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PROGRESS REPORT ON THE IMPLEMENTATION OF THE PAN- EUROPEAN STRATEGY TO PHASE OUT LEADED PETROL

submitted by
the Ministry of Environment of Denmark
through the Ad Hoc Working Group of Senior Officials

BACKGROUND DOCUMENT



UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE

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List of abbreviations

*

CEE	Central and Eastern Europe
CEP	Commission on Environmental Policy
DANCEE	Danish Co-operation for Environment in Eastern Europe
EBRD	European Bank for Reconstruction and Development
EN	European Norm
EC	European Community
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
EEC	European Economic Community
EEA	European Environment Agency
EU	European Union
IFI	International Financing Institutions
LRTAP	Long Range Transboundary Air Pollution
NIS	New Independent States
REC	Regional Environmental Centre
RON	Research Octane Number
SILAQ	Sofia Initiatives on Local Air Pollution
UN	United Nations
USA	United States of America
US-EPA	The US Environmental Protection Agency
WB	World Bank

1 Introduction

1.1 Background and purpose

Background

The Pan-European Strategy on the Phase Out of Added Lead in Petrol was presented and adopted at the fourth "Environment for Europe" Ministerial Conference held in June 1998 in Aarhus, Denmark. Today, the Strategy has been signed by a total of 33¹ signatories.

The strategy recommends the signatories:

- By January 2005, leaded petrol will not be marketed in the European countries

Furthermore, it recommends that countries commit themselves

- to obtain a market share of unleaded petrol of at least 80% by 1 January 2002 at the latest, and
- to setting a limit for the content of lead in leaded petrol of maximum 0.15 g/l by 1 January 2000 at the latest, while the lead content of unleaded petrol should not exceed 0.013 g/l.

An open-ended UN/ECE Task Force established by the CEP (UN/ECE Committee on Environmental Policy) had been responsible for conducting the analysis leading up to the strategy. The members of this Task Force came from most of the European countries. Furthermore, WB, EBRD and US-EPA also contributed actively to the work of the Task Force. The work of the Task Force is documented in a three documents, viz:

- UN/ECE Task Force to Phase Out Leaded Petrol in Europe. Main Report. Ministry of Environment and Energy/DEPA, Denmark. Fourth Ministerial Conference "Environment for Europe" Aarhus, Denmark 23-25 June 1998.
- UN/ECE Task Force to Phase Out Leaded Petrol in Europe. Country Assessment Report. Ministry of Environment and Energy/DEPA, Denmark. 1998.
- UN/ECE Task Force to Phase Out Leaded Petrol in Europe. Regional Car Fleet Study. Ministry of Environment and Energy/DEPA, Denmark. 1998.

¹ Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom and United States.

Purpose

These reports provided detailed motivations of the Strategy ,assessments of its feasibility and possible options and measures.

This review aims to provide an overview of the progress of implementation of the strategy. The review considers all signatories as well as other European countries, acknowledging though that not all countries have signed the strategy.

The review also identifies and discusses the main issues of concern in regarding to attaining the ultimate objective of the strategy, viz. the complete phase out by 2005.

1.2 Study approach and organisation

The review takes as its starting point the conclusions and recommendations contained in the strategy, which also identifies key enabling factors, critical constraints and relevant policy interventions. Further, the review makes use of the substantial documentation contained in the reports prepared by the UN/ECE Task Force. Last, but not least, the review draws on research and studies conducted since 1998 as well as on information kindly provided by selected national experts and representatives through a questionnaire survey conducted as part of this study. Further, the study team has consulted with the SILAQ coordinator and with the UN/ECE Secretariat, both of whom kindly provided comments and shared their available data and information.

Study organisation

The review was launched in early 2002 by DANCEE, and was prepared by COWI A/S. In conducting the review, COWI subcontracted experts to assist in the collection of data and information, viz. Dr Yoncho Pelovski from the Balkan Science and Education Centre of Ecology and Environment and COWI Moscow Representative Office.

Study approach

The study has been conducted in three consecutive phases:

- 1 Desk study identifying and compiling all readily available information.
- 2 Questionnaires and personal consultations whereby more up-to-date and comprehensive information was gathered focusing on those countries, where the available information was quite old or incomplete.
- 3 Synthesis and reporting where all the information collected was compiled.

In conducting all three phases, the contents of the strategy, in particular its objectives and the identified aspects of feasibility and measures, has been used as the important benchmark.

1.3 Outline of the report and appreciations

This report first provides a status for the phase-out of added lead in petrol and the perspectives for 2005. Thereafter, the report summarises main policy developments at the international level and discusses the role that these developments have played. Following this, national strategies and their typical contents are reviewed. The next chapter looks at the main data sources and assesses the comprehensiveness and quality of the applied data and information. The final chapter discusses the feasibility and the perspectives of reaching a pan-European phase out by 2005.

The Strategy is contained in Annex 1 whereas Annex 2 contains the questionnaire that has been used. Annex 3 is an explicative list to Table 1. Finally Annex 4 and 5 contain other references to materials and resource persons that have been consulted.

The Consultant wants to thank all the individuals and organisations that have contributed through the provision of data, information and comments. Their contributions have been vital to ensuring the quality of the review. Nevertheless, it should also be emphasised that the contents and conclusions of this report are the sole responsibility of the Consultant.

2 Status for lead phase-out

The table overleaf presents the current status as regards the phase out of added lead in petrol. The table has been structured along lines quite similar to those of table 1 of the strategy², but not quite as detailed. In constructing the table overleaf, emphasis has been put on aspects that relate directly to the objectives of the strategy, viz. the market shares, the lead contents and the possible timing of a complete phase out.

In the table, the countries are organised using the same categories as in the table of the strategy. Thus, the table groups the countries according to their most recent market share of unleaded petrol using 5 distinct groups: market shares below 25%, market shares between 25% and 49%, market shares between 50% and 74%, market shares between 75% and 89% and those above 89%. Countries marked in bold are countries that have signed the strategy.

Comparing table 1 of the Strategy with the table overleaf, one can see that the latter contains more countries than the former did. The reason is that this review includes information on a few more countries.³ This chapter first discusses the progress made in regard to implementation of the objectives of the strategy. Secondly, the chapter discusses the perspectives for attaining a European phase out by 2005.

2.1 Current status

Substantial progress

The table clearly shows a substantial progress towards the objectives of the strategy, and in quite a few cases, the observed progress is likely to have been more rapid and outspoken than anticipated at the time of the Aarhus Conference.

² to be found on page 12 of the Strategy (Annex 1)

³ The additional countries for which estimates on market shares have been identified are: Uzbekistan, Kyrgyzstan, Malta, and Iceland. Furthermore, information on phase out dates have been identified for Macedonia and Turkmenistan, whereas information on the lead content of petrol has been obtained for FR Yugoslavia.

Table 1: Status on Implementation of the Strategy

(Countries in bold have signed the Strategy)

Country (categorised according to market share)	Maximum lead content g/l		Market share of unleaded petrol, %						Phase-out plans bans in force or planned bans
	leaded	unleaded	94	95	96	00	01	02	
Market share in 2001 (or latest year for which data have been available) < 80%									
Cyprus		0.013	5	7	11				2005 (latest)
Bulgaria ^{*)}	0.15	0.013	5	7	6	38			2004
Malta						40			
Romania ^{*)}	0.15/0.32	0.005/0.013		13	5			40	2005
Uzbekistan ^{*)}	0.15/0.17	0.013					30	41	2008
Turkey ^{*)}	0.15	0.013	8	8	18		48	52	2005
Croatia ^{*)}	0.15/0.50	0.013			30	63			2005
Albania (rough estimate) ^{*)}	0.15	0.013			100	75			2005
Greece ^{*)}	-	0.005	43	32		63	69	100	-
Market share in 2001 (or latest year for which data have been available) ≥ 80%									
Kazakhstan		-		80	80	85			2005
Latvia	0.15	0.005			60		99.5	99.5	
Moldova ^{*)}	0.17	0.013		57	63	<100	99		
Liechtenstein^{*)}								100	-
Kyrgyzstan	0.17	0.01/0.013						<100	-
Italy^{*)}	-	0.005	36	39	46	69	81	100	2002
Spain^{*)}	-		22			63	86	100	2002
Portugal	-	0.005	34	35	42		100	100	ban
Slovenia^{*)}	-		36	45	54		100	100	ban
Czech Republic^{*)}	-	0.013	37	48	55	71	100		ban
Poland^{*)}	-	0.013	26	35	48	78		100	ban
Ukraine^{*)}	-	0.013	86	81	84	83	100		2003
Ireland	-	0.005	58	57	65	98	100	100	ban
France^{*)}	-	0.005		50	56	99	100	100	ban
Luxembourg	-	0.005					100	100	ban
Iceland	-						100	100	
Armenia	-	0.013	0	0	0	100	100		ban
Russian Federation	-	0.01/0.013			47	100	100	100	2003
Azerbaijan	-				57	100	100	100	ban

Table 1 (continued)

Country (categorised according to market share)	Maximum lead content g/l		Market share of unleaded petrol, %						Phase-out plans bans in force or planned bans
	leaded	unleaded	94	95	96	00	01	02	
market share in 2002 (or latest year for which data have been available) > 80% (continued)									
Hungary ⁾	-	0.005		49	64	100	100	100	ban
Monaco ⁾	-				67		100	100	ban
United Kingdom⁾	-		58	63	68	100	100	100	ban
Belgium	-	0.005	65	69	74		100	100	ban
Estonia ⁾	-	0.013		77	81	100	100	100	ban
Switzerland⁾	-	0.005		85		100	100	100	ban
Netherlands	-	0.005	80	82	92		100	100	ban
Belarus	-		61	79	97	100	100	100	ban
Lithuania	-	0.013	41	78	98		100	100	ban
Georgia	-			75	98	100	100	100	ban
Germany	-	0.005	92	95	98	100	100	100	ban
Norway	-	0.005		92	100	100	100	100	ban
Slovakia	-	0.005	81	100	100	100	100	100	ban
Sweden	-	0.005		100	100	100	100	100	ban
Austria	-	0.005	100	100	100	100	100	100	ban
Denmark	-	0.005	100	100	100	100	100	100	ban
Finland	-	0.005	100	100	100	100	100	100	ban
Countries with no available information on market/production share									
FYR Macedonia	0.60	?0.002							2008
Turkmenistan									2005
FR Yugoslavia ⁾	0.4/0.6	0.02							

Note: Please refer to Annex 3 for further specification of countries marked with ⁾

Market share

In 1996 (the latest year for which the Strategy contained information on market shares), the market share of unleaded petrol was below 50% in 13 of the 39 countries represented in the table, whereas the number has declined to 5 out of 43. The proportion of countries with a market share below 50% can thus be said to have declined from 33% to 12%.

