



Global Warming and CDM Implementation in Thailand

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(public Organization)

Major Greenhouse Gases

In the nature

Water vapor

O₃/CO₂/CH₄/N₂O

- Water vapor
- Ozone
- Carbon dioxide
- Methane
- Nitrous oxide

Man made

SF₆/HFC/PFC/CFC

- Sulfur hexafluoride
- Hydrofluorocarbons
- Perfluorocarbons
- Chlorofluorocarbons

The greenhouse effect

1 Solar energy

The sun's rays pass through Earth's atmosphere. Much of this energy is absorbed by the surface and atmosphere.

2 Reflected energy

Some of the radiation is reflected back toward space.

Reflected rays

3 Trapped warmth

Reflected energy has longer wavelengths that cause molecules of greenhouse gases in the troposphere, the lowest layer of the atmosphere, to move more rapidly.

The rapid movement of these molecules traps heat in the troposphere warming the planet. This is called **the greenhouse effect**.

4 Greenhouse gases

The gases that are affected this way are called greenhouse gases. The main ones are:

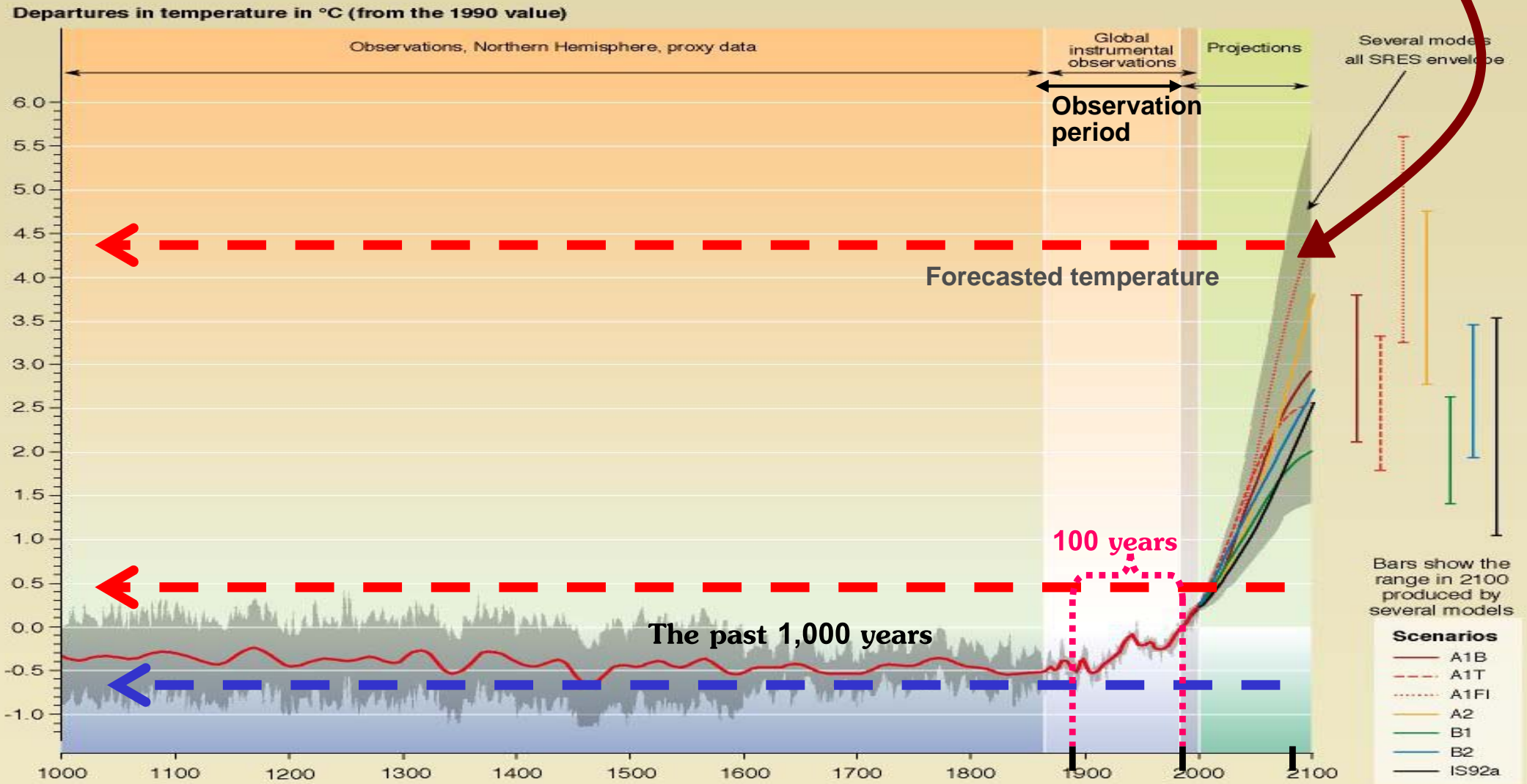
- Carbon dioxide (CO₂)
- Water vapor
- Methane
- Nitrous oxide

Trapped heat re-radiates back toward Earth.

5 Global warming

The higher levels of CO₂, methane, and other greenhouse gases accumulating in the atmosphere enhance the natural the greenhouse effect, raising the global temperature.

