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Key Indicators of Climate Change and Energy Use and Approaches to Measure the Biological Diversity

WIFO continues, in the present paper, its report on key indicators of climate change and energy use in Austria with data for the year 2009. The indicators thus mirror the impact of the economic crisis 2008-09 on greenhouse gas emissions, and the use and consumption of energy. The climate-relevant greenhouse gas emissions decreased significantly by 7.9 percent in 2009. With the GDP shrinking by 3.9 percent, the total gross domestic consumption of coal, mineral oil, natural gas, and renewable energy sources in 2009 declined by 5 percent as compared to the preceding year; at the same time, the use of renewable energy sources increased by 2.9 percent. In Austria, mainly the production of the energy intensive industry and the freight transport were affected by the international financial and economic crisis. Against the backdrop of the "International Year of Biodiversity 2010" as proclaimed by the United Nations, the subject "biological diversity" and approaches to measure biodiversity represent the special focus of the present paper.

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The key indicators of climate change and energy use for Austria as submitted annually by WIFO emphasise relevant developments in connection with economic trends and environmental policy measures so as to raise the awareness for the impacts of economic activities on climate change and energy use (*Kletzan et al.*, 2008, *Kletzan-Slamanig et al.*, 2009, *Kettner et al.*, 2010). After a moderate reduction in the preceding year greenhouse gas emissions decreased markedly in 2009 (–7.9 percent). This was due to a distinct reduction of the energy consumption following the economic downturn 2008-09, especially in the energy intensive manufacturing industry and in the freight transport. The real added value of the manufacturing sector 2009 fell by 14.3 percent as compared to the preceding year (*Scheiblecker et al.*, 2011). The trend of a strong reduction of the greenhouse gas emissions, and most notably of the CO_2 emissions was observed in all of Europe in 2009. According to the *European Environment Agency* (2011) the decline of the emissions in the EU was not only due to the recession but also to the clearly increased use of renewable energy.

In May 2011, the International Energy Agency published first results on the worldwide development of CO_2 emissions in the year 2010[1]. They show, with +1.6 gigatons in comparison to the preceding year, the so far highest increase since the beginning of measurements (worldwide emissions 30.6 gigatons CO_2). The severe recession had, therefore, only a short-term slow-down effect on the development of the greenhouse gas emissions. The 2010 emission inventory of Austria will not be available before January 2012. For the group of the industrial installations regulated by the EU-Emission Trading System (ETS) data for the year 2010 have already become available. The notable decline of the industrial production in the year 2009 led to a reduction of the CO_2 emissions of the installations covered by the EU-ETS by 14.9 per-

[1] International Energy Agency, http://www.iea.org/index_info.asp?id=1959, accessed on 30 May 2011.

cent. In 2010, the CO_2 emissions increased again by 13.3 percent along with the recovery of the economy, yet remained under the value of 2008 by still 1.2 million tons.

The special focus of the present report is on biological diversity, thus in retrospect relating to the "International Year of Biodiversity" proclaimed by the United Nations for 2010, as well as the "Decade of Biodiversity", also proclaimed by the United Nations for the years from 2011 to 2020.

The "Decade of Biodiversity" aims, in its programme, to improve the protection of animal and plant species threatened worldwide, and by doing so to preserve the genetic diversity of species and the functionality of ecosystems. By his economic activity man is leaving an expanding ecological footprint in the sense of physical effects on the environment by production and consumption (*Wackernagel et al.*, 2002). This entails a loss of the biological diversity in a so-far unprecedented speed. The importance of the biological diversity for the functional integrity of ecosystems and for the prosperity and economic development of man is dealt with in several studies (for a survey see *European Commission*, 2008). Thus, the natural ecosystems supply services on the basis of foodstuffs, wood, water, energy, and render protection against soil erosion and flooding. Moreover, ecosystems produce medicinal products and have a sink function for the absorption of waste materials and emissions including carbon. The efforts to protect the biodiversity aim at significantly slowing down the worldwide loss of species and habitats (also the millennium development goals of the UNO)[2]. The existing ecosystem has developed in dependence of the climatic conditions and thus reacts to the climate change in a highly sensitive way.

Key indicators relevant to climate change and energy

The emissions of greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride and chlorofluorocarbons) in Austria amounted, in the year 1990, to 78.2 million tons CO_2 equivalents, the value serving as the benchmark for the Kyoto Protocol. They had an upward tendency in the 1990s and the early 2000s, and in 2005 reached their peak value at 92.9 million tons CO_2 equivalents. Since then, the emission of greenhouse gases has been declining. At 80.1 million tons they remained, owing to the crisis, below the level of the preceding year. The development of the CO_2 emissions follows a similar trend, since they account for more than 80 percent of the total of the greenhouse gases.

