Workshop to Promote the Ratification of the Protocol on Heavy Metals across the entire UN ECE Region

Yerevan, Armenia 2008

LRTAP
Long-range Transboundary Air Pollution

Umwelt Bundes Amt
for our Environment

Imprint

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Yerevan; 14 to 16 May 2008

Introduction

The Task Force on Heavy Metals in its reports to the WGS explains broadly the exceedances of Critical Loads by HM deposition in the ECE Region. The TF reports that HM emissions have declined in many countries. However, further reductions are thought to be possible and, indeed, necessary, if the on-going violation of Critical Loads for HM depositions is to be decreased. The TF reiterates that, as the result of its findings, emission reductions in the region could lead to an effective decrease of HM depositions, ie in spite of the significant contributions from atmospheric hemispheric transport of HM. The most efficient reduction of HM depositions could result from the application of the HM Protocol in the entire region.

Against this background, and since most Eastern European Countries haven not yet ratified the HM Protocol, the TF attempts to bring these countries to the ratification process. As part of these on-going affortss, a workshop was arranged in Yerevan, Armenia.

Following an invitation by Armenia and support the TFHM by Germany, conducted a **Workshop to Promote the Ratification of the Protocol on Heavy Metals across the entire UN ECE Region** in Yerevan from 14 to 16 May 2008.

In contrast to similar attempts by other bodies, this workshop acquired broad participation by experts from countries which had not yet ratified the HM Protocol. Interest by the participants, together with careful preparation by the host and Katja Kraus, chairperson of the TF, resulted in extremely worthwhile and constructive discussions throughout the Workshop.

A comparison was made of the list of countries which have already ratified the HM Protocol to the list of LRTAP Convention Parties which have not yet ratified it. The Workshop demonstrated that difficult economic climates in these countries were not necessarily the reason why ratification had not taken place. The presentations and subsequent discussions at the Yerevan Workshop indicate the following shortcomings which have hampered the ratification process in countries:

- lack of knowledge on HM emissions in their own country
- misunderstanding of procedures for the development of HM emission inventories
- limited capability to establish emission inventories
- lack of knowledge of implementation of BAT and uncertainty on the costs for the application of BAT for the control of HM emissions
- limited environmental infrastructure and institutional development, in particular in the current economic climate.

Other noteworthy points to emerge were:

- The UNECE Secretariat guidelines for the establishment of emission inventories have been very much appreciated.
- First activities to support the establishment of national emission inventories were started immediately after the workshop.
- The inclusion of the basic obligations from the HM Protocol into political programmes has proved to accelerate the ratification process.
- Experts from all participating countries advised that there is a political will to control polluting industries. Those countries that do not have adequate emission controls in place would welcome visits from TF experts to assist with the steps towards ratification of the Protocol.
- Presentations EMEP Centers and from Western European countries contributed greatly to the positive nature and successful outcome of the Workshop.

The Chair and all participants thanked the Armenian Ministry of Nature Protection for hosting the Workshop. Everybody was impressed with by the excellent support provided by staff from the ministry. Participants also gave a vote of thanks to the German Federal Ministry for Environment and the Chair of the HM Task Force, Katja Kraus, for the preparation of this successful Workshop. All felt that a follow-up event would help further to support the ratification process in countries which have yet to adopt the Protocol.

Agenda

Day 1 (Wednesday 14th May: 12.00- 18.00)

1. Registration
2. Opening, organisational and technical questions
3. Opening statement by the Armenian Ministry
4. The Convention and its Protocols – framework and requirements (Tea Aulavuo, Secretariat of the Convention)
5. Development of the Heavy Metals Protocol up to now, D. Jost, Germany- former Chairman of the Task Force on HM)
6. Experiences in transposing the obligations of the HM Protocol into national law (Ivan Angelov, Bulgaria)
7. Evaluation of concentrations of air pollutants and depositions of HM over the EECCA region (Ilia Ilyin, MSC-East)
8. Presentations from national experts of the EECCA region on the situation in their country (eg emissions, sources of HM, monitoring, reporting), and the needs/steps to fulfil obligations and to implement the Protocol
9. The effectiveness of the HM Protocol - emission reductions and costs (TNO-study) (M. van het Bolscher, The Netherlands)

Evening: Dinner at the invitation of the Federal Environmental Ministry, Germany

Day 2 (Thursday 15th May: 9.00 – 18.00)

10. Technologies and techniques and their emission reduction potential and costs (Andre Peeters Weem, The Netherlands)
11. Synergies of Reduction of HM and particulate matter (Katja Kraus, Germany)
12. Critical Loads / Critical Levels and Effects of HM – Integrated Assessment (Jean-Paul Hettelingh, The Netherlands)
13. Additional technical measures/options and their reduction potential (M. van het Bolscher, The Netherlands)
14. Overview of the situation in the EECCA region - evaluation of a questionnaire of the Secretariat of the LRTAP Convention and ideas on revising the Protocol and its annexes (Johan Sliggers, The Netherlands)
15. Presentations from national experts of the EECCA region on the situation in their country (eg emissions, sources of HM, monitoring, reporting and the needs/steps to fulfil obligations and to implement the Protocol
16. Future aims of the TF (Katja Kraus, Germany)

Day 3 (Friday 16th May: 9.00 – 13.00)

Discussion of problems on the road to implementation and possibilities to support EECCA countries in implementing the HM Protocol

Recommendations for EECCA countries

Recommendations for future work of Task Force on Heavy Metals

Conclusions and Resolution

Participants of the Workshop:
Yerevan from 14 to 16 May 2008

Name, first name	country
Alybaeva Chynara	Kirghizia
Angelov Ivan	Bulgaria
Aulavuo Tea	Finnland
Balan Violeta	Moldova
Djuraskovic Pavle	Montenegro
Gabrielyan Aram	Armenia
Gilca Gavril	Moldova
Hettelingh Jean-Paul	Netherlands
Ilyin Ilia	Russia
Jost Dieter	Germany
Karchava Janri	Georgia
Komosko Irina	Belarus
Korkhmazyan Margarita	Armenia
Kraus Katja	Germany
Malitz Anika	Germany
Morozov Vladimir	Ukraine
Muradyan Asya	Armenia
Papyan Simon	Armenia
Peeters Weem André	Netherlands
Rukhaia Kakha	Georgia
Saroyan Hasmik	Armenia
Shmeleva Tatiana	Kirghizia
Sliggers Johan	Netherlands
Turlikyan Angela	Armenia
Van het Bolscher Maarten	Netherlands
Varygina Marina	Russia
Volkodeava Marina	Russia
Yusim Olga	Russia
Zavryalov Sergei	Belarus

ACTIVITIES TO PROMOTE IMPLEMENTATION OF THE PROTOCOLS

Tea Aulavuo, Secretariat of the LRTAP Convention

With the increasing recognition of the widespread effects of air pollution and of its long-range components, it has become evident that tackling these effects requires effective implementation of the obligations of the Convention on Long-range Transboundary Air Pollution and its protocols by countries throughout the UNECE region. While the Convention contains general principles and obligations, its protocols impose concrete measures that Parties must take to cut their emissions of specific air pollutants and to tackle specific environmental problems. The protocols also foresee a formal mechanism for a review of compliance allowing the Convention's Implementation Committee to assess whether Parties comply with their obligations. This is why promoting the ratification and implementation of the Convention's protocols by the countries in Eastern Europe, the Caucasus and Central Asia (EECCA) and in South-Eastern Europe (SEE) is a high priority under the Convention.

The Protocols most relevant for accession by EECCA and SEE countries are: the 1984 Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of air Pollutants in Europe (EMEP); the 1998 Protocol on Heavy metals; the 1998 Protocol on Persistent Organic Pollutants (POPs); and the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (the Gothenburg Protocol).

In recent years, the Convention bodies, the individual donor governments and the Convention secretariat have undertaken a number of activities to further focus on countries in EECCA and SEE and to assist non-Parties to ratify and to implement the protocols. These include the following:

- All the lead countries of expert groups and task forces operating under the Convention have been encouraged to organize capacity-building activities for EECCA and SEE, such as the Yerevan workshop on heavy metals sponsored by Germany, as well as to provide funds for the participation of experts from countries of those sub-regions in the meetings and workshops they host;
- Detailed implementation guidance for the Protocol on Heavy Metals, the Protocol on POPs and on Gothenburg Protocol will be made available on the Convention website in early 2009. These guidance documents aim at encouraging Parties to the Convention to implement and to accede to the protocols by helping the policy makers, as well as the authorities charged with practical aspects of implementation, with the necessary analysis and planning. They provide simple explanations of the texts of the protocols to help understand what is required for accession.
- CAPACT (Capacity Building for Air Quality Management and the Application of Clean Coal Combustion Technologies in Central Asia) project, finalized in 2008, supported Kazakhstan in developing a national implementation plan for the Protocol on Heavy Metals, the Protocol on POPs and the Gothenburg Protocol. Additional funding from the Convention's Trust Fund, which is supported by a number of Parties, enabled the participation of experts from all EECCA countries to the workshops held under the project. Further information on the outcomes, including the Kazakh national implementation plan as well as a guidance document helping the national authorities to develop their national plans are available on the project website at www.unece.org/ie/capact .
- The Western Balkans project. A recent Dutch initiative is providing funding through the Convention's Trust Fund to encourage accession by five SEE countries to the Protocol on Heavy Metals, the Protocol on POPs and the Gothenburg Protocol. The first step is to develop national plans for accession.
- The Action Plan for EECCA[1] (ECE/EB.AIR/WG.5/2007/17), first adopted in 2005 and revised in 2007, aims at promoting the Convention in EECCA and to involve these countries in the work of the Convention. To this end, it outlines main aims, identifies related actions and specifies who should be doing what.

1 Available in English, French and Russian on www.unece.org/env/lrtap/WorkingGroups/wgs/docs40th%20session.htm

- In 2007-2008, a questionnaire survey was carried out among EECCA and SEE countries in order to identify the problems and to find solutions for improving ratification and implementation of the protocols The outcomes of the survey are available in the annex to document ECE/EB.AIR/WG.5/2008/11[2].

Information, assistance and funding opportunities are available for helping countries in EECCA and SEE in their efforts to implement and to ratify the Protocol on Heavy Metals and other protocols under the Convention.

Consequently, representatives from these countries are encouraged to express their needs at the meetings of the Convention bodies (the Executive Body, the Working Group on Strategies and Review, the EMEP Steering Body and the Working Group on Effects) as well as to submit proposals that require funding to the Convention secretariat.

Current Parties to the protocols have much benefited from the effective implementation of the protocol obligations in terms of reduced emissions and recovery of damaged ecosystems. What is more, the long-term benefits for the human health, environment, and agricultural and economic development have only started to become visible. Therefore the implementation of the protocols should be seen (and presented to the national decision makers) as a beneficial investment for the future.
Website: www.unece.org/env/lrtap/

2 Available in English, French and Russian on www.unece.org/env/lrtap/WorkingGroups/wgs/docs42nd%20session.htm

The History of the Heavy Metals Protocol

Dieter Jost, Germany

Preparations for an UNECE Heavy Metals Protocol had been started by the Executive Body to the Convention on Long Range Transboundary Air Pollution after finalisation of the negotiations for the 1994 Protocol on Further Reduction of the Sulphur Emissions and after some experts work done already before.

From beginning of its work the Ad Hoc Preparatory Working Group on Heavy Metals experienced high political priority and was qualified by broad participation from metal and chlorine producing and manufacturing industries, from environment protection organisations and from those for consumers' safety.

Atmospheric pollution levels are evaluated by means of monitoring and modelling. Monitoring can provide information about actual magnitudes of concentrations in air, in precipitation or wet depositions and their long-term trends. Atmospheric modelling is necessary to obtain information about transboundary pollution. Within the frame of the Convention this work is performed by EMEP (European Monitoring and Evaluation Program).

The following arguments against an international regulation had been brought forward:

- doubts concerning harmful effects to human health
- broad distribution of naturally occurring heavy metals
- some heavy metals being essential trace substances for humans
- no feasibility of abatement measures.

In the late nineties the "effects based approach" for air pollution abatement was already favoured for the preparations of further Protocols within the frame of the 1979 Convention on Long Range Transport of Air Pollutants. But with respect to heavy metals – and also concerning Persistent Organic Pollutants – as well knowledge as data basis for an effects based approach were considered to be not yet sound enough.

But in the end the scientific findings on harmful effects to the environment and to human health (food chain) - first of all for arctic regions, remote areas but also for areas with depositions from other sources - caused by heavy metals emissions transported in the atmosphere over long distances and the reports on successfully applied modern techniques on abatement of heavy metals emissions lead to political negotiations, which resulted in a very much technically based approach once more. Finally the Protocol could be signed in Aarhus in 1998.

In spite of regionally significant natural sources heavy metals, first of all cadmium, lead and mercury are assessed as accumulating poisons to the environment, undergoing long range transport in the atmosphere and their emissions to the environment need to be controlled (Annex I to the Protocol).

A 2003 report on a Europe wide study on heavy metals in mosses demonstrated the accumulation of heavy metals air pollution in the environment and the long-range atmospheric transport of heavy metals; also natural and anthropogenic emissions can be differentiated[1].

A more quantitative impression may be gained from calculations, as shown by an example for Germany.

