

**ENVIRONMENTAL POLLUTION AND PRODUCT  
CHARGES IN ARMENIA:  
Assessment of Reform Progress and Directions for  
Further Improvement**



**ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT**

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## TABLE OF CONTENTS

ACRONYMS.....	6
1. GENERAL INTRODUCTION.....	7
2. BACKGROUND.....	8
3. THE CURRENT SYSTEM OF POLLUTION AND PRODUCT CHARGES.....	9
3.1 Legal Background.....	9
3.2 Institutional Framework.....	10
3.3 Pollution Charges.....	11
3.3.1 Air Pollution Charges.....	11
3.3.2 Water Pollution Charges.....	13
3.3.3 Waste Charges.....	14
3.4 Environmentally Harmful Product Charges.....	15
3.5 Generation, Collection and Use of Pollution and Product Charge Revenues.....	16
3.5.1 Generation and Collection of Revenues.....	16
3.5.2 Revenues from Air Pollution Charges.....	19
3.5.3 Revenues from Water Pollution Charges.....	20
3.5.4 Revenues from Waste Charges.....	22
3.5.5 Revenues from Product Charges.....	22
3.5.6 State Environmental Expenditure.....	23
3.5.7 Data on Selected Industrial Enterprises.....	25
4. EVALUATION OF THE POST-1998 SYSTEM OF ECONOMIC INSTRUMENTS.....	27
4.1 Environmental Effectiveness.....	27
4.1.1 Insufficiently High Charge Rates and Counterproductive Charge Base.....	27
4.1.2 Ineffective Assessment of Charge Payments.....	30
4.1.3 Limited Enforcement of Charge Payments.....	30
4.2 Capacity to Raise Revenue for Environmental Measures.....	30
4.2.1 Poor Revenue Raising Capacity of the Environmental Charges.....	30
4.2.2 Weak Link between Charge Revenues and Financing Environmental Measures.....	31
4.3 Cost Aspects.....	32
4.3.1 Affordability of Charge Payments to Industry.....	32
4.3.2 Administrative Costs.....	32
4.4 Legal and Institutional Issues.....	33
4.4.1 Legal Concerns.....	33
4.4.2 Institutional Problems.....	34
5. ARMENIA'S PROGRESS IN IMPLEMENTING INTERNATIONAL RECOMMENDATIONS AND OPTIONS FOR FURTHER REFORM.....	36
5.1 Summary of International Recommendations and Their Implementation in Armenia.....	36
5.1.1 Reduction of the Number of Chargeable Pollutants.....	36
5.1.2 Coverage of Mobile Sources.....	38
5.1.3 Increasing Pollution Charge Rates.....	38
5.1.4 Increasing Collection Rates.....	38

5.2. Opportunities and Constraints for Further Improvement .....	39
6. LESSONS LEARNED FROM THE REFORM PROCESS IN ARMENIA .....	41
REFERENCES .....	42
INTERVIEW PARTNERS.....	44
ANNEX 1. CONTRIBUTION OF SELECTED LARGE ARMENIAN ENTERPRISES TO OVERALL EMISSIONS AND DUE REVENUES IN 2002.....	45

## ACRONYMS

AMD	Armenian dram (throughout this text the average exchange rate over the year 2002 of 575.03 AMD = 1 USD is used)
EAP TF	Environmental Action Programme Task Force
EECCA	Eastern Europe, Caucasus and Central Asia
ELV	Emission (Effluent) Limit Value
EU	European Union
MFE	Armenian Ministry of Finance and Economy
MNP	Armenian Ministry of Nature Protection
OECD	Organisation for Economic Cooperation and Development
RA	Republic of Armenia
SINP	State Inspectorate for Nature Protection
STS	State Tax Service
USAID	United States Agency for International Development
USD	US Dollar

## 1. GENERAL INTRODUCTION

Economic instruments have been playing an increasingly important role in the environmental policies of OECD countries over the last decade. OECD countries generally use environmental taxes for a limited number of pollutants, while focusing more on taxes for environmentally harmful products. In the countries of Eastern Europe, Caucasus and Central Asia (EECCA)<sup>1</sup>, the economic instruments for natural resource use were introduced in the 1980s, and a system for pollution charges on an experimental basis in selected regions in 1990. After the break-up of the Soviet Union in 1991, economic instruments for environmental protection and natural resource management were introduced in all EECCA countries. A prevalent feature of the use of economic instruments in these countries is that they are closely integrated with systems of pollutant emission or natural resource use limits, where enterprise-specific emission limits are laid down in environmental permits. Generally, the standard pollution charge applies for emissions within the defined limits while emissions above the limits are charged at higher non-compliance rates. In contrast to OECD countries, EECCA countries have traditionally levied environmental charges on a large number of pollutants, but hardly any on environmentally harmful products. The effectiveness of the pollution charges in the EECCA has been predominantly low due to the lack of focus on principal pollutants, low charge rates, insufficient monitoring of pollutant discharges, and lenient enforcement.

Armenia was the first country in the EECCA region to introduce charges on environmentally harmful products and to simplify the pollution charge system in a reform of 1998. *The objective of this report is to analyse the experience of the reform of the system of economic instruments for environmental protection in Armenia and to make recommendations for further improvement.* It focuses on pollution and product charges<sup>2</sup>. It does not cover user charges for water, wastewater, and waste management services or natural resource use charges. Unless otherwise specified in the report, the information provided was collected during a fact-finding mission in Armenia and is based on interviews with Armenia's environmental, economic and financial government agencies, and on official documents and data provided by these stakeholders. The mission took place in April 2004 and was funded by the EAP Task Force Secretariat, which is hosted at the OECD Environment Directorate.

The structure of the report is the following: After a brief discussion in [Section 2](#) of the background of, and rationale for, the reform in Armenia, [Section 3](#) describes the current system of pollution and product charges. It covers the legal background of the current system of economic instruments of environmental policy, outlines institutional responsibilities, gives details of the application of the pollution and product charges and discusses revenue collection issues. [Section 4](#) contains an evaluation of improvements in the system compared to the pre-1999 period as well as of its effectiveness and efficiency in attaining its explicit and implicit objectives. Several legal and institutional shortcomings are also discussed. [Section 5](#) assesses the reform of the Armenian system of environmental economic instruments against international recommendations and discusses opportunities and constraints for further improvement. [Section 6](#) concludes with a discussion of lessons learned from the Armenian experience and their relevance for other EECCA countries.

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<sup>1</sup> The EECCA region covers Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

<sup>2</sup> Note that in line with the Armenian denomination the term 'charges' is used with respect to payments levied on pollutants and harmful products. These 'charges' are nevertheless unrequited payments and should hence not be interpreted in the sense of the national accounts' definition of charges (and fees) as payment in exchange for services.

## 2. BACKGROUND

The introduction of economic instruments for environmental protection in the Republic of Armenia (RA) dates back to 1986, when the country was still part of the Soviet Union. In that year, “The Provisional Methods for Estimating the Damage Caused to the National Economy by Environmental Pollution” were adopted, aimed at determining the damage to the national economy from violations of the environmental legislation of the Soviet Union and the Union republics thereof (EAP TFS/DANCEE, 2000). With Resolution No. 448 of the Government of the RA of 8 September 1993, a comprehensive set of rates for payments for environmental pollution was introduced and the Polluter/User Pays Principle officially enacted.<sup>3</sup> Since then, environmental charges have been in place for air pollution (including transport-related pollution), water pollution, industrial waste generation, along with natural resource charges. In 1997, the applicable payment rates were increased.

The effectiveness and revenue-raising capacity of the system of environmental charges in place prior to 1999 was widely regarded as low (Harutyunyan, 1999). The changes that have been introduced since 1998 were designed to address this problem by simplifying the system (through limiting the number of chargeable parameters to those that are monitored and generate significant revenues), raising the charge rates, and introducing product charges.

The system was re-authorised by Law No. 270 of 30.12.1998 “On Environmental and Natural Resource Payments”. *The law declared the raising of revenues for environmental protection measures as the main objective of environmental charges.* This law introduced, among other things, charges on a set of (initially) 20 product categories considered to be environmentally damaging (see Table 6), making Armenia the first EECCA country to have introduced product charges on a large scale. Another major feature of this reform was a reduction in the number of water pollutants that are subject to charges from 27 to 19. Various charge rates were also increased. This reform was also important from a legal point of view: before 1998, environmental charges were only based on a government regulation which lacked sufficient legal status. With the revision in 1998, environmental charges for the first time were regulated by a law. In April 2000, the list of air pollutants from stationary sources that are subject to pollution charges was reduced from 51 (in 1998) to 10, and charge rates for selected pollutants were increased further. The 2000 rates are still in effect at the time of the writing of this report.

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<sup>3</sup> The Polluter Pays Principle states that those who cause pollution should offset its effects by compensating for the damage incurred, or by taking precautionary measures to avoid creating pollution. It is generally interpreted in the way that the polluter should bear the costs of pollution prevention and control measures. Contrary to a widespread perception in EECCA countries, not only economic instruments (such as taxes, charges or tradable permits) but all environmental policy instruments that make polluters reduce their negative environmental impacts and pay for these reductions are in line with the Polluter Pays Principle.



### 3. THE CURRENT SYSTEM OF POLLUTION AND PRODUCT CHARGES

#### 3.1 Legal Background

The current system of environmental pollution and product charges in Armenia is based on the Law of the Republic of Armenia “On Environmental and Natural Resource Payments” (Law No. 270) which entered into force on 1 January 1999. The Law was complemented by two government decrees on rates of the environmental charges, also effective as of 01.01.1999.

Article 4 of Law No. 270 stipulates that environmental payments include:

- a) payments for discharges of pollutants into the environment (air and water);
- b) payments for placement of production and consumption waste in the environment; and
- c) payments for environmentally harmful products.

Air pollution charges are imposed on both stationary and mobile sources. Charges on water pollution are levied on direct discharges into water bodies and, since recently, on industrial discharges into the sewer. The waste charges are imposed on on-site storage and landfill disposal of industrial waste.

According to the law “On Environmental and Natural Resource Payments,” all pollution charges discussed in this report are obligatory payments to the state budget with a purpose of receiving revenues for carrying out environmental measures (Article 2). Therefore, pollution and product charges are primarily considered as revenue-raising instruments. However, apart from one exception<sup>4</sup>, there has so far been no earmarking of environmental charge revenues for environmental projects, and, unlike in many other EECCA countries, there is no system of environmental funds in Armenia. There is no reference to an incentive objective of pollution and product charges in the law.

The rates for environmental charges are set by law. For pollution charges, exceedances of limit values for air emissions and water discharges laid down in firm-specific permits are subject to a 3-fold increase of payment rates.

