Background paper for session 2

Purpose of Session:

- *To build on previous workshops and move forward practical proposals for integration of sectoral approaches in the future framework*
- *To advance the understanding on the roles of SA in the future framework including the implementation methodology of SA through discussions on the practices in the major sectors.*

1. Introduction

(1) What is sectoral approach?

- Sectoral approach is a tool to promote improvement of efficiency through public-private cooperation with a view to achieving economic development and reduction of GHG gases at the same time.
- In order to pursue this approach, it is important to facilitate concrete ambitious actions by countries ensuring feasibility based on available technologies and commercially viable investments in global markets. .

(2) Role of sectoral approach

Sectoral approach can promote actions compatible with economic growth through (1) setting ambitious and feasible commitments/actions and (2) steadily implementing them.

(1) Role for defining commitments/actions

By focusing on efficiency, sectoral approach can

- evaluate current status of efforts of each country
- show achievable path based on technologies and viable business activities

(2) Role for implementation of commitments/actions

By focusing on efficiency, sectoral approach can

- promote technology transfer and financial support through identifying technologies and calculating cost effective reduction potentials
- facilitate measurement, report and verification with clear milestones
- encourage private sector to improve their efforts and gain opportunities

2. Progress of efforts in each sector (Detail of each sector is attached)

(1) Sectors exposed to international competition (Iron and Steel, Cement, Aluminium)

In sectors such as iron and steel, cement and aluminium where difference of cost for reduction of GHG can lead to distortion of market and induce carbon leakage, total global reduction of GHG emissions can be achieved only through the improvement of efficiency at sites around the world without limitation of production volume. Because production process and technologies are relatively homogeneous in these sectors, it is ultimately possible to realize similar level of efficiency in every country, with the existing suite of technologies.

Voluntary efforts by industries are currently progressing in these sectors, such as agreement on methodologies to measure emissions or indicators to evaluate efficiency. However, ways of cooperation differs among sectors and it is necessary to look at features of each sector in considering how to incorporate them into the future framework.

<Common situation>

- Agree on methodologies to measure emissions
- Agree on indicators to evaluate efficiency
- Promote technology cooperation and transfer of know-how, through identifying effective technologies for emission reductions
- Calculate mitigation potentials

< Concrete efforts for improvement of efficiency>

Aluminium: Set quantitative objectives for improvement of efficiency

Iron and Steel: Consider methodologies for equitable effort sharing among developed and developing countries

Cement: Consider desirable form of global commitments which minimize the impacts on international competitions. Also consider possible methodologies for improvement of CDM mechanism.

Discussion points

- What are advantages and limitations of industry-driven activities? What kind of role can they play to complement commitments and actions by governments?
- What can be agreed voluntarily by international industries by 2009? What is the goal of their activities?
- How to deal with the principle of common but differentiated responsibilities and respective capabilities in the context of daily commercial trading?
- What are the purpose and incentives for private sectors to promote sector-based actions? What are expected to be incorporated into the future framework?

(2) Other major sectors

[Power generation sectors]

Improvement of efficiency in power generation sector is important because of its impacts on global GHG emissions. Although there is not much international competition in power generation sector in itself, it has much indirect impacts on other industrial sectors such as iron and steel, cement etc. Especially in coal-fired power plants where technological homogeneity exists, international unification of methodology for measurement, transfer of technologies, and analysis of mitigation potential is likely to be developed.

At the same time, public-private cooperation is indispensable. Because of the factors which are

closely related to availability of and accessibility to the resources and characteristics of sector structure and national energy security policies, (e.g. introduction rate of non-fossil fuels), it is important to realize the practical and comparable efforts with measures best suit to its particular circumstances in each country.

Discussion points

- What are advantages and limitations of industry-driven activities? What kind of role can they play to complement commitments and actions by governments?
- What sort of policies and measures are expected to be introduced by governments in order to promote actions in such sectors?
- What are the purpose and incentives for private sectors to promote sector-based actions? What are expected to be incorporated into the future framework?

[Road transport]

Improvement of efficiency in road transport sector is also important because of its impact and effectiveness. Integrated approach ((i) improvement in fuel efficiency, (ii) diversification of automotive fuels, (iii) improvement in traffic flow, (iv) effective utilization of motor vehicles) is effective to improve efficiency in road transport sector, as a whole, in a measureable, reportable and verifiable manner. Emission reduction in this sector can be maximized in a reasonable and sustainable way through piling up nationally appropriate measures by sharing know-how among countries under public-private partnership. However, because of the factors closely related to the policies of each country, for example, model mix in each market (Diesel/Gasoline, AT/MT, market share of SUVs or two/three wheelers etc.), infrastructure for public transportation or traffic management, it is quite difficult to realize equal level of efficiency in every country. Therefore, it is necessary to identify what can be improved through technology development and what policies should be implemented by each country.

Discussion points

- What is the basic nature of road transport sector? What should be taken into consideration to address emissions from this sector?
- What are the obstacles in mitigation actions? What sort of policies and measures could promote actions in this sector?
- What are expected to be incorporated into the future framework?

3. Sectoral approach in the future framework

(1) Role for defining commitments/actions

From a long-term perspective, sectoral efforts are expected to converge globally although in the short term the level and form of efforts vary among the countries, according to their capabilities

and responsibilities. Sharing the direction of convergence among public and private sectors can be helpful for effective global efforts.

[Iron and Steel, Cement and Aluminium sector]

Analysis of sectoral efficiency and mitigation potential in each sector can be utilized to evaluate adequacy of efforts for the sector as a part of QERLOs for developed countries and also sectoral actions for developing countries.

