Global warming and it's Solution (Kyoto mechanism)

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Mitsubishi Research Institute

Dr.Tadashi Aoyagi

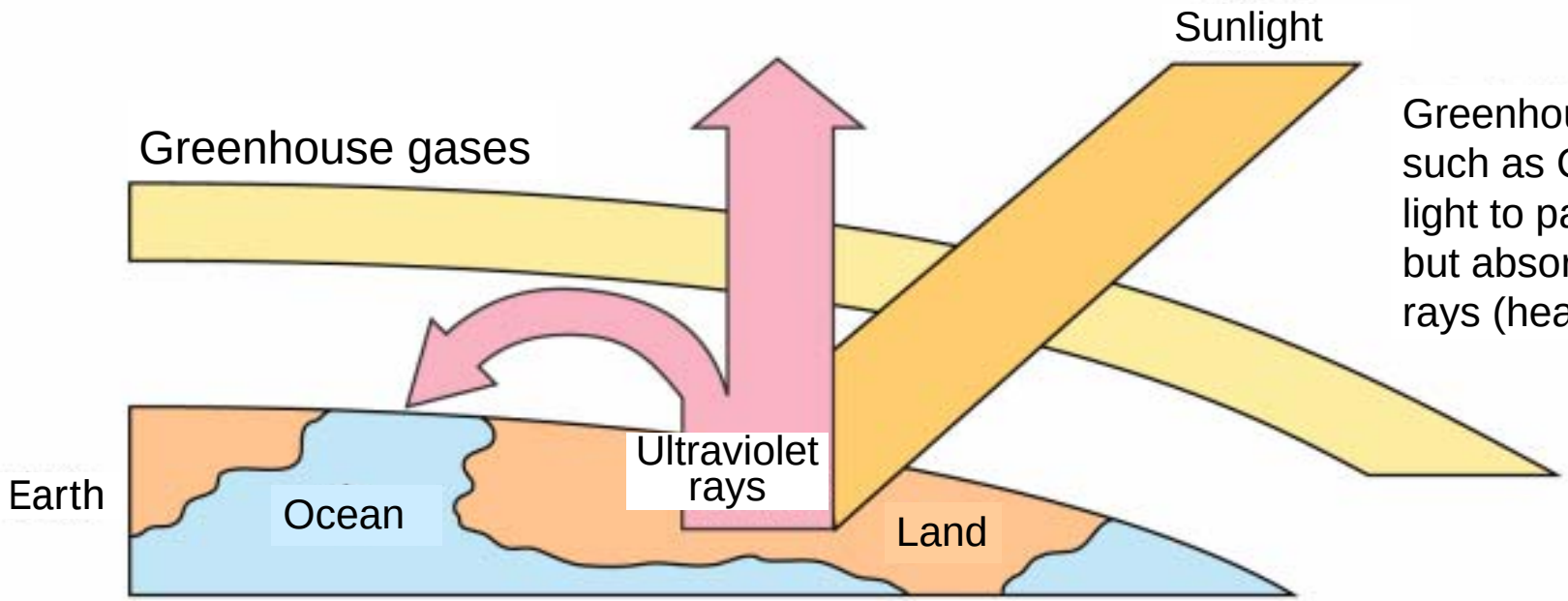
Agenda

- Global warming
- International discussion
- Ratification process of KM
- GHG emission in main countries
- Kyoto Mechanism (KM)
- Emissions trading
- Role of Private sector
- Activities in Mitsubishi Research Institute

What is global warming

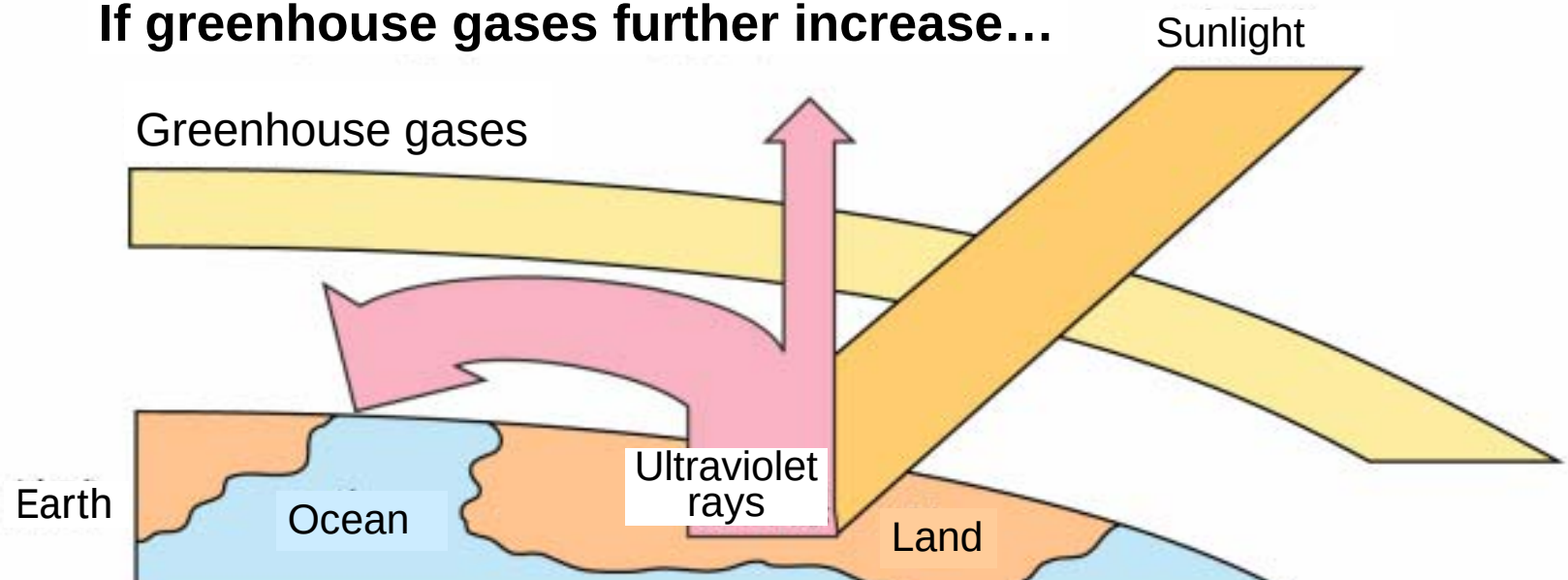
- Mechanism of global warming
  - Unbalance of heat-balance of the earth
- Founded in late 19th Century
  - Arrhenius (Swedish scientist)
- GHGs (greenhouse effect gases)
  - CO2、methane、HFC、CFC、N2O、SF6
  - Global warming potential
- Several signs of warming

Mechanism of Greenhouse Gases



Greenhouse gases, such as CO_2, allow light to pass through but absorb ultraviolet rays (heat).

If greenhouse gases further increase…



IPCC report (Inter-governmental panel on climate change)

- First report(1990）
  - 60% ghgs reduction is needed for CO2 stabilization)
- Second report(1995）
- Third report(2001）
- Contents
  - Forecast of warming
  - Cost for adaptation
  - Social impact of warming

Main result of IPCC report

- Future scenario of economic energy society
- Future energy consumption
- Future temperature raise
- Future sea level raise
  - GHGs are main contributors for last 50 years global warming
  - Average temperature raise at the end of 21st century is 1.5C, maximum 6.1C.

International discussion for global warming（1）

- 1988 Toronto conference
  - Developed countries should commit 20% energy consumption reduction.
- Establishment of IPCC
- Second world climate conference(1990)
- 1992 Earth summit（UNCED UN conference on environment and development）
  - Framework convention on climate change
- Enter into the forth 1994

International discussion for global warming（2）

- COP1 (conference of the parties) 1995
  - Berlin mandate
- COP3 1997 Kyoto conference
  - Kyoto protocol
- COP7 COP7 2001 Marrakech conference
  - Marrakech accord

Framework convention on climate change

- Object
  - Stabilize ghgs concentration in the atmosphere
- Obligation of developed countries
  - Return the ghg emission to 1990 level in 2000
- Support developing countries in finance and technology (rich developed countries)
- Definition of countries
  - Developed countries Annex I OECD,EITs
  - Rich developed countries Annex II OECD
  - Developing countries

Road to Marrakech Accord

- COP1（1995）
  - Berlin mandate,which requests Annex I countries to set their own reduction target by COP3
- COP2(1996） GHG reduction taraget must be legally bind

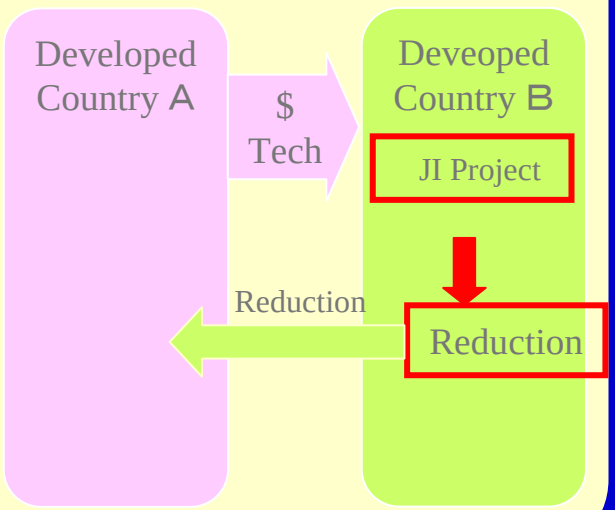
Kyoto protocol(COP3）

- Dec 1997
- Introduction of flexibility concept due to the difficulty of emission reduction (energy usage is directly connected with economic activities)
  - Time flexibility, regional flexibility, reduction point flexibility ,gas flexibility)
- Reduction target for developed countries
- Legally binding close

Basic Features of Kyoto Mechanism

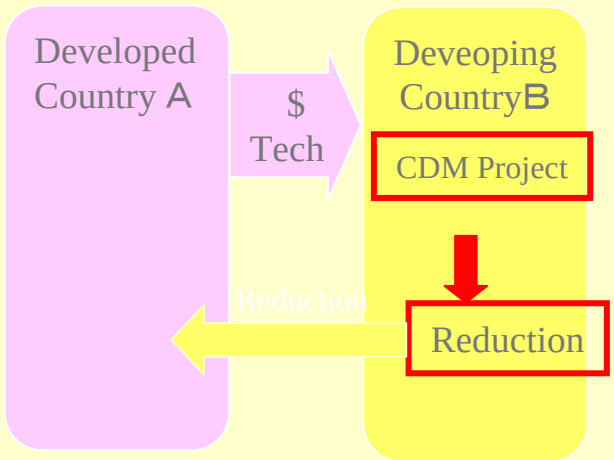
Joint implementation（JI）
（Article 6 of Protocol）

Developed country can receive "emissions reduction units" when it helps to finance projects that reduce net emissions in another developed country (including countries with economies in transition).