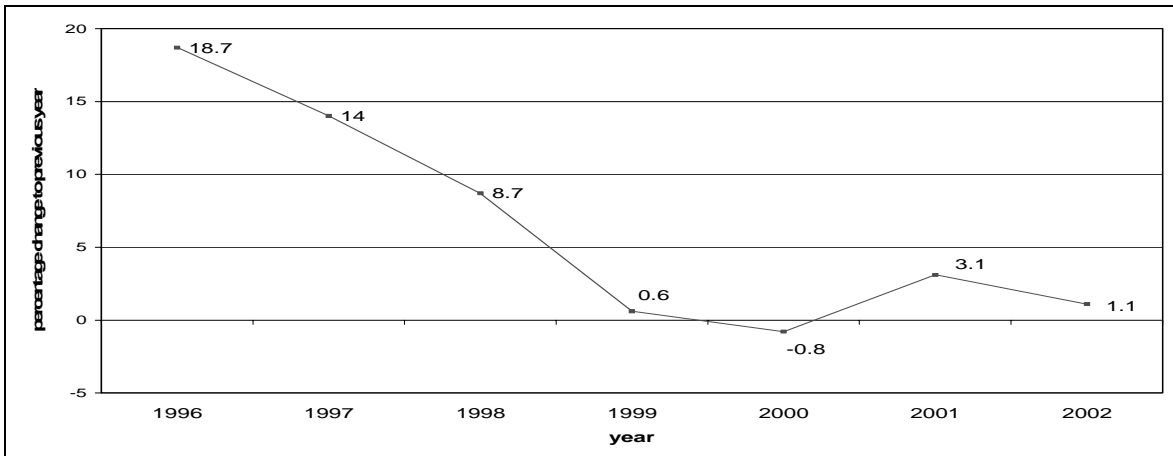
The law also lays down the basic rules for penalties for violations. *Late payments* are subject to penalties of 0.2% of the due amount per day. If the payment delay is more than 2 months, a fine is imposed of 5% of the due payment amount for every following 15 days. *Underreporting* is penalized by a fine equal to 50% of the underreported amount, repeated underreporting by a 100% fine.

The law provides for no systematic correction of pollution charges for inflation, and the occasional changes in the charge rates were not intended to make such corrections. Figure 1 shows that the inflation rate in Armenia has decreased significantly over recent years. Unlike pollution charges, product charges are fixed on an *ad valorem* basis as a percentage of the market prices (excluding taxes), thus assuring automatic adjustment to inflation.

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<sup>4</sup> The Law ‘On targeted use of environmental payments by companies’ of 15 May 2001 stipulates that the revenues of the environmental charges from 8 companies (2 cement and 6 metallurgical/mining companies) should be redirected to the local communities in which these companies are located (see section 3.5).

Figure 1: Inflation Rate<sup>5</sup>, 1996-2002



Source:

EAP TSF/DANCEE, 2000; Statistical Yearbook of Armenia, 2003.

### 3.2 Institutional Framework

Three government agencies are primarily involved in administering the system of economic instruments for environmental protection in RA. The Ministry of Nature Protection (MNP) plays the principal role: it designs economic instruments, introduces new types of these instruments and controls (through regional and central state inspectorates) actual volumes of pollution and natural resources use. The Ministry of Finance and Economy (MFE) proposes the charge rates (for promulgation in the law) and allocates the charge revenues collected, for the most part, by the State Tax Service (STS).

Certain roles are also played by the Ministry of the Interior and the State Customs Committee. The pollution charges levied on vehicles registered in Armenia are collected at the time of vehicle inspections by the road police. Revenues from pollution charges on transit transport are collected by the Customs Committee<sup>6</sup>. The Customs Committee also collects charges on imported environmentally harmful products, while the STS collects charges imposed on such products when they are produced domestically.

Responsibilities for control and enforcement of pollution and product charge payments are split between the MNP and the STS. As enterprises assess and report their environmental charge payments due, the State Inspectorate for Nature Protection (SINP), which is part of the MNP, is in charge of controlling the pollution volumes reported, and the STS controls the payments. Enterprises present quarterly reports on the volumes of discharges and waste generation to the regional environmental inspectorate for approval (the data are then compiled by the MNP and shared with the Council for Statistics), and then submit a copy of the report to a local tax office within 5 days and pay the charges to a budget account. Where the inspectorate detects firms' underreporting, it establishes a protocol which has to be sent to the tax office, which then has to collect the past charges due. Where enterprises are fined for environmental violations, the imposed penalties should also be paid to the budget.

<sup>5</sup> Percentage change in consumer prices; change to previous year.

<sup>6</sup> An exception are agricultural vehicles for which the collection of charges is under the responsibility of the Ministry of Agriculture.

When enterprises do not pay the due environmental charges, the STS may go to court after 180 days of non-payment, although it is not obliged to do so. Where a case is taken to court, the latter may either allow the enterprise more time to settle its debt or declare the firm bankrupt and seize its assets to satisfy the debt (STS, 2004).<sup>7</sup> Interviews with the responsible state authorities in Armenia suggest that, in practice, cases are not frequently taken to court (SINP, 2004).

### **3.3 Pollution Charges**

Pollution charges in Armenia are levied on air pollution from stationary and mobile sources, water pollution, and “placement” (i.e., storage and disposal) of waste.

#### **3.3.1 Air Pollution Charges**

Since 2000, ten air pollutants emitted by *stationary sources* have been subject to environmental charges: particulate matter (inorganic dust), carbon monoxide, nitrogen oxides, sulphur dioxide, chlorine, chloroprene, chromium oxide, formaldehyde, toluene and xylol. This list was considerably shortened compared to the 51 air pollutants that were subject to charges in 1993-1999. According to the interviews with MNP officials, the choice of substances to be kept as the charge base was guided by their revenue generation and environmental impact. To some extent, the choice was also driven by the available monitoring technology: toluene and xylol (both solvents) are examples of substances kept on the list because they are actually monitored (MNP, 2004).

The current charge rates for air pollutants from stationary sources were set in April 2000, when a new rate calculation method was used, based on the toxicity of air emissions of individual pollutants. Under this approach, the rate for one ‘reference pollutant’ is multiplied by a coefficient reversely proportionate to a respective ambient air quality standard (maximal allowable ambient concentration), implying that the stricter the ambient standard, the higher the resulting charge rate (MNP, 2004). As can be seen in Table 1, not all charge rates were increased between 1998 and 2000. While, for example, the charge rate for chromium oxide was increased by a factor of 316, the charge rate for chloroprene remained the same, and those for particulate matter and SO<sub>2</sub> were even decreased by roughly two thirds. For emissions above the specified ELVs, the 3-fold rate is applied.

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<sup>7</sup> It is worth mentioning that the STS has weaker power to enforce environmental charges than regular taxes, which fall under the Tax Code. For regular taxes, the STS can attach a firm’s account once its tax debt exceeds 1 million AMD. Any incoming funds on the account are then directly transferred to the budget until the debt is satisfied.

**Table 1. Charge rates for air emissions from stationary sources**

Pollutant	Rate per tonne, AMD		Rates ratio	Rate per tonne, USD
	1998	2000	2000/1998	2000
Particulate matter	1800	600	0.33	1.04
CO	30	80	2.67	0.14
NO <sub>x</sub>	2250	7400	3.29	12.87
SO <sub>2</sub>	1800	600	0.33	1.04
Toluene (C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> )	150	500	3.33	0.87
Chlorine (Cl <sub>2</sub> )	3000	6000	2.00	10.43
Chloroprene (C <sub>4</sub> H <sub>5</sub> Cl)	45000	45000	1.00	78.26
Chromium oxide (CrO <sub>3</sub> )	60000	18957000	315.90	32 966.98
Xylol (C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub> )	450	1500	3.33	2.61
Formaldehyde (HCNO)	30000	23400	0.78	40.69

Source: Harutyunyan, 1999; data provided by the MNP; 1 USD = 575.03 AMD

The charges on *mobile sources* take two different forms:

- Charges per type of motor vehicle for vehicles registered in Armenia are payable once a year, by juridical and physical persons owning the vehicle. The payment is a precondition for receiving the vehicle's technical inspection certificate.
- Transit vehicle charges per category of motor vehicles and their load carrying capacity for vehicles not registered in Armenia are payable by juridical and physical persons at each entry into the country.

Table 2 presents the charge rates on Armenian-registered motor vehicles. The charges essentially depend on the horsepower of the specific vehicle. According to EAP TFS/DANCEE (2000), in 1999, the rates varied between 1350 AMD (2.4 USD) for small cars and 36000 AMD (62.6 USD) for large trucks.

**Table 2. Charges per Type of Motor Vehicle (for vehicles registered in Armenia)**

Horsepower (M)	Vehicle charge in AMD
< 50 M	10 x M
50 M – 80 M	20 x M
81 M – 100 M	30 x M
101 M – 150 M	40 x M
150 M – 200 M	50 x M
201 M – 250 M	60 x M
251 M – 300 M	70 x M
> 300 M	100 x M

Source: data provided by the MNP

Transit charges for vehicles not registered in Armenia are differentiated for passenger and freight transport and according to broad categories of the vehicles' cargo carrying capacity (see Table 3). As a reason for charging transit transport, MNP representatives quoted the fact that many transit vehicles take fuel in Iran where it is cheaper than in Armenia, while emitting pollution in Armenia (MNP, 2004).

**Table 3. Transit Vehicle Charges (for vehicles not registered in Armenia)**

<b>Vehicle categories</b>	<b>Charge rate in AMD</b>
<b>Passenger</b>	
Passenger cars	2500
Buses with less than 12 seats	5000
Buses with 12 seats and more	10000
<b>Cargo</b>	
Cargo capacity less than 8 tonnes	5000
Cargo capacity from 8 to 20 tonnes	10000
Cargo capacity 20 tonnes and more	15000

*Source: data provided by the MNP*

In 1993-1999, Armenia had motor fuel charges (only paid by companies), differentiated between leaded and unleaded petrol and diesel. These charges were replaced by the charge per type of motor vehicle and product charge on petrol and diesel (the latter was abolished in 2000 in favour of an increased excise tax on motor fuels). While there were plans to differentiate the excise tax on leaded and unleaded petrol in order to introduce an incentive for substitution, this idea was dropped when the import of leaded petrol was banned as of 1 January 2000.

### **3.3.2 Water Pollution Charges**

Currently, charges are imposed on 19 water pollutants (before 1999, 27 water pollutants were charged). The choice of these 19 parameters is explained by the available laboratory capacity: in Armenia, analysis and monitoring is currently possible only for these parameters. According to the interview with the Water Resource Management Agency, these parameters are typical for Armenia and are believed to cover 80% to 90% of all water pollutants in the country (MNP, 2004).

According to the interviews with various departments of the MNP, the revision of charge rates at the end of 1998 and the following years lacked a clear rationale (MNP, 2004). In 1999, for example, the BOD rate was increased 6-fold, and the rate for suspended solids increased from 680 to 5310 AMD. In 2000, the charge rates were significantly reduced for some substances (e.g., phosphorus) and considerably increased for others (e.g., heavy metals and cyanides). For the majority of pollutants, however, the rates have remained the same since 1999.

**Table 4 Pollution Charge Rates (per tonne)**

Substance	1999 AMD	in 04/2000 AMD	in 2000 USD	in 2000/1999 %
suspended solids	5 310	5 300	9.22	100
ammonium nitrate	5 120	5 100	8.87	100
acetone	301 000	301 000	523.45	100
biochemical oxygen demand	18 416	18 400	32.00	100
oil products	204 600	204 600	355.81	100
copper	1 023 900	1 023 900	1 780.60	100
sulphates	100	100	0.17	100
zinc	1 023 300	1 023 000	1 779.04	100
chlorides	30	30	0.05	100
chromium	20 460	153 400	266.77	750
total phosphorus	10 023 000	40 000	69.56	0.4
fluorine	13 640	511 500	889.52	3 750
pesticides, herbicides, insecticides	18 150	18 200	31.65	100
acetic acid	16 918	16 900	29.39	100
sulphuric acid	16 918	16 900	29.39	100
detergents	102 300	102 300	177.90	100
salts of heavy metals	174	511 500	889.52	293 966
cyanides	174	511 500	889.52	293 966
phenols	10 023 000	1 023 900	1 780.60	10

*Source: Harutyunyan, 1999; data provided by the MNP; 1 USD = 575.03 AMD*

Theoretically, all users have to pay the pollution charges levied on water effluents, including the water and wastewater utilities (Vodokanals). However, this would imply a double payment for the same discharges by industry into the sewerage system and by the Vodokanals into water bodies. This double payment has so far remained theoretical because the Vodokanals have been exempt from pollution charges (see Section 3.5.1).

