

Undergraduate Program in Central European Studies

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Environmental Policy in the Central European Context

Time: Tuesday 10 am

Location: Coffee Heaven, Můstek

Professor: Jana Krajcova (JK), email: jana.krajcova@cerge-ei.cz

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See also: <http://home.cerge-ei.cz/richmanova/TeachingUPCES.html>

(and <http://home.cerge-ei.cz/ortmann/UpcesCourse/UpcesCourse.html> for Spring 2009 course)

8 Environmental Policy in the Czech Republic – History and current issues

Recall the evidence from the literature:

INTERVENTIONIST SOLUTIONS:

Plott (1983)

the MOST efficient: the **permits** policy > **taxes** > **standards** > the **unregulated** market is the LEAST efficient

Plott 1982, p. 107: “**The standards approach is the one found most frequently in application. The current air pollution policies are a good case in point.**”

Porter et al (2009, p. 190) “**Among economists at least, the use of tradable emission allowances under an aggregate emission cap is generally considered a mature policy technology. It has become the default policy option in controlling a variety of large scale air emissions and is being increasingly considered for replacing inefficient sourcespecific regulation of water pollutants (Tietenberg, 2002). The same policy technology is also being used in fisheries regulation and elsewhere (National Academy of Sciences, 1999). In a competitive emissions market with low transaction costs, the initial allocation of rights will not affect the final use of the allowances. However, how the rights are allocated can have significant economic consequences through their effect on the entry and exit decisions and marginal tax rates (Goulder et al 1999).**”

Tradable emission permits (“allowances”)

- Polluters with high abatement costs have incentives to buy them
- Polluters with low abatement costs have incentives to sell them

- In the aggregate the number of permits is determined by a desirable standard of pollution (as in the standards policy)
- Important design issues for such permit markets:
 - How to endow firms (consumers) with permits?
 - How to minimize the transaction costs?
- in absence of transaction costs, no efficiency losses, “only” distributional concerns
 - in presence of transaction costs, “cost-effectiveness” is compromised
 - What are the consequences of particular transaction costs / endowments

Cason, Gangadharan (2004)

By and far, the theory (as reflected in the hypotheses) gets confirmed.

With decreasing marginal t-costs, final cost-effectiveness greater the further the initial endowment of allowances is away from the cost-effective allocation; with constant marginal t-costs, ... no impact on final cost-effectiveness

NON-INTERVENTIONIST SOLUTIONS:

Experimental evaluation of Coase’s Theorem:

Hoffman & Spitzer (1982)

- the results provide strong support for Coase's proposition that agents will bargain to a joint-profit- maximizing outcome when it exists in 2- and 3-party bargaining situations under full information and when one party has the right to make the decision unilaterally under limited information.

Harrison & McKee (1985)

- strong support for the Coase Theorem
- In the absence of transferable property rights the parties will not choose the joint payoff maximum
- The establishment of joint property rights increases the number of joint maximum payoff outcomes.
- The establishment of unilateral property rights increases the number of joint maximum payoff outcomes.

VOLUNTARY PROGRAMS:

Cason, Gangadharan (2002)

- a market with incomplete information (about the environmental quality of the good) and consumers that care for environment
- no signaling, no reputational concerns => market failure
- various treatments to remedy the market failure:;
- (costly) **certification** (“eco-label”) > seller **reputation** > **cheap talk** signals (when looking at the quality provision, there are some efficiency costs of certification)
- laboratory results suggest that government regulators or non-governmental organizations can improve environmental performance by providing the option of certified green labeling

Potoski, Prakash

- joining ISO 14001 (a voluntary “club” program, setting standards of conduct for its members) improves environmental performance

Evans et al.

- Voluntary programs ... one the hand ...
- On the other hand ... mandatory information disclosure programs such as The EPA's Toxics Release Inventory (TRI)
- Mandatory information disclosure programs require that the firm report information that could be damaging ... (e.g., reputationally).
- Reporting, while being done on the firm level to EPA etc., is initiated within firms by individuals... clearly, that means there is all kinds of potential for moral and other dilemmas.
- Do firms report?
- Old Government Accountability Office data from 1991 suggest that about one third of firms that should have reported did not, Intentionally or unintentionally (they did not know)

PART I – State of the environment in CR: History and current issues

The Environment in the Czech Republic 1989-2004/2007

CENIA – Czech Environmental Information agency www.cenia.cz

The first 15 years after the velvet revolution

“From the environmental point of view the last fifteen years have been long enough for us to become a standard European country, whose inhabitants can breathe relatively fresh air and drink quality water. On the other hand this time period has not been long enough for forests to become healthy and for soil to be cleared of an abundance of pesticides and pollutants. The youngest generation of people, who still remember yellow fog in the surroundings of the North Bohemian power plants and who used to go to “curative stays” away from their homes, is not even in their thirties yet.”

“In the past fifteen years we have had the chance to witness or take part in the process concerning environmental protection, the creation of the basic conceptual and legal framework for this environmental protection and its enforcing at home as well as in terms of international cooperation.”

Libor Ambrozek, Minister of Environment

Back in history

- pollution of some parts of the environment was not a problem,
- original regulations to preserve such commodities (quantity and quality) for economic reasons
- became a problem with developing industrial production, obviously,
 - the absorption capacity of the atmosphere and surface waters not unlimited
 - pollution harmful to health,
 - increasing problems with waste management

- agricultural and forest lands reduction
- expanding transportation infrastructure (and pollution)
- new technologies -> new problems (artificial radioactivity, non-natural chemicals, genetically modified organisms)
- 19th/20th century -> need for systematic environmental protection
- most favorable conditions in developed countries of Western Europe and North America = biggest pollution producers, but at the same time, countries with the highest expenditures on environmental protection and with inhabitants showing the greatest interest in the issue
- in the 2nd half of the 20th century rise of environmental protection law, initiation of international cooperation, conventions and protocols....

Czech Republic

- situation influenced by geopolitical situation after 1945
- Czechoslovakia, one of the most developed countries in the world with strong manufacturing industry before WWII forced by the Soviet bloc to shift its production to heavy industry, especially metallurgy, steel industry, coal carbonization, heavy chemical industry and mechanical engineering
- enormous energy demands of heavy industry satisfied by mainly brown-coal fired plants -> pollution + strip mining; none of the coal plants had a desulphurization equipment
- socialistic farming -> adverse impacts on agricultural landscape, excessive use of fertilizers, chemical pest control
- protection on some level existed (water law, forest law, laws on state protection of nature and agricultural land, measures against air pollution) -> production was, however, priority
- adverse effects became very visible in 1970s and 80s ->
 - dead trees in "Krusne hory",
 - unnatural color of rivers in Northern Bohemia (Usti nad Labem),
 - "moonscape" = areas of strip mining,
 - life expectancy of people living in polluted areas of North-Western Bohemia and Northern Moravia significantly below national average, which itself lower than the average in Western Europe
- emergence of professional and civic environmental activists – some of them banned and punished by the regime
- in 1980s the problem became evident -> environmental committees of the communist party were established, some tangible measures were implemented (e.g. fly-ash separators installed in power plants)
- 2nd half of 90s citizens becoming conscious of the problem, the environmental protection became a recognized priority after 1989