Clean Development Mechanism（CDM）
（Article 12 of Protocol ）

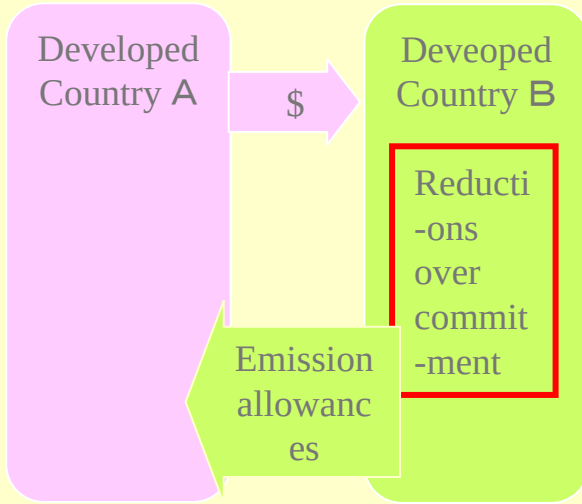
Developed countries to finance emissions-reduction projects in developing countries and receive credit for doing so.



※Credit gained for reductions after 2000

Emissions Trading
（Article 17 of Protocol ）

Parties with emissions commitments may trade their emission allowances with other Parties to achieve their commitments



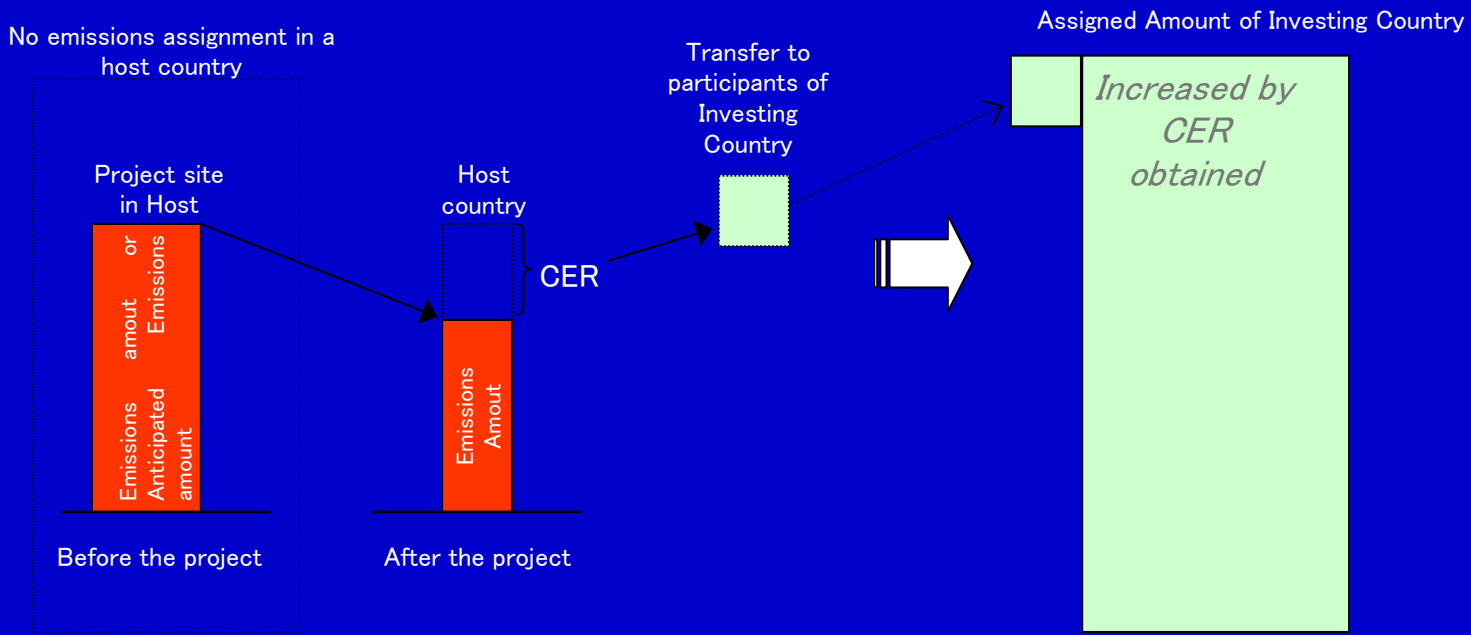
Marrakech Accords Kyoto Mechanism

- Supplemental to domestic actions, domestic action thus constitutes a significant element of each Annex I Party's effort to meet the commitments
- Annex I Party may transfer/acquire AAUs, ERUs, CERs, and RMUs under Article 17

Basic Features of Clean Development Mechanism

- Annex I countries implement projects to reduce emissions in a Non-Annex I countries, and the resultant reductions in emissions are shared between the participants of the project.
  - Credits issued in CDM is called CER（Certified Emission Reduction）
  - Annex I countries can use CER for their obligations under the Kyoto Protocol
  - Developing country where the projects is undertaken is called “Host country”, country financing the project is called “Investment Country”
  - Example of GHG Reduction Projects：Renewable energy, Enhancement of energy efficiency, Fuel switch, Reuse of Methane
  - CO2 sink project ： Afforestration and Reforestraton

- CDM allows developed country to increase its emission limit
  - Rigid examinations for credit issuance
- CDM is only scheme in Kyoto Mechanism that credits can be obtained before the first commitment period (from 2000)



Basic Features of Clean Development Mechanism

- Assist Annex I Parties to meet the targets
- Assist non-Annex I Parties to achieve sustainable development (transfer of technologies, financial assistance)

Bush Administration Climate Change Policy

- Reduce U.S. GHG intensity 18% by 2012
- Improve voluntary national emissions registry
- Provide baseline protection and give “transferable credits” for “real” reductions
- Further measures if 2012 goal will not be met

Senate Proposals

Marrakech Accords CDM

- it is the host Party's prerogative to confirm whether a CDM project activity assists it in achieving sustainable development;
- Annex I Parties are to refrain from using units generated from nuclear facilities to meet their commitments

Marrakech Accords CDM

- public funding for CDM projects is not to result in the diversion of ODA and is to be separate from and not counted towards the financial obligations of Annex I Parties
- share of proceeds for adaptation: 2% of issued for a project activity;
- CERs bankable up to 2.5% of a Party's assigned amount pursuant to Article 3.7 and 3.8

Marrakech Accords CDM

- CDM Executive Board established

  10 members (Annex1 Parties-4, NonAnnex1 Parties-6)
- Simplified modalities and procedures for small-scale project activities agreed at COP8:
  - (a) Renewable energy project activities <15 MW,
  - (b) Energy efficiency improvement project activities <15 GWh/year; or
  - (c) Other project activities which emit <15 kt-CO2/year

Marrakech Accords CDM

- Crediting period starts after the date of the registration of the project activities
- Credits for a project starting as of 2000-Nov11,2001 may be issued retrospectively but not earlier than Jan1,2000, if submitted for registration before Dec31, 2005

Marrakech Accords CDM

- Afforestation and reforestation projects shall be the only eligible LULUCF projects under the CDM during the 1st commitment period(CP)
- Each Annex I Party's net acquisition of CERs from A&R CDM projects for the 1st CP: not exceed 1% of base year emissions

CDM project cycle

Flow of CDM project, where project participants implement emissions reduction or sink projects in developing country and obtain CER as a result of the project, is as follows.

① Designing of CDM Project

◆ Designing of CDM project by the project participant
- ☞ Necessary to complete project design documet (PDD) by the participant

②Approval by both Investing and Host governments

◆ Project participant gain approval, in written form, by both investing and host country governments.
- ☞ Procedures within Japan as an investing country has already determined in Oct.2002.
- ☞ Host countries procedures need to be consulted (not determined in most cases)

③Validation and Registration of CDM Project

◆ Validation is done to evaluate CDM project using PDD made by the project participants
- ☞ Validation is done by Designated Operational Entity (DOE)
- ☞ DOE is selected by the project participant

◆ After the validation, qualified projects will be officially registered
- ☞ CDM Executive Board (EB) will register the project

Implementation of the Project

④Monitoring of the CDM project

◆ Project participant implements the project and conduct monitoring activity to calculate GHG reduction

