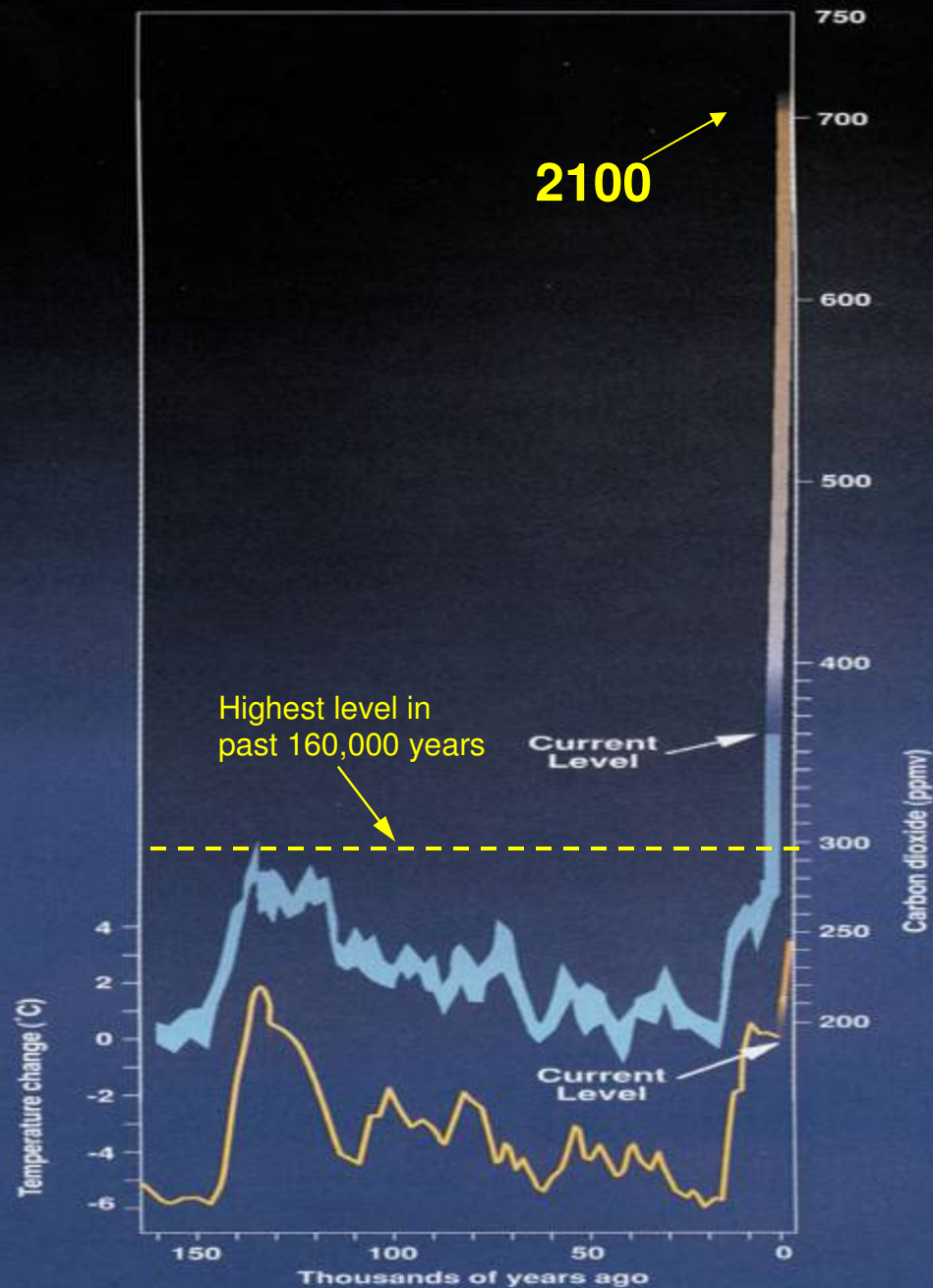
Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Solar radiation passes through the clear atmosphere

Most radiation is absorbed by the Earth's surface and warms it.

Infrared radiation is emitted from the Earth's surface.

## Atmospheric Carbon Dioxide Concentration and Temperature Change



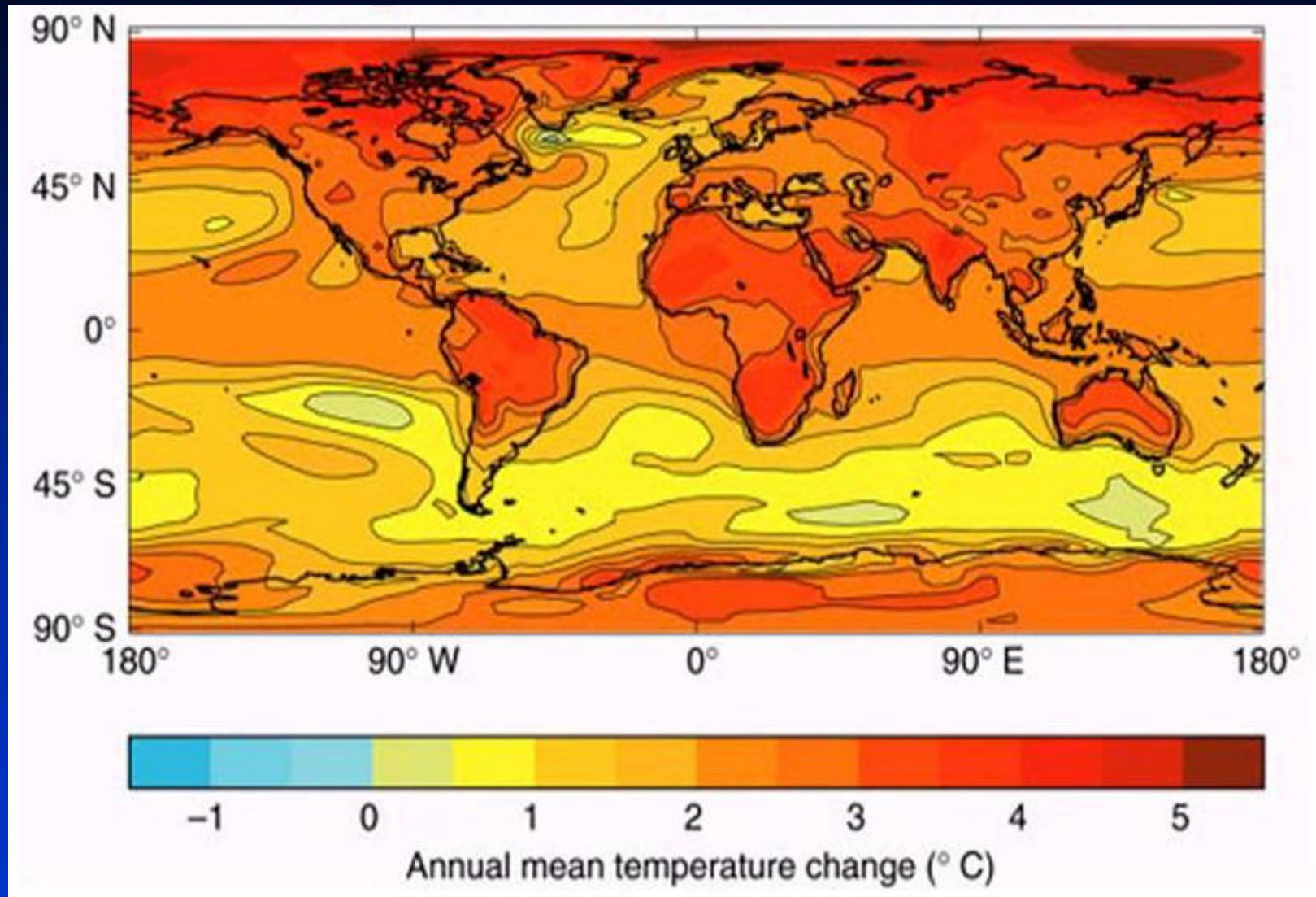
- CO<sub>2</sub> concentrations will likely be more than **700 ppm by 2100**, and higher in following centuries

