2. Driving forces and pressures

2.1. Socioeconomic background in the Phare countries

The activities of a human society — exploitation of resources, production of goods, transportation and consumption — all affect the environment. All these various activities contribute directly or indirectly to air pollution. In the Phare countries, the range of socioeconomical activities which can cause environmental change is extremely wide. There are, however, certain similarities among the different economies in relation to air quality.

Basic statistical socioeconomic data for individual Phare countries are given in Table 2.1 (Statistical compendium, 1996).

Basic geographical and socioeconomic statistics in the Phare countries — Table 2.1

Country	Total area (km^2)	Agriculture land (km^2)	Forested area (km^2)	Population (1 000)	Population density (per km^2)	GDP 1994 (Mio USD)	GDP 1994 per capita (USD)
Albania	28 750	11 260	10 960	3 369	117	1 689	700
Bosnia and Herzego-vina	51 130	20 000	20 000	3 628	71	7 768	1 307
Bulgaria	110 910	60 180	39 130	8 549	77	16 985	1 106
Czech Republic	78 840	42 760	26 290	10 275	130	25 777	3 498
Estonia	45 100	14 540	20 170	1 507	33	2 317	1 510
FYROM	25 713	12 910	10 200	1 946	76	3 470	1 552
Hungary	93 030	61 220	17 190	10 162	109	31 155	4 072
Latvia	64 600	25 400	28 700	2 572	40	9 370	1 173
Lithuania	65 300	35 130	19 634	3 744	57	7 596	1 132
Poland	322 580	187 070	87 320	38 499	119	61 360	2 503
Romania	238 390	147 980	66 800	22 830	96	30 023	1 274
Slovak Republic	49 040	24 460	19 890	5 325	109	11 190	2 331
Slovenia	20 250	7 880	10 664	1 925	95	15 789	7 206

Political changes in central and eastern Europe during the period 1985–90 affected the general social and economic situation in these countries. The decline in economic growth during this period resulted in a general decline in production in the region, which also continued after 1990. In comparison to the situation in the beginning of the 1990s, energy and solid fuel consumption has decreased in most of the Phare countries (Table 2.2). In addition, the decrease in production connected with economic transformation in the Phare countries and, the direct restructuring processes that resulted in a decline in energy intensive production, led to a decrease in energy and solid fuel consumption. In Estonia, the Czech Republic, Hungary and Poland, the structure of fuel consumption has also changed, with an increase in natural gas consumption.

On the other hand, the intensity of traffic (number of cars) has increased considerably in the Phare Countries since the beginning of the 1990s (Table 2.2) and has now become an important contributor to environmental stress.

The intensity of human activity as a decisive environmental stress factor is closely related to the population density. The land cover map (Figure 2.1) shows the areas with highest

population density in the Phare region to be the capital cities and industrial regions such as Silesia in southern Poland and northern Moravia, north-western Bohemia region (part of Black Triangle region), the region of Györ and Tatabanya in north-eastern Hungary, Dimitrovgrad and Marica in south-eastern Bulgaria and Baia Mare in Romania. These regions are amongst the most industrialised in Phare area and contain a high proportion of the region's heavy industry (coal mining, coke, iron and steal production, etc.).

Areas with high population density are also characterised by a high density of transport. Transit traffic by heavy trucks and private cars increases significantly the number of cars inside the cities. During the last few years a start has been made (e.g. in Budapest and Prague) to build orbital motorways around the cities so as to enable vehicles to avoid entering the cities unnecessarily.

Table 2.2 **Air quality related economical statistics in the Phare countries, 1990 and 1995 (Statistical compendium,1996)**

Country	Gross inland energy consumption 1 000 toe		Solid fuel consumption (1 000 toe)		Gas consumption (1 000 toe)		Passenger cars (per 100 inhabitants)	
	1990	1995	1990	1995	1990	1995	1990	1996
Albania	2 204	1 020	630	38	204	23	—	—
Bosnia and Herzego-vina	753	1 595	—	348	490	211	—	—
Bulgaria	26 770	20 568	8 782	7 213	5 394	4 583	15	19*
Czech Republic	46 785	39 013	29 697	20 855	5 264	6 547	23	33
Estonia	10 208	5 126	6 415	3 610	1 785	3 121	15	28
FYROM	2 993	2 572	1 562	—	279	—	11	12*
Hungary	28 427	25 103	6 201	4 184	8 911	9 163	19	21
Latvia	3 274	3 702	435	215	2 144	1 010	11	15
Lithuania	16 883	8 510	809	184	4 672	2 041	13	21
Poland	97 880	94 472	75 379	70 330	8 850	8 902	14	19
Romania	60 518	44 026	11 683	10 094	28 830	19 316	—	—
Slovak Republic	21 197	17 447	7 395	5 232	5 344	5 268	17	19
Slovenia	5 226	5 583	1 416	1 224	686	671	30	38

Note: * = 1994 data; - = no data.