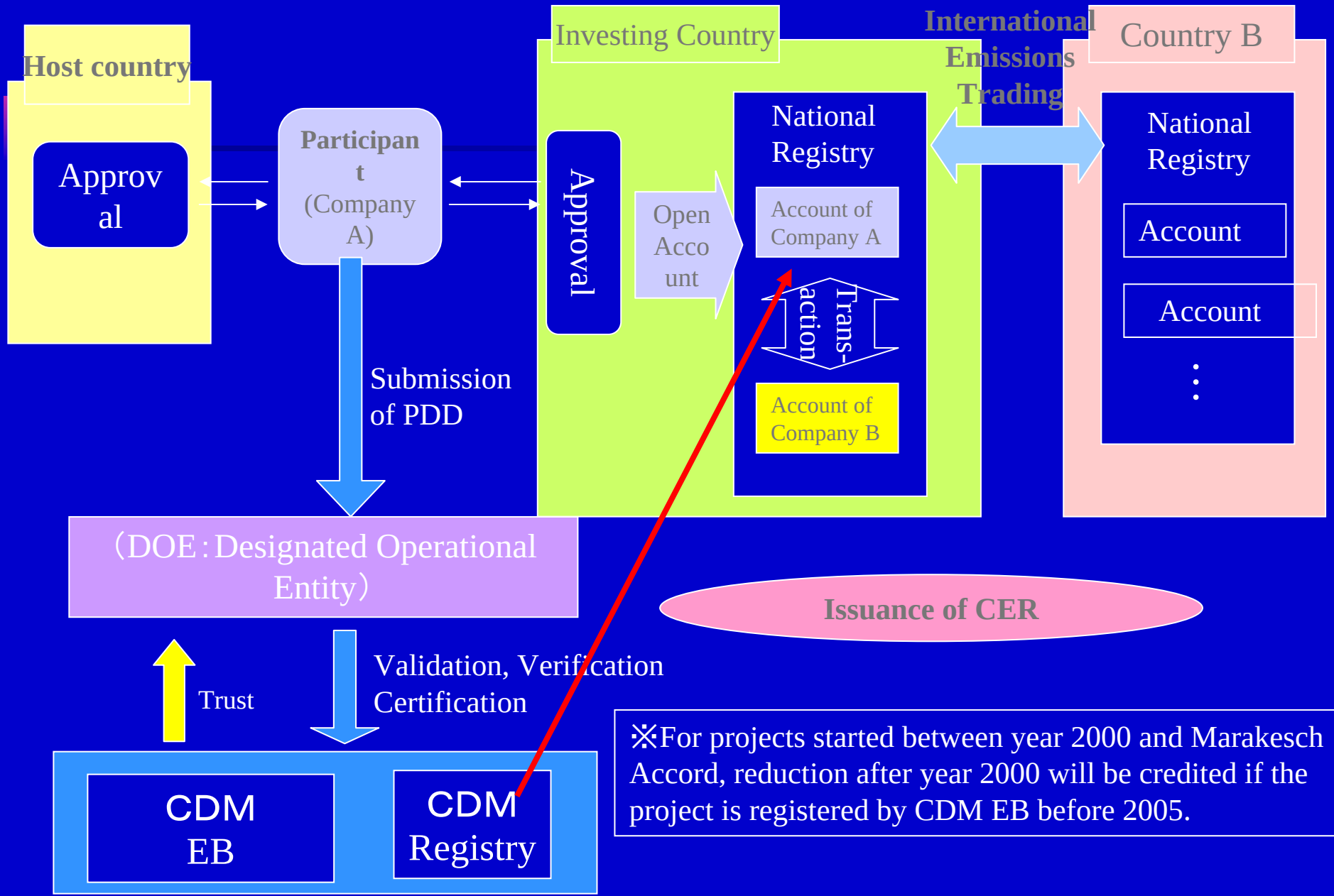
⑤Verification/ Certification/ Issuance of CER

◆ Projects participant reports to DOE the monitoring result and reduction amount of emissions
◆ DOE will conduct verification of the monitoring result and reduction amount
◆ DOE will officially certify (certification) by the result of verification
◆ CDM EB will issue CER (issuance) equivalent to amount certified by DOE
◆ Issuance CER will include reduction amount of emissions after 2000

⑥Sharing of CER

◆ 2% of issued CER is deducted for supporting developing countries
◆ Certain % of CER is deducted for operational cost of CDM
  ☞ Percentage is not determined at the moment
◆ Remaining CER is shared between Host country and project participant
  ☞ Sharing ratio needs to be pre-determined
  ☞ In case project participant is more than one, sharing ratio among the participants needs to be pre-determined

CDM Project Cycle



※For projects started between year 2000 and Marakesch Accord, reduction after year 2000 will be credited if the project is registered by CDM EB before 2005.

Toward the implementation of CDM

Following the Marrakech Accords in COP7, full-scale international negotiations have been ongoing toward the launch of CDM.

COP/MOP

Consult

CDM Executive Board (EB)

Consult

Small-scale CDM Panel *(SSC)*

- ◆ Recommends simplified modalities and procedures of SSC to EB
  - ☞Range of Project to apply simplified modalities
  - ☞Possibility of debundling several SSC projects
  - ☞Methodologies for Baseline and Monitoring
  - ☞Simplified procedures for CDM projects

CDM Accreditation Panel *(CDM-AP)*

- ◆ Recommends Accreditation of Operational Entity (OE), Temporary stoppage of accreditation, Re-accreditation to
- ◆ CDM Accreditation Assessment Team *(CDM-AT)* is established to investigate OE, and results are reported to EB as necessary
  - ☞CDM-AT will report to CDM-AP the results of OE evaluation

Methodology Panel *(Meth Panel)*

- ◆ Recommends rules of CDM, especially that of Baseline and Monitoring to EB
  - ☞PDD, especially Baseline and Monitoring
  - ☞Decision making tree for selecting best method
  - ☞Determination of Methodology for the existing project

To be a host country of a CDM project activity

- Ratify the Kyoto Protocol
- Assess a project proposal from the SD priority, provide a letter of approval
- Develop procedures for public participation and environmental impact assessment
- Capacity building needs

  :Institutional, legal capacity

  :Development of project portfolios

  :OEs familiar with the host country's circumstances

Current situation

- Dynamic Political Situation
- Development of regimes and markets related Kyoto ratification
- Development of non Kyoto related regimes & markets

CDM GETS STARTED

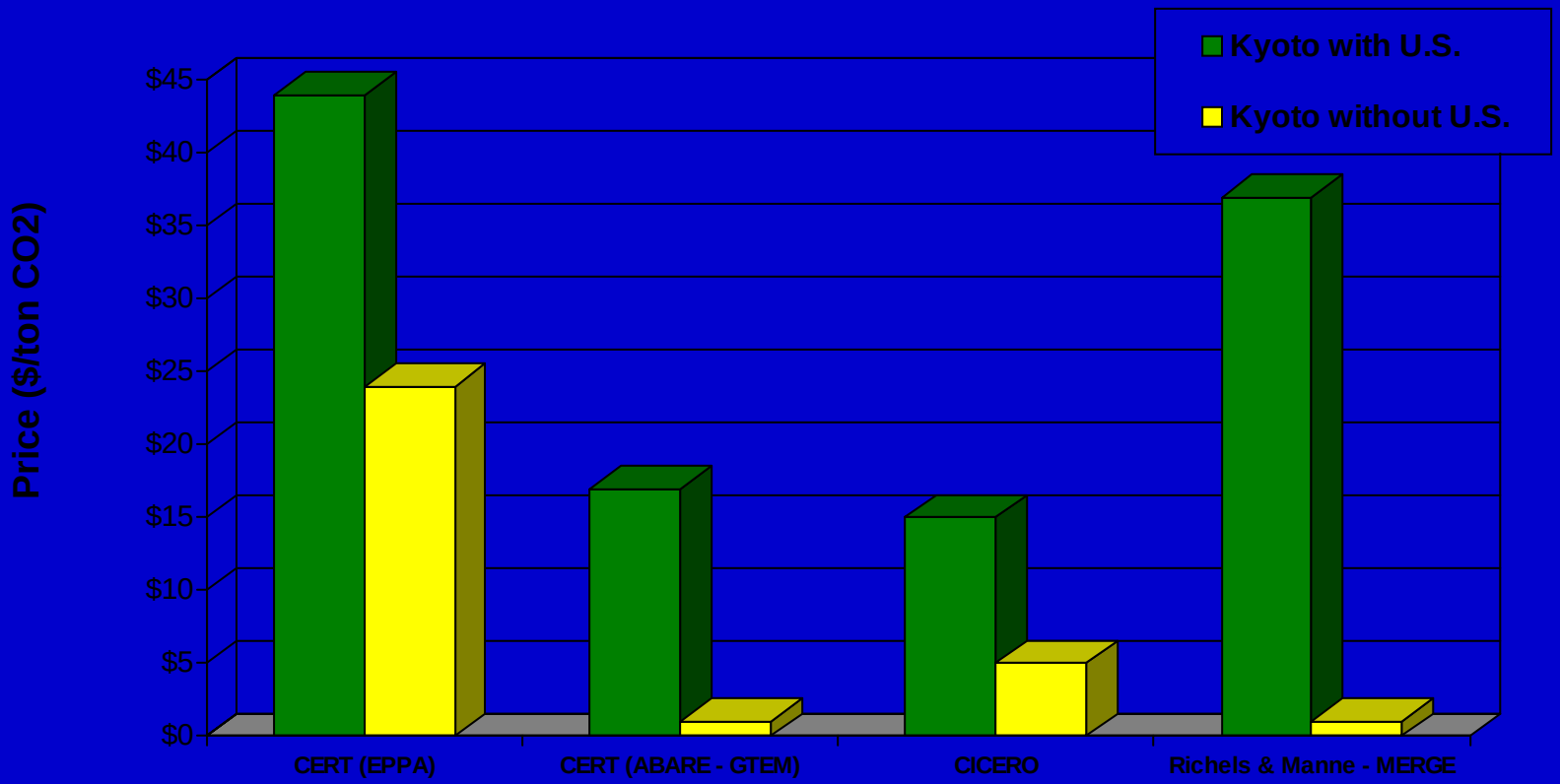
Projects Will Be Slow in Coming

- CDM finally becomes operational
- Rules & procedures too detailed (baselines, certification, "fast-track")
- Projects starting but many are government funded or sponsored
- Industry investors not happy with delays & lack of incentives

Ratification of KP

- USA withdraw
- EU ratified
- Japan ratified
- Russia maybe ratify
- Canada ratified
- Australia out

Economics of Kyoto:
Cost Projections with & without the U.S.