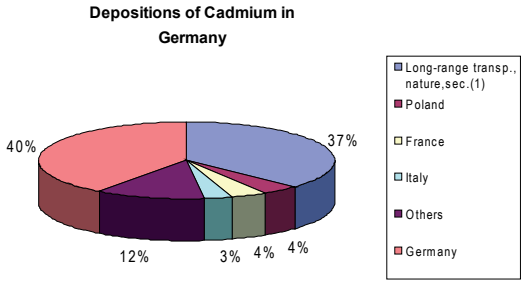


Figure 1: Cadmium deposition in Germany (Results from the European Monitoring and Evaluation Program 2006, by MSC East)

The most important obligations by Parties to the Protocol are summarized as follows.

Basic Obligations
(Article 3)

- Reduction of emissions of heavy metals Cd,Hg,Pb (Annex I)
- Control of major source categories (Annex II)
- Application of BAT (Annex III)
- Application of Emission Limit Values (Annex V) or equivalent measures
- Application of control and management measures to products (Annexes VI and VII)
- Important exception clauses

1 UNECE/ICP Vegetation (2003). Heavy Metalls in European Mosses 2000/2001 Survey cf.
http://icp/vegetation.ceh.ac.uk

The Heavy Metals Protocol from 1998, which is in force since 2003 obliges the Parties to apply modern techniques for the abatement (Annex III to the Protocol) of heavy metals (Cd, Hg, Pb according to Annex I) emissions and the application of emission limit values (Annex V) or equivalent strategies. The most important sources for emissions of the three priority metals are: road traffic (lead), metal industries, cement production, glass production and processing and waste incineration (see also Annex II). Later on it was demonstrated by the Task Force on Heavy Metals, that there are some more source categories to be dealt with:

- Combustion of biomass and peat
- Rotary furnaces in iron foundries
- Secondary aluminium production
- Manganese production.

Control of heavy metals emissions by application of best available techniques (Annex III) yields almost always abatement of particulate emissions too and vice versa. (For further information see

www.unece.org/env/tfhm/third%20meeting/PostOttawa/Background_BAT-ELV_14.06.06.FINAL.doc

by Katja Kraus, presented to the 4th meeting of the Task Force on Heavy Metals, 5-7- June 2007).

Further important sources for heavy metals emissions are uses of heavy metals containing products, which emit to the atmosphere during their life cycle. Therefore the Protocol requires measures to reduce emissions from products (Annexes VI and VII). With respect to mercury the annual emissions to air from product use in EU27 have been estimated to be in the range 10-18 tonnes (best estimate 14 tonnes) from technical products and to 2-5 tonnes from cremation, in total 12-23 tonnes. (Product-related emissions of Mercury to Air in the European Union. Karin Kindbom and John Munthe. Presentation to the 4th Meeting of the Task Force on Heavy Metals, 5-7 June 2007).

Since the Protocol came into force the decreasing trend of emissions has continued in many countries. But nevertheless critical loads for heavy metals, first of all Hg and Pb but Cd too are still not yet met in large parts of the region, the depositions are still intensive as can be taken from figures 2 and 3.

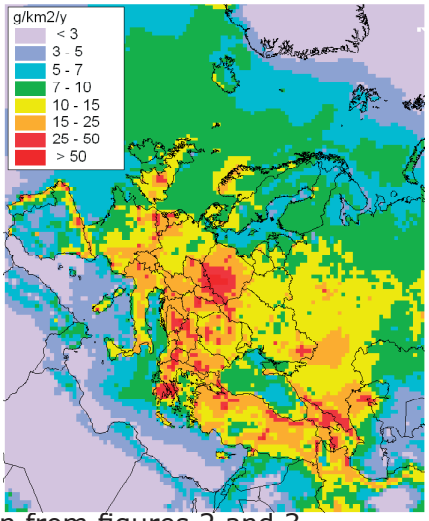


Figure 2: Total deposition of mercury for the year 2005. Calculated by EMEP-MSCE

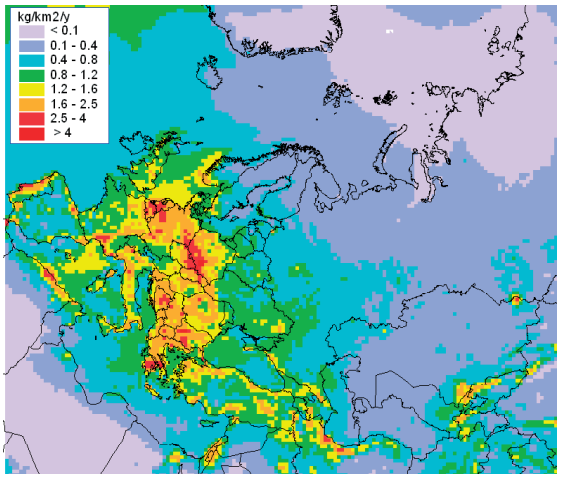


Figure 3: Totals depositions of lead fort the year 2005. Calculated by EMEP-MSCE

New emission control techniques for the reduction of heavy metals emission are now available. Important emitter countries are not yet Parties to the Protocol. Therefore is increasing the number of Parties a key part of any successful attempt to reduce heavy metals (and particulate matter) in the Convention area.

Evaluation of concentrations of air pollutants and depositions of HMs over the EECCA and SEE region

Ilia Ilyin, EMEP/MSC-E

Support efforts made by the EECCA (Eastern Europe, Caucasus and Central Asia) and SEE (South-Eastern Europe) countries to become more involved within the Convention work and to intensify the ratifications of its Protocols is one of the priority tasks of CLRTAP. Following the recommendation of the Executive Body for the Convention the Action Plan for the EECCA countries [ECE/EB.AIR/2006/13] was worked out by the Working Group on Strategies and Review.

EECCA and SEE regions are in a special focus of EMEP too. According to the Action Plan territories of the new Parties to the Convention (Kazakhstan and Kyrgyzstan) as well as Tajikistan, Turkmenistan and Uzbekistan were included into the EMEP domain. Starting from 2008 these countries will receive information on transboundary fluxes and pollution levels on regular basis.

This presentation provides information on emissions data, monitoring activity, modelling results available in EMEP, and contribution to the effects-based approach. The presentation is focused on lead data for 2005, based on EMEP contribution to the CAPACT project.

Armenia, Belarus, Croatia, Republic of Moldova, Russia and Ukraine have officially reported emission data to UN ECE Secretariat at least for one year (from 1990 to 2005). In order to fill gaps in the emission data emission expert estimates (e.g., GEIA, TNO) were applied. In addition to anthropogenic emissions, input of metals to the atmosphere through wind re-suspension is considered. Its contribution can be significant, especially in the Central Asian region abundant with deserts.

Currently monitoring stations are located outside EECCA and SEE countries. Nevertheless, it is planned to establish four monitoring stations under supervision of EMEP (in Kazakhstan, Republic of Moldova, Armenia and Georgia).

Since monitoring network is scarce, measurement-modelling approach to evaluate HM pollution levels over EECCA and SEE countries is applied. In order to calculate concentrations, depositions and transboundary transport of heavy metals MSCE-HM model is used. The verification of model includes comparison with the available monitoring data and analysis of uncertainties. Uncertainties of model results (30 – 40%) are comparable with those of measurement data and lower than those of emission data (factor of 2-3). Hence, EECCA and SEE countries are encouraged to pay attention to quality of their emission data.

Levels of concentrations and depositions are formed by various factors including magnitude and distribution of emissions, meteorological conditions and transboundary transport. Averaged over countries depositions range from 0.2 to 2.1 5 kg/km^2/y (lead), 3-160 g/km^2/y (cadmium) and 2-30 g/km^2/y (mercury).

Contribution of transboundary transport to lead depositions from anthropogenic sources in EECCA and SEE countries is 30 – 90%. For cadmium and mercury these ranges are 15 – 95%, and 25 – 85%, respectively. The main transboundary contributors to depositions are neighbouring countries. Besides, significant contribution is made by wind re-suspension.

EMEP cooperates with the Working Group on Effects in the field of development of effect-based approach. In particular, ecosystem-dependent depositions are calculated annually. These depositions are submitted to Coordinating Centre for Effects (CCE) to evaluate exceedances of critical loads.

Detailed information (in Russian and in English) for each EECCA or SEE country for 2008 will be allocated in the internet at MSC-E site:

www.msceast.org.

A hard copy of a country-specific report can be prepared and delivered to a country by request.

The effectiveness of the HM Protocol - emission reductions and costs

Estimation of emission reduction resulting from the implementation of the HM Protocol for the year 2000 and projections for 2010, 2015, 2020

Maarten van het Bolscher, Ministry of Environment, The Netherlands

Introduction

For the sufficiency and effectiveness review of the UN-ECE CLRTAP Protocol on Heavy Metals, TNO (a Dutch research consultant) has been asked by the Dutch Ministry of Environment to executed a study to the effectiveness of the Heavy metal Protocol. Phase I of the study focuses on the emissions of Heavy Metals in the UN-ECE region. Estimations are made for the possible reduction of the emissions if more countries would ratify the Protocol. Phase II of the study focuses on further emission reductions and incremental costs of possible additional measures, after complete implementation of the current Heavy Metals Protocol.

The study

An emission inventory for Heavy Metals has been compiled for the year 2000 based on the submissions of emission data from the Parties to the Convention on Long Range Transboundary Air Pollution (CLRTAP). The inventory covers the UN-ECE region (without Canada and the United States). For the counties, sources and or compounds lacking in the official data submissions, default emissions estimates have been prepared and applied to complete the inventory.

The HM protocol targets three particularly harmful metals: cadmium, lead and mercury, the so-called priority heavy metals. However, six other heavy metals (arsenic, chromium, copper, nickel, selenium and zinc) are also included in the study since their emissions are simultaneously reduced as a consequence of reduction measures of the three priority heavy metals.

Emission projections for the years 2010, 2015 and 2020 are made based on activity scenarios.

The key-source analysis of the projected emissions assuming full implementation of the UN-ECE Protocol allows to identify the remaining sources. These remaining sources are briefly discussed in terms of their potential and costs for (further) reduction.

References

- Study to the effectiveness of the UNECE Heavy Metals (HM) Protocol and cost of possible measures, Phase I: Estimation of emission reduction resulting from the implementation of the HM Protocol, TNO report B&O-A R 2005/193
- Study to the effectiveness of the UNECE Heavy Metals (HM) Protocol and cost of possible measures, Phase II: Estimated emission reduction and cost of options for a possible revision of the HM Protocol, TNO report 2006-A-R0087/B

More information
The reports can be found on
www.tno.nl/HM_POP

Techniques for reducing emissions of Heavy Metals within the framework of the HM protocol.

André Peeters Weem, InfoMil, Netherlands

The Heavy Metals Protocol under the LRTAP Convention gives obligations for the Parties to the Protocol to reduce emission of the Heavy Metals Cadmium (Cd), Mercury (Hg) and Lead (Pb). Annexes 2, 3 and 5 to the Protocol give information about the relevant industrial sources of emissions, about the Best Available Techniques (BAT) to reduce these emissions and about Achievable Emission Levels (AEL) when the BAT are used.

In this presentation these Annexes will be explained, and the experience in the Netherlands with the implementation of BAT will be described. Information will be provided on the different types of BAT that are in use, about AELs that are achieved in practice, about recent developments in EU legislation and about sources of relevant information.

The relevant sources of industry are mentioned in Annex 2 to the Protocol. Most of these sources are in use in the Netherlands. For some activities only one or two plants are in use, e.g. production of primary steel and aluminium, for other activities many plants are in use, like municipal waste incineration, and some processes have been banned, like chlor-alkali plants using mercury cells.

The environmental policy and legislation in The Netherlands is for a large part based on EU legislation. The obligations from the HM protocol are implemented through the environmental permits for these installations, based on the European IPPC Directive (Integrated Pollution Prevention and Control Directive). For some activities also general legislation is in place. This is based on EU Directives for Large Combustion Plants (LCP Directive) and Waste Incinerators (WI Directive).

The emission standards in the permits for these installations are based on the use of BAT. The AEL are based on information about BAT in the HM Protocol, but also in the European BAT Reference documents and in the Dutch emission Guideline NeR.

In general the BAT used to reduce emissions of HM is based on filtration. The most used filters for these types of installations are Fabric Filters (FF) and Electrostatic Precipitators (ESP). For some specific source types other techniques are used like the high efficiency air scrubber.

For reduction of mercury, techniques to reduce emissions are based on absorption on activated carbon. For mercury it is important to control the input of mercury to installations by controlling the content of mercury in fuels and waste.

The benefits of the reduction of HM are not limited to only HM emissions. Most techniques are based on reducing the amount of particulate matter so emission of PM will in most cases decrease with decreasing emissions of HM. Also emissions of POPs like halogenated dioxins and furans will be reduced.
Techniques to reduce emissions of HM can also bring large benefits to occupational health and in some cases to energy consumption.

There is little information available about costs of these measures. Available data are in general old and only representative for a specific situation. General data will be presented with references and sources of information.

Effective Combined Reduction of Heavy Metals and Particulate Matter

Katja Kraus, Federal Environmental Agency, Germany

Long-range transboundary air pollution has been recognised as an important factor affecting ecosystems and human health. Many sources of particulate matter (PM) are also relevant sources of heavy metals (HM), e.g. combustion of fuels or ferrous metals industries. HM are often bound to dust particles. Since most point sources are treated very effectively, fugitive emissions (e.g. from industrial processes and storage) become more significant. Highly efficient fabric filters can deal with PM concentrations < 1mg/m^3. Other effective options are to upgrade/improve design and maintenance, to use low emission process technology, to switch fuel where possible and to reduce fugitive emissions.