Global temperature increased $0.6 \pm 0.2^\circ\text{C}$ during the past century, and the temperature is forecasted by the end of this century as ...



source : IPCC

Global Warming Potentials: GWP

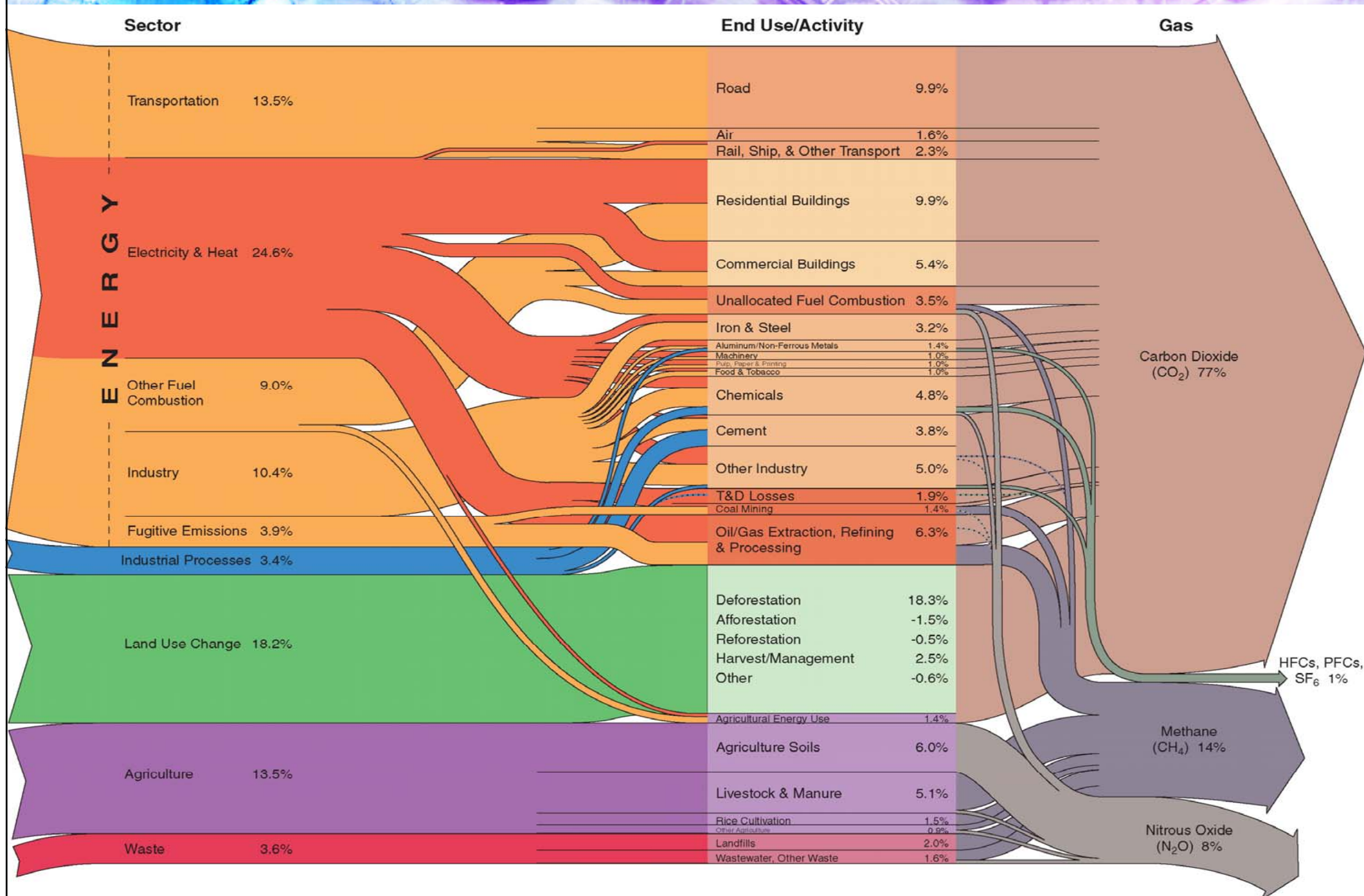
Greenhouse Gases

GWP

Age of GHG in the atmosphere (yr)

Carbon dioxide	CO₂	GWP: 1	200 – 450
Methane	CH₄	GWP: 21	11
Nitrous oxide	N₂O	GWP: 310	120
Hydrofluorocarbons	HFCs	GWP: 140 – 11,700	2 – 19
Perfluorocarbons	PFCs	GWP: 6,500 – 9,200	> 1,000
Sulfur hexafluoride	SF₆	GWP: 23,900	3,200