Source Natsource

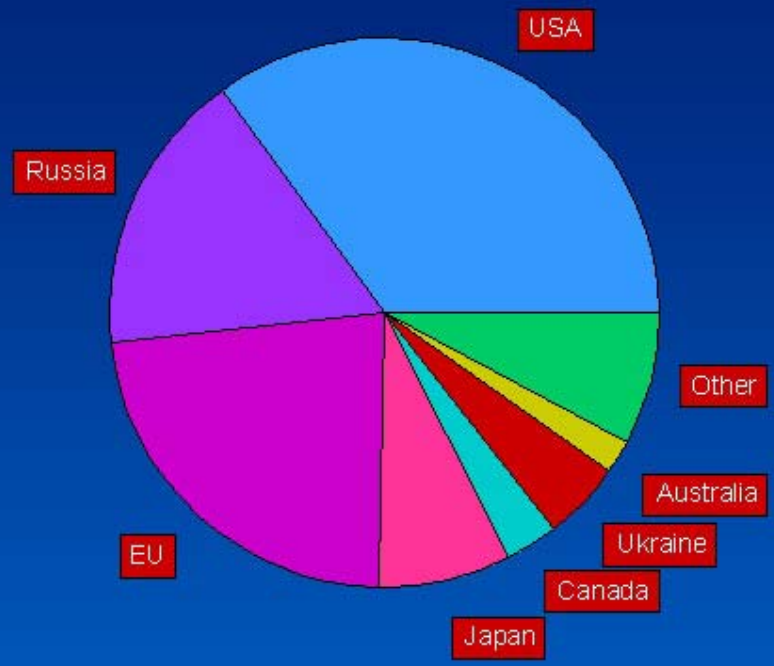
PROTOCOL STATUS

Likelihood of Protocol Entry Into Force

- Kyoto Protocol enters into force 90 days after at least 55 countries ratify accounting for at least 55% of 1990 Annex I CO_2 emissions
- Because US (36%) will not ratify, everything depends on Russian ratification
- Protocol will probably enter into force by the end of 2003 (but not necessarily in time for COP-9 to be COP/MOP-1)

1990 ANNEX B CO2

55% Needed for Protocol Entry Into Force



STATE OF PLAY

Initial Phase of KP Nearing Completion

- Russia analyzes economic implications
- Japan, Canada, other Umbrella Group countries ratify in spite of difficulties
- US is going own way with long-term focus
- War in Iraq greatly complicates process & outlook

PROTOCOL STATUS

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RATIFICATION

Numbers Grow But CO_2 Requirement Not Met Yet

- As of 20 March, 106 countries had ratified, but only 43.9% of 1990 CO_2 emissions covered
- EU and Japan ratified prior to Rio+10 and others followed in the fall
- Canada ratified in December in spite of lack of Provincial agreement
- US & Australia remain outside

FEASIBILITY OF TARGETS

Can Countries Meet Targets Using Flexibility?

- Most Annex B countries can not reach targets by domestic measures alone
- CDM can deliver only 200-300 MT of credits by 2010
- Flexibility within Annex B theoretically adequate to cover deficits, but depends on Russia

WHY EMISSIONS INCREASE

Several Factors Tend to Cause Emissions to Rise

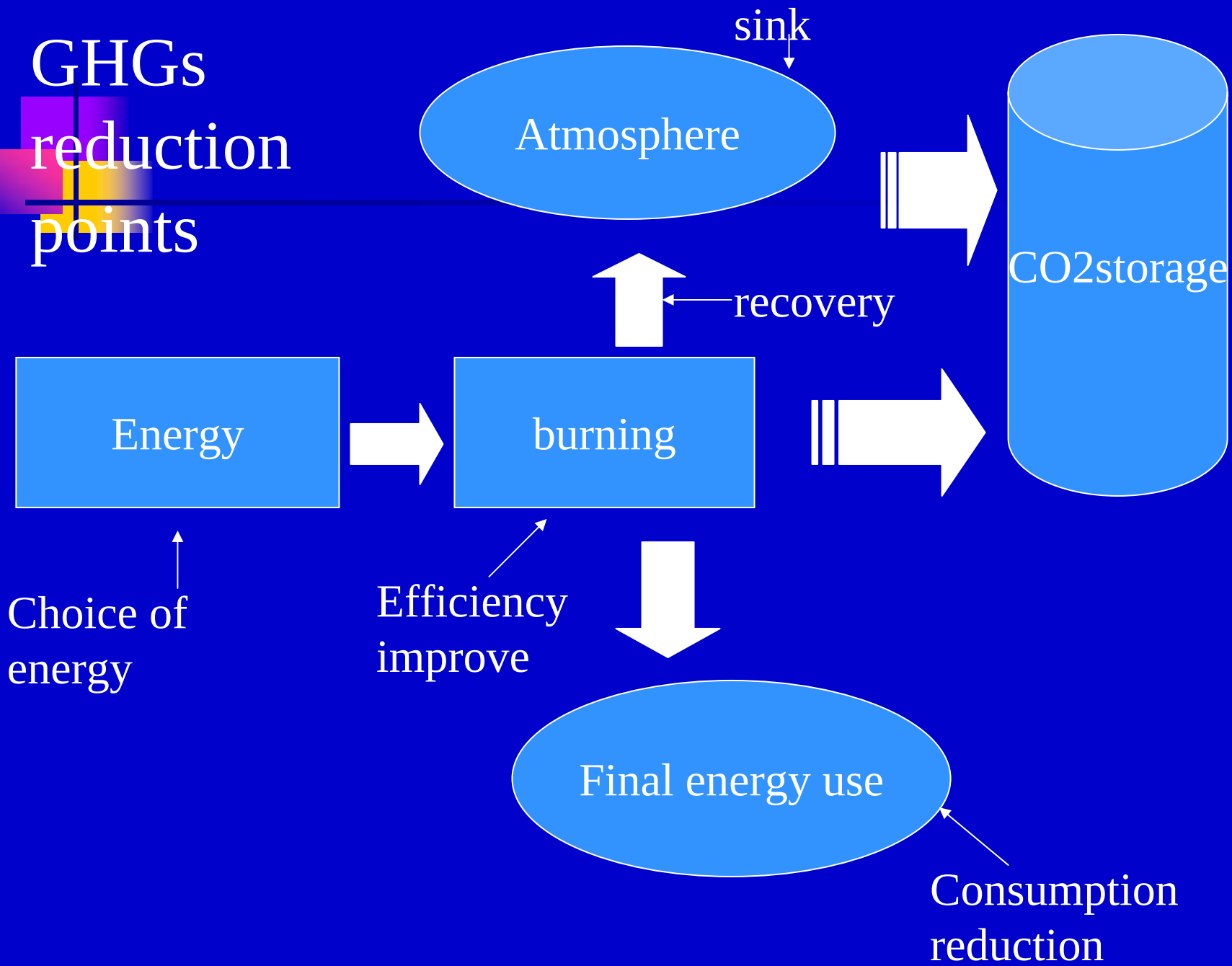
- **Economic growth**: Energy is still needed, especially if manufacturing sector is important
- **Population growth**: More people mean more cars, more houses, more electricity use, etc.
- **Rising lifestyle expectations**: Increases in disposable income often mean larger cars, larger houses, more electrical appliances, etc.

RUSSIAN RATIFICATION

Biggest Country in World Holds Most of Cards

- Ratification is essential for KP entry into force
- "Hot air" is essential for many OECD countries to meet targets
- Probably will ratify, but not quickly
- Probably will sell some hot air, but not all
- Resulting price in credits market will be high

GHGs reduction points



GHGs reduction points

- Choose low emission fuel
- Increase energy efficiency at energy conversion
- Recover from flue gas
- Recover from atmosphere(sink)
- Increase energy efficiency at final use
- Methane use

Low emission energy source

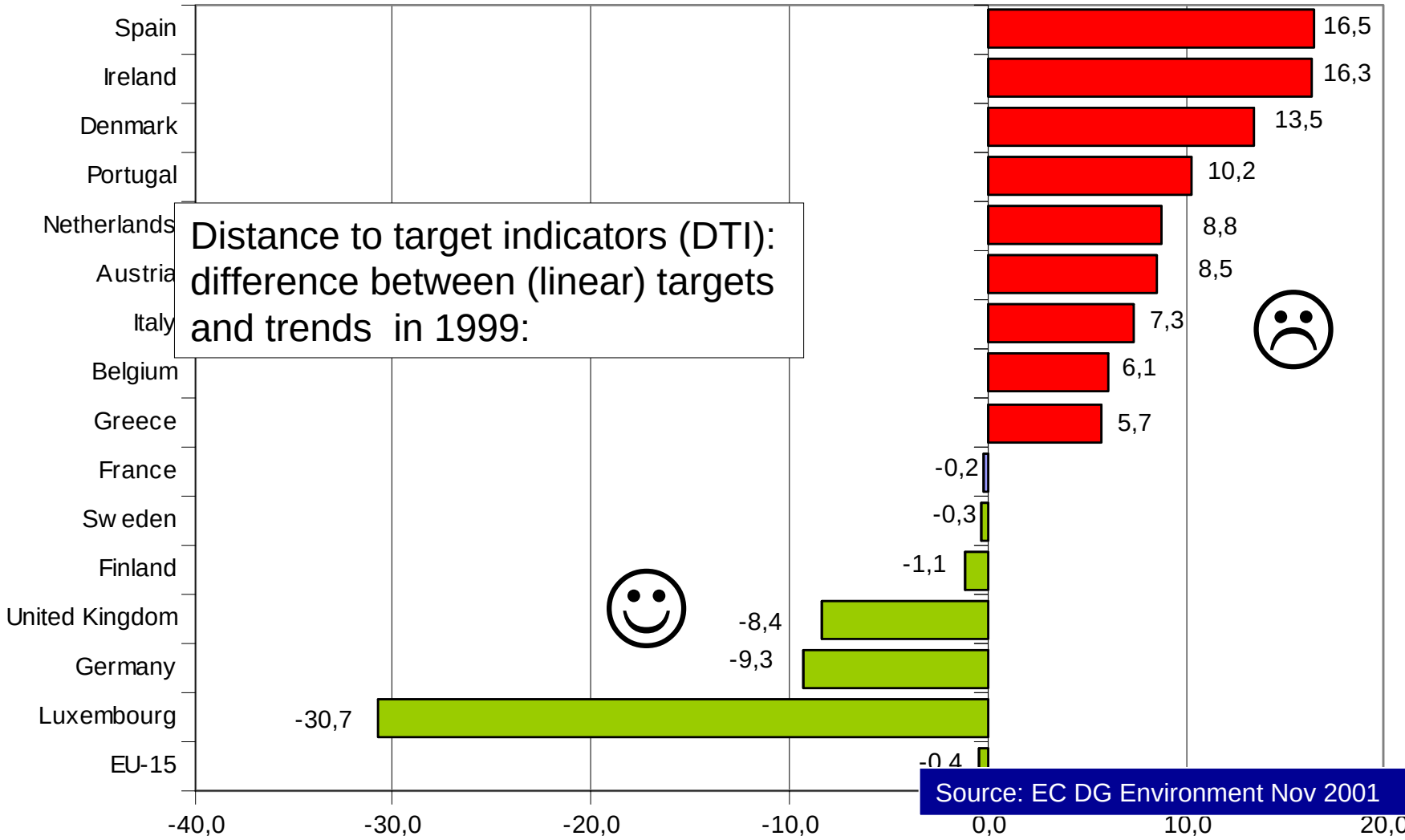
- nuclear
- Hydrogen in future
- Natural gas(methane)
- Renewable energy(wind,solar,biomass)

