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Working Group on Strategies and Review

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Item 5 of the provisional agenda

FOLLOW-UP ON THE REVIEW OF THE PROTOCOL ON HEAVY METALS

Report by the Chair of the Task Force on Heavy Metals

1. This report presents the results of the fourth meeting of the Task Force on Heavy Metals, held in Vienna from 6 to 8 June 2007, in accordance with item 1.5 of the 2007 workplan (ECE/EB.AIR/2006/11) adopted by the Executive Body at its twenty-fourth session (ECE/EB.AIR/89).

2. Mr. D. Jost (Germany) chaired the meeting, which was hosted by Austria with support from the United States of America and Germany.

3. Experts from the following Parties to the Convention attended the meeting of the Task Force: Austria, Canada, the Czech Republic, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden, Ukraine, the United Kingdom of Great Britain and Northern Ireland and the United States of America. The European Commission and United Nations Environment

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Programme (UNEP) were represented at the meeting. Also present were representatives from the Coordination Centre for Effects (CCE), the International Cadmium Association, Eurochlor, the International Cooperative Programme (ICP) on Modelling and Mapping, the International Council on Mining and Metals, and the EMEP[1] Meteorological Synthesizing Centre-East (MSC-E). A member of the UNECE secretariat also attended.

I. OBJECTIVES AND INTRODUCTORY REMARKS

4. Following completion of the review of the sufficiency and effectiveness of the Protocol on Heavy Metals (ECE/EB.AIR/WG.5/2006/2) approved by the Executive Body at its twenty-fourth session (ECE/EB.AIR/89, para. 29 (b)), the Task Force carried out further technical work to assist the Working Group on Strategies and Review, at its fortieth session, in assessing work under the Protocol on Heavy Metals and in proposing further action to reduce emissions of heavy metals for consideration by the Executive Body. In line with the workplan, the Task Force focused in particular on:

(a) Exploring, from a technical point of view, potential options for further reducing the emissions of the heavy metals listed in annex I to the Protocol, and compiling advantages and disadvantages of the options including their cost-effectiveness;

(b) Assessing quantitative and, where this was not possible, qualitative information on health and ecosystem benefits of further measures to reduce emissions of heavy metals listed in annex I.

5. The secretariat presented the mandate of the Task Force referring to the relevant decisions and the workplan items adopted by the Executive Body at its twenty-fourth session. The Task Force was also informed of the decisions on heavy metals made by the Working Group on Effects, at its twenty-fifth session (ECE/EB.AIR/WG.1/2006/2, para. 41).

6. Mr. I. Ilya (MSC-East) informed the Task Force of the recent activities of EMEP, focusing on the reporting of emission data by Parties to the Convention and its protocols. He emphasized that although the data reporting had improved in 2007 as compared to 2006, discrepancies between the official reporting by Parties and the estimates by emission experts[2]

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[1] The Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe.

[2] Estimates made by the Dutch research organization, TNO and the ESPREME research project under the European

remained. Uncertainties within the official emission data required further attention. Furthermore, he informed the Task Force that the application of wind re-suspension of particulate heavy metals had improved the model results. He drew attention to the need to consider intercontinental transport of mercury to assess pollution levels in Europe.

7. The Chair reported on the fifth meeting of the Expert Group on Particulate Matter (Langen, Germany, 24–25 May 2007) pointing out the connections between the particulate matter (PM) and heavy metals.

8. Mr. J. Whitelaw (UNEP) informed the Task Force about the ongoing and planned activities of UNEP in addressing mercury emissions at the global level.

II. EXPLORATION OF OPTIONS FOR FURTHER REDUCING EMISSIONS

A. Presentations of relevant activities and findings

9. The Task Force reviewed a number of relevant activities and findings. The presentations made at the meeting are listed below. They are available on the Task Force website at: http://www.unece.org/env/wgs.