The 1996 market shares were those that were known at the time of framing the strategy. Taking the CEE Candidate countries, the market shares of unleaded petrol in 1996 were as low as 5% and 6% respectively in Romania and Bulgaria. Czech Republic, Hungary, Latvia, Poland and Slovenia had market shares in the range of between 50% and 60%. Since that time, substantial progress has been made in Romania and Bulgaria, and the other six countries have achieved the 100% phase out. Slovakia phased out already in 1995 and Lithuania also had a remarkably high market share already in 1996: 98%. Most of these countries are signatories to the Strategy and being Candidate countries they also need to comply with the Directive 98/70/EC. This Directive is further described in chapter 4.

As can be seen, the NIS countries have also made considerable progress, and the future perspectives are further discussed in the coming section. In Western Balkan, the market shares of leaded petrol still appear to be significant, and this is also further discussed in the coming section. As regards Cyprus and Malta, little information has been obtained on the current situation, whereas the information obtained on Turkey indicates substantial progress since the time of framing the strategy. The market share of unleaded petrol has increased from 18% in 1996 to an estimated 52% in 2002.

The EU countries and Western Europe in general today have all banned the marketing of leaded petrol within their territory as stipulated in Directive 98/70/EC.

Lead content in petrol

As regards the limits for the content of lead in unleaded petrol, the target of 0.013 g/l has been attained in many countries. This is likely to reflect an overall tendency also of EU standards for unleaded petrol becoming the key benchmark⁴, not only in EU and Candidate Countries, but also at a wider European level.

Considering the lead content of the leaded petrol, the limits are in some cases in excess of the recommendation of the Strategy of 0.15 g/l. Most notable exceptions are Romania and Cyprus where the applied limits are 0.40 and 0.32, respectively. In Romania, the limit of 0.32 applies however only to RON98 petrol, while the information on Cyprus is fairly old. In the case of Cyprus it may be expected that the EU approximation process will involve also an accelerated phase down and phase out of added lead in petrol.

In the case of Turkey, it should be noted though that until quite recently 0.40 was the official limit, but most of the leaded petrol did comply with the present limit of 0.15 g/l recommendation of the Strategy (see the below text box on the initiatives taken and the consequent future prospect of Turkey in relation to the phase out of added lead in petrol).

⁴ And noting that future EU standards will involve the limit of 0.005 g/l

Textbox 1: Unleaded petrol in Turkey

The Turkish production of petrol almost corresponds to the demand. At the time of the strategy, the amount of production was 86% of demand. Thus, the technologies and capabilities of the domestic refining industry is a crucial determinant for Turkey's ability to improve the quality of vehicle fuels on the market. Turkey did not sign the strategy, and indicated that it would not be able to meet neither the intermediate target of a market share of 80% of unleaded petrol in 2002 nor the target date of 2005. At the time of the strategy, Turkey reported a market share of 18% of unleaded petrol in 1996.

Since that time, substantial progress has nevertheless been made. In 2002 (data covers the first seven months of the year) the market- and the production share of unleaded petrol was around 52% and 66% respectively, and the country expects to achieve a complete phase out by 2005. Furthermore, while the limit for the lead content in leaded petrol is still the 0.40 g/l, the Turkish Petroleum Refineries Corporation (TÜPRAS) reports that it, as a refinery and starting from August 2002, has phased down to max. 0.15 g/l. The refinery supplies about 80% of total petrol demand in Turkey. Similarly, the lead content of unleaded petrol has been phased down to 0.005 g/l.

Turkey has adopted a national strategy in pursuit of these objectives and in support of the efforts to implement EU Directive 98/70/EC, which commit Member States to phase out added lead in petrol. The strategy includes an investment programme for TÜPRAS to enhance the quality of fuels, and the dissemination of the contents and implications of this programme to government and to the automotive sector as well as tax differentiation in favour of unleaded petrol. The latter will adjust production plans in line with the phase out strategy. The investment programme has addressed one of the main obstacles to an accelerated phase out, viz. the lack of finance, and will lead to a complete phase out by 2005.

2.2 Perspectives for 2005

Intermediate market share target of 80%

While the available information on market shares in 2002 omits quite a few countries, there are nevertheless indications that most signatories of the Strategy have succeeded in attaining a market share of at least 80% in 2002, or at least getting much closer to the target. In the cases of Bulgaria and Romania, the fact that these countries have framed comprehensive and operational strategies for the phase-out of added lead in petrol should be strongly emphasised. Thus, while the market share is not at 80% in 2002, the countries are nevertheless on the path of a rapid market penetration of unleaded petrol reflected in an increase in the market share, comparing 1996 to 2002 from 5% to 40% in Romania, and from 6% to 67% in Bulgaria.

Progress in EU and Western Europe

The table confirms that all EU countries and other Western European countries have now implemented a phase out in accordance with Directive 98/70/EC, which obligates Member States to phase out added lead in petrol by 2000 and by 2005 at the latest (by derogation to the directive).

Progress in Candidate countries

Most of the candidate countries have phased out or are well on the way towards a phase out. Eight countries have today realised the objectives of the strategy, while Romania and Bulgaria appears to be well on track with phase-out dates of 1 January 2004 and 1 January 2005 respectively. The ability of refineries to undertake the necessary modernisations is likely to be the most important potential critical condition in these countries to realise the target. In particular in Romania, this reservation should be noted. Furthermore, there continues to be

reluctance in Romania as regards the ability of the old cars to use unleaded petrol, and this can also pose a constraint to an accelerated phase out.

Only little information has been obtained on Cyprus and Malta, which renders an assessment of the progress and perspectives of these countries quite difficult. Nevertheless, being Candidate countries they can be expected to strive for compliance with the Directive 98/70/EC.

Progress in Western Balkan countries

The information gathered on Western Balkan countries is scarce. However, Croatia signed the Strategy in 1998, and has made considerable progress towards its implementation reflected in a reported increase in the market share from 30% in 1996 to 63% in 2000 (latest year). Croatia continues to aim at 2005 as the target year for a complete phase out. FYR Macedonia and Yugoslavia report to have limits for the content of lead in leaded petrol in the order of 0.4/0.6 (Yugoslavia) and 0.6 (FYR Macedonia). While only little other information is available on the Western Balkan countries, these limit values could however indicate severe current obstacles to a rapid phase out of added lead in petrol.

Taking e.g. FYR Macedonia this tendency could be confirmed by the fact that use of leaded petrol is still substantial: *in 1995, only 9.3% of motorists used unleaded petrol and in 1999 this figure only rose to 15.5%*, which is very much inconsistent with the fact that only 15 – 30% of the cars in use are unsuited to unleaded petrol⁵. This tendency could indicate for example a lack of information and knowledge among the consumers, and/or insufficient supplies of unleaded petrol. The currently applied standard is high and the speed in the progressive diminution of the lead content in petrol seems to have bad perspectives. According to UN/ECE (2002b), the timeframe for implementing new lead standard for added lead in petrol in FYR Macedonia is the following:

- 0.6 g/l until 31 December 2004
- 0.3 g/l until 31 December 2005
- 0.15 g/l from 1 January 2006 (and 0.013 for unleaded petrol)
- Complete phase out of added lead in 2008

In Yugoslavia (Serbia and Montenegro) the use of added lead in petrol is still widespread, related to a car fleet using leaded petrol and illegal import low-grade motor fuels.

In Albania, the estimated market share of unleaded petrol lies in the range of 75%, and the country expects to phase out by 2005. However, According to the latest environmental performance review performed by UN/ECE (2002a), *“due to poor fuel quality control it is not known whether the lead content is sufficiently low so as not to ruin the cleaning function of the catalytic converters. The emission of lead from cars is not a concern in Albania today since only about 10 per cent of passenger cars use petrol. However, the concentration of lead in the air could increase if traffic grows and leaded petrol continues to be used”*. Further in the same report it is mentioned that *“No economic instruments to reduce emissions to air, other than the additional tax levied on the import of used vehicles, have been used in Albania. Moreover, the relatively high excise tax on unleaded fuel (90% compared to 20% on leaded petrol) is likely to discourage the introduction of petrol-fuelled cars with catalytic converters”*.

⁵ Source: (UN/ECE 2002b)

Progress in NIS countries

As a general tendency for the Western Balkan countries, it is a fact that there is neither a consistent policy/strategy nor an action plan for phasing out added lead in petrol. Furthermore, the use of lead in petrol is widespread and the content of lead in the petrol is also relatively high.

The information provided for this review indicates that the NIS countries have made considerable moves towards a phase out of added lead in petrol. The below table summarises the information provided on the NIS countries. The table simply reproduces the information contained in table 1 for the NIS countries solely, and it aims to provide a clearer picture of the status and trends of this region.

Table 2. Overview of the progress of phase out of added lead in petrol in NIS countries.