High efficiency energy conversion

- cogeneration
- Fuel cell
- Micro gas turbine
- Gas turbine

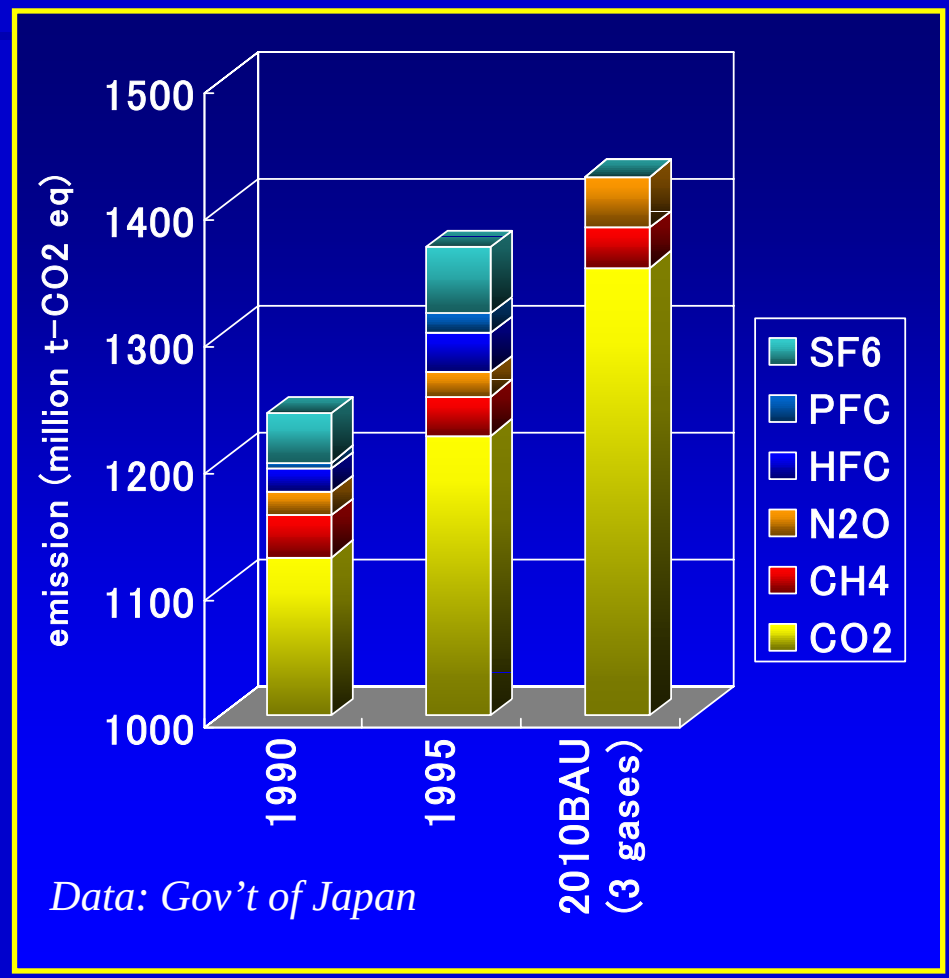
Main countries GHG emission situation

EU Progress of Individual Member States



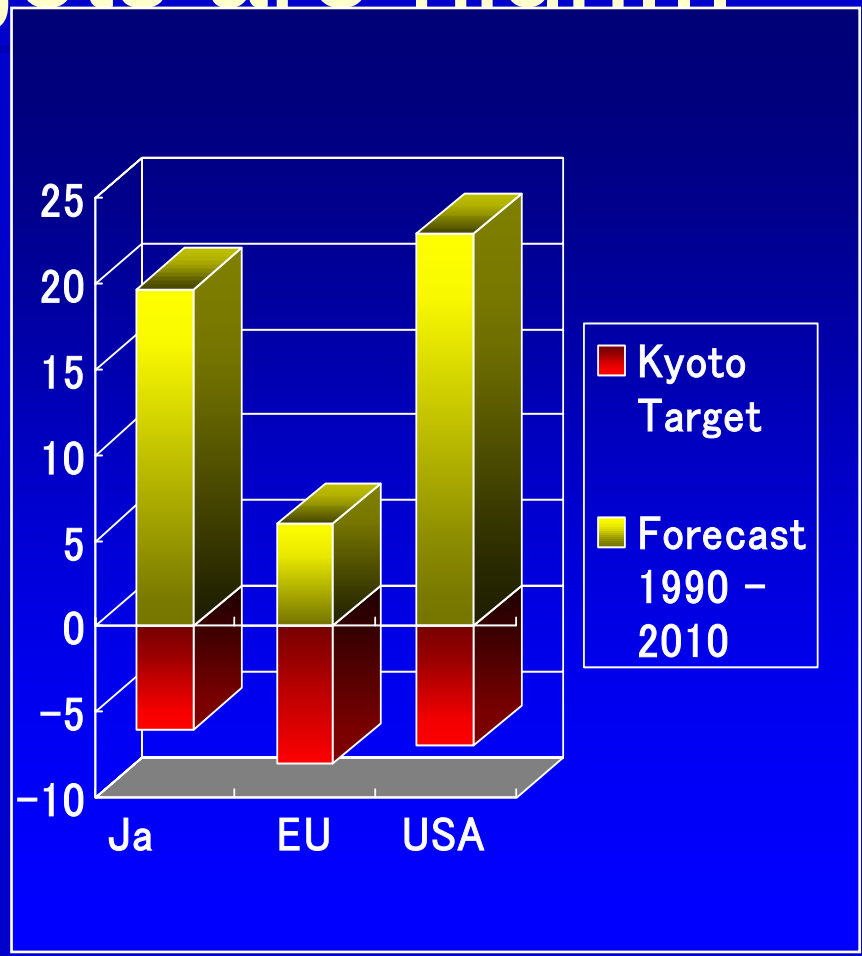
Japan: emissions are on the rise…

- Japan
  - Has to decrease emissions by 6%
  - So far it has increased by about 10%
  - Without measures, it will increase by another 10%
  - Decrease in 1997 and 1998 mainly due to recession



…but the targets are high…

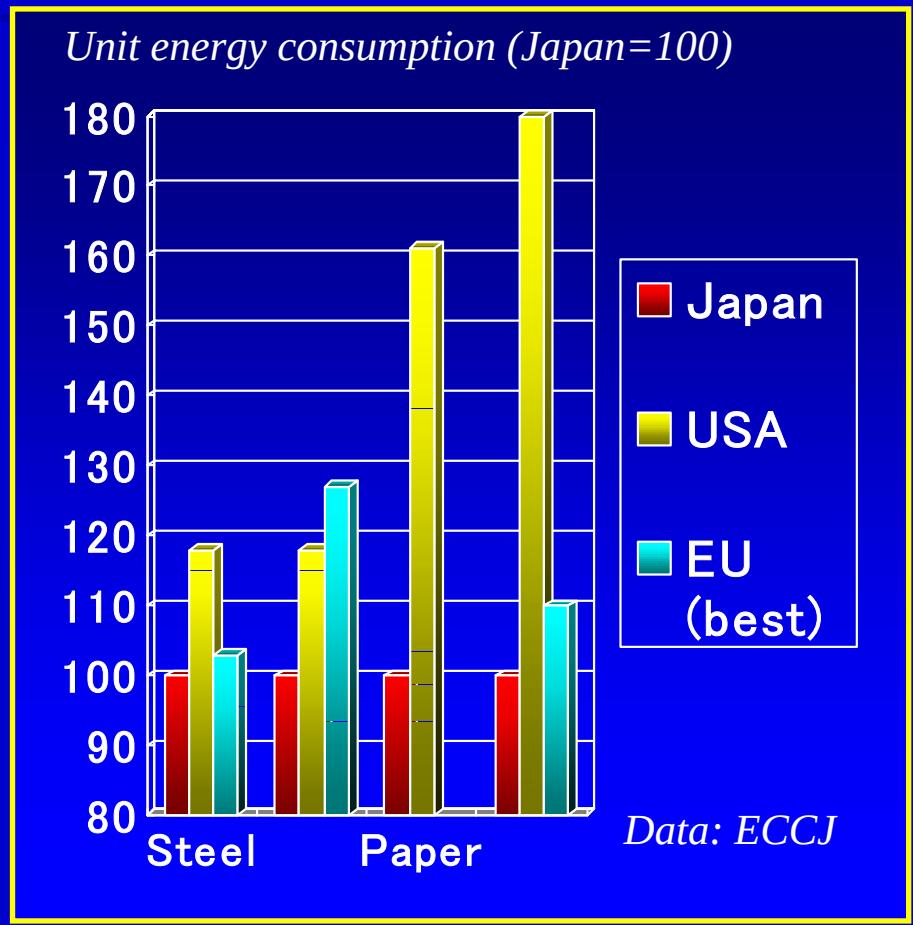
- The developed countries face tough emission targets under the Kyoto Protocol
- “Hot Air” trading mainly from Russia will not be enough to cover the deficit