### **3.3.3 Waste Charges**

Waste charges are imposed on juridical and physical persons for the 'placement' of industrial and municipal waste in the environment. The translation of the Russian term 'placement' covers both the storage of waste and its disposal in landfills. There actually does not exist any other form of waste management in Armenia, there is no recycling or waste separation. The 459 existing open landfills are not differentiated into landfill classes, nor do they conform to any environmental and hygiene standards (there is, for example, no protection against leaching). They are essentially waste dumps in which waste is frequently burned in open air, but at low temperatures, which results in significant air pollution (MNP, 2004).

Five classes of waste are distinguished, four of which refer to hazardous waste (class 1 being the most hazardous and class 4 the least hazardous waste) and one to non-hazardous waste<sup>8</sup>. Waste charges are differentiated by class of hazardousness. While industrial enterprises have to pay for the waste they generate, which they either store on-site or dispose of in landfills, households do not pay pollution charges for their municipal waste which goes to landfills (they pay user fees for waste collection). Mining/metallurgical companies are exempt from paying charges on non-hazardous industrial waste<sup>9</sup>. On the other hand, the government has imposed waste charges on landfills under the pretext that they dispose of waste (MNP, 2004).

The current charge rates were set in April 2000 (see Table 5). They were doubled compared to the 1999 levels to adjust for inflation.

**Table 5. Charge Rates for Disposal of Industrial and Municipal Waste**

Waste categories	1998 rates in AMD	04/2000 rates in AMD	2000 rates in USD
Class I: extremely hazardous	18 000	36 000	62.61
Class II: highly hazardous	9 000	18 000	31.30
Class III: moderately hazardous	1 800	3 600	6.26
Class IV: least hazardous	600	1 200	2.09
Non-hazardous (non-toxic industrial waste and municipal solid waste)	300	600	1.04

*Source: UNECE, 2000; data provided by the MNP; 1 USD = 575.03 AMD*

Normative documents related to waste policy have so far taken the form of government decisions. There are no waste-related permits and no limits for waste generation, so the charges are currently based exclusively on good-faith reporting by industry. A law on waste is expected to be adopted by the Parliament before the end of 2004. The introduction of waste permits for enterprises is planned for 2005 (MNP, 2004).

### 3.4 Environmentally Harmful Product Charges

The law of 1998 introduced, from 1 January 1999, charges on environmentally harmful domestic and imported products (transit goods are exempt from them). The product charges, designed as revenue raising and not as incentive instruments, currently cover 22 product categories (see Table 6), but the exact list of product categories subject to charges and their rates have varied since 1999.

<sup>8</sup> Note that in some statistics municipal solid waste is recorded under a sixth category, but in any case the charge rate is the same as for the 5<sup>th</sup> waste class.

<sup>9</sup> This exemption was first inscribed in the Government Resolution NOO-3 of 31 December 1998 (which had the status of a law), and then in the law "On Rates of Environmental Charges" of April 2000.

**Table 6. Environmental Product Charges (% of value)**

<b>Product</b>	<b>01.01.1999- 01.06.1999</b>	<b>From 15.06.1999</b>	<b>From 01.08.1999</b>	<b>As of 04/2000</b>
Asbestos-containing materials, vehicle breaks	1.0	3.0	3.0	3.0
Lead containing materials, paint	1.0	3.0	3.0	3.0
Luminescent bulbs, mercury amalgams	1.0	3.0	3.0	3.0
Typographic production substances; zinc bleaches	1.0	3.0	3.0	3.0
Gasoline	0.75	2.0	44.0	-
Diesel	0.75	2.0	25.0	-
Asphalt	0.75	2.0	2.0	2.0
Hydrocarbon lubricants	0.75	2.0	2.0	2.0
Mineral oils	0.75	2.0	2.0	2.0
Welding electrodes	0.5	1.5	1.5	1.5
Naphthalene (solid)	0.5	1.5	1.5	1.5
Lead and lithium car batteries	0.5	1.5	1.5	1.5
Transformer oil, electrolytic condensers	0.5	1.5	1.5	1.5
Tyres	0.25	0.8	0.8	0.8
Cine and photo films	0.25	0.8	0.8	0.8
Glass fibre	0.25	0.8	0.8	0.8
Unclean empty vessels (oil tank trucks, fuel cans)	0.25	0.8	0.8	0.8
Detergents	0.15	0.5	0.5	0.5
Freon-containing equipment and products	0.15	0.5	0.5	0.5
Plastic and polyethylene packaging and bags	0.15	0.5	0.5	0.5
Oil & oil products, except gasoline	-	-	-	2.0
Anti-freezers	-	-	-	2.0
Break fluids	-	-	-	2.0
Hydraulic fluids	-	-	-	2.0

*Source: Harutyunyan, 1999; data provided by the MNP*

As Table 6 shows, petrol and diesel, formerly subject to high product charge rates, were removed from the list in 2000. The excise taxes on motor fuels were simultaneously increased to provide the same revenue level. In fact, the MFE has always regarded the product charges on petrol and diesel as purely fiscal instruments.

### **3.5 Generation, Collection and Use of Pollution and Product Charge Revenues**

#### **3.5.1 Generation and Collection of Revenues**

Table 7 gives a comprehensive view on the actual revenue of all environment-related charges and their evolution between 1998 and 2003. Revenues from natural resource use charges, which are not further discussed in this report, are presented alongside pollution and product charges. While Table 7 focuses on actual revenues, Table 8, for charges on waste and water pollution and on air pollution from stationary sources, compares the actual with the due amounts, showing collection rates for 1999-2003.



Table 7 shows that before the reform of the environmental charge system in Armenia in the late 1998, the natural resource charges yielded higher revenues than the pollution charges. Now, the pollution and product charges are clearly the dominant source of environment-related budget revenue. Most important in terms of revenue generation are charges on mobile air emission sources and environmentally harmful products. Overall, revenues from environmental charges have grown over the recent years. The improving economic situation contributes to increasing revenues. The slump in revenues in 2001 compared to 2000 is possibly due to the suppression of the diesel and petrol charges, for which not only collection rates were high, but also the related revenues.

Table 8 draws the attention to significant differences between charge payments due and actually collected in each given year, as well as to substantial fluctuations of charges due, revenues actually collected, and collection rates over the period. While part of the fluctuations may be explained by a few cases of environmental (and natural resource) charges being written off where state companies were privatised and by further exemptions discussed below, others raise questions about the accuracy of the data. It is worth noting that even payments due may be incorrect, as most environmental charge payments are determined by enterprises' self-assessment and reporting. Overall, the collection rates of pollution charges remain low. This becomes obvious considering aggregated due and actual charge payments as reported in Table 8 over the period 1999-2003 (see Table 9). Collection rates are low for charges on air pollution from stationary sources, water pollution and waste 'placement'. They are, however, higher for product charges and, to some extent, also for pollution charges on mobile sources, as discussed later on in this report.

One reason for the fluctuations in the collection rates and, particularly, for the fact that these rates sometimes exceed 100% is that enterprises frequently have charge debts outstanding for a period of time. In the statistics, charge payments are accounted for when the payment occurs, and not in the year they were actually due (accounting of actual payments on a cash basis as opposed to an accrual basis). The due payment in the reference year then grows also because of penalties, while the revenue actually collected remains low. The writing off of charge liabilities can also affect the statistics. According to the State Tax Service, over the last four years penalties were written off in two or three cases (STS, 2004). The tax office can only do so in accordance with the law and does not have any discretion in that matter. Along with the inability to pay, there are also cases of deliberate delinquency (firms refusing to pay).

The quality of statistics is further affected by problems of incorrect reporting. To give one example, companies sometimes pay their air and water charges, or pollution and natural resource charges, not separately but together and also declare them only under one of the two categories concerned. While this does not pose a problem for the STS, which keeps a common account for all environmental charges, it implies that the totals are more reliable than the disaggregated data. Finally, data are sometimes distorted by the fact that regional SINP offices do not submit correct numbers for the estimated charges to the central inspectorate or submit them too late (STS, 2004; SINP, 2004).

Information on the breakdown between environmental charges paid at the base rates and those paid at 3-fold non-compliance rates is rather sporadic. As a rough estimate, SINP stated that about 5-7% of the total revenue consisted of exceedance payments. In individual cases, however, the share may be higher.

**Table 7. Actual Revenues from Environmental and Natural Resource Charges and Their Share in the Environment-Related Budget Revenue**

Type of Charge	1998		1999		2000		2001		2002		2003	
	Revenue (million AMD)	% in total budget revenue	Revenue (million AMD)	% in total budget revenue	Revenue (million AMD)	% in total budget revenue	Revenue (million AMD)	% in total budget revenue	Revenue (million AMD)	% in total budget revenue	Revenue (million AMD)	% in total budget revenue
<b>I. Natural resource charges, total</b>	<b>302.0</b>	<b>49.7</b>	<b>527.2</b>	<b>7.9</b>	<b>596.1</b>	<b>14.5</b>	<b>823.3</b>	36.1	1 046.0	26.8	1 177.9	21.0
1. Water use	5.2	0.9	129.4	1.9	93.6	2.3	413.2	18.1	50.2	1.3	60.3	1.1
2. Mining	296.8	48.8	355.8	5.3	389.9	9.5	322.2	14.1	907.9	23.2	1 005.8	17.9
3. Use of biological resources	0.0	0.0	42.0	0.6	112.6	2.7	<b>87.9</b>	<b>3.9</b>	<b>87.9</b>	<b>2.2</b>	<b>111.8</b>	<b>2.0</b>
<b>II. Environmental charges, total</b>	<b>275.2</b>	<b>45.3</b>	<b>6 147.4</b>	<b>92.1</b>	<b>3 520.1</b>	<b>85.5</b>	<b>1 458.3</b>	63.9	2 863.1	73.2	4 427.5	79.0
1. Air emission charges	273.5	45.0	734.2	11.0	817.6	19.9	853.9	37.4	2 257.7	57.8	2 614.8	46.6
1.1 Stationary sources	2.4	0.4	10.4	0.2	39.7	1.0	10.7	0.5	82.0	2.1	43.7	0.8
1.2 Mobile sources	271.1	44.6	723.8	10.8	777.9	18.9	843.2	37.0	2 175.7	55.7	2 571.1	45.9
2. Wastewater effluent charges	1.3	0.2	173.8	2.6	29.8	0.7	44.3	1.9	37.0	0.9	1 192.1	21.3
3. Waste "placement" charges	0.4	0.1	3.3	0.0	5.3	0.1	4.5	0.2	22.3	0.6	58.3	1.0
4. Environmentally harmful products	0.0	0.0	5 236.1	78.4	2 667.4	64.8	555.6	<b>24.4</b>	<b>546.1</b>	<b>14.0</b>	<b>562.3</b>	<b>10.0</b>
<b>III. Other charges</b>	<b>30.8</b>	<b>5.1</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>TOTAL</b>	<b>608.0</b>	<b>100.0</b>	<b>6 674.6</b>	<b>100.0</b>	<b>4 116.2</b>	<b>100.0</b>	<b>2 281.6</b>	<b>100.0</b>	<b>3 909.1</b>	<b>100.0</b>	<b>5 605.4</b>	<b>100.0</b>