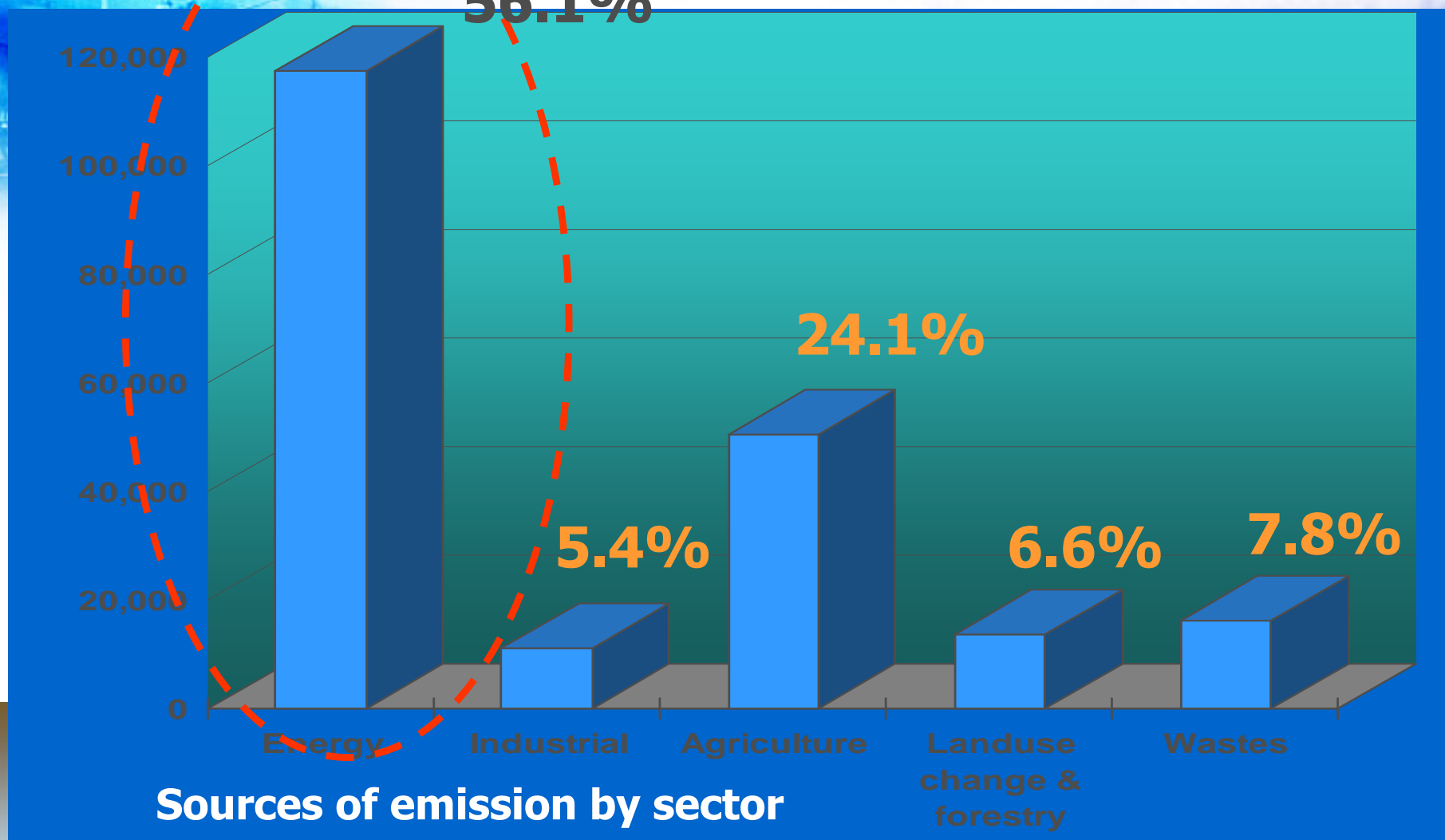
GHG Flow Diagram: Global Greenhouse Gas Emissions



Thailand GHG emission in 1998

~ 297.6 MtCO₂e

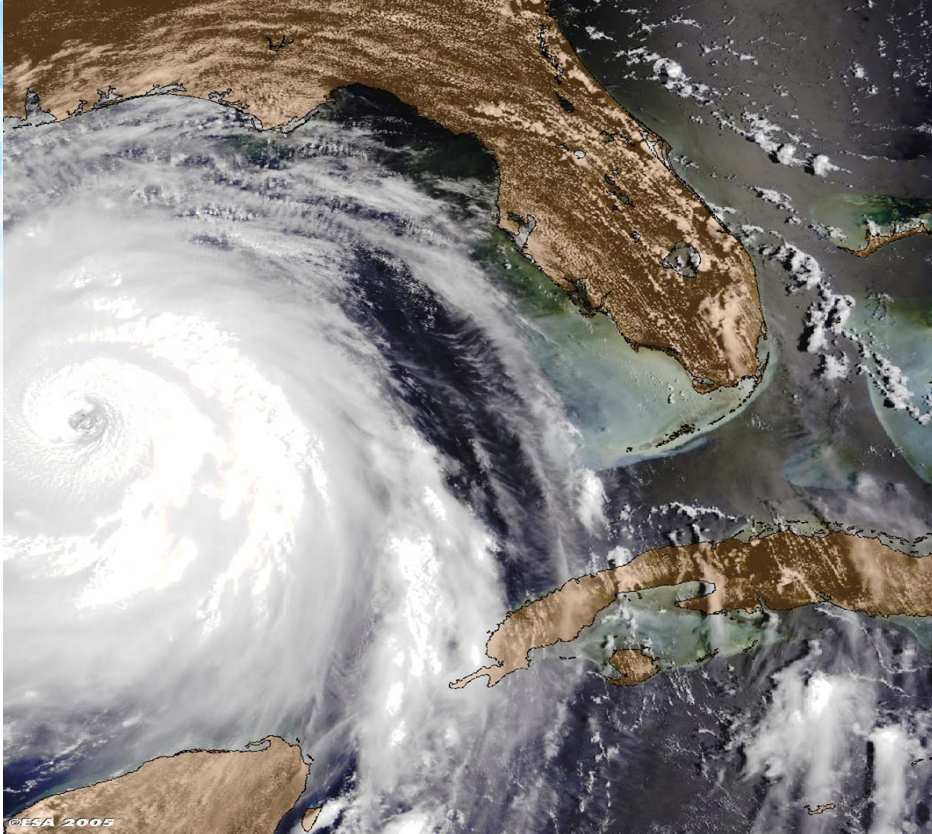
Emission
(1000 tons)



2007 Reuter Top 30 GHG Emitter

Country	1990 (ตัน)	2000 (ตัน)	2004 (ตัน)	1990 vs 2000 (%)
23 Argentina	249	289	N.A	+16
24 Pakistan	206	285	N.A	+38
25 Thailand	176	265	N.A	+51
26 Venezuela	199	240	N.A	+20
27 Taiwan	129	230	N.A	+79
28 Netherlands	210	215	219	+2
29 Nigeria	164	194	N.A	+18
30 Uzbekistan	163	180	N.A	+10