…and options are limited…

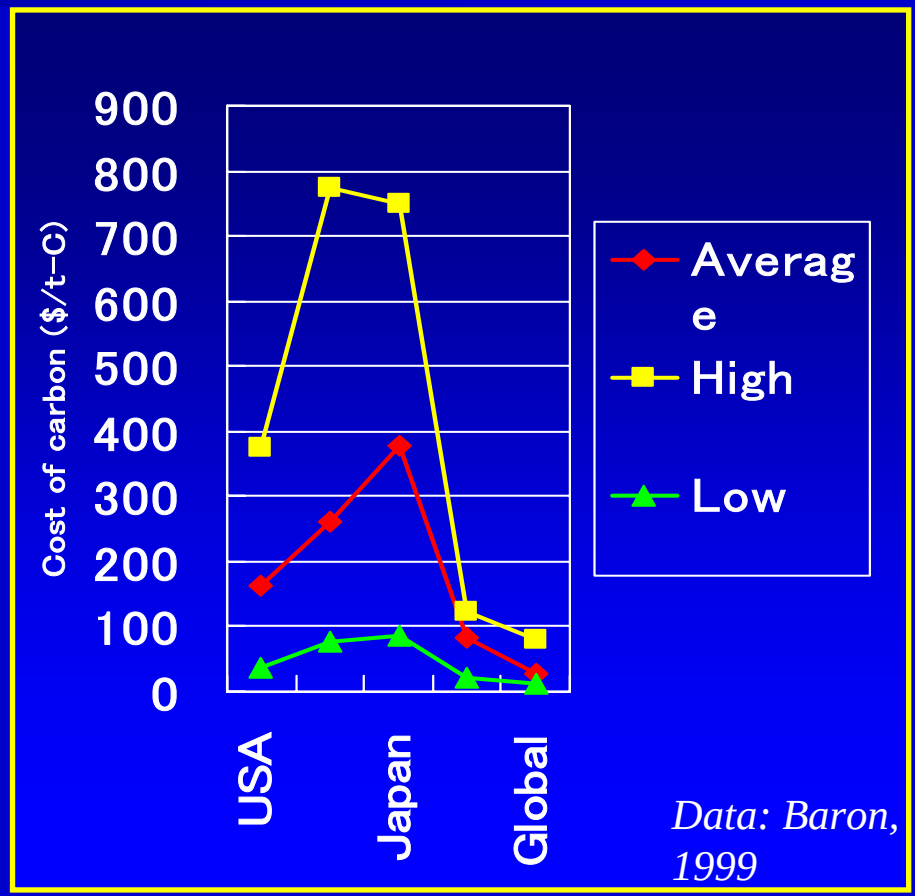
- The case of Japan
  - Energy efficiency already highest among OECD.
  - Mass transportation exists.
  - Little scope for additional reforestation.

→ Limits domestic options, but provides a source for technology transfer



…as well as costly

- Survey of models yield the following:
  - Japan is probably the costliest place
  - Trading (ET, JI, CDM) can contribute
- Need to consider necessity/possibility of trading
- Japan will be one of the biggest ‘buyer’ in trading



Japan's targets to achieve 6% reduction by Sectors

(Ratio from target year)

Sector	Target
① CO2 from energy sources	±0. 0%
② CO2, methane (CH4) and Dinitorogen Monoxide (N20) from non-energy sources	▲0. 5%
③Development of innovative technology and further extensive efforts by public	▲2. 0%
④ Three gases including alternatives of fluorocarbon, HFCs, PFCs, SF6	+2. 0%
⑤ Sinks by forest management	▲3. 9%
Total	▲6. 0%

1. **For the time being, we shall to reduce 6% with above mentioned targets (1 to 5). However, in case adequate progress is expected within the first commitment period, further emissions reduction shall be promoted.**

2. **On the other hand, taking account of Kyoto mechanism being supplementary to domestic measures, we shall seek for the utilization of the mechanism to achieve Kyoto Protocol in cost effective manner.**

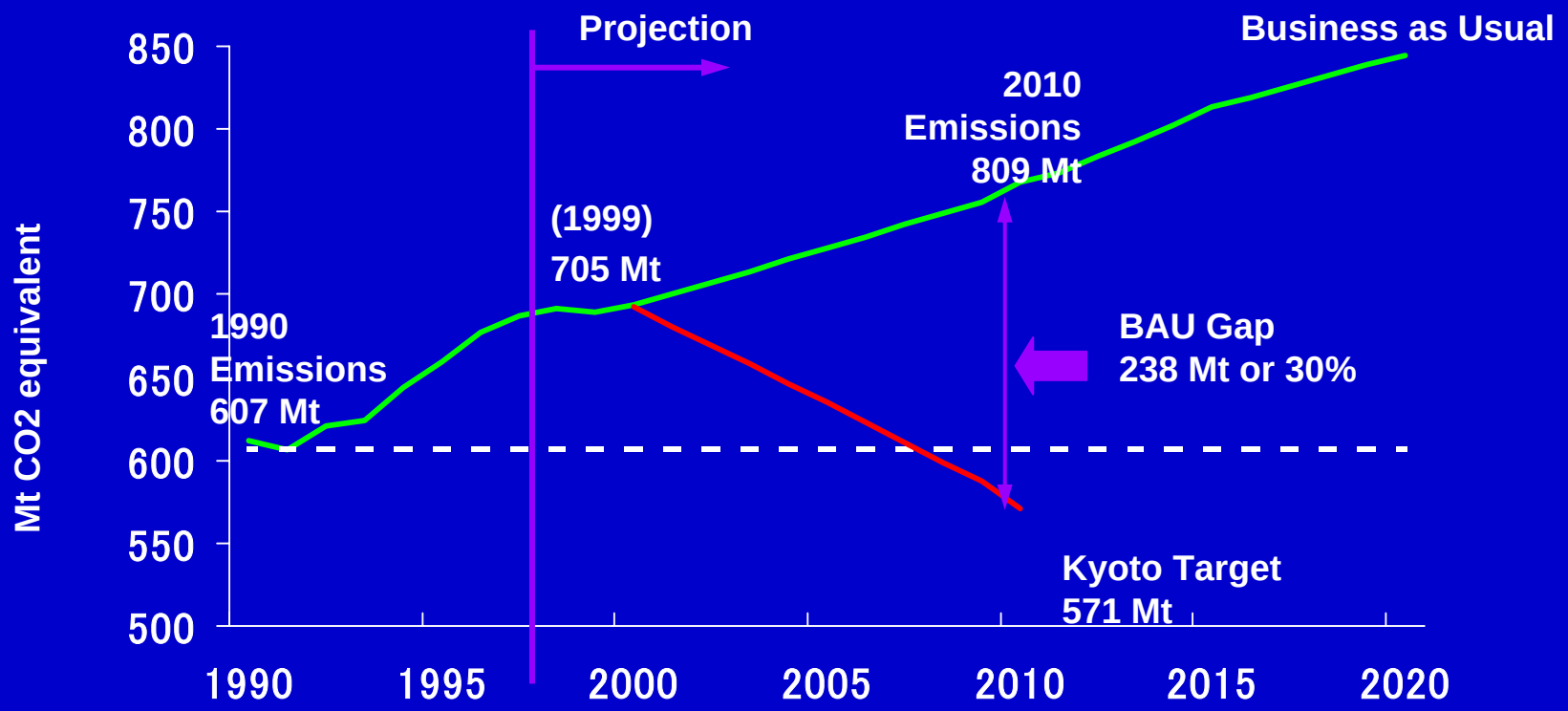
Use of Kyoto Mechanism

- Although we understand that Kyoto mechanism is supplementary to domestic measures, we shall seek for the utilization of the mechanism to achieve Kyoto Protocol in cost effective manner.
- CDM has great significance as international contribution as it will promote sustainable development in developing countries

→**Followings need to be established or promoted**

1. System to approve and support CDM/JI
2. National Registry to register credits
3. Supporting measures for private entities in CDM/JI
4. Building awareness and capacity of Host
5. Preparation for International Emissions Trading

Canada's Kyoto Challenge



Kyoto Ratification: Canada

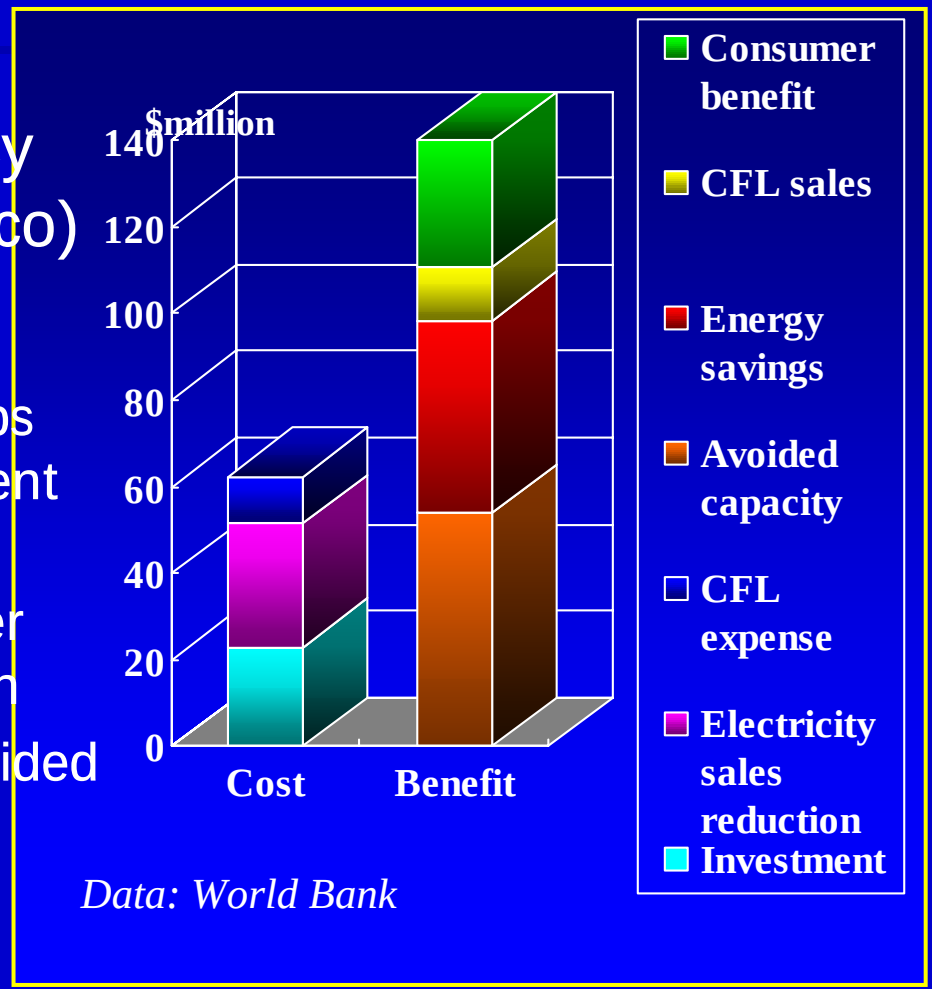
- Strong economic ties to the US (~90% of exports to US)
- Provincial opposition from Alberta
- Demand for Cleaner Energy Credits – 70 Mt /yr