Source: Data provided by the MNP

**Table 8. Revenues of Pollution Charges Due and Actually Collected in Million AMD and Collection Rates**

Charge	1999			2000			2001			2002			2003		
	Due	Actual	% actual in due	Due	Actual	% actual in due	Due	Actual	% actual in due	Due	Actual	% actual in due	Due	Actual	% actual in due
Air	72.6	10.4	14.3	157.6	39.7	25.2	74.7	10.7	14.3	43.4	82.0	189.1	49.7	43.7	87.9
Water	266.5	173.8	65.2	65.2	29.8	45.7	84.7	44.3	52.3	596.9	37.0	6.2	648.4	1 192.1	183.9
Waste	10.3	3.3	32.0	52.1	5.3	10.2	48.7	4.5	9.2	10.0	22.3	223.8	9.8	58.3	594.9
<b>Total</b>	<b>349.4</b>	<b>187.5</b>	<b>53.7</b>	<b>274.9</b>	<b>74.8</b>	<b>27.2</b>	<b>208.1</b>	<b>59.5</b>	<b>28.6</b>	<b>650.3</b>	<b>141.3</b>	<b>21.7</b>	<b>707.9</b>	<b>1 294.1</b>	<b>182.8</b>

Note: Revenues from air pollution charges refer to stationary sources only – Source: data provided by the MN

**Table 9. Revenues of Pollution Charges Due and Actually Collected in Million AMD and Collection Rates (cumulative over 1999-2003)**

	Charges due	Charges collected	% actual in due
Air	398	187	46.9
Water	1 662	1 477	88.9
Waste	131	94	71.6
<b>Total</b>	<b>2 191</b>	<b>1 757</b>	<b>80.2</b>

Source: data provided by the MNP; own calculations

### 3.5.2. Revenues from Air Pollution Charges

The high importance for air pollution charges in overall revenues from environmental charges (see Table 7) is mainly due to the charges on mobile sources, and, more specifically, to transit charges. While no time series data are available on the collection rates of air charges on mobile sources, these can be considered as comparatively high. Charges on transit transport are collected by the customs and, according to the interviews with the MNP, collection rates are almost 100%. The vehicle charges collected by the road police from Armenian vehicle owners are also high. The road police is said to collect a bit less than 100% of charges theoretically due because some vehicle owners simply do not have their inspections done, by this also avoiding the environmental charge payment. All in all, transport charge revenues collected by the customs are approximately four times higher than those collected by the road police, because the transit charge rates are higher. However, the fact that air pollution charge revenues from mobile sources are much higher than from stationary sources is not only due to differences in collection rates: traffic-related emissions are much higher than those from stationary sources. In 2002, for example, traffic-related air emissions made up 87% of all air emissions (MNP, 2004).

For stationary sources, the decrease in revenues in 2001 as compared to 2000 may be explained by the suppression of air pollution charges for 39 substances in 2000 (although those substances did not provide much revenue, and the revenue fell further in 2002). There are no significant exemptions to charges on air pollution from stationary or mobile sources.

Two factors may impinge upon the correctness of the reported data. Firstly, it is the charge object itself which determines its charge payment due, so there is scope for underreporting. Secondly, payments due are frequently determined based on estimated emissions and the estimation methods are likely to be flawed (e.g., many obsolete technology-based emission factors are used).

Data on emission volumes and *calculated* revenues per pollutant for stationary air emission sources in 2002 are presented in Table 10. The revenues were calculated by multiplying the emission volumes per pollutant by the respective charge rate. The fact that the overall revenue is lower than the due charge payments reported in Table 8 might be because of penalties and non-compliance payments not being included in the calculation. When interpreting Table 10, not too much importance should be given to the overall amount of revenues. These data, rather, give valuable information on the importance of specific pollutants in Armenia and on the relative usefulness of the respective pollution charges to generate revenue.

According to Table 10, three pollutants accounted for 93% of the 2002 revenue from charges on air pollution from stationary sources: particulate matter, nitrogen oxides and sulphur dioxide. The only other pollutant that is also emitted in large amounts is carbon monoxide (the significance of emissions should, of course, be determined based on the pollutant's toxicity and health impact). However, due to the lower charge rate, it contributes only to about 3% to the revenue.

**Table 10. Revenues from Charges on Air Pollution from Stationary Sources, 2002**

Substance	Rate, thousand AMD	Volume of emissions, tonnes	Calculated revenue due, thousand AMD	Share in the total revenue, %
Total revenue due for air emissions from stationary sources			34 854.8	100.000
Particulate matter	0.6	13 499.95	8 100.0	23.239
Carbon monoxide (CO)	0.1	12 283.80	982.7	2.819
Nitrogen oxides (NOx)	7.4	2 703.78	20 008.0	57.404
Sulphur dioxide (SO <sub>2</sub> )	0.6	7 243.00	4 345.8	12.468
Chlorine (Cl <sub>2</sub> )	6.0	0.83	5.0	0.014
Chloroprene (C <sub>4</sub> H <sub>5</sub> Cl)	45.0	28.70	1 291.5	3.705
Chromium oxides	18 957.0	0.01	103.4	0.297
Formaldehyde (HCNO)	23.4	0.05	1.1	0.003
Toluene (C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> )	0.5	13.80	6.9	0.020
Xylol (C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub> )	1.5	7.00	10.5	0.030

*Source: Data provided by the MNP*

### **3.5.3. Revenues from Water Pollution Charges**

Cumulated over the period from 1999 to 2003, collection rates for charges on water pollution have been higher than for air pollution and waste charges (see Table 9). Nevertheless, they were subject to large fluctuations as well, with a slump in 2002 and a disproportional collection rate in 2003. Overall, the evolution of revenues over the period is difficult to explain. In particular, it is impossible to analyse the impact of adjustments in charge rates over time.

Exemptions from payment obligations apply primarily to the Vodokanals. There are three water and wastewater utilities in Armenia: Yerevan Vodokanal responsible for the Yerevan municipality, ArmVodokanal responsible for areas outside Yerevan, and a small Vodokanal of the City of Armavir. While the former two are 100% state-owned, the latter is 51% owned by the state and 49% by the municipality. All three companies were exempt from pollution charges between 1999 and 2001 because they were supposedly improving their wastewater management. They were forgiven a pollution charge amount of approximately 1.1 billion AMD (corresponding to approximately 2.5 years worth of water pollution charges) in December 2003 as part of a swap with subsidies they receive from the state to keep the water fees for households low.<sup>10</sup> Furthermore, the Vodokanals have their debt for the payments of water pollution charges due between 1 January 2003 and 31 December 2005 suspended until 1 January 2006. The suspended amount of charges should normally be paid in the period of 2006 to 2009. But the Vodokanals are hoping to be granted an extension of the exemption in 2006 (State Committee for Water Management, 2004). Provided the exemption is not extended, annual charge payments over these four years will amount to approximately 600 million AMD (1/4 of the charge debt of previous years and the current pollution charges of approximately 300 million AMD)<sup>11</sup> for the Yerevan Vodokanal. For the ArmVodokanal, water pollution charges are approximately 50% lower.

<sup>10</sup> This was made possible by a specific law on Vodokanals setting the conditions of their financial rehabilitation programmes. This law also establishes the low rates Vodokanals are paying for water use.

<sup>11</sup> There are no penalties as the payment was officially suspended.

Industry had to pay pollution charges for wastewater discharges into the sewer for the first time in 2003. Before that, industry only paid user fees to the Vodokanals for discharges to the sewer and pollution charges for discharges to open waters. Potential underreporting is also a problem with respect to water pollution charges.

Table 11 presents the 2002 data on effluent volumes and *calculated* revenues per pollutant. As in Table 10 above, revenues were calculated by multiplying the discharged volumes per pollutant by the respective charge rate. The fact that the overall revenue is higher than the due charge payments reported in Table 8 might be explained by the exemptions granted to the Vodokanals until the end of 2005. (Penalties and non-compliance payments, again, are not included in the calculation.) The same limits of interpretability of the data that were pointed out for Table 10 also apply here. Table 11 highlights that in the case of water pollution charges, 93% of the revenues in 2002 came from two parameters, biochemical oxygen demand (BOD) and suspended solids. BOD on its own accounted for 84% of the calculated revenues. Sulphates and chlorides had large discharge volumes, while highly toxic discharges of heavy metals (including copper) contributed a significant percentage of the revenues.

**Table 11. Revenues from Charges on Wastewater Effluents, 2002**

<b>Substance</b>	<b>Rates, thousand AMD</b>	<b>Volume of effluents, tonnes</b>	<b>Calculated revenue due, thousand AMD</b>	<b>Share in the total revenue, %</b>
Total revenue due for wastewater discharges			891 913.20	100.00
Suspended solids	5.30	14 587.00	77 313.20	8.70
Ammonium nitrate	5.10	645.70	3 293.10	0.40
Acetone	301.00	0.00	0.00	0.00
BOD	18.40	40 788.00	750 493.70	84.10
Oil products	204.60	34.87	7 133.60	0.80
Copper	1 023.90	27.47	28 126.50	3.20
Sulphates	0.10	25 168.00	2 516.80	0.30
Zinc	1 023.90	0.87	890.80	0.10
Chlorides	0.03	23 392.00	701.80	0.10
Chromium	153.40	0.04	6.30	0.00
Total phosphorus	40.00	38.71	1 548.40	0.20
Fluorine	511.50	0.09	43.70	0.01
Pesticides	18.20	0.00	0.00	0.00
Acetic acid	16.90	0.03	0.50	0.00
Sulphuric acid	16.90	0.04	0.60	0.00
Detergents	102.30	20.43	2 090.00	0.20
Salts of heavy metals	511.50	34.71	17 754.20	2.00
Cyanides	511.50	0.00	0.00	0.00
Phenols	1 023.90	0.00	0.00	0.00

*Source: Data provided by the MNP*

### 3.5.4. Revenues from Waste Charges

Revenues due from waste charges as well as their collection rates fluctuate significantly (see Table 8 above). The fluctuations may be due to the self-assessment of waste charge payments by industry. Companies report both the waste amounts they produce and the classes their waste belongs to. Simple multiplication of the waste amounts reported per waste class by the respective charge rates yields the amount of waste charges due. Possibilities for false reporting here are double: companies may understate the amount of waste generated and also report falsely on the hazardousness class their waste belongs to.

The revenue data in Table 12 were calculated in the same way as in Tables 10 and 11 and the same remarks apply here. Apparently, the 2002 revenues were almost entirely based on non-hazardous industrial and municipal solid waste. On the one hand, this can be explained by Armenia currently producing hardly any waste falling under the two most hazardous categories.<sup>12</sup> On the other hand, it may be due to underreporting of waste amounts and false waste class reporting.

**Table 12. Revenues from Charges on Waste, 2002**

Waste category	Rate, thousand AMD	Volume of waste generation, tonnes	Calculated revenue due, thousand AMD	Share in the total revenue, %
Total revenue due for waste 'placement'			22 212.6	100.00
Class I: extremely hazardous	36.0	5.5	197.7	0.89
Class II: highly hazardous	18.0	0.0	0.0	0.00
Class III: moderately hazardous	3.6	108.1	389.3	1.75
Class IV: least hazardous	1.2	3.6	4.3	0.02
Non-hazardous (non-toxic industrial waste and municipal solid waste)	0.6	36 035.4	21 621.2	97.34

*Source: Data provided by the MNP*

### 3.5.5. Revenues from Product Charges

Revenues from the product charges are recorded in Table 7. They accounted for the major part of environmental charge revenues between 1999 and 2000. After the repeal of the petrol and diesel charges in 2000, the product charge revenues dropped to 11% of their 1999 level, and to about 21% of their 2000 level. The stability of the actual revenues from these charges over the last three reported years suggests that charge collection poses only minor problems for the product charges. This is easily explained by the fact that the majority of products subject to environmental charges are imported and payments are collected at the border by the Customs Service. Indeed, MNP representatives claim that the share of domestic products in the overall product charge revenues for 2003 was only about 1% (MNP, 2004).<sup>13</sup> For imported products subject to environmental charges, underreporting is not an issue. For locally produced products, it is the

<sup>12</sup> The waste from Armenia's one nuclear power plant does not count under the listed waste classes, as these only refer to waste being landfilled and because waste from nuclear power generation is not under the jurisdiction of the MNP but under that of the Ministry for Energy.