Climate Change Weather Extremes







**Coastal erosion
at Thasala,
Nakorn Srithamarat**

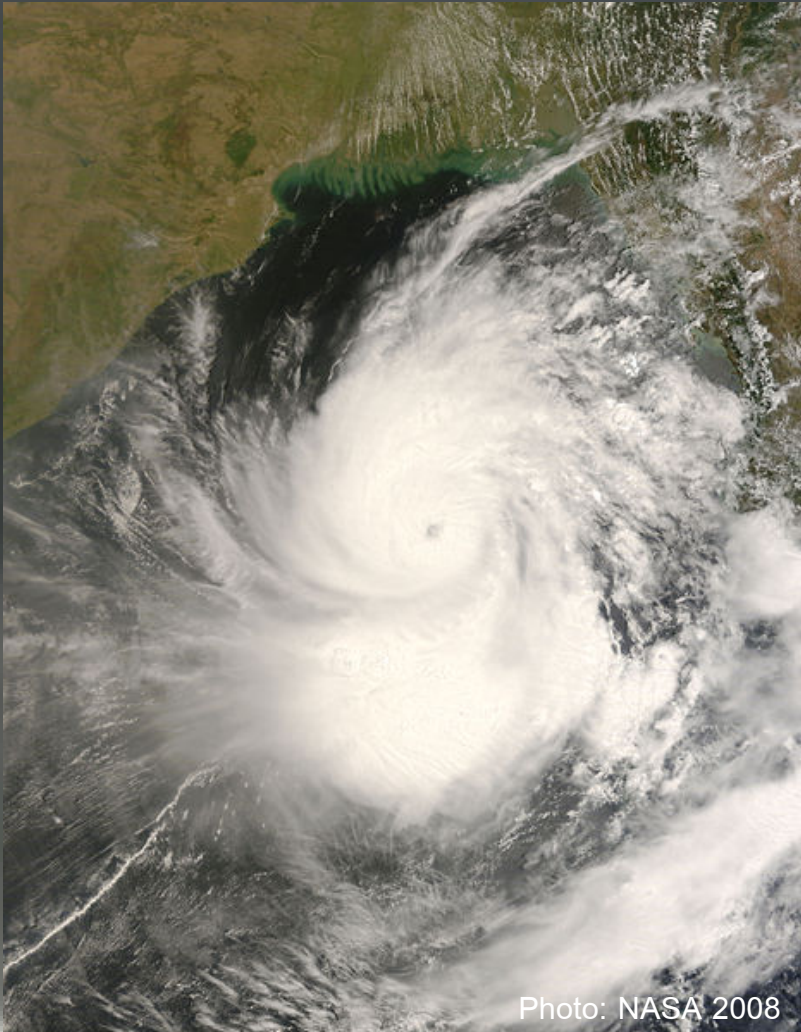


Photo: NASA 2008

Nargis cyclone, MYNMAR

May 2008



Photo: Nick Tzolov 2008



Extreme weather in Vietnam

February 2008



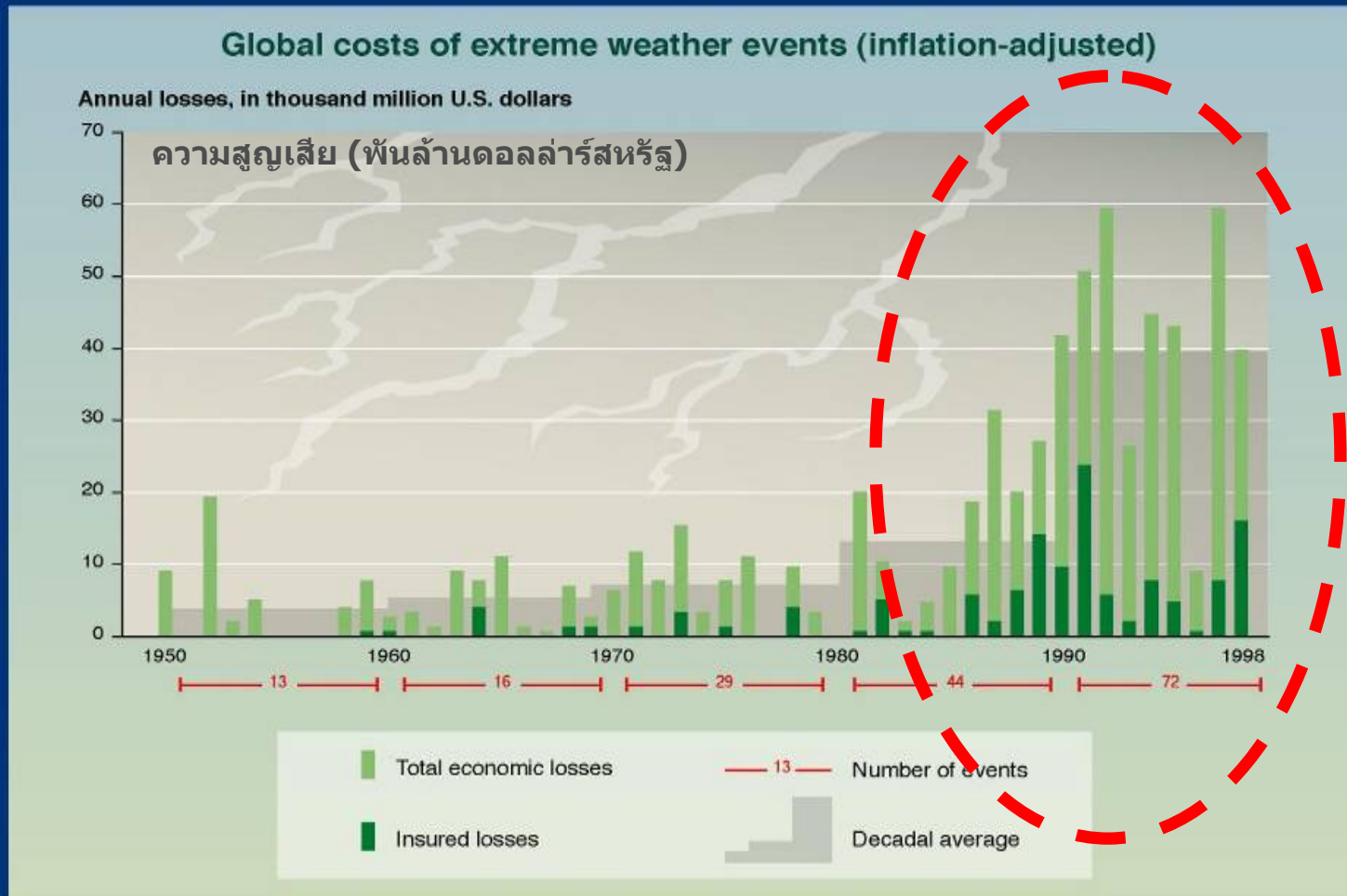
Snowing in the north of Vietnam, -10°C

(snow on the ground stayed for a month)

**2 deaths, more than 100 cases of
illness, and more than 1,000 deaths of
cattle**



Global cost of Extreme weather during the past 5 decades increased 10 times from 4 to 40 billion \$, and the number of major disasters increased from 13 to 72 times.