[Power generation sector]

Analysis of sectoral efficiency and mitigation potential in the power sector includes improvement of efficiency of existing coal fired power plants by minimizing of deviation from designed efficiency, applying BAT for incoming power plants, and raising proportion of non-fossil fuel generation to the level appropriate to the country's own circumstances at the period in question.

On the other hand, appropriate consideration should be paid to specificities of the power generation sector, national energy policy, wide spectrum of technologies, and heavy dependence of local sources of primary energy

[Road Transport sector]

Improvement of efficiency in the road transport sector can be achieved through integrated approach. It is quite difficult to simply compare these factors because each factor is strongly influenced by unique conditions of each country, including geographical situation or size of countries. Therefore, appropriate objective for each factor should be identified through sharing effective policies and measures.

Discussion points

- For sectors which have risk of carbon leakage, how can governments utilize sector-based activities by industries? In this regards, is there any measure to coordinate polices internationally?
- What can be the relationship between economy-wide absolute reduction target for developed countries and efforts in each sector?
- What will be the challenges in utilizing sectoral approaches for defining commitments/actions or introduction of policies and measures?

(2) Role for support of implementation

Effective technology cooperation and financial support can be realized through identifying technologies and policies, based on inputs from private sectors that play an important role in technology transfer and investment. Followings are examples of concrete mechanisms.

[Possible efforts in each sector]

- Sharing of technology roadmap for RD&D in cooperation through sectoral discussion and with input from technological expert organization (e.g. IEA)
- Setting efficiency standard for investment which could underpin conditionality of loans
- Setting sectoral benchmark as a baseline for additionality for crediting mechanisms
- Promote financial mechanisms which provide incentives for developing countries by identifying prioritized policies and measures in each sector

[Cross-sectoral measures]

- Developing and promoting the cooperative schemes to help developing countries (e.g.. advisory group for sectoral technology cooperation) to
  + share information on, identification of BAT, prioritized areas, and effective policies and measures to enhance technology deployment
  + promote cooperation among public and private experts of each sector in developed and developing countries for development and deployment of new technologies, including R&D and necessary policy measures, taking into consideration internationally shared technology roadmap
  + advise effective usage of financial resources

Discussion points

- What are necessary elements to provide incentives to private sectors for investment and technology cooperation (including capacity building)? What kinds of mechanisms are desirable in order to prevent distortion of international market?
- How can we enhance measurability, reportability and verifiability of supported actions? What should be done to accelerate data collection?
- What kinds of roles should governments (both developed and developing) play? What should be agreed under the UNFCCC?
- Will appropriate measures differ according to sector? For example, some sectors are suitable for setting certain benchmarks for energy efficiency standard or crediting baseline, while others are not. How should we think about the relationship with the carbon market?

4. Discussion under the UNFCCC

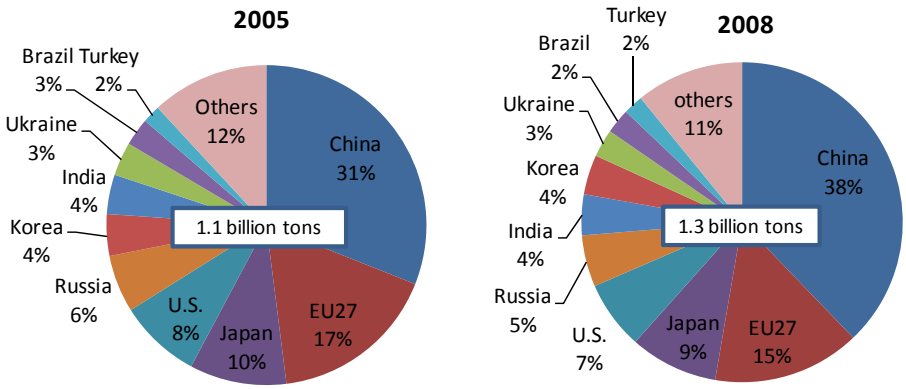
Discussion points

- What elements of sectoral approach should be agreed by COP15 as basic concepts of the future framework? What can be agreed after COP15?
- If some elements should be incorporated into a part of the international agreement, how can they be stipulated?
- How should we put forward the discussion about sectoral approach under the UNFCCC?

Iron and Steel

Current Status

- **Share in Global Emission of energy-related CO2**: 6% (2005)
- **Global share of Iron and Steel Production** :



(Source: worldsteel)

- **Medium term forecast of real steel demand**

  Trend 2010 – 2015 (%/year):

  India (7.7%), China (6.2%), CIS (4.0%), South America (3.7%), NAFTA (2.4%), EU25 (1.7%), South Korea and Taiwan, China (1.9%), Japan (-0.1%)

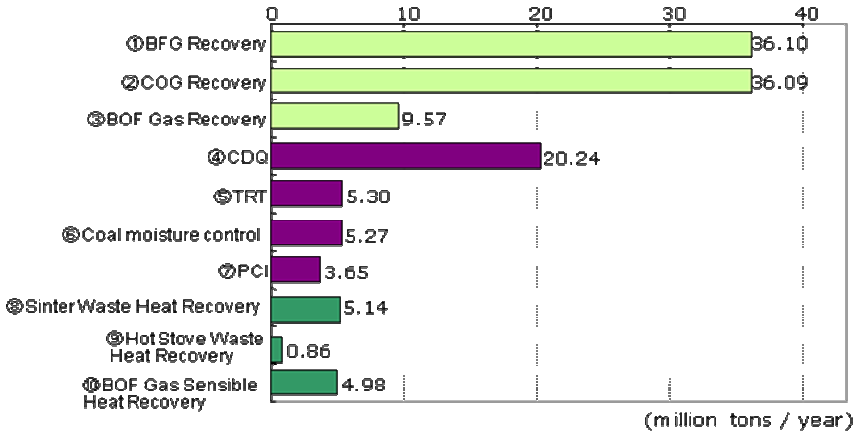
  (Source: worldsteel)