<sup>13</sup> No time series are available on the development of both production and consumption of environmentally harmful products subject to environmental charges.

State Tax Service that collects the charge payments based on production statements by companies. There is no information about possible underreporting.

### 3.5.6. State Environmental Expenditure

Table 13 presents the state environmental expenditure for the years 1998 to 2003, disaggregated into investment and current expenditure and into different environmental domains. State expenditure for natural resource management is also included. As can be seen, the share of current environmental expenditure in the GDP has constantly increased from 0.05% in 1998 to 0.09% in 2003. In an international comparison, the share of the overall state environmental expenditure in the GDP in Armenia remains low: 0.25% in 2003 compared to 0.8% in Poland and 0.5% in Hungary and the Czech Republic in 2000 (Eurostat, 2002).

**Table 13. State Environmental Expenditure in Armenia (million AMD)**

	1998	1999	2000	2001	2002	2003
GDP	955400	987100	1031300	1175500	1321900	1434900
State environmental expenditure	1505.2	2783.6	3387.6	2176.9	2301.5	3627.6
in percentage of the GDP (%)	0.16	0.28	0.33	0.19	0.17	0.25
Current state environmental expenditure	510.8	498.8	570.8	564.4	930.6	1233.5
in percentage of the GDP (%)	0.05	0.05	0.06	0.05	0.07	0.09
<b>National and regional environmental investments</b>						
<b>Total</b>	<b>994.4</b>	<b>2284.8</b>	<b>2816.8</b>	<b>1612.5</b>	<b>1370.9</b>	<b>2394.1</b>
Air (total)	0	0	0	0	0.0	0
Water resource protection	690.3	1544.2	2354.6	1337.9	1295.4	2379.3
Waste management	304.1	740.6	462.2	274.6	75.5	7.6
Nature protection	0	0	0	0	0	7.2
<b>National-level (state) current environmental expenditure</b>						
<b>Total</b>	<b>293.8</b>	<b>428.7</b>	<b>462.1</b>	<b>440.2</b>	<b>809.6</b>	<b>1109.5</b>
Air (total)	0.0	0.0	0.0	0.0	0.0	0
Water resource protection	n.a.	185.0	229.0	150.7	324.3	599.4
Waste management	120.0	12.0	48.1	13.1	15.7	15.7
Nature protection	62.8	118.0	68.1	144.4	189.4	182.7
Environmental education and information	4.5	5.1	6.8	6.5	7.3	8.8
Monitoring and information systems	11.6	12.3	14.6	16.1	18.7	11.8
Administrative expenditure	94.9	96.3	95.5	109.4	254.2	291.1
<b>National-level (state) current expenditure for natural resource management</b>						
<b>Total</b>	<b>217.0</b>	<b>70.1</b>	<b>108.7</b>	<b>124.2</b>	<b>121.0</b>	<b>124.0</b>
Forest protection and rational use	200.0	64.5	108.7	115.0	114.0	114.0
Fishery resource protection	17.0	5.6	0.0	9.2	7.0	10.0

*Note: 2003 data are preliminary estimates. - Data do not include loans. Source: Data provided by the MNP.*

As can also be seen from Table 13, in Armenia, the highest part of the state environmental expenditure goes to the water domain and administrative expenditure. Expenditure for the waste domain has significantly declined over the years. The MNP-provided data show that subsidies to the Vodokanals for investments in wastewater collection and treatment and to cover these companies' operational losses constitute a major share of the state environmental expenditure (MNP, 2004).

Comparing the actually collected revenues from environmental and natural resource use charges with the total state environmental and natural resource management expenditure in Table 14 shows that the share of the revenues allocated back to the environment varies significantly over the years. On average over 1998-2003, 68% of the environment-related revenues have been allocated back to this sector.

**Table 14. Total Environmental and Natural Resource Use-Related Revenues and Expenditure**

<b>Year</b>	<b>Environmental and natural resource charge revenues, million AMD</b>	<b>Total state environmental and natural resource management expenditure, million AMD</b>	<b>Share of state environmental and natural resource management expenditure in revenues, %</b>
1998	608	1 505	248
1999	6 675	2 784	42
2000	4 116	3 388	82
2001	2 282	2 177	95
2002	3 909	2 302	59
2003	5 605	3 628	65

*Source: Data provided by the MNP; own calculations.*

When only considering environmental charge revenues and the state environmental expenditure (Table 15), the share of revenues that were allocated back to the environment is higher. It amounts to 80% on average over the same 6 years.

**Table 15. Total Environmental Revenues and State Environmental Expenditure**

<b>Year</b>	<b>Total environmental revenues, million AMD</b>	<b>Total state environmental expenditure, million AMD</b>	<b>Share of state environmental expenditure in revenues, %</b>
1998	275	1 288	468.10
1999	6 147	2 714	44.14
2000	3 520	3 279	93.15
2001	1 458	2 053	140.76
2002	2 863	2 181	76.16
2003	4 428	3 504	79.13

*Source: Data provided by the MNP; own calculations.*

The fact that state environmental expenditure, on average, remains below the revenues collected points to the advantage an environmental fund could provide: the use of all environmental revenues for environmental expenditure could, in theory, be assured. Nevertheless, the MFE, during an interview, expressed its conviction that there was no need for a specific environmental budget line, as environmental funding would not necessarily be at the amount of the environmental revenues (MFE, 2004). Indeed, facing a permanent national budget deficit, the government considers financing of environmental programmes as one of its last priorities.<sup>14</sup>

<sup>14</sup> With respect to funding, the MFE acknowledges that it currently gives priority to social issues, such as education or pensions (MFE, 2004).



Finally, it should be mentioned that there are attempts to directly recycle environmental revenues for local environmental projects. This only direct revenue recycling scheme is set out in the Law “On targeted use of environmental payments by companies” of 15 May 2001. This law requires that the revenues from pollution charges from 8 companies (6 mining/metallurgical companies and 2 cement companies) be redirected to the local communities (i.e., the lowest administrative level) in which these companies are located. Under this law, the local communities become eligible for funds when they submit project proposals to the Ministries of Nature Protection and Health, by which the proposals have to be approved. After that, the regional (marz) governor has to send the proposal to the MFE which would then allocate a certain amount of the environmental revenues from the budget back to the project. Almost all local communities concerned have recently submitted project proposals for the first time for funding in 2005, ranging from rehabilitation of a wastewater treatment plant to improvement of municipal solid waste collection to upgrading public healthcare services (MNP, 2004).

### **3.5.7. Data on Selected Industrial Enterprises**

Environment-related data by industrial sector is currently not available from Armenia’s general statistics because the State Council for Statistics is about to transpose its previous industry classification to the NACE classification (*Nomenclature statistique des activités économiques dans la Communauté européenne* – Statistical Classification of Economic Activities in the European Community). In Armenia, 2004 will be the first year of reporting under NACE. When it became clear in 1996 that the industry classification would be adjusted to the NACE classification, Armenia ceased publishing data disaggregated to the level of individual sectors altogether and has since only published cumulative data on the environment, i.e., aggregated at the national level (State Council for Statistics, 2004). This is also explained by a lack in demand for more detailed data, at least from the MFE, which is only interested in overall revenue data.

The following analysis, therefore, relies on data for a set of large enterprises which was provided by the State Inspectorate. It appears that a small number of enterprises is responsible for a major part of pollution from stationary sources. As far as air pollution is concerned, 930 enterprises are covered by air emission permits.<sup>15</sup> These enterprises are believed to cover about 98% of all air emissions (MNP, 2004). But the 9 biggest stationary industrial sources (2 cement plants, 5 mining/metallurgy plants, and 2 thermal power plants) on their own presumably account for 70% of the air emissions from all stationary sources (SNIP, 2004).

The inspectorate provided emission data on 9 individual enterprises:

- Five non-ferrous metallurgical enterprises:
  - Kapani metallurgical processing enterprise,
  - Agarak copper/molybdenum metallurgical processing enterprise,
  - Armenia Copper Ltd. copper mining/processing enterprise,
  - Zangezur copper/molybdenum factory,
  - Ararat Gold Ltd. gold processing enterprise,
- Makur Erkat (Yerevan) iron processing company,

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<sup>15</sup> All enterprises that have a permit have to pay charges.

- Hrazdan (Yerevan) thermal power plant,
- Ararat Cement Ltd. cement company, and
- Nairit Gortsaran Ltd. chemical company.

The contributions of individual enterprises to the overall emissions and waste amounts in 2002 (see Tables 10 to 12) are presented in Annex 1. Among others, these data show that in 2002:

- The five non-ferrous metallurgy plants together accounted for almost 95% of all SO<sub>2</sub> emissions from stationary sources and for 12% of suspended solids in wastewater discharges. Their contribution to the overall amounts of other substances that yielded significant amounts of revenues (e.g., NO<sub>x</sub>, particulates, BOD, copper, salts of heavy metals) are low.
- The one thermal power plant accounts for 60% of NO<sub>x</sub> emissions from stationary sources, while its emissions of all other regulated and reported substances remain below 1% of the overall emissions in 2002. Note that no emission data were reported on particulates in 2002, but data reported for 2003 show that this plant's particulate emissions amount to roughly 20% of the country's overall particulate emissions in 2002.
- The cement plant contributes primarily to carbon monoxide emissions (63% of CO emissions from stationary sources overall), however, CO does not contribute much to the overall revenue from environmental charges.
- The chemical plant accounts for all chloroprene emissions from stationary sources, 43% of the chlorine and 33% of the toluene emissions. It also accounts for 9% of the copper emissions, 8% of the chloride emissions and 5% of the sulphate emissions in wastewater discharges. However, only the charges on chloroprene, BOD, suspended solids and copper yield significant revenues. Finally, the chemical plant is important in terms of hazardous waste generation: it produced 99% of all reported waste class III amounts.
- The iron processing plant does not contribute much to the charged substances. The only emissions of this plant accounting for more than 1% in overall country emissions are SO<sub>2</sub>.

The findings that (a) these largest enterprises currently are subject to a number of environmental charges for substances they emit in low quantities, and (b) a few plants account for a large part of emissions of substances that yield significant revenues point to possibilities for streamlining the system of environmental charges in Armenia. This is further discussed in Section 4.3.2.

## 4. EVALUATION OF THE POST-1998 SYSTEM OF ECONOMIC INSTRUMENTS

Compared to the environmental charge system in place before 1999, Armenia has made important improvements. Besides introducing charges for environmentally harmful products, the number of pollutants charged was reduced and the rates of several charges were significantly increased. Also, with respect to charges for air pollutants from stationary sources, a more transparent rate calculation method was introduced. Furthermore, the system of economic instruments was stipulated in a law, providing a stronger legal basis for its implementation. Finally, a first, although limited, mechanism for direct earmarking of environmental charge revenues for environmental projects was introduced. However, when considering Armenia's system of environmental charges in detail, a number of important shortcomings remain. They are discussed throughout this and the following section.