Technical and non-technical measures are available simultaneously to reduce HM and PM. Combining HM and PM reduction improves cost effectiveness due to reduced health effects.

Heavy metals are common air pollutants and are emitted as a result of various industrial activities. For example, mercury and lead are known neurotoxins, and cadmium can have adverse effects on organs like kidneys or lungs. But also a large part of the effects of air pollution is due to dust exposure. In a newly-published study undertaken by WHO, no threshold for dust particles could be identified below which adverse effects on human health could not be expected. The WHO gives an air quality guideline of 10µ/m^3 $PM_{2.5}$ (www.euro.who.int/air/activities/20070716_1). WHO has concluded that particles can cause damage in the lungs because of their size and shape. And the finer the particles the easier they find their way into deeper parts of the lungs. This is why advanced reduction measures for dust in Germany and Europe have been taken. WHO's studies have also led to the adoption of the Framework Directive on Air Quality in the European Union. From 2005, a limit value of 40 µg/m^3 for PM_{10} (annual limit for respirable particles) came into operation.

Often emissions of HM and PM occur together depending on the type of industrial activity. HM emissions are very fine and can bind themselves to every size fraction of dust particle. If Cd, Pb and Hg emissions are particle-bound, the metals can be captured by dust-cleaning devices. For gaseous mercury adapted techniques are necessary, such as carbon injection or special filters. Lowering the temperature of the off-gas leads to condensation and adsorption on particles, which enhances the removal by filtration of Hg.

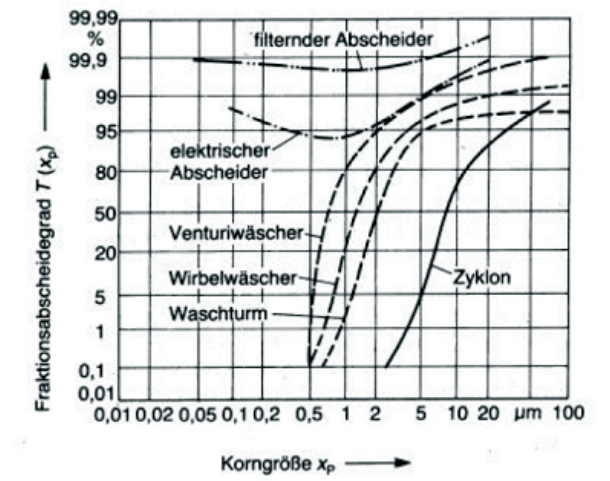
In 2006, the total dust emissions in Germany were 270 kt. However, in 1993, emissions were very much higher at 667 kt. The biggest contributors to these (2006) emissions were industrial processes at 152 kt (56%), e.g. production of metals (45 kt - 17%) and mineral products like glass (23 kt - 9%). Traffic contributed around 54 kt (20%) and emissions from residential heating and small businesses some 27 kt (10%). Dust from large combustion plants contributed only 12,5 kt (5%), but in 1994 it was as high as 60 kt.

Great endeavours have been made in Germany to reduce the dust emissions from point sources. The biggest success was reached by using filtration devices. The following table shows values for dust separation devices from a German measuring programme for stationary sources. As can be seen, different techniques are available for a range of particle concentrations

Dust Separation Device	PM concentration (mg/m^3)
Fabric filter	1 - 20 (often < 5)
Electrostatic precipitator	1 - 30 (often < 10)
Wet electrostatic precipitator	< 3
High efficient wet scrubber	1[1] – 5 (one value 80[2])
Multi cyclone (effective on only limited (ie larger) particle sizes)	16 – 100
Small scale firing unit (6 kW) without dust separation	20 - 50

The Table above relates to Dust Separation Techniques (German measuring programme for stationary sources).
Different treatment methods show different collection efficiencies. Very effective are electrostatic precipitators and fabric filters. They also deal with fine particles ($PM_{2,5}$) efficiently. Less effective are inertial separators (i.e. gravity or cyclone types) but these are generally used only as pre-separators for coarse particles, for example if sparks or glowing particles are present or to protect downstream separators or filters. For separating different gaseous components simultaneously, or for specific pollutants, or if a temperature control/decrease is desired, wet separators can be used, such as Venturi scrubbers.

The Figure below illustrates the relative PM reduction efficiencies of the various techniques.



filternde Abscheider- filters

elektrische Abscheider - electrostatic precipitators (ESP)

Venturiwäscher – Venturi scrubber

Wirbelwäscher – turbulent contact separator /disintegrater

Waschturm – wet scrubber (tower)

Zyclon - cyclone

In a measuring programme for fine particulates in Germany, about 50 different installations were assessed. The following Table gives an overview of removal efficiencies, and raw and clean gas concentrations. This study provided the scientific basis for a general limit value for dust of 20 mg/m^3 in Germany which was introduced in 2002 (TA Luft –Technical Instruction on Air Quality Control).

Installation	Dust separation device	Raw gas concentration	Clean gas concentration	Efficency %
Burning of brown coal	Electrostatic precipitator (ESP)	4-10 g/m^3	10 – 20 mg/m^3	97.9 – 99.6
Circulating fluidised bed combustion	Fabric filter	60 – 80 g/m^3	10 – 20 mg/m^3	99.86 – 99.95
Melting Zn in rotary kilns	Venturi scrubber	1 – 3 g/m^3	10 – 40 mg/m^3	81 – 98.5
Other industrial processes, including power generation	Fabric filter ESP Wet scrubber	1 – 100 g/m^3	0.1 – 30 often < 10 mg/m^3	95 – 99.999 often >99

Dust from coal burning power stations is generally separated with ESP or fabric filters. In Germany, 9 out of the 10 biggest mercury emitters are power plants. Recent research has concluded[3] that fabric filters showed considerable better removal efficiencies than ESP, especially for fine particles. They are also able to retain dioxines, furanes or mercury when used in association with effective absorbent agents (for example KOH and $Ca(OH)_2$). But compared to ESP there are also disadvantages, such as higher temperature sensitivity, higher pressure loss and therefore a higher energy demand.

General statements on costs concerning the different types of dust separators cannot be made. Costs depend a great deal on local conditions. In addition, treatment and disposal costs must be considered when wastewater is involved. The following Table gives an overview on the contribution of the main cost items to the total cost of installing and operating three principal dust separators.

	Scrubber	**ESP**	**Fabric filter**
Capital costs, %	40 to 60	60 to 75	50 to 75
Energy[4] costs, %	25 to 50	15 to 30	15 to 30
Maintenance and repair[5] costs, %	10 to 25	10 to 15	10 to 35[6]

Because of the sharp decline in emissions of dust from point sources, fugitive emissions have become increasingly more important. For example, a German research project at a copper plant and an iron foundry showed that 80% of total PM emissions are emitted via roofline, windows and doors. Compared to the treatment of stack emissions, the abatement of fugitive emissions can be technically sophisticated and expensive. This is because low PM concentrations are involved and high volumes of air need to be treated.

In EU countries, all major industrial installations are regulated accordingly to the IPPC Directive. This assures a general high level of environmental protection and a level regulatory playing field EU-wide. The so-called Best Reference Documents (BREF) are incorporated into the IPPC Directive and address emissions from each industrial sector. These describe techniques and prescribe how these emissions must be treated using best available technologies. Direction is given to ensure that emissions are not shifted from one source to another, such as from air to water. For example, water, sludge and other waste has to be disposed of if wet separators are used in gas streams.
Generally, these BREFs are an important source of information on industrial installations. They are already well-established and widely-employed worldwide. Many BREFs have already been published for many different processes. Those applicable to the following sectors contain information on effective reduction of PM and heavy metals.

- Iron and steel production
- Lime and cement production
- Ferrous metal processing
- Non-ferrous metals processing
- Glass manufacture
- Forges and foundries
- Large combustion plants
- Waste incineration
- Ceramics

Source: http://eippcb.jrc.es/pages/FActivities.htm

Conclusions
In most cases, an effective emission control for dust also leads to an efficient reduction of heavy metals. Compliance with obligations of the heavy metals protocol often comes as a consequence. When choosing separation devices, related equipment or application method, the characteristics of the exhaust gases have to be taken into account. Fine particles and adhering heavy metals are effectively reduced by filtering precipitators. The volatility of mercury means that it demands special attention. Its efficient separation can be accomplished through lowering the temperature of the off-gas and use of absorbent agents.

1 Amine scrubber in an iron foundry
2 Combination of a cyclone with venturi scrubber in the exhaust of a cuppola furnace
3 Notter et al, VDI-Berichte Nr. 2035, 2008
4 To get over drop in pressure
5 For fabric filters including new filter material
6 Not included costs for waste water treatment

Modelling and mapping of critical loads of heavy metals and their exceedances under the LRTAP Convention

Dr. Jean-Paul Hettelingh, Director, Coordination Centre for Effects (CCE)

The critical load of a heavy metal is the highest total metal input rate (g ha^{-1} a^{-1}) below which harmful effects on human health and ecosystems will not occur in an infinite time perspective, according to present knowledge. While critical loads explore the sensitivity of ecosystems against metal inputs, the risk of effects can only be described by the exceedances, i.e. by comparison of critical loads with the actual inputs.

The development of the critical load approach for heavy metals within the framework of the Working Group on Effects was inspired by Article 6 (g) of the Protocol on Heavy Metals, done at Aarhus (Denmark, 1998) which encourages work on an effects-based approach for the support of the development of emission control strategies. The critical loads approach is considered an appropriate way to link depositions of metals with effects on human health and the environment. The reason includes the fact that critical loads had been successfully applied to develop optimized control strategies for acidifying and eutrophying air pollution in Europe.

Critical loads of cadmium, lead and mercury have been computed by 18 National Focal Centres (NFCs) of Parties to the LRTAP Convention. These national data were collated into a single database for the purpose of identifying sensitive areas in Europe. Critical loads from parties who did not submit data can be computed using the so-called CCE-Background database that contains relevant data on land cover, soil type and meteorology.

Computing exceedances, i.e. comparing the critical loads to atmospheric deposition for Parties under the Convention within the EMEP domain (i.e. Europe west of the Ural mountains) shows that cadmium was not a widespread risk in 2000, that the risk from lead deposition has decreased since 1990 but was still widespread in 2000, and that the risk from mercury remains high without much change from 1990 to 2000 in most of the countries.

The CCE seeks to strengthen its network of National Focal Centres with the further participation of EECCA-Parties under the Convention. For this the CCE has tentatively extended the CCE-Background database to include preliminary information on ecosystems in EECCA countries. This work was performed in collaboration with a Dutch research institute (www. alterra.wur.nl/NL/). This extension of the CCE-Background database needs to be reviewed and revised in collaboration with (future) NFCs and scientists from EECCA countries.

A short overview is presented of the effect oriented work under the Convention and the work of the CCE with particular focus on critical loads of heavy metals. The presentation includes a short overview of currently available information on tentative critical loads for ecosystems in EECCA countries.

www.mnp.nl/cce

Additional technical measures/options and their reduction potential

Emission reduction and costs for implementing additional reduction measures in Europe, abatement options after full implementation of the HM Protocol

Maarten van het Bolscher, Ministry of Environment, The Netherlands

Contents

This presentation will be a follow up of the presentation 'The effectiveness of the HM Protocol - emission reductions and costs'. Options will be explored for further reduction of the emissions of heavy metals, based on the results of the study by TNO on costs and options for further reduction. Starting from the full implementation of the current HM Protocol, the option that all countries fully implement the current HM Protocol is to be seen as a baseline and forms the minimum case. The maximum case is when additional measures for all three priority heavy metals at new and existing sources are taken. Figures on emission (reductions), costs and exceedances have been compiled for all European countries in the EMEP domain. In the various options distinctions are made between EU and other European UN-ECE countries.

Two main sets of measures are explored, one for dust related measures that reduce emissions of cadmium and lead and one for measures that reduce emissions of mercury. Other distinctions between scenarios are whether measures are taken for new stationary sources only or for both new and existing stationary sources.

Besides the emissions and emission reduction for cadmium, mercury and lead in 2020 as a result of the different options, costs will be shown. The costs of the options are shown as incremental costs, calculated as additional costs on top of the costs of a full implementation of the present HM Protocol. This implies that the differences between the costs of the present Emission Limit Values (ELVs) and the adjusted ELVs will be calculated.

References

- Study to the effectiveness of the UNECE Heavy Metals (HM) Protocol and cost of possible measures, Phase II: Estimated emission reduction and cost of options for a possible revision of the HM Protocol, TNO report 2006-A-R0087/B
- Emissions, depositions, critical loads and exceedances in Europe, Report of the Directorate for Climate Change and Industry, Dutch Ministry of VROM, 2006, (also available at the CCE from www.mnp.nl/cce)

Implementation and ratification of CLRTAP Protocols by countries with economies in transition: existing and possible future obligations

Johan Sliggers, Netherlands

Countries with economies in transition have difficulty in ratifying our Convention protocols. Currently, only very few EECCA and SEE countries have ratified the last three Protocols (HM, POP and Gothenburg). Apart from obvious economic problems, other reasons for not being able to ratify protocols could be that the legal framework in the countries is not compatible with the protocols or that basic activity data for emission inventories are not available.

