▸Environmental indicators

1. Per capita energy sector carbon dioxide emissions

Metric (actual data) for 1990 = 854,611,349.6 Metric Tonnes of Carbon (MTC) / 364.5 million people and 1999 = 842,565,219.7 MTC / 375.9 million people.
Indicator values for 1990 = 2344.612756 kg carbon per capita and 1999 = 2241.461079 kg carbon per capita

Vector values for 1990 = 2.535540779 and 1999 = 2.405134107

Change in percent for the indicator = -4.6 and for the vector = -5.14

Discussion

The vector measures the distance from the 1990 world average level of carbon any earth citizen emitted (1) and aims at 30% of that level as a sustainability goal. The EU values for 1990 and 1999 are high above the world average (ca. 1.5 times) despite a small decrease of 5%. This change towards the better stems from only a minor reduction in carbon dioxide emissions from fossil fuel combustion (- 1.41%), accompanied by population growth of 3.13%.

At present it is not clear whether this represents a downward trend that will continue in the future. Despite the EU's Kyoto commitment and the policies that have been implemented to achieve it, anecdotal reports from some Member States indicate that the trend could come to a halt. In the UK for example, emissions have been on the rise in both 2000 and 2001. In Spain, emission growth above its target was reported, and first calculations from data on Germany's primary energy consumption in 2001 indicate a rise of 1.5 % in Europe's largest greenhouse gas emitting nation[10].

It should be noted, however, that emissions of all greenhouse gases counted under the Kyoto Protocol fell more strongly than CO2 alone. They decreased by 4% between 1990 and 1999, which in fact marks half the cut the EU has pledged to achieve under the climate treaty.

References

CO2 emissions from fossil fuel combustion only (excluding e.g. fugitive emissions) are taken from EEA Technical Report No. 60/2001. This report contains the official figures submitted to the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) in 2001, as part of the EU's annual reporting obligations. It is available from the EEA website (http://www.eea.eu.int).

Population data is from Eurostat, extracted from 'EU energy and transport in figures 2001'. The figures represent the average value over the year.

[10] Calculations for 2001 emissions in Germany from GERMANWATCH (http://www.germanwatch.org). Other emission and climate change related news are available from Climate Ark News Service (http://www.climateark.org)

2. Most significant energy-related local pollutant(s)

Metric (actual data) for 1990 = primary particulates (PM10) and precursors 25,229 kt / population 364.5 million and 1998 = 17,961 kt / population 374.9 million

Indicator values for 1990 = 69.21536351 kg per capita and 1998 = 47.90877567 kg per capita

Vector values for 1990 = 1 and 1998 = 0.65796657569

*Change in percent for the indicator = -30.8 and for the vector = -34.*2

Discussion

This indicator measures the evolution of emissions per capita of local pollutants since 1990. The sustainability goal lies at a reduction by 90% from 1990 levels. It is up to the SEW reporter to decide which pollutant to evaluate. For the SEW 2002 report on the EU, primary and secondary fine particulates were chosen as the local pollutants to be measured. These particulates are responsible for a number of respiratory problems, especially for people in urban areas, where exposure levels are highest.

The indicator measures a set of four particulates, following a classification developed by the European Environmental Agency (EEA) "Primary (PM10) and secondary fine particulates are summed in this indicator, by using aerosol formation factors (…): SO2 0.54; NOx 0.88 and NH3 0.64." (source: EEA Indicator fact sheet 'Environmental Signals 2001: Chapter air pollution - Emissions of primary particulates and secondary particulate precursors').

The indicator values show a considerable improvement in air quality between 1990 and 1998. The level of per capita emissions of the indicator declined by over 30%. This corresponds to an improvement of the vector value by over a third. Considerable progress towards the sustainability target has been made.

This is due primarily to emissions reductions for sulphur dioxide (SO2), nitrous oxide (NOx), and primary particulates (PM 10) from the energy industry. SO2 emissions alone have been cut in half since 1990, due to "a switch from high sulphur solid and liquid fuels to natural gas in the energy industries, industry and domestic sectors, the construction of new power plants, and the use of low sulphur coal and flue gas desulphurisation." (EEA Indicator Fact Sheet Signals 2001– Chapter Air Pollution/ Emissions of SO2)

References

Particulates data taken from EEA fact sheet, available from the EEA website (http://www.eea.eu.int)

Population data same source as indicator 1.

▸Societal indicators

3. Households with access to electricity

Vector value for 1990 and 1999 = 0.01 (estimate)

Discussion

No actual data was available for this indicator.

The indicator is used to measure the availability of energy services to all parts of society.

Conversations with a number of EU energy experts revealed that it is widely assumed that grid connection is close to being total. This indicator is not regarded as particularly relevant for a strongly industrialised region as Western Europe. Some countries prepared their SEW using the weight of energy in the family budget instead.

Nevertheless, socially marginalized groups without permanent housing may be excluded from access to electricity, of course. Rural areas, however, are well-connected.