### 4.1. Environmental Effectiveness

Generally, the effectiveness of pollution charges is evaluated with respect to their ability to act as incentives to promote changes in environmental behaviour. However, the specific objective of the system of environmental pollution and product charges in Armenia, as formulated by the law "On Environmental and Natural Resource Payments" of 1998, is to receive revenues in order to carry out environmental measures. This suggests only an indirect link between the environmental charges and environmental effects. At the same time, the incentive impact of the charges is frequently mentioned by Armenian stakeholders as a desired feature of the system (see, for example, Harutyunyan, 1999).

The representatives of various departments of the MNP and the MFE agreed that there is no evidence of the current system of pollution and product charges providing any incentive effect with respect to pollution reduction (e.g., MNP, 2004; MFE, 2004). This is explained by shortcomings in the environmental charge system itself and the lax enforcement, as described in Sections 4.1.1-4.1.3.

#### 4.1.1. *Insufficiently High Charge Rates and Counterproductive Charge Base*

The fluctuations in the available data on air emissions of the most widespread pollutants from stationary sources (Table 16) make it difficult to draw strong conclusions. While the overall increase in total pollutants are probably explained by a growth in industrial activity<sup>16</sup>, it is not obvious what explains the slump in 1999.<sup>17</sup> Interestingly enough, the same trend is visible in the share of pollutants treated. Overall, the data suggest that *air pollution charges* have not been effective in reducing untreated emissions (see the years 1999 and 2002) or in increasing the share of pollutants treated (see the years 1998 and 2002).

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<sup>16</sup> The total industrial production grew (over previous year) by 5.3% in 1999, 6.4% in 2000, 5.3% in 2001 and 14.6% in 2002 (Statistical Yearbook of Armenia, 2003, Table 187).

<sup>17</sup> Note also that the data are in contradiction to those presented in Table 10.

**Table 16. Emissions of Air Pollutants from Stationary Sources, 1998-2002 (thousand tonnes)**

	1998	1999	2000	2001	2002
<b>Total volume of air pollutants generated</b>	<b>58.8</b>	<b>30.6</b>	<b>53.6</b>	<b>72.2</b>	<b>77.5</b>
<b>Volume of pollutants treated</b>	<b>42.4</b>	<b>8.9</b>	<b>23.3</b>	<b>55.2</b>	<b>56.1</b>
Share of pollutants treated in total volume, %	72.1	29.1	43.5	76.5	72.4
<b>Total emissions of pollutants</b>	<b>16.4</b>	<b>21.7</b>	<b>30.3</b>	<b>17</b>	<b>21.4</b>
Particulate matter	1.5	1	1.2	1.8	2.4
SO <sub>2</sub>	3.2	0.8	8.4	4.4	7.2
NO <sub>x</sub>	4.1	3.8	3.9	4.2	2.4
CO	7.3	9.2	5.9	6.2	9.1
Volatile organic compounds	0.1	0.7	0.5	0.1	0.1

*Source: Statistical yearbook of Armenia 2003, Table 157*

One reason for this finding is that the current air pollution charge rates are too low to have an incentive effect. As a rough estimation, it was suggested that charge rates for stationary sources would have to be increased at least 10-fold if they were to provide incentives for pollution reduction. Specifically for the air domain, MNP officials pointed out that there actually were low-cost technologies that could be introduced to reduce air pollution. One of the main reasons that these technologies are not applied is a lack of knowledge by the enterprises about possible improvements (MNP, 2004). While the data in Table 17 indicate that a major part of pollutants is actually treated, at least to some extent, the actual treatment efficiency cannot be assessed without any information what treatment the data refer to.

The analysis of air pollution charges also shows that a lack of an incentive impact may not only be due to the level of charge rates, but may also result from the choice of the charge base itself. For example, the charge rates for domestic transport are based on the engine capacity, following a suggestion by the MFE. Given that emissions from different vehicle types of the same engine power are not necessarily similar (not to mention the age of vehicles), these charges constitute rather a property tax than an emission charge. With vehicle holders paying independently of their actual use of the vehicle, the instrument actually sets the wrong incentive: to use the vehicle as much as possible. A more appropriate basis for charge differentiation would be the mileage multiplied by fuel use per kilometre, or simply fuel use. But exactly the differentiated fuel use charge was abolished in April 2000. Suggestions (during the interviews with Armenian government officials) to increase the fuel excise tax instead of charging vehicle ownership met with concerns of the MFE about possible increases in fuel prices (MFE, 2004). The MNP is more supportive of replacing the vehicle ownership charge by higher fuel excises (MNP, 2004).

The fact that the current pollution charges fail to provide environmental incentives was also confirmed by a representative of the public authority in charge of the Vodokanals, in this case with respect to *water pollution charges* (State Committee for Water Management, 2004). The two large water supply and wastewater treatment plants, Yerevan Vodokanal and ArmVodokanal, have 21 wastewater treatment plants but only a few of them are operational. Only 4 of these treatment plants, including one in Yerevan, operate using mechanical treatment (chemical treatment is no longer used because the equipment is old and in disrepair). While Vodokanals in Armenia account for approximately 90% of all wastewater discharges and are theoretically subject to large pollution charge payments, this does not hold in practice where the charges are routinely forgiven. (The double payment by industry and Vodokanals for the same pollution is also questionable.) Pollution charges for Yerevan Vodokanal and ArmVodokanal amount to approximately 4% of their total current expenditure<sup>18</sup>. Given that this percentage is quite high, the lack of incentives is

<sup>18</sup> Pollution charges per year are approximately 300 million AMD for Yerevan Vodokanal and 150 million AMD for ArmVodokanal. The total current expenditure is almost 7 billion AMD for Yerevan Vodokanal and approximately 4 billion AMD for ArmVodokanal.

probably due to this sector's exemption from charge payments rather than to insufficient charge rates<sup>19</sup>. The current exemption from water pollution charges does not help to channel resources into environmental investment, either: there are currently no plans for any such investment, unless there is external financing<sup>20</sup>.

It should also be mentioned that the charge base for water pollution is rather poorly defined. Firstly, separate charges are levied on similar substances: total phosphorus is charged separately from detergents, and copper, zinc and chromium separately from "salts of heavy metals". Secondly, there is no differentiation in charge rates between different heavy metals. Thirdly, the list of substances charged is even longer than it appears at first sight as the list of chargeable water pollutants refers not only to individual substances but also to categories of substances covering multiple pollutants (e.g., "salts of heavy metals"). And finally, as confirmed by the MNP, the designation of substances should equal the way substances are measured, as otherwise arguments are always possible. This has indeed entailed some incoherence in the list of water pollution charges where sulphates, chlorides and heavy metals are listed as salts while copper and zincs are listed as metals. As a result, permitting agencies have to make necessary adjustments when setting ELVs and calculating charges for enterprises.

The *waste charges* have very low rates, especially for non-toxic waste (600 AMD, approximately 1.04 USD, per tonne). This is particularly important as waste class misreporting by enterprises is considered a widespread phenomenon. Despite the assumed false reporting, the amounts of reported hazardous waste have increased over the recent years (Table 17). This table also gives support to what was stated earlier: that treatment of such waste is practically inexistent. The MNP officials confirmed that the waste charge rates were not set with a view to incentive effects but only to raise budget revenue (MNP, 2004).

**Table 17. Generation, Reuse and Treatment of Industrial Toxic Waste (thousand tonnes)**

	1998	1999	2000	2001	2002
Generation	33.0	170.5	147.3	324.9	327.9
Reuse	0.2	1.0	2.1	3.3	1.1
Treatment	0.4	0.02	0.05	1.4	0.9

*Source: Statistical Yearbook of Armenia 2003, Table 158*

Finally, the *product charges* are not believed to have any incentive impact, either. On the one hand, because the charge rates are too low; on the other hand, because products were charged without any regard for the market availability of alternative, less environmentally harmful products and these products' prices. According to the MNP representatives, charges were imposed on selected products considered harmful to the environment, without an incentive objective (MNP, 2004). Most likely, the environmental reasons were a welcome argument for raising additional revenues. It should be further noted that the list of products charged reveals several inconsistencies and a lack of clear definitions: for example, three separate categories refer to oil products and two to hydraulic fluids. It remains unclear why these were not combined into respective broader categories. It is similarly unclear why asbestos products are assembled under one product group together with vehicle breaks. Furthermore, detergents are charged both as products and as water pollutants, while insecticides, herbicides and pesticides are on the water pollution charge list but are not charged as products.

<sup>19</sup> The interview suggested that if the Vodokanals are no longer exempted from pollution charges after 2005, they are going to increase their user fees from currently 10 AMD to approximately 30 or 40 AMD in 2006 in order to compensate for their charge payments (State Committee for Water Management, 2004).

<sup>20</sup> The upcoming World Bank loans for the two large Vodokanals, as well as a loan to the small Vodokanal by the German government include a component for treatment. Being bound by a loan to invest in treatment actually appears to be the only stimulus for such environmental investment on the part of the Vodokanals. Costs for the rehabilitation of the wastewater collection and treatment system are estimated at 300 million USD.

In summary, not only are pollution and product charge rates too low to induce behavioural changes, they also seem to not always have been set with a view to damage caused by specific pollutants. Representatives of the MFE admitted that adjustments of the charge rates are guided by the possibility to increase revenues rather than by any environment-related considerations (MFE, 2004).

#### **4.1.2. *Ineffective Assessment of Charge Payments***

Apart from the fact that the calculation of charge payments is predominantly based on self-assessment by polluters and hence depends on the accuracy of their statements, a serious flaw in the current system of environmental charges is that charges due are always calculated from production volumes. As long as production volumes and not the actual level of emissions determine charge liabilities, there is no direct link between actual reductions in discharges and a reduction in due charge payments, and, therefore, no incentive to reduce pollution. This problem clearly calls for monitoring *actual* emissions, at least for major polluters and for a limited number of pollutants that can be measured at a reasonable cost. This would create a sound basis for pollution charge assessment and an incentive for pollution reduction.

#### **4.1.3. *Limited Enforcement of Charge Payments***

Up to this day, the incentive function of the pollution and product charge system has not only been undermined by insufficient charge rates or inadequate charge bases, but clearly also by a lack of enforcement of charge payments. The low environmental charge collection rates (see Tables 8 and 9) are explained by a lax approach of the courts toward environmental requirements, limited resources of the environmental inspectorate, as well as the difficult economic situation of most industrial facilities and social constraints (for more discussion on the latter, see Section 4.2).

The limited resources of the environmental authorities have a major impact on the enforcement of charge payments. The environmental inspectorate simply does not have enough people to check the accuracy of all pollution charge declarations submitted by industry. In court cases, large industrial firms are able to hire expensive consultants and lawyers, while the MNP often loses because of the lack of legal expertise. On the other hand, the State Tax Service lacks substantive environmental knowledge to argue such cases (STS, 2004).

In addition, the exemption of the Vodokanals from paying wastewater charges without any requirement to channel the related resources into environmental investment can be assumed to have undermined the environmental effectiveness of the charges. Similarly, offsets of charge payments by the Vodokanals in exchange for subsidies these enterprises receive (in order to keep user fees low) do not induce any environmental improvements. Finally, the poor enforcement of charge payments adds to the insufficient charge rates in undercutting the application of the polluter pays principle.

### **4.2. Capacity to Raise Revenue for Environmental Measures**

#### **4.2.1. *Poor Revenue Raising Capacity of the Environmental Charges***

Where environmental charges serve primarily to raise revenue, charge rates could, in principle, be chosen independently of environmental considerations related to the charge base. But the capacity of a charge to raise revenue will depend on its environmental effectiveness: the more environmentally effective the charge, the more rapidly the charge base will erode, and the faster the revenues will decrease (OECD, 2001). So far, Armenia's environmental charges have not provided an incentive impact and not led to behavioural changes which would have eroded the charge base.