4 periods of the development of environmental protection in CR after 1989

Founding Period (1989–1992)

- started with the so-called Rainbow Program, a political document focused on preparation and approval of new environmental laws (especially new laws on waste, air, nature and landscape protection and environmental impact assessment) and amendment of some laws from the previous period.
- new regulations struggled to achieve the best possible improvement of the environment in the shortest time and contained a number of transformation features (e.g. very strict rules of trans-border waste shipments, temporary emission limit values or temporary unsecured landfills).
- the assessment of resulting economic impact was not a priority

- a period of economic transformation which made the economic impact assessment almost impossible.
- old public administration institutions transformed and new institutions were established (especially the Ministry of the Environment and the Czech Environmental Inspectorate) as well as supportive organizations (such as the State Environmental Fund of the Czech Republic or the Czech Environmental Institute).
- the public interest in the environment was high, the condition was improving mainly thanks to the economic transformation (restrictions or shut-downs of many energy-intensive and polluting industries).

Implementation Period (1993–1998)

- the environmental laws had been drafted and their implementation started
- unsafe landfills closed,
- purification devices installed in power plants and other pollution-producing facilities,
- gas pipelines installed in cities and in the country within a global program,
- waste water treatment plants and sewer systems built in some places.
- the **environmental impact assessment (EIA)** became a common practice.
- annual investment costs made up between 2 and 2.4 % of the GDP
- the condition of basic environmental elements, namely air and water, started to improve fast (values of some pollution indicators were decreasing by more than 10 % a year).
- on the other hand, the **public interest** in the environment **was receding**.
- In 1995, after long political debates, a **new national environmental policy** was approved with **the aim to achieve the same level of the environmental quality as the EU15 average by 2005**.
- 1994 negotiations with the OECD => certain liberalization of existing laws (especially on waste management) and preparation of new laws (especially on chemical substances and preparations)

Pre-Accession Period (1999–2003)

- the main objective was to prepare CR for accession to the European Union.
- a second generation of environmental legislation was prepared and passed; virtually all existing legal regulations were replaced by new ones and issues which had not been dealt with (e.g. GMO, industrial accident prevention, integrated pollution prevention and control – IPPC, packaging and package waste, and access to environmental information) were newly regulated.
- the whole process finished in June 2003; the European Commission provided the Czech Republic with three transition periods (concerning directive on packaging and packaging waste, directive on urban waste water treatment and the deadline of emission limits for sulphur dioxide from two large combustion plants).
- the condition of environmental elements was stabilized at the level of “worse EU average”,
- the investment in environmental protection dropped to 0,7 % of GDP and the public interest remained quite low
- the new 1999 national environmental policy, fully compatible with the environmental policy of the European Communities was updated in 2001
- further development was substantially influenced by the public administration reform where many powers were transferred to the new regions (13 regions and the capital).

European Period (from 2004)

- meant basically a continuation of trends which had started in the previous period, i.e. stabilization of the environment, investment of 1 % of GDP, low public interest.

- the legislation was amended continuously with respect to the development of European regulations and on the basis of existing experience with the implementation.
- In 2004 a new national environmental policy of the Czech Republic was approved with effect until 2010.

CLIMATE

- after more pressing problems (air and water pollution, waste management) have been solved, at the beginning of the pre-accession period, climate protection became more important, now no.1 issue in common with the EU

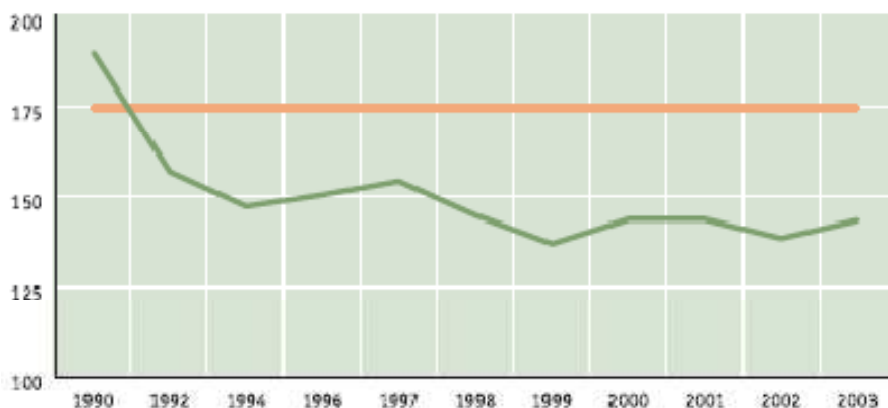
Total GHG emissions from 1990 to 2003 [mil. t CO₂eq]

	1990	1992	1994	1996	1997	1998	1999	2000	2001	2002	2003
CO ₂	161,9	133,3	125,9	128,3	132,7	124,5	117,7	123,9	123,6	118,6	123,3
of which CO ₂ emissions	164	139,8	130,6	132,8	137,3	128,3	121,1	127,9	128	123,1	127,1
of which CO ₂ sink LUCF	-2,1	-6,5	-4,7	-4,5	-4,6	-3,8	-3,4	-4	-4,4	-4,5	-3,8
of which CO ₂ from road transport	6,7	6,5	7,5	9,6	10,3	9,9	10,7	11,2	11,8	11,0	13,095
CH ₄	16,8	14,4	13	12,6	12,1	11,4	10,7	10,7	10,5	10,4	10,2
N ₂ O	11,3	9,2	8,3	9,2	8,8	8,4	8,1	8,2	8,3	8,2	8,2
F-gases	-	-	0,2	0,3	0,6	0,5	0,5	0,9	1,3	1,3	1,7
Total	190	156,9	147,2	150,4	154,2	144,8	137	143,7	143,7	138,5	143,4
In % of 1990	100	82,6	77,5	79,2	81,2	76,3	72,2	75,7	75,7	72,9	75,5

Source: Czech Hydrometeorological Institute, CO₂ from road transport: Transport Research Centre in Brno

The aggregated CO₂eqv emissions were calculated using the radiation potential values of the greenhouse gases according to valid methods (e.g. for CO₂ = 1, CH₄ = 21, N₂O = 310). It means that e.g. methane is 21 times more harmful to the Earth's climate system than carbon dioxide. The enumeration includes also emission sink caused by changes in landscape use and forestry (LUCF – Land-Use Change and Forestry). Emissions from international air transport are provided separately.

