2. MONITORING THE ENVIRONMENTAL AND RESOURCE PRODUCTIVITY

A central element of green growth is the environmental and resource efficiency of production and consumption improving over time and space, and across sectors. Understanding this evolution and the factors driving these changes is an essential ingredient in developing green growth policies.

Progress can be monitored by relating the use of environmental services in production to the output generated and by tracking the decoupling of trends in the production and environmental services. The ultimate goal here is to achieve an absolute decoupling, i.e. the state when the economic output is growing, but the pressures and impacts from the use of environmental services show an absolute decrease.

Decoupling at the national level can be partly explained by displacement effects – such as the substitution of goods or services produced domestically, and requiring high levels of environmental services, with imports – that do not necessarily imply decoupling at the global level. Such shortcomings in production-based measures can be addressed by focusing on consumption-based measures, such as consumption-based greenhouse gas emissions.

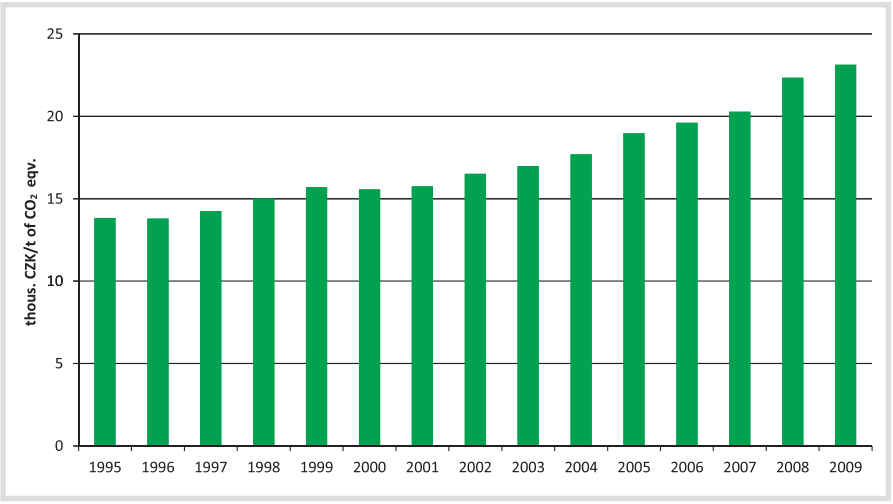
The main issues of importance to green growth include carbon, energy and resource productivity, which further comprises material, water and nutrient resources.

2.1. GREENHOUSE GAS PRODUCTIVITY

The greenhouse gas emission productivity of economic production is calculated by dividing gross domestic product in constant prices by the total emissions of all greenhouse gases monitored by UNFCCC caused by economic production activities (in CO_2 equivalents). The household's emission and sinks from the land use change are included.

Climate change is one of the foremost challenges we are facing nowadays. Its impacts are expected to have a substantial influence on the socioeconomic development. The key aim of greenhouse gas emission productivity indicator is to monitor eco-efficiency of the whole economic production and assess its development over time.

Figure 7: Production-based greenhouse gas productivity (thous. CZK/t of CO_2 eqv., in 2000 constant prices)



Source: Czech Hydrometeorological Institute, Czech Statistical Office

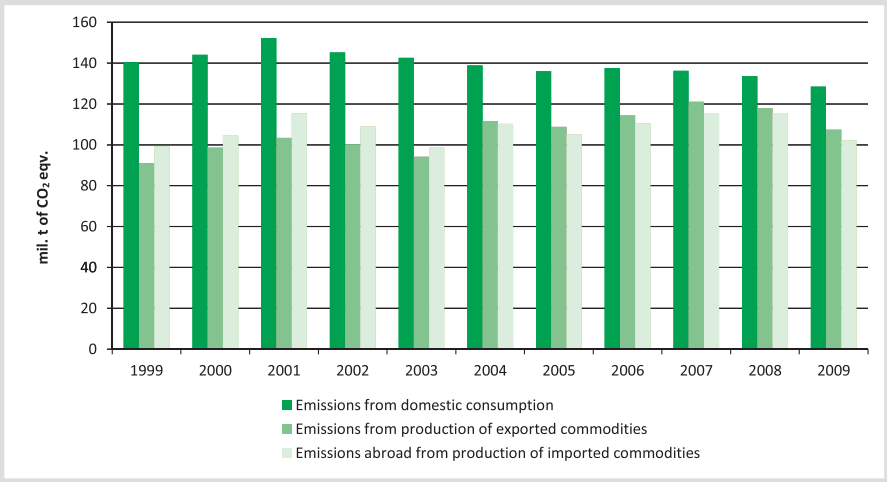
Emissions in the Czech Republic dropped dramatically at the beginning of the 1990s. The development of emissions has been fluctuating since and the growth of this indicator is driven mainly by an increase in economic productivity. The international comparison shows that Czech greenhouse gas emissions productivity achieves 67% of the OECD average.