**Table 18. Share of Different Types of Charges in the Total Environmental Charge Revenue**

Type of charge	1998		1999		2000		2001		2002		2003	
	Revenue (million AMD)	% of total	Revenue (million AMD)	% of total	Revenue (million AMD)	% of total	Revenue (million AMD)	% of total	Revenue (million AMD)	% of total	Revenue (million AMD)	% of total
<b>Environmental charges, total</b>	<b>275.2</b>	<b>100.0</b>	<b>6147.4</b>	<b>100.0</b>	<b>3520.1</b>	<b>100.0</b>	<b>1458.3</b>	<b>100.0</b>	<b>2 863.1</b>	<b>100.0</b>	<b>4427.5</b>	<b>100.0</b>
Air emission charges	273.5	99.4	734.2	11.9	817.6	23.2	853.9	58.6	2257.7	78.9	2614.8	59.1
Stationary sources	2.4	0.9	10.4	0.2	39.7	1.1	10.7	0.7	82.0	2.9	43.7	1.0
Mobile sources	271.1	98.5	723.8	11.8	777.9	22.1	843.2	57.8	2175.7	76.0	2571.1	58.1
Wastewater charges	1.3	0.5	173.8	2.8	29.8	0.8	44.3	3.0	37.0	1.3	1192.1	26.9
Waste charges	0.4	0.1	3.3	0.1	5.3	0.2	4.5	0.3	22.3	0.8	58.3	1.3
Product charges	0.0	0.0	5236.1	85.2	2667.4	75.8	555.6	38.1	546.1	19.1	562.3	12.7

Source: Data provided by the MNP; own calculations

Table 18 shows that air emission charges for stationary sources, and, most of the time, wastewater charges, only contribute to a minor degree to the overall revenue from environmental charges. A closer look at the individual substances and activities subject to environmental charges in Armenia with respect to their contribution to the overall environmental revenue (without penalties) in 2002 (see Section 3.5) revealed that 93% of the revenues from charges on air emissions from stationary sources came from three parameters: nitrogen oxides, particulate matter and sulphur dioxide (see Table 10). In the case of wastewater charges, two substances – suspended solids and BOD – likewise accounted for 93% of the revenues from this charge category (see Table 11). In the case of product charges, the evolution portrayed in Table 7 suggests that petrol and diesel charges, abolished in April 2000, accounted for 80% to 90% of the overall product charge revenues in 1999 and 2000, respectively.

All this suggests that if environmental revenue raising is the primary aim of the reform of the Armenian system of environmental charges, most parameters charged do not contribute in any significant way to that objective. Furthermore, the most effective part of the charge base in terms of environmental revenue generation, petrol and diesel, was suppressed.<sup>21</sup> Charging a high number of pollutants and products without any evidence of effectiveness raises unnecessarily the administrative costs of the system (see Section 4.3.2).

The currently low level of revenues from the environmental charges is also confirmed by their share in the overall state tax revenues. Despite strong increases over the recent years, in 2002, environmental charges amounted to only 1.4% of the overall state tax revenues (MFE, 2003).

#### **4.2.2. Weak Link between Charge Revenues and Financing Environmental Measures**

Despite the legal definition of environmental charges as having the purpose of creating revenues in order to carry out environmental measures, there are no environmental funds in Armenia. Part of the reason for this may be the external pressure on the government from the IMF against extra-budgetary funds or other types of earmarking (including environmental funds). Nevertheless, a draft law on a national environmental fund has been prepared by the MNP<sup>22</sup>, which is trying to put it on the Parliament's agenda

<sup>21</sup> The remaining excise tax is not considered an environmental tax.

<sup>22</sup> This was made possible by a provision under Armenia's Natural Resource Management and Poverty Reduction Strategy.

(MNP, 2004). In the absence of an environmental fund, there is no linkage between the budget resources spent on environmental issues and the environmental revenues generated. On the other hand, there is no evidence that the recycling of revenues from environmental charges would significantly increase the instruments' effectiveness in changing polluters' behaviour.

It should also be mentioned that even the only direct mechanism for earmarking environmental charge revenues which stipulates the redirection of revenues from pollution charges from 8 companies to their local communities (see Section 3.5.2) has been subject to several problems. Firstly, it only applies to pollution charges but not to natural resource charges, which is questionable given that mining companies pay more charges for natural resource use than for environmental pollution. Secondly, the local communities are institutionally weak and need help in developing proposals and implementing projects. Thirdly, the money collected from these 8 firms' charge payments is not kept on a separate account but goes into the general budget and is forfeited at the end of a fiscal year for other purposes. Given that the total revenue is not high, it would be more useful to accumulate the funds over several years to finance a larger environmental project.

Finally, the inexistence of an environmental fund is frequently stated as reason for the non-acceptance of higher charge rates by industry. Furthermore, the MNP does not consider it worthy to increase charge rates as long as related revenues are not earmarked for environmental purposes (MNP, 2004).

### **4.3. Cost Aspects**

A widespread recommendation of the economic profession toward environmental policy makers is to expand the use of environmental taxes relatively to the use of command-and-control instruments in order to reach environmental improvements at a lowest cost to society, i.e., in an *economically efficient* way. In Armenia, with environmental charges so far having no significant effect on the polluters' behaviour, economic instruments fail to bring about social benefits in terms of abatement cost savings or incentives for innovation. This section focuses on the costs of the present system of environmental charges to both industry and government.

#### **4.3.1. Affordability of Charge Payments to Industry**

There are indications that affordability issues might constrain the charge levels at least for some substances and products. On the one hand, MNP representatives indicated that a major reason for the low collection of environmental charges is the poor financial situation of enterprises, at least of large polluters. This is particularly true with respect to wastewater charges (Harutyunyan, 1999), as both Vodokanals and industrial facilities find it financially difficult to make due payments. The Vodokanals are public monopolies and could theoretically pass environmental charge payments on to the users of their services. This possibility, however, is effectively limited by the ability of industry and households to afford higher user fees for water and wastewater services.

On the other hand, at least with respect to air charges, MNP representatives (MNP, 2004) insisted that affordability was not an issue as charge rates are low (here, affordability was rather considered a problem with respect to investment in pollution abatement equipment). The SINP also indicated that the nine large industrial companies for which detailed data were provided (see Section 3.5.3) had no pollution charge debt, and that affordability was not an issue for them. Overall, more in-depth analysis is needed to come to clear conclusions about the affordability of environmental charges in Armenia.

#### **4.3.2. Administrative Costs**

There is a generally acknowledged lack of financial resources for environmental agencies in Armenia. While qualification is not considered an important problem, data collection is subject to both database software-related and staff resource problems. The Council for Statistics, for example, has only two staff



responsible for environmental statistics for the whole country (State Council for Statistics, 2004). Regional environmental inspectorates have no computers and carry out calculations manually (SINP, 2004). This, naturally, affects the quality of the available data at both the regional and national levels. The MNP is subject to enormous financial constraints, affecting its environmental monitoring and enforcement capacity.

The costs of administering environmental charges, especially with respect to monitoring and compliance control, clearly increase with the system's complexity. In principle, the administrative costs could be lowered to some extent if enterprises self-monitored their emissions and the inspectorate only had to make spot checks to control the correctness of self-monitoring. However, self-monitoring of emissions is undertaken by only very few large enterprises in Armenia, and the reported data are often unreliable (SINP, 2002). Therefore, there is a strong case for limiting the number of parameters subject to environmental charges to those for which monitoring capacity actually exists, in order to reduce unnecessary administrative costs<sup>23</sup>. In order to limit the complexity of the system, it is advisable to eliminate the inconsistencies in the present lists of chargeable parameters (see the discussion in Section 4.1.1). Furthermore, emissions of toxic substances, such as heavy metals, may be better regulated through command-and-control instruments to ensure their reduction to permissible levels.

The administrative efficiency of product charges in Armenia is higher than that of the pollution charges, because with the majority of the chargeable products being imported, control and collection are limited to a few entrance points and are undertaken as part of customs control. For vehicles, the control and collection are facilitated by the existing administrative procedure for vehicle inspections.

In order to reduce the administrative costs, the MNP currently considers establishing thresholds for the amount of charges due below which charges should not be paid quarterly but only annually. This is particularly important as there are many small and only a few large payers. The environmental inspectorate has voiced a concern that such change would limit too much the reporting requirements for industry (MNP, 2004). However, in the absence of self-monitoring by these smaller firms, the quality of the reported data is unlikely to be lower under an annual declaration requirement.

#### **4.4. Legal and Institutional Issues**

##### **4.4.1. Legal Concerns**

In addition to problems with respect to the environmental effectiveness, revenue raising capacity and administrative cost-effectiveness of Armenia's current environmental charge system outlined above, a number of legal shortcomings and ambiguities were identified by several MNP officials.

The first important drawback is the absence of a waste law. The lack of waste permits and with this of any limits for waste generation also results in inspectors not paying sufficient attention to waste class misreporting. In addition, the ambiguous definition of the term 'placement of waste' in the 1998 law on environmental charges makes it unclear whether only waste generators or also landfills should pay waste charges (MNP, 2004). The promulgation of a law on waste management is planned for 2005.

In the water domain, there are inconsistencies between different laws on whether only those who discharge into the water body should pay or also those discharging into the sewerage system. Currently, both industry discharging into the sewer and the Vodokanals pay for the same effluents. In another example, Armenia's Water Code requires the establishment of three separate charges for water abstraction, wastewater discharge (volume-based) and water pollutants (per substance) (MNP, 2004). The development, with U.S. assistance, of a Water Resource Fee Strategy aims at streamlining this system (for more discussion of this project, see Section 5).

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<sup>23</sup> This, of course, does not mean that other substances should not be monitored at all.

Legal contradictions also exist with respect to air pollution charges. According to the 1998 law “On Environmental and Natural Resource Payments”, every juridical and physical person causing emissions to air needs to have an air permit and pay air pollution charges. However, the MNP, in an effort to reduce administrative costs, has issued an implementing regulation establishing a threshold (taking into account the volume and toxicity of the emissions) below which a permit is not required and hence no air emission charges are assessed (MNP, 2004).

A more general problem with respect to the law on charge rates (2000) is that, for example, for air and water, the chemical formulas of the respective substances are not included in the legal texts. For some parameters, it is unclear which specific substances are covered, broadening the application of the law (see Section 4.1.1).

A further legal shortcoming, acknowledged by basically all the MNP officials interviewed, is the lack of a systematic correction for inflation written into the law, which would prevent inflation to erode the pollution charge rates. Although the inflation has significantly slowed down since 1999, fluctuations persist (see Figure 1 above). MNP representatives also complained that environmental charges are currently not part of permit conditions, i.e., permits do not contain an obligation to pay environmental charges (MNP, 2004).

#### **4.4.2. Institutional Problems**

There are also a number of institutional issues that require consideration. Firstly, permits are currently issued by the MNP at the national level, where different departments write air and water permits. There are plans to decentralise the permitting system in the near future. According to these plans, air emission permits for the 100 largest polluters would be issued at the national level, and for all others by the regional (marz) authorities.<sup>24</sup> All water-related permitting would be decentralised to the five river basins (MNP, 2004). This reorganisation would not only preserve single-medium permitting but also further fragment institutional competencies, which may complicate coordination between different permitting authorities and run contrary to the international best practices of integrated permitting<sup>25</sup>.

Already today there are indications of a lack of interagency coordination. For example, the fact that phosphates and detergents appear separately on the wastewater charge parameter list was explained by a lack of coordination between different agencies in the MNP. As a consequence, the double charging of phosphates needs to be dealt with when permits are issued to avoid double payment for the same substances (MNP, 2004).