Country	Market share of unleaded petrol						Phase out status	Signed the strategy
	94	95	96	00	01	02		
Azerbaijan				57	100	100	ban	yes
Armenia	0	0	0	100	100		ban	yes
Belarus	61	79	97	100	100	100	ban	yes
Georgia		75	98	100	100	100	ban	no
Kazakhstan		80	80	85			2005	no
Kyrgyzstan						<100		no
Moldova ¹⁾		50	50	>50				yes
Russia		47		100	100		2003	no
Turkmenistan							2005	no
Ukraine	86	81	84	83	100		ban	no
Uzbekistan					30	41	2008	no

¹⁾ According to non-official sources lead is no longer used in Moldova, this statement has not been confirmed.

The table contains information on eleven of the twelve NIS countries⁶.

Apart from the fact that many of these countries did not sign the strategy, they have all made considerable progress towards the phase out of added lead in petrol. Most of the countries did already have fairly high market shares in 1996, but at the same time, a significant part of the fuel demand was for low octane petrol. At that time there was therefore a concern whether it would be possible for refineries to accommodate a shift in demand towards more diesel and more high-octane petrol, and at the same time not only continue with the low market shares of leaded petrol, but even eliminate this completely. The table shows that developments since the time of the Strategy do not confirm this scepticism. The countries that have implemented a ban have in many cases done so on the basis of thorough investigations. For example, in Ukraine, substantial work has been done to confirm the long term ability of the country to comply with a ban before its introduction, and similarly in Armenia, where attention was also

⁶ There is no information on Turkmenistan

focused on the need to prevent the contents of aromatics, in particular benzene, to increase substantially as a result of the ban. Still, refinery upgrading and repair and the state of the fuel sector in general continue to be an important determinant for the perspectives of lead phase out, as the below text box illustrates, which considers the Central Asian countries.

Textbox 2. Refineries and unleaded petrol in Central Asia

The Central Asian countries, Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan and Uzbekistan are characterised by important oil reserves and (potential) production. As to the progress in phasing out added lead in petrol, even though the information available is scarce, the identified key obstacle in adopting and meeting the Strategy is the need of upgrading the refinery industry in the region combined with inadequate fuel quality monitoring and enforcement.

Kazakhstan, Turkmenistan and Uzbekistan, are reported to dispose of a significant refining capacity, altogether 778,500 bbl/d, with Kazakhstan disposing of nearly 60% of the total capacity of the three countries. In the countries there exists a large over-capacity of the refinery industry, due to inappropriate location of the refineries (inheritance from former Soviet Union), the “confined” location of countries (e.g. no access to ports enabling easy reach of new markets) and inappropriate production (which does not satisfy the demand), which all together may contribute to creating a non-competitive sector.

The degree of “deregulation” of the sector constitutes also an important factor, e.g. in Turkmenistan the oil is sold at fixed prices, below the world market prices, and therefore diminishing the incentive to sell to the home market refineries, and hence contributing to the further “under-use” of the refineries. In Kazakhstan, the interest in modernising the sector has been reported to be mainly in the upstream petroleum sector, implying therefore a slow modernisation of the refinery industry. In Uzbekistan a unfavourable investment climate combined with a drop in the oil production (as existing fields are exhausted faster than new are discovered) seem to be the major reasons for the lack of investment in the refinery sector.

Today all three countries have started to upgrade their refining industry, e.g. Kazakhstan has just signed with Japanese investors the modernisation of the Atyrau oil refinery, which is one of the 3 major refineries of the country. One of two major refineries in Turkmenistan Turkmenbashi, is currently under revamp. Maintaining an appropriate speed in the modernisation process, all three countries may thus still be able to meet their objectives of achieving a phase-out, which have been identified in this study to be 2005/2008.

As for the remaining countries in the Central Asian region, Kyrgyzstan and Tajikistan their refining capacity is relatively small and the refineries are relatively new (each country disposes of one refinery, respectively built in 1997 and 2001). Both countries relies com-

Source: Energy Information Administration (www.eia.doe.gov), Country reports..

Apart from the ability of refineries to meet future demands without adding lead to the petrol, another major concern expressed by some NIS representatives during the preparatory work leading up to the Strategy related to enforcement and control. While this issue has not been addressed explicitly during this study, it should be noted that it may still be a valid concern although the amounts of petrol traded with illegally high content of lead need not necessarily be high. This issue is further discussed in the next chapter, and it is also mentioned in the below text box on the Russian process towards a phase out of added lead in petrol.

Textbox 3. Lead phase out in the Russian Federation.

In the Russian Federation, all petrol production is unleaded and has been so since July 2001. While there is no information on market shares, the market share can nevertheless be estimated to be about 100% as well, as all petrol demand is satisfied through domestic production. Limit values for the content of lead in unleaded petrol lies between 0.013 and 0.01 g/l. The latter applies to Normal-80, Regular-91, Regular-92, Premium-95 and Super-98, while the former applies to A76, AI91, AI92, AI93 and AI95. No-lead additives are used in some, but not all, unleaded petrol. The no-lead additives are either oxygen-containing additives or Manganese anti-detonator.

The rapid phase out of leaded petrol in production is basically a result of the Federal Program "Fuel and Energy", which was adopted in 1996. Unleaded petrol constituted about 47% of the petrol production in 1995. The Program included a sub-program entitled "Reconstruction and Modernization of the fuel industry", and the implementation of the program was foreseen to lead to a complete phase out in 2010, and to an interim target share of between 60% and 65% in 2000. However, in 2000, the situation was far in excess of this interim target with a production share of 99.6%. Consequently, a new Federal Program "Energy Efficient Economy" for the period 2001-2005 was adopted in 2001, which set the deadline for the complete phase out at 1 January 2003, and the refineries are actually ahead of this target having accomplished the phase-out in 2001 already.

This positive development indicates an ability and willingness of the refineries to raise the necessary finance to enable the required upgrading of their equipment and technology. This focus has been reinforced by several instruments and activities undertaken by the Federal authorities. Thus, revised or new fuel quality standards were introduced in 1997, 1999 and 2000, and today the standards correspond to EU standards (EN 228-1993 and EN 228-1999). The introduction of these international standards to a large extent supported the interests of the refineries. About 14% of the Russian petrol production is exported (more than 3.5 million tonnes). General information campaigns about the health risks caused by airborne lead were launched in the late 1990s and the pressure of NGOs and environmental authorities further supported the development.

While well functioning systems of certification and control are in force vis-à-vis the refining industry, there are nevertheless indications that some amounts of illegally produced leaded petrol (small installations) is still traded, in particular in regions where the control over the use of leaded petrol is relatively weak. While the estimated market share of this petrol is less than 1%, it is still an indication that enforcement and control in relation to smaller installations, specific regions and the consumption side can be improved. In pursuit of this, a new law "About the Usage of Oil Products" is under development.

3 International agreements

International agreements

Internationally, several policy initiatives and agreements play an important role in promoting the objective of phasing out added lead in petrol in Europe. Most important are the following:

- Environment for Europe
- Pan-European Strategy to Phase Out added Lead in Petrol
- Heavy Metals Protocol under the LRTAP Convention
- Directive 98/70 and the process of approximation

Sofia Ministerial Conference and SILAQ

The Environment for Europe put the issue of lead in petrol explicitly on its agenda in 1995 at the third "Environment for Europe" Ministerial Conference held in **1995** in Sofia, Bulgaria. The Conference adopted the "Sofia Initiatives" one of which were to improve the local air quality in Central and Eastern Europe, and which included the promotion of unleaded petrol. Further, the issue of lead phase out was also included in the key recommendations from the Environment Programme for Europe⁷.

The Sofia Initiatives on Local Air Pollution (SILAQ) is a CEE initiative coordinated and run by the involved countries. Originally, the involved countries were Bulgaria, Slovakia, Hungary, Poland, Romania and Slovenia. SILAQ facilitates experience sharing and joint actions and initiatives among the participating countries. While SILAQ firstly concentrated largely on the lead phase out issue, the focus has now moved into the direction of particulate matter.

Aarhus Ministerial Conference and the Strategy

Subsequently, and building upon the above, the UN/ECE open ended Task Force was established by CEP (UN/ECE Committee on Environmental Policy) in **1996** to consider a strategy for the phase-out of added lead in petrol in Europe. The Task Force was co-chaired by Denmark and Bulgaria, and participation in the Task Force was open to all UN/ECE countries⁸. In the context of the Task Force several background analyses were conducted with the assistance of DANCEE. These analyses served as major inputs into the framing of the ultimate strategy, which was presented and adopted at the fourth "Environment for Europe" Ministerial Conference held in **1998** in Aarhus, Denmark.

⁷ The key recommendations were inserted as an annex during the completion of the Sofia Ministerial Declaration.

⁸ Furthermore, the Pan-European NGO Coalition, World Bank, SILAQ, UN/ECE, REC, EBRD, European Commission, European Environmental Bureau and OECD were invited to participate.

While the Strategy itself is an important outcome of the work of the Task Force, the role of the processes involved in preparing it should not be underestimated. The four meetings of the Task Force provided an excellent forum for wider experience sharing and in-depth discussions of analyses and results from those. Thus, this process assisted to shed light on the feasibility and the important constraints related to the objective of lead phase out thereby also enhancing the commitment and involvement of participants. The process revealed the environmental and health gains to be achieved and it illustrated the technical and financial feasibility of addressing the issue (not disregarding the important obstacles to be overcome as well).