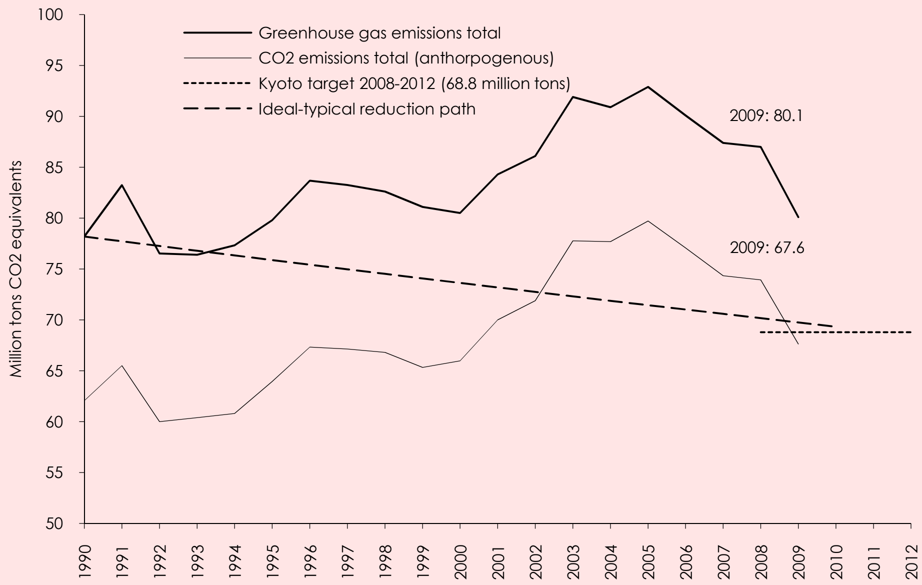
The target set for Austria according to the Kyoto Protocol and the EU-Burden-Sharing Agreement is to reduce the greenhouse gas emissions by an average of 13 percent in the years 2008-2012 as compared to 1990, which corresponds to 68.8 million tons CO_2 equivalents per year. For the year 2009, therefore, the deviation to the target value comes to 16.4 percent. As the emissions in 2008 were higher than in 2009, the failure to reach the target value for 2008-09 averages 21.4 percent, or 14.8 million tons CO_2 equivalents per year. So as to partly bridge that gap between the actual emissions and the emission target value, emission credits from abroad amounting to 45 million tons CO_2 equivalents have been purchased by the Austrian JI/CDM Programme for the Kyoto period 2008-2012. A further deficit of about 30 million tons CO_2 equivalents is expected for the entire commitement period.

The largest share of emissions of greenhouse gases in 2009 is to be allocated to the manufacturing industry (28.1 percent), as well as transport (27.0 percent), the share of the CO_2 emissions amounting to even 32.9 percent, and 31.6 percent, respectively. However, the level of the emissions in the industry did not change in the period of 2000-2009, while it rose by 13 percent in the transport sector. The generation of energy in 2009 made for 15.9 percent of the greenhouse gas emissions; by the increased use of renewable energy sources the emissions in that sector have, since 1990, declined by 7.2 percent (from 13.8 million tons to 12.8 million tons CO_2 equivalents). Also in the sector of heating and small-scale consumption (14.1 percent of the emissions) the emissions have considerably decreased since 1990 (–21.5 percent) to

[2] http://www.un.org/millenniumgoals.

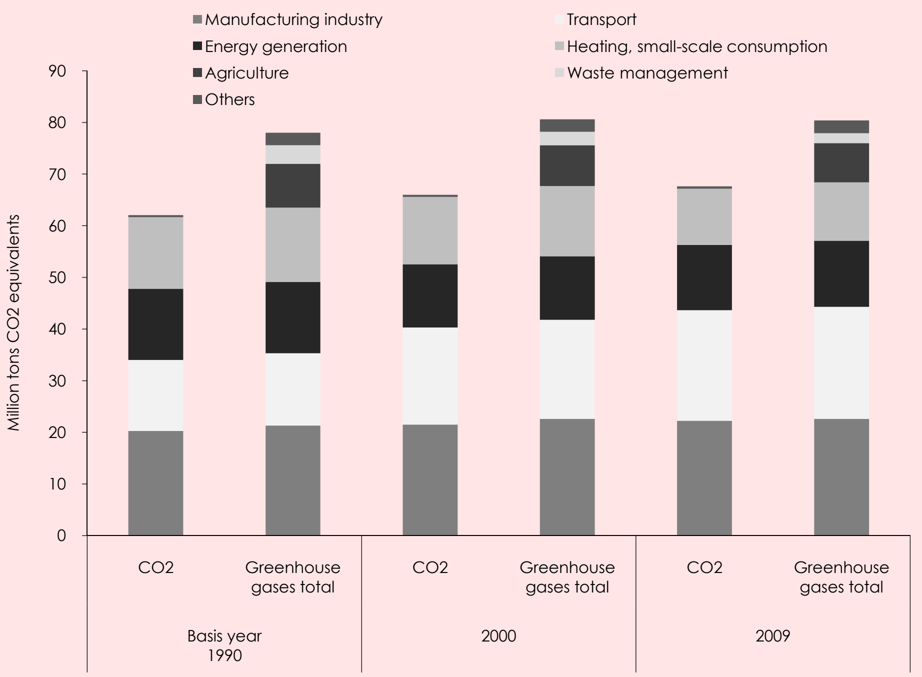
11.3 million tons CO_2 equivalents in the year 2009. The sectors agriculture and waste management, which mainly emit methane and nitrous oxide, caused, in 2009, 9.5 percent, and 2.4 percent, respectively, of the emissions, which, too, have considerably declined since 1990.

Figure 1: Development of the greenhouse gas emissions in Austria and Kyoto target



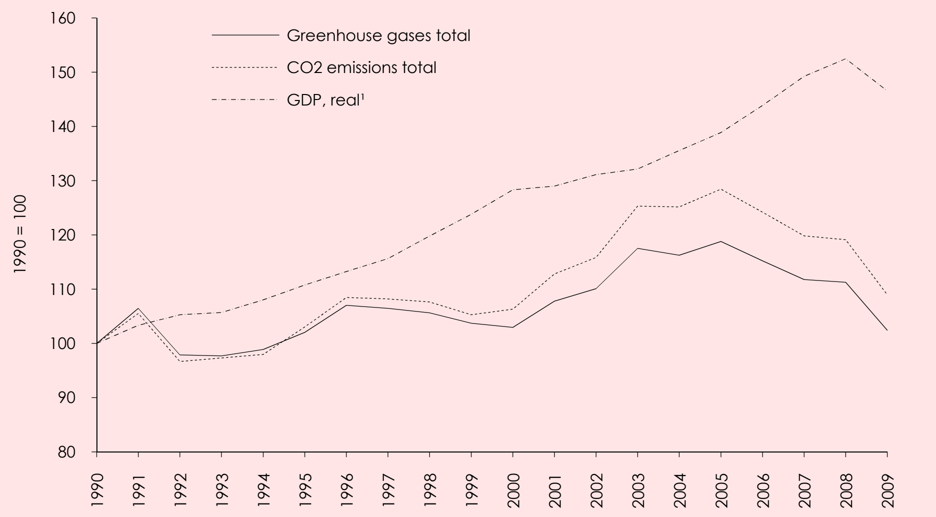
Source: Federal Environmental Agency.