2.2. Atmospheric emissions

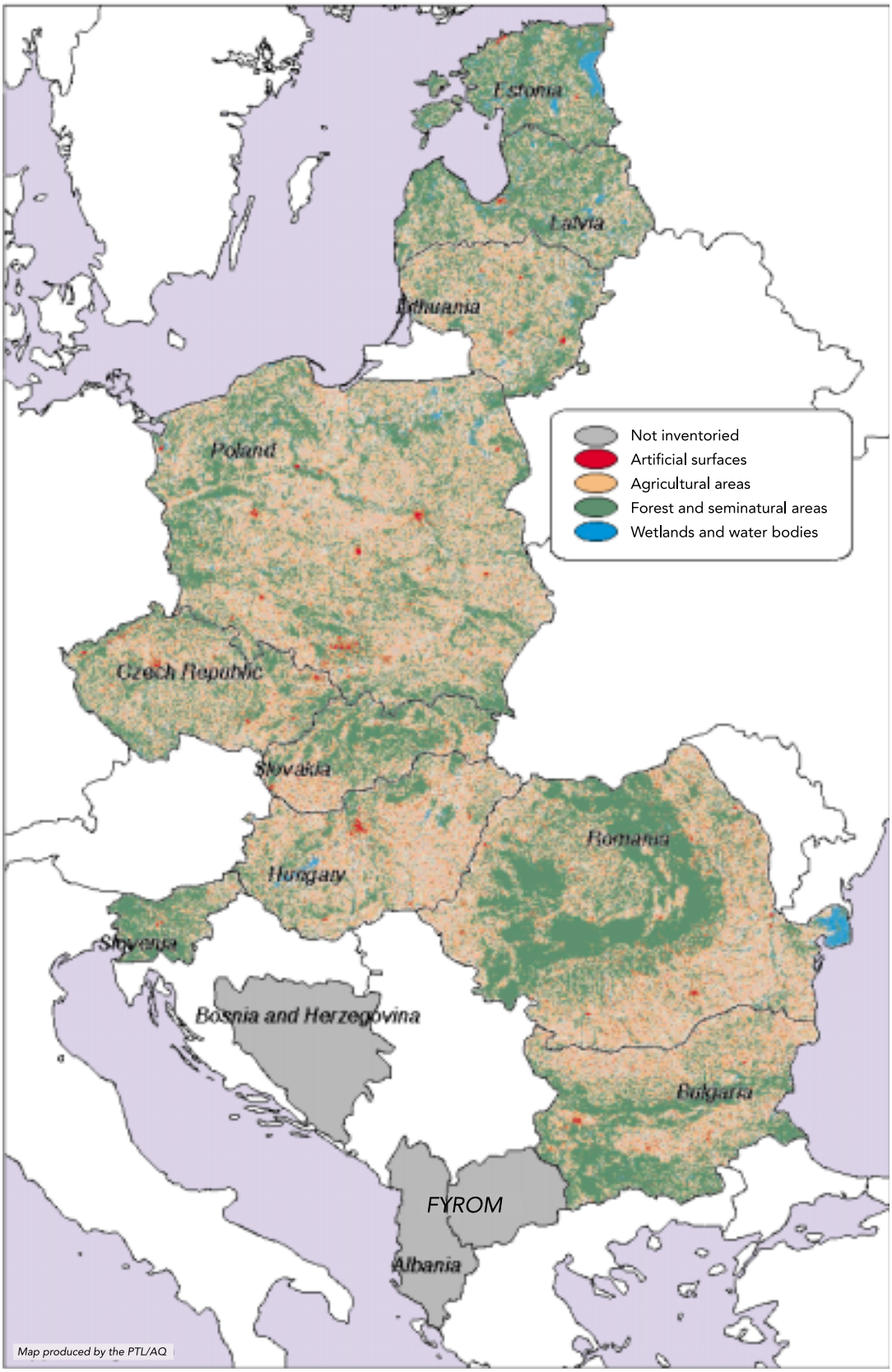
At the beginning of the 1990s, about 38 % of sulphur dioxide and 16 % of NMVOC emitted throughout Europe were produced in the Phare countries. Approximately 90 % of SO_2 emissions in the Phare area were produced by electricity and heat generation. More than 50 % of SO_2 in each Phare country was emitted from large point sources. More than 90 % of CO_2 in this part of Europe arose from the combustion of fossil fuels. The proportion of traffic-related emissions varied between 25 % (Slovenia) to 5 % (Romania). In 1990, the percentage of cars equipped with catalytic converters was negligible. According to Corinair90, NMVOC and NO_x emission from road transport in 1990 accounted for approximately 50 % of the national total emissions in Slovenia, Estonia and Hungary, about 35 % in Lithuania and approximately 20 % in Bulgaria, the Czech Republic, the Slovak Republic and Poland. The proportion of CO emission from traffic was more than 60 % in Hungary, Estonia, Slovenia and Lithuania (Marecková, private communication). The increased proportion of road transport emission in national totals is indicated by 1996 estimates (in Bulgaria: for NO_x 32 %, for CO 48 % and for NMVOC 19 %; in the Czech Republic: for NO_x 52.2 %, for CO 32.8 % and for NMVOC 23.2 %).

