Chapter 7 : Industry

Coordinating Lead Authors

Lenny Bernstein (USA), Joyashree Roy (India)

Lead Authors

K. Casey Delhotal (USA), Jochen Harnisch (Germany), Ryuji Matsuhashi (Japan),
Lynn Price (USA), Kanako Tanaka (Japan), Ernst Worrell (The Netherlands), Francis Yamba (Zambia), Zhou Fengqi (China)

Contributing Authors

Stephane de la Rue du Can (France), Dolf Gielen (The Netherlands), Suzanne Joosen (The Netherlands), Manaswita Konar (India), Anna Matysek (Australia),
Reid Miner (USA), Teruo Okazaki (Japan), Johan Sanders (The Netherlands), Claudia Sheinbaum Parado (Mexico)

Review Editors

Olav Hohmeyer (Germany), Shigetaka Seki (Japan)

Chapter Scope

Provide assessment of actions

- Past
- Ongoing
- Short 2010
- Medium term 2030

to mitigate GHG emissions from the manufacturing and process industries

70+pages

emissions

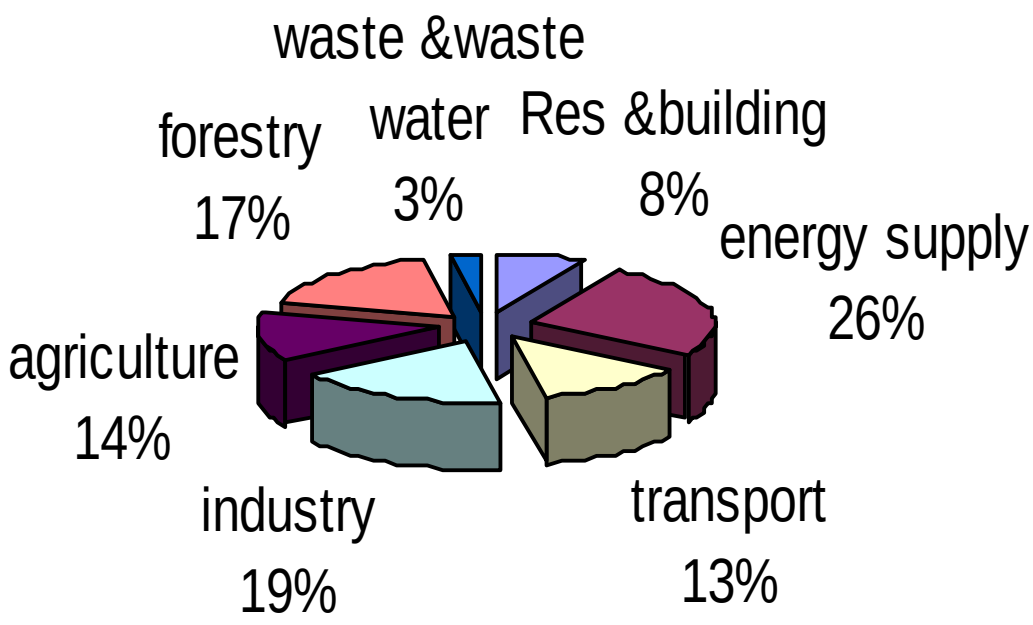
CO_2 from: industries (90% of industrial CO_{2e} emission)

- Energy Use of fossil fuel
- Non energy use of fossil fuel for chemical processing and metal smelting
- non-fossil fuel sources, for example cement and lime manufacture.

Non-CO_2 from:Industrial processes

N_2O and HFCs from chemical processing
PFCs from aluminium, magnesium, and semiconductor production
SF_6 from electrical switchgear
CH_4 and N_2O from food processing

Globally: 12 Gt CO_{2e}



Source :IPCC, 2007

Key Findings

- In 1971-2004 primary energy consumption in non industrial sectors have been increasing and industrial sector's share declined from 40% to 37%.