- **Organizations for implementing sectoral cooperation:**
  - APP: Participated by 7 countries which cover more than half of the global emission from iron and steel.
  - worldsteel: Participated by 180 steel producers which cover 85% of world steel production and have the participation of major steel-producing countries.
- **Methodologies for measurement:** Agreed at common calculation methodologies (including boundaries and indicators) under APP and worldsteel
- **Identification of BAT, best practices**: Shared a booklet for 64 environment and energy saving technologies under APP.
- **Status of technology transfer:** Experts have been dispatched to steel plants in APP partner countries to make performance assessments and recommendations for improvement (India: 3 steel plants, China: 3 steel plants).
- **Indicators:** CO2 intensity(kg-CO2/t-crude steel) or energy efficiency (PJ/t-crude steel)
- **Data Collection:**
  - APP: Using data hub (DH) and expert group (EG), APP partners are decided to establish comprehensive database of steel mill. (Data Collection rules and formula are decided and the data collection has started.)
  - worldsteel: Organizing an experts group from member companies upon completion of data collection in major steel producing countries in order to check data credibility and definition

of applicable energy saving technologies and operating practices.

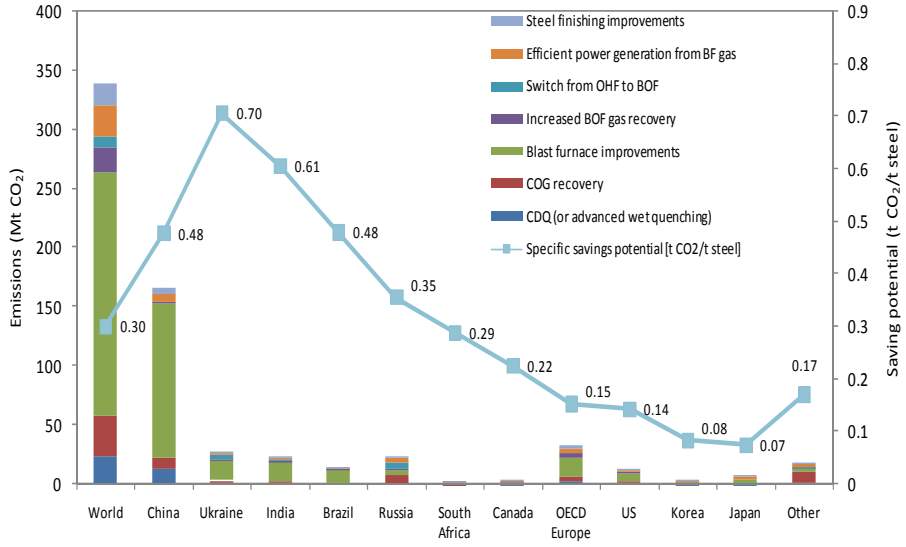
■ **Reduction Potentials:**

- APP: Technical potentials by 10 energy saving technologies were estimated to be 127 million CO2 ton per year.



(Source: APP)

- IEA: Reduction potentials with existing effective energy saving technologies were estimated to be 340 million CO2 ton per year.



(Source: IEA)

■ **Technology Development:** Introducing development technology program in countries and regions and exchanging views under "CO2 breakthrough program" of worldsteel .

How to incorporate current efforts into the post-2012 framework

■ **Methodologies to evaluate levels of efforts**: Major economies are expected to set goals for each iron and steel plant (which covers over 1% share each country's production or over 200,000 tons of production) in line with the following methodologies;

- Indicate the level of objectives (energy efficiency or carbon intensity) according to the different

production process (BOF, EAF, DRI, etc.)

- Share the long-term goal in 2050, which is the theoretical value induced from technologies
- Set the mid-term objective in 2020 or 2030 which can be plotted on the way to the long-term goal, taking into account the expected production levels and technological, geographical and economical barriers.
- Add up the mitigation potentials according to the above methodologies, considering current efficiencies and intensities calculated based on the measurement methodologies below.

■ Methodologies to disseminate technologies and practices:

- Promotion of proper methodologies for measurement: Methodologies for measurement which do not include indirect emissions (expressed as efficiency of electricity consumption) can hide actual emissions and hamper introduction of certain energy saving and environment technologies.
- Enabling environment: Proper legal systems toward promotion of energy conservation are necessary, including the introduction of "energy saving law". Common factors and unique factors should be induced from the analysis.
- Strengthen incentives for international investment: Appropriate financial scheme which includes prioritized taxes, exemption of import tariffs etc.
- Share of information: Enhancement of knowledge through sharing the list of environment and energy saving facilities. Especially, certain energy saving technologies bring adequate cost reduction to the plants, and nations that introduce such technologies do gain the profits in saving resources and attain effective reduction of CO2 emissions. Therefore, domestic policies are also important to promote introductions of technologies by providing proper environment to incentivize private sector.

■ Mechanism for Measurement, Report and Verification:

- Indicators*: CO2 intensity (kg-CO2/t-crude steel) or energy efficiency (PJ/t-crude steel)

  *[1] Calculated according to the different production process.