GHG emissions in the Czech Republic compared to the Kyoto Protocol target



Source: <http://indikatory.env.cz>

- absolute majority of the main greenhouse gas, i.e. carbon dioxide, comes from **fossil fuel combustion in power industry** (fossil fuels make up almost 90 % of primary domestic energy sources), and also from **transportation**

- the decrease in emissions between 1990 and 1992 without any doubt caused by a drop in industrial production and the economic transformation (reduction or complete shutdown of some energy-intensive productions)
- in 90s more than 2000 MW of installed output in coal-fired power plants was closed, smaller sources changed fuel (to natural gas) and increasing industrial production came along with modern and energy efficient installations.
- since 1998 the emissions have stabilized at about 76 % of the base year 1990
- **current problem:** levels of specific carbon dioxide emissions per capita and year (approx. 11.6 tons) for CR exceeds both the OECD average (10.9 t) and the EU15 average (approx. 8.2 t).
- **positive fact:** CR by far complies with the Kyoto Protocol target to keep the GHG emissions 8 % below the 1990 level.

Ozone Layer

- the risk of the depletion of the Earth ozone layer is viewed as a serious global problem, which has been successfully handled at the international level
- first addressed in CR in the early 1990s, when appropriate legal regulations based on international treaties (Vienna Convention, Montreal Protocol) were passed and implemented.
- In the early 1990s the annual use of ozone depleting substances in CR was over **5,000** tons
- Since 1 January 1996, the production and import of "CFCs" (Chlorofluorocarbon = a class of chemical compounds that deplete ozone) were outlawed and more restrictions on other categories of regulated substances were placed.
- The basic use of ozone depleting substances is now covered by imports and does not exceed **200** tons per year.
- CR meets its obligations resulting from the Montreal Protocol and its amendments

Air

- air pollution was the most pressing issue at the beginning of the Founding Period
- national emissions of most major pollutants (especially **suspended particulate matter, sulphur dioxide** and **nitrogen oxides**) were one of the highest in the world and the air pollution of some regions (especially in North-Western Bohemia and Northern Moravia) was causing serious **health problems** and **large forest damage**.
- **1st generation of new legal regulations of air protection, passed in 1991, was focused on the biggest air pollution decrease possible in the shortest time.**
- In late 90s the emission and pollution levels stabilized and more attention was paid to the transposition of EC regulations -> in 2002 new law on air protection and implementing regulations was passed.
- air protection can be divided in two areas: emissions and air pollution levels
- emissions of all monitored pollutants dropped between 1990 and 1998; like with GHG emissions, the main reason during the Founding Period was **economic transformation** and resulting cuts or shutdowns in some energy-intensive and polluting productions.
- between 1993-1998 the decrease in air pollution was caused by the implementation of **emission reduction measures** like the introduction of dust filters, desulphurisation units, installation of gas pipelines, implementation of protective measures in industrial pollution sources, installation of smog warning and regulation systems

Emissions of main pollutants 1990–2004

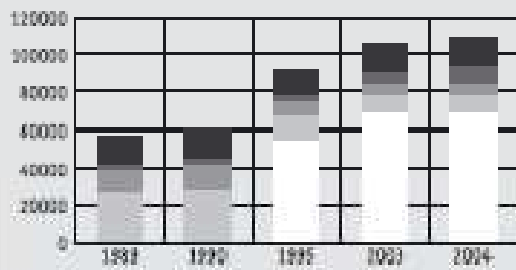
Year	Dust (kt)	SO ₂ (kt)	NO _x (kt)	CO (kt)	VOC (kt)	NH ₃ (kt)	Cd (t)	Hg (t)	Pb (t)	PAH (t)	PCB (kg)	PCDD (kg)
1990	565	1850	551	1275	441	156	4.3	7.5	241			
1991	524	1749	527	1197	394	134	3.9	7.4	215			
1992	425	1495	499	1141	366	115	3.6	7.3	249			
1993	367	1366	459	1055	346	99	3.5	7.5	228			
1994	258	1205	378	1036	310	91	3.5	7.2	222			
1995	211	1103	370	1043	292	86	3.6	7.4	204			
1996	178	944	366	1012	293	81	2.9	5.9	181			
1997	127	697	349	944	277	81	3.0	5.5	171			
1998	84	438	321	765	242	80	2.7	5.2	151			
1999	66	268	313	716	234	75	2.7	3.7	146			
2000	57	264	326	648	227	74	2.9	3.8	106			
2001	54	251	332	649	220	77	2.6	3.3	47	36.7	96.1	0.19
2002	59	237	318	546	203	84	2.7	2.8	47	24.4	82.5	0.18
2003	79	231	333	576	204	82	2.3	1.8	39	26.7	84.6	0.19
2004	76	229	339	581	199	81	2.5	2.0	40	27.0	85.0	0.19

Source: Czech Hydrometeorological Institute (CHMI), Czech Environmental Inspectorate (CEI), Transport Research Centre, Research Institute of Agricultural Machinery, Czech Statistical Office (CSO)

PCDD – polychlorinated dibenzodioxines/
dibenzofuranes
VOC – volatile organic compounds
PAH – polycyclic aromatic hydrocarbons
PCB – polychlorinated biphenyls

- for nitrogen oxides the change is less distinct: the positive influence of reduction measures was partially offset by transport increase
- the share of road transport is increasing, although it is partly moderated by fast car enhancement (increase in the number of cars with catalysers from zero in 1990 to approximately 47.5 % in 2004).

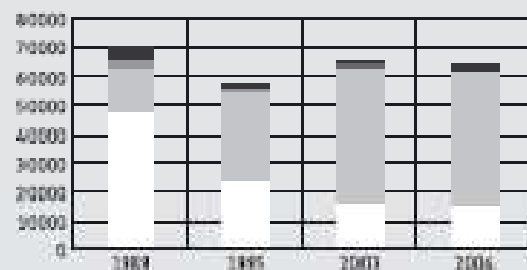
Conveying capacity of different types of passenger transport in the Czech Republic (mil. people.km)



Source: Statistical yearbooks; Transport yearbook

Public city transport
Air transport
Railway transport
Road - public transport (includes trolley buses)
Road - ICT (= individual car transportation has been monitored since 1995)

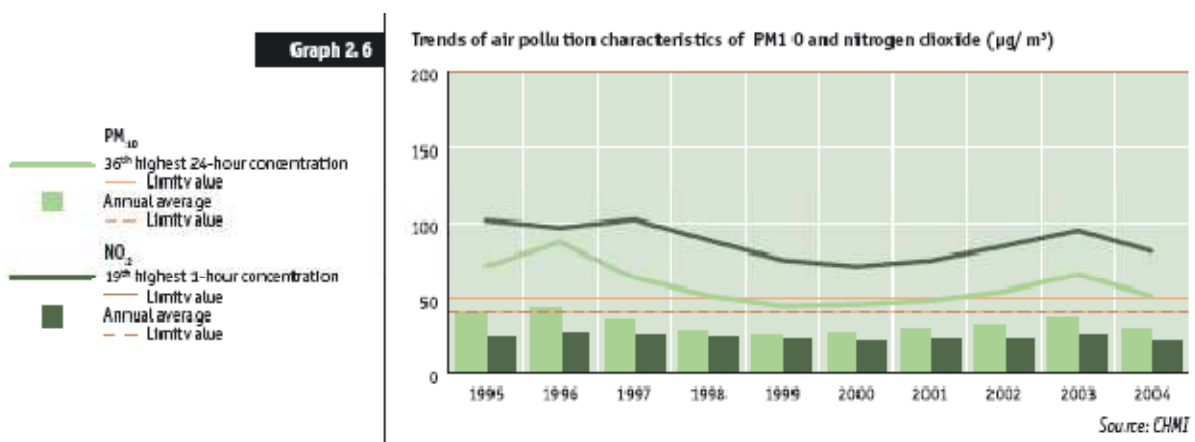
Conveying capacity of different types of freight traffic in the Czech Republic (mil. tonnes.km)



Source: Statistical yearbooks; Transport yearbook; GENA reconstruction. Due to changes in methodology, the data comparability is valid from 2000.