2.2. CONSUMPTION-BASED GREENHOUSE GAS EMISSIONS

Greenhouse gas emissions from domestic consumption are calculated as emissions from domestic production plus emissions from the production of imported commodities minus emissions from the production of exported commodities. The greenhouse gas emissions of imports and exports shows the shifts in environmental pressures related to global climate change: instead of releasing emissions from producing commodities at home, the economy imports these goods and shifts the emissions related to their production to other countries.

Greenhouse gas emissions from domestic consumption decreased by about 9% in 1999-2009. On the other hand there was an increase in greenhouse gas emissions from the production of exported commodities by about 18% and a slight increase in greenhouse gas emissions abroad from the production of imported commodities by about 3%. A larger increase in emissions related to exports compared to emissions related to imports implies growing shifts of environmental pressures from other countries to the Czech Republic.

Figure 8: Greenhouse gas emissions from domestic consumption and from the production of exported and imported commodities (mil. t of CO_2 eqv.)



Source: Charles University Environment Center, Czech Hydrometeorological Institute, Czech Statistical Office

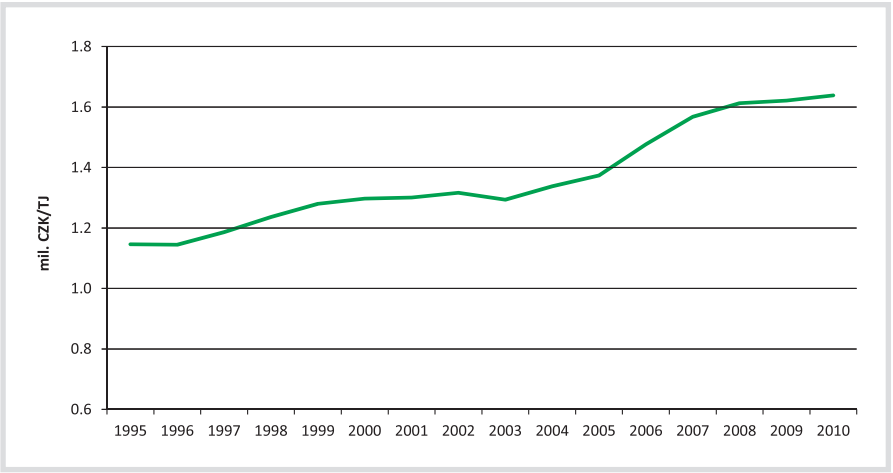
In other EU27 and OECD countries, greenhouse gas emissions related to imports are usually significantly higher compared to the emissions related to exports. Similar emission levels related to imports and exports in the Czech Republic are caused by a high share of coal in the primary energy supply. Coal is more carbon-intensive than other fuels, which implies more carbon embodied in the goods produced.

2.3. ENERGY PRODUCTIVITY

The indicator of energy productivity is constructed as a ratio between the gross domestic product expressed in constant prices and the total primary energy supply.

An increasing energy productivity is important for fulfilling the objective of the green growth concept. It enables the production of a higher economic output from the same amount of energy. This in principle does not diminish the consumption of raw materials and fuels, but it increases welfare produced by the same energy input. Energy productivity is connected with technological development and with the growth of high value-added sectors.

Figure 9: Energy productivity (mil. CZK/TJ, in 2000 constant prices)



Source: Czech Statistical Office, Ministry of Trade and Industry (data for 2010 are preliminary)