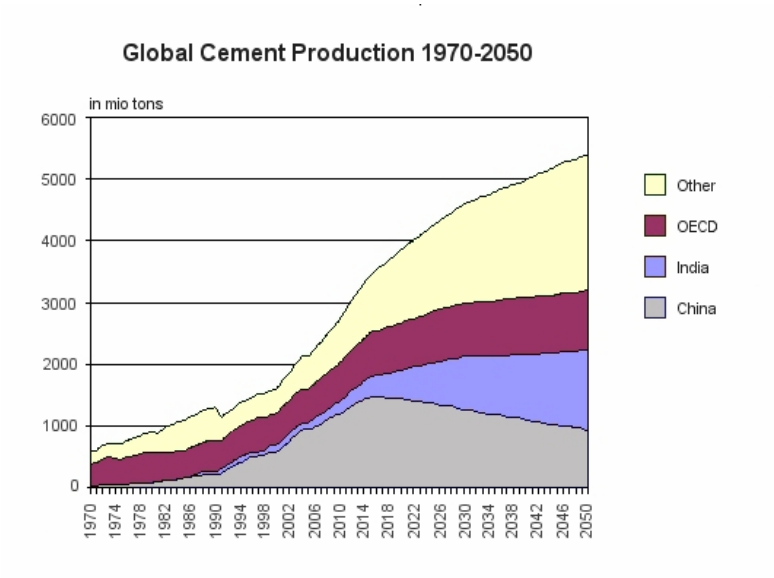
  *[2] Introduction rate/ volume of major environment and energy saving technologies should be also calculated.
- Methodologies for measurement, report and verification:
  - International standardization of existing methodologies (under ISO)
  - Incorporation of internationally standardized methodologies into domestic systems
  - Registration of major production and energy saving facilities to the government.
  - Report to the UNFCCC (which entails registration of major production and energy saving facilities to the UNFCCC)
  - Evaluation and verification of expert groups which consist of experts from public and private sectors.

Cement

Current Status

- **Share in Global Emission of energy-related CO2**: 3% (2005)
- **Global share of Cement Production**：China(48%),India(6%),United States (4%), Japan(3%), Russia（2%）, Spain(2%), EU(12%)

  Total: 2.56 billion tons *(Source: CEMBUREAU)*



Source: International Energy Agency

- **Organizations for implementing sectoral cooperation:**
  - CSI: participated by 19companies which covers 30% of global production from plants in 70 countries(0.65 billion tons of production)
  - APP: participated by 7 countries which covers 60% of global production(1.42 billion tons of production)
- **Methodologies for measurement**: CO2 protocols agreed by CSI and APP countries
- **Identification of BAT, best practices**: Booklet for energy saving technologies and best practices has been in preparation under APP
- **Barriers against technology transfer**: Regulatory, economic and technical barriers and their solutions have been examining to identify under APP.
- **Status of technology transfer**: Introduction of energy efficient technologies have been steadily progressed in developing countries and gaps between developed and developing countries have been significantly lessened.

（ex.） Distribution rate of New Suspension Preheater* in China

*NSP is the technology to produce cement in the most energy efficient way

<Trend of NSP cement output /total cement output>

2002	2003	2004	2005	2006	2007	2008(SEP)
17.14%	22.14%	32.83%	44.85%	48.78%	55.0%	approx 60.0%

(source: www.dcement.com)

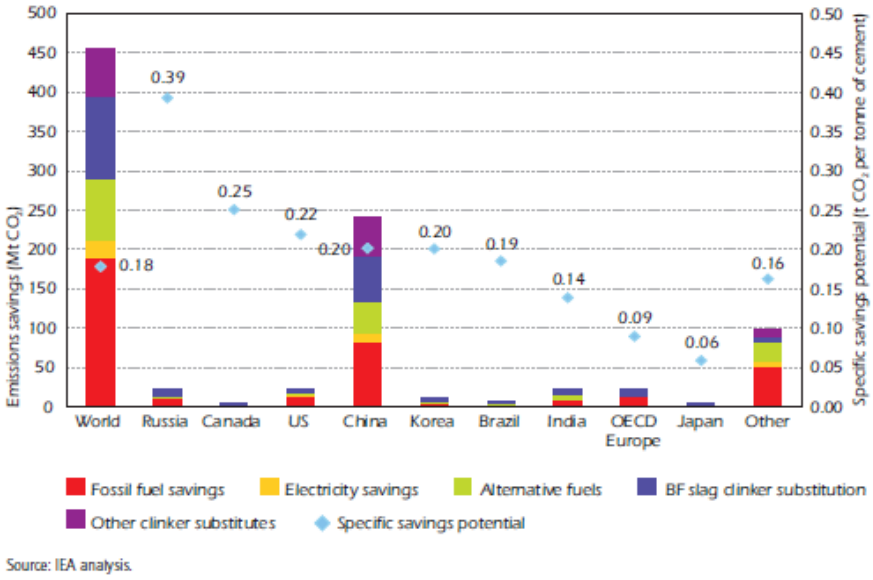
- **Indicators:** CO2 intensity（kg-CO2／ t -cement）

■ **Data Collection:**

- CSI: Collecting data from 845 plants in 43 countries (2006)
- APP: Collecting data from 7 countries (4 countries have proposed their own data).

■ **Reduction Potentials:**

CO2 Reduction Potentials in Cement in 2005, Based on Best Available Technology



Source: IEA analysis.

- APP: Collecting potentials from 7 countries (4 countries have proposed their own data).

How to incorporate current efforts into the post-2012 framework

■ **Methodologies to evaluate levels of efforts**: For developed countries, level of effort can be roughly evaluated through CO2 intensity per production (as a result, consumption for developed countries stabilizes at approximately 450 kilo-cement/ person). For developing countries, certain level of increase in consumption is projected in a short term according to their development stages. In the long term, it is expected to draw a path to stabilize at a certain level same as developed countries.