The Heavy Metals Protocol

The Convention on Long-range Transboundary Air Pollution of 1979 has been extended by eight specific protocols including the Protocol on Heavy Metals adopted in **1998** in Aarhus, Denmark. The protocol targets three particularly harmful metals: cadmium, lead and mercury and the parties to the protocol are obligated to reduce their emissions for these three metals below their levels in 1990. The Protocol aims to cut emissions from industrial sources, combustion processes and waste incineration and leaded petrol being relevant in relation to the combustion processes. Furthermore, the Protocol requires the Parties to phase out leaded petrol. Today the protocol has been signed by 36 parties. In the context of the convention an institutional framework that links science and policy has been established, where the Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air pollutants in Europe (EMEP) has provided monitoring and modelling data on concentrations and depositions of lead in Europe⁹.

Directive 98/70/EC

In 1998, The European Commission launched its Directive 98/70/EC Relating to the Quality of Petrol and Diesel Fuels and amending Council Directive 93/12/EEC¹⁰. According to this Directive, all Member States are obligated to prohibit the marketing of leaded petrol within their territory by 1st January 2000 at the latest¹¹. This Directive presents a major step forward in pursuit of intentions expressed much earlier, e.g. in Directive 85/10/EEC on the lead content of petrol¹². Furthermore, the EU requirement that cars should be equipped with catalytic converters should be noted also. Catalytic converters can be destroyed, or their performance reduced, if leaded petrol is used.

⁹ The monitoring performed in this connection has enabled the countries to give an overview of the development of lead concentration in the air. The latest technical note on "Comparison of emissions with concentrations in the air and precipitation of mercury, lead and cadmium measured at selected EMEP stations", indicates a decrease of heavy metal emissions to the atmosphere in Europe and also on a global scale, applying particularly to lead, cadmium, and mercury emissions.

¹⁰ The Directive is initiated in the frame of the Autooil programme (which started in 1992) and which aims at reducing emissions from road transport.

¹¹ Member State can have an extension till 2005. This assumes that they can demonstrate that the implementation of such a ban would lead to severe socio-economic problems or would not lead to overall environmental or health benefits. Requests for derogations were to be submitted before 31st August 1999.

¹² At the EU level, it should be noted that the efforts towards lead phase shall be seen in the light of the overall Auto Oil Programme. Stakeholder views and careful analyses constituted important elements of the preparations of this.

Market developments Market developments largely follow the above policy developments. As more and more countries phase out added lead in petrol, the number of possible outlets for leaded petrol is reduced. Consequently, the scope of action for refineries that rely largely on the production of leaded petrol becomes more limited. Requirements for catalytic converters in (new) cars further stimulate the demand for unleaded petrol.

Progress since 1998 The positive trends since 1998 (as illustrated in table 2.1) are thus largely attributable to these initiatives and agreements and to the fact that they are backed up by true commitments and the ability of individual countries to turn this commitment into realised action.

EU developments have played an important role in regard to the phase out not only in Member States, but also in the Candidate Countries, where EU approximation has been a key item on the political agenda of these countries. In regard to lead phase out, the Strategy (and the related or preceding initiatives) has also played a role. Thus, national plans for phase down or phase out have for example been prepared in Romania and Bulgaria at quite an early stage.

In the NIS countries, the process of lead phase out has also accelerated quite substantially during the last five years. Both Ukraine and Russia will ban added lead in petrol in 2003, and substantial progress has been made also in other regions. In the Caucasus countries, national plans have been prepared and implemented in pursuit of the lead phase out objective. Also the Central Asian countries have made progress as documented for example in the Cleaner Transport Fuels for Cleaner Air in Central Asia and the Caucasus study. The major drivers behind these efforts are likely to be manifold and to include: focus on upgrading of refining industry to meet future demands and to be capable of marketing products internationally, recognition of the health implications of lead, and appreciation of the technical and financial feasibility of lead phase out. The international focus¹³ on the lead issue and the issue of fuel quality in general has presumably assisted to accelerate these developments as well.

The Western Balkan countries have been affected by the years of war and unrest. Consequently, their progress hitherto has been limited. Still, EU alignment can be a driving force in accelerating the process in these countries, and in this, they may also benefit from relevant experience from other countries.

¹³ Reflected also in international and bilateral assistance provided to the elaboration of programmes and strategies.

4 National strategies and plans

Many countries have pursued their international commitments and their national intentions through national strategies and plans. For example, Bulgaria, Romania, and Turkey have elaborated national strategies, and the rapid phase out in Russia is also largely a result of such a national strategy. The same goes for a wide range of other countries including for example the Ukraine, Armenia, and Uzbekistan.

The following table provides examples of the contents of national strategies for some selected countries. The table presents this information for countries that are still in the process of phasing out, and for which recent information on the progress and contents of national strategies and plans has been obtained. In addition, the table includes this information on Russia and Ukraine. Russia and Ukraine are two major oil producing NIS countries that have managed a substantial acceleration of the lead phase out process compared to their past expectations to a possible lead phase out date. It should be noted that the table should not be seen as exhaustive. Rather it illustrates the key contents of national strategies and actions that the contact persons of the countries have seen as the major factors to support the process of lead phase out.

Regulatory instruments such as stricter standards are a major instrument in many of the countries concerned. This is in line with the conclusions also of the analyses that preceded the strategy. In many transition economies, and in particular NIS countries, the use of economic instruments is difficult. It can often not be used vis-à-vis consumers (i.e. as a means of affecting consumer's demand), because dual distribution systems are often not in place and it will be too expensive to establish and control. Consequently, tax differentiation needs to be implemented and take its full effect at the import- and production level, and this has in many cases not been considered to be effective. Consequently, standards have been, and are, the typical means of pursuing the lead phase out objective, and the more general objective of cleaner fuels, in the NIS countries.

Refinery upgrading and investment programmes are an important element of a lead phase out strategy as shown in the table overleaf. It should be noted that this has also applied to many of the fuel producing countries that are not included in the table, e.g. in the CEE region.

Table 3. Examples of Contents of national programmes.

Country	Use of additives	Phase out date	Investment programmes	Economic instruments	Awareness building	Regulatory instruments	Car fleet aspects
Armenia	No	2002	No - no production in Armenia of petrol	No	Yes - Information on the ban	Ban on leaded petrol and focus on standards Enhanced control over benzene and aromatics	-
Bulgaria	No	2004	Yes - implementation in progress	Yes	Yes - extensive general campaigns	Gradually tighter fuel standards	Requirements for catalytic converters on new cars
Romania	Yes	2005/2008	Yes - ability to raise finance is still a critical issue	Retail price 10% lower for unleaded petrol. Differentiation in favour of environmental-friendly vehicles	-	Gradual reduction of allowed lead content in petrol	Requirements for catalytic converters phased in Ability of old cars to use unleaded petrol
Russian Federation	Yes - use is limited	2003	Reconstruction and modernisation of fuel industry sub-programme	No	Yes - general information campaigns	Gradually tighter fuel quality standards have been the main policy instrument	-
Turkey	No	2005	Yes	Yes	Dialogue between refining industry, and government and automotive industry	Gradual reduction of allowed lead content in petrol	Automotive sector to adjust production plans accordingly
Ukraine	No	2003	Yes	No	-	Gradually tighter fuel quality standards have been the main policy instrument	Prohibition of import of cars without catalytic converters from 2003
Uzbekistan	No	2008	Plans for refinery investments need finance - already critical at the initial research phase	Planned to use tax differentiation in favour of unleaded petrol	Awareness campaign is planned on lead's health impacts	It is prohibited to import leaded petrol	-

In many CEE countries, the instruments used in pursuit of lead phase out have included a wide spectrum of measures. For example, dual distribution has been more widespread in these countries thereby facilitating the use of tax differentiation. The paths towards lead phase out have thus typically resembled that of many EU countries, with the important distinction that restructuring and privatisation of the refining industry has been an important element as well.

The realisation of such programmes lies in the hands of the industry, which may be more or less privatised. The commitment and credibility of national strategies nevertheless can have an important impact on the decisions and strategic developments of the refineries.

Textbox 4. Lead phase out in Armenia

In Armenia, leaded petrol has been banned since January 2002. DANCEE funded support to explore possibilities of such a ban and investigate the potentials of promoting cleaner fuels in general was an important part of the preparatory work that preceded the ban.

Armenia imports all of its petrol and is thus fully dependent on the developments in possible supplying countries. Furthermore, the low income level of the country's population and its difficult economic situation implies that equity aspects are vital in deciding on any policy intervention. This includes also concerns about the protection of the small entrepreneurs and agriculture from any significant negative effects from possible fuel price increases. Consequently, and because of a certain degree of uncertainty as regards the actual lead content of fuel, there was a need for thorough analysis prior to deciding on a possible phase down or phase out strategy.

As part of this, a total of 21 fuel samples taken in four cities of Armenia and subsequently tested. None of these samples contained lead above or even near the 0.013 g/l limit for unleaded petrol, while some were above the European limit of 0.05 g/l. In conclusion, these samples confirmed the indications of other studies (e.g. on the lead concentrations based on snow samples) that leaded petrol is not traded in the Armenian fuel market to any significant extent.

These results and results of other research were discussed with all the main stakeholders together with possible implications of a ban. It was concluded that a ban was feasible and would not lead to excessive price increases, if any at all. Consequently, it was decided to implement a ban on leaded petrol. Simultaneously, it was recommended also to improve the monitoring and control of the contents of benzene and aromatics. Equipment and raw materials to pursue this were acquired with the assistance of DANCEE. The main reason for this was the prime concern of many stakeholders that a ban could lead to future increases in the content of benzene and aromatics. Along the same lines, related limit values were introduced in the standards.

Armenia as most other NIS countries do not have systems for dual distribution of leaded and unleaded petrol. Furthermore, the labelling of fuels at the retail level is quite poor in general. Consequently, focusing on standards and opting for a ban is much more cost effective than a gradual phase out, in particular because it does not involve any significant transaction costs at the moment in question.