Pneumatic transport
Air transport
Water transport
Road transport
Railway transport

- after 1998 the emission reduction slowed -> stabilization (only exception is 50 % y/y drop in lead emissions caused by the prohibition of leaded petrol distribution effective from 1 January 2001)
- the growth in emission of solid particular matter in 2002 and 2003 and the growth of ammonia emissions in 2003 were caused by changes in methodology (the emission inventory was extended by other air pollution sources).
- **the most pressing emission problem** of the Czech Republic is a high emission of **dust and nitrogen oxides**.
 - emission of dust is reflected in exceeding limit values for human health protection for suspended particulate matter PM10,
 - the values of nitrogen oxides are so high that the national emission ceiling might not be complied within 2010.



Areas of exceeded limit values of regulated pollutants excluding ozone in 2004



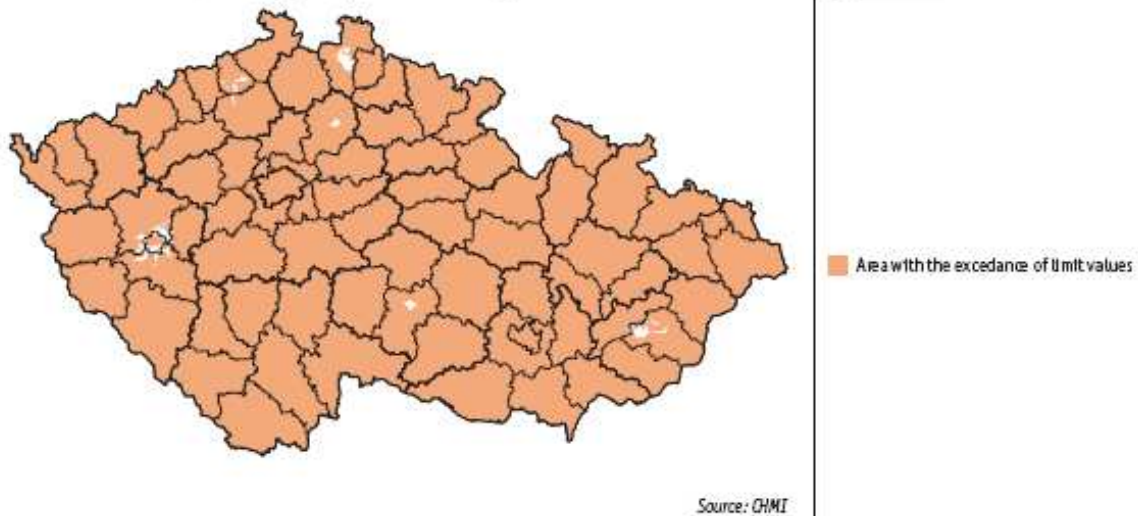
Source: CHMI

Fig. 2.1

■ Area with the exceedance of LV
■ Area with the exceedance of LV+MT
 LV = limit value
 MT = margin of tolerance
 Compliance with the limit values following the legal regulations means a duty to prepare plans for improvement of the air quality.

- most exceeded areas concern PM10, other limit values are exceeded only in very limited but densely populated areas, especially in Prague and Ostrava
- despite that the zones with worse air quality represent only 3.5 % of the CR area more than 34 % of population live there
- major problem of air quality is the pollution with tropospheric ozone:

Areas of exceeded limit values of regulated pollutants including ozone in 2004

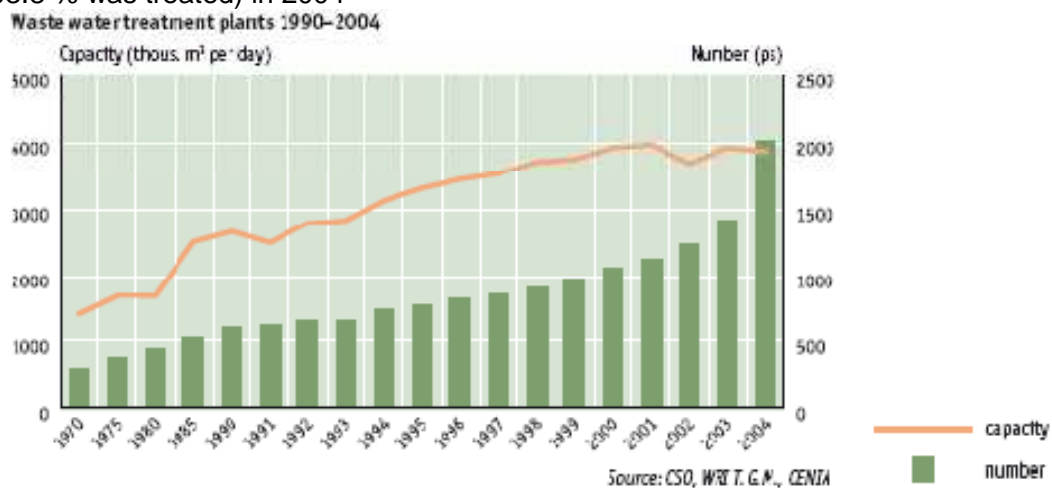


⇒ at least one pollution limit value (usually for ozone) is exceeded in majority of area

- a **topical problem** in CR (and in number of other states) concerning air pollution is the non-compliance with ambient air quality standards for suspended particulate matter PM10 (particulate matter or fine particles, are tiny particles of solid or liquid suspended in a gas or liquid. PM10 is used to describe particles of 10 micrometers or less (thoracic fraction) and PM2.5 represents particles less than 2.5 micrometers (respirable fraction) in aerodynamic diameter)
- most problematic regions are the Moravian-Silesian region, Prague, parts of the Central Bohemia, and Usti nad Labem regions
- The biggest proportion of air pollution comes from local furnaces burning solid fuels and from traffic (not only exhaust fumes, but also abrasion of tyres and brakes and road surface)
- another group of major air pollutants are “secondary particles” from gas precursors (sulphur dioxide, nitrogen oxides, VOC (= volatile organic compounds are organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere) and ammonia)
- health-wise, fine PM2.5 suspended particulate matter (or smaller ones) present the biggest hazard
- pollution caused by tropospheric (“ground”) ozone has been a long-term problem of the whole Europe; it comes from photochemical reactions between gas precursors (nitrogen oxides and VOC), as the main sources of the precursors are combustion engines, it is very difficult to reduce the emissions
- one **positive fact** is that the limit values for sulphur dioxide in the whole country are complied with and the limit values for nitrogen dioxide are exceeded only in Prague
- CR complies with its international commitments for air protection (the UN ECE Convention on Long-Range Trans-Boundary Air Pollution and 8 related protocols).