On an ad hoc basis some EECCA and SEE countries have indicated their difficulties and needs in various meetings of the Executive Body and Working Group on Strategies and Review. To get a more structural view on the problems these countries face in the implementation and ratification of protocols the Secretariat to the Convention sent out a questionnaire. The results of this "Questionnaire to EECCA and SEE countries on the ratification of Protocols to the Convention on Long-range Transboundary Air Pollution" have been presented and discussed at the 41st WGSR in April. Up to now only 5 countries replied to the questionnaire. The main conclusions on the difficulties to implement the last 3 protocols are:

- the need for technical assistance, implementation guidance and methodologies;
- the different approach of best available techniques (BAT) and emission limit values (ELV's) in the protocols (g/m^3) and in the countries' legislation (tonnes/year);
- the timeframes for the implementation of measures for (existing) sources;
- the need for financial support for the implementation of the measures;
- the lack of political interest.

Parties to the current protocols under the CLRTAP have to fulfil the obligations set by the protocols. For the HM Protocol the main existing obligations are:

- reporting on emissions (inventories have to be developed and maintained);
- application of BAT for new stationary sources;
- application of BAT for existing stationary sources;
- application of ELV's for new stationary sources;
- application of ELV's for existing stationary sources;
- application of product control measures; and
- reporting on protocol obligations through the Strategies and Policies Questionnaire.

For the POP Protocol and the Gothenburg Protocol the main obligations are comparable. For POP the use and production of many substances have been banned and restricted and for Gothenburg extra obligations refer to ELV's and BAT for new mobile sources and limit values for fuels.

The main obligations of the existing protocols can be summarised by emission ceilings and obligations on emission abatement techniques. Although the Convention is working on a revision of its protocols, the basic structure of the new or revised protocols will most probably remain the same. A prerequisite for the implementation and ratification of protocols is, therefore, to be able to make emission inventories and to include emission standards in national legislation. In the revision of the protocols some flexibility could be built in the protocols to assist countries with economies in transition implementing and ratifying these protocols.
One could think of the following possibilities:

- less strict obligations e.g. higher ceilings and higher ELV's;
- obligations enter into force at a later date; and/or
- only technical obligations for new sources and limitations on fuels.

It will be important to know what the problems and preferences are of the EECCA and SEE countries so the appropriate flexibility can be built in in future obligations of our protocols.

Presentations from National Experts

Armenia

Angela Turlikyan, Ministry of Nature Protection

The Republic of Armenia ratified the Convention on Long-range Transboundary Air Pollution on 21 February, 1997. But this action is contributed to the universal and productive co-operation of the UNECE states which is aimed at the reduction of air pollution, including long-range transboundary air-pollution.

Combating air pollution is one of the major environmental challenges the RA Government is currently addressing by means of supporting activities undertaken within the framework of international co-operation.

For meeting the obligations under a series of environmental conventions, including the Convention on Long-range Transboundary Air Pollution, in 1998 and later in 2004, the RA Government adopted a resolution approving a plan of actions on meeting the country's obligations under the Convention on Long-range Transboundary Air Pollution.

The Ministry of Nature Protection was acknowledged as the coordinator of the approved action plan. This meant it accepted an obligation to submit to the Government a yearly report on the activities performed.

Following the ratification of the Convention, the RA Government, pursuant to the Convention requirements, adopted a series of documents ensuring the improvement of the available atmosphere protection legislation. The names of the more essential documents are given below:

- Resolution on Approving a Provision on Making State-Level Records of Adverse Impacts on the Atmosphere, April 1999;
- Resolution on Norms for Maximum Permissible Emissions, their Adverse Impact on the Atmosphere and an Emission Permit Issuing, March 1999;
- Resolution on Regulating the Use of Leaded Petrol, December 1999;
- Resolution on Banning Production, Import and Use of Leaded Petrol, September, 2001;
- Resolution on Approving a Plan of Actions Aimed at the Reduction of Transport Emissions, July 2005.

In compliance with the documents mentioned above, the RA Government adopted a resolution according to which, starting from January 2008, a ban has been imposed on the import of cars not fitted with exhaust gas catalysts.

In 2005, activities were implemented with regard to verification of emissions inventory data, mapping of emission sources and recording of their precise number.

The objective of the aforementioned action plan funded by the RA Government was to reveal the shortcomings present in the system of state-level emissions recording, as well as to bring emissions data reporting format to conformity with the guidelines as applied to emissions reporting to the Convention Secretariat.

The Convention Secretariat was provided with a review of the country's strategies and policies as applied for combating air pollution in 1998, 2000, 2002 and 2004.

The Republic of Armenia signed the Protocol on Heavy Metals in 1998. Mindful of the significant role the Protocol plays in the reduction of emissions for heavy metals, the RA Government is undertaking preparation activities towards its further ratification.

Therefore, according to the national environmental action plan for 2008-2012, an evaluation will be carried out with respect to the country's capacity for ratifying the Protocol and meeting the obligations under it.

Moreover, in accordance with the air pollution monitoring development plan for 2008-2012, measurements will be made with regard to heavy metals concentration.

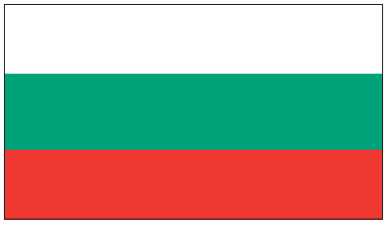
Scientific research companies in the country are currently making measurements of heavy metals concentration in soil and atmosphere, albeit somewhat fragmentary.

Non-ferrous metals and cement industries come to be the main sources for emissions of heavy metals. Data exist, even though they are incomplete, on heavy metals emissions for non-ferrous metals industries, particularly for copper and copper alloys industries. However, the Ministry of Nature Protection of Armenia totally lacks data for a heavy metals emissions inventory for cement industries.

Prior to the ratification of the Protocol, an evaluation will be carried out with regard to the country's capacity for meeting the obligations, particularly including:

- identification and examination of emission sources for heavy metals, and emissions survey making;
- emissions reduction capabilities and maximum emissions cutting;
- capabilities of applying and introducing the best available techniques;
- preparation of proposals on promoting in Armenia research activities on the Convention- and Protocols-related issues, monitoring, information and technology exchange.

In 2007, establishment work of a first class EMEP site was launched with joint financial support of the Coordinating Chemical Centre, Norwegian Government and the Ministry of Nature Protection of Armenia. Site development was completed by the second half of 2008.



Bulgaria

Ivan Angelov, Ministry for Environment and Water

This presentation explains Bulgaria's experience in preparing for ratification and fulfilling this country's obligations under the Protocol on Heavy Metals to the Convention on Long-range Transboundary Air Pollution (CLRTAP).
Bulgaria has long been involved in the CLRTAP, even before the political changes started in 1989. The Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes was adopted in Sofia in 1988. The Convention has been in force in Bulgaria since 1983 and, at present, the country is a Party to all of the current Protocols.

1. Bulgaria was amongst the first countries which signed the Heavy Metals Protocol. The motives for this were the country's policy directed to protect the environment and human health, together with the harmonization of Bulgarian legislation with that of the European Union.

2. What were the preconditions for the ratification of the Protocol by Bulgaria?

- The resolution for official application by Bulgaria for European Union membership was passed in 1995 by the Bulgarian National Assembly and steps were taken to prepare for and to respond to the criteria for this membership. It is difficult to tell which actions were solely oriented towards ratification of the CLRTAP protocols and which were directly connected with EU accession;
- The National Strategy on Environment for the years 2000-2006 was developed by the Ministry of Environment and Water. The study carried out when preparing the strategy predicted that the emissions levels for some heavy metals in 2010, compared to 1990, will be as follows: 60% less for Pb, 57% less for Cd and 49% less for Hg. These projections clearly indicated that the country can cope with the main requirements of the HM Protocol.

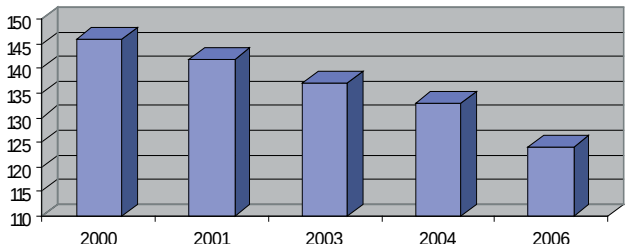
- The application of Best Available Techniques. Once it had applied for accession to the EU, the country was obliged to harmonize its legislation and to ensure compliance with it. One of major tasks in this regard was ensuring compliance with the Directive 96/61/EC (also known commonly as the IPPC Directive). One of the basic principles of this Directive is the application of so-called best available techniques (BAT). In this case, it turned out again that, in ensuring compliance with the EU legislation, Bulgaria created preconditions for ratification of the HM protocol;
- Development and implementation of regulations aimed at reducing emissions from industrial stationary sources, large combustion plants and waste incineration. These regulations are now replaced by new ones which transpose the current EC legislation.
- Development and implementation of the National Program for leaded fuels phase out in Republic of Bulgaria.
- Development and implementation of regulation for marketing batteries and for treatment of the wastes from batteries. This regulation sets limits for the mercury content in the batteries, either produced nationally or imported;
- It is a fact that ratification did not lead to new financial obligations for the country nor for its population. This is because Bulgaria was committed at that time to implement stricter EC requirements which were connected with potentially higher implementation costs.
- Existing at that time was sufficient administrative capacity which allowed the country to meet its obligations under the HM Protocol, for example compiling inventories, development of strategies and programmes etc. It should be borne in mind that keeping the administrative capacity at a high level is of vital importance for implementation of any treaty. This is one of the main conclusions drawn from Bulgaria's experience, with difficulties presented by loss through resignation of qualified experts, which has been a consequence of fast and continuous changes in economy and society.
- The country did not encounter any special difficulties from a political point of view due to the commitment of all the governments since 1994 to the principle of EU membership. Furthermore, there were no specific problems due to the lack of knowledge of emitters, sources, loads, monitoring etc. as there were projects directed to acquire it.

3. The presentation will be limited to the list of the specialized legislation in force which is intended to guarantee the compliance with the requirements of the Protocol and to a short description of the situation through the years regarding compliance with the requirements of the Protocol and, as a result, improvements in air quality.

- The legislation includes ordinances which has as its objective:
  - quality of liquid fuels, the terms, procedure and methods for their control;
  - emission limit values of hazardous substances;
  - conditions and the requirements for construction and operation of installations for incineration and installations for co-incineration of waste;
  - conditions and procedure for issuing of permits for Integrated Pollution Prevention and Control for the construction of new and the operation of existing industrial installations and equipment;
  - emission limit values (concentrations in waste gases) of sulphur dioxide, nitrogen oxides and total dust, discharged to the atmosphere from large combustion plants, transposing Directive 2001/80/EC;
  - requirements for marketing batteries and accumulators and for treatment and transportation of spent batteries and accumulators;
  - calculations of emissions of harmful substances (pollutants) released into the ambient air (for the purposes of the reporting);
- The emissions of heavy metals in the ambient air:
  The two graphs below indicate the reduction of heavy metals emissions as a result of applying measures prescribed in the HM Protocol. What should be underlined is that, despite the growth in the economy, the measures applied resulted in Bulgaria meeting its obligations. It should also be noted that it is expected that the effect of applying BAT will be fully revealed later, because of the delay in emissions inventories reporting, i.e. in 2008 we report data for 2006.

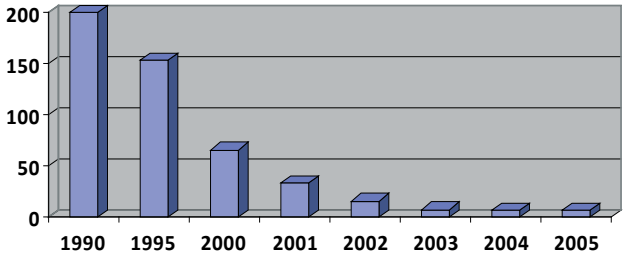
- Emissions of Pb from industry (over 5% average growth of GDP through the corresponding period):

t/year



- Emissions of Pb from road transport:

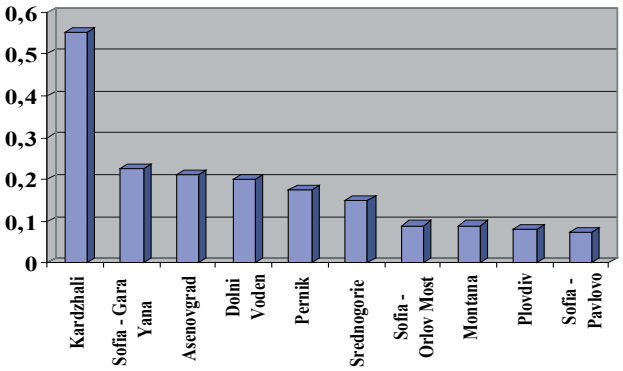
t/year



- Observation of the air quality standards:

  some hot spots regarding achieving air quality standards. And these hot spots are, as a rule, at site It should be acknowledged that, despite considerable reduction of emissions, there are still s where there are big plants for ferrous or non-ferrous metals and their operators have problems with applying BAT and observing ELVs. Nevertheless, the breaches are not of a striking nature as can be seen in the graph below. This illustrates data from the 10 monitoring stations with the highest annual levels of Pb emissions in 2006 (annual AQ standard is 0.5µg/m^3). It shows that there is only one monitoring station which registered levels above the limit value.