(a) Reducing emissions of mercury, lead, and cadmium in the United States, by Mr. C. French (United States);

(b) A study by TNO of the effectiveness of the Protocol on Heavy Metals and the costs of additional measures: Phase II – Emission reduction and cost of a possible revision of the Protocols, by Mr. M. van het Bolscher (the Netherlands);

(c) Canadian emissions levels, emissions sources and management approaches for mercury, lead and cadmium and four new risk management initiatives, by Ms. G. Howland (Canada);

(d) Possible options for improving heavy metal emissions reductions and technical and

Union 6th Framework Programme: “Estimation of willingness-to-pay to reduce risks of exposure to heavy metals and cost-benefit analysis for reducing heavy metals occurrence in Europe”.

non-technical reduction measures for PM, by K. Kraus (Germany);

(e) Approaches and technologies to reduce mercury emissions from coal-fired power plants and waste incineration, by Mr. C. French (United States);

(f) Exploration of possible options for the reduction of heavy metals from a technical point of view including costs and benefits, by Mr. M. van het Bolscher (the Netherlands);

(g) Heavy metal modelling in EMEP: model development and new results, by Mr. I. Ilyin, (MSC-E);

(h) Information on emissions, depositions, critical loads and exceedance in the EMEP region for cadmium, lead and mercury as well as tentative results for arsenic, chromium, copper , nickel, selenium and zinc, by Mr. J.-P. Hettelingh (CCE);

(i) Comments on the status of emission inventories and modelling of cadmium and mercury under the Convention, by Mr. J. Munthe, (Sweden);

(j) Product-related emissions of mercury to air in the European Union (EU), by Mr. J. Munthe, (Sweden);

(k) Possible additional measures for heavy metals in products to further reducing air emissions, by Ms. P. Ekblom (Sweden);

(l) Conversion of existing chlor-alkali industry to mercury-less technology in the Czech Republic, by Ms. B. Cimbálníková, (the Czech Republic);

(m) Reduction of mercury emissions from the manganese industry and the secondary steel industry, by Mr. T. Faerden (Norway).

B. General observations and key issues

10. This section presents the general observations made by the Task Force and the key issues it raised on the basis of the information presented to it, with respect to emissions, critical loads and exceedance as well as regional and global approaches.

1. Emissions

11. The Task Force noted that in the EMEP region official emission data of heavy metals

continued to have significant uncertainties. Submission of the reported data remained insufficient and official emissions were still underestimated for some countries. The Task Force recognized the necessity of further improvement of emission inventories by Parties.

12. Emissions of heavy metals had decreased significantly since 1990 in Europe, Canada and the United States, and further reductions were expected over the next five to 15 years in some countries. For example, in the United States mercury emissions were projected to decrease by about 50 tons further by 2020 due to recent or planned actions to reduce emissions from coal-fired power plants, secondary steel production, and some other sectors.

13. In some cases, fugitive emissions represented a significant portion of total emissions of industrial sources. In these cases, collecting fugitive PM emission would also reduce heavy metals. Techniques had been identified to reduce these fugitive emissions.

14. It was pointed out that wind re-suspension of soils could be an important contributor to environmental concentrations and depositions of heavy metal, especially for lead. The Task Force noted that further research of this process should be continued.

15. There were source categories, which might be significant, that are currently not covered by the Protocol, such as manganese production and coke ovens.

16. Main sources of particulate emissions were also sources of heavy metals. There were multi-pollutant control measures to reduce heavy metals cost-effectively along with other pollutants (e.g. PM, sulphur dioxide ($SO_{2)}$, dioxins). Of the 10 most important PM sources, five were covered by the Protocol on Heavy Metals.

17. Mercury emissions related to products had declined significantly in the the EU and the United States. However, recent estimates for the EU, the United States and Canada indicate that mercury products still contributed significantly to total anthropogenic air emissions. For the EU, product related-emissions of cadmium were also considered significant. There were cost-effective technical options for further reducing product related emissions of heavy metals. For mercury, alternatives were available for almost all applications.

18. The Task Force had reported within the sufficiency and effectiveness review that many Parties had gone beyond the control measures that the Protocol required in its annex VI. Also, many Parties had implemented regulatory and/or voluntary measures for additional product groups including many of those identified in annex VII to the Protocol;

19. Large potential for further reduction of the heavy metal emissions existed for countries

that had not yet ratified the Protocol.

20. To assist those countries, guidelines for implementation of the Protocol could be developed as was done in the case of the Protocol on Persistent Organic Pollutants (POPs). A workshop in one of those countries could be useful to share experiences in managing emissions covered by the Protocol on Heavy Metals.

2. Critical loads and exceedances

21. A representative of the CCE presented information on critical loads and their exceedances in the EMEP region for cadmium, lead and mercury as well as tentative results for six other metals: arsenic, chromium, copper, nickel, selenium and zinc. Participants concluded that lead and mercury significantly exceeded critical loads, while for the other metals there were no widespread exceedances. Continued emphasis on cadmium, lead and mercury was seen justified.