Water

- at the beginning of the 1990s water pollution was considered **the second most pressing issue**, with most important watercourses belonging to the category of polluted or heavily polluted and the contamination of groundwater being also high
- unlike with air pollution no new legal regulations were prepared and the situation was addressed by amendments to the law passed in the 1970s.
- Water protection focuses on two areas: emissions (water contamination, especially surface water) and water quality (both surface and underground water sources)
- surface water pollution comes from
 - point sources (municipal waste water and industrial waste water)
 - diffused sources (washing of mineral fertilizers and plant protection agents from soil)
- attention was focused mainly on pollution discharged into surface water, i.e. construction, rebuilding and intensification of waste water treatment plants and construction of sewer systems (the number of households connected to sewer systems was increasing from 72.6 % (of which 71.2 % was treated) in 1990 to 78.8 % (of which 93.8 % was treated) in 2004)



- cuts or shutdowns of some big industrial production entities brought also an important decrease in pollution from point sources; some of the productions were phased out and all the exemptions from the water law were cancelled in 1990
- at the beginning of the Pre-Accession Period the quality of surface water was significantly improved and the quality of groundwater was stabilized => more attention was paid to the transposition of EC legal regulations which culminated when new comprehensive regulations concerning water were approved
- **current (as of 2004 or so...) issue of surface water pollution** is the non-existence of sewer system and waste water treatment plants for places with 2,000 to 5,000 inhabitants (some parts of the sewerage system are not connected to any waste water treatment plant at all)
 - pursuant to the relevant Directive 91/271/ EEC waste water is supposed to be treated in all places with more than 2,000 inhabitants effective from **2005**
 - CR is not able to keep the deadline for economic reasons and therefore a transition period was agreed on with the European Commission to meet this obligation by **2010**
- while treatment of waste water from point sources is technically feasible, though expensive, surface sources are a pressing problem, which is caused by the impossibility

to reduce soil fertilization and plant treatment under a certain level and the fact that the fertilizers are washed out from the soil very slowly.

- **SURFACE WATER QUALITY**

Quality of surface water in the Czech Republic 1991–1992



Source: WRI T.C.M. on the base of CHMI data

Fig. 2.3

Class	Classification
I and II	Non-polluted and slightly polluted water
III	Polluted water
IV	Strongly polluted water
V	Heavily polluted water

Quality of surface water in the Czech Republic 2003–2004

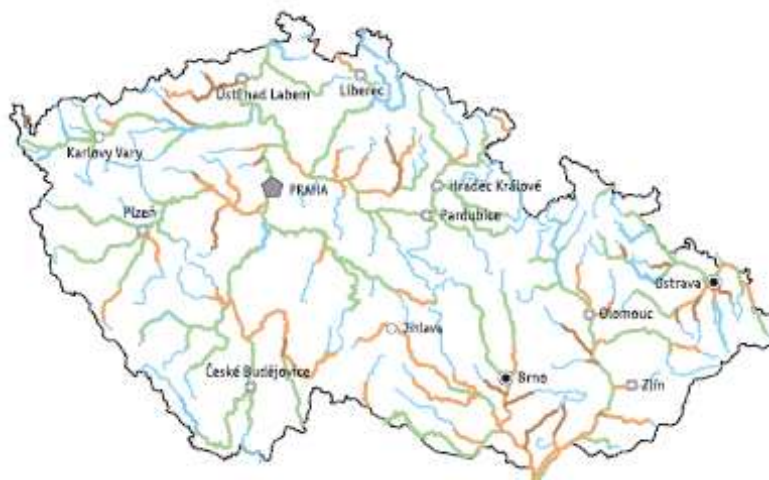


Fig. 2.4

Class	Classification
I and II	Non-polluted and slightly polluted water
III	Polluted water
IV	Strongly polluted water
V	Heavily polluted water

- “current” problem is the contamination of some parts of watercourses with specific pollutants (hazardous chemicals, radioactive substances) and the risk of eutrophication of water reservoirs (= an increase in the concentration of chemical nutrients in an ecosystem to an extent that increases the primary productivity of the ecosystem. Depending on the degree of eutrophication, subsequent negative environmental effects such as anoxia and severe reductions in water quality, fish, and other animal populations may occur.), caused mainly by nitrates and phosphates from sewage water (from point sources without a third step of water treatment for phosphorus and nitrate elimination) and by denudation of cultivated land (from diffusive sources).

- As all watercourses flow out of the Czech Republic and there is no water fed into the country, the whole Czech Republic was defined as a “sensitive area” in the EU terminology, meaning that it is subject to stricter parameters for treated sewage water.
- **GROUNDWATER**
- the present quality of groundwater can be considered **stabilized and more or less satisfactory**
- there is a certain risk of “old environmental load” (old waste landfills, contaminated industrial zones)
- groundwater pollution, e.g. ammoniated ions from agriculture, which existed in the early 1990s, has been removed
- **DRINKING WATER**
- the number of inhabitants connected to the public water supply lines increased from 83.2 % in 1990 to 89.8 % in 2004
- the quality of supplied drinking water is mostly sufficient
- the problem is that more than 10 % people, connected to the public water piping, are not connected to a sewerage system

Soil

- the decreasing of the farm land cultivation area is very slow, cultivation of almost 72 % remains relatively high compared to the EU15 average (60.1 %)
- new issue is uncultivated land which is idle and grows weeds
- the quality of soil in the Czech Republic at the beginning of the Founding Period was affected by “socialist” agriculture (plant and animal large-scale production with a high use of fertilizers and pesticides) and by the atmospheric deposition due to high pollutant emissions into the air
- after 1990 there was a radical decrease in the use of mineral fertilizers and pesticides
- the Implementation Period brought environmentally positive changes in agriculture, cuts in some agriculture productions and a decrease in the atmospheric contamination fall-out.
- fast reduction of the negative impact on soil has, however, a **very slow response**
- in the early 1990s the content of cadmium and lead in the Central Bohemian region, the content of cadmium and mercury in Northern Moravia were above the threshold levels, and the content of chromium in Southern Moravia was occasionally high -> since then the situation has come under control, which can be explained by drop in use of mineral fertilizers and their quality and by lower atmospheric deposition
- organic pollutants (polychlorinated biphenyls, polycyclic aromatic hydrocarbons and organic chlorinated pesticides) exceed the threshold levels occasionally, they were used in large uncontrolled amounts in past and due to their persistence they are only slowly eliminated
- **erosion**, especially water erosion, remains a pressing problem. It is the result of long time intensive exploitation of soil.
- other soil-related issues include compacting caused by heavy machinery and subsequent water retention and worse plant growth.