- Global average **temperatures** projected to **increase** between 1.8-4.0°C **by 2100**

Source: [CSIRO](#)

**ADB**

# Projected Changes in Annual Temperatures for the 2050s



The projected change is compared to the present day with a ~1% increase per year in equivalent CO<sub>2</sub>

Source: The Met Office. Hadley Center for Climate Prediction and Research

# Effects of global warming on water & air

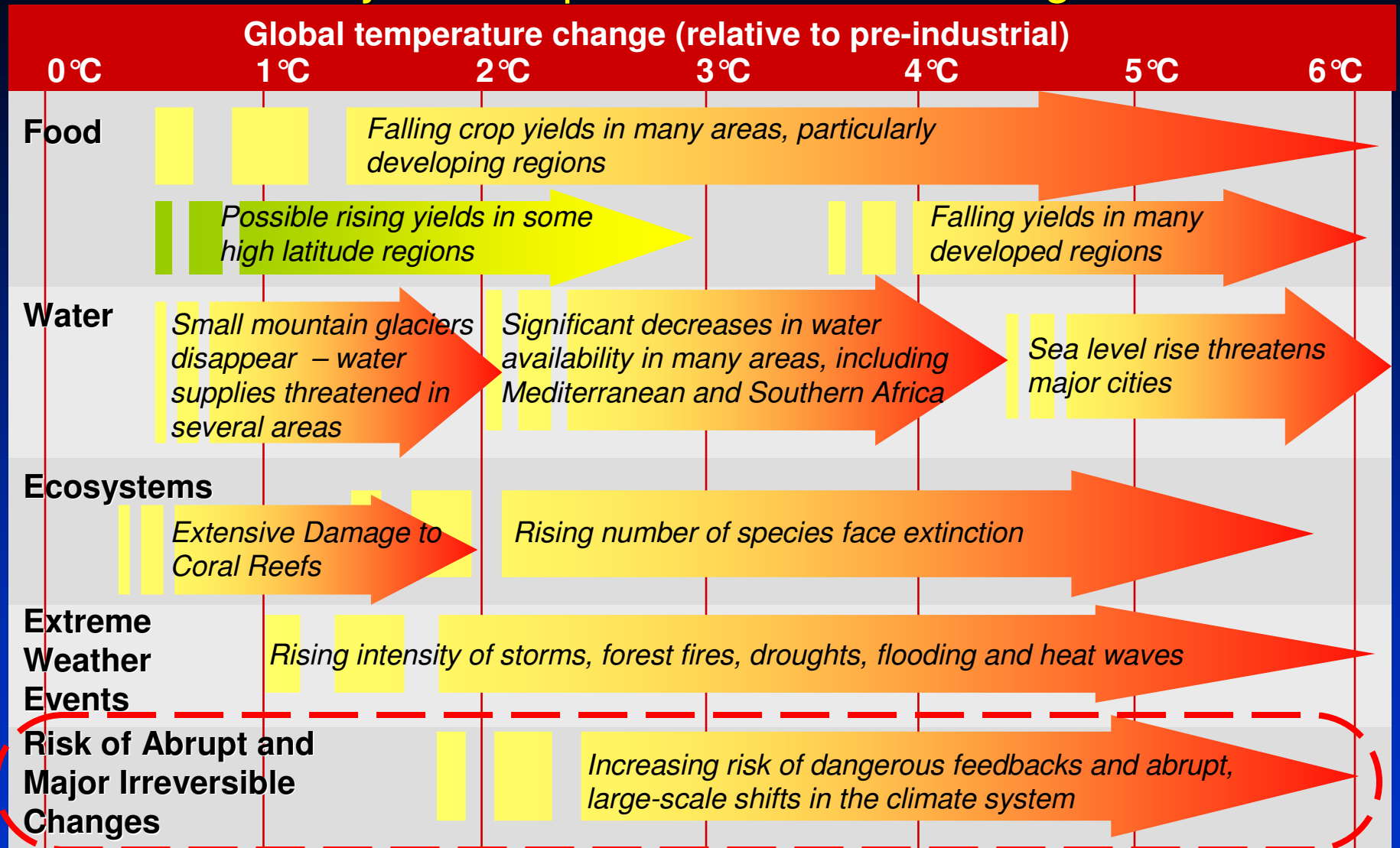
Global warming  
(temperature increase)