CDM/JI project example(1) ...multiple benefits

- Efficiency increase of a gas-fired power plant (1,000MW) from 30% to 40%
  - Saves 44,000,000m3/yr of natural gas
  - Saves 1,000,000t-CO2/yr of carbon (which can be marketed: indicative price up to $10/t-CO2, thus 10 year reduction could finance about 10% of investment)
  - Reduces pollution through reduced energy consumption and additional environmental measures
  - Improved quality of electricity and/or heat

CDM/JI project example(2) … commercially viable projects

- ILUMEX High Efficiency Lighting Project (Mexico)
  - Replace 1.8 million incandescent light bulbs with compact fluorescent light bulbs (CFL)
  - Net producer/consumer benefits are $76 million
  - 940,000t: Lifetime avoided emission of CO_2



Designing CDM/JI projects from investor's view

Uncertainties

- *Additionality*
- *Baselines*
- *Supplementarity*
- *Credit sharing*

Project design principles

Risk reduction

- *Diversity of projects*

Regret reduction

- *Consistency with investor strategy*

Host-country needs

- *Needs extensive consultation*

Private sector initiatives

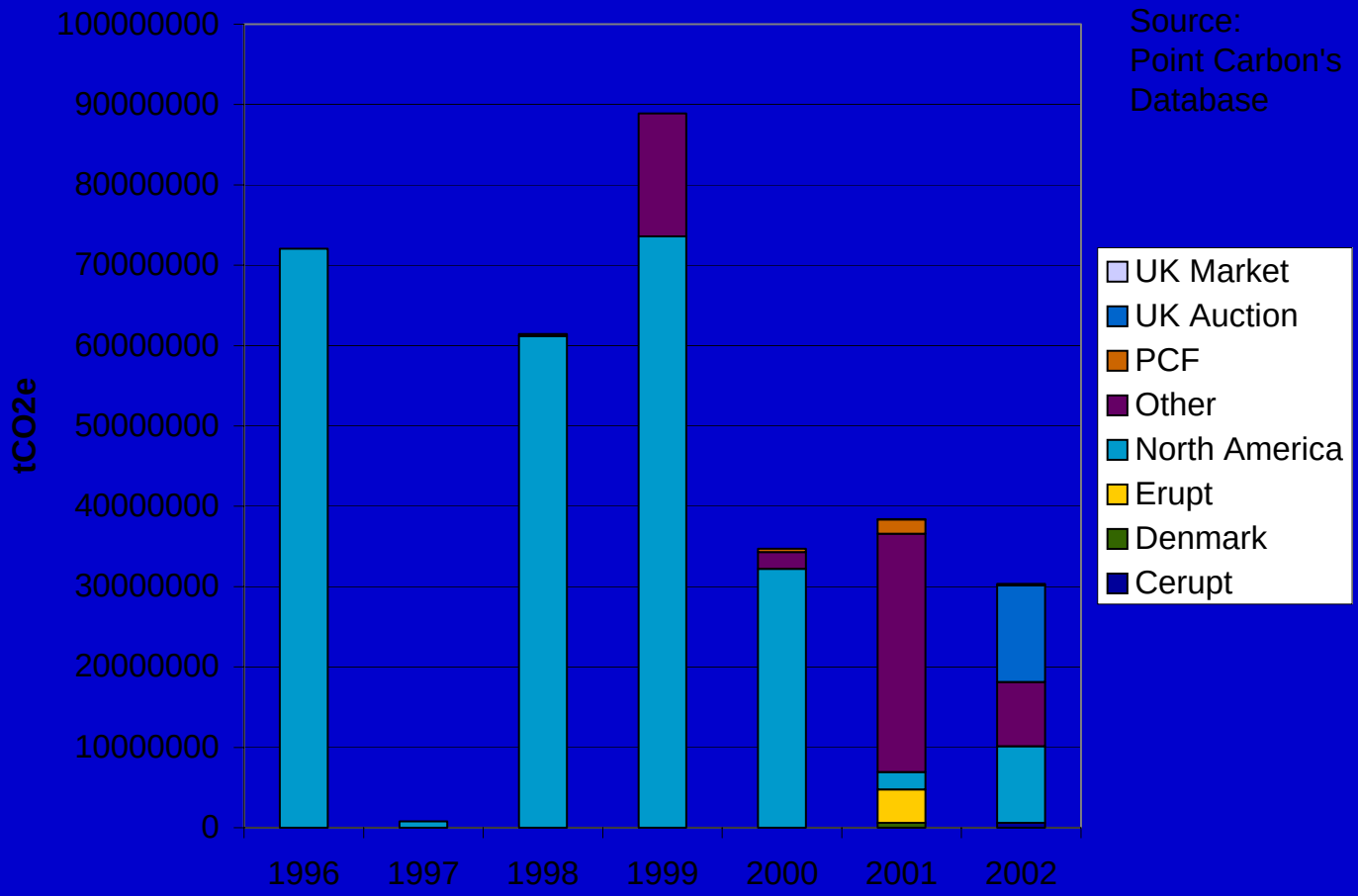
Carbon Trading

- Trading by private rule
- Trading by official rule
  - Denmark green electricity trading
  - UK GHG trading market
- EU wide trading will start from 2005
- Japan starts to design of GHG trading rule

Current Market Activity

- Last 12 months most active in GHG market (compliance tools, VERS); 30 to 50 mmt CO_2e traded in last year
- UK GHG trading program
  - DuPont - Mieco executed first GHG transaction of government-sanctioned instrument
  - Auction held to provide companies with funds to reduce emissions below a baseline; $305 million allocated, 4 mmt of reductions committed
  - Approximately 20 trades have occurred and 100,000 to 200,000 allowances traded
- Danish power sector cap & trade program
  - Initial cap on CO_2 of 23 million tons in 2000 is reduced 1 million tons per year through 2003
  - Approximately 10 trades have occurred and 300,000 to 500,000 allowances traded
- First swap of UK and Danish allowances brokered in 2002
- Swaps of Danish allowances for VERs have occurred

Transacted Volumes, July 2002



Source:
Point Carbon's
Database

Recent GHG Market Pricing

GHG Prices by Commodity and Vintage (U.S.$ per ton CO_2E)

Commodity Type	Vintage Year	Price per ton CO2E (US$)
Verified Emission Reductions ("VERs")		
Annex B VERs	1991-2007	$0.30-$2.00
Annex B VERs	2008-2012	$1.50-$3.00
CDM VERs	2000-2012	$3.00-$5.00
Dutch ERUs		$4.40-$7.99
Compliance Tools		
Danish allowances	2001-2002	$1.96-$3.07
Danish allowances - Bid/Offer	2002	$1.77-$2.03
UK allowances	2002	$6.81-$8.79
UK allowances - Bid/Offer	2002	$8.06-$8.50

Source: Natsource, June 2002

Forecasted Volumes 2002

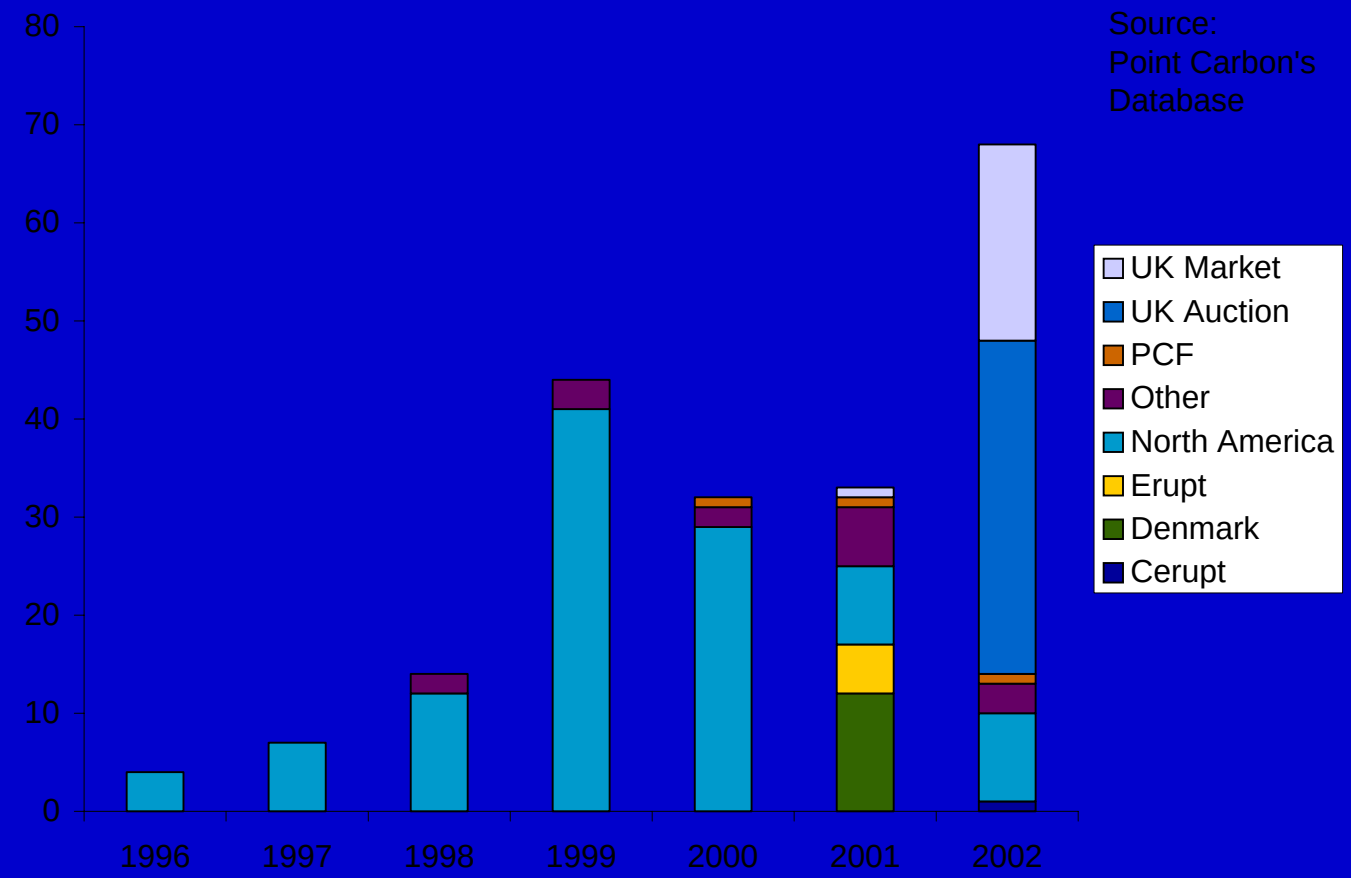
System	Reductions MtCO2e	Price USD/tCO2e	Million USD
UK Auction	9 – 39	6 – 23	215 -229
UK Market	2 – 5	4 – 12	7 – 60
Erupt and Cerupt	12 – 16	4.2 – 5	50 - 80
Prototype Carbon Fund	4.5 – 7.5	3 – 4	13 - 30
Denmark	0 - 0.8	2– 4	0 – 3.2
North America	16 – 70	1 – 2	16 – 140
Other	0.5 – 20	1 – 3	0.5 – 60
Sum	43-165		303 – 602
Mean value	104		453