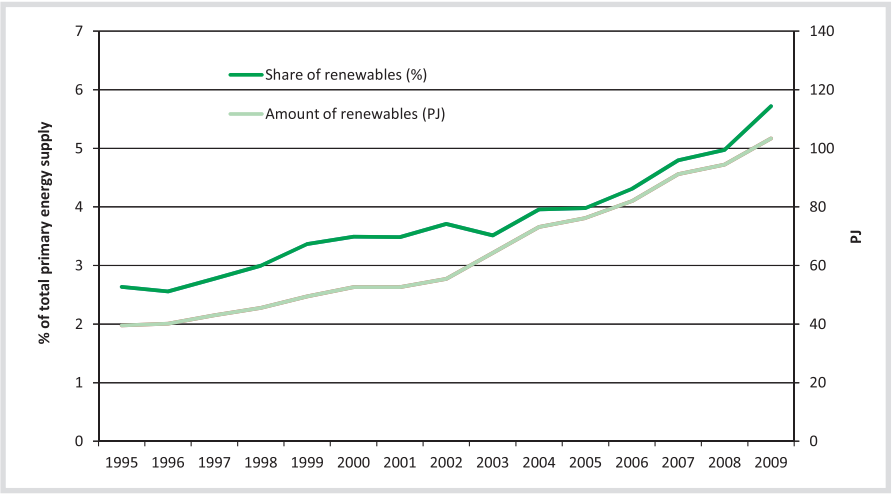
Energy productivity of the Czech Republic is steadily increasing. During the last few years, the pace of energy productivity growth has slowed down due to many reasons, among others to the global economic crisis. Energy productivity has no legally-binding target in the country. However, according to the national energy policy energy intensity (the inverse value of productivity) should decrease by about 3% annually. In 2009, the Czech Republic was 20% below the OECD average in energy productivity.

2.4. RENEWABLE ENERGY SOURCES

The renewable energy sources indicator is constructed as a share of the total amount of energy produced from renewable energy sources (as specified by law 180/2005 Coll.) from the total primary energy sources of the Czech Republic.

Renewable energy sources are a keystone of green growth. They provide sustainable, low-carbon energy basis on which green growth can be built. The problem with renewable energy sources is their relative low density compared to intensive non-renewable energy sources and their technological unpreparedness for a large scale contribution to the energy basis of the economy.

Figure 10: Renewable energy sources (% of total primary energy supply)



Source: Czech Statistical Office, Ministry of Trade and Industry

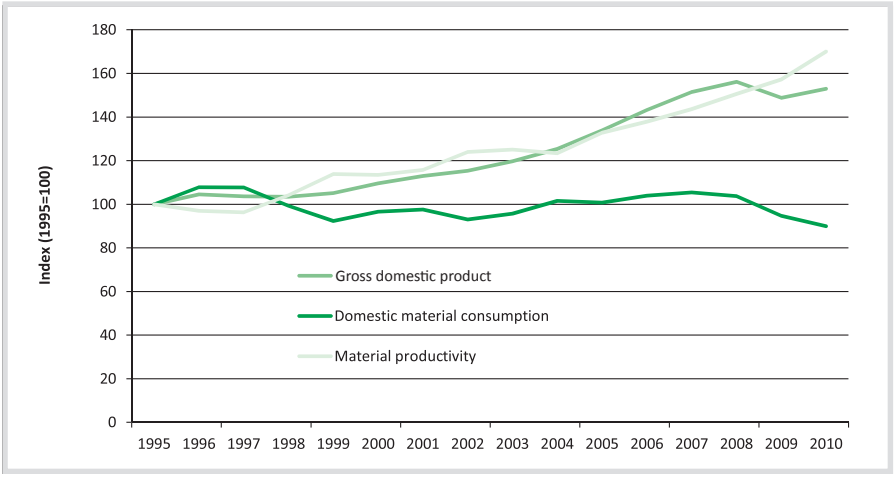
There is a significant and growing trend in the use of renewable energy sources in the Czech Republic. The pace of growth has been increasing since 2002 due to many factors, of which the public support for renewable energy is one of the main reasons. There are two binding targets for the Czech Republic in the field. A short term goal was to achieve an 8% renewable sources level by 2010 while the EU as a whole target level was 12% (the average production of energy from renewable energy sources in the OECD countries was 7.1% in 2008). The long-term target for the country is 15% by 2030.

2.5. MATERIAL PRODUCTIVITY

Domestic material consumption is the sum of the physical amount of extracted materials (energy carriers, ores and non-metallic minerals) and produced biomass (agricultural crops, timber logging, etc.), which were obtained on the territory of a given country including, all imports and excluding all exports. Material productivity itself is calculated as gross domestic product (in constant prices) divided by domestic material consumption.

The material productivity of the Czech economy increased by about 70% in 1995-2010. This increase was mostly driven by an increase in the gross domestic product (by 53%) while domestic material consumption remained fairly stable. This development may reflect the more efficient use of materials by the Czech economy. In spite of the increase in material productivity, the Czech economy did not experience any more profound absolute decoupling between material use and economic performance – the domestic material consumption ended at only moderately lower levels in 2010 compared to 1995.