Melts ice, glaciers,  
Heats up ocean,  
Alters global  
**water** cycle

Greater thermal energy  
stored in atmosphere =  
more active heat exchange  
via **air** circulation

More extreme weather events  
Storms, Floods, Heat waves, Droughts

# Projected Impacts of Climate Change



280ppm CO<sub>2</sub>e  
(Pre-Industrial)

430ppm CO<sub>2</sub>e (Today)

550ppm CO<sub>2</sub>e

650ppmCO<sub>2</sub>e

ADB

Source: Stern Review

# Climate Feedback Loops: The Point of No Return

“Risks of large scale and possibly irreversible impacts are yet to be reliably quantified” – IPCC WGII

- Ice cap melting ⇒ reducing mirror effect, creating self re-enforcing warming cycle
- Thawing of permafrost ⇒ uncontrollable release of methane into the atmosphere, creating vicious warming cycle
- Forest destruction ⇒ carbon sink becoming carbon source, creating vicious warming cycle
- **Collapse of ice sheets and runoff of glaciers**  
⇒ surge in sea level
- **Halt of the “ocean heat conveyor belt” (Thermohaline Cycle)**  
⇒ complete and rapid shift in climate as we know it

# Impact on Asia

- Reduction on GDP and living standards

*India and S.E. Asia could lose on average 2-3% and as much as a 9-13% (95 percentile) of GDP by 2100*

- Changes in rainfall patterns, melting glaciers and loss of mountain snow

*Increased risk of floods and intense bursts. Special impact on large parts of the Indian sub-continent and over quarter of a billion people in China*

- Increase in sea levels

*South and East Asia could lose 15% of their land area. Small island states in the Indian and Pacific Oceans are acutely threatened*

- Declines in crop yields and impact on agriculture

*Strong impact on Western Asia, where yields of the predominant crops may fall by 15 – 35% once temperatures reach 3-4 °C*

## Aggregate Estimates of Economic Impacts

Types/Causes of GDP decline*	IPCC 2001 climate scenario	Increased risks if higher temperatures
Direct impacts on market sectors	5%	7%
Broad Impacts	11%	14%

\* Estimates vary depending on scenario of temperature increase and differences in which impacts are measured. Adjusting for income inequality raises estimates by at least one quarter. The total impact could therefore be equivalent to 20% reduction in consumption per head.

# Climate Change

What can we do?

ADB

# Stern Review on Mitigation

- Climate Change is “the greatest and widest market failure ever seen”
- Climate change mitigation and growth can both be pursued – **key is investment towards a low-carbon economy**

therefore...

- **Need to price the externality – carbon pricing via tax or trading or implicitly through regulation**

# Stern Review on Adaptation

- **The need to adapt is inevitable.** Climate change is with us, and more is on the way. Adaptation mainly driven by actions in private sector but public policy has crucial role.
- **Adaptation is not a substitute for mitigation.** It can only reduce the costs of climate change; for severe impacts there are limits to what adaptation can achieve.
- **Adaptation can reduce costs.** Weather-related and other impacts have rapidly rising costs. Investing now can reduce damage. In future, this will be more expensive.

# ADB's Programs on Mitigation and Adaptation

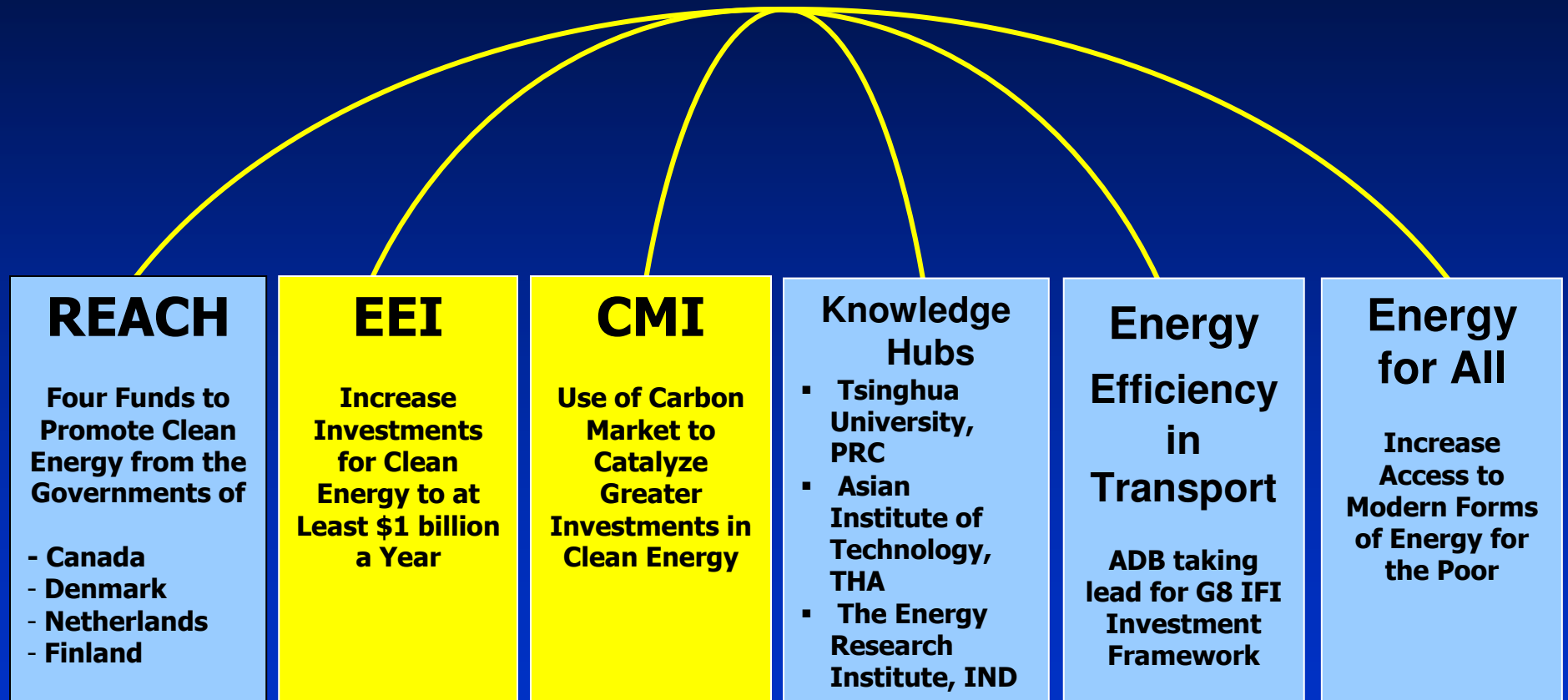
# ADB's Role in Climate Change

## Increase SUPPLY of projects

### – *Make Projects Happen*

1. Underlying finance and services
2. Capacity Building for project development
  - Clean energy and other GHG mitigation projects
  - Adaptation projects
3. CDM Project technical support