SYR - FIGURE 2-7

UNFCCC 1994

**41 Industrial countries
(Annex I)**

**148 Developing countries
(Non Annex I)**

**Kyoto Protocol
2005**

**Annex I countries committed to
Reduce GHG 5% of 1990**

**Non-Annex I countries has
no commitment**

Thailand ratification status



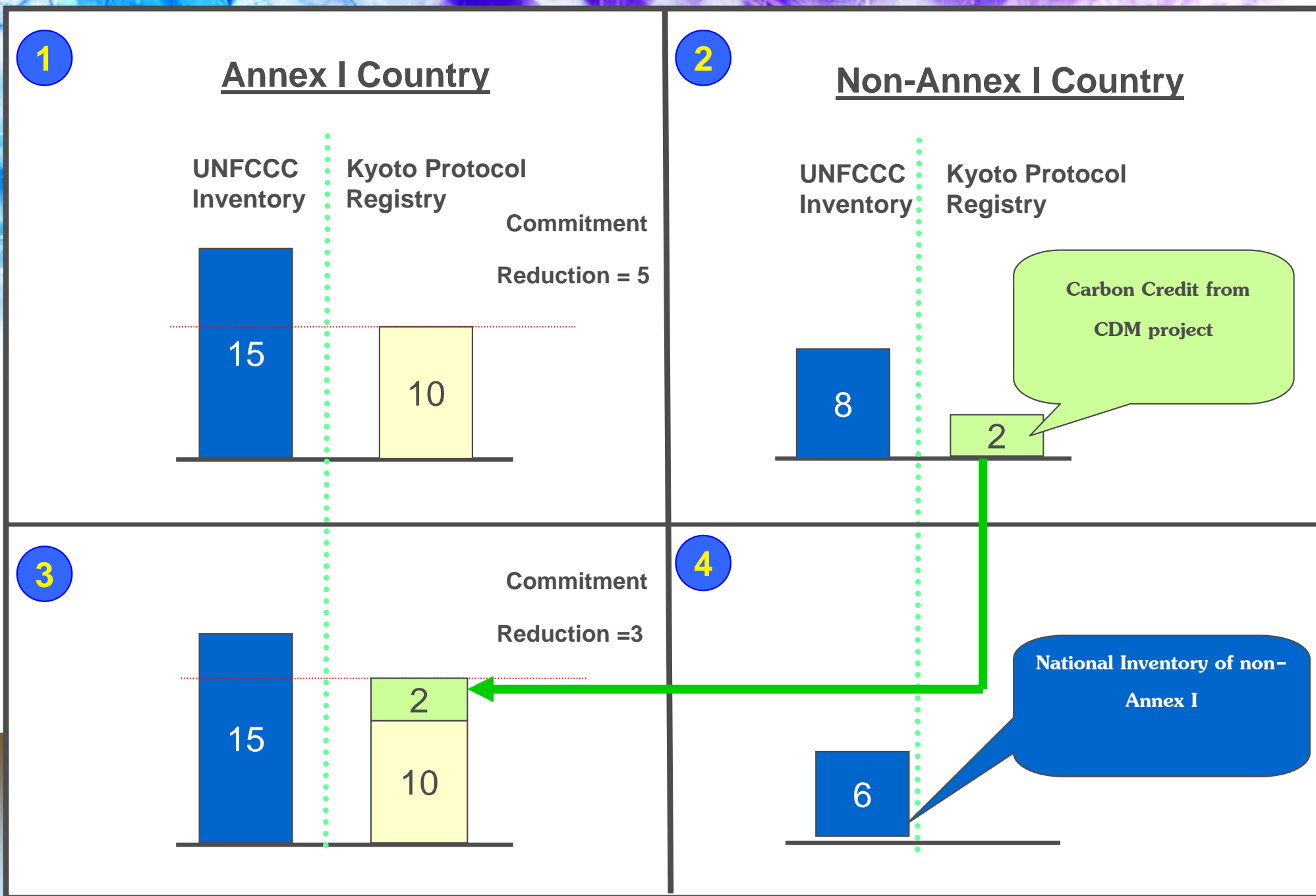
Thailand ratified

- United Nations Framework Convention on Climate Change (UNFCCC) in December 1994
- Kyoto Protocol in August 2002

Kyoto Protocol

- **Joint Implementation (JI) – Annex I**
- **Emission Trade (ET) – Annex I**
- **CDM (Clean Development Mechanism) : non-Annex I can take voluntary participation to reduce GHG as “Carbon Credit”**