The extraction and distribution of fossil fuels are important sources of CH4, particularly coal mining and the natural gas distribution network (9 % in Lithuania — 56 % in Romania). For NMVOC emissions, extraction, distribution, and storage of crude oil and crude oil products are the most important processes.

NMVOC emissions occur within all main source sectors. However, the proportion attributed to the different groups varies from country to country. Combustion of fossil fuels is the main cause of SO_2, CO and CO_2 emissions in all countries. The proportion varies among the countries due to the national differences. However, it should be noted that differences in emission contributions are also — at least in part — due to differences in the national approach and methodology used to compile the emission inventory.

The decrease in solid fuel consumption, as documented in Table 2.2, fuel switching with an increasing share of natural gas compared to coal, restructuring of the economies, renewal of power plants and finally, abatement measures on large point sources (flue gas desulphurisation) are the main reasons for the remarkable decrease of SO_2 emissions in the Phare countries in the last 10 years (Figure 2.2). Trends in annual emissions of nitrogen dioxide, NMVOC and carbon monoxide are presented in Figures 2.3–2.5 (emission data see EMEP, 1999). For those countries where an emission inventory of particulate matter has been compiled, similar decreasing trends were observed (Table 2.3).

Figure 2.1 **Land cover in the Phare countries**



Trend of sulphur dioxide emissions in the Phare countries, 1988–97 (1000 t SO_2) Figure 2.2