References

Pedro Barata, Euronatura, Portugal

Gunnar Boye-Olesen, INFORSE, Denmark

Rob Bradley, CAN Europe, Belgium

4. Investment in clean energy

Discussion

No data on EU level was available.

This indicator measures the share of total investment in energy that goes into renewable energy technology. Clean energy has a higher potential for job creation, seen as a social good, than centralised conventional power plants.

▸Economic indicators

5. Energy resilience: energy trade

Metric (actual data) for 1990 = non-renewable share of Gross Inland Consumption (GIC) 1,274.6 Mtoe/ net-imports of non-renewable energy 643.73 Mtoe and 1998 = 1,379.9 Mtoe / 722.93 Mtoe

Indicator values for 1990 = 50.50% and for 1998 = 52.39%

Vector values for 1990 = 0.505044719 and 1998 = 0.523900281

Change in percent for the indicator = +3.7 and for the vector = +3.7

Additional metric values: Gross Inland Consumption total in 1990 1,318.087 Mtoe, in 1998 1,435.6 Mtoe. Imports of renewable energy is assumed to be zero.

Discussion

This indicator measures the degree to which a country/ region relies on importing non-renewable fuels for their domestic energy supply. Indicator values are arrived at by dividing net-non-renewable imports by non-renewable primary energy consumption. This does not measure the country's overall reliance on non-renewable fuels. This is done via Indicator 8, which measures the share of renewable energy sources.

In statistical terms, net-non-renewable energy imports in the EU equal total net-energy imports, because renewable energy imports are not accounted for separately in the official statistics at the moment. According to information from EEA's Ian Smith, "renewable imports / exports are (almost) zero and renewable electricity (even hydro) is assumed to be zero for imports and exports. However this methodology may change."

The results for this indicator show that the EU's dependence on foreign non-renewable fuels is increasing, as primary energy consumption soars. Gross inland consumption (GIC) rose by nearly 9% between 1990 and 1998, and imports of non-renewable sources increased by 12.3%. Apparently, the additional energy demand is being filled to an increasing extent by external sources. Accordingly, import dependency increased by nearly 4%.

This development has a number of reasons. Firstly, there is a shift in the EU's energy production mix (discussed in Part I of this report) away from coal towards natural gas. In 1990, coal made up nearly 30% of domestic energy production. Between 1990 and 1998, production of coal was nearly halved. The resulting gap, worsened by a rise in overall consumption levels, could not be filled by the significant increases in the production of other fuels, such as oil or natural gas. Imports had to make up for two thirds of the additional energy needed.

Secondly, there is a sectorally specific growth in energy consumption, which changes the structure of fuel demand. The increase of nearly 9% between 1990 and 1998 was caused primarily by the tertiary sector and transport in particular. While industry reduced its energy use in times of overall rising consumption, fuel demand in transport grew by over 17% or 45 Mtoe. This increase amounts to over one third of the overall rise in energy consumption in the EU.

This development is of crucial importance regarding the future development of energy consumption in the EU and also that of carbon dioxide and other emissions. The high growth in the transport sector and increases in the services sector are the main drivers behind the overall growth (or only moderate reductions in emissions) observed in recent years. More policies targeting these sectors need to be developed and implemented if current trends are to be stopped and reversed.

This development also refutes an argument frequently made by the nuclear industry in particular, that for the sake of energy security, import dependency should be mitigated

by expanding the use of nuclear power. As long as the transport sector runs primarily on petrol, energy imports cannot be substituted by electricity. And for those that can, sustainable and low-risk alternatives are available.

References

Energy trade and consumption data from Annual Energy Review 2000.

Information on methodology for energy imports and exports from Ian Smith, Energy & Environment Data, European Environment Agency, Denmark (Ian.Smith@eea.eu.int) - personal communication.

6. Burden of energy investments

Discussion

No data on EU level was available

This indicator measures the GDP share of government investment for non-renewable energy.

▸Technological indicators

7. Energy productivity

Metric (actual data) for 1990 = GIC 1,318.087 Mtoe/ GDP 5315 billion Euros (1990)/ PPP proxy: 0.9 and 1999 = GIC 1,442.4 Mtoe/ GDP 8004 billion Euros (1999)/ PPP factor 1999: 0.918

Indicator values for 1990 = 9.3447036434 MJ/$GDP and 1999 = 6.9263355994 MJ/$GDP

Vector values for 1990 = 0.86473513402 and 1999 = 0.61219043436

Change in percent for the indicator = -25.88 and for the vector = -29.20

Discussion

This indicator measures the amount of energy used per unit of economic output. This is done by dividing primary energy consumption and gross domestic product (GDP). The indicator measures a country or region's energy productivity against the world average in 1990, which was 10.64 MJ per $ GDP. The sustainability target lies at a reduction of energy input per dollar to a tenth of this value.