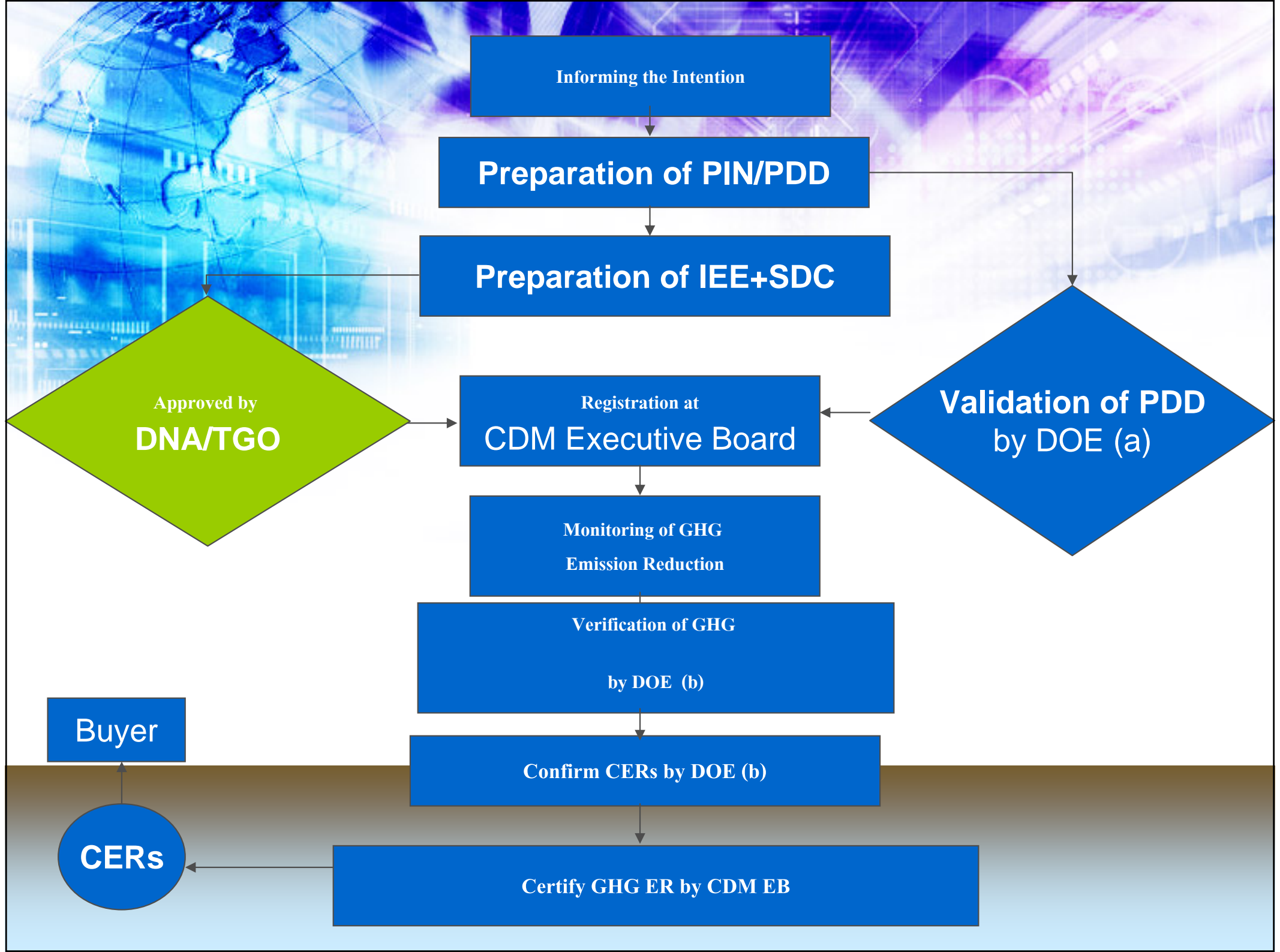
การลดก๊าซเรือนกระจกตามพันธกรณีผ่าน CDM





CDM Principles

- **Voluntary** : accepted by the host country,
- **Additionality** : not business as usual, different from the baseline scenario, Transparency & Accountable
- **Sustainable Development** : In accordance to the host country's policy on SD,
- **Certify** : by UNFCCC CDM-EB



Informing the Intention

Preparation of PIN/PDD

Preparation of IEE+SDC

Approved by
DNA/TGO

Registration at
CDM Executive Board

Validation of PDD
by DOE (a)

Monitoring of GHG
Emission Reduction

Verification of GHG

by DOE (b)

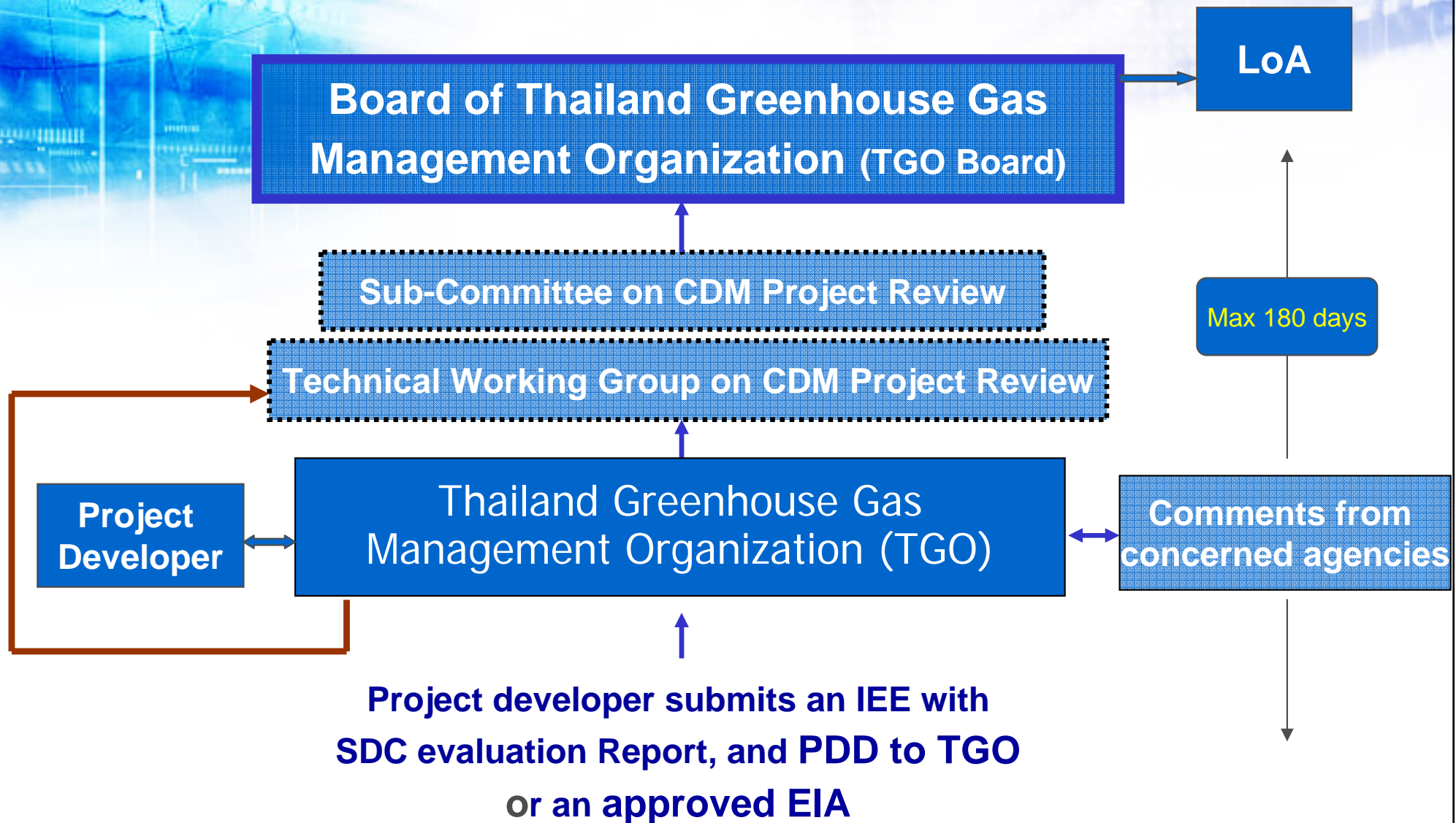
Confirm CERs by DOE (b)