Figure 2: Sectoral greenhouse gas emissions in Austria



Source: Federal Environmental Agency.

Figure 3: Development of the greenhouse gas emissions in comparison to the GDP



Source: Federal Environmental Agency, WIFO database. – [1] On the basis of the prices of the preceding year, year of reference 2000.

Figure 4: Greenhouse gas emissions per capita in the EU 27

2009

Source: Eurostat, UNFCCC, WIFO calculations.

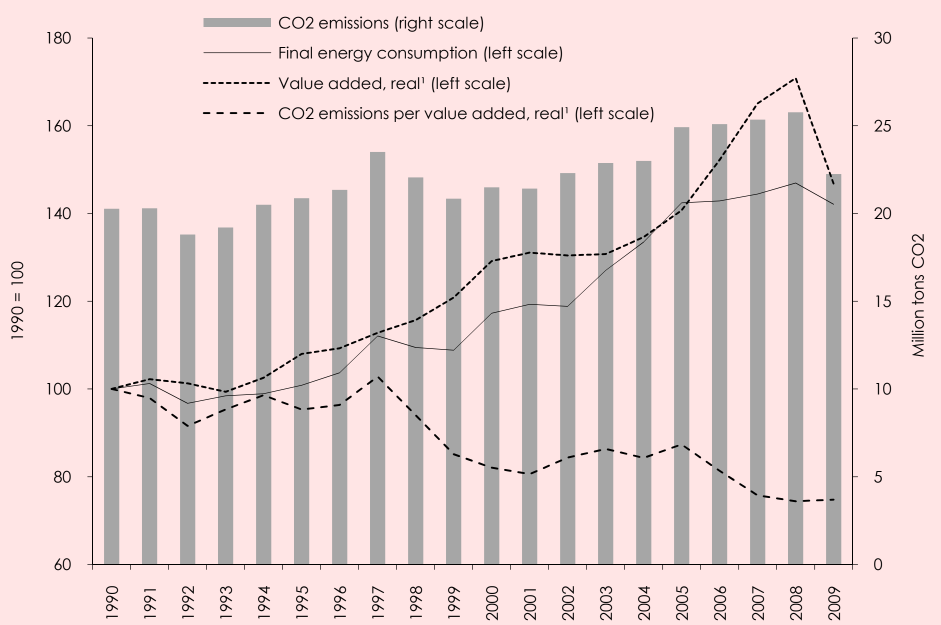
Between 1990 and 2000 the greenhouse gas emissions in Austria remained stagnant; only after 2000 they started to rise sharply, and continued to surge until 2005 (Figure 3). Since then, the greenhouse gas emissions have been declining. Therefore, different periods of the development of the growth of the GDP on the one hand, and the development of the greenhouse gas emissions on the other, have been distinguished since 1990: from 1990 to 2000 they were relatively independent, since then emissions remained nearly static or went up insignificantly with a growing GDP. By contrast, the emissions in the period 2000-2005 increased somewhat more strongly than the GDP. An absolute de-coupling has been evident since 2005, that is to say the emissions declined with the GDP increasing. In the year of the economic crisis 2009 the decrease of the emissions was more significant than that of the real GDP, as mainly the industrial production and the freight transport were affected by the global financial and economic crisis. The individual sectors contributed to the overall development differently and also show a highly differentiated pattern of decoupling (Figures 6 to 8).

Figure 5: Greenhouse gas intensity measured against the GDP in the EU 27

2009

Source: Eurostat, UNFCCC, WIFO calculations.

Figure 6: CO_2 emissions, final energy consumption and gross value added of the manufacturing industry

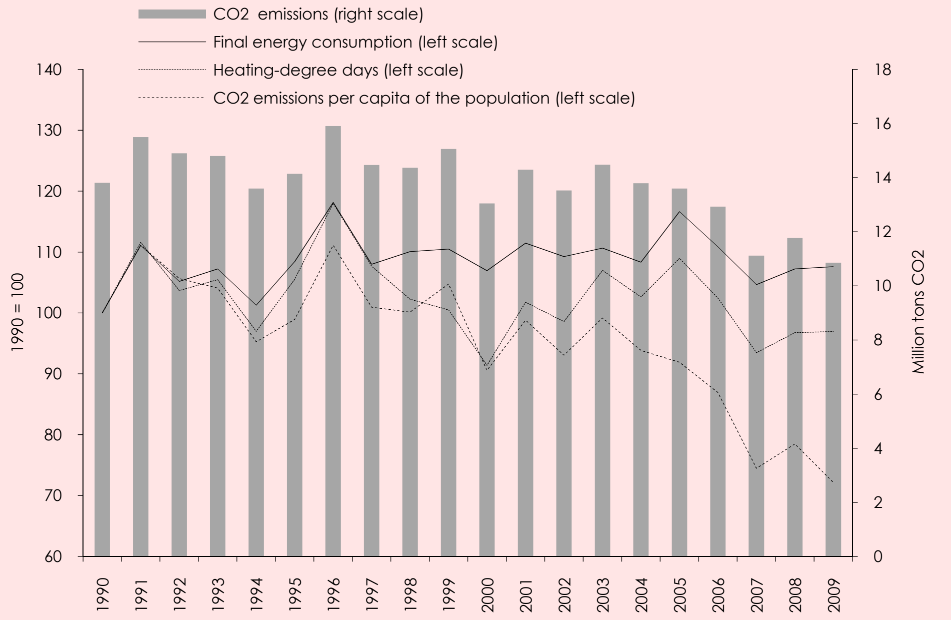


Source: Federal Environmental Agency; Statistics Austria, energy balance Austria 1970-2009; WIFO data-base. – [1] Manufacturing including mining at producers' prices, year of reference 2000.