■ **Methodologies to disseminate technologies and practices:**

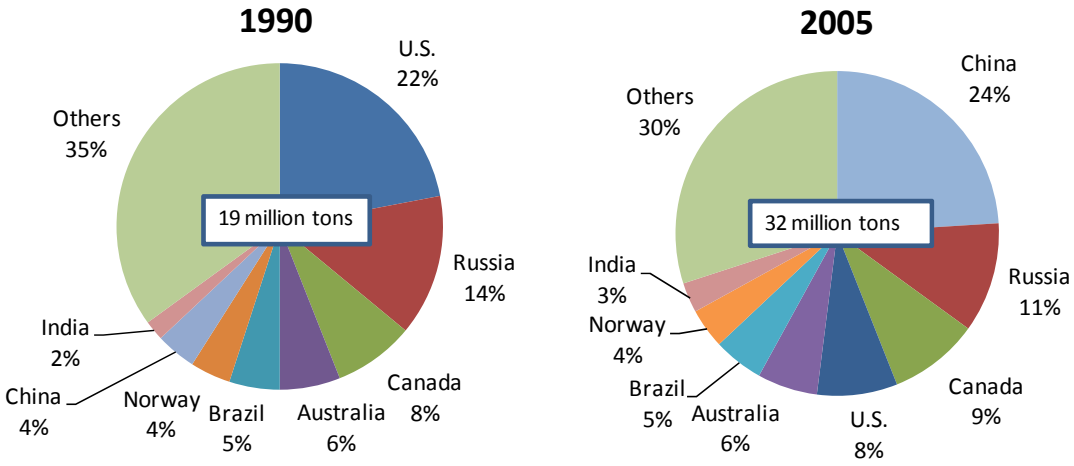
- Improvement of operation: Capacity building (ex. energy conservation diagnosis, seminar for measurement of emissions etc.) and establishment of joint venture companies are effective to provide know-how in the process of production.
- Use of waste: Introduction of environmental regulation in each country can effectively promote commercial use of waste.
- Decrease clinker ratio in Cement: It is difficult to set uniform standard for clinker-cement ratio because each country has its own upper limit.

■ **Mechanism for Measurement, Report and Verification:** Use CO2 protocol for measurement and verify its trend and improvement by using CO2 intensity.

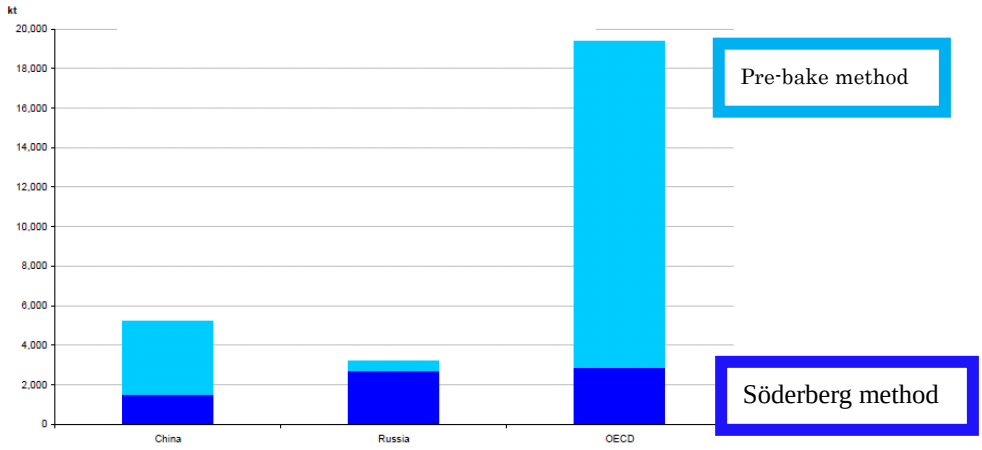
Aluminium

Current Status

- **Global share of Cement Production** : China (24%), Russia (24%), Canada (9%), United States (8%), Australia (6%), Brazil (5%), Norway (4%), India (3%) Total: 32 million tons



- **Organizations for implementing Sectoral cooperation**:
  - IAI: Participated by 25 companies which cover 80% of global emissions. Collecting data from 115 plants among total 200 plants in the world.
  - APP: Participated by 7 countries which cover 48% of aluminium production in the world. (29.8 million tons)
- **Methodologies for measurement**: GHG protocol based on WBCSD/WRI protocol, IPCC guideline, ISO14064 (IAI)
- **Identification of BAT, best practices**: Drew a technology roadmap including future vision with technologies for achievement (IAI)
- **Introduction of technology:**



Aluminum production by production method (2003)

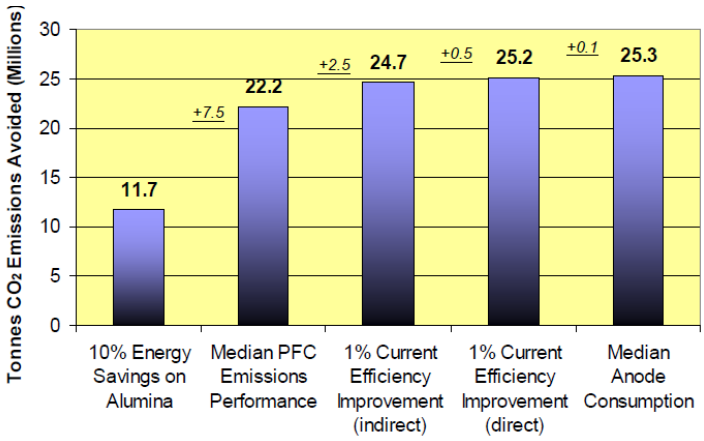
(Source: OECD)

*Pre-bake method is more energy efficient methodology than Söderberg method

- **Indicators:** PFC intensity (t-CO2 eq/t-aluminium), Intensity for consumption of electricity for refinement

（MWh/ t-aluminium） etc.