5 Methods of data collection

This chapter first presents the information sources which have constituted the basis of this review on phase out of added lead in Europe. A discussion of the "reliability", consistency and comprehensiveness of the data is given in the succeeding section.

This review has been conducted in three consecutive phases:

1. Desk study reviews consulted all existing and available literature and surveys
2. Questionnaire based survey to obtain more accurate, comprehensive or up-to-date information for selected countries
3. Data compilation and analysis assessing the state of progress of the Strategy based on the information obtained in phase 1 and phase 2.

This chapter thus aims to explain in more detail about the consulted sources of information and the results of the questionnaire.

5.1 Sources of information

5.1.1 Consulted literature

First, the existing literature was reviewed thereby establishing a first rough status on market shares and limits for content of lead in petrol. The review also gave useful indications on which countries to focus on in relation to questionnaire survey. The identified literature was consulted throughout the process of conducting the review. Thereby, information obtained through the questionnaire survey could be validated, and the representativeness of certain statements of the questionnaires could be assessed. Lastly, it should be noted that much of the consulted literature actually do provide substantial amounts of valuable information of relevance to this review.

An annotated list of the main material consulted during this review is given below:

- *The 2000 and the 2002 surveys on strategies and policies for air pollution abatement carried out by UN/ECE*: These UN/ECE surveys have included specific questions in relation to the use of unleaded petrol, such as "progress made in making unleaded petrol available". The UN/ECE has kindly made these surveys available to the Consultant.
- *Study on Fuel Quality Issues in Central Asia and the Caucasus supported by the World Bank*: This study has built on the momentum of the Strategy

signed in Aarhus, Denmark, and treated the obstacles encountered as to diminishing air pollution from transport sources and came out with a series of recommendations. Of particular relevance to this study is the fact that the study provides reviews of current and planned refinery technologies and the consequent implications for lead contents. Furthermore, the study also describes results of the testing of fuel samples, and assesses their general relevance.

- *“Trends in intra EU deliveries of unleaded petrol”, 2000, 2001 and 2002:* These yearly publications published by Eurostat present figures on the use of unleaded petrol within the European Union.
- *DANCEE study on cleaner fuels in Armenia:* This study constituted the background for Armenia's decision on the phase out of added lead in petrol. The study contains a thorough investigation and mapping of the situation followed by detailed analyses of institutional, economic, and technical problems. The study not only considers the issue of lead phase out, but also the general issue of the promotion and use of cleaner fuels.
- *The recent environmental performance reviews of Albania, Macedonia, Yugoslavia, Estonia, Romania, Latvia and Ukraine.* These reviews, which are voluntary exercises undertaken at the request of the countries themselves, assess among others the countries efforts to reduce its overall pollution burden, and they do consider the issue of phasing out added lead in order to improve air quality.
- *Energy Information Administration (www.eia.die.gov)* which provides overall updates and reviews for the energy sector in a wide range of countries.

For further detail on the literature source please refer to Annex 4 for a complete literature list.

5.1.2 Questionnaire survey

As stated in the inception report, the questionnaire survey was restricted to countries where the preliminary desk study indicated that lead in petrol would still be an issue, and where the desk study revealed a need for more and up-to-date information.

In this regard it should be emphasised that the survey did not intend to be comprehensive in the sense of covering all countries. Rather the focus was to address the countries that were considered to be representative for a wider group of countries and/or countries for which there was an urgent need for more information. The questionnaire survey was performed in the period August to November 2002, including follow up. The table below shows to which countries questionnaires were submitted and the rate of response. During the period of conducting the questionnaire survey, other literature was also extensively studied and analysed in order to seek further information in particular on the countries covered by the questionnaire.

Table 4: Submission of questionnaires.

Group of countries	Country	Reply
NIS	Azerbaijan	yes
	Belarus	yes (orally)
	Kazakhstan	no
	Tajikistan	no
	Uzbekistan	yes
	Kyrgyzstan	yes
	Moldova*	yes
	Turkmenistan	no
	Russia	yes
	Ukraine	yes
	Romania	yes
Western Balkan	Albania	yes
	Bosnia Herzegovina	yes (orally)
	Bulgaria	yes
	FYR Macedonia	yes (orally)
	FR Yugoslavia	yes (orally)
Others	Greece	Yes
	Cyprus	yes (orally)
	Turkey	yes

* reply to the draft report

The questionnaires were submitted to relevant resource persons in the country. For the countries, which have provided orally responses, the survey took form of bilateral consultations based on the questionnaire. Typically, the respondents were either government official from Ministry of Environment or Transport or they were a key expert known to the consultant, whose knowledge and network was useful to the fulfilment of the assignment.

A complete list of respondents and persons liaised with is given in Annex 5.

In order to enhance the response rate, the questionnaire was framed in a relatively short and targeted manner omitting many of the issues that had caused severe problems and delays in 1996-1998 where a more comprehensive survey was conducted. The questionnaire itself contained 11 questions grouped around the following topics:

- General information
- Baseline data on the production and use of leaded petrol and unleaded petrol
- Strategy or action plans for phase-out of added lead in petrol and their major contents
- Possible references other resources persons/literature

A copy of the questionnaire is enclosed in Annex 2. In order to ease the communication with the NIS countries a Russian translation of the questionnaire was submitted to those countries.

5.1.3 Consultations

In addition to the questionnaire survey consultations have been carried out involving main internationally recognised agencies dealing with phase out of added in petrol.

Contacts were taken with the secretariat of the SILAQ. It did provide very useful and relevant information on countries participating in SILAQ, namely Bulgaria, Hungary, Poland, Romania, Slovakia, Slovenia, Croatia, Czech Republic and Macedonia. Further the UN/ECE Secretariat provided useful assistance, e.g. in terms of sharing the results of its latest questionnaire survey performed in relation to the LRTAP Convention. Consultations with the World Bank indicated that the above list of literature did cover the World Bank's recent activities in this field and in these regions.

5.2 Data assessment

Comprehensiveness

This review includes 48 of the UN/ECE countries. While 5 have thus been omitted (Andorra, San Marino, Canada, Israel and United States of America), it is nevertheless quite a high fraction. The omitted countries are either non European countries or they are fairly small countries which can be assumed to follow the EC standards. The survey's inclusion of as many as 48 countries compared to the strategy's 40 countries (and where substantially more efforts were dedicated to collecting information for the strategy) is a reflection of many positive developments, among which are:

- Studies and reviews of cleaner fuels issues and lead phase out issues have been carried out extensively in many relevant countries.
- Reporting mechanisms within the EU and information dissemination from CEE countries have substantially improved over the last five years.
- The heavy metals protocol under the LRTAP Convention provides a set-up for regular monitoring.
- The substantive responses received to the questionnaire from Albania, Turkey, Russia, Kyrgyzstan, Azerbaijan, Romania, Bulgaria, Uzbekistan, and Ukraine.

Of these 48 countries, only 19 national experts were asked to participate in the questionnaire survey. This corresponds to less than half of the original survey carried out in connection with the preparation of the Strategy, where 50 questionnaires were submitted.

As it appears from Table 4 above the geographical focus of the questionnaire survey was the NIS and the Western Balkan countries. The preliminary assessment indicated that these countries could prove to have problems with regard to lead phase out. Most of the Western Balkan countries were not included in the survey that was conducted as part of the strategy, due to the political situation in the region at that time.

9 countries completed the questionnaire and 6 countries provided information orally or by other means, yielding a response rate of 79%. It should be noted that 5 out of 6 of the countries which has not responded to questionnaire are not signatories to Strategy.

Reliability

While the responses received were quite comprehensive, there were inevitably differences in the coverage of the responses and the extent to which respondents had considered the various questions. Nevertheless, cross checking, when possible, the information provided with similar information from other sources does not indicate severe problems of inconsistency.

A preliminary presentation of results of the study was done by DANCEE in connection with the 9th session of CEP in November 2002. The participating countries were kindly asked to review the status table presented.

As described, this review builds largely on results from the questionnaire survey and information collected by means of other information sources and literature. While substantive efforts have been put into the task of cross-checking data and information and emphasis has been put on relying mainly on trustworthy and official sources, the reliability of the results is of course quite dependent on the reliability of the different original sources. While this remains the responsibility of the Consultant, a special effort has however been put into the task of developing a comprehensive explanation and description of the data sources underlying the information contained in the status table of this report.

6 Feasibility and perspectives

6.1 Enabling factors

At the political level, there is a general awareness of the health and environmental benefits to be gained from a phase out of added lead in petrol. As the previous chapters have shown, this recognition has in many countries materialised itself in actions and policies in pursuit of a rapid phase out or phase down. These developments have been further supported by market developments and by the overall documented economic and technical feasibility of the lead phase out issues. In regard to the latter, the fact that a lead phase out process had already been completed in several countries before the time of framing the Strategy was important to enhance the belief in the feasibility of a lead phase out.

The most important enabling factors can thus be summarised as follows:

- General recognition of the health and environmental implications of lead
- The economic and technical feasibility of lead phase out
- Market developments
- Restructuring and privatisation

The former two are reflected in the international and national strategies and commitments, whereas the latter two have substantial impacts on the speed of implementing these strategies and commitments.

The phase out of added lead in petrol is in most cases both technically and financially feasible. Studies undertaken in relation to the preparation of the Strategy illustrated that costs could lie in the range of 2-3 cents/litre or maybe even lower (World Bank, 2001).

Market developments in Europe strongly point to unleaded petrol as the future dominant petrol type. This situation applies in the EU and very soon to the enlarged EU. Furthermore, a number of countries that expect to be EU Members in the foreseeable future are on the same path along with other European countries. Consequently, refineries need to adjust to these developments in order to remain competitive, and to maintain a flexible position where their products can be sold in many countries. These market developments are for example mentioned by Russia as one of the driving forces behind the accelerated lead phase out, and they strongly support the realisation of the objectives of the Strategy at the overall European level. In general, the market developments provide refineries with an incentive per se to upgrade their production capacity

to produce petrol products that comply with more international standards and will be in alignment also with future domestic standards.