µg/m^3



4. The cost of the compliance. The 2006 inventory shows that Bulgarian industry is the biggest source of Pb emissions with an approximate 85% contribution, and of Cd emissions too with a 89% contribution. LCP and industry are the biggest Hg emitters, i.e. 43% and 32% respectively. These data correspond to those for Ambient Air Quality Management Areas (AAQMA). HM emissions are concentrated in the AAQMA which contain in its territory large metallurgical plants for ferrous or non-ferrous metals. Almost all of these emissions in such management areas are coming from these plants. That is why, instead of providing you with full details of costs for all measures taken or which have to be taken, which would be quite difficult for me, I will give you an example of the costs and the effects resulting from applying BAT in a plant for non-ferrous metals. This example illustrates the solution of the core problem, which is limiting the emissions from the main sources of pollution:

The total Pb emissions from this plant, before applying BAT and before installing up-to-date filters, were estimated at 10.6 t/y. After installing five filters, at approximately 2 million € each, the total Pb emissions are expected to drop to 1.5 t/y. The Cd emissions will also drop from 1.15t/y to 0.3t/y. Thus, an investment of approximately 10 million € will result in:

- considerable improvement of the ambient air quality in this management area with all the positive consequences for the environment and human health;
- removing the corresponding AAQMA from the list of those with high content of HM in the ambient air;
- decreasing the total HM emissions which the country reports every year to CLRTAP in its inventory.

My personal opinion is that these are good results at an acceptable price.

Moldova

Violeta Balan, Monitoring Center on Air Quality
Gavril Gilca, Ministry of Ecology and Natural Resources

The Republic of Moldova ratified the Convention on Long-range Transboundary Air Pollution on June 9, 1995. This was done by Parliament Decision nr 399-XIII from March 16 1995. Two additional Protocols were adopted, i.e.

- on Heavy Metals
- on Persistent Organic Pollutants

on October 1, 2002 by Parliament Decision No. 1018-XV from April 25, 2002.

The political, legal and institutional framework on heavy metals strategy of the Republic of Moldova is in a consolidation period. The legislative and normative framework partially ensures the implementation of heavy metals strategies and the main legislative links in this field are:

- Law on Air Protection No. 1422-XIII from 17.12.1997;
- Law on Environmental Protection No. 1515-XII from 16.06.93;
- Law on Ecological Expertise and Environmental Impact Assessment No. 851- XIII from 29.05.96;
- Instruction on Prejudice Assessment of the Atmospheric Air in Management of Industrial and Household Wastes, from 08.06 2004;
- Instruction on Prejudice Assessment of the Atmospheric Air caused by pollution of the stationary sources from 08.06 2004;
- Law on the Payment for Environmental Pollution No. 627 from 05.06.98;
- Law on Market of the Oil Products nr.461-XV from 30.07.2001;
- Law on Hydrometeorological Activity No. 1536-XIII from 25.02.98

The implementation of HM strategies is carried out by a large number of institutions. Included is one of the more important aspects - monitoring activity. The responsible institutions in the given area are as follows:

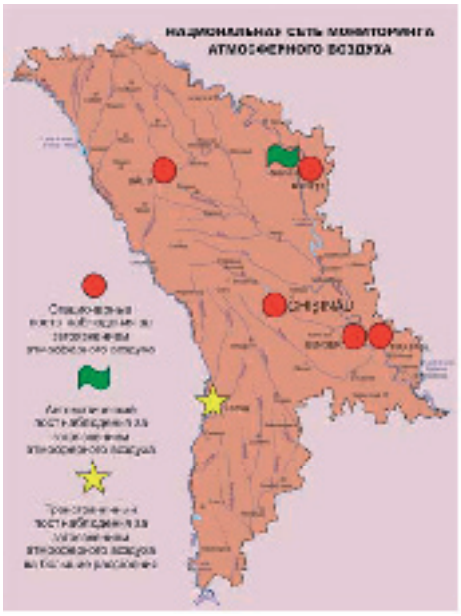
- The State Ecological Inspectorate (Ministry of Ecology and Natural Resources**) -** monitoringof emissions in atmosphere;
- National Scientific Applied Center of Preventive Medicine (Ministry of Health) **-** monitoring of atmospheric air in settlements of sanitary zones;
- Institute of Ecology and Geography (Academy of Sciences) - research and estimation the influence of industrial emissions on atmospheric air quality, application of the newest techniques and implementation of the international standards.

The State Hydrometeorological Service is the main institution at the national level which carries out the monitoring of atmospheric air quality in all territories of the republic and has the following basic tasks:

- Monitoring of atmospheric air quality and establish a pollution level;
- Operative detection of the cases with high and extremely high pollution;
- Notification, as a matter of urgence, the relevant body, local authorities, ministries and the decision- making departments;
- Regular informing on atmospheric air quality in the territories of the Republic.

The network of the atmospheric air quality consists of 19 observation stationary posts in five industrialized centers of the Republic of Moldova (Chisinau-6; Balti-2; Tiraspol-3; Bender-4; Ribnita-2) and sampling is carried out in conformity with established program (7 am,1 pm,7 pm) for the basic pollutants (solid suspensions, sylphur dioxide, carbon monoxide, nitrogen dioxide,) and specific ones (phenol, soluble sulphate, formaldehyde). See figure 1.

Figure 1



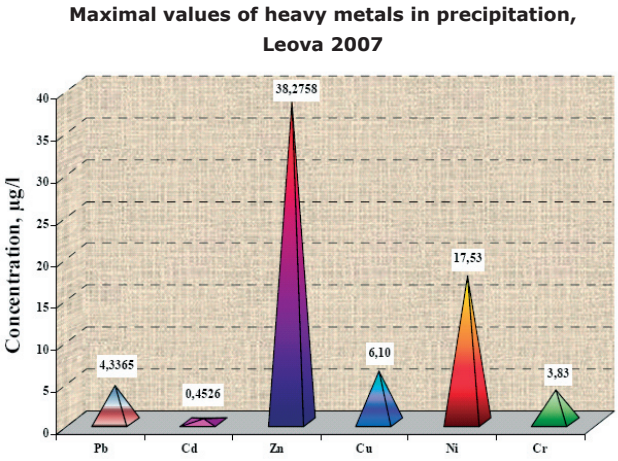
In 2007, in accordance with the Law on the payment for environmental pollution, the automatic station of air quality MP-16M was purchased. This station is located in the north-east part of the Republic, in the village of Mateuti - district Rezina, where the biggest factories are situated for example, the Moldavian metallurgical factory and the cement factories in Rezina and Ribnita. This is a unique automatic station in the Republic of Moldova and in East Europe. It measures continuously 17 total parameters, 12 atmospheric pollutants and five meteorological parameters including (NO, NO2, NOx, SO2, H2S, NH3, CO, ∑CH, O3, PM10, TSP and γ-radiation).

Monitoring of air quality enables the daily environmental forecasting for localities where this takes place. It is part of the air pollution control regulation in these localities and makes a contribution to the solution of the most important problems
concerning environment quality. It also assists with the integration of environmental aspects of the economy and the promotion of their continuous and durable development.

Meeting the requirements of the CLRTAP, the transboundary air quality monitoring is carried out at station Leovo, which is located in the south-west part of the Republic. Beginning in February 2008, measurements have been conducted under the EMEP Program (1st level). The heavy metals (Pb, Cd, Cu, Zn, Cr and Ni) are analyzed only from precipitation.

Figure 2

In 2007, the analysis data (station Leova) denoted that the highest concentrations have been registered for zinc, nickel and lead. An



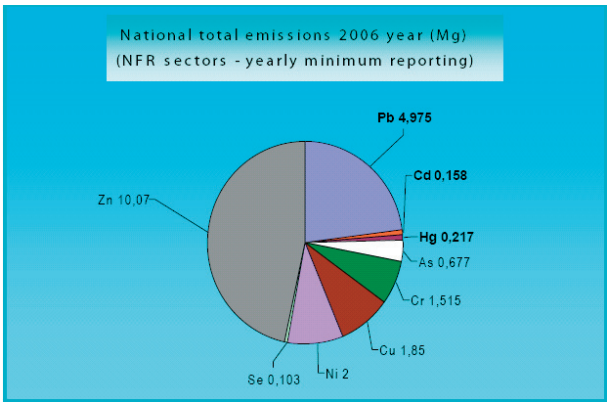
explanation is that it is the result of transboundary air pollution from the intensively polluted air masses from areas in other countries. Also, emissions from fuel burning and technological processes, e.g. manufacturing of building materials, metallurgy are responsible. See Figure 2.

Equipment available enables to carry out investigations of heavy metals in surface waters, sediments, in soils and in other environmental compounds to be carried out.

Data analysis on heavy metals in soils denotes that the average contents of total forms (zinc, lead, copper, nickel and manganese) in the soil samples taken do not exceed the limit values. In the investigated soil samples the contents of heavy metals (mobile forms) are higher in comparison with total forms. The highest pollution level of mobile forms was registered in gardens and vineyards. In 2007, from data analysis it was found that the soils in the parks of the city of Chisinau were polluted heavier with heavy metals than agricultural areas in this region.

Transport is one of the basic sources of pollution which negatively influences atmospheric air quality. Total emissions from vehicles have increased from 110.000 tonnes in 1999 to 170.000 tonnes in 2006. In 2006, emissions from automobiles in the Republic have risen to 88.6 percent of the total amount of atmospheric air pollutants.
In conformity with the national standard, working in the Republic of Moldova, the lead content of marketed gasoline shall not exceed 0,013 g/l.
From January 1, 2003 it was prohibited to import and use leaded gasoline in the Republic.

Figure 3



One of the most important sources of atmospheric air pollution are combined heat and power generation plants (CHP plant), which in 2006 contributed about 21 % of the total pollutant. See Figure 3.

Important solutions to the above-mentioned problems will be the fruitful implementation of the main international instruments, especially transposing into practice the requirements of the LRTAP Convention, and the provisions of the additional protocols. It is noteworthy that the Republic of Moldova has ratified two Aarhus Protocols (1998) and has signed the Gothenburg Protocol.

As regards fulfilling its current commitments to the Heavy Metals Protocol, the Republic of Moldova faced the greatest complexities and difficulties in meeting the requirements of the followings articles and annexes:

- Article 5 (1,2) regarding application of economic tools, development of contracts and voluntary agreements;
- Article 6 Research, Development and Monitoring;
- emissions, long-range transport and deposition levels and their modelling, the best available techniques and practices and methods of restriction of emissions, gathering of the information on levels of the contents of the heavy metals, recycling , if necessary, disposal of products or waste products;
- Annex 4 regarding timescales for the application of limit values of emissions and the best available techniques to new and existing stationary sources;
- Annex 7, 3c) regarding mercury-containing fluorescent lamps;
- Republic of Moldova has not started to establish an emission inventory.

There is no methodology for defining values for emission ceilings, reasons are for example:

- lack of knowledge of the the mechanism;
- political difficulties (lack of data from the left bank of Dniester river);
- economical problems (lack of financial resources).

The low level of environmental infrastructure and institutions development, and particularly the conditions of market economy, can be also considered to be weak points in the process to achieve objectives. In this context, the Republic of Moldova has to make considerable efforts in order to implement the established goals and meet the requirements of the legal, institutional, technical and economic demands.

Ukraine

Vladimir Morozov, UkrNTEC

Harmonisation of Ukrainian and EU legislation has been a priority of our government from its first years of independence in early 1990 and this is widely supported by public opinion. Reference to corresponding European document even serves as a password in the usual cumbersome processes of adoption of new legal acts. In March 2004 a special Law of Ukraine was passed "On the State Programme for the Approximation of the Ukrainian Legislation to the European Acquis Communautaire".

With regards to environmental legislation, Ukraine has ratified 27 key conventions, including the Kyoto Protocol under the UN Framework Convention on Climate Change (February 2004) and the Stockholm Convention on POPs (September 2007). Furthermore, about 200 European and international standards have been implemented. This process gains in strength. In 2008, another Ukrainian Law on IPPC was drafted together with ambitious plans to introduce European procedures and norms of industrial environmental performance.

Ukraine joined The World Trade Organization in May 2008, and currently negotiates the Free Trade Agreement within the Enhanced Agreement with the EU.

But so far these developments have not addressed Ukraine's participation in the Convention on Long-range Transboundary Air Pollution and its eight protocols. The first three protocols, i.e. on the EMEP Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (Geneva, 1984), the Sulphur Protocol (Helsinki, 1985) and the NOx Protocol (Sofia, 1988), were automatically signed and ratified by Ukraine under the USSR umbrella. The next four protocols, i.e. on VOC (Geneva, 1991), Sulphur (Oslo, 1994), Heavy Metals and POPs (both Aarhus, 1998), Ukraine signed, but did not ratify, and the Multi-effect Protocol (Gothenburg, 1999) was not even signed. But nevertheless, as already mentioned, the Stockholm Convention on POPs was ratified last year.

This illustrates the absence of a clear strategy. Decisions have been taken rather occasionally depending on the situation at that moment. It is worth mentioning that Ukraine had no official account of its energy balance since the early 1990s and has never prepared a National Environment Action Plan.