Greenhouse gas emissions per capita in Austria were, at 9.6 tons CO_2 equivalents and below the EU-15 average (11.5 tons CO_2 equivalents), yet above those of thee EU-27 average (9.3 tons CO_2 equivalents). Austria climbed to rank 13, improving its position by one as compared to the preceding year. The by far highest emissions per capita were recorded in Luxembourg (23.7 tons CO_2 equivalents) followed by Ireland (14 tons), the lowest were recorded in Latvia (4.7 tons CO_2 equivalents).

In 2009, the greenhouse gas intensity (emissions by GDP, nominal, in purchasing power parities) were, at 0.36 kg CO_2 equivalents per euro in the EU 15, and at 0.39 kg CO_2 equivalents per euro in the EU 27. Here, Austria, at 0.33 kg CO_2 equivalents per euro, ranked third, like in the preceding year. Only France (0.31 kg CO_2 equivalents per euro), and Sweden (0.23 kg CO_2 equivalents per euro) were more carbon-efficient. Estonia showed the highest emission intensity (0.84 kg), and in the preceding year Bulgaria ranked last (0.76 kg).

Figure 7: CO_2 emissions, final energy consumption of households and heating-degree days



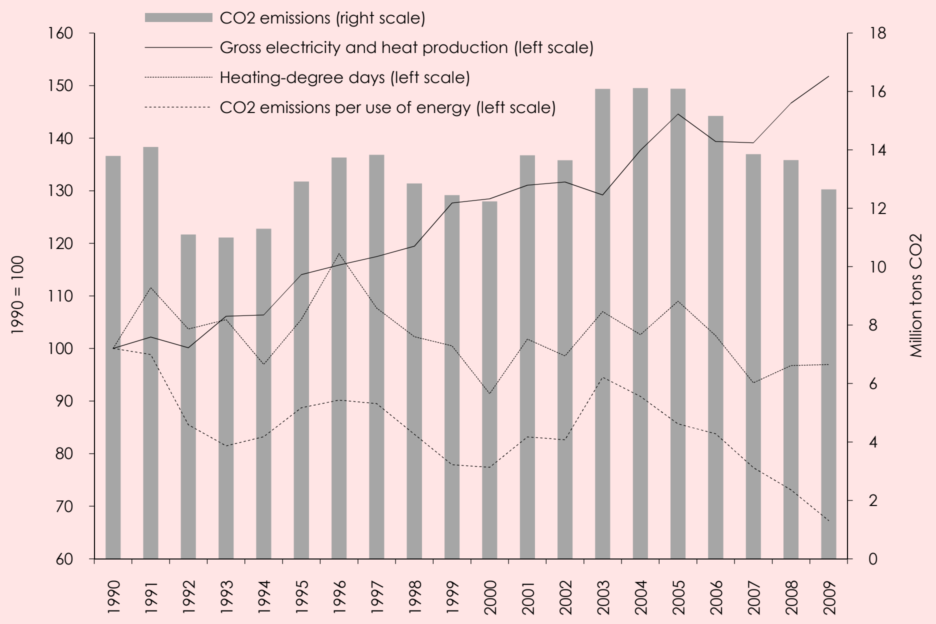
Source: Federal Environmental Agency; Statistics Austria, energy balance 1970-2009; WIFO database.

The CO_2 emissions of the manufacturing industry went up sharply above all in the period after 2000 (Figure 6); the economic crisis entailed, in 2009, a slump of the emissions that took a more or less parallel course with the decline of the real value added. In the entire period 1990-2009 the final energy consumption of the manufacturing industry increased in step with the value added, so that the energy efficiency increased only slightly. The CO_2 emissions per real value added have, however, been declining since 1997, the consumption of the industrial sector has thus been shifting to energy sources with lower CO_2 emissions factors ("de-carbonisation").

The final energy consumption of the private households (Figure 7) remained almost constant in the period 1990-2009, while the CO_2 emissions (mainly since 2001) decreased. Consequently, the per-capita emissions of the household sector dropped significantly. Accordingly, the decrease of the emissions was partly compensated by the growth of the population in Austria. The pattern of the development of the final energy consumption also correlates with that of the heating-degree days.

The consumption of electricity has developed most dynamically in Austria since 1990, so that despite the considerable expansion of the domestic electricity production also the net imports have heavily increased since 2002 (Figure 8). The CO_2 emissions of the sector energy and heat generation have considerably fluctuated. Between 2000 and 2004 they increased considerably for a short period of time and have been declining again since 2005. Since 2005, also the average CO_2 intensity of the energy used for the production of electricity and heat has rapidly decreased. That can be ascribed, too, to the dynamic expansion of the generation of electricity and heat from renewable energy sources in that period.

Figure 8: CO_2 emissions, energy use and public electricity and heat generation

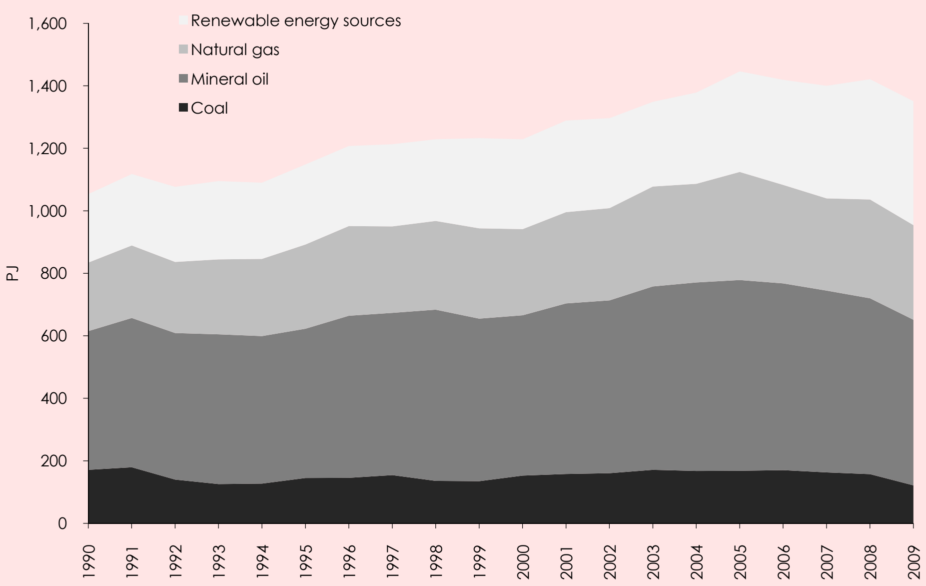


Source: Federal Environmental Agency; Statistics Austria, energy balance 1970-2009; WIFO database.