- Developed country 35%
- Transition economies 11%
- Developing countries 53%

Key Findings

- 85% in the energy-intensive industries
- Iron and steel, non-ferrous metals, chemicals and fertilizers, petroleum refining, minerals (cement, lime, glass and ceramics) and pulp and paper.
- Large industries dominate globally these sectors
- SMEs are important in developing countries: metals, chemicals, food, paper and pulp.
- Challenge is Small may not have economic and technical capacity

Some facts

- Developing nations now produce

  -78% of world cement

  - 58% of world fertilizer
  - 50% of aluminum
  - 42% of world steel

  Developing nation's share is expected to grow further

  New facilities are world best but large demand for technology transfer still exist

Mitigation Options

- Sector-wide options
- Process-specific options

- We list examples of technologies

- Operating procedures

- Energy Efficiency
- Fuel switching
- Power Recovery
- Renewables
- Feedstock change
- Product change
- Material efficiency
- Non-CO_2 GHG control
- CO_2 sequestration

Mitigation Options

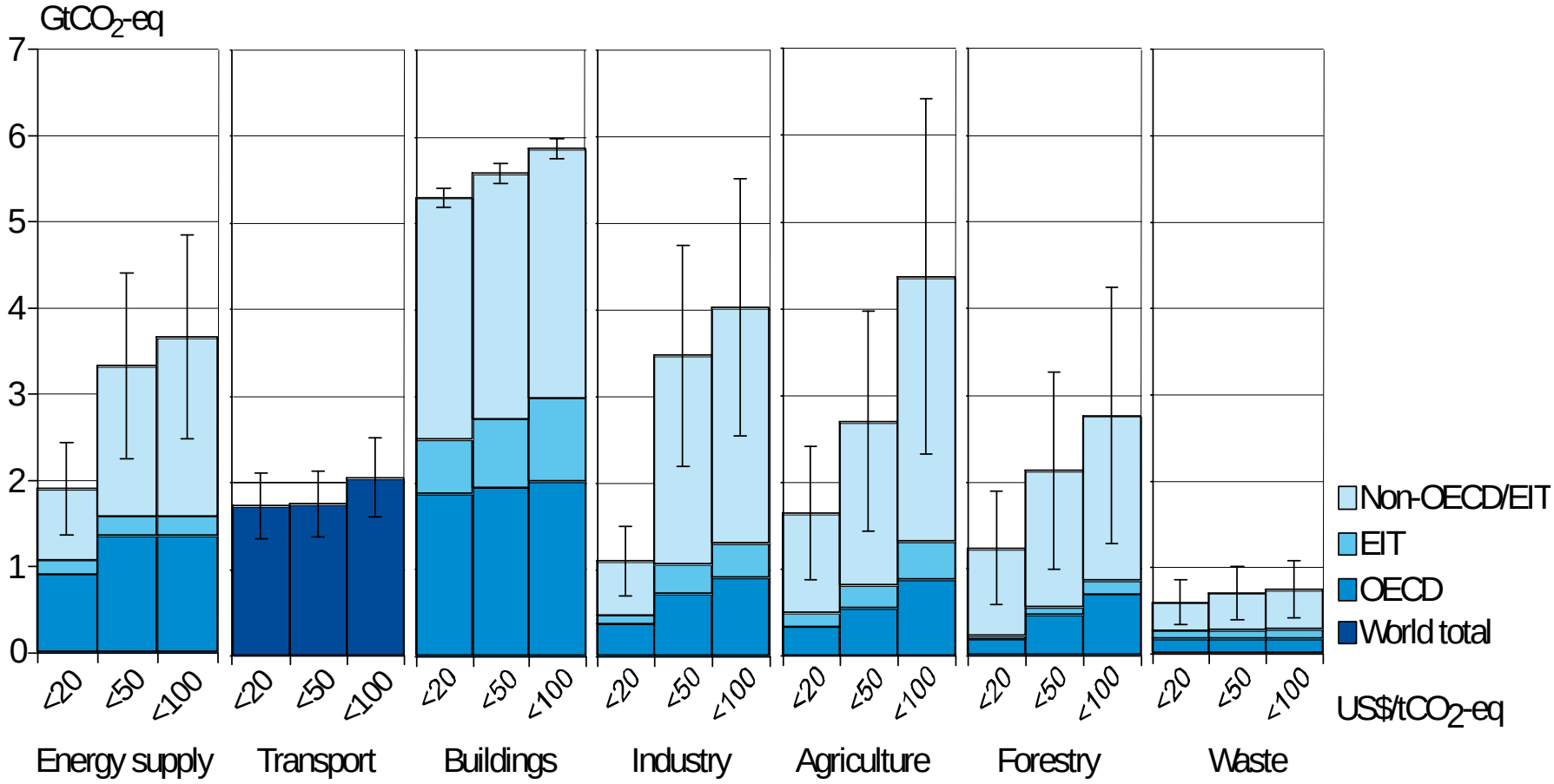
- Operating procedures
- *Management practices, training*
- *Energy Audits and Management Systems*
- *GHG Inventory and Reporting Systems*
- *Companies can use benchmarking to compare their operations with those of others, to industry average, or to best practice*

Mitigation Potential

Mitigation potential and cost in 2030 have been estimated through an industry-by-industry assessment for energy-intensive industries and an overall assessment for other industries.