- **Intensity goals:**
  - PFC intensity (t-CO2 eq /t-aluminium): 1 t-CO2eq/t-aluminium by 2010
  - Intensity for consumption of electricity for refinement (MWh/ t-aluminium):14.5 MWh/ t-aluminium by 2010
- **Data Collection:**
  - IAI: Collecting, month-or-year-based data on GHG protocol, from 115 plants which covers 64% of global production.
  - APP: Participating in IAI data collection from May 2008.
- **Reduction Potential:**



(source:IAI)

How to incorporate current efforts into the post-2012 framework

- **Methodologies to evaluate levels of efforts**:
  - Introduction rate of non-fossil fuels in the use of electricity
  - Introduction rate of recycling system
  - Deviation rate from average intensity
    - Consumption of perfluorocarbon
    - Energy consumption (including electricity consumption), CO2 emission
- **Methodologies to disseminate technologies and practices:**
  - Improvement of operation and management: Capacity building and establishment of joint venture companies are effective to provide know-how in the process of production.
  - Promotion of recycling: Enhancement of recognition of recycling management and introduction of environmental regulation in each country are effective.
  - Transformation to “pre-bake method”
  - Introduction of non-carbon fuels
  - Diffusion of technologies: Formulate registry of providers for technologies and strengthen cooperation with consumers of technologies.
- **Mechanism for Measurement, Report and Verification:** Use GHG protocol for measurement and verify its trend and improvement by using above mentioned indicators.

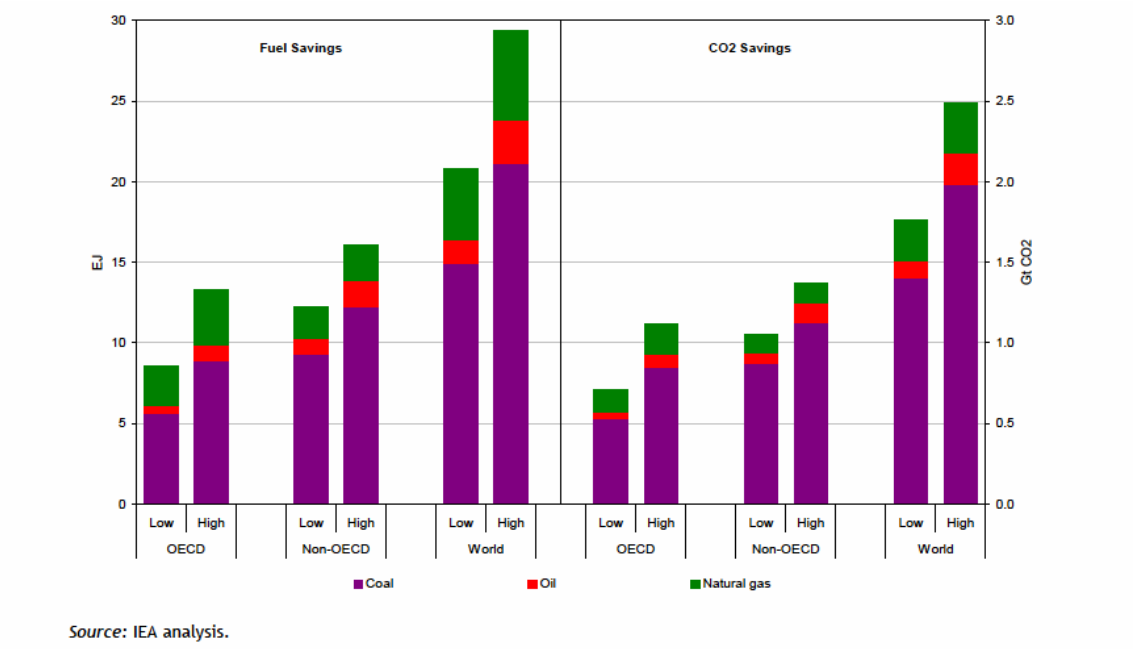
Power Generation

Current Status

- **Share in Global Emission of energy-related CO2**: : 41.1 % (2006) (*IEA CO2 Emissions from Fuel Combustion 2008*) 1.15 billion tons (*IEA CO2 Emissions from Fuel Combustion 2008*)
- **Global share of Power Production** : U.S. (22.6%), EU (17.5%), China (15.3%), Japan (5.8%), Russia (5.3%), India (3.9%) (2006, *IEA World Energy Outlook 2008*)
- **Organizations for implementing Sectoral cooperation**:
  - APP (Asia Pacific Partnership on Clean Energy and Climate): participated by private and public in 7 countries (which covers over 60% of global emissions from electricity and heat). Implementing peer reviews and potential analysis toward efficiency improvement of coal-fired power plants.
  - IEP (International Electricity Partnership): participated by industrial electricity organizations in Japan, U.S., EU, Canada, Australia. Aiming at forging a common position regarding the climate change issue as a business in developed countries.
  - WBCSD: participated by major 8 electric companies in developed and developing countries. Published a policy recommendation
  - E8: participated by major 10 companies in G8 countries. Published a policy recommendation.
- **Methodologies for measurement:** The IEA provides metrics in its publication 'IEA Worldwide Trends in Energy Use and Efficiency, 2008 (Annex A: Date Sources, Country Coverage and Methodology, Page 81)', which could be referred for comparable purposes for the efficiency performance in power generation. It is, however, important to recognize the efficiency gains could be realized through measures such as 'minimizing deviation from designed efficiency' and 'BAT application to the incoming power plants', and that methodologies to enhance these practical measures need to be sought.
- **Identification of BAT and Best practices:** Compiled a "Green Handbook" for best practices of operation and management (APP). Preparing for identifying mitigation potential of each technologies and measures and a roadmap for technology development (IEP).
- **Introduction of technology (Coal):** 85 % of global installed capacity are "sub-critical power plants "which have less thermal efficiency compared to "supercritical", "ultra-supercritical", "fluidized bed combustion", and "Integrated Gasification Combined Cycle plants".
- **Indicators:**
  - Existing power plant: indicate the level of maintaining its initial performance （Improving or minimizing a deviation from the designed efficiency）
  - Incoming power plant: establish a common design for guideline under certain conditions (conditions of steam etc.)