22. Critical load exceedance for cadmium was calculated using modelling results based on officially reported emission data. Exceedance was very small (0.34 per cent) for most parts of Europe. However, official emission data had been shown to be significantly underestimated for some countries. Furthermore, cadmium input to agricultural soils via fertilizers might be of significant magnitude and should be taken into account. This suggested that currently available official critical load exceedance should be viewed with some caution when used as a basis for considering the need for further measures to control emissions.

23. Critical loads of mercury were significantly exceeded in most parts of Europe. Available tools for evaluation of source-receptor relationships and impacts (e.g. emission inventories, atmospheric models and critical loads) provided results that were uncertain in some aspects, but robust in terms of describing the approximate magnitude and direction of changes in deposition and impacts resulting from changes in emissions or emission patterns.

24. Participants took note of the assessments provided by the Task Force on the Health Aspects of Air Pollution to the twenty-fifth session of the Working Group on Effects, indicating that input of the three priority heavy metals to European ecosystems were still at levels which posed a threat to human health and ecosystems.

3. Regional and global approaches

25. Monitoring data and assessments of emission inventories from Europe clearly showed that decreases in emissions of mercury had resulted in reduced deposition within the EMEP

region. Significant reductions of the ecosystem input could thus be achieved by further control measures on regional scales.

26. Nevertheless, mercury emissions were a global issue. While emissions were decreasing in Europe, the United States and Canada, they were increasing in some other parts of the world (e.g. in Asia). For example, results of monitoring of air concentrations of mercury indicated that increasing global emissions were compensating emission reductions in Europe.

27. A global outlook in terms of emissions, atmospheric models and control strategies was thus necessary for long-term assessments and the development of long-term strategies for mercury. Since intercontinental transport contributed considerably (up to 90%) to mercury pollution in the European region and North America, its influence had to be taken into account for the evaluation of transboundary transport of mercury. For further development of the EMEP unified global model, relevant input data, such as global-scale emissions, land cover etc., would be useful.

28. Assessment of global mercury issues was under way within the UNEP Global Mercury Programme with the intention of presenting proposals and/or options for possible further action to the UNEP Governing Council in 2009. At that time the Governing Council would take a decision on the range of measures to be taken.

29. UNEP work was also proceeding on lead and cadmium, but at this stage the issue of a legally binding instrument was not being considered.

III. CONCLUSIONS (OPTIONS FOR REDUCING EMISSIONS)

30. This chapter presents the conclusions by the Task Force on potential options for further reducing the emissions of heavy metals listed in annex I to the Protocol, both for stationary sources and for products.

A. Stationary sources

1. Current situation compared to obligations under the Protocol

31. On the basis of the sufficiency and effectiveness review, the Working Group on Strategies and Review recognized that many Parties apply lower emission limit values (ELVs) for stationary sources than those set out in annex V of the Protocol. Some countries have ELVs for mercury, cadmium and lead for which annex V has no ELVs. The current level of applied techniques to reduce heavy metals emissions differs within the UNECE region. Control

techniques for the heavy metals listed in annex I have been developed further for some sectors as described in the background document on best available techniques (BAT) and limit values (14 June 2006), submitted to the third meeting of the Task Force on Heavy Metals[3].

2. Recent developments since the sufficiency and effectiveness review

32. New techniques were available to further reduce emissions for example from the manganese production industry, secondary steel industry, coal combustion and secondary copper production, particularly to reduce mercury emissions.

33. Currently, the Protocol did not address the manganese production. Mercury emissions from manganese production were identified as an important source in Norway. Full-scale cleaning of mercury emissions from two plants, based on activated carbon filter, had been operating for five years, reducing the emissions by 600 to 800 kg/year.

34. The Protocol did not provide specific mercury reduction measures for secondary steel production. Mercury emissions could be reduced significantly from secondary steel production by removing mercury-containing electric components from scrap metal before it entered the secondary steel production process. The United States and Canada were in the process of implementing programmes to remove mercury-containing switches from end-of-life vehicles.

35. To reduce emissions further, a full-scale cleaning of mercury emissions in waste gas from an electric steel furnace would be implemented in Norway in 2008. This measure was expected to reduce mercury emissions by 85 to 90 per cent.

36. Germany had implemented new integrated low emission process technologies for secondary copper production that reduced emissions beyond current requirements of the Protocol (i.e. KRS technology, low emission poling technology).