Total energy consumption

The gross domestic consumption of coal, mineral oil, natural gas and renewable energy sources in 2009 was, at 1,351 PJ, by 28.2 percent higher than in 1990. Except for coal, the use of which was reduced in the period from 1990-2009 by 1.7 percent p.a. on average from 172 PJ to 122 PJ, the consumption of all energy sources increased. The consumption of natural gas increased strongest (+38.2 percent, +1.6 percent p.a., from 219 PJ to 303 PJ). The use of renewable energy sources has been expanded dynamically since 1990 (+80.9 percent to 397 PJ).

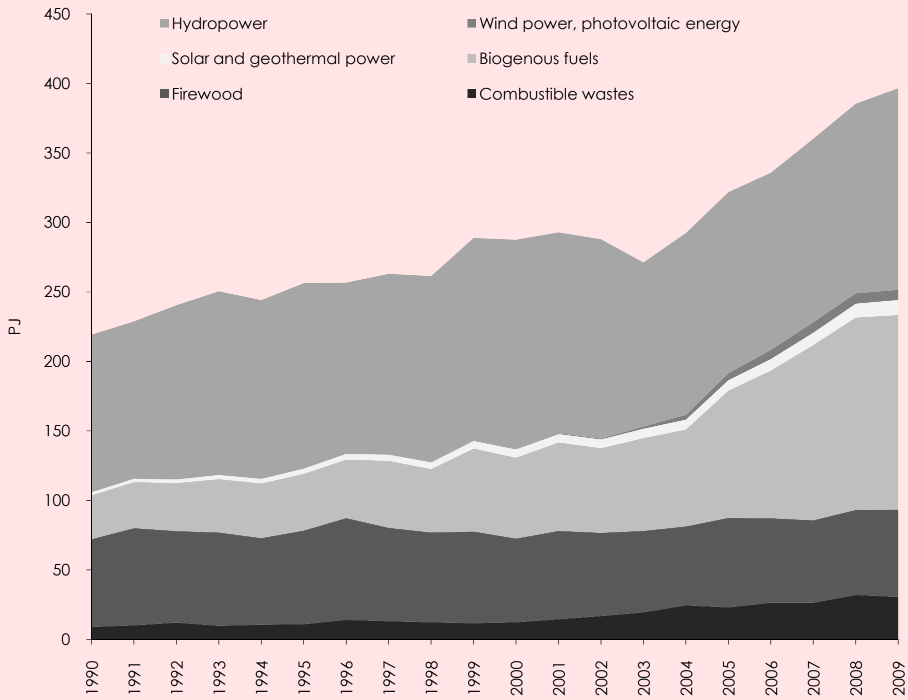
Figure 9: Gross domestic consumption by energy sources in Austria



Source: Statistics Austria, energy balance 1970-2009.

In comparison to the preceding year the gross domestic energy consumption in 2009 fell by 5 percent, with the most pronounced decrease in the sector of the fossil fuels (coal –22.6 percent, mineral oil –5.9 percent, natural gas –4.1 percent). The use of renewable energy sources, by contrast, rose by 2.9 percent. Since 1990, the share of the fossil fuels of the total energy consumption shrank from nearly 80 percent to 70.7 percent in 2009, while that of the renewable energy sources rose from 20 percent in the year 1990 to 29 percent in the year 2009.

Figure 10: Gross domestic consumption of renewable energy sources in Austria



Source: Statistics Austria, energy balance 1970-2009.

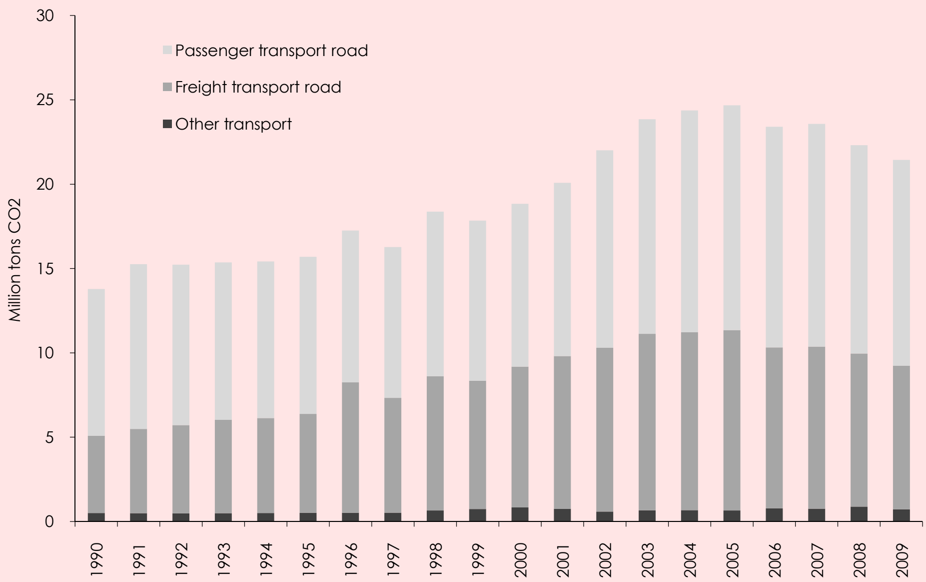
With a distinct reduction of the gross domestic energy consumption in the year 2009, the consumption of renewable energy sources rose by 2.9 percent. In 2009, hydropower, at 36.6 percent, ranked first among the renewable energy sources, followed by the biogenous fuels at 35.3 percent. Firewood took a share of 15.9 percent of the gross domestic consumption from the renewable energy sources, combustible wastes 7.7 percent, solar energy and geothermal energy 2.7 percent, and wind power and photovoltaic energy 1.8 percent.