Source: www.PointCarbon.com

The Carbon Market in 2002: Volumes and Prices

System	Million tCO2e	Price USD/tCO2e	CDM?
UK Auction	12	17	No
Erupt and Cerupt	12 – 16	4.2 – 5	Yes
Prototype Carbon Fund	4.5 – 7.5	3 – 4	Yes
UK Market	0.5-0.9	6.0 – 7.5	Probably
Denmark	0 - 0.8	4 – 4.6	Not yet
North America	10 – 30	1 – 3	Yes
Other	10 – 20	1 – 3	Yes

No. of transactions, July 2002



Source:
Point Carbon's
Database

Main Points

- Project-based credits could become a bridge between JI/CDM and market
- Need to create value in multiple jurisdictions
- Kyoto Unit will be hard currency
- Multinationals & speculators will provide demand for currency trading

Activities at Private level

Actions by Japanese company to tackle global warming

- No significant action compared to the US, Canadian, UK private sector, such as
  - Internal trading
  - Active participation in the international negotiation process
  - Private-sector based mutual trading for getting trading experience
- Some companies join international industry NGO activities, such as
  - WBCSD, E7

Example of Action by the Japanese company

- Investing in the World Bank PCF
  - Anticipating return as GHG credits
    - Utility companies, trading companies
- Investing in the EBRD ESCO fund
  - Anticipating new business opportunities
    - utility company
- Afforestation activities using biotechnology
  - Anticipating potential carbon credit
    - Paper and pulp, automaker
- Forming an alliance with an US trader
  - Establishing future trading markets
    - Trading company

Action by Japanese company(continued)

- Technology research and development
  - CO2 recovery from flue gas
  - Byproduct HCFC recovery
  - Energy saving
    - Hybrid engine,efficient air conditioner etc
  - New technology
    - Fuel cell, micro gas turbine,carbon recovery from flu gas
- Opportunities for wind power are sought through introduction of ‘green certification’
- Technology is advanced, but cost reduction is needed to enhance market competitiveness

Latest situation of Japanese industry

- Uncertainty of Kyoto regime
  - Bush administration position for KP
  - Huge negotiation position gap between Annex I countries, developing countries
- Recession
  - Investment fund is unavailable for the projects with much uncertainties
- Recognize difficulty of GHG reduction
  - There are so many hurdles to overcome even if they decide to apply for KM
- Those factors bring more conservative attitude for companies

Reasons for Setting a Target (1/4)

- Environmental stewardship
  - Recognition of the validity of climate change science
  - Corporate responsibilty
- Translate philosophical commitments
  - Managers and employees work by numbers
  - Numerical target triggers immediate focus on addressing the problem
  - Reaching a target = demonstration of commitment + tangible result

Reasons for Setting a Target (2/4)

- Competitiveness considerations
  - Reduce costs by using resources efficiently
  - Increase market share by helping customers reduce emissions and energy consumption
  - Affect share price by showing corporate social and environmental responsibility
- Forward-looking investment strategies
  - Especially industries with long investment lives
  - Realize cheap emission reductions today

Reasons for Setting a Target (3/4)

- Changes in regulatory environment
  - Air quality regulation (taxes vs. Market mechs).
  - Energy market reforms
    - Energy supply decisions to demonstrate environmental stewardship
    - Technological advances turned power consumers into suppliers
    - Markets for direct sales of “green” energy
- Stay ahead of the regulatory curve

  Instead of following regulations and avoiding fines

Reasons for Setting a Target (4/4)

- Managing regulatory risk
  - Important for long term investments – invest today, realize profits in the future
  - “Learning by doing” to prepare for future regulation
- Guiding policy development

  Set voluntary targets to demonstrate effectiveness of flexible approaches

MRI's Activities

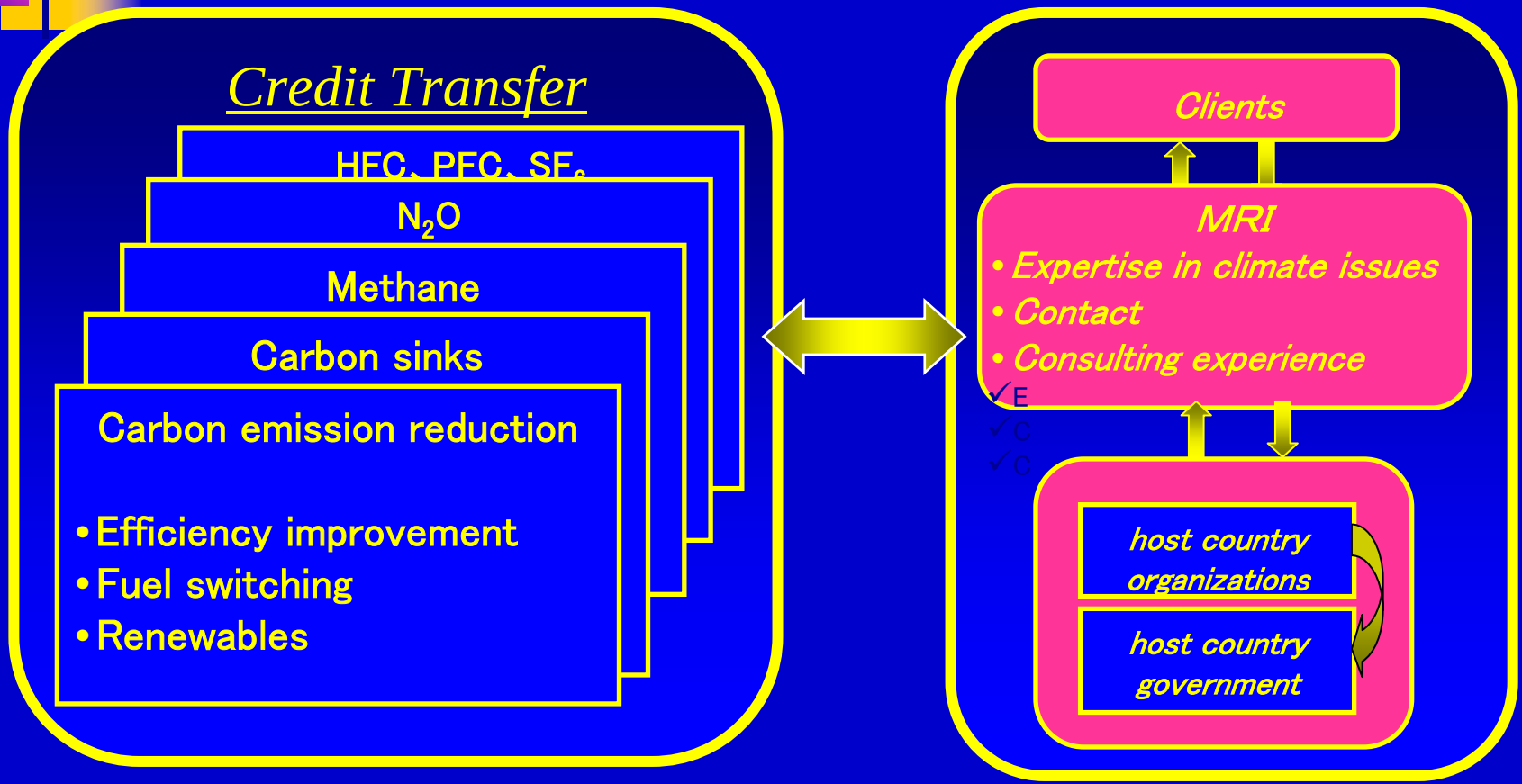
- MRI is a Japanese private think tank established in 1970, it has wide variety activity area such as macro economy, social development, information technology
- MRI has 14 years' experience on research related to climate issues, since 1988 Toronto conference
- MRI has the largest research staff among the Japanese think tanks
- MRI has worked closely with both the Japanese government and industry on this issue
- MRI is involved in the internal discussions within Keidanren
- Since MRI has wide network in Japanese business, we can introduce proper contact points to foreign

MRI Carbon Offset Initiative

- ***Objectives***
  - Find and evaluate commercially viable projects that result in emission reduction.
  - Explore opportunities to expand businesses related to credit trading.
  - Eventually set up a pilot system to assess, trade and verify credits from such projects through “learning-by-doing”process.

Outline of COI

Project Identification:scheme



Project identification: status

Selection criteria

- Host countries:
  - Political stability
  - Reduction potential
  - Understanding towards Kyoto Mechanisms
  - Development of cooperating organizations
- Area of investigation
  - Host country needs
  - Investor needs
  - GHG reduction potential

- Countries
  - Brazil
  - Hungary
  - Thailand
  - Malaysia
  - Other Asean
- Sectors
  - energy/power
  - cement
  - air-conditioning
  - waste

Pushing the initiative forward

- Cooperation with the governments, which paves way for CDM/JI-specific projects
- Cooperation with private and public funding institutions
- Establishing a contract-based network in the host-countries

Host country viewpoints

- Greenhouse gas reduction is not the only priority for host country parties; overall objective is sustainable development
- CDM projects are different from conventional direct investment projects.
  - Respect of host country needs (technology, employment..)
  - Contribution to the host country economy
  - Local community support
  - Contribution to local environmental issues

COI takes the necessary steps

1. Establishment of dialogue
   - With host country government, host and investor companies, locally active NGOs
2. Identification of opportunities
   - Selection of projects that meet the requirements of each stakeholders.
3. In-depth feasibility studies
   - To ensure commercial / environmental success, and to meet host country needs
4. Implementation