37. The Protocol provided no specific reduction measures for mercury emissions from coal-fired power plants. Technologies for mercury specific reduction were being tested and showed some promise, such as powdered activated carbon (PAC) injection. Other approaches and technologies that captured various amounts of mercury (Hg) along with other pollutants included, inter alia, coal cleaning, fabric filters and wet scrubbers. Selective Catalytic Reduction

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[3] The background document is available on the website at:
http://www.unece.org/env/tfhm/third%20meeting/Background_BAT-ELV_060407.doc

(SCR), which was used for NOx (nitrogen oxides) control, could convert Hg^0 to Hg^{2+}. The Hg^{2+} is more easily captured by some common control technologies. For example, wet scrubbers capture Hg^{2+} effectively.

38. Main sources of particulate emissions were also sources of heavy metals. Particle-bound metals, such as cadmium and lead, could be effectively reduced by PM control measures. The binding effect could be increased by technical measures like cooling processes or steam conditioning. Multi-pollutant control measures that reduced heavy metal emissions cost-effectively along with other pollutants (e.g. PM, SO_2, dioxins) were applied in some countries.

39. In some cases, fugitive emissions represented a significant portion of total emissions of industrial sources like in the ferrous and non-ferrous metals industry. In these cases an optimized collection of fugitive PM-emission would also reduced heavy metals. For example, “house-in-house” technology for the primary copper production by covering the converter and oven could reduce the emissions effectively (emissions were site-specific, but could be significant: measurement at one installation reported 80 per cent emissions via roofline). Cooler production processes had less PM and therefore less heavy metal emissions than hot processes.

3. Cost and benefits of additional measures for the EMEP area

40. An analysis carried out by TNO, CCE and MSC-East and presented to the Working Group on Effects and to the Working Group on Strategies and Review, evaluated the relative changes between 1990 and 2020 of (1) current legislation and current ratification by European countries (CRHM) in 2010 and 2020; (2) full implementation of the Protocol by all European countries (FIHM); and (3) full implementation of the Protocol plus additional measures (FIHM+AM) (see table 1). Full implementation meant that all European countries implemented the provisions of the Protocol referring to stationary sources; additional measures meant stricter ELVs based on the same techniques and for mercury some existing techniques.

Table 1: **Emissions and calculated emissions for several options for Europe**

Year/scenario	Cd	Pb	Hg
1990	172	279	146
2000	100	100	100
2010 CRHM	87	49	95
2020 CRHM	86	51	95
2020 FIHM	57	38	92
2020 FIHM + AM	36	19	54

41. As summarized in Table 1, the analysis concluded that the full implementation of the Protocol by all EMEP domain countries could reduce dust related emissions of cadmium and lead by an estimated 43 and 62 per cent respectively compared to 2000. The full implementation of the Protocol could reduce mercury emissions by an estimated 8 per cent.

42. The additional measures were further investigated for the EU25+[4] and non-EU25+[5] countries.

43. Starting from the full implementation of the Protocol on Heavy Metals, the options had gradually introduced the additional measures to reduce cadmium and lead and subsequently reduced mercury. For each of the options, emissions, emission reductions, investment and operational costs over a 20-year period had been estimated and were expressed as an annual cost. Benefits were expressed as the reduction of the areas at risk and of accumulated exceedances (see Table 2).

44. As summarized in Table 2 (in annex), the results of the analysis were:

(a) Additional measures in 2020 of dust-related measures could lead to reductions of up to 37 per cent and 52 per cent of cadmium and lead emissions respectively in Europe (19% and 41% in EU25+; 50% and 60% in Non-EU25+) compared to full implementation;

(b) Additional measures in 2020 of measures to reduce mercury could lead to reductions up to 42 per cent in Europe (37% in EU25+, and 46% in Non-EU25+) compared to full implementation.

45. The analysis investigated the costs of the options:

(a) Costs of dust-related measures (cadmium and lead) ranged from about €3 billion (new sources) to €9 billion (new and existing sources). These amounts excluded the costs of the EU25+ countries to implement measures specified under EU regulations. Therefore, the largest share of the incremental cost affected non-EU25 countries to enable them to take the same measures;

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[4] "EU25+" refers to the EU Member States together with Norway and Switzerland.

[5] "Non-EU25+" refers to Parties to the Convention outside of North America and the EU 25+.

(b) Costs for additional mercury measures on top of dust measures range from about €3.5 (new sources) to €18.5 billion (new and existing sources).

46. It should be noted that ex-post evaluations of costs made showed that these costs were a factor of two to ten lower compared to the ex-ante-calculated costs.