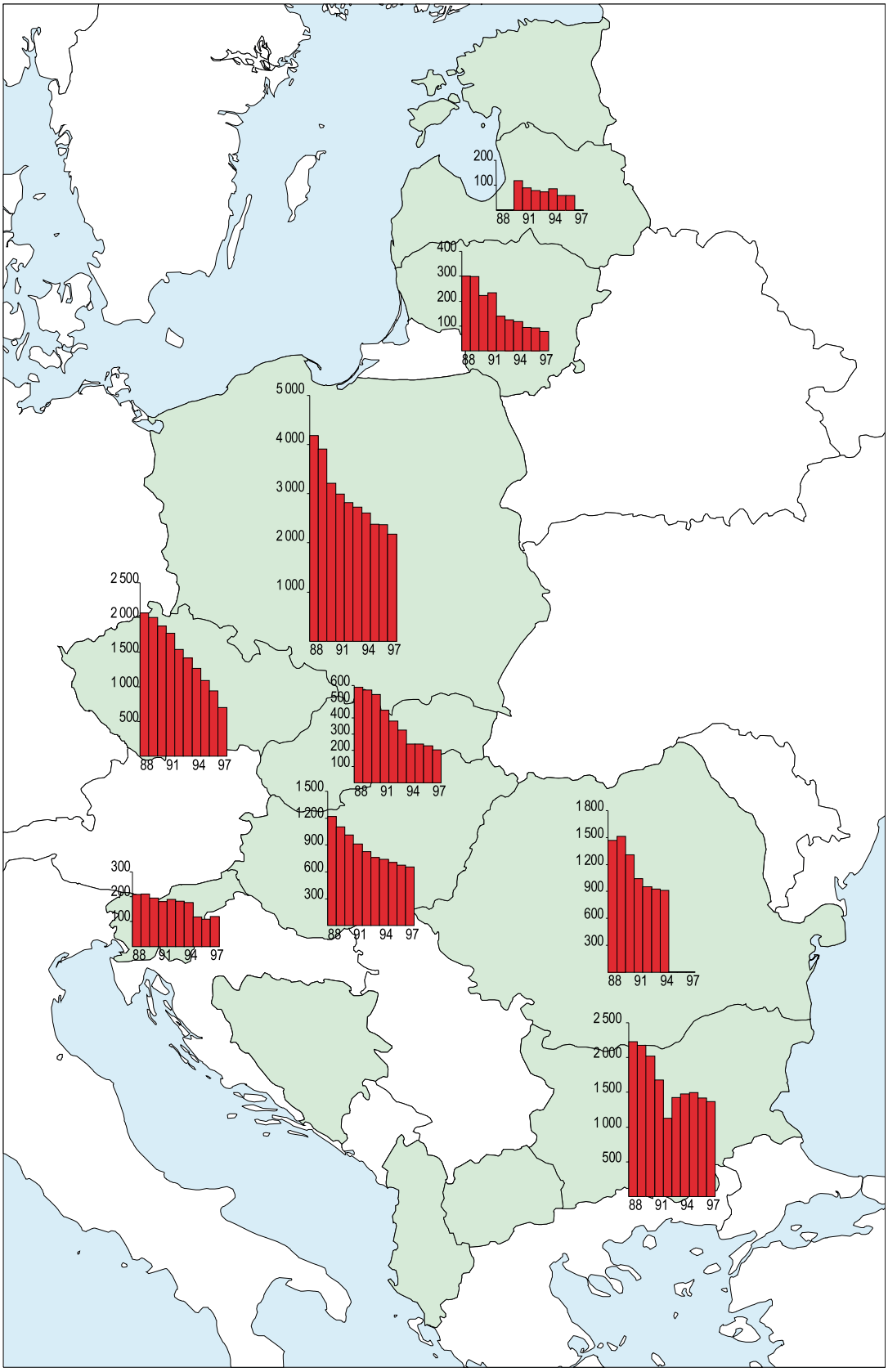
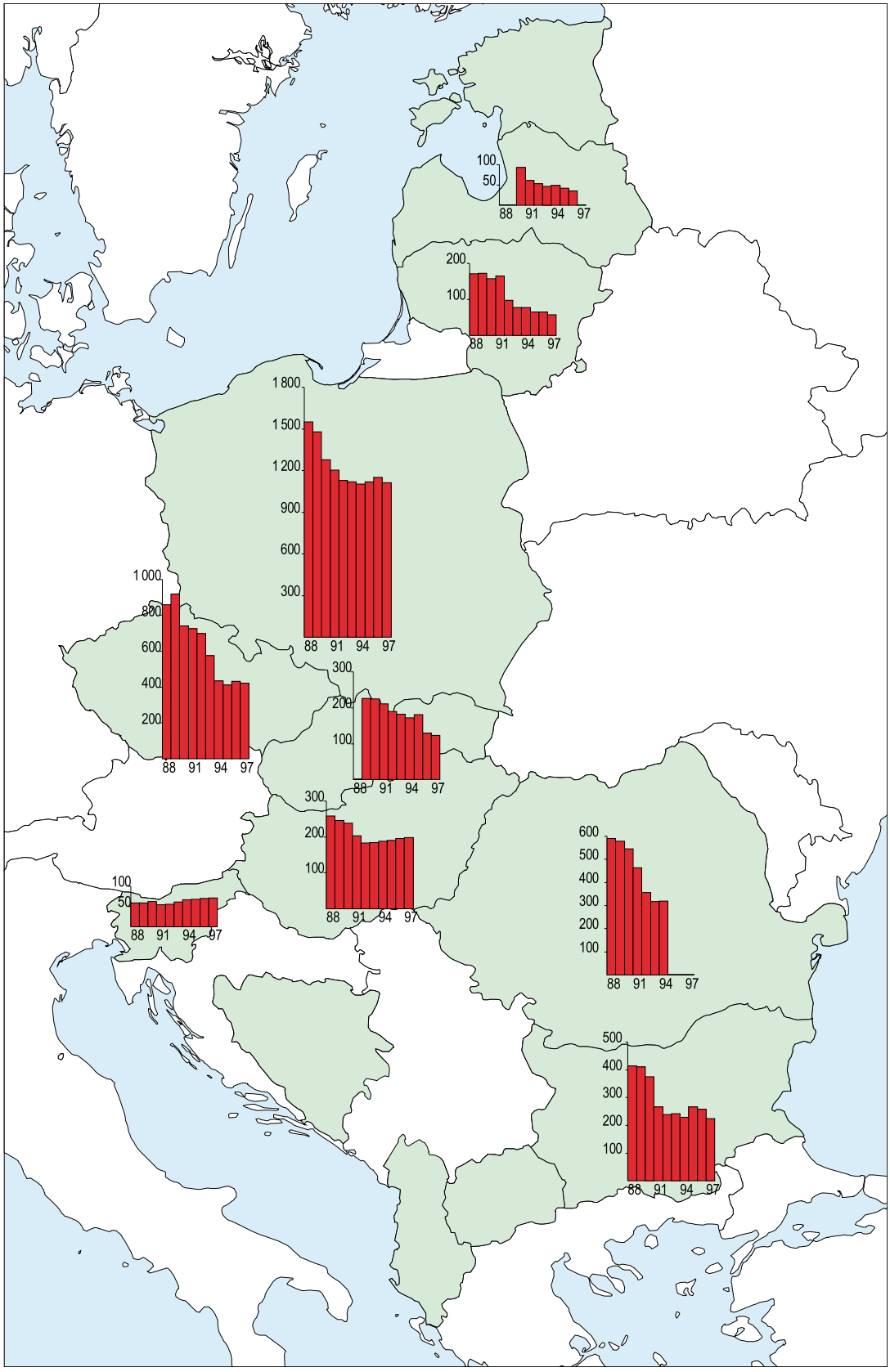