Figure 11: Material productivity, domestic material consumption and gross domestic product (index, 1995=100)



Source: Czech Statistical Office

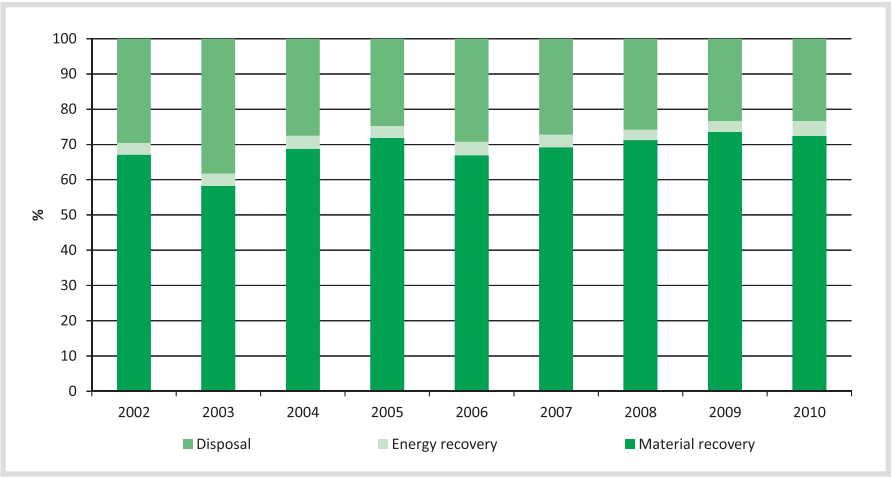
The material productivity of the Czech economy is more than 30% lower as compared with the EU27 and OECD averages. This is given by the fact that the domestic material consumption per capita is close to the EU27 and OECD averages, while the gross domestic product per capita is about 30% lower. This disproportion between material use and economic performance can be attributed to a relatively high share of industry, as industries are more material-intensive than services, as well as the high share of solid fuels in the primary energy supply, as one can get less energy per weight unit of solid fuels compared to liquid and gas fuels.

2.6. WASTE TREATMENT

Waste treatment comprises of gathering, collecting, purchasing, transport, storage, treatment, recovery, and disposal of waste, including municipal waste. European legislation divides the waste treatment methods into waste recovery and waste disposal, while at the national level some other types of waste treatment are added. For the purpose of this indicator, the waste treatment methods were broken down into material recovery, energy recovery and waste disposal (including incineration).

The share of disposed (mostly landfilled) waste went slightly down in 2002-2010, on the other hand the share of material and energy recovery of waste increased. In particular material recovery, which comprises the majority of treated waste in the Czech Republic, reached a share of 70% of the total waste treatment in 2010. However, apart from material recovery as defined by European legislation, this treatment method also includes the use of waste for landscaping, which represents a significant amount of waste, mostly soil. Apart from this soil, the share of material recovery was about 47% in 2010.

Figure 12: Waste treatment by main treatment methods (%)



Source: Czech Statistical Office

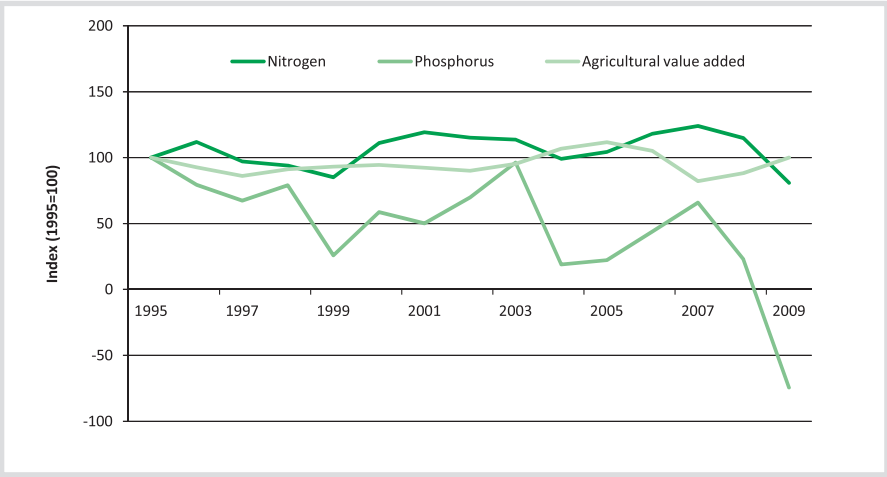
An increase in the material recovery of waste is noticeable in the whole EU27 (an increase of 21% in 2004-2008). Even though the international comparison can be problematic due to different methodologies of waste treatment reporting in the EU countries, the material recovery of wastes in the Czech Republic reported by Eurostat was 26% higher than the EU27 average in 2008.