At the time of framing the strategy, there was a concern in many countries about the ability to raise the finance that was necessary to implement the necessary investments. Since that time, many countries have apparently been able to realise the necessary investments. Part of the explanation is likely to be found in well advanced processes of restructuring and privatisation, which renders it more attractive for foreign investors to invest in the sector. Furthermore, the credibility of government's commitment to national lead phase out strategies and to international agreements can affect refineries' actions and accelerating their efforts to align with national commitments and legislation. The ability to raise the necessary finance has for example been a major factor in Poland's move from a market share of 48% in 1996 and to the current complete phase out, and it is a major contributor also to the progress made in Bulgaria, where the launched privatisation programme is designed in such way that it is bound to the national programme of phase out of added lead in petrol.

Textbox 5. Lead phase out in Romania and Bulgaria.

Romania and Bulgaria have both signed the Pan-European strategy. Romania however indicated that it would not be able to meet the limits for lead content within the time frame. Today, both countries comply with the 0.013 g/l limit for unleaded petrol. Romania however still applies a limit value of 0.32 g/l for the high octane petrol (RON98).

An action plan in pursuit of lead phase out was adopted in Bulgaria already in 1998, and Romania adopted its action plan for reducing the lead content of leaded petrol also in 1998. According to the latter, the limit for the content of lead in leaded petrol should have been reduced to 0.15 g/l in 2001, but it remains today at the level of 0.32 g/l. This delay is likely to be a reflection of a difficulty in mobilising the finance that is necessary to enable refineries to produce more unleaded petrol and to reduce the contents of lead in petrol in general. Romania has the biggest refining industry of the region, but the capacity has been underutilised for years due to shortages of crude oil supplies and there is a significant need for modernisation and repair. In recent years though, progress has been made towards restructuring of the sector, and finance is beginning to flow into the sector enabling the necessary investments to begin to materialise. Moldova has become a significant outlet for Romania's refining industry.

By comparison, Bulgaria has a much smaller refining industry, the restructuring of which has nevertheless also taken several years. Still, progress has been made with Lukoil now being a major investor in the largest refinery Neftochim, and having made a commitment to undertake a large investment programme at the refinery.

Both countries have now regulations in force according to which catalytic converters are mandatory and that comply with EU standards for unleaded petrol and aim to phase out added lead in petrol by 1 January 2004 (Bulgaria) and 1 January 2005 (Romania).

6.2 Critical constraints

While the above section illustrates the major enabling factors of importance to the observed high level of phase out at the European level, some of these factors may however still be critical constraints in some countries.

Thus, in many Western Balkan countries, a major progress is likely to be conditioned on the progress as regards two important and partly related factors, viz:

- The need for refinery repair and upgrading to enable production of unleaded petrol of sufficient quality and octane number. The region still suffers from the period of war, unrest and instability, and consequently, the refineries are in need of finance to upgrade.
- The need for credible accompanying and supporting measures at the government level. The issue of lead phase out and fuel quality in general must have a priority at the government level. This is what happened in Bulgaria and Romania in the mid and late 1990s, and it was reflected in the framing and pursuit of comprehensive national strategies. These strategies applied a mixture of economic instruments (tax differentiation), gradual tightening of standards, and awareness building campaigns. Furthermore, the introduction of requirements for catalytic converters on new or imported cars (in alignment with EU legislation) was another supportive regulation in these countries. Pre-announcements and setting of time schedules was another important element of these strategies, as it enables consumers and industry, not least, to adjust over time. Such strategies accompanied by a dedicated will to realise their contents will affect the behaviour of the supply side, and provide incentives for refineries to intensively seek financing opportunities to enable compliance with the requirements of the domestic market.

In the NIS countries, the realisation of the planned phase out dates indicated by the countries does for some of the Central Asian countries, depend on the realisation of plans for modernisations and upgrading.

Lastly, while the scope of this study has not related to implementation and enforcement, the possible impact on an intensified effort in this field needs to be mentioned as well. Enforcement and control are important in ensuring a factual compliance with adopted bans and standards. While the overall impact of possible violations on actual market shares need not be that substantial, it nevertheless has an important influence on the overall credibility of the regulatory systems and in providing fair and equal conditions of competition.

Textbox 6. Lead in petrol in the Balkan countries



Thus, a ban on the use and production of leaded petrol is the major step towards achieving a phase out of added lead in petrol, but enforcement and control are important remedies in ensuring a 100% factual realisation of this. This issue was raised already at the time of framing the strategy, and the questionnaire survey conducted in relation to this review indicates that this *may be* an issue for further consideration. Also the WB study on Cleaner Transport Fuels for Cleaner Air in Central Asia and the Caucasus indicates that post-refinery blending of lead and lead-like octane boosting additives into the petrol *may* constitute a problem in some countries¹⁴ together with the more frequent general violations of fuel standards (content of aromatics and benzene, and octane number).

¹⁴ Still, the samples were few and the fraction of violations in this respect proved to be small.

6.3 Perspectives

This report shows that remarkable progress has been made throughout Europe in regard to the phasing out of added lead in petrol, and the report has identified the major drivers behind this development. The drivers are to a large extent related:

- International focus and agreements
- National strategies and commitment
- Market developments
- Restructuring and privatisation

In addition, many countries¹⁵ had phased out already at the time of framing the strategy, i.e. during the 1980s and early 1990s. Consequently, the experience from the countries constituted an important basis for the framing of the strategy. This experience served to verify the feasibility of a phase out, and to illustrate the possible means of pursuing this and addressing the most important possible obstacles.

While the progress of implementation of the Strategy is very significant, there is a need for an intensified effort in most of the Western Balkan countries. Their refining industry is in need of investments to enable a phase down strategy to be implemented. Furthermore, for an accelerated effort to commence, the issue, and its substantial health benefits, needs to be promoted on the political agenda of the countries.

While EU alignment can and should play an important role in this respect, the process will also benefit from international assistance targeted towards more strategic and feasibility related issues, and from the facilitation of experience sharing and possible coordination of initiatives. The latter applies equally to experience sharing and coordination within the region, as well as to experience sharing vis-à-vis other relevant countries.

Enforcement and control can also prove to be important contributors to ensuring a factual and sustainable phase-out, and thereby to ensure that the substantial health and environment benefits are harvested. This issue should be in focus also for countries that have achieved the 100% phase out. In pursuit of this, there may be a role to play for experience sharing and for intensified efforts towards harmonisation of regulations, custom duties and control mechanisms. International assistance can have a role to play in this field in order to accelerate the process.

¹⁵ Such as USA, Denmark and Slovakia.

7 Conclusions

The overall and immediate objectives of the strategy

The strategy aims

- to achieve a ban on the marketing of leaded petrol by 1st January 2005 at the latest
- to obtain market shares of 80% of unleaded petrol by 1st January 2002 at the latest
- to set a maximum limit for the content of lead in leaded petrol of 0.15 g/l and a maximum limit for the content of lead in unleaded petrol of 0.013 g/l by 1st January 2000 at the latest.

Status and trends: the signatories

The strategy was signed by a total of 31 European countries¹⁶. All of these countries have either phased out already (27) or expect to do so by 1st January 2005 or even earlier. The phase-out countries count all the 19 Western European countries that signed the strategy, 6 EU Candidate countries (Czech Republic, Latvia, Lithuania, Poland, Slovakia and Slovenia) and 1 NIS country (Ukraine).

Bulgaria and Romania have made considerable progress during the last years, and both countries aim to phase out before 2005. The state of the refining industry may come to be the critical factor for Croatia in implementing the ban, which is planned for 2005. Still, Croatia has doubled its market share comparing 1996 (30%) to 2000 (63%), and does still aim at 2005 as the target date for the ultimate phase out. Cyprus, being a Candidate Country, aims at 2005 as the phase out date.

As regards the intermediate target of a 80% market share of unleaded petrol by 1st January 2002, patterns similar to the above can be observed indicating that the majority of countries were able to comply with this target.

The information on limit values for the content of lead in petrol is more limited. Still, it indicates an overall high level of compliance today with the target values. In Romania, the lowering of the high limit value for leaded petrol of 0.32 g/l down to 0.15 g/l is part of the national action plan, and similarly in Croatia.

¹⁶ This figure excludes USA and Canada. They signed the strategy, but have not been included in this review as the review focuses on the European aspects of lead phase out.

Status and trends:
Other European
countries

Substantial progress can also be observed for countries that did not sign the strategy. In this regard, it should be mentioned that many countries that did not ultimately sign the Strategy did however participate very actively in the work of the UN/ECE Task Force, and have adopted quite comprehensive national strategies in pursuit of the objective of lead phase out. Another important explanation for the substantial progress at the overall European level is found in the process of EU alignment in many countries. Directive 98/70/EC obligates Member States to phase out added lead in petrol by 2000 and by 2005 at the latest.

Thus, 10 countries that did not sign the Strategy have nevertheless phased out added lead in petrol or are very close to. This group of countries includes Western European countries (Monaco), CEE countries (Hungary, Estonia), and NIS countries (Azerbaijan, Armenia, Belarus, Estonia, Georgia, Kyrgyzstan and the Russian Federation). In regard to the NIS countries, the influence of EU alignment per se is not likely to be the major explanation. Rather, it is presumably to be found in the on-going efforts towards improving the fuel quality standards combined with the urgent need for repair and modernisations, which was apparent at the time of framing the strategy. Since the time of the strategy, much has been done to upgrade refineries as illustrated for example by the cases of Ukraine and Russia.