Certify GHG ER by CDM EB

Buyer

CERs

CDM approval procedure in Thailand





**LoA has been issued for 41 projects
with expected CERs 2.94 MtCO₂ e/yr
(Sept 2008)**

- **Biogas from landfill, tapioca plants, palm oil plants, pig farms, ethanol plants**
- **Biomass power plants – bagasse, rice husk, chip woods,**
- **Fuel switching**
- **Heat waste utilization**
- **N₂O reduction**
- **Transportation sector is coming**

**Another 29 projects are under approval process
with expected CERs about 1.6 MtCO₂ e/yr
(Sept 2008)**





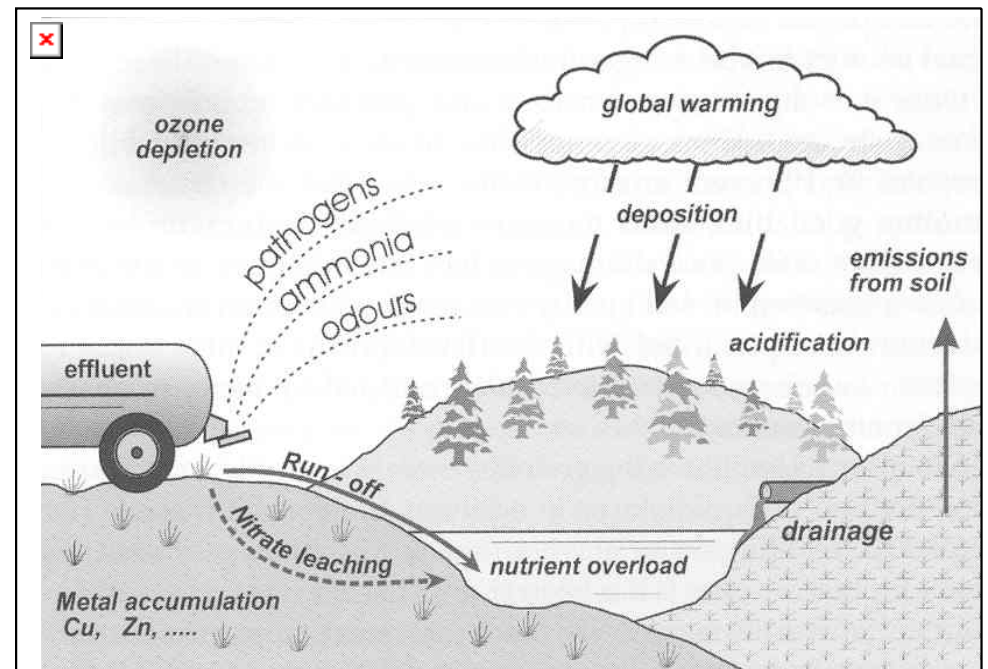
Registered and Certified Projects (Sept. 2008)

- **10 projects have been registered,**
- **2 projects were certified
(411,400 tCO₂e/y)**

Sustainable Development Criteria for reviewing CDM projects in Thailand

There are 4 major SD perspectives for project evaluation

- 1. Natural resources and environment**
- 2. Social**
- 3. Technology**
- 4. Economics**



Sustainable Development Criteria for CDM projects in Thailand

Environment & Natural Resources

- Greenhouse gas emission
- Air pollution
- Noise pollution
- Odour
- Wastewater
- Waste management
- Soil contamination
- Underground water contamination
- Hazardous waste
- Water requirement and efficiency
- Soil/ coastal erosion
- Green area
- Ecosystem and Biodiversity
- Species diversity
- Use/importation of alien species

Social

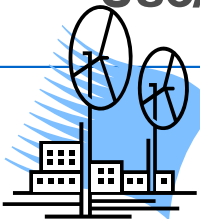
- Public participation
- Support for local community development activities
- Public health

Technology

- Technology development
- End of project life plan
- Training

Economic

- Stakeholders income
 - Labour income
 - Raw material supplier
- Energy
 - Renewable energy utilization
 - Energy efficiency
- Local content