47. The analysis benefits were expressed as the reduction of the magnitude of the average accumulated exceedance and of the per cent of area where critical loads were exceeded:

(a) The average accumulated exceedance of critical loads of lead was reduced from 3 g ha^{-1} yr^{-1} under full implementation to 2 g ha^{-1} yr^{-1} when additional measures are included. For mercury, the figures were 0.12 g ha^{-1} yr^{-1} and 0.064 g ha^{-1} yr^{-1};

(b) The area at risk for cadmium, lead and mercury under full implementation plus additional measures was reduced to 0.02, 19 and 74 per cent respectively (previously the figures were 0.1, 33 and 80).

48. It was noted in the analysis that the actual benefits were likely to be higher because exceedances were underestimated as a result of national emission data being too low. Furthermore, the actual exceedance of the critical load of cadmium for agricultural might turn out to be higher due to the use of fertilizers. Cadmium loads from fertilizers were of about the same magnitude as from atmospheric deposition.

49. The options identified in the analysis could be considered as an example of possible sets of measures. Other sets could be imagined, for example, based on derogations for groups of countries, derogations in time or different time frames for the implementation of measures.

B. Products

1. Current situation compared to obligations under the Protocol

50. The Task Force reported in its sufficiency and effectiveness review that many Parties had gone beyond the control measures that the Protocol require in annex VI. Also, many Parties had implemented regulatory and/or voluntary measures for additional product groups including many of those identified in annex VII.

(a) Options

51. There were also options for further reducing emissions from mercury-containing

products, which had been, or were about to be, implemented by many Parties. These included: prohibition for mercury in batteries; limits on the mercury content in button-cell batteries; restrictions on mercury in measuring instruments for consumers, fever thermometers, mercury-containing components in vehicles, and electrical and electronic equipment; and limits on the mercury content of lamps. Some Parties also had requirements on separators in dental clinics to trap mercury from dental amalgam.

52. There were also options for further reducing emissions from cadmium and lead - containing products that had been implemented by many Parties. These included regulatory collection targets; voluntary collection programmes; labelling; restrictions with exemptions (cadmium); marketing fee for applications such as batteries, cadmium and lead-containing components in vehicles; and electrical and electronic equipment. In addition, some Parties had introduced control measures for cadmium used as surface treatment, stabiliser and colouring agent.

(b) Reductions

53. Mercury emissions from the life cycle of products had declined significantly in the EU and the United States. However, recent estimates for the EU, the United States and Canada indicated that mercury products still contributed significantly to total anthropogenic air emissions.

54. Mercury emissions to air from mercury in products in the EU25 had been estimated to be 10-18 tons/year from technical products plus 2–5 tons/year from cremation, corresponding to 8–16 per cent of the total emissions in the EU. Apart from cremation, additional emissions arose from handling of amalgam, waste handling, and waste incineration and sewage sludge. A recent assessment indicated that the total amount of mercury air emissions arising from the use of dental amalgam could double the total air emissions from products.

55. In Canada, of the domestic mercury emissions estimated for 2003 (totalling approximately seven tons), about one quarter was thought to be largely attributable to mercury-containing products. A recent study in the United States also suggested that roughly one quarter of mercury emissions to air are related to the life cycle of products.

56. The Risk Assessment Report on Cadmium in the EU estimated cadmium air emissions from products at 8 tons/year (6.5% of total anthropogenic air emissions), taking into account the production of cadmium and cadmium oxide, the production and recycling of cadmium batteries, cadmium alloys, and municipal waste incineration. However, the incineration of municipal waste might involve materials in which cadmium was present as an impurity. With regard to the United

States, available information suggested that the level of cadmium emissions from the life cycle of products is much lower.

(c) Costs and benefits

57. The European Commission's impact assessment on advantages and disadvantages of marketing restrictions on heavy metals in certain products in the EU concluded that they are cost-effective.

58. For example, as regards electrical and electronic equipment (EEE), the Commission's impact assessment found that substitutes existed for most applications and that there would be only limited costs for manufacturers to phase-out heavy metals in EEE. Financial benefits were found due to lower production and disposal costs through use of secondary materials and re-using/recycling. The Commission also concluded that clean up costs and costs for environmental impacts were not included in the prices of the products, and that the associated risks were substantial and therefore prevention at source was preferable to end-of-pipe solutions. For some Parties, collection and recycling programmes were in place for EEE products.