The above gives a background to the heavy metals regulation which at the time of the Aarhus Ministerial Conference of 1998, exemplified successful cooperation within international agreements. This very promising start included the following:

- The Interagency Working Group was created at the Ministry for Environment by the Cabinet of Ministers Order from July 1998 with participation the of 17 governmental bodies;
- The Concept of Strategy of Heavy Metals Emission Control was adopted by the Cabinet of Ministers Resolution from August 2000;
- National Action Plan for Heavy Metals Ambient Air Emission Control was first drafted in 2000;
- Special survey of 2001 Heavy Metals Ambient Air Emissions using new statistic form, specially developed guidance and software programmes, and training of officials was carried out;
- Annual reporting on Heavy Metals Ambient Air Emissions by industrial installations with an updated statistic questionnaire (2-TP Air) was introduced for about 70,000 respondents.

It helped to solve in an ad hoc manner some important questions, like providing geographic coordinates of industrial facilities, which before that were considered as a top secret, and distribution of up-to-date software and training of state officers. However, further significant changes should follow, including improving quality of data on heavy metals ambient air emissions from industries on basis of consistent methodological approach, and the introduction of PM10 monitoring and regulation, which is still absent.

Concerning the ambient air pollution monitoring, the National Committee of Hydrometeorology has the responsibility for it, TSP are measured at 76 stations in 48 towns. As is done in other EECCA countries, samples taken twice per day, on 7 am and 7 pm (20 minutes intake), but data are presented as a monthly average.

Eight metals are determined, including Pb and Cd, but Hg is omitted.

Monitoring of soil contamination by heavy metals is carried out in 17 towns once every five years. In general, soil protection is an evident gap in Ukrainian environmental legislation, as these questions are out of scope of any existing permit.

The Ministry of Health has its own monitoring programmes with significantly more samples and stations, but cooperation between the institutions is very poor.

Heavy metals emissions are surveyed between other air pollutants with help of the basic statistical survey questionnaire No. 2-TP (air) Report on Ambient Air Protection. In its new version, approved by the Order of National Statistics Committee of Ukraine in June 2005, European SNAP classification is used and inclusion levels are specified for the pollutants. This was the first time this had happened within the EECCA countries.

Main industrial sources of HM emissions are privately owned in Ukraine. The National Statistics Committee of Ukraine last published industrial plants structure of ownership in 2004 as:

- State – 2.0%
- Communal – 5.5%
- Private – 92.5%

And for main industrial economic activities private ownership was:

- Production of coke and oil products – 95.3%
- Machine building – 97.3%
- Metallurgy and metal working – 98.0%
- Chemical and petrochemical industry – 98.2%

As the privatisation campaign goes on, the private sector now absolutely dominates.

Ukraine tries to introduce some elements of the IPPC system into its environmental regulation of industries, but so far permits are issued for plants on media principles. For air emissions, three categories of installations are considered. The first category fully reflects Annex 1 of the IPPC Directive, for which BAT measures are required.

Ukraine has inherited the Soviet environmental regulatory system. Here, any source of industrial pollution was considered as unique and emission limit values for it were determined on the basis of dispersion modelling. An endlessly long list of health standards was used which gave maximum allowable concentrations of pollutants in environment.

General binding rules developed for big and medium capacity boilers and gas-turbine units in fact contradicted this approach and existed as an exception. These were drastically changed with the adoption of the Ministry for Environment, in June 2006, of the approval of air pollutants emission limits from stationary sources. National ELVs for a long list of pollutants for any industrial operator set by this order have no distinctions for different industrial processes and installations, and in general reflect European BAT level. But for many Ukrainian economic sectors they are completely unrealistic, and in fact their adoption just boosts immediate development of sectoral standards.

As an inspiring example of international cooperation, Danish assistance in the elimination of leaded petrol use in Ukraine may be considered. Due to the efforts of the Task Force to Phase-out Leaded Petrol in Europe activities in late 1990, the Cabinet of Ministers of Ukraine Resolution on Adoption of the Programme of Leaded Petrol Phase-out was adopted in October 1999. Also this Law of Ukraine on Prohibition of Import and Sale of Leaded Petrol and Lead Additives to Petrol was passed in 15 November 2001. In accordance with this law, the production, import and sale of leaded petrol were banned from 1 January 2003. The current national standard for lead content in petrol is 0.013 g/l.

For better cooperation within the LRTAP Convention, Ukraine has to solve urgently its problem of arrears to the EMEP of 1992-2001 amounting to US$ 316,194. At the September 2008 32nd session of the Steering Body to the EMEP, significant progress was achieved in solving of this long-term question with the substantiation of Ukrain's contribution in kind, including the project to establish an international benchmark station for EMEP background monitoring.

Russia

Marina Volkodaeva , FSUE "SRI Atmosphere"

The governmental accounting of the harmful impacts on ambient air (and its sources) is carried in the Russian Federation in accordance with the law "On Atmospheric Air Protection". The informational basis for the governmental accounting is the result of regularly updated inventories of atmospheric pollutant emissions. These inventories are developed at the enterprises of the Russian Federation. The territorial bodies of the Federal Service for Environmental, Technological and Nuclear Supervision develop annual "Reports on emissions of pollutant substances into atmospheric air" for the several territories (subjects of the Russian Federation). The materials of the abovementioned territorial "Reviews" are processed, critically analyzed and summarized in the Federal State Unitary Enterprise "Scientific Research Institute for Atmospheric Air Protection", which, on the basis of the abovementioned data and expert opinions, develops "The Annual of the emissions of pollutant substances into atmosphere of cities and regions of the Russian Federation (Russia) (hereinafter refereed as "Annual"). Therefore, the accounting concerning the emissions of the harmful (pollutant) substances in the Russian Federation is carried out "from the bottom upwards".

One of the most important tasks related to the governmental accounting of the pollutant substances is the implementation of its results in order to fulfill the Russian international obligations, in particular, the obligations concerning the Convention on long-range transboundary air pollution. One of such obligations is the annual presentation to UNECE the data on the emissions of several pollutant substances into atmospheric air at the European territory of the Russian Federation (ETR), in particular, data concerning emissions of heavy metals. Figures 1-3 show the six-year trends relating to cadmium, mercury and lead emissions. These trends have been prepared by the FSUE "Scientific Research Institute for Atmospheric Air Protection".

Figure 1:
Cadmium emissions trend (ETR)
2000–2005

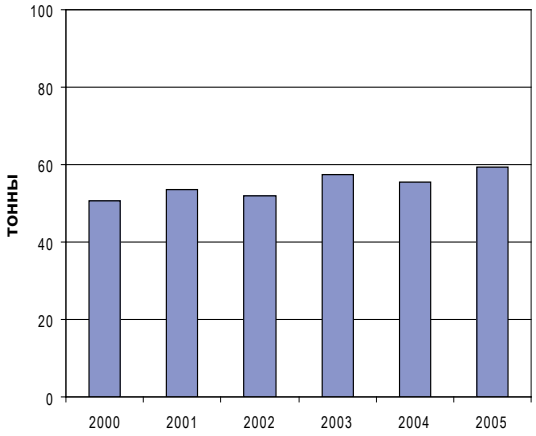
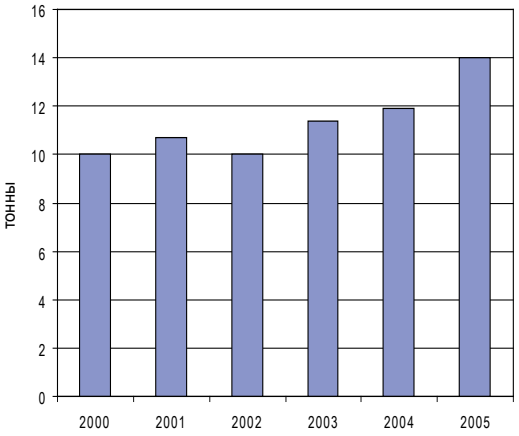


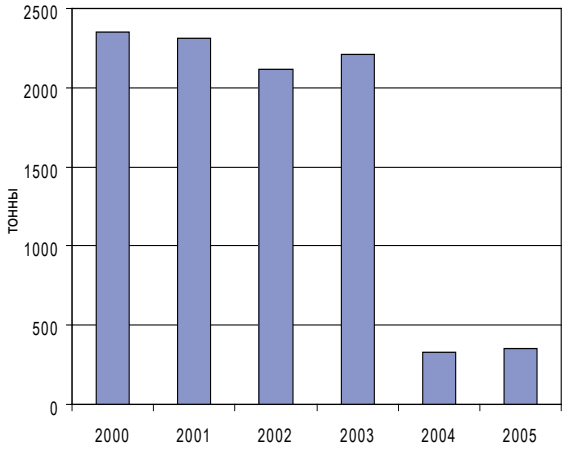
Figure 2:
Mercury emissions trend (ETR)
2000–2005



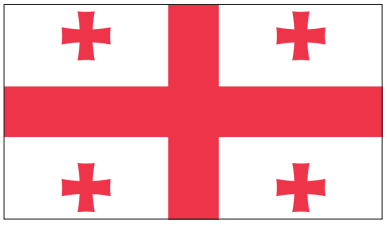
It is necessary to note that the "Annual" summarizes data covering much more wider spectrum of the substances than it is provided for the Convention (total number of pollutant substances– 102; main pollutant substances – 9; specific pollutant substances– 93; heavy metals - 9: lead, cadmium, arsenic, zinc, chrome, nickel, mercury, cuprum, selenium) . The greatest amounts of lead, cadmium, arsenic, zinc and chromium are emitted by the enterprises

located in the Sverdlovsk Region; nickel and its compounds – by the enterprises located in Krasnoyarsk Territory and Murmansk Region; metal mercury– by the enterprises located in the Chelyabinsk Region; cuprum – by the enterprises located in the Murmansk and Sverdlovsk Regions and in the city of Norilsk; selenium – by the enterprises located in the Sverdlovsk Region and in the city of Norilsk.

Figure 3:
Lead emissions trend (ETR)
2000–2005



01.07.2003 - the special law related to the prohibition of production and distribution of leaded fuel by motor transport at the territory of the Russian Federation has been entered into force (FL "On prohibition and distribution of the leaded fuel at the territory of the Russian Federation", which was adopted by State Duma from 7.03.2003 and approved by the Federation Council from 12.03.2003)



Georgia

Karchava Janri, Rukhaia Kakha

1. Georgia covers a territory of 69700 km^2, including ~ 85 % of mountainous areas. The length of borders with the neighboring countries is: 273 km - with Russia, 252 km - with Turkey, 164 km - with Armenia, and 322 km - with Azerbaijan. Population of the country amounts to 4452100 people, including urban residents – 2573800 people, and rural residents – 1878300 people. Density of population is ~ 70 people/km^2.
2. In 1999 Georgia acceded to the 1979 Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP).
3. In order to prepare conditions to supporting ratification of the Protocol on Heavy Metals an inventory of operation of sources of emission of harmful chemicals into the atmosphere is being developed through estimated definition method of annual emission of individual components into atmospheric air by fragmented presentation of quantitative characteristics of heavy metals (**Pb, Cd, Hg**) emission and their discharge to water objects. An inventory of domestic, industrial, medical and biological waste was accomplished in 2007 enabling an assessment of the content of heavy metals (**Pb, Cd, Hg**).
4. Lack of unified up-to-date monitoring system for atmospheric air pollution in the country. Lack of monitoring of atmospheric air pollution by heavy metals (**Pb, Cd, Hg**) in them.
5. There is no unified register of sources of atmospheric air pollution by heavy metals (**Pb, Cd, Hg**).
6. The Georgian Law "On Environmental Impact Permits" lists specific activities requiring an Environmental Impact Permit. According to the Law, in order to secure an Environmental Impact Permit an applying entity should submit an Environmental Impact Assessment Report to the Ministry of Environmental Protection and Natural Resources made in accordance with the requirements of existing legislation. An Environmental Impact Permit shall be issued on the basis of positive conclusion of ecologi-

cal expertise. In parallel, according to the Georgian Law "On Atmospheric Air" an entity applying for permit should also submit a Technical Report of Emission of Harmful Chemicals into Atmospheric Air and Emission Sources for approval by the Ministry of Environmental Protection and Natural Resources, and a Design of Maximum Allowable and Temporarily Agreed Norms of Emission of Harmful Chemicals into Atmospheric Air. Furthermore, according to the Georgian Law "On Water", a Design of Maximum Allowable Wastewater Discharges should be also submitted. Above said designs are required annexes to an application to consider and issue an Environmental Impact Permit.

7. Regulation of emission of harmful substances into atmospheric air for point sources of emission is carried our in two slightly different methods essentially based on the same criterion of Maximum Allowable Concentration (MAC) of a harmful substance in atmospheric air. For the point sources of emission of harmful substances into atmospheric air generated by an activity that according to the Georgia Law "On Environmental Impact Permits" requires an Environmental Impact Permit, emissions shall be regulated on the basis of integrated data analysis of Technical Report of Inventory of Emission of Harmful Substances into Atmospheric Air and their Sources, and a Design of Maximum Allowable and Temporarily Agreed Norms of Emissions of Harmful Substances into Atmospheric Air clearly presenting the map of dispersion of a harmful substance in atmospheric air. For point sources of emission of harmful substances in atmospheric air generated by activities that according to the Georgia Law "On Environmental Impact Permits" do not require an Environmental Impact Permit, emission regulation *shall be carried out* on the basis of *technological regulation* containing maximum allowable concentrations of any harmful substance in the pipe of an air-gas-dust flow.