# ADB's Mitigation Activities

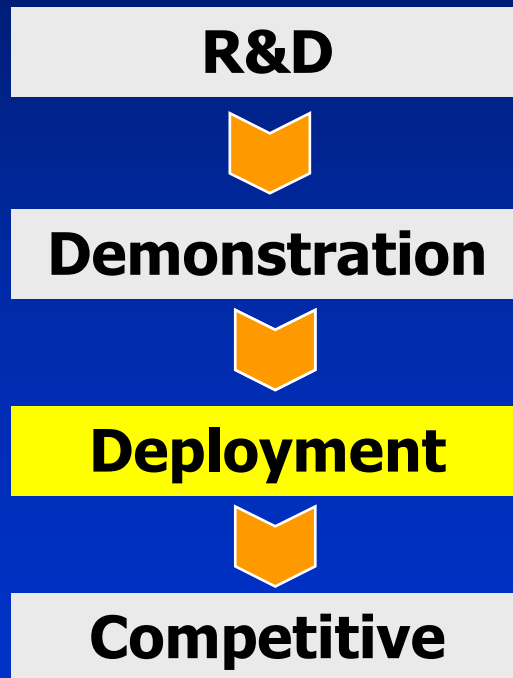


# Energy Efficiency Initiative

- Launched in July 2005
- Expand ADB operations in energy efficiency to \$1 billion/year
- Promote investments in addition to advocacy
- Focuses on both demand and supply side (also includes renewable energy)
  - **Demand side:** loss reduction on the consumer side of meters, cleaner production technologies in energy intensive industries, high-efficiency commonly used equipment and appliances – industrial motors, lighting, insulation, cooling etc.
  - **Supply side:** T&D loss reduction, new technologies for power generation, renewable energy (including hydropower and cogeneration based on agro products)

# EEI Core Focus

## Stages of Technology Development



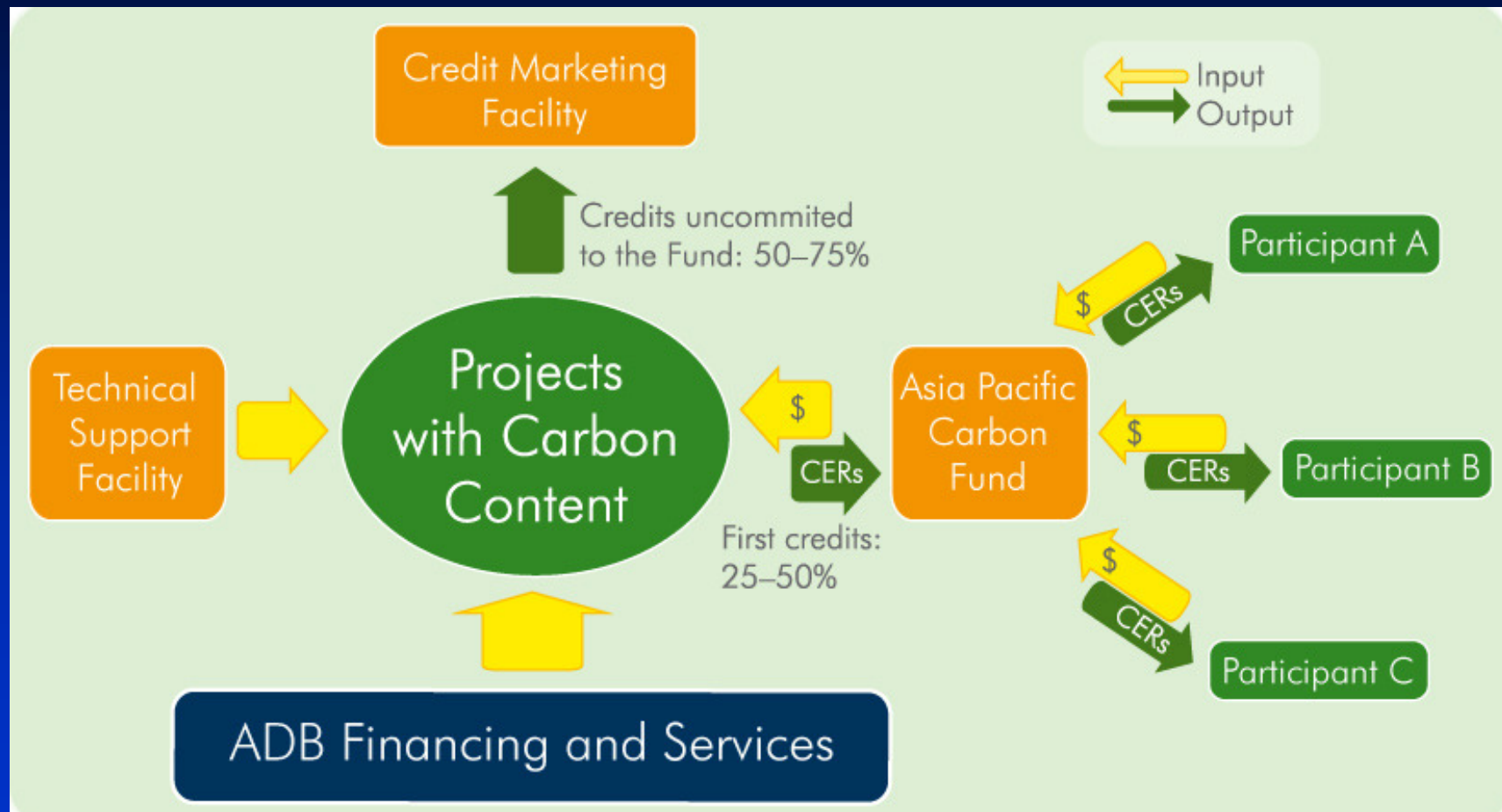
- IEA identifies the crucial need for large **deployment programs** to bridge the gap between R&D and commercialization of clean energy technologies

