Annex 7.d Emissions from the industry sector

This annex describes emissions from industry now, historical and projected business as usual trends, drivers behind emissions growth, and prospects for emission savings.

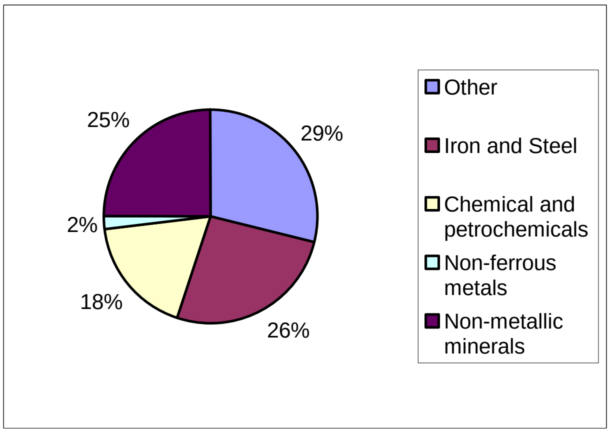
Now

Industry is directly responsible for 14% of GHG emissions, or 20% if upstream emissions from the power sector are also included. Greenhouse gas (GHG) emissions from industry arise from:-

1. Direct fossil fuel combustion in manufacturing and construction (4.3 GtCO_2 in 2000)
2. Direct emissions of CO_2 and non-CO_2 emissions from the chemical processes involved in producing various chemicals and metals (1.3 GtCO_2e in 2000). Industrial processes emissions are discussed in box A below.
3. Upstream emissions from the power sector. Industry consumes about one third of electricity and heat produced by the power sector and so is indirectly responsible for 3 - 3.5 GtCO_2 in 2000[1].
4. Indirect source of emissions from the transport sector, for the movement of goods (manufactured goods account for 75% of all global trade[2]). There are no available estimates of these indirect emissions.

Of the direct CO_2 emissions from manufacturing and construction (#1 in above list), over two thirds were from three sectors: iron and steel, non-metallic minerals and chemicals and petrochemicals (see figure 1).

Figure 1 Direct CO_2 emissions from manufacturing and construction[3]



Historical and business as usual trends

Direct emissions from industry and upstream emissions from the power sector increased by around 10% between 1990 and 2000. This reflects an increase in upstream emissions via the power sector and direct emissions from industrial processes. Meanwhile, direct CO_2 emissions from manufacturing and construction were broadly constant, as growth in emissions from developing countries were counteracted by a reduction in these emissions from OECD countries.

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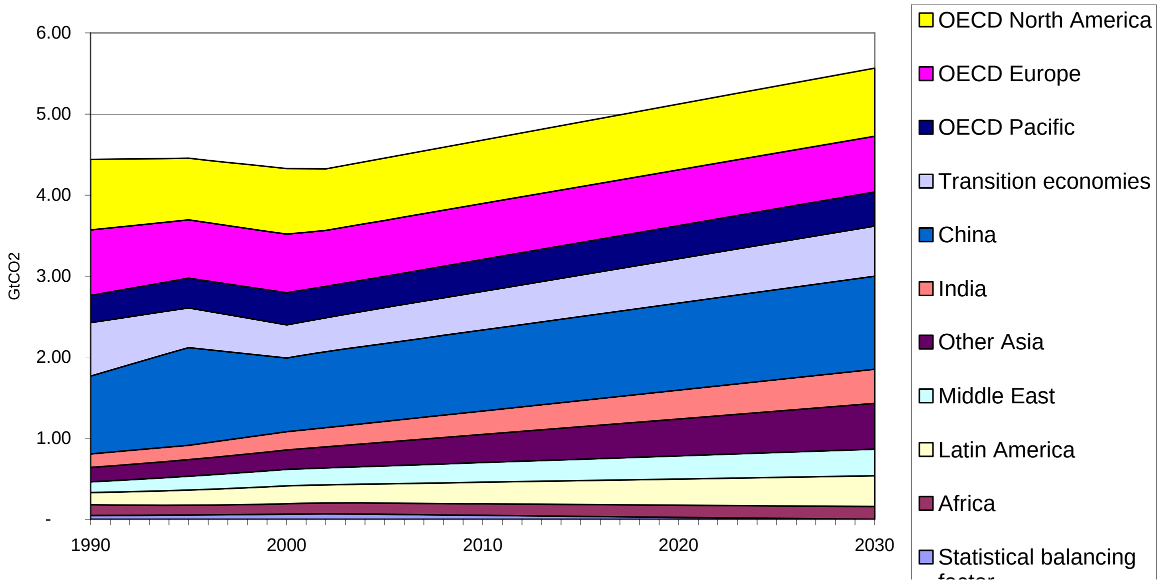
[1] Stern Review calculation based on an assumption that industry consumes about one third of the electricity and heat produced by the power sector (see WRI (2005)).
[2] This figure includes all manufactured goods, including automobiles. WRI (2005).
[3] Source: IEA (2006a). The graph also includes emissions from coke ovens, blast furnaces and process emissions, thus bring total emissions represented here to 5.3 GtCO_2.