Maximum Allowable Concentrations of Harmful Substances

Name of substance	Degree of hazard	Maximum Allowable Concentration, mg/m^3		
		Maximal single	Average daily	Tentative Safe Exposure
Cadmium	1		0.0003	
Mercury	1		0.0003	
Lead	1		0.0003	
Tetraethyl lead				0.000003

8. Point sources listed in List of Categories of Annex II to Protocol on Heavy Metals which are sources of heavy metals (**Pb, Cd, Hg**) pollution in the environment belong mainly to private sector. It should be noted that capacities of these productions in Georgia are lower than the values listed in the List of Categories except for the two cement plants (Rustavi and Kasp) with an annual capacity of 80000 tons each. It should be also noted that state-owned *Railway of Georgia* LLC and *Tbilisi Metropolitan Railway* LLC are also significant sources of heavy metals (**Pb, Cd, Hg**) pollution in Georgia.
9. Large amounts of mercury-containing luminiferous lamps, and cadmium-containing and nickel-containing alkaline accumulators are stored in *Railway of Georgia* LLC, and in particular in *Tbilisi Metropolitan Railway* LLC by creating a serious problem to the environment due to unresolved issue of safe disposal of these wastes.
10. Lack of systemic elaborations to decrease/reduce content of heavy metals (**Pb, Cd, Hg**) in different products in Georgia.
11. Information from Report 3/2003 of the Meteorological Synthesizing Centre-East (MSC-E Report 6/2003, "Transboundary Heavy Metals and Persistent Organic Pollutants Pollution in Georgia", August 2003) represents sme value by presenting emission of heavy metals (**Pb, Cd, Hg**), air concentration and deposition trends in 1990-2001, characteristics of transfer of these metals in 2001 with emission scenarios and spatial emission dispersion, their deposition maps from national sources within the territories of other countries, cumulative depositions in its own territory and contributions of external antropogenic sources into the country territory (transboundary depositions are calculated by the 2001 emission data), model data were compared with the 2001 measurement data represented in database of the Chemical Coordinating Center (CCC/EMEP), as well as measured and calculated average annual and calculated average monthly values of atmosheric concentrations for these metals are referred to.

12. Also, some valuable information is presented in information booklet of the Caucasus Environmental NGO Network (CENN) "Lead Polluted Environment and Our Health: Problems and Solutions", Tbilisi, 2008) characterizing main aspects of environmental pollution by lead and their implications (environmental policy in the country, main sources of lead pollution, indices of lead pollution in the environment in the city of Tbilisi, public health impact (primarily on children) of lead pollution in the environment with relevant recommendations).
13. Main source of air pollution in Georgia (primarily in urban areas) is the operation of vehicles (leaded exhaust and storage of leaded accumulators unfit for use) with the significant aspects presented below:

- There is a noticeable trend of increase of degree of mechanization from 72 units in 2001 to 84 units in 2006 (around 17% increase, i.e. 3.4% annually),
- More than 75% of motor vehicles is environmentally unfriendly due to extremely high concentrations of harmful components in the exhaust,
- Technical condition of motor vehicles and degree of technical maintenance are inadequate in terms of atmospheric air protection,
- An adequate set of measures needs to be implemented to further reduce the share of black market for fuel consumption by vehicles,
- A need to legislatively ensure improvement of quality of fuel for vehicles,
- Low quality of motor gasoline: lead, manganese, benzene (cumulatively aromatic hydrocarbons), sulphur with the main aspects described below.

Ecological characteristics of motor gasoline by Decision № 124 of Georgian Government dated 31 December 2004

Gasoline ingridients subject to limitation	Before 1 January 2006	From 1 January 2006	From 1 January 2007
Lead	≤ 0,013 g/l	≤ 0,005 g/l	
Benzene	≤ 5 % (volume)	≤ 1,0 % (volume)	
Aromatic hydrocarbons	≤ 45 % (volume)	≤ 42 % (volume)	≤ 35 % (volume)
Sulphur	≤ 500 mg/kg	≤ 150 mg/kg	≤ 50 mg/kg

Difficulties in enforcement of prohibition of unleaded gasoline and overall improvement of gasoline quality:

- Black market (illegal import),
- Lack of control system over gasoline quality due to fragmented nature of gasoline supply and other factors,
- Lack of funds.

Negative effects (health, social, environmental, financial and economic) of low quality of fuel for motor vehicles (converters problem).

Regulation mechanisms need to be improved for the operation of motor transport in Georgia which leads to the necessity to improve:

- Legislative regulation,
- Financial regulation mechanism,
- Technical maintenance and technical regulation means (installation of converters),
- Traffic infrastructure and arrangement,
- Traffic intensity management,
- Supply of fuel to motor transport,
- Establish a control system over motor transport gasoline quality,
- Establish a unified system for optimal coordination to improve agreed operation of different agencies associated with different aspects of motor transport impact on atmospheric air quality and public health.

Annex

ECE/EB.AIR/WG.5/2008/
Annex of the Report of the Chair of the Task Force on Heavy Metals, June 2008

WORKSHOP TO PROMOTE THE RATIFICATION OF THE PROTOCOL ON HEAVY METALS ACROSS THE ENTIRE UNECE REGION

1. This report was prepared by the Chair of the Task Force on Heavy Metals in cooperation with the secretariat. The workshop took place from 14 to 16 May 2008 in Yerevan, Armenia. It was organized and financed by the German Federal Environment Agency and the Armenian Ministry of Nature Protection that hosted the meeting.

2. Thirty experts attended the workshop. The following Parties to the Convention were represented: Armenia, Belarus, Bulgaria, Germany, Georgia, Kyrgyzstan, Moldova, the Netherlands, the Republic of Montenegro, Ukraine Also present were representatives of the Coordination Centre for Effects (CCE), the Meteorological Synthesizing Centre-East (MSC-East) of EMEP. A member of the UNECE secretariat also attended.

3. Mr. Simon Papyan, First-Deputy-Minister for the Environment, welcomed the participants on behalf of the Armenian Ministry of Nature Protection. Mrs. Katja Kraus (Germany) opened the meeting by thanking Armenia for hosting the workshop. She stressed the importance of new ratifications by countries in transition for further reductions of heavy metal emissions and offered assistance from members of the Task Force to help EECCA and SEE countries to join the Protocol. Mrs. A. Turlikyan (Armenia) chaired the meeting.

I. AIMS OF THE WORKSHOP

4.The objectives of the workshop were to:

a. Promote the ratification of the Protocol on Heavy Metals in East-Europe, Caucasus and Central Asia (EECCA) and in South-East Europe (SEE);

b. Raise awareness and interest of the countries in EECCA and SEE and involve them further in the activities carried out under the Convention;

c. Provide information on the Protocol's requirements and on the technical and legal measures needed for their implementation;

d. Provide information on exceedances of HM critical loads (impacts on health and environment) in the EECCA and SEE region;

e. Provide information on guidelines and other information sources; on support mechanisms and funding opportunities available to assist countries to ratify and to implement the Protocol; and on benefits to be gained from acceding to the Protocol;

f. Exchange experiences and identify difficulties in the national implementation process among the countries in the region;

g. Identify future steps towards the implementation of the Protocol;

h. Discuss possibilities of supporting countries in transition in their efforts to ratify.

II. INTRODUCTION

5. In the Executive Body and the Working Group on Strategies and Review, Western countries expressed a clear desire to help the EECCA and SEE countries to implement and ratify protocols to the Convention. To this end, all sorts of projects have been initiated and meetings under the Convention are being held in EECCA and SEE countries, such as this workshop. Also it is clear that SEE and EECCA countries really do want to accede to the Protocols but face serious difficulties in doing so. Countries are preparing their ratification but want to be certain that they comply with the obligations of the Protocols. At the workshop, all SEE and EECCA countries presented their experiences with regard to their national situation concerning the implementation and ratification of the HM Protocol.

6. The members of the TFHM, MSC-E and the CCE taking part presented:

- the outcome of the questionnaire sent to EECCA and SEE countries on the implementation and ratification of protocols to the Convention;
- the obligations of the protocols under the Convention with emphasis on the HM Protocol;
- experiences in transposing the obligations of the HM Protocol into national law;
- evaluation of concentrations of air pol-

lutants and depositions of HM over the EECCA region;

- technical measures to reduce HM emissions;
- emission reductions and control costs in the European territory of the ECE;
- critical loads and exceedances in SEE and EECCA countries.

7. The workshop was held in an atmosphere of frank discussion. Participants expressed their satisfaction for the opportunity to have an open debate. Many countries of the EECCA and SEE region have similar problems with regard to the ratification of the HM Protocol. Many of the obligations of the Protocol appear as a hurdle for ratifications for countries in transition. A new or amended Protocol should take into account the special needs of these countries.

III. OBLIGATIONS OF THE HM PROTOCOL AND QUESTIONNAIRE SENT TO EECCA AND SEE COUNTRIES

8. The basic obligations of the Protocol on Heavy Metals are:

- Emission ceilings: Reduction of total annual emissions of Cd, Pb and Hg from the levels of emissions in 1990 (or an alternative year from 1985 to 1995);
- Application of emission limit values and BAT to new and existing stationary sources;
- Application of control measures on products such as unleaded gasoline and batteries;
- Development and maintenance of inventories of emissions and projections (for Cd, Pb and Hg);
- Reporting obligations on emissions (yearly) and on strategies and policies (biennial).

9. At the workshop the conclusions of the "Questionnaire to EECCA and SEE countries on the implementation and ratification of protocols to the Convention" were confirmed and complimented. The conclusions of the questionnaire and the input from the workshop can be summarised as followed:

- Need for technical assistance, implementation guidance, methodologies on emission inventories and ELVs;
- Emission inventories and activity data in EECCA and SEE countries are based on statistics which differ significantly and sometimes these statistics are no longer available (cause for difficulties to define the baseline for the emission ceiling under the HM Protocol);
- Countries have a different approach/ methodologies to apply BAT and ELVs (weight/time or weight/production unit) compared to the protocols (mg/m^3);
- Timeframes for existing stationary sources would be too limited to transpose into national regulations;
- BAT and ELVs for mobile sources are not compatible with national legislation;
- Lack of supportive administrative capacity for the implementation activities;
- Lack of political interest in the countries at the top level;
- Need for financial support for:
    - o institutional building with in the environmental ad ministration;
    - o industrial restructuring.

IV. CONCLUSIONS AND RECOMMENDATIONS

10. On the third day of the Workshop, the participants discussed, via a 'tour de table', problems that existed in their countries with regard to the implementation of the HM Protocol. They also covered some other more unexpected problems, e.g. waste disposal, such as for mercury polluted activated carbon, and use of leaded petrol, and their ideas on solutions that could contribute to the eventual ratification of the HM Protocol. In particular, the participants from countries in transition made recommendations for work inside the countries, for cooperation with countries that have ratified already and with the secretariat. More flexibility of protocol obligations towards countries with economies in transition would help them in the ratification process of the protocols.

11. Many of the problems in the EEECCA and SEE countries encountered in the implementation of the obligations of the protocol have a similar origin. They relate to the former air pollution legislation in the Soviet Union and the methodologies and statistics used at that time. Furthermore, the changes since the partition of the former Soviet Union make it difficult to derive emission ceilings, especially with respect to base years.

12. A summary of the key points of the problems/difficulties and suggested solutions and items for future work made by the individual countries are grouped per subject:

a. Emission ceilings and inventories

There is a need to improve the emission inventories and to harmonize the methodological approach for the emission inventories in the EECCA and SEE countries with that of the Convention and its Protocols. For the improvement of data, there is need for a common methodology and reference methods for the monitoring of the emissions. Since the problems with respect to emission inventories are similar in most of the EECCA and SEE countries, it would be good to work together to develop a common methodology for the implementation of emission inventories for the HM Protocol and other protocols that could form an interstate standard.

There is also a need to communicate ways how to report activity and emission data to EMEP. The Russian Federation offers to present and share emission data for the entire Russian territory, as well as for the previous years for the former Soviet Union.

The revised Guidebook on Emission Inventories should be translated into Russian. The Russian translation should be checked by experts from these countries.

b. Emission limit values

There is a need to compare and harmonize the emission standards and national environmental legislation of EECCA and SEE countries with those in the HM Protocol and other protocols.

For the implementation of emission limit values of the Convention protocols into national legislation, there is a need for a common methodology and reference methods to do that. Since the problems are similar in most of the EECCA and SEE countries, it would be good to work together to develop a common methodology for the implementation of ELVs into national legislation for the HM Protocol and other protocols that could form an interstate standard.

c. Best Available Techniques

Currently, there is no mechanism for the introduction and implementation of BAT into national legislation in most of the EECCA and SEE countries. Therefore, there is a need to harmonize the national legislation with international regulations to implement BAT.

To fulfil the obligation of transposing BAT into national legislation there is a need for a common methodology and reference methods. Since the problems are similar in most of the EECCA and SEE countries, it would be good to work together to develop a common methodology for the implementation of BAT obligations into national legislation for the HM Protocol and other protocols that could form an interstate standard.