2.7. NUTRIENT BALANCES AND AGRICULTURAL OUTPUT

The nutrient balance is calculated by subtracting the removal (e.g. uptake by crops) from the supply (e.g. manure or mineral fertilizer spread on fields). Value added (in constant prices) is used as a measure of agricultural output.

The nutrient balance for nitrogen did not show any particular trend in 1995-2009 while the nutrient balance for phosphorus ended up at lower values at the end of the monitored period compared to 1995 (the negative balance in 2009 was given by the shift of application of fertilizers from autumn 2009 to spring 2010 due to climatic conditions). As the agricultural value added remained quite stable, there was no decoupling between agricultural output and environmental pressures related to the use of nitrogen fertilizers. On the other hand there was a relative decoupling between agricultural output and environmental pressures related to the use of phosphorus fertilizers.

Figure 13: Nutrient balances for nitrogen, phosphorus and agricultural value added (index, 1995=100)



Source: Czech Statistical Office, Eurostat

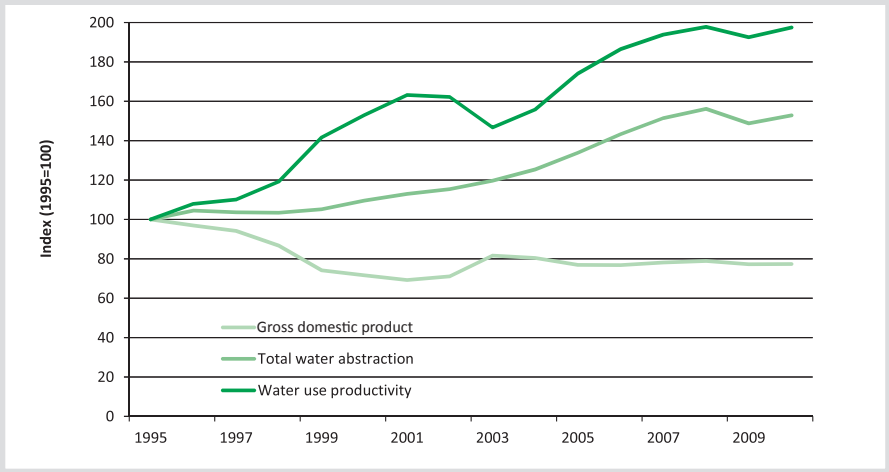
Compared to most of the EU27 and OECD countries, the Czech Republic shows higher values for nitrogen nutrient balance, but lower values for phosphorus nutrient balance. Before the so-called Velvet Revolution in 1989, the nutrient balances in the Czech Republic were a few times higher, which posed a significant threat to the quality of soils and ground water, eutrophication of surface waters, and to biodiversity. Now the nationwide situation has improved, but there are still significant nutrient surpluses in regions with intensive agricultural production. Besides concerns stated above the lower reliance on nutrients is also desirable because phosphorus is becoming increasingly scarce and the production of nitrogen fertilizers from elemental nitrogen is very energy intensive.

2.8. WATER USE PRODUCTIVITY

Total water abstraction includes the abstraction of both surface and underground water. Only abstractions higher than 6,000m³ per year or 500m³ per month are recorded. Water use productivity is calculated as the gross domestic product (in constant prices) divided by the total water abstraction.

Water use productivity of the Czech economy increased by about 97% in 1995-2010. This increase was caused by both an increase in the gross domestic product and decrease in the total water abstraction. This reflects the more efficient use of water by the Czech economy and also an absolute decoupling: the growth in economic performance and an absolute decrease in environmental pressures related to water abstraction.

Figure 14: Water use productivity, total water abstraction and gross domestic product (index, 1995=100)



Source: Czech Statistical Office, Ministry of Agriculture, T. G. Masaryk Water Research Institute

Water abstraction in the Czech Republic is dominated by surface water, which composes about 80% of total water abstraction. In 2010, the power industry had the largest share in total abstraction (48.3%), followed by the water supply for public use (34%) and industry (14.5%). These three sectors also stood behind the decrease in water abstraction in 1995-2001, while the increase in 2001-2003 was only caused by the power industry. Very low abstractions, on the other hand, were attributed to agriculture in 2010 (about 2%). Compared to other EU27 and OECD countries, the Czech Republic shows below-average per capita water abstraction. Higher water abstraction is characteristic for countries, which extensively abstract water for agricultural purposes such as Greece, Spain or Bulgaria.