Transport

In Austria, the CO_2 emissions relative to the transport sector have risen by 59.6 percent to 21.4 million tons CO_2 in the year 2009 since 1990 (Figure 11); as compared to the preceding year there was a decrease by 3.7 percent in 2009. Here, especially the emissions of the sector other transport (amongst others domestic air traffic, navigation on the Danube –17.7 percent) decreased. In 2009, the emissions of the freight road transport were lower by 6.2 percent and those of the passenger transport lower by 1.3 percent than in 2008. The by far largest share of the transport-related emissions in 2009 fell upon the road transport, at 97 percent (2008: 96 percent). The passenger transport on the road was, as before, at 57 percent, the biggest emitter of the transport sector followed by the freight road transport at 40 percent.

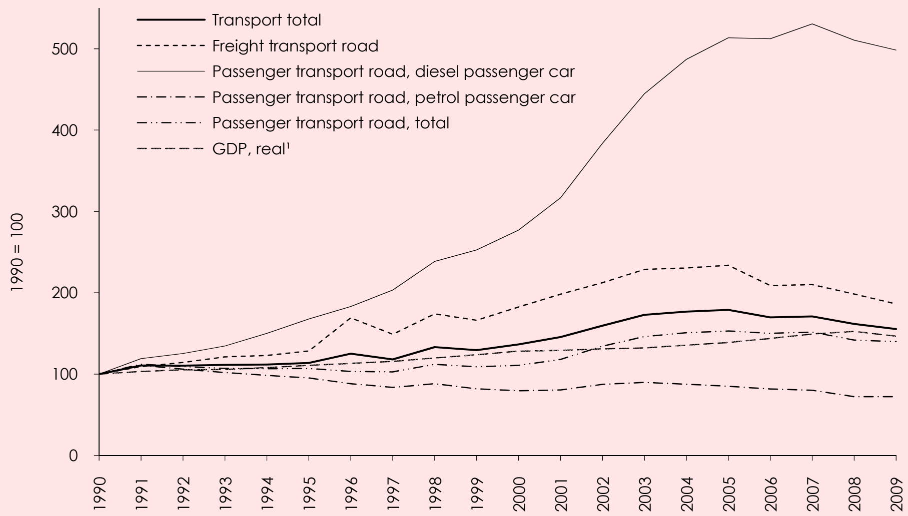
Since 2007, a decline of the CO_2 emissions in the transport sector was recorded. In the years 2008 and 2009 that decline was, however, to be at least partly ascribed to the economic crisis and the ensuing slump in the freight transport. It remains to be seen to what extent that trend of a reduction of the transport emissions is to continue in the period of the economic upswing with the emission development consequently taking an independent course from the growing economy in the transport sector. Only a continuous reduction of the emissions independent of the economic growth would permit conclusions as to increased energy efficiency in the transport sector and/or a change in the transport behaviour.

Figure 11: CO_2 emissions of the transport sector



Source: Federal Environmental Agency.

Figure 12: Development of the CO_2 emissions of the transport sector relative to the GDP



Source: *Federal Environmental Agency* (2011). – [1] On the basis of the prices of the preceding year, year of reference 2000.

In the period 1990-2009 the transport-related CO_2 emissions rose more rapidly (+55 percent) than the gross domestic product (+47 percent; Figure 12); here, the emissions of the freight transport increased distinctly stronger than the GDP (+86 percent), and those of the passenger transport on the road slightly underproportionally (+40 percent).

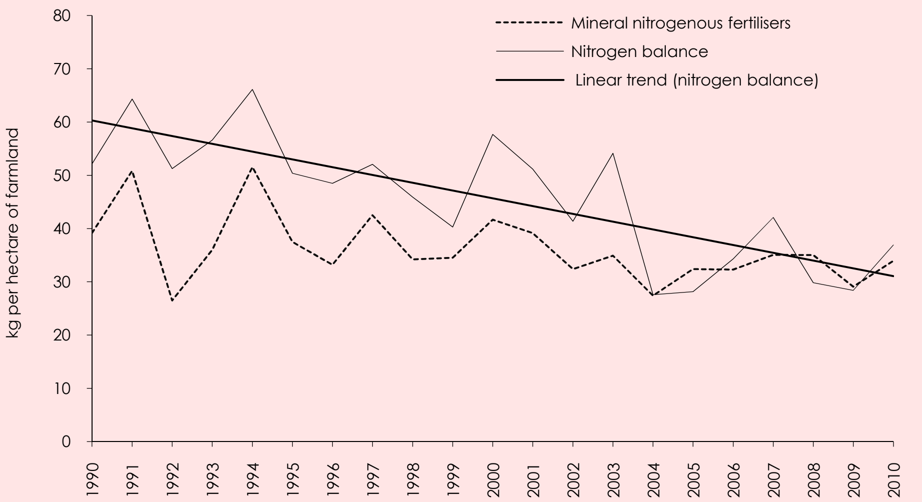
Agriculture

The nitrogen balance is the amount of nitrogen used in the agricultural sector offset by its extraction by agricultural crop plants. For 2010, there is a surplus – which goes to say that more nutrients are supplied to the environment than are extracted. The target is a zero balance. Observations since 1990 show a continuous approximation towards that target, i.e., the balance surplus and the amount of fertilisers employed are declining, as also mineral fertilisers are less used. In the last 20 years the efficiency of nitrogenous fertilisation in the Austrian agricultural sector has, therefore, been continuously stepped up.