Figure 2.3 **Trend of nitrogen oxides emissions in the Phare countries, 1988–97 (1000 t NOx)**



Trend of carbon monoxide emissions in the Phare countries, 1988–97 (1 000 t CO) Figure. 2.4

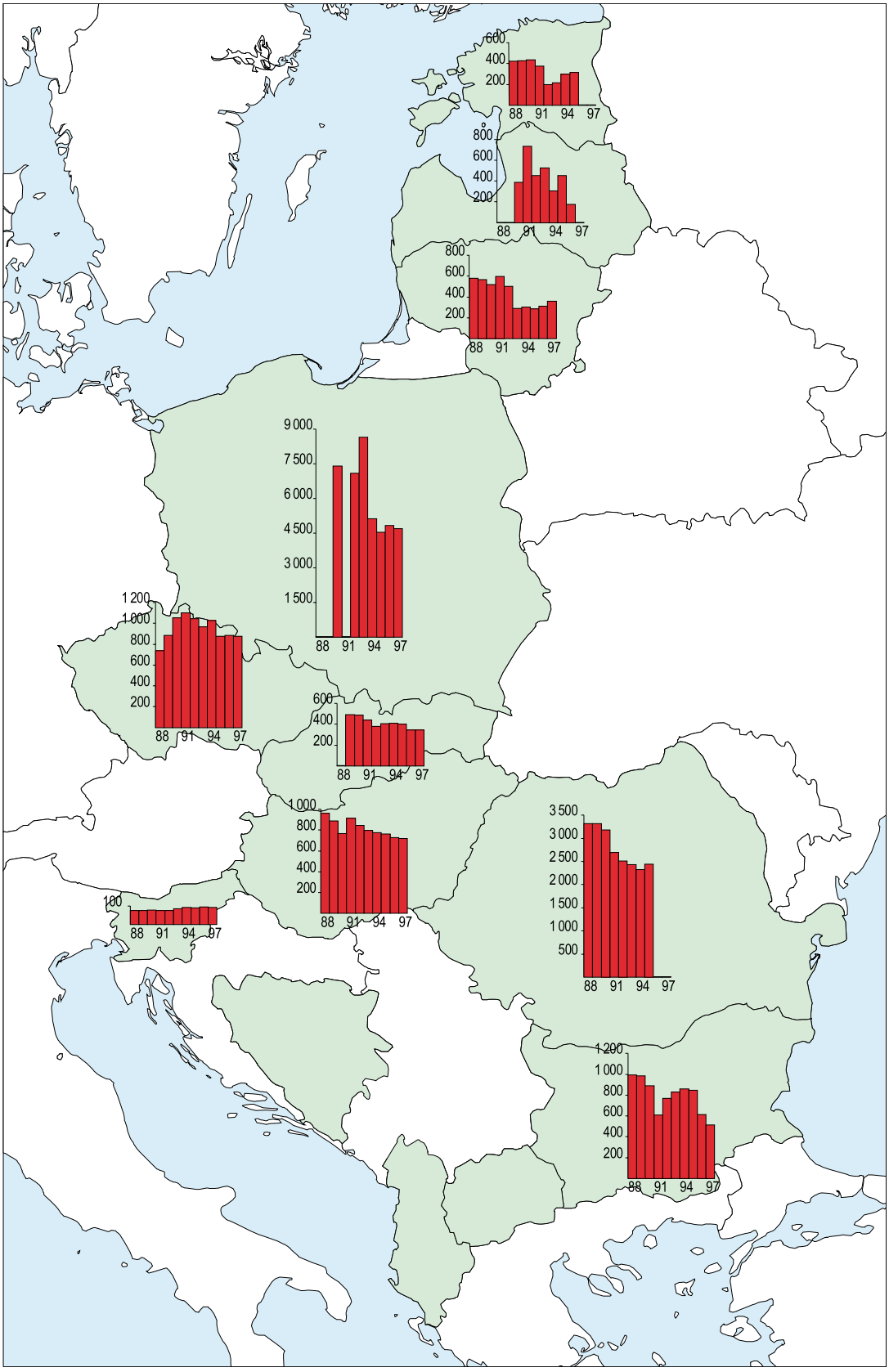
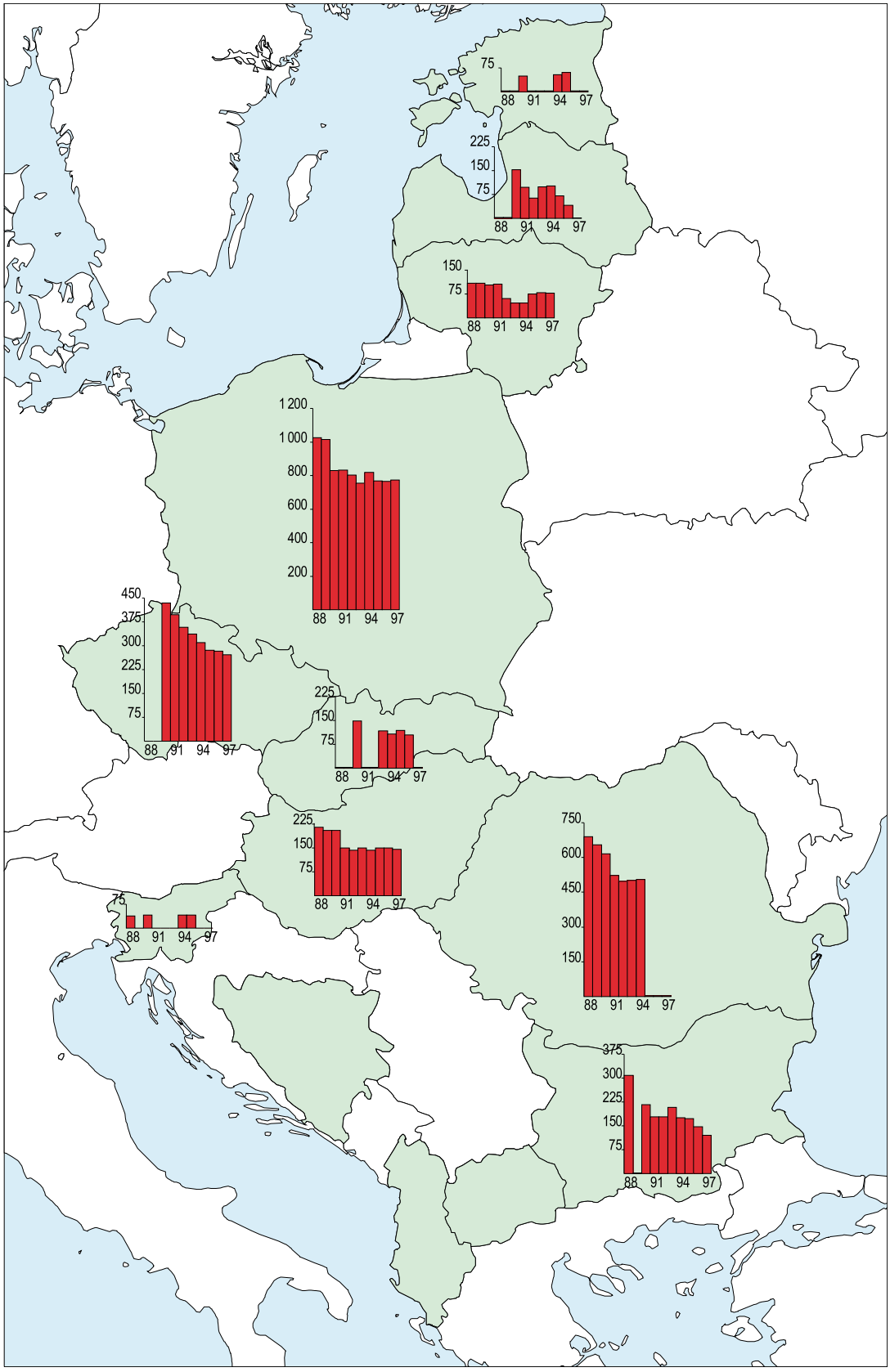