Potential risk to farm land from water and wind erosions (%)

Risk category	Water erosion	Wind erosion
Not endangered	4.2	77.5
Prone	27.9	9.3
Slightly endangered	25.9	5.7
Endangered	18.1	5.4
Strongly endangered	10.0	1.8
Most endangered	12.9	0.2

Source: Environmental Report of the Czech Republic 2004

Tab. B3.1.4 Spotřeba průmyslových hnojiv NPK, 1980–2007
The consumption of NPK industrial fertilizers, 1980–2007

Rok Year	N	P ₂ O ₅	K ₂ O	Celkem Total
	kg.ha ⁻¹ zemědělské půdy			kg.ha ⁻¹ agriculture land
Ø 1986–90	95,0	65,1	63,8	223,8
1995	55,4	14,6	12,8	82,8
2000	58,9	10,8	6,2	75,9
2005	73,2	11,7	7,7	92,6
2006	77,4	11,7	9,4	98,5
2007	83,8	15,3	9,9	109,1

Zdroj: MZe
Source: MZe CZ

Tab. B3.1.5 Spotřeba vápenatých hnojiv v tunách zboží celkem, 2003–2007
The consumption of lime fertilizers in tonnes of products, 2003–2007

	2003	2004	2005	2006	2007	
	t					
Zemědělská půda	171 000	141 000	93 110	102 526	229 754	Agricultural land
Lesní půda	.	.	.	12 000	7 200	Forest land

Pozn.: Vzhledem k poklesu v používání vápenných hmot roste podíl zemědělských půd se zvýšenou aciditou. Výpadek ve vápnění lesů byl způsoben problémy při výběrovém řízení na leteckou společnost a také klimatickými podmínkami. U zemědělských půd je nárůst pravděpodobně způsoben lepšími finančními možnostmi zemědělců a osvětou.

Note: Due to the decrease in the use of lime materials the share of agricultural land with elevated acidity has increased. The discontinuation of forest liming was caused by problems related to the tender for an airline and by climatic conditions. The increase in agricultural land is most likely due to better financial opportunities of farmers and increased awareness.

Other areas

Geological environment

- affected by strip and underground mining of coal and other mineral materials (large-scale uranium leaching in Northern Bohemia)
 - ⇒ **vast landscape devastation**
 - ⇒ **imminent risk of land slip and large surface water contamination.**
- **black and brown coal mining** substantially decreased in the 1990s, **ore extraction discontinued completely** (reorientation of industry, reducing share of coal-fired power plants, employment of other fuels, like natural gas)
- **uranium extraction should be abandoned soon, too**

- current issues
 - high proportion of limestone mining in nature reserves (Cesky kras and Moravsky kras),
 - the groundwater contamination after uranium extraction in the region of Ceska Lipa
 - the risk of landfall and methane bleeding in the Moravian-Silesian Region

Forests

- CR is a country with an average forest area (the forest percentage is 34.1 %, the OECD average was 34.4 % in 2000), although it is the 8th most wooded OECD country in Europe
- more than 28 % of the area in south-west and northern Bohemia and north-east Moravia is covered with forests; the smallest forest area (less than 14 %) is in Prague, and a slightly bigger forest percentage is in eastern Bohemia and southern Moravia (about 14–28 %)
- **catastrophic condition of forests in 1989** was the best-known symptom of the bad environment (e.g. air pollution affecting particularly spruce mono- cultures).
- despite that pollutant emissions on forests were decreasing (“passive measures” like liming, fertilization and artificial forest reproduction and gradual changes in forest composition), **the condition of the forests was not improved.**
- in mid 90s new comprehensive regulations concerning forests were approved, amended several times ever since
- the main problem is the health of forests areas which has been monitored since 1986 within the UN EEC and EU ICP program – Forest
 - the basic parameter is the defoliation rate in %
 - between 1989 and 2004 the defoliation rate went up and the health of trees is getting slightly worse
- the age, species and spatial structure is not good
- **forest health is a chronic problem and solving it will take a long time**
- more than 75 % of the forest areas are agricultural forests, the percentage of forests not used primarily for agriculture is growing very slowly

Nature and Landscape

- involves **landscape and species protections**
- at the beginning of the Founding period the condition of nature and landscape was equivalent to the condition of fundamental environmental elements – air and water
 - the landscape infrastructure was disturbed and the biological diversity was decreasing
 - the only national park established before 1989 was in the Giant Mountains (1963)
 - only 20 protected nature areas covering only 12 % of the territory.
 - Act on Nature Protection, was passed in 1992 to serve as a comprehensive regulation for nature and landscape protection
- CR is a relatively densely populated country with extensive linear infrastructure which divides the landscape into fragments and limits the natural species migration, large parts of the territory are endangered by water erosion and are easily affected by floods a
- hot issue is the conflict of interests between the land required for the building of transport infrastructure and utility buildings and the effort to improve the landscape condition.

- the percentage of specially protected areas in the Czech Republic (15.9 %) is slightly above the EU 15 average (12.1 %) and the OECD average (12.4 %)
- three quarters of the existing national parks and 5 out of the 25 existing protected landscape areas were proclaimed after 1989
- at the moment the Czech Republic is building a part of the European network of protected areas known as NATURA 2000

Specially protected areas as of 31 December 2004

Category	National Parks	Protected Landscape Areas	National Natural Reserves	Natural Reserves	National Natural Monuments	Natural Monuments
Number	4	24	110	713	101	1 123
Area (thous. ha)	119,02	1 040,12	27,87	34,26	2,69	27,02
% of territory of the Czech Republic	1,51	13,19	0,35	0,43	0,03	0,34
Forest cover (%)	87	54	82	44	59	70

Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic (ANCLP CR)

- a recent issue of species protection is the genetically modified organisms (GMO) which might threaten the natural biological safety if they spread without control, in other words they might disturb the balance among natural species. Regulations concerning GMO were passed in the late 1990s

Specially protected animal species as of 31 December 2004

Fauna:	Mammals	Birds	Reptiles	Amphibians	Fish	Cyctotomata
Total number of species in CR	61	222 ¹⁾	11	21	59	2
Critically endangered species	8	35	3	9	4	2
Highly endangered species	12	58	5	7	3	0
Endangered species	10	30	1	4	10	0

Source: MoC

Specially protected plant species as of 31 December 2004

Plants and fungi	Higher vascular	Bryophyte	Lichens	Fungi
Total number of species in CR	3 600	860	1 500	5-6000
Critically endangered species	246	0	0	27
Highly endangered species	142	0	0	12
Endangered species	92	0	0	6

Source: MoE

Waste

- main problems were **illegal landfills**, a **lack of legislative interest** and very little information about waste, its disposal and landfills before 1989
- waste disposal has changed significantly over the last 15 years
- the first generation of legal regulations from 1991 contained a number of time-limited transformation elements (e.g. stricter rules of trans-border waste shipment, temporary unsecured landfills)