The method to calculate that indicator was developed by the OECD. It offsets the nitrogen inputs (e.g., from mineral fertilisers, seeds, atmospheric deposition) with the outputs (nutrients in agricultural goods and foodstuffs). Natural nitrogen sources (manure from working animals, fixation of nutrients in legumes) are also included in the calculation. The short-term balance trend is determined by fluctuations in the crop production yield and the amount of mineral fertilisers supplied.

The determining factors for the long-term declining trend are, apart from enlargement of the organically cultivated area, a better quality of the fertilisers, more efficient application techniques, higher farm labour qualifications, and environmental policy measures such as the agri-environmental programme ÖPUL with specific measures in regions with higher levels of contamination of the groundwater with nitrogen compounds. The development of the nitrogen balance corresponds to the economic expectations: in phases of falling output prices a decrease of the use of mineral fertilisers is to be expected. In the year 2010 the basic production prices of crop products were by almost 20 percent higher than in 2009, for which reason the use of mineral fertilisers increased.

Figure 13: Nitrogen balance and use of mineral fertilisers



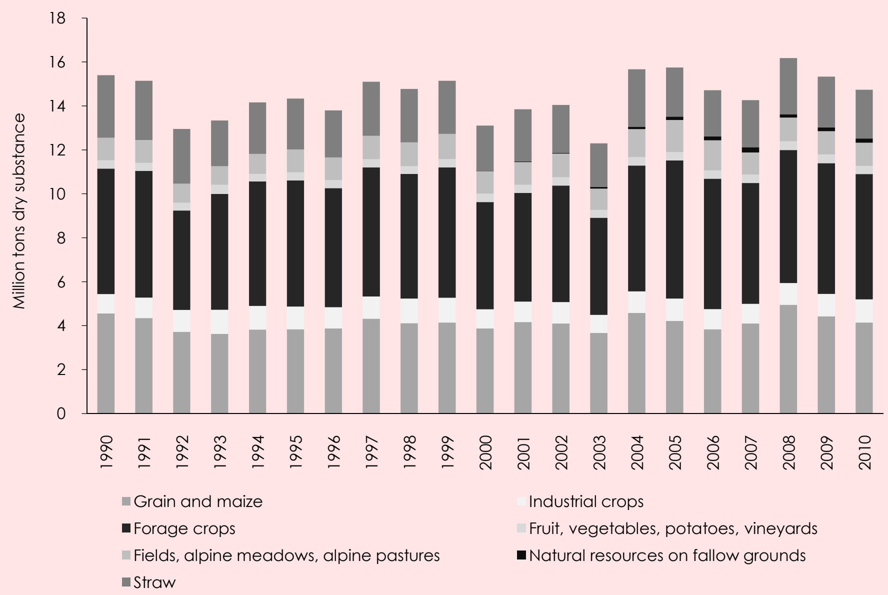
Source: WIFO calculations on the basis of OECD and Statistics Austria.

The basis of agriculture is the production of crop plants. The agricultural products are put to use as foodstuffs, animal feedstuffs, and material and energetic processing. Therefore, the production of biomass is a central indicator for the capability of the agricultural sector to provide inputs for downstream sectors. The long-term development of biomass production depends, apart from the availability of acreage and the development of the productivity, on the investments made by the agricultural sector. In the short term, the weather is a decisive factor for the yield. In 2010, the biomass harvested, measured against the dry matter with harvest and storage losses deducted, was again somewhat less than the amount of the preceding year. Following that, the production was, at slightly more than 14 million tons of dry biomass, all in all in keeping with the long-time average production.

In Austria, the area used for agricultural purposes is continuously diminishing. Up to now, the entailing decrease in the yield was only just balanced off by the progress made in productivity. In the year 2008, the obligation to set aside arable land as a prerequisite for farm subsidies was suspended after the health check reform in the same year. Consequently, the cropland in Austria was enlarged by approximately 30,000 hectares.

The energetic utilisation of biomass yielded from domestic production can, apart from such one-time effects, be increased in different ways: by-products such as straw or waste products such as liquid manure are no food competitors, as indeed are grain, oil crops, sugar beets ("industrial crops"). That competition between the use of agricultural products to generate energy and to produce foodstuffs can be attenuated in some areas, if the by-product is, say, protein from the ethanol or vegetable oil production to be used to feed animals, as is the case in Austria.

Figure 14: Production of commercially available biomass in the agricultural sector



Source: WIFO calculations on the basis of *Buchgraber et al.* (2003), DLG-table of the nutritive value of fodder value, *Resch* (2007), Statistics Austria. Straw is a by-product of grain production (without maize); the assumption being a balanced proportion of grain and straw of 1 : 0.9. Loss factors fodder sector according to *Buchgraber – Resch – Blashka* (2003), supply balances according to Statistics Austria.

Deliberations on the measurement and evaluation of the biological diversity

Pursuant to the UN Convention on Biodiversity as agreed on in the year 1992, biological diversity means "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Article 2.1). In brief, the Convention is to oblige the signatory countries to introduce measures for the conservation of the biological diversity, the genetic resources and the resources of the ecosystems.

Prior to the conference in Rio de Janeiro, which passed the said Convention, the "Brundtland-Report" had postulated the concept of sustainable development: "Sustainable development is development which meets the needs of the current generation without preventing future generations from satisfying their needs and choosing their own life-style" (*Brundtland – Agnelli – Hauff,* 1987). That definition has not only gained great significance in the general discussion relative to environmental policies, but is also frequently used as a reference in the economic literature.

The guiding principle in the (economic and) political practice in terms of sustainable development should, according to *OECD* (2011), not be a single indicator (as, say, the gross domestic product), but a number of dimension figures considering the material living conditions, the quality of life and of the environment, personal security, and subjective well-being (see box).