Figure. 2.5 **Trend of non-methane VOC emissions in the Phare countries, 1988–97 (1 000 t NMVOC)**



Annual atmospheric emissions of particulate matter (1 000 t) Table. 2.3

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Czech Republic	840	673	631	529	501	441	344	201	179	128
Poland		2 400	1 950	1 680	1 580	1 495	1 395	1 308	1 250	1 130
Slovak Republic	308	321	304	234	181	147	91	93	70	63

In spite of the considerable decrease in sulphur dioxide emission, these emissions, calculated per capita, are still much higher in the Phare countries compared to the average for EU-15 countries, as illustrated in Table 2.4. In contrast, NO_x emissions per capita are, on average, higher in EU-15 countries.

Atmospheric emissions per capita Table. 2.4

Country	NO_x			SO_2			CO_2	
	1990	1995	1997	1990	1995	1997	1990	1995
	(kg/capita)			(kg/capita)			(t/capita)	
Albania	7.1	7.1	7.1	28.2	9.5	21.4	0.3	0.1
Bosnia and Herzegovina	22.1	4.4	22.1	132.3	151.6	132.3	:	:
Bulgaria	44.0	31.1	26.3	236.3	175.1	159.7	10.6	8.6
Czech Republic	72.2	40.1	41.2	182.6	106.2	68.2	16.1	12.6
Estonia	45.1	31.2	29.9	158.6	73.0	79.0	26.3	13.1
FYROM	18.2	18.2	2.8	49.6	49.6	8.1	:	:
Hungary	23.4	18.7	19.5	99.4	69.4	64.7	7.3	6.3
Latvia	36.2	16.3	13.6	46.3	22.9	22.9	9.0	4.4
Lithuania	42.2	17.4	15.2	59.3	25.1	20.6	11.2	6.4
Poland	33.2	29.1	30.1	83.4	61.7	56.7	10.0	8.6
Romania	23.9	18.4	14.1	57.4	57.4	39.9	7.5	5.6
Slovak Republic	42.3	34.0	23.1	102.0	44.9	37.9	11.3	8.4
Slovenia	32.2	34.8	36.9	100.8	61.8	62.3	6.8	7.3
Phare countries	34.3	25.2	24.8	99.8	72.4	62.0	9.8	7.5
EU 15	36.2	31.2	29.6	44.6	29.0	25.1	9.0	8.6

During the 1990s, mobile sources (mainly passenger cars, buses and lorries) have become an increasingly important emission source in the Phare countries. Hence, the type, quality and age of car fleets in the Phare countries now have a strong influence on the emission characteristics in Phare cities. It is also likely that differences in car fleet characteristics are contributing significantly to differences in urban ambient air quality within the Phare region.