- In early 90s unsecure landfills were closed down (approximately 8,000 landfills) and new landfills were built, complying with the relevant environmental safety parameters and European regulations.
- at present the capacity of secured landfills is sufficient for decades
- in 1997 a second generation of legal regulations was approved influenced especially by the OECD requirements and in compliance with the Basel Convention on trans-boundary shipment of hazardous waste, bringing about certain liberalization of the waste movements (colored lists of wastes according to their risk level) and termination of waste management programs
- during the Pre-Accession period a third generation of legal regulations was approved, in compliance with the EC requirements: **the disposal of selected waste commodities was changed comprehensively** (electrical scrap, wrecked cars, batteries and accumulators, sludge, etc.), packaging disposal and return of some products.
- **“On one hand, waste disposal is closely related to environmental protection; on the other hand it is an industry with important turnover.”** Three generations of regulations show that to set parameters in this industry is very difficult
- during the 90s the production of hazardous waste decreased and the volumes of municipal waste are comparable to other developed European countries.
- waste monitoring was in the 1990s rather difficult (**paper**).
- **increased waste recycling and the use of waste as secondary raw material are very positive.**
- at the moment there are 298 landfills, 33 of them with the possibility of depositing hazardous waste, there are three incineration plants (Prague, Brno and Liberec); the number of incineration plants for hazardous waste has been decreasing (67 in 2001, 24 in 2004).
- the total amount of waste incinerated and used in the energy sector in 2004 was ca 9.1 % of municipal waste and 10.2 % of hazardous waste
- compared to most European countries, the % of waste deposited in landfills is still quite high in CR ☹

Waste production in the Czech Republic between 1998 and 2004 (t)

Category	1998	1999	2000	2001	2002	2003	2004
Hazardous	3 399 468	2 380 171	2 603 337	2 785 128	1 289 912	1 194 619	1 424 022
Total	44 121 739	38 088 453	40 162 871	42 655 501	24 959 160	25 172 816	26 583 877

Source: CSO

Location of incineration plants including cement works using waste in technology in 2004

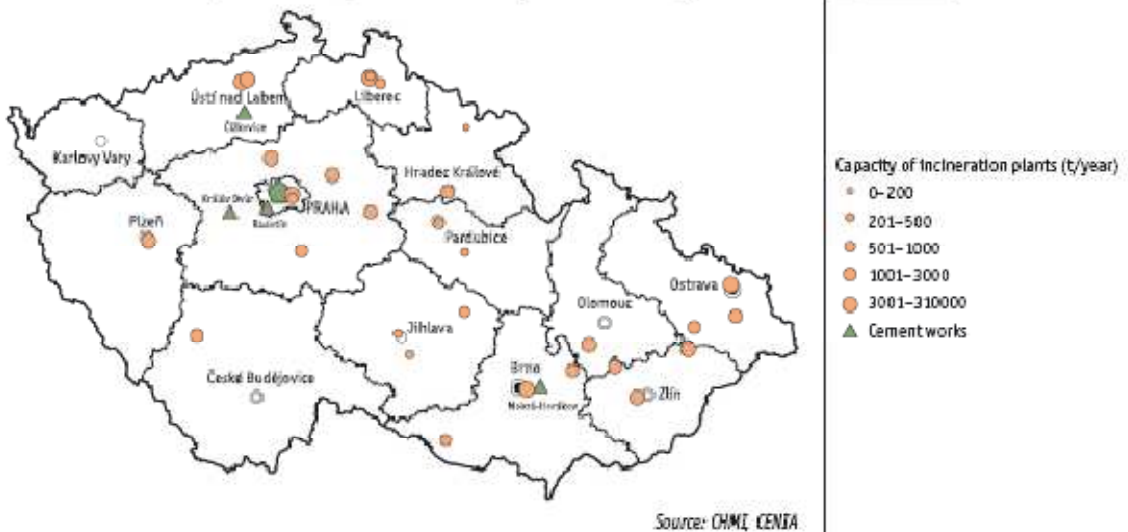
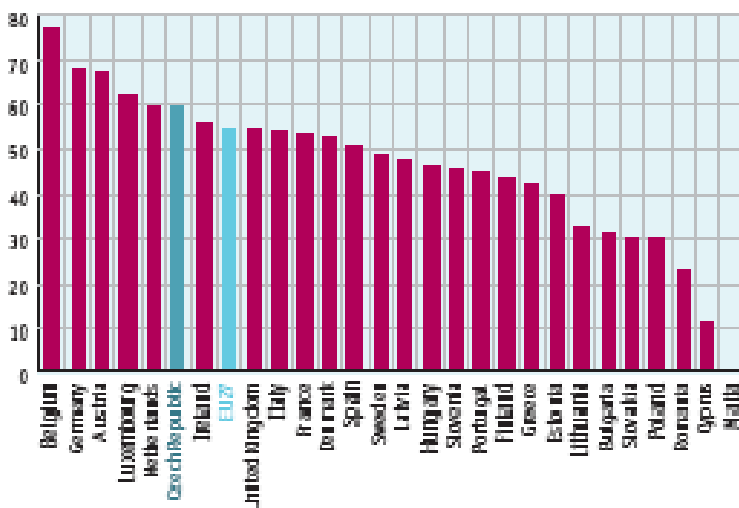


Fig. 2.8

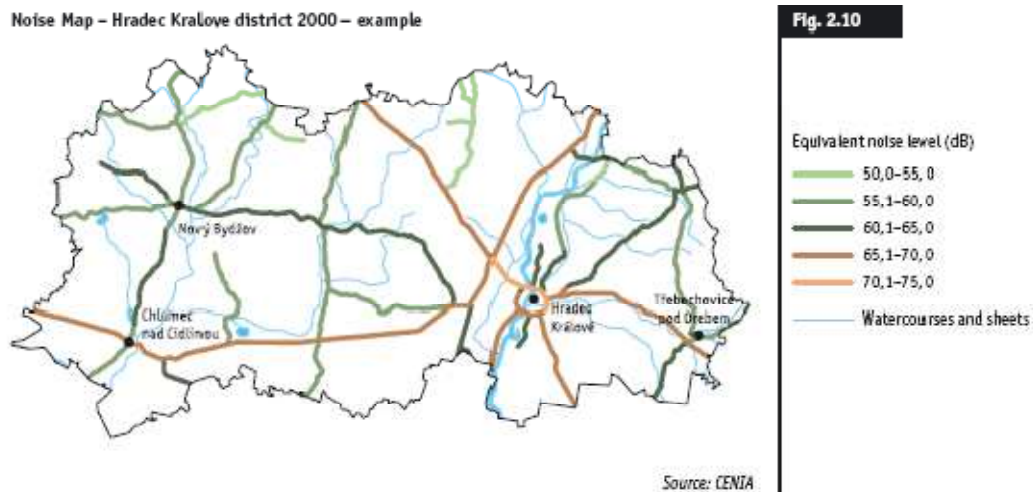
The rate of packaging waste recycling in the EU and recycling in 2005 [%]



Noise pollution

- significant problem from the long-term point of view, especially in cities
- **about 85% is caused by transportation** (all kinds... road, air, railway...)
- **transport is one of the most rapidly developing fields** of human activity
- environmental impacts of transport are increasing in CR
- negative impacts of transport on:
 - Health
 - Directly: emissions, noise, accidents
 - Indirectly: contribution to obesity and "civilizing diseases"
 - Buildings
- although discussed in the EU for a long time, in CR it was not a priority between 1990 and 1998 as the country had to deal with air and water pollution and waste disposal

- legal regulations for the noise pollution levels were passed in the Pre-Accession period, and regulations concerning noise pollution have been prepared since 2004.