Thus, while Ukraine and Moldova were the only NIS countries to sign the strategy, much progress can however be observed in the whole region in regard to lead phase out. In addition to the above, Turkmenistan and Kazakhstan are expected to achieve a phase out in 2005 whereas Uzbekistan aims at 2008 as the target year.

In the Western Balkan countries there is a need for an intensified effort to facilitate substantial progress in the fields of lead phase out and cleaner fuels. While the information that has been obtained on these countries is relatively scarce, it nevertheless provides indications of a substantial use of lead in fuel production. To reverse this, there is a need for the issue to be a priority at the government level and for refineries to upgrade in order to enable the production of sufficient amounts of high quality unleaded petrol. These two issues are partly related as a dedicated government effort (resulting in e.g. awareness building and tax differentiation to stimulate demand, and tightening of fuel quality standards) to reduce the content of lead in petrol will incite refineries to intensify efforts towards repair and upgrading.

Conclusions

In conclusion:

- The signatories of the strategy are most likely able to attain the overall objective of a phase-out by 2005. The vast majority of signatory countries have already phased out. The three countries that may have most problems in fulfilling the 2005 deadline (Croatia, Romania and Bulgaria) have shown a remarkable progress since 1996. This progress is largely a result of the framing and the dedicated pursuit of comprehensive strategies towards this aim. The strategies of these countries have 31st December 2003 (Bulgaria) or 1st January 2005 (Croatia and Romania) as the ultimate phase out dates.
- The intermediate target of a market share of 80% by 1st January 2002 was obtained by the majority of signatory countries. Greece and Romania were

reported to have lower market shares, but still Greece phased out in 2002. Development trends in a few other countries including Bulgaria indicate that the market shares were likely to be lower than 80% by 1st January 2002.

- The limit values for the content of lead in petrol of respectively 0.013 and 0.15 g/l in unleaded and leaded petrol have been achieved in the majority of signatory countries as well. Only very few countries report higher limit values, typically for specific qualities (e.g. 98RON in Romania) of leaded petrol.
- As explained below, much progress has also been made in countries that did not sign the strategy. For example, countries like Ukraine and Russia have phased out already, and Turkey aims to do so by 2005. This is likely to be attributable to a number of factors that have pulled in the same direction and that have in some cases been mutually reinforcing. These factors include: the process of preparing the Pan-European strategy, the EU Directive 98/70/EC and the efforts towards EU alignment in Candidate Countries, the Heavy Metals Protocol under the LRTAP and market developments throughout the European region.
- By 2005, and 2008 at the latest, the majority of the European countries will have phased out added lead in petrol.

Annex 1. The Pan European Strategy

Progress report on the implementation of the Pan-European strategy to phase out added lead in petrol

Annex 2. The Questionnaire

Review of the Pan-European Strategy on the Phase-out of Added Lead in Petrol

Questionnaire survey undertaken for the Danish Cooperation for Environment in Eastern Europe (DANCEE)

I. Introduction

COWI A/S has been contracted by the Danish Cooperation for Environment in Eastern Europe to undertake a review on the status for the implementation of the Pan-European Strategy on the Phase Out of added Lead in Petrol adopted in Aarhus in 1998. Dr. Pelovski from the Balkan Science and Education Centre of Ecology and Environment is assisting COWI with this assignment.

The Strategy recommends the signatories:

- By January 2005, leaded petrol will not be marketed in the European countries
- Furthermore, it was recommended, that countries commit themselves to:
 - Seeking to obtain a market share of unleaded petrol of at least 80% by 1 January 2002 at the latest, and
 - Setting a limit for the content of lead in leaded petrol of maximum 0.15 g/l by 1 January 2000 at the latest, while the lead content of unleaded petrol should not exceed 0.013 g/l.

It is the aim of the present review to provide an overview of the progress in the ECE countries and to provide a forecast on the fulfilment of strategy and a discussion of issues of common concern. In overall the review will be a motivation, guideline and tool to the further work of phasing out leaded petrol from the market by 2005 and takes part in the process towards the Kiev Conference in May 2003.

Specifically, the review covers the Western European countries, the Central and Eastern European (CEE) countries, the Balkan and the NIS countries, and will take into account the reservation made by some countries in Aarhus.

II. Approach to Data Collection

The approach used in the study is as follows:

- This questionnaire is submitted to you as a representative of the main national authority or as a resource person within the field of Phase-out of Added Lead in petrol in your country;
- You are kindly asked to fill in the questionnaire by 19 November 2002 and return it to us.
- We will follow up by e-mail and telephone to see if any questions need clarification, so that the deadline may be met by and an adequate level of information detail can be obtained.
- Upon reception of the questionnaire the team will proceed with a compilation of the main findings and conclusions which will be submitted to you for validation during November 2002.

E-mail correspondence is considered the most convenient means of communication. However, we are also going to use telephone communication, when necessary. You are most welcome to contact us for further information regarding the project in general and the questionnaire in particular. The contact details are given below.

III. Other Contact Persons

In the case where you are not the resource person within the field of Phase-out of Added Lead in Petrol, we would highly appreciate your assistance in sending us the name of the most appropriate contact person whom you find better informed on the Phase-out of Added Lead issues in your country and who can provide the kind of information requested in the questionnaire.

Alternatively, your field of responsibility or expertise may only cover some of the issues treated in the questionnaire, you are therefore kindly asked to fill out the questionnaire partly and as it will appear last in the questionnaire you are asked to provide the names of other resource persons who cover the rest of the fields.

IV. Submission of questionnaire

We would appreciate if you could forward your answers by e-mail or, alternatively, by fax to:

Mrs. Suzanne Steensen

E-mail: suz@cowi.dk

Tel.: +45 45 97 22 55

Fax: +45 45 97 22 12 (Attention: SUZ).

Or

Mrs Albina Shuyska

E-mail: asu@cowi.dk

Tel.: +45 45 97 14 39

Fax: +45 45 97 22 12 (Attention: ASU).

Finally, we have for your convenience attached an introduction letter from the Danish Cooperation for Environment in Eastern Europe (DANCEE).

Thank you very much for your assistance and co-operation in providing information on the issues of Phase-out of Added Lead in Petrol.

V. The questionnaire

A. General information

Q 1. Information about the respondent

Name:	
Institution:	
Area of responsibility:	
Address:	
Phone no.:	
E-mail:	

Q 2. Have the country signed the Pan-European Strategy?

Yes	No	If not, when do you expect your country to sign the Strategy?

B. Baseline data on the production and use of leaded and unleaded petrol)

Q 3. Please provide baseline data on share of unleaded petrol (please provide the latest available data and the prospects for 2005 - **If data are not available for 2002, Please indicate the estimated share as per 1 January 2002**):

	Latest available year (please indicate year and figure)		Prospects for 2005
	Year	Share	
▪ Market share of unleaded petrol			
▪ Production share of unleaded petrol (if available)			

Q 4. Please specify the current available types of leaded and unleaded petrol and limit of lead content (indicate eventually range of limit depending on the type of fuel/gasoline available on the market):

Name of petrol type	Leaded petrol		Unleaded petrol	
	RON/MON specification	Limit of Lead content	RON/MON specification	Limit of Lead content

Q 5. Additive use in unleaded petrol

Yes	No	If possible (please specify the different type of additive in use)
		<ul style="list-style-type: none"> ▪ ... ▪ ... ▪ ...

C. Strategy or actions for Phase-out of Added Lead in Petrol

Q 6. Has the country adopted a National Strategy/Action Plan for the Phase-out of added lead in petrol?

Yes	No	If Yes please refer to question 7. If No, when do you expect your country to adopt such a strategy of action plan?

Q 7. If your country has adopted a Strategy, please provide information about the instruments used to implement the Phase-out of Added Lead in Petrol:

	Current or past activities/measures	Foreseen/planned activities/measures
Awareness activities: <ul style="list-style-type: none"> ▪ General information campaigns ▪ Specific Information (e.g. on mislabelling) ▪ Others 		
Regulation on lead content in petrol: <ul style="list-style-type: none"> ▪ Prohibition/ban on leaded petrol sale and/or production ▪ Fuel Quality standards 		
<ul style="list-style-type: none"> ▪ Catalytic Converters requirements on cars ▪ Enforcement and control measures ▪ Others 		
Tax differentiation: <ul style="list-style-type: none"> ▪ Tax incentive scheme (e.g. higher taxes on leaded petrol) ▪ Use of subventions (to e.g. subvention to equip old cars with retrofit catalyst) ▪ Others 		

Q 8. Are other programmes/activities planned of relevance to the phase out or phase down of added lead in petrol. Please indicate whether this is in the frame of other international agreements such as the Protocol on Heavy metals, the Convention on Long-range Transboundary Air Pollution, EU directives, other conventions, or initiatives (e.g. SILAQ), or whether it is a national action solely?

Programme/activity	Related to international agreements (please specify)	Brief description of the programme/activity

Q 9. What are the main obstacles in implementing a complete phase-out of lead in the country?

	Yes	No	Reason
Inadequate regulation/legislation			
Inadequate enforcement/control system (e.g. control of technical specification on imported new and old cars, control of sold fuel quality, etc.)			
Lack of capital/investments (e.g. lack of necessary investment to perform the production conversion in the refinery sector)			
Insufficient level of knowledge (e.g. lack of knowledge at consumers' level - cars owners - about the feasibility of using unleaded fuel e.g. due to habits/misperceptions....)			
Political/Sectoral considerations (e.g. agricultural sector uses leaded fuel)			
Car fleet features (e.g. mainly old car fleet)			
Other obstacles: <ul style="list-style-type: none"> ▪ ... ▪ ... ▪ ... 			

D. Reference list and Other contact persons

Q 10. Can you identify other existing studies (preferably in English), if any, already carried out in relation to Phase-out of Added Lead in your country (please provide the list of references)?