59. The impact assessment of the Commission's proposal to restrict the marketing of mercury containing measuring instruments for consumers and all fever thermometers found that substitutes were available at similar prices. There would be a negative impact on a few producers within the EU, but that should be balanced with costs avoided for removing mercury in the waste stream as well as the decreased impacts of the emissions. A very limited negative effect on employment was found. Thus, the Commission concluded that the proposed restriction was cost-effective with minor social effects.

60. In Canada, a risk-management strategy for mercury-containing products was being developed to reduce mercury releases to the environment from consumer products to the lowest possible level. A socio-economic study of mercury-containing products and their alternatives was completed as part of the development of the strategy. Currently, a federal regulation was considered to be the most appropriate tool to achieve the objectives.

IV. FURTHER WORK OF THE TASK FORCE

61. The Task Force agreed it would carry out further work in 2008 and 2009 as required by the Executive Body.

62. It proposed to organize a workshop in Eastern Europe, the Caucasus and Central Asia (EECCA) to promote ratification of the Protocol, to assess needs and constraints related to

implementation and to recommend future action.

Annex

Table 2: **Emissions, costs and area at risk for the different options in 2020**

Option	Dust measures		Hg measures		Countries	Emissions (tonnes)						Costs (M€)	Area at risk (%)*		
	New source	Existing source	New source	Existing source		Cd	Reduction (%)	Pb	Reduction (%)	Hg	Reduction (%)		Cd	Pb	Hg
1. Full Implementation HM Protocol.					EU(25)+	95	0%	2622	0%	141	0%	0	0,03	38	66
					non-EU(25)+	121	0%	3139	0%	175	0%	0			
					All	**217**	**0%**	**5761**	**0%**	**316**	**0%**	**0**	**0.1**	**33**	**80**
2. Additional measures Cd and Pb new.	*X*				*EU(25)+*	*90*	*5%*	*2264*	*14%*	*141*	*0%*	*448*			
	X				*non-EU(25)+*	*103*	*15%*	*2514*	*20%*	*172*	*2%*	*2 546*			
					All	**194**	**11%**	**4778**	**17%**	**313**	**1%**	**2 994**	**<0.10**	**<33**	**<80**
3. Additional measures Cd and Pb new. The EU+ also existing.	X	X			EU(25)+	81	15%	1548	41%	141	0%	1 344			66
	X				*non-EU(25)+*	*103*	*15%*	*2514*	*20%*	*172*	*2%*	*2 546*			
					All	**184**	**15%**	**4062**	**29%**	**313**	**1%**	**3 890**	**<0.10**	**<33**	**<80**
4. Additional measures Cd and Pb new and existing.	X	X			EU(25)+	81	15%	1548	41%	141	0%	1 344			66
	X	X			non-EU(25)+	68	44%	1265	60%	166	5%	7 637			
					All	**149**	**31%**	**2813**	**51%**	**307**	**3%**	**8 981**	**<0.10**	**<33**	**<80**
5. Additional measures Cd and Pb new and existing. The EU+ also additional measures Hg new.	*X*	*X*	*X*		*EU(25)+*	*83*	*13%*	*1551*	*41%*	*124*	*12%*	*4 848*			
	X	X			non-EU(25)+	68	44%	1265	60%	166	5%	7 637			
					All	**151**	**31%**	**2816**	**51%**	**290**	**8%**	**12 485**	**>0.02**	**>19**	**>74**
6. Additional measures Cd and Pb new and existing. Additional measures Hg new and the EU+ also for existing.	X	X	X	X	EU(25)+	77	19%	1540	41%	89	37%	11 936	0.02	27	61
	X	*X*	*X*		*non-EU(25)+*	*74*	*39%*	*1276*	*59%*	*148*	*16%*	*10 187*			
					All	**151**	**30%**	**2816**	**51%**	**237**	**25%**	**22 123**	**>0.02**	**>19**	**>74**
7. Additional measures Cd and Pb new and existing plus additional measures Hg new and existing.	X	X	X	X	EU(25)+	77	19%	1540	41%	89	37%	11 936	0.02	27	61
	X	X	X	X	non-EU(25)+	60	50%	1250	60%	94	46%	15 454			
					All	**137**	**37%**	**2790**	**52%**	**183**	**42%**	**27 390**	**0.02**	**19**	**74**

Emission and Cost data have been obtained from Visschedijk et al. (2006) (See text for an explanation on the *grey marked* rows).
Area at risks data have been obtained from Hettelingh et al. (2006)
*Please be aware that the countries covered within the two studies is not exactly the same.
Due to rounding off the numbers, there migth be a small difference between the numbers in the TNO study and the numbers in the table