- the noise pollution concerns a significant part of the population in Hradec Kralove district.
- people in many other cities and locations close to busy communications and traffic junctions (roads, airports) are affected in the same way

15 years Later after the revolution

At the end of 1980s the environment of today's Czech Republic belonged to **the worst in Europe** and in some indicators the worst in the world; the north-west of the country together with nearby Saxony and Poland was called the **Black Triangle**. The communist regime did not publish any environmental information and the situation was considered more disastrous than it actually was.

After the changes in 1989 a major priority was to achieve a better environment.

During the Founding Period (1989–1992) new regulations were passed quickly and new institutions to support environmental protection were established. The country also experienced economic transformation which resulted in lower emissions released into the air and water, reflecting more or less the lower economic performance expressed as the GDP.

During the Implementation Period (1993–1998) the effects of new legislation became visible and the country experienced so-called **decoupling** (separation of GDP which was growing again and pollution, which was decreasing). The Implementation Period finished with the improvement of all environmental elements which might have been improved over such a short period of time. Basic environmental indicators did not show any big differences from the EU 15 or OECD averages and became comparable.

The dynamics of the changes were substantially slower in the Pre-Accession and European periods (1999–2004) and the environment was mostly **stabilized**. The changes were slower as everything that was technically and economically plausible in the short ten-year period had been done and further positive changes were either extremely expensive or impracticable in a short period of time (as e.g. significant improvement of the condition of the forests).

The current state of the Environment of the Czech Republic is **still not satisfactory** (exceeded target limit values for the protection of human health and vegetation regarding tropospheric ozone and limit values for human health protection for PM10, high percentage of soil endangered by erosion, forest degradation, unsatisfactory forest condition and a high number of endangered species).

In the years to come we can expect lower pollution decreased by active measures aimed at air protection and natural evolution (car pool enhancement and technology updates); also increased qualities of surface and ground water due to implemented active measures and natural evolution (building and rebuilding of sewage water treatment plants, technology updates, implementation of good agricultural practices, eco-agriculture); and positive changes in waste management (leading to waste minimization).

And ... another 3 years later ... AKA Conclusions from 2007 report on Czech environment

An evaluation of the state and the development of the Czech Republic's environment in 2007 shows that after the previous stagnation of 2005–2006, the state of the environment has been improving.

The decline in air and water quality seen over the preceding two years was merely a temporary fluctuation and does not indicate the reversal of the long-term positive trend in the development of the environment.

However, it is notable that the principal problems of and threats to the future development that had been identified in previous years are of increasing significance and urgency. These include growing greenhouse gas emissions, the large proportion of air emissions from pollution sources that are difficult to regulate (transport and household heating) and the dynamic development of road transportation with its associated adverse environmental effects.

The main negative conclusions of the report and threats to future development:

Following the steep decline of the early 1990s that ensured compliance with the commitments under the Kyoto Protocol, greenhouse gas emissions have not decreased any further, and even have displayed a moderate increase in recent years. In addition, emissions from mobile sources are also increasing, reaching 13 % of the total emissions in 2006. Specific greenhouse gas emissions in the Czech Republic are amongst the highest in Europe.

Transportation is one of the main air polluters and its effect on air quality keeps growing. According to NFR classification, road transportation (that is responsible for almost all pollution from transportation) accounted for 32 % of NO_x, 23 % of VOC, 33 % of PM₁₀ and 46 % of PM_{2.5} emissions in 2006. A significant proportion of suspended particles is produced by household heating (30 % of PM₁₀ and 23 % of PM_{2.5}).

Transportation performance in passenger transportation has been increasing, while the performance in private automobile transportation keeps increasing. The high age of the vehicle fleet poses complications for reducing emissions from transportation. Freight road transportation is a major component of transportation performance within freight transportation (72 %), while its environmental impact is the highest of all modes of freight transportation.

In most of the Czech Republic, limit values for ground-level ozone have been exceeded, which poses a risk to both human health and ecosystems.

The fuel composition of the primary energy basis has stabilized, having a high proportion of solid fuels. The use of solid fuels for household heating is declining very slowly.

Despite a moderate annual increase, the proportion of renewable energy sources (RES) in the consumption of primary energy sources (PES) does not make it likely for the State Environment Policy's objectives to be met within the given time horizon (a 6 % proportion of RES in PES consumption by 2010). The proportion of RES in gross domestic electricity consumption decreased from 4.9 % in 2006 to 4.7 % in 2007.

The health condition of the Czech Republic's forests as determined by the level of defoliation of coniferous trees older than 60 years is amongst the highest in Europe.

According to preliminary results, waste production has shown an annual increase, with an ever increasing proportion of waste being landfilled. Preliminary data indicates that a persistently high proportion of municipal waste continues to be landfilled.

The incidence of allergies in children is on the rise, especially within the preschool age group.

The main positive conclusions of the report:

Air quality in the Czech Republic has displayed a year-to-year improvement; the area with poor air quality with respect to human health has decreased from 29 % of the Czech Republic in 2006 to 6.3 % in 2007. However, these areas house more than 32 % of the Czech population. In addition, this improvement also resulted from the favorable meteorological conditions during 2007. The Moravian-Silesian Region remains problematic from the viewpoint of air quality.

Water pollution from point sources has been decreasing; a decrease in water pollution with organic substances in 2006 was not confirmed in 2007. According to the current analysis, running water quality has improved. This result was influenced by methodological changes in monitoring. The State Environment Policy's objective in the area of providing the population with drinking water has been accomplished, with 92 % of the Czech Republic's population being connected to water supply systems. At the same time, water losses within the piping systems have decreased.

The economy's energy intensity continues to sharply increase as it has since 2005, i.e. at an annual rate of approximately 6 %.

The performance of freight rail transportation has shown an annual increase of 3.3 %, which, considering the moderate decline in total freight transportation volumes, indicates that the most environmentally harmful freight road transportation is no longer increasing.

The proportion of permanent grasslands and forests has increased at the expense of arable land. There is a continuing development of organic agriculture, i.e. with respect to both an increase of organically farmed land and the number of organic farms. The species composition of forests contains growing proportions of deciduous woody species.

Since 2003, when non-capital expenditures started to be monitored in addition to capital expenditures, we have witnessed a growing trend in the amount of the total expenditure on environmental protection, both in absolute terms and as a proportion of GDP. In 2006, it reached CZK 63.5 billion, i.e. 2 % of GDP.