Yes	No	If yes, please provide the title and Author and specify whether these reports are available on an Internet web site, or could we get them in electronic form or a paper copy?
		<ul style="list-style-type: none"> ▪ ... ▪ ... ▪ ...

Q 11. If possible, please provide names of other resource persons specialised/responsible in specific sub-issues within the field of Added Lead in Petrol in your country.

Name 1

Institution: _____
Address: _____
Area of responsibility: _____
Phone no.: _____
Fax no.: _____
Email: _____

Name 2

Institution: _____
Area of responsibility: _____
Address: _____
Phone no.: _____
Fax no. _____
Email: _____

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Annex 3. Notes relating to table 1

Country (in alphabetic order)	Detailed information on selected countries
Albania	The response to the questionnaire survey further indicates that 110,000 tonnes of unleaded petrol was sold in 2002, while the production of unleaded petrol amounted to 50,000. Further the actual content of unleaded petrol on the market was 0.002 g/l. According to the latest DRAFT environmental performance review, UN/ECE 2002, it is stated that <i>“due to poor fuel quality control it is not known whether the lead content is sufficiently low so as not to ruin the cleaning function of the catalytic converters. The emission of lead from cars is not a concern in Albania today since only about 10 per cent of passenger cars use petrol. However, the concentration of lead in the air could increase if traffic grows and leaded petrol continues to be used.”</i> Further in the same report it is brought out that <i>“No economic instruments to reduce emissions to air, other than the additional tax levied on the import of used vehicles, have been used in Albania. Moreover, the relatively high excise tax on unleaded fuel (90% compared to 20% on leaded petrol) is likely to discourage the introduction of petrol-fuelled cars with catalytic converters.”</i>
Azerbaijan	Information received from the questionnaire survey. In 2005, the market share is estimated to attain 80%.
Bulgaria	Information received via the questionnaire survey indicates that the max lead content is according to regulations 0.013 and will be applied until 2003 and it will thereafter be reduced to 0.005 g/l. Bulgaria produces unleaded petrol and satisfies completely the needs of the country. The unleaded petrol production increased from 0.3 % (4.4 thousand t/y) in 1990 to about 46 % (503 in 2001), and in 2004 it will be 100 % (1538) - RON 95 and RON 98. The deadline for the complete phase-out of leaded petrol is 31 December 2003 (Government Decision 173/98). The consumption of unleaded petrol in the country in 2000 is 249.14 thousand tons or 38 % from total petrol consumption, that means increasing with 67 % compared with 1999 (149 thousand tons). The main part of the unleaded petrol produced in the country is exported. The country aims at prohibiting the sale and production of leaded petrol pr. 1 January 2004.
Croatia	Figure on market share for 2000 is from minutes of SILAQ workshop 2001. In addition, Croatia has informed UN/ECE that leaded petrol will be phased out in 2005 (UN/ECE, 2002d). According to the questionnaire survey, all petrol stations have since 1992 offered unleaded petrol with different pump nozzles for leaded and unleaded petrol. Historically, the market share of unleaded petrol increased from 2.5% in 1990 to 50% in 1999, while the consumption of leaded petrol has remained almost constant in recent years.
Czech Republic	The figure for 2000 applies actually to 1999 and represents an increase from 63% in 1997. According to (UN/ECE, 2002d), the Czech Republic has phased out the use of leaded petrol, the sale of leaded petrol was terminated by 1.1.2001.
Estonia	According to regulations, the 0.013 level of lead content will apply until 2003, and it will thereafter be reduced to 0.005 g/l. Estonia has phased out the use of leaded petrol.
France	According to UN/ECE, (2002d) France began to commercialize unleaded gasoline in 1990 and completely suppressed the sale of unleaded petrol from 1 January 2000.
Greece	According to UN/ECE (2002d), Greece has phased out the use of leaded petrol.
Hungary	Ministerial Decree 12/1998. (XI. 23.) GM banned leaded petrol on 1 April 1999.
Italy	Lead petrol has been banned since 1. January 2002.
Liechtenstein	No data have been available, the market share is the consultant own estimation.
Macedonia	Macedonia has reserved its position on the final phase out date and has called for a delay until 2008.
Monaco	Monaco has phased out the use of leaded petrol.
Moldova	The source of information is the Ministry of Ecology, Construction and Territorial Development (March 2003)
Kazakhstan	The figures for market share indicate production share and not market share. The figure for 2000 applies to 1999 and has been assessed based on information on production figures taken from World

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Country (in alphabetic order)	Detailed information on selected countries
	Bank 2000.
Kyrgyzstan	According to World Bank 2000, Kyrgyzstan imports most of its consumption. There is however a small and fairly simply refinery, which produces only low octane petrol. Today, this petrol is leaded, but it is planned to replace it by unleaded by 2005 at the latest, presumably by blending with imported high octane unleaded petrol.
Poland	The figure on market share for 2000 applies actually to 1999. Poland has phased out the use of leaded petrol.
Romania	Romania indicates that the market share in 2005 will be 60% implying a phase-down, but not a phase-out by that time. Still, the official phase-out date appears still to be 2005, at which time though, it is forecasted that all production will be unleaded. In the strategy, Romania states that 2008 is the realistic date.
Russian Fed- eration	Substantial progress appears to have been made since 1995, today the market share is estimated to 100% and Russian expect to implement a ban in 2003.
Slovenia	The use of leaded petrol for on-road vehicles was phased out in 2001.
Spain	Spain has phased out leaded petrol. Sales of leaded petrol has stopped from 1. January 2002 in accordance to Royal Decree 403/2000.
Switzerland	Switzerland phased out the use of leaded petrol for on-road vehicles by 1 January 2000
Turkey	The domestic refinery TÜPRAS supplies about 80% of the national demand, and from August 1 st 2002, the refinery has phased down the lead content of leaded petrol to 0.15 g/l and the lead content of unleaded petrol is phased down to 0.005 g/l. The market share of 2002 applies to the first seven months. The information on Turkey derives from the reply to the questionnaire.
Turkmenistan	According to WB 2000 the major refinery in Turkmenistan, Turkenbashi, is under revamp. In 2005, the refinery will produce only unleaded petrol and in amounts which will enable an export of about 1,000,000 t/y.
Ukraine	It is under consideration to tighten the deadline to 2003 of the total phase out in light of very positive developments of the production of unleaded petrol in recent years.
United Kingdom	The general marketing of leaded petrol in the UK has been banned since 1 January 2000 under EU Directive 98/70/EC.
Uzbekistan	Information received from questionnaire.
Yugoslavia	Information from SILAQ workshop 2001 (Minutes of meeting) and bilateral consultation.

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Caucasus, Washington.

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Washington.

Annex 5. Consulted contacts

Country	Name and address
Albania	Mr. Agim Malja Faculty of Natural Sciences, Department of Industrial Chemistry Technology of Organic Chemistry Sector of Coal and Fuel Management Boulevard " ZOGU I", Tirana, Albania Email: amalja@fshn.tirana.al
Azerbaijan	Mr. Rasim Sattarzade State Committee on Ecology and Control of Natural Resources Utilization National Coordinator for Cleaner Fuels Study rsattarzade@azdata.net Questionnaire submitted formally to Minister of Environment G. Bagirov
Bosnia-Herzegovina	Prof. M. Omanovic (bilateral consultations)
Bulgaria	Mr. Valery Serafimov Chief of Air Monitoring Department Ministry of Environment 67 W. Gladstone St. 1000 Sofia, Bulgaria
FYR Macedonia	Prof. Mile Dimitreivski (bilateral consultations)
Greece	Mr. Fokion Vosniakos Tei of Thessaloniki Hellenic Gasolines 54101 Theassoloniki Greece Email: pmetzel@netor.gr
Kazakhstan	Mr. Aleksander Bogdanchikov Chief of Department for Fuel Economy, Toxicity Reduction and Operating Materials Research Institute of Transport in Kazakhstan

Country	Name and address
Kyrgyzstan	<p>Dr Ainura Djumanalieva Research Officer Kyrgyz. Medical Academy 720021 Bishkek Kyrgyzstan E-mail: ainura@elcat.kg</p>
Moldova	<p>Mr. Spivacenco Yurii Vice-minister Ministry of Transport and Roads 12A Bucuriei Str. 2004 Kishinau Moldova</p> <p>Ms Maria Nagornii (in reply to draft report)</p> <p>Ministry of Ecology, Construction and Territorial Development Politica Ecologica [policy@mediu.moldova.md] Email: policy@mediu.moldova.md</p>
Romania	<p>Dipl.eng. Radu Zamfirache Romanian Oil Company SNP PETROM SA - INCERP CERCETARE Subsidiary Director of the Research Institute for Oil Processing and Petrochemistry Bdul. Republicii 291A, 2000 Ploiesti Romania Email: radu_z@incerp.ro</p> <p>Expert Elena Bucur (supplementary information)</p> <p>Directorate for European Integration, International Relations Ministry of Waters and Environmental Protection Romania Email: elena@mappm.ro</p>
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Country	Name and address
Tajikistan	<p>Mr Nazarov Shams Head Dept. for Special State Control: Atmosphere Ministry for Nature Protection Bohtar Street 12 734025 Dushanbe Tajikistan Email: kodir@tajikistan.com</p>
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Turkmenistan	<p>Mr. Vladimir A. Glazovsky Head of Environmental Department, Ministry of the Use of the Natural Resources and Environmental Protection 102, Kemine St. Ashgabat Turkmenistan</p>
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Uzbekistan	<p>Mrs Rosliakova Lilia Vasilievna - Head of department of control emission sources State Inspection of Nature Protection Committee of Uzbekistan 13-A Nosir Str. Tashkent, 700100 Uzbekistan</p>
Yugoslavia	<p>Prof. Predag Polic (bilateral consultations)</p>