*Source: IEA Energy Technology Perspectives 2006*

# EEI Priorities

- Provide analyses regarding costs/impacts of EE in Asia-Pacific
- Technology identification, accelerated deployment of leading choices
- Establish suitable financing models that help blend private and public funds to implement projects – the Clean Energy Financing Partnership Facility
  - Increase in grants and concessional loans to support project preparation, risk mitigation, and technology transfer

# Carbon Market Initiative



# CDM Concept

Industrialized Country  
(Annex B)

Developing Country  
(non-Annex B)

Carbon Credits

(=GHG Emission rights)

**Entity A**

✓GHG Emissions

**Entity B**

✓Project Activity

✓Emission Reduction

**Finance**

**Technology**

(Capacity Building)

# CDM Reality

Industrialized Country  
(Annex B)

Developing Country  
(non-Annex B)

Carbon Credits

**Entity A**

✓GHG Emissions

**Entity B**

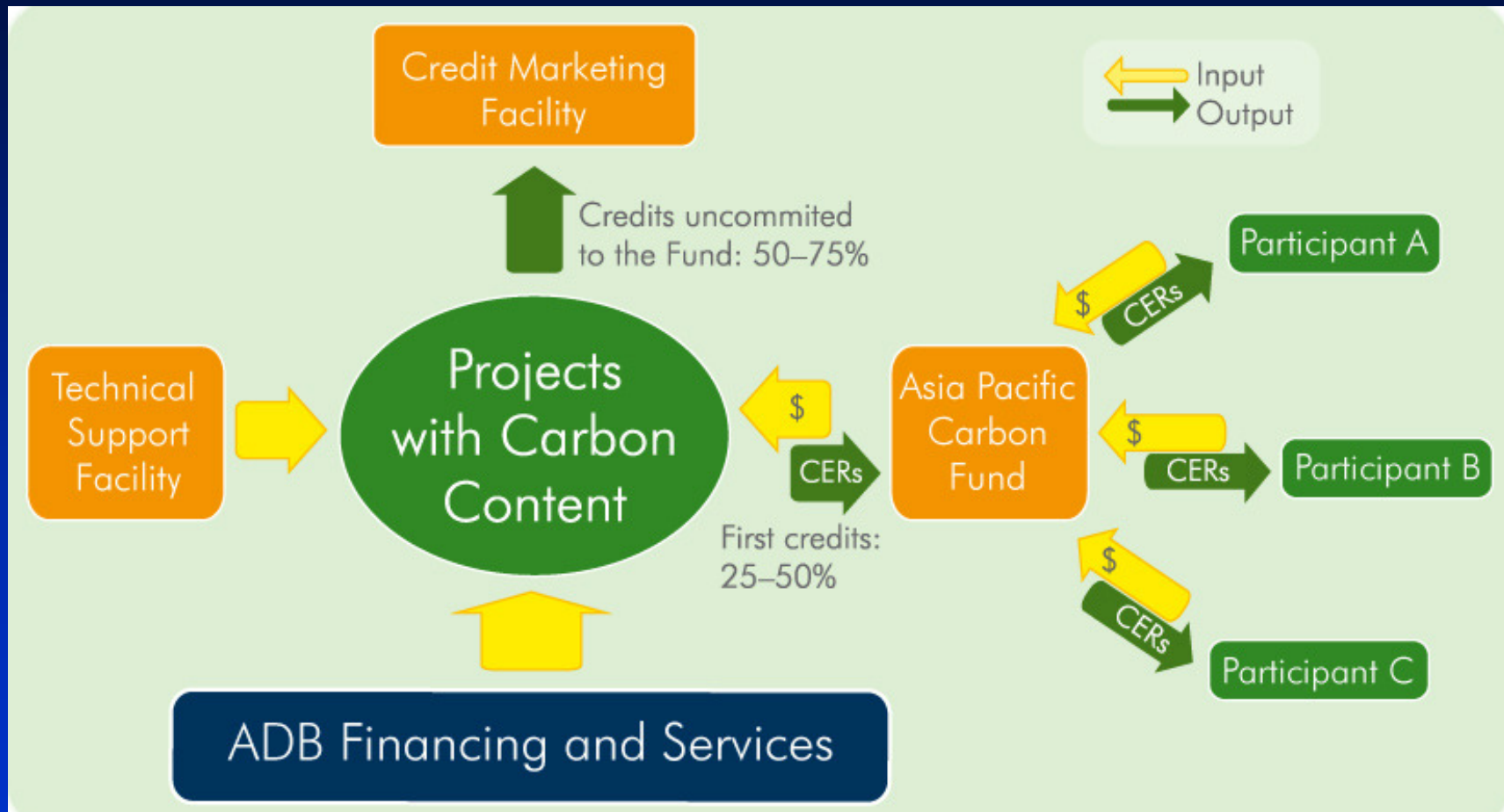
✓Project Activity  
✓Emission Reduction

Payment

# Consultation with Project Developers

1. Need underlying finance  
⇒ **ADB long-term finance**
2. Desire highest prices/best conditions for CERs  
⇒ **Dedicated credit marketing service**
3. Prefer upfront payment for future credits  
⇒ **Upfront procurement vehicle**
4. Require CDM implementation support  
⇒ **Comprehensive CDM technical support team**

# Carbon Market Initiative: 3 Components



# Component 1: Asia Pacific Carbon Fund

- ❑ Co-finances projects alongside ADB
- ❑ Fills a critical project financing gap
- ❑ Can purchase 25-50% of expected carbon credits
- ❑ 100% Upfront payment of contracted credits
- ❑ Projects have strong development benefits and follows comply with ADB safeguard policies

## Component 2: CDM Technical Support

- ❑ Upstream support in project preparation phase
  - Due diligence: technical, financial, legal, safeguards, governance
  - Capacity building trainings
  - Carbon credit valuation
  - Documentation preparation for credits (PIN, PDD, methodology)
  - Obtaining host country approvals
  - Facilitating project Validation & Registration
- ❑ Downstream support in project execution and commercialization
  - Implementation / commissioning
  - Monitoring & Verification
  - Certification & Issuance of CERs to sponsor/developer & fund