Direct CO_2 emissions from fuel combustion in manufacturing and construction

In the baseline scenario, direct CO_2 emissions from manufacturing and construction are expected to reach 5.6 $GtCO_2$ in 2030[4] and 6.5 $GtCO_2$ in 2050[5]. Figure 2 illustrates that emissions growth is driven by developing countries (anticipated growth rate of 50% in the period to 2030, relative to 6% growth from OECD countries).

Figure 2 Direct CO_2 emissions from manufacturing and construction 1990-2030[6]



Drivers of emissions growth

Economic growth: Rapid urbanisation and infrastructure development is expected to accompany economic growth, particularly among developing and transition economies. As such, industrial energy demand is highly sensitive to growth in these economies over the medium term.

Efficiency: Process and end use efficiency improvements have delivered major energy savings in recent decades, particularly in key energy intensive sub-sectors. For example, increased production efficiency accounted for approximately a 10% reduction in overall industrial energy demand among the IEA –11 group of countries between 1973 and 2000 (despite an 88% increase in manufacturing output).[7] Greater use of more integrated processes, for example to utilise waste heat, together with the introduction of new technologies particularly in key energy intensive sectors are critical to reducing global growth in emissions.

Carbon intensity: Progressive substitution of gas or renewable sources for coal and oil inputs has contributed to the slight reduction in direct CO_2 emissions from manufacturing and construction. For example, the share of coal within the fuel mix of the in Annex II industrial sector fell from 17% to 9% while the share of natural gas rose from 24% to 29% between 1971 and 2003.[8] Higher energy prices are likely to be a key incentive to achieve the necessary future reductions in industrial carbon intensity.

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[4] IEA (2004).
[5] IEA (2006a).
[6] Data source: WRI (2006) and WEO (2004).
[7] IEA (2004)
[8] IEA (2005)

Prospects for cutting emissions

The industry sector can contribute to emission savings through measures to switch towards lower carbon fuels and technologies, improve efficiency, and reduce upstream emissions via reduced demand for energy. For example, the IEA found that industry could contribute 5 $GtCO_2$ saving at $25/$tCO_2$ by 2050[9]. Almost half of this is upstream emission savings arising from reduced demand for electricity.

Carbon capture and storage (CCS) is likely to be a particularly important emission saving technology. Many industrial plants will be well suited to CCS because they are large point sources of emissions. In the analysis by the IEA, CCS accounted for around one third of emission savings from the sector.

Box A Industrial Processes: emissions and prospects for savings

CO_2 is produced as a direct result of the chemical process involved in producing cement and aluminium. In the cement industry, China is currently by far the greatest emitter (accounting for about 40% of global cement emissions[10]). Lime manufacture is another important source of CO_2 emissions.

Industrial process CO_2 emissions could more than double in the period to 2050 under BAU conditions[11]. If emissions could be kept constant at current levels by 2050 (as some studies suggest fossil fuel emissions could be) then savings would amount to 1 $GtCO_2$ in this year.

Non-CO_2 emissions are released during the production of substances such as adipic and nitric acid, aluminium and substitutes for ozone depleting substances (such as refrigerants, aerosol propellants, solvents and fire extinguishing agents).

Industrial process non-CO_2 emissions are expected to more than double under BAU conditions between 2000 and 2020[12]. Analysis by the IPCC[13] suggests that 0.4 $GtCO_2e$ could be saved at a cost of less than $3/$tCO_2e$ by 2020.

<u>References</u>

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[9] IEA (2006b)
[10] WRI (2005).
[11] Emission estimates from 1990 to 2002 from WRI CAIT database. There were no available projections for CO_2 industrial process emissions so the Stern Review has assumed that emissions grow at the same rate as CO_2 fossil fuel related emissions are anticipated to grow in the period to 2050 (at growth rate of 1.8% pa, as used by the IEA (2006a)).
[12] EPA (forthcoming)
[13] IPCC (2001).

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