    ** Attention should be paid to the following two points:*
    - *Performance-based thermal efficiency depends on factors including demands, situation of operation, and structure of energy mix.*
    - *Interval for replacement will become longer than other industries.*
- **Situation of Data:**
  - IEA: Calculated reduction potential of each technologies and potential from improvement of efficiency of

coal-fired power sector (1.8 -2.5 billion tons)



Source: IEA analysis.

- Federation of Electric Power Companies: Calculated mitigation potential in the world through introduction of BAT and improvement of operation (approximately 1.87 billion tons)

- IEP: Preparing a roadmap for introduction of BAT

How to incorporate current efforts into the post-2012 framework

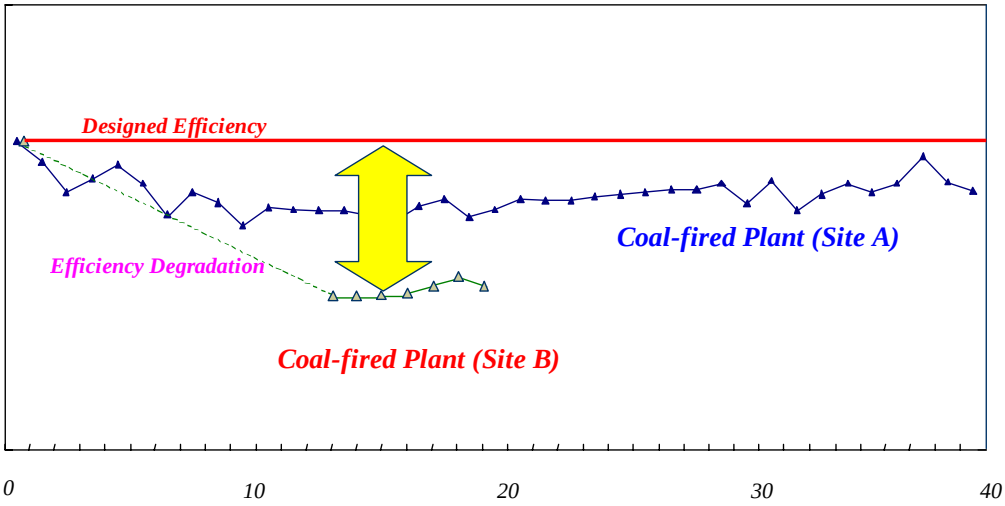
■ **Methodologies to evaluate levels of efforts:**

MRVable Indicators for Power Sector

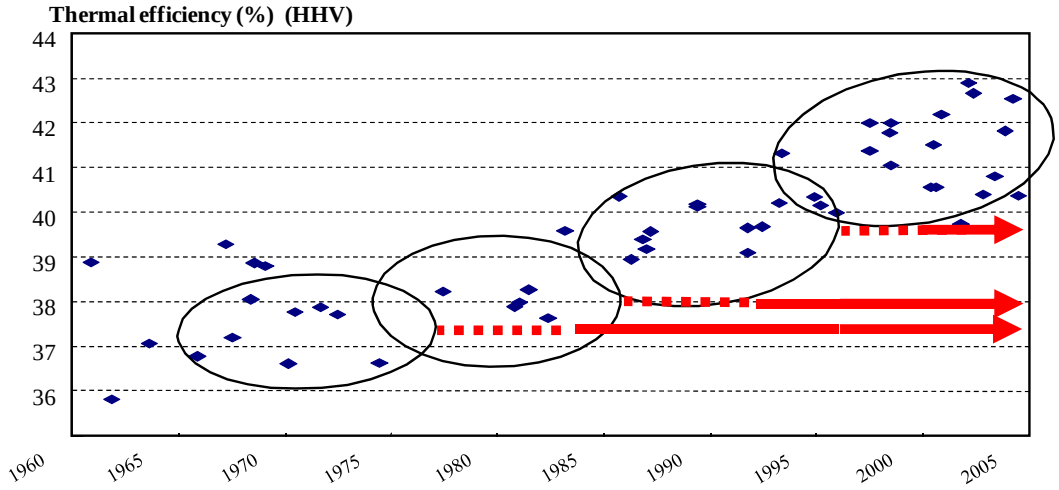
Measures to be considered		*Conceptual indicator*	*Possible MRVable indicators*
Non-fossil fuels	*Optimization energy mix* *-- Nuclear* *-- Renewables* *(associated with national energy policy)*	*Proportion of non-fossil fuel generation*	
Fossil fuels	*1. O&M improvement* *(e.g APP peer review)*	*Thermal Efficiency*	*Deviation from designed efficiency*
	2. Renovation& Replacement *(supported by financial initiatives such as tax credit etc.)*		*Minimum efficiency standard for incoming plant*
	3. BAT installation		
Others	*Capacity building…etc.*	*Important but it is Not likely to be MRVable…*	

- Existing power plant: indicate the level of maintaining its initial performance （Improving or minimizing a deviation from the designed efficiency）

Thermal Efficiency



- Incoming power plant: establish a common design for guideline under certain conditions (conditions of steam etc.)