## Component 3: Credit Marketing Service

- ❑ Assists with sale of credits *not* purchased by Fund
- ❑ Provides financial incentives for project completion
- ❑ Buyers will bid for credits offered
- ❑ Competitive process to achieve best prices & terms
- ❑ APCF investor can also participate as seller or buyer

# Priority Target Projects

## ❑ Fugitive Methane Capture

- Coalmine methane
- Municipal waste management (landfill methane)

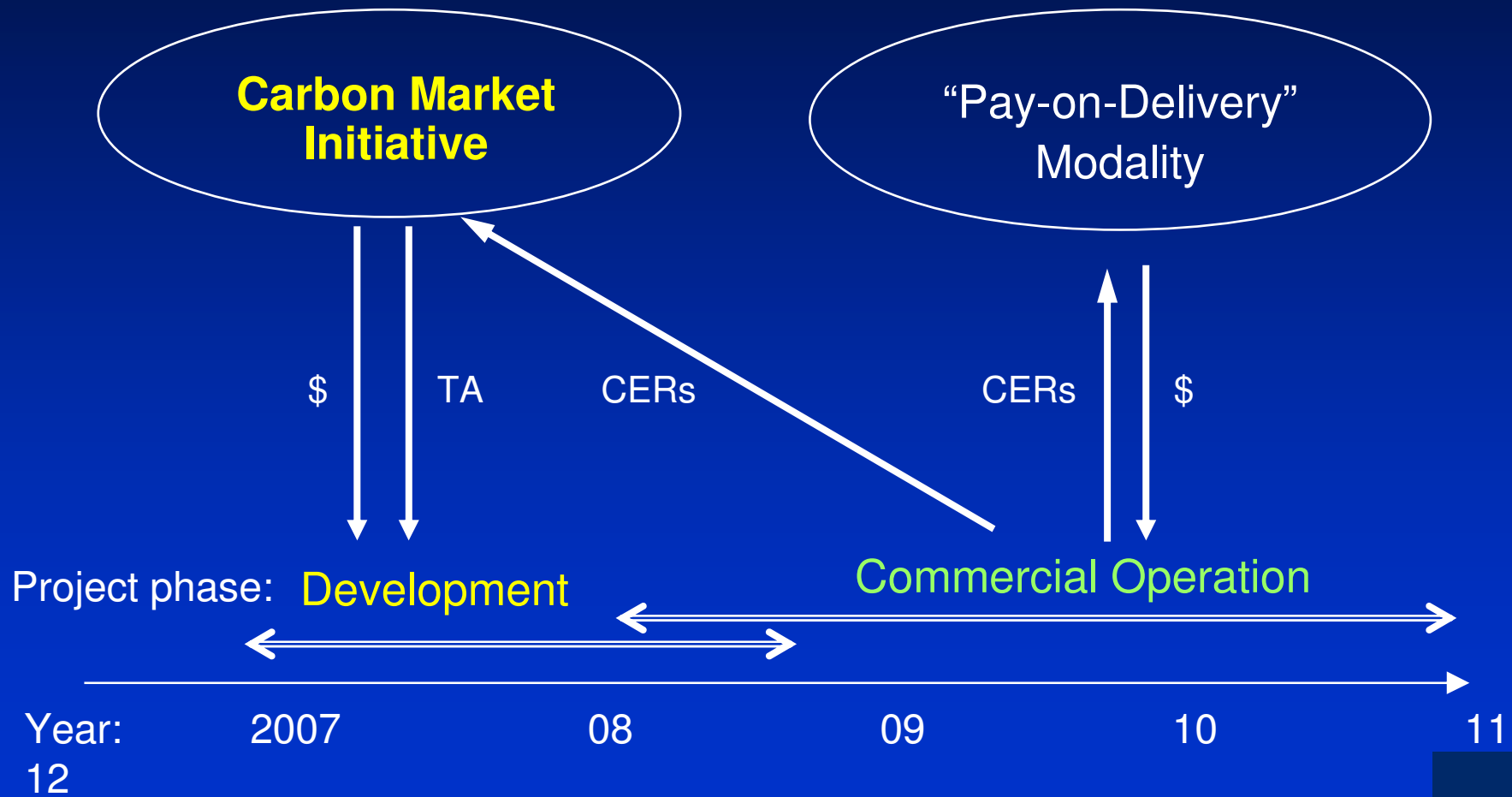
## ❑ Energy Efficiency

- Industrial technology
- Supply-side efficiency (e.g. upgrade of generation equipment)