Wide range : 0.6 to 5.1 GtCO_{2e}/year

Science and Economics Says All sectors and countries have reduction potential



Source : IPCC 2007

Mitigation Potential

The largest mitigation potentials are located in the steel, cement, and pulp and paper industries and in the control of non-CO2 gases.

Barriers

Many options exist for mitigating GHG emissions from the industrial sector, but full use is not being made of them in either industrialized or developing nations.

Barriers to mitigation

- Scientifically issue is understood but there is
- Lack of market response as well as govt. actions

  - Need: appropriate incentive
  - Competing demands for financial and technical resources within the company
  - Capacity building and access to information
  - Slow capital stock turn over

GHG Mitigation is Only One Driver

- Industry decisions will continue to be driven by

  - Customer preferences
  - Costs
  - Competitiveness
  - Government regulation

  - Predictable policy needed

Achieving SD

Cleaner production without compromising employment

SMEs can be major players

High first cost of mitigation

Integration of SME with national development strategy

Vulnerability

- Industry: vulnerable to Weather extremes

  -Site selection

  -Climate proof construction is needed

  - Relocation
  - Diversify raw materials use: ag/forest
  - Consumer preference
  - Government regulation

Links to sustainable development

- SD consequences of mitigation options are not automatic but can be achieved through
- social and local waste reduction strategies at the company level (ITC, Tata Steel, Ltd., BEE)
- studies show in India policy towards wide spread electricity efficient technology leads to higher employment and income generation
- SME are playing part in advancing the SD agenda, for example as part of coordinated supply chain or industrial park initiatives, or by participating in research and innovation in sustainable goods and service

Experience with policies

- Kyoto mechanisms (CDM and JI)

-majority are in energy supply sector and progress slow and regional differences

- Voluntary programmes and agreements: both govt. and company initiatives: Examples- target setting, loans, covering process emissions: Japan.., World semi conductor associations' actions Japan, korea.. Chemical industry has reduced emissions by 9% (2003-1990), Steel Industry target of 10.5% by 2010.

Financial instruments

- Financial instruments Limited experience with taxing industrial GHG emissions :

NL: Tax deductions, France lease credit for energy efficiency, UK Capital allowance scheme for energy efficiency, Australia fuel credit,

In Japan NEDO pays off % of cost of new high performance furnace.

others

- *Regional and national GHG emissions trading programmes*
- *Regulation of non-CO2 gases*
- Energy and technology policies
- Air quality policy
- Sustainable development policies: energy efficiency, dematerialization and use of renewables (ITC, TATA steel, Jindhal)

Co-benefits

- Health
- Reduction of dust
- increased production
- improved product quality, working environment, low maintenance cost
- decreased liability, improved public image and worker morale, and delaying or reducing capital expenditures

Technology Research, Development, Deployment and Diffusion (RDD&D)

- The energy intensity of most industrial processes is at least 50% higher than the theoretical minimum
- Both Public and Private sector
- Govt often willing to fund at early stages
- Private sector should assume risk and capture the rewards of commercializing technology

Success stories

- Well define VA s, realistic targets, govt support, part of large environmental policy package
- Threat of penalty, tax, regulation incase of non compliance helps to achieve more than business as usual reduction
- Individual company initiatives
- It raises awareness, cooperation

Long term outlook by 2030

- Advanced biological processing in chemicals sector
- Use of hydrogen for metal smelting, in fuel cells for electricity production, and as a fuel
- Nanotechnology, which could provided the basis for more efficient catalysts for chemical processing and effective conversion of low-temperature heat into electricity

Key uncertainties and gaps in knowledge

- **Uncertainty**
  - **The rate of technology development and diffusion**
  - **The cost of future technology**
  - **Future energy and carbon prices**
  - **The level of industry activity in 2030**
  - **Policy drivers, both climate and non-climate**

- **gaps in knowledge are:**
  - **base case energy intensity for specific industries: developing & transition economies**
  - **co-benefits**
  - **SD implications of mitigation options**
  - **consumer preferences.**

Thank you