- Proportion of non-fossil fuel generation: Total introduction rate/volume of non-carbon fuel generating (%/kWh) (may vary because of national circumstances)

■ **Methodologies to disseminate technologies and practices:**

- Improvement of operations: Capacity building through raising the awareness of an importance of thermal efficiency improvement, and providing technologies. Introduction of incoming power plants through BOT is also effective.
- Improvement of environment for investment: evolving into a fair electricity market/fuel market to foreign capital, stabilization of policies, stabilization of finance etc.

■ **Mechanism for Measurement, Report and Verification:** Management of thermal efficiency through utilizing of improving or minimizing a deviation from the designed efficiency. Monitoring introduction rate of BAT and non-carbon energy.

Road Transport

Current Status

- **Share in Global Emission of energy-related CO2**: 17% (2006)
- **Share in Transportation sector** :

Area	Emission from transport sector (MtCO2)	Emission from road transport (MtCO2)	Road transport/ transport	Share in Road Transport Sector
Global	6,452.8	4,712.2	73%	―
U.S.	1,809.3	1,527.2	84%	32%
EU27	952.0	889.4	93%	19%
Japan	245.4	219.7	90%	5%
China	366.8	249.2	68%	5%
India	101.2	92.9	92%	2%

(IEA CO2 EMISSIONS FROM FUEL COMBUSTION 2008 EDITION)

- **Organizations for implementing sectoral cooperation:** Intergovernmental meetings, for example, OECD/ITF (International Transport Forum), APEC, ASEAN, MEET (Ministerial Conference on Global Environment and Energy in Transport), IEA workshops, have intensively discussed the issue in cooperation with relevant international agencies and development banks. For initiatives by industry, WBCSD projects, like SMP (Sustainable Mobility Project), should be referred as one of contribution to mitigation. In addition, possibility of establishing a road transport taskforce under the framework of APP has been examined.
- **Methodologies for measurement**: CO2 emission in road transport sector is calculated through consumption of fuels. Methodologies for measurement of efficiency for new vehicles should be set by each country according to the national circumstances.
- **Identification of BAT, best practices**: The followings are examples of themes for each of which BAT and best practices should be identified
  - Methodologies for efficiency standard setting
  - Promotion of diffusion of vehicles using alternative fuels (including bio-fuels)
  - Improvement of the flows of traffics
  - Promotion of eco-driving
- **Status of technology deployment**: Much of vehicles have been supplied by major automobile companies and technologies have been developed and diffused all over the world according to the geographical conditions and preference of consumers. On the other hand, there is much room for improvement of technologies by local companies.
- **Indicators:** The following factors can be considered as indicators;
  - Fuel consumption
  - Fuel efficiency (new vehicles, in-use mode, performance on road)
  - Average running speed

  For example, in order to calculate fuel efficiency of in-use mode, it is necessary to have data on 1) fuel efficiency of new vehicles, 2) number of new/in-use vehicles, and 3) number of vehicles by vehicle ages. The

problem is that at present development of a database would be difficult as such data are in different formats in each country. There is also a question over the reliability of data. In addition, Note that methodologies to identify the relationship between these indicators and policy measure should be developed.

- **Data:** Methodologies and situations of data collection vary from countries even among developed countries. In major economies including China and India, it is already possible to get data on fuel efficiency of new vehicles, fuel consumption, number of new/in-use vehicles. For further evaluation of improvement of traffic flaws, it is necessary to get more micro data, such as those on payload, running distance, average running speed, which are currently available only for U.S., EU, and Japan. Verification is also needed for the reliability of data.

How to incorporate current efforts into the post-2012 framework

- **Methodologies to evaluate levels of efforts**: Following 4 factors should be pursued at maximum to reduce CO2 emissions from road transport sector.
  - Improvement of fuel efficiency
  - Diversification of fuels
  - Traffic Flaw Improvement
  - Efficient use of vehicles

  To facilitate the efforts toward improving these factors, a variety of measures should be promoted through deployment of advanced technologies and know-how among developed countries and between developed and developing countries.

- **Methodologies to disseminate technologies and practices:**
  - Promotion of local production leads to diffusion of law-carbon technologies (vehicles) in developing countries.
  - For further improvement of efficiency, public private cooperation should be enhanced in order to promote deployment of advanced technologies and know-how.
    - Mode efficiencies:
      + Introduction of fuel efficiency standard and diversification fuels: share of knowledge among governments is essential because these measures are related much to the industrial and energy policies of each country.
      + Introduction of energy saving technologies: Transfer and diffusion of technologies including high efficiency air conditioners or low fuel efficient tires is effective.
      + Efficient use of vehicles: Promotion of eco-driving under public private cooperation is effective.,
    - System efficiencies: Share of know-how among governments is effective for improvement of public transportation, logistics, and traffic management.
    - Data collection: Public-private cooperation is necessary for collection and analysis of statistics and methodologies for calculation.
- Mechanism for Measurement, Report and Verification: Methodologies should be developed for MRV. Collection of data in developing countries should be started as a first step.