The protection of the biological diversity is, therefore, to be considered part of the concept of sustainable development. A comprehensive, systematic definition of the biological diversity to serve as the basis of the assessment of sustainability has not yet been provided. The aspect is, however, in principle taken into consideration in individual indicator systems; thus, the EU indicators for sustainable development in the domain "natural resources" contain the indicator "adequacy of the designated areas under the EU Habitats Directive"[3].

Welfare measures complementary to the gross national product

In an extensive reflection on the report on methods to measure the economic success and social progress published by the International Commission on Measurement of Economic Performance and Social Progress in 2009, *Stiglitz – Sen – Fitoussi* (2009B) discussed which key performance indicators were to be added to the "dashboard of the economic policy", with the gross domestic product being the only instrument there so far. They pleaded for a pragmatic approach employing the indicators to encompass all social assets (including the natural, social, and man-made capital) to measure welfare. These indicators should be combined with carefully selected physical indicators. By doing so, too much consumption in one period to the account of the consumption in future periods can be measured.

The Commission came to recommend as follows:

- A comprehensive measurement of the material and immaterial quality of life commands well-defined sustainability indicators.
- Changes of "assests" (stocks) are to be measured.
- A monetary sustainability index is advisable, but should, with the current conditions in mind, be mainly confined to purely economic aspects of sustainability.
- The environmental aspects of sustainability require an independent monitoring on the basis of carefully selected physical indicators.

These recommendations are understood on the premises that the measurement of sustainability is basically different from traditional statistical data. Amongst others, not only mere observations of the actual situation are required but also projections so as to deal with all aspects of sustainability. Accordingly, a retrospective view and the determination of the status quo do not suffice. Moreover, understanding the potential interlinkages of economy and natural environment is the prerequisite to be able to consider the long-term effects.

A large number of indicators in connection with the biological diversity is observed in Austria in an ongoing monitoring programme. Selected results show the following findings (*Federal Ministry of Agriculture, Forestry, Environment and Water Management,* 2010)[4]:

- Approximately 2,950 species of vascular plants grow in Austria. This high number, considering the size of the country, is to be ascribed to the diversity of the different habitats.
- Out of the above number, 1,187 (40 percent) can be assigned to be in the category of threatened plants. Thereof, 36 species can no longer be found in nature. 172 species are facing extinction. In comparison to Central Europe, Austria thus shows an above average number of threatened plant species.
- Most of the threatened plant species depend on dry and wet grasslands low in nutrients, bogs, and extensively cultivated farmland.
- The share of animal species facing extinction is, at 14 percent, highest in Austria among the birds.

The findings of the ecological research show that the further life and survival of the species can only be ensured if the habitats adequate to the species are available and in good state. This makes for a methodical approach that can meet the requirements of *Stiglitz – Sen – Fitoussi* (2009A), viz. the projection on changes of the

[3] http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/indicators/theme8.
[4] http://www.umweltbundesamt.at/umweltsituation/naturschutz/artenschutz.

biodiversity. From changes in the land use, conclusions can be drawn as to whether, and to what extent that land suffers deterioration. So as to avoid deterioration, large areas in Austria were put under nature conservation. 13.8 percent of the Austrian territory is protected under European ordinance law (Natura-2000 areas), further designated areas are protected by and are subject to conservation terms (nature reserves, protected landscape areas, national parks, natural parks, and other reserves)[5].

The agriculture statistics, the forest conditions surveys (*Geburek et al.*, 2010), and the ongoing sustainability monitoring of the *Federal Ministry of Agriculture, Forestry, Environment and Water Management* (2010) provide points of reference for changes on the remaining areas that might threaten the biological diversity. In the year 2008, the sealed surface areas (roads and rail grounds, building space, and fixed surface areas) amounted to approximately 4,416 km^2 or approximately 2.3 percent of the national territory. Because of the topography, however, only 37 percent of the entire territory can be used as permanent settlement areas for agricultural, settlement and transport purposes. Of the permanent settlement area, more than 6 percent are sealed surface areas (highest percentage in Vienna and in the alpine federal provinces Vorarlberg at 8.0 percent, Tyrol at 8.6 percent, and Salzburg at 7.3 percent). From 1995 to 2011, the sealed surface area throughout Austria increased by more than 170 percent.

In accordance with the Austrian Sustainability Strategy the gain in sealed surface areas is to be limited to 1 hectare per day only. In fact, more than 8 hectares of the surface area are sealed per day. Not only the sealing of areas entails severe consequences for the biodiversity: transport routes are barriers severely restricting if not impeding the mobility of numerous different species. Therefore, not only the scope of the surface areas sealed is decisive for the biodiversity but also the linear spread over the surface.

On the basis of that comprehensive survey, reliable conclusions can be drawn, from changes of the land use, to changes of the structure of the species. Since the intensity of the use of land depends strongly on economic activities, the impact thereof on the biodiversity can be assessed as soon as the functional relationship has been clarified. At present, final findings for Austria have not yet been concluded; the first results from the forestry sector (*Geburek et al.*, 2010) show that the indices to measure the biodiversity react systematically to changes induced by man. Subsequently, the effects of economic activities on the biodiversity are to be qualified by the interdisciplinary cooperation of ecology and economy not only ex post, as has been the case so far, but also ex ante.

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Key Indicators of Climate Change and Energy Use and Approaches to Measure the Biological Diversity – Summary

WIFO proceeds to put forward a series of key indicators on the development of greenhouse gas emissions, energy use und energy consumption employing the latest available data of 2009. Thus, indicators reflect the impact of the 2008-09 international economic and financial crisis. Thereafter, in 2009 greenhouse gas emissions decreased by a remarkable 7.9 percent with respect to the previous year. Gross domestic consumption of energy receded by 5 percent while renewable energy consumption grew by 2.9 percent. In contrast, real GDP dropped by 3.9 percent. In Austria, the energy-intense industrial production and freight traffic have been most affected by the economic crisis. Given the United Nations international year of biodiversity in 2010, this edition of indicators is complemented by a focal point on quantifying biodiversity.