The data on energy consumption had to be converted from Mtoe into megajoules for the calculation of the indicator. To account for regional differences in the actual value of the goods produced, the GDP figures are adjusted for purchasing power parity (PPP). For the EU, PPP factors for the conversion of Euros into US dollars were obtained from the Organisation for Economic Co-operation and Development (OECD).

However, EU level values were only available for the years 1997 to 2001. As these values (0.911-0.925) were constantly increasing over this five year period, the 1990 value was assumed to be below 1997 level. As the period covered by the OECD values was a high growth period, a 1990 value of 0.9 was used, just slightly below the 1997 figure. This arbitrary choice was necessary to make all figures compatible. As real 1990 PPP figures become available, the indicator should be recalculated.

According to the SEW indicator, energy productivity in the EU improved considerably between 1990 and 1998. While the EU economy already used over 10% less energy per output unit than the world average in 1990, this level was further improved by over a quarter. In 1999, the economies of the European Union were on average much more energy-efficient than at the start of the decade. Apparently, the EU has realised some of the potential for so-called 'no-regret' energy cuts through efficiency gains. Despite the fact that this development has still led to an increase in energy consumption, it is a promising trend, which has taken the EU a good step towards a more sustainable economy.

References

1990 values for GIC and GDP from Annual Energy Review 2000.

1999 values for GIC and GDP from 'EU energy and transport in figures 2001'.

PPP factors were obtained from the official statistics of the OECD (http://www.oecd.org).

8. Renewable energy deployment

Metric (actual data) for 1990 = renewable energy 43.530 Mtoe/ GIC 1318.087 Mtoe and 1998 = 58.554 / 1435.638

Indicator values for 1990 = 3.30% and 1998 = 4.08%

Vector values for 1990 = 1.0618 and 1999 = 1.0528

Change in percent for the indicator = +23.6 and for the vector = -0.85

Discussion

This indicator measures the share of renewable energy sources as a share of overall primary energy consumption. The values for the country/ region are compared with the 1995 world average value, which was 8.64% as a reference (vector value = 1). The sustainability target is a 95% share of renewable energy sources in primary energy consumption (and not just in electricity). The SEW reports follow an EIA classification of renewable energy, which excludes large hydro power (everything above 10 MW of generating capacity), but includes biomass fuels such as wood, charcoal, animal and vegetal wastes as well as energy from modern bio-fuels and waste-to-energy as well as PV, wind power, solar thermal electric, tidal, and geothermal power plants.

It should be noted that renewable energy and the respective shares of its various sources is significantly different in electricity production. Overall, renewable energy sources provide a good four percent of Europe's electricity at present. Wind, small hydro and biomass account for a good 1 % each.

For the EU share of renewable energy, all energy from hydro power was excluded, because no clear distinction between power from small and large facilities and their respective development could be made. All data from conventional sources combines all hydro power as one category, despite the potentially significant differences in the environmental and social impact of various dam sizes. According to an IEA study on 'The Evolving Renewable Energy Market', "in 1996, small hydro plants (less than 10 MW) in the European Union accounted for about 10 percent of installed hydro capacity. Small hydro capacity in 1996 was 9,643 MW, having expanded by 709 MW since 1993." Despite this indication for the share of small facilities of all hydro power in the Union, proper data for real change in growth over the observation period for the indicator was not available, therefore preventing its inclusion.

Hydro power as such accounts for the second largest single share of non-fossil, non-nuclear energy after biomass. Capacity for electricity from hydro increased between 1990 and 1998 by 17%, slower than non-hydro renewable energies.

Renewable energy as defined above, grew considerably over the same period. In absolute terms, its level was increased by over one third, from around 43 Mtoe to over 58 Mtoe. This increase corresponds to a growth in the share of renewables in overall primary energy consumption of nearly a quarter (the absolute growth level slightly lessened by higher energy consumption).

Biomass continues to hold the lion's share, although its importance decreased slightly. Biomass accounted for over 94 percent of non-hydro renewable energy in 1990, and 92% in 1999. Still, its growth accounted for most of the growth in renewables in absolute terms.

Non-biomass non-hydro renewable energy grew by nearly four-fifths (79%) between 1990 and 1998, starting from negligible levels. The available data does not reveal which particular energy source was responsible for most of this increase, but current trends lead one to attribute it to the surge in wind energy. After 1998, wind power rose even more strongly. In 2001 alone, installed capacity in wind power was increased by over one third compared to the previous year, and in 2001 stood at nearly 18,000 MW.

Nevertheless, the overall share of renewable energy in the fuel mix of primary energy consumed in the EU remains very low and at a highly unsustainable level. The vector value for 1990 and 1998 is above the 1995 world average. Renewable energy still plays only a very minor role in providing the EU with its primary energy.

References

All EU energy figures from Annual Energy Review 2000.

Wind power figures from "Wind Directions", volume April 2002 (available from the European Wind Energy Association (EWEA) (http://www.ewea.org).