To assist EECCA and SEE countries in the application of BAT, translation of (or parts of) the Best Reference Documents (BREFs) would be most helpful to allow the industries, the national ministries and agencies to evaluate the appropriate methods to be used.

d. Air quality monitoring and modelling

Although monitoring of air quality is not a basic obligation in the HM Protocol or any other protocol, countries are, for many reasons, keen on having monitoring stations in their national network and to take part in the EMEP monitoring network. Help is needed for the improvement of the national monitoring systems and to upgrade monitoring stations to allow for sampling and analysis of the heavy metal components, e.g. by atomic absorption spectrophotometry, AAS. There is a need to extend the operations of one or more of the domestic monitoring stations to include EMEP monitoring. With such an EMEP station the national network can be calibrated. Data from EMEP stations in the EECCA and SEE region are scarce. Modelling would profit from such measurements. It was noted that donor and methodological assistance for the development of the monitoring network in the EECCA and SEE countries exits, e.g. via EMEP/CCC and Norway.

There is a need for a common methodology and reference methods for the monitoring of emissions and air quality. EMEP/CCC could play a role here. There is also a need to communicate ways how to report monitoring data to EMEP/CCC.

Steps being taken by EMEP towards EECCA countries were welcomed, in particular the extension of the EMEP domain eastwards to include all Central Asian countries in regular model calculations of heavy metals atmospheric transboundary transport. A further extension of the model into a global EMEP model would improve calculations of concentrations, deposition and transboundary fluxes in the EMEP domain. Also better emission data is needed.

Furthermore, MSC-East would welcome non-official information/expert estimates on emissions, measurements and soil concentrations of heavy metals available in EECCA and SEE countries.

e. Flexibility of Protocol(s)

Many obligations of the HM Protocol and other protocols are difficult to meet for EECCA and SEE countries. It would have been helpful for these countries if their needs could have been addressed in drafting the protocols better.

To ease the ratification process for EECCA and SEE countries different options would be possible:

- less stringent emission ceilings and ELVs
- making the provisions non-binding for some individual sectors or existing sources
- extend the timeline to reach emission ceilings and ELVs
- allow for the implementation of BAT and ELVs for the sources existing in a country. Countries would not have to implement BAT and ELVs for all sources of the protocols. This is especially important for the smaller countries.

Also possible would be to increase the obligations gradually for countries in transition. When revising the Protocols, more such flexibility should be considered. A solution could be a Protocol with different obligations or annexes for North America, for Western Europe and for EECCA and SEE countries. Because amending protocols has only limited possibilities to increase flexibility, EECCA and SEE countries expressed a preference for revising the protocols into a new one instead of amending the current ones.

f.Waste issues

Assistance is needed to help define and implement a mechanism for the safe disposal or recycling of hazardous waste. In this respect, especially were mentioned:

- Securing safe storage of waste/management of hazardous waste (e.g. accumulators), a common methodology and integrated approach is needed;
- A need for safe disposal of mercury-containing lamps;
- Methodological guidance is needed for the re-use and disposal of the harmful components in used catalytic converters;
- Guidance and methodology is needed for the disposal of dust from ESPs and fabric filters containing heavy metals, of activated coal containing mercury and how to neutralize the environmental impact of mercury.

Assistance is needed in some countries for the disposal of significant quantities of heavy metal-containing waste.

g. Financial and other support

For the implementation of the obligations of the HM Protocol and other protocols, financial support for two types of tasks would be helpful. Specifically, support for technical questions (e.g. implementing ELVs, BAT and monitoring) and for governments to build and maintain capacity in governmental institutions in order to build an institutional structure for permitting, implementing and controlling improvements in national air quality management. One could imagine twinning projects between a Western country or European Commission and a EECCA/SEE country.

The Trust Fund to implement the action plan for EECCA countries holds money for workshops, development of guidelines, translations of documentation etc. Another example is the project for the implementation and ratification of the last three protocols by five SEE countries. This is a three-year project to financially assist governments and is worth in total almost 700,000 €. Countries could ask the Secretariat help in searching for and obtaining financial assistance.

For the further support, the participants from EECCA and SEE countries mentioned four topics: (i) workshops, (ii) national implementation plans, (iii) focal point for EECCA and SEE countries and (iv) translation of documentation.

(i) There is clearly a need for follow-up activities after the workshop, so as not to lose the momentum. The Task Force could assist in organizing regular capacity building workshops in the future by addressing specific topics of the Protocol, emission inventories, ELVs, BAT etc. This could be done by holding workshops in the region. A 'Methodology Council' between EECCA and SEE countries, currently a Working Group for exchanging information, could coordinate such workshops. A possible first opportunity could be a meeting taking place in St Petersburg in September 2008 to consider methodological aspects of amending the former Soviet air pollution legislation. The delegation of the Russian Federation invites EECCA (and SEE?) experts to attend this meeting.

(ii) Countries usually develop comprehensive n tional implementation plans for the ratification of the HM Protocol and other protocols. Such plans would consist of an assessment of the potential to fulfil the Protocol's obligations, an estimation what needs to be done to fully implement the Protocol's obligations, a list of necessary institutional arrangements and responsibilities, etc. Some of the EECCA and SEE countries would welcome help from the secretariat or other countries in drafting such national implementation plans and/or to review them. A regional project for the non-Parties from the EECCA and SEE region would be welcome in order to speed up the ratification process.

(iii) There is a need for a contact person or focal point where EECCA and SEE countries can ask questions on data collection, data transmission (e.g. the activity data, emissions and emission projections and monitoring) and make further requests (e.g. the establishment of an EMEP monitoring station). A coordination point, for instance at the Secretariat, would be most welcome.

(iv) Translation of important documentation, especially the implementation guidelines, into Russian language is urgently needed. The Russian Federation could possibly assist with these translations and checking to avoid misconceptions or misunderstandings. Establishing a Working Group to control the quality of the translations could be pursued.

h. Raising political awareness in EECCA and SEE countries

For actual changes in EECCA and SEE countries with respect to legislation political support at a high level is essential to implement the necessary institutional arrangements. In these countries the low interest of society and politicians is a problem. Also, countries lack of a national strategy for the ratification of protocols. Therefore, political will and public awareness should be increased to move things forward. To point out the explicit benefits acceding the HM Protocol and other protocols, e.g. increased health of the population and improvements in environment, is one way of raising awareness.

HM emission reduction would also result in a reduction of particulate matter (PM). There is a clear relationship with the improvement on air quality (especially PM) and people's health. In the Convention, the EU and the USA performed many calculations that all showed a positive benefit to cost ratio. CBA calculations of measures to abate air pollution generally show that air pollution abatement pays.
Another possibility to boost the political interest in EECCA and SEE countries would be to hold the 2009 Executive Body meeting in one of the EECCA or SEE countries and possibly sign one or two protocols there. One could imagine a two week meeting with, in the first week, workshops on emission inventories; ELVs; BAT; air quality monitoring and how to create political interest for environmental problems and ways to solve them, especially towards implementing protocols to the Convention. If the WGSR and EB find this attractive then such a project can be further developed and financial resources sought.

Checklist for national implementation plans for the Protocol on Heavy Metals under the Convention on Long-range Transboundary Air Pollution

Prepared by Mr. Johan Sliggers (the Netherlands) in consultation with Ms. Katja Kraus (Chair of the Task Force on Heavy Metals)

Introduction

This checklist aims at assisting Parties to the Convention on Long-range Transboundary Air Pollution (the Convention) in establishing and/or reviewing their national implementation plans for the Protocol on Heavy Metals (the Protocol). It is an additional tool to the detailed implementation guide prepared by the UNECE secretariat. The list contains 11 questions summarizing the steps to be taken by the country at the national level prior to ratifying the Protocol in order to meet the obligations of the Protocol and the Convention. The list constitutes a general tool for use by all Parties to the Convention and does not cover specific national legislative or administrative measures and procedures that are mandatory for a given Party for implementation and ratification of international legal instruments, e.g. state committee/intergovernmental consultations, parliamentary approvals, cost-benefit analyses etc. The list goes through the obligations under the Protocol, provides some explanation on them and for each obligation spells out relevant questions that the national implementation plan for the ratification of the Protocol should address.

Basic obligations

The core of the Protocol are the "basic obligations of Parties" (in Article 3) that should be met upon ratification/accession.

The first of these obligations is to reduce the emissions of cadmium (Cd), lead (Pb) and (mercury) Hg. (Art. 3.1).

1. What is the base year?

Parties must reduce their annual emissions from the emissions of 1990, except if they specify another base year (between 1985 and 1995) upon ratification of the Protocol.

2. What are the emissions in the base year?

These data need to be forwarded to the EMEP Centre for Emission Inventories and Projections (CEIP) and the secretariat notified about these data.

The second obligation is to apply best available technologies (BAT) and emission limit values (ELVs) to each new and existing stationary source within the source categories for which the Protocol specifies BAT and ELVs (Art 3.2).

3. Have the BAT and ELVs outlined in annexes III and V to the Protocol been transposed in national regulations or law?

The third obligation is to apply product control measures (Annex VI) and consider applying other product management measures (Annex VII). (Article 3 paragraphs 3 and 4). (Please note that the other measures on products are voluntary).

4. Are the limitations to lead in petrol and mercury in batteries transposed in national regulations or law?

The fourth obligation is to develop and maintain emission inventories for Cd, Pb and Hg (Art. 3.5.).

5. Does your country have an emission registration system for making emission inventories according to the methodologies of EMEP?

Guidance how these inventories can be calculated is given in the EMEP/EEA Air Pollutant Emission Inventory Guidebook. There are methodologies ranging from simple (Tier 1) to more elaborate (Tier 3). If countries have difficulties with the more elaborate ones they can use the simpler methods.

Possible exemptions to the basic obligations

6. Are the emissions not going down?

Art. 3.6. contains an exemption from the obligation to reduce emissions from the base year (Art 3.1). If your country after having implemented all BAT and ELVs (Art. 3 paragraphs 2 and 3) cannot achieve an emission reduction you are exempted from the obligation to reduce emissions.

7a. Is your country of over 6 million km^2 area? and if so

7b. Does your country want to make use of Article 3.7?

In line with Art 3.7, large countries can benefit from exemptions to applying BAT and ELV's (Art.3.2. (b)-(d) provided that they can reduce their emissions of heavy metals by at least 50% over the eight years following the Protocol's entry into force). The intention to apply this exemption must be specified upon ratification.

General obligations

A country that prepares to ratify the Protocol should also be able to comply with obligations

in articles 4 to 7. It is therefore important to address them in the implementation plan.

Please note that articles 4 and 6 address the Parties to the Protocol as a whole. For instance the effect programme of the Working Group on Effects works on the effect side of research and monitoring and EMEP is working on modelling of concentrations and depositions but of course all Parties to the Convention can contribute to these activities.

Article 5 obliges Parties to develop a strategy, policy and programme to fulfil the obligations of the Protocol. The national implementation plan of your country would be such a strategy, policy and programme. Art. 5 suggest further measures to take and allow Parties to take more stringent measures than required by the Protocol.

Article 7 provides for two kinds of reporting obligations:

Article 7, para 1 (a) calls for information on the measures that Parties are taking to implement the protocol. This information must be reported via a "Strategies and Policies Questionnaire" every two year. (Parties' replies are compiled and published by the secretariat: see

www.unece.org/env/lrtap/conv/conclusi.htm

Article 7, para. 1 (b) requires Parties to provide data annually on emissions of Cd, Pb and Hg. Guidance on what data should be submitted is given in the Emission Reporting Guidelines (ECE/EB.AIR/2008/4). Please note that this data must be annually reported to CEIP, and the secretariat notified of this submission.

8. Who and which institution is responsible for the reporting of:

- ***a. the strategies and policies (i.e. filling in the Strategies and Policies Questionnaire)***
- ***b. the emissions?***

Articles 8 to 19 describe procedures for amendments and regular reviews of the Protocol obligations and other procedural issues. These are less relevant for the preparation of a national implementation plan.

Article 8 addresses EMEP (the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe).

Article 9 provides for an obligation to review the compliance by the Parties with its obligations and mandates the Implementation Committee to carry out this work.

Article 10 deals with the reviews to be carried out at the Executive Body's sessions.

Article 11 sets out procedures for the settlement of disputes between Parties.

Article 12 specifies that Annexes III to VII are not mandatory but recommendatory in character. Articles 13 – 19 set out procedural issues, related to signature, ratification, entry into force, etc.

Article 16 describes the procedure for acceding to the Protocol.

Article 17 specifies the dates of the entry into force of the Protocol and that for a country that has completed the procedures for acceding to the Protocol, the Protocol obligations will enter into force for this country ninety days later

Monitoring

The Protocol does not contain obligations for the monitoring of concentrations to air or depositions of heavy metals. However, in practice, most countries wish to monitor the levels of pollutants and if these levels are going down. The Chemical Coordinating Centre (CCC) of EMEP coordinates the monitoring network under the Convention.

Emissions from sources have to be monitored if exceedances of limit values occur and when the mass flow of particulates is higher than 10 kg/h.

9. Is monitoring of emissions in the cases above taking place?

Inspection and enforcement

It is not only important to ensure that BAT and ELVs are appropriately addressed in national regulations and law but also that they are effectively implemented and enforced.

11. How does the regulatory framework in your country make sure that BAT and ELVs are implemented (permitting, inspection, control and enforcement)?

11 November 2008