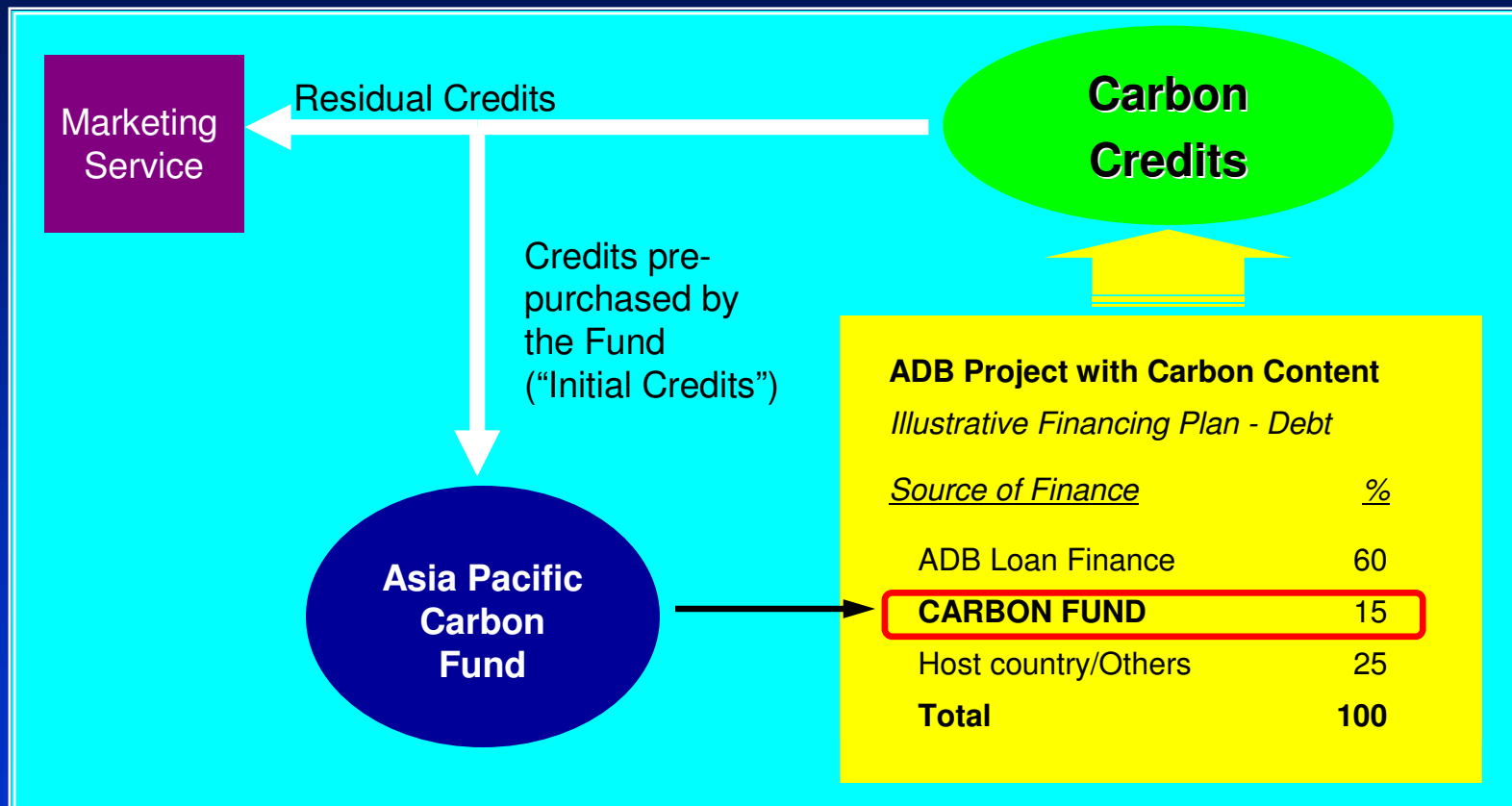
## ❑ Renewable Energy

- Biomass energy
- Small to mid-scale run-of-river hydropower
- Wind power
- Geothermal power

# Timing of Intervention



# Sample Project Financing Plan



# CMI Workflow

1. Project Referral



2. Preliminary Review



3. Documentation



4. APCF

- Due Diligence
- Negotiation
- Board Approval

4. APCF

- Upfront Payment



5. Monitoring



6. Issuance/Transfer



7. Credit Marketing

## Summary: CMI Main Advantages

- Lower budget commitments to project financing plans
- Early stage co-financing at attractive terms
- Grant funds from ADB for project preparation
- Long term project implementation support
- Substantial market upside for residual credits

# ADB's Adaptation Activities

# Challenges

## Mitigation

- Current global agreement only up to 2012; mandatory targets only adopted by countries emitting about half of global annual anthropogenic GHG emissions
- Projects only happening in PRC, India, Brazil and a few other countries; not catalyzing broad investment in low-GHG options across countries & sectors

## Adaptation

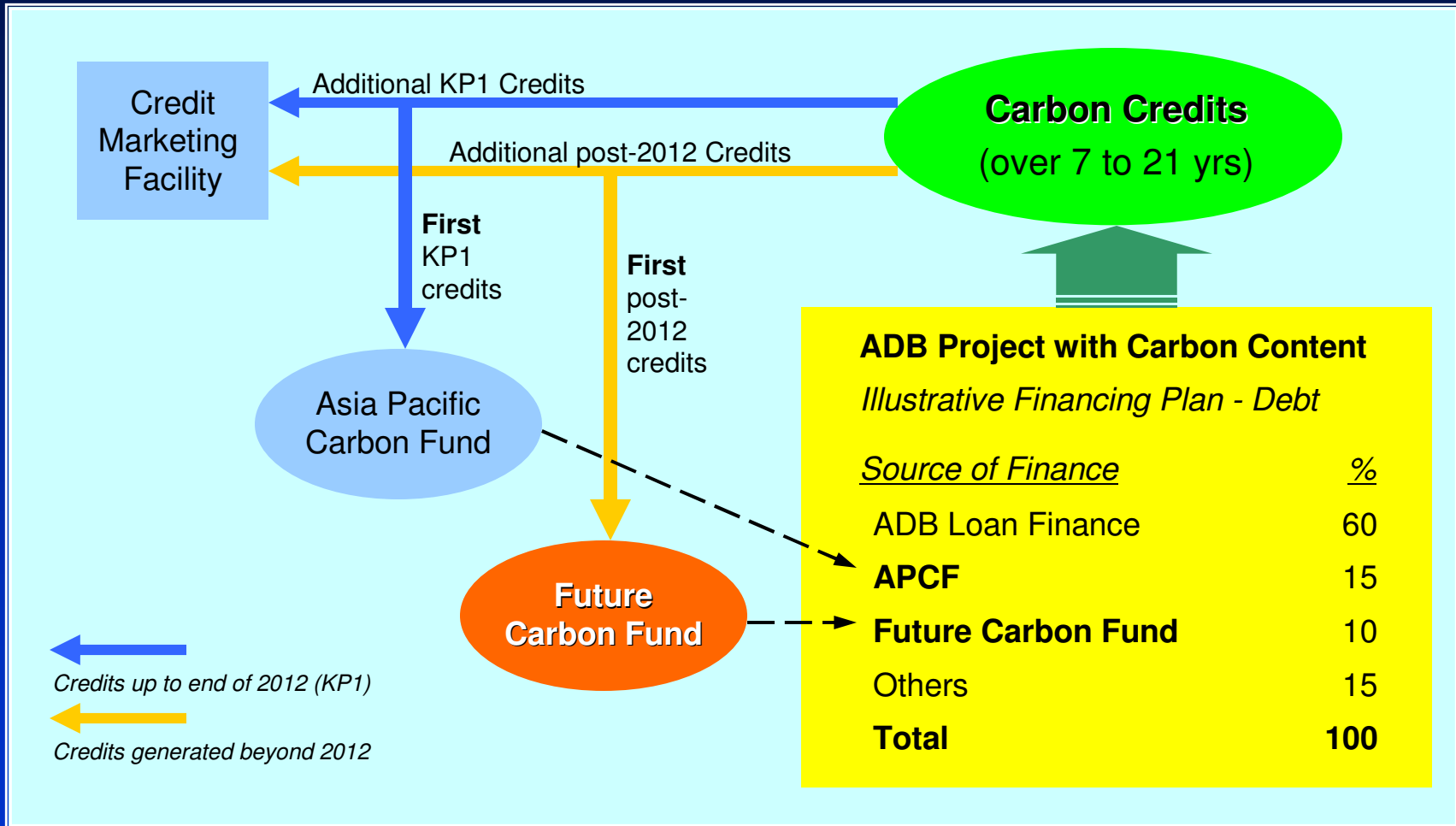
- Lack of regional models focusing on vulnerability of developing countries
- Financing for adaptation investments
- Limited effort on potential “climate refugee” issues