Sustainable Development Criteria for reviewing CDM projects in Thailand

Scoring

-1 , -2 , -3 indicates **Negative impact to the area**

0 indicates **no impact / equivalent to base case**

+1 , +2 , +3 indicates **Positive impact to the area**

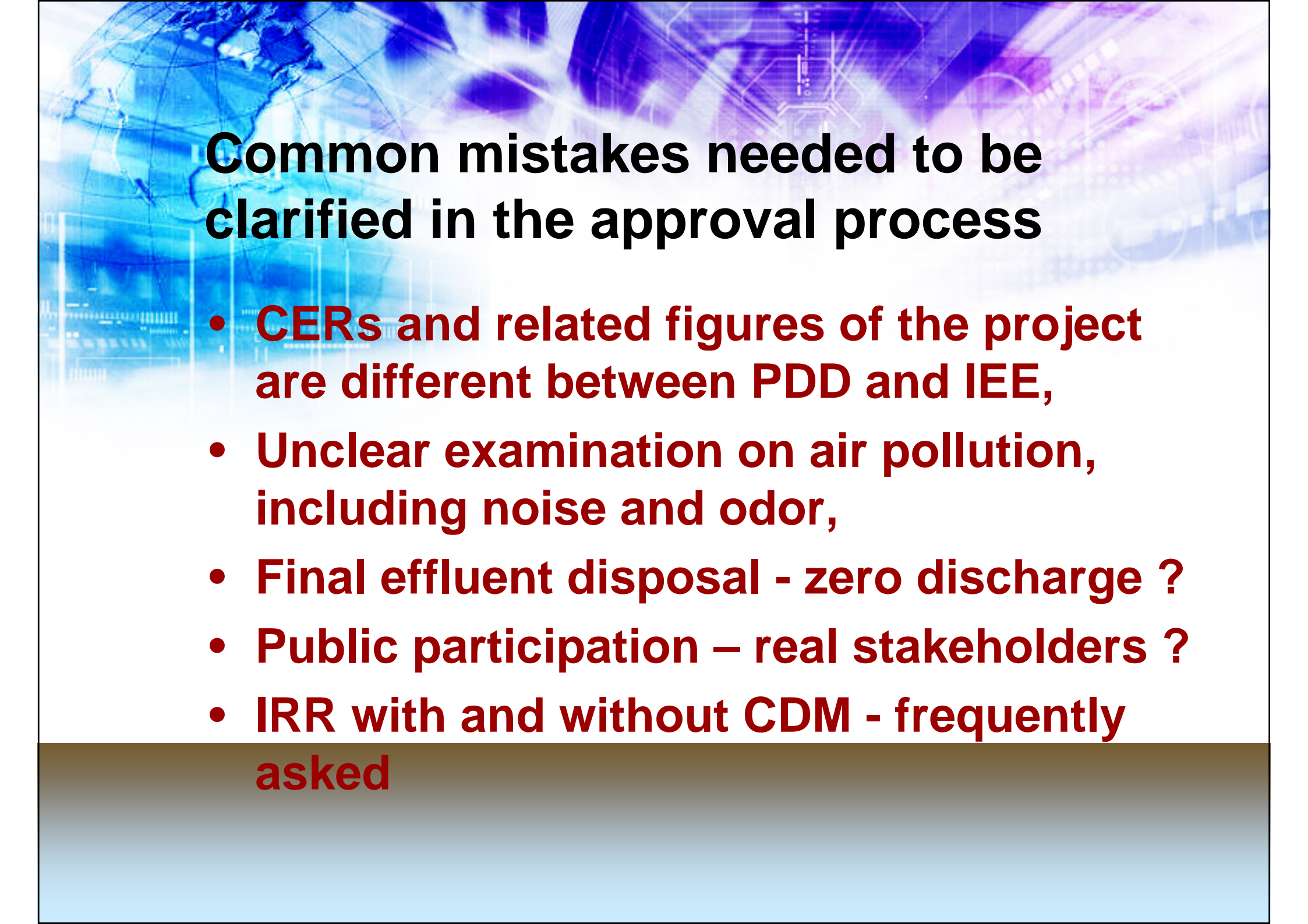
For the project to be considered as a CDM project, each group of criteria and the total score must be positive (more than zero).



CDM Forestry Project

Thailand's CDM Forest Definition

- **Area 1 rai (1 ha = 6.2 rais)**
- **Crown cover 30%**
- **Tree height 3 m.**



Common mistakes needed to be clarified in the approval process

- **CERs and related figures of the project are different between PDD and IEE,**
- **Unclear examination on air pollution, including noise and odor,**
- **Final effluent disposal - zero discharge ?**
- **Public participation – real stakeholders ?**
- **IRR with and without CDM - frequently asked**



Priority and promotion policy

- **Land fill**
- **Pig farm**
- **Energy efficiency**
- **Taxation**



Transaction Cost to implement CDM project in Thailand

- Preparation of PDD+ Validation ~ 1.5 - 2 MB
- Approval Fee at TGO including monitoring fee
0.075 - 0.9 MB
- Registration Fee at CDM EB
 - Annual <15,000 tCO₂ US\$ 0.1/CER
 - Annual > 15,000 tCO₂ –US\$ 0.2/CER
 - Maximum charge –US\$ 350,000
- Monitoring ~ 0.15 – 0.3 MB
- Verification ~ 1 – 2 MB
- Certification ~
- Levy 2% of CERs for Adaptation Fund
- **TOTAL ~ 4 – 8 MB / Project (US\$115,000 – 230,000)**

Ratchaburi Farms Biogas Project at SPM Farm

Small-scale CDM Project

Biogas from swine farm

Biogas system



Bioscrubber



Electricity

~40%



Gas engine

~39%

Hot water



Boiler



Jaroensompong Corporation Rachathewa **Landfill Gas to Energy** Project in Thailand





Surin Electricity Company Limited

(Biomass project from bagasse)





Thank you for your attention

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