# Future Carbon Fund Concept

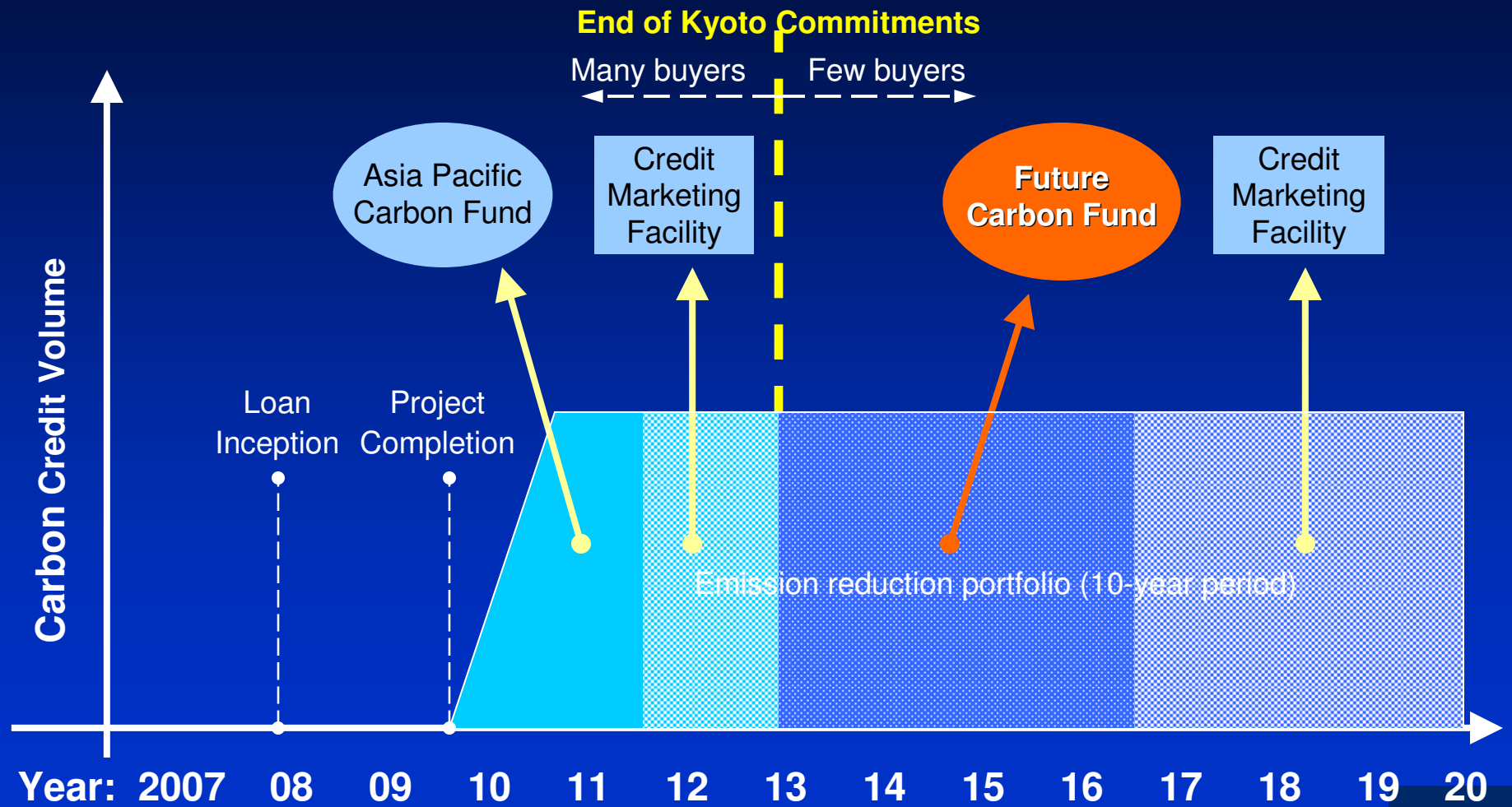
---

- Establishment of a **Future Carbon Fund** (FCF) to pre-purchase future carbon credits (post-2012) from projects supported by ADB financing and the CMI
- The FCF would become the fourth component of the Carbon Market Initiative, along with:
  - The Asia Pacific Carbon Fund
  - The Technical Support Facility
  - The Credit Marketing Facility

# Sample Project Financing Plan



# Sample Project Credit Flow



# THANK YOU!

*For information on adaptation activities, please contact:*

**Jay Roop / David McCauley**

Environment and Social Safeguards Division  
Regional & Sustainable Development Department  
Asian Development Bank

Tel: (+632) 632-5631

E-mail: [jroop@adb.org](mailto:jroop@adb.org) / [dmccauley@adb.org](mailto:dmccauley@adb.org)

*For information on mitigation activities, please contact:*

**Toru Kubo / Josh Carmody / Sam Tumiwa**

Energy, Transport and Water Division  
Regional & Sustainable Development Department

Tel: (+632) 632-5912

E-mail: [tkubo@adb.org](mailto:tkubo@adb.org) / [jcarmody@adb.org](mailto:jcarmody@adb.org) / [stumiwa@adb.org](mailto:stumiwa@adb.org)

**ADB**