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<sup>24</sup> Currently, the marzes are not considered ready to assume permitting responsibilities because of their limited resources and competences.

<sup>25</sup> In a more positive development, Armenia is planning to move from the current permitting of companies (which may combine rather heterogeneous economic activities at different sites) to source-specific permitting (MNP, 2004).

Insufficient collaboration between the SINP and the STS was said to sometimes limit enforcement of charge liabilities. This is particularly true in cases where the inspectorate detects underreporting of pollution volumes, and hence of charge payments, by enterprises, or violations of permits. In such situations the inspectorate has to create a protocol which is to be sent to the tax office which is in charge of assessing additional charge liabilities. The project interviews suggested that the tax office does not necessarily follow up on this (SINP, 2004). As a consequence, the inspectorate now wishes to be able to deal with the financial side as well, i.e., to be able to charge the outstanding payments (and penalties) directly from the enterprises. Such a step would increase the responsibility of the inspectorate and provide it with more funding. There are, however, doubts, even within the MNP, about the desirability of this change. Firstly, the inspectorate may not have sufficient competences to handle fiscal issues. Secondly, the inspectorate would probably be even less effective than the State Tax Service in enforcing charge liabilities (MNP, 2004).

Finally, doubts may also be cast on the desirability of the MFE playing a major role when it comes to the setting environmental charge rates. This institution's strong influence is explained by its general responsibility for the budget revenue and the fact that environment-related charges are part of the general revenue. While their central role may be sensible where general budget considerations are at stake, a stronger role of the Ministry for Nature Protection would be desirable in designing economic instruments of environmental policy in order to ensure that they reflect environmental priorities.

## 5. ARMENIA'S PROGRESS IN IMPLEMENTING INTERNATIONAL RECOMMENDATIONS AND OPTIONS FOR FURTHER REFORM

### 5.1. Summary of International Recommendations and Their Implementation in Armenia

An analysis of the pollution charge systems in place across the EECCA region highlights some fundamental deficiencies regarding their effectiveness (EAP TF, 2003). The reform of pollution charges was identified as one of the priorities under Objective 1 (Improve environmental legislation, policies, and institutional framework) of the EECCA Environment Strategy (UNECE, 2003) adopted by Environment Ministers at the "Environment for Europe" conference in Kiev in May 2003. The Strategy envisioned to:

- review the number of pollutants subject to charges;
- increase the charge rates to a level that would provide incentives to reduce pollution;
- increase the collection rates.

A further recommendation concerns mobile sources and suggests to eliminate any pollution charges levied upon such sources (OECD, 2003).

These reforms have long been advocated by international experts, including the EAP Task Force Secretariat at the OECD. The following sections summarise these recommendations<sup>26</sup> and assess the reform of the Armenian system of economic instruments of environmental policy against them.

#### 5.1.1. *Reduction of the Number of Chargeable Pollutants*

One of the main reform recommendations is to drastically reduce the number of pollutants upon which pollution charges are levied to only a limited number of major priority pollutants that can be monitored at reasonable costs (EAP TF, 2003; OECD, 2003).<sup>27</sup> The following directions have been recommended to reduce the charge base in EECCA countries (OECD, 2003: 46-47):

- ***Exclusion of hazardous air and water pollutants from the charge system.*** Toxic substances such as heavy metals, phenols, etc. should be strictly regulated through permits based on technology considerations and regularly monitored. Any accidental releases of such pollutants are likely to cause significant damage to human health and the environment and should be prosecuted through a full range of enforcement responses and liability provisions. Pollution charges for hazardous pollutants play virtually no incentive role that would complement command-and-control

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<sup>26</sup> For further presentations and discussions of the reform suggestions see UNECE (2003), OECD (2003), OECD (2004), and EAP TF (2003).

<sup>27</sup> This recommendation is backed up by international best practices. In Western European countries air emission taxes are mostly limited to SO<sub>2</sub> and NO<sub>x</sub>, as is the case in Denmark, Italy, Sweden and Norway (European Commission, 2003; Sørensen, 1999; Sjölin and Wadeskop, 2000), and SO<sub>2</sub> taxes are frequently levied on the sulphur content of the fuel used, thereby further reducing the administrative costs of the system. The tax base for effluent taxes in OECD countries also consists of only a handful of different pollutants. For example, the Danish sewage tax covers only three parameters: nitrogen, phosphorus and BOD (OECD, 2004).

regulation and, due to the large number of such pollutants, overly complicate the administration of the system.

- ***Replacement of pollution charges on industrial waste with user fees for waste management services.*** The permitted limits for industrial waste generation in EECCA are based on actual technologies and practices, so the charges do not provide any incentive for waste minimization. Also, the revenues from pollution charges on waste generation are not earmarked for the development of waste management facilities, as is usually the case in OECD countries where such charges are used. This, in combination with a weak command-and-control regulation for hazardous waste management, results in inappropriate disposal practices (including on-site storage). In addition, the current system of charging for waste generation without stringent regulatory control over safe management of hazardous and municipal solid waste discourages the development of a market for waste management services. While developing a comprehensive industrial waste regulatory framework, it should be considered to eliminate or phase out pollution charges for industrial waste and allow providers of waste collection, transport, storage, treatment, and disposal services to charge enterprises *directly* for these services in order to recover the full costs of safe management of the wastes.

According to international recommendations, the selection of effective environmental charge parameters should be based on a determination of priority environmental problems. Pollution charges should be targeted at a few key pollutants that are discharged mainly by a number of big stationary point sources in order to have an incentive impact. For example, a sulphur dioxide pollution problem, when the major polluters are power plants and a few industrial facilities, can be effectively addressed by a pollution charge. If major contributors to the problems are numerous small sources, pollution charges are not a good tool.

Since 1998, Armenia has reduced the number of pollutants charged from previously 78 (51 air pollutants and 27 water pollutants) to now 29 pollutants (10 and 19, respectively). Nevertheless, the overall number of pollutants charged is still too high, and the system too complex, to be efficient in an administrative sense. There are inconsistencies and overlapping parameter definitions in the lists of substances charged (see Section 4.1.1), and many toxic water pollutants are still subject to pollution charges. Given the limited monitoring capacity in Armenia, this complexity is not only costly but also counterproductive.

With respect to waste, the problematic use of pollution charges continues. The waste charges are not linked to any regulatory system for waste management (although this is likely to change with the adoption of a law on waste in 2005), and revenues from the waste charges are not earmarked for the development of waste management facilities. There are so far no plans to replace the waste charges by fees for waste management services which waste generators would pay directly to service providers to cover the full costs of safe waste management.

### **5.1.2. Coverage of Mobile Sources**

The international recommendations for EECCA countries are to replace pollution charges for mobile sources by a product charge on fuel, which is a much more effective tool for tackling this environmental problem (OECD, 2003). Apart from raising revenues, such product taxes can provide incentives to consume environmentally-friendlier transport fuels when rates are differentiated for different fuels based on environmental criteria (OECD, 2004).<sup>28</sup> Furthermore, the costs of administering motor fuel taxes can be kept low by adding the tax to the price of fuel (and collecting it together with excise taxes), as it is done in OECD countries.

This area is an example where some of the early reform progress in Armenia seems to have been rolled back: the product charges on motor fuel, slightly differentiated according to fuel type, were abolished. The remaining (undifferentiated) excise taxes on fuel no longer create revenues that could be used for environmental purposes.

### **5.1.3. Increasing Pollution Charge Rates**

The EAP Task Force recommendations for EECCA countries focus not only on the need to drastically reduce the pollution charge base to several priority pollutants, but also to increase charge rates, thus providing significant incentives to reduce pollution. An analysis of typical charge burdens and pollution abatement costs of enterprises, as well as of the economic feasibility and political acceptability should underlie the determination of charge rates (OECD, 2003). In OECD (2004), it is further argued that establishing flat rates, the same below and above ELVs, would help provide a continuous incentive for pollution reduction even beyond compliance with the permitted limit as long as this is economically feasible. The flat rate would also take away any incentives to adjust ELVs with a view to the enterprises' charge burden.

Several charge rates in Armenia have been increased since 1998. This holds, in particular, for CO, NO<sub>x</sub>, toluene, chlorine, chromium oxide and xylol emissions into air from stationary sources, and for BOD, suspended solids, chromium, fluorine, heavy metal and cyanide effluents into water. However, for a number of other pollutants (e.g., particulates, SO<sub>2</sub>, and formaldehyde for air and phosphates and phenols for water), charge rates have remained stable or were even decreased (see Section 3.3). The environmental charge rates, in general, remain insufficiently high. Where the charge rates were increased, the increases were too low to provide incentives for environmental improvements.

### **5.1.4. Increasing Collection Rates**

An effort to increase collection rates of pollution charges is necessary to provide incentive effects of this instrument and could also enhance the credibility of the pollution charge system. In order to increase collection rates of environmental charges, it is important that discretionary powers of regional and local environmental agencies implementing the charges be limited. Any exemptions and reductions that may be used should be transparent to all and applied in an identical and foreseeable manner by all environmental agencies in the country. This does not only require a fully functioning enforcement system but also effective monitoring mechanisms (OECD, 2004).

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<sup>28</sup> Most OECD countries practise some form of differentiation of the tax rates for motor fuels based on environmental criteria, such as their content of lead (used in all OECD countries where leaded petrol is not yet banned completely), benzene, and sulphur.

Although tax exemptions or reductions may decrease the effectiveness of the instrument and the revenues generated, special tax treatment for some economic actors is not uncommon also in OECD countries. Uncertainty over economic effects, particularly of negative effects on the competitiveness of industrial sectors, is one reason sometimes stated to justify tax exemptions or reductions for business. There are also examples of environmental tax exemptions granted to avoid any negative economic implications on private households (OECD, 2001). Such tax exemptions or reductions are set in the law and apply equally to all economic actors, usually with no discretion given to the authorities, thereby avoiding corruption.

Presently in Armenia, discretion in writing off environmental charge or penalty liabilities is limited to cases foreseen by the law. The environmental authorities use discretion in imposing charge payments mainly to compensate for the existing legal gaps. This concerns, for example, legal uncertainties about whether dischargers into the sewerage should pay water pollution charges (in addition to user charges to the Vodokanals), whether landfills should pay charges for waste disposal, and how to calculate the charges for the parameters that are not clearly defined in the regulation.

Despite the limited discretion of the SINP and the STS to forgive charge and penalty payments, charge collection rates fluctuate strongly and are frequently well below 100% (see Table 8, Section 3.5.1). The principal reasons for the low collection rates are that environmental inspectors routinely accept to defer payment liabilities into the future, and that the tax authorities are reluctant to seek court injunctions after the statutory 180 days of non-payment of charge liabilities.

## **5.2. Opportunities and Constraints for Further Improvement**

The following incremental improvements to the current system are considered achievable in the short term through changes in the legislation or implementing regulations that are either already planned or strongly supported by the MNP (MNP, 2004):

- a) clarification of the definition of ‘placement of waste’ and establishment of waste permits to serve as a basis for waste charges (there are currently no plans to replace the pollution charges on waste by tipping fees for waste management services);
- b) clarification of the definitions of air and water pollution parameters subject to charges;
- c) clarification of charge liabilities for industrial wastewater discharges into the sewer;
- d) introduction of the obligation to pay charges into permit conditions;
- e) including in the law a provision for systematic correction of charge rates for inflation;
- f) increase of selected charge rates, especially for air pollution from stationary sources (this measure is supported by the MFE);
- g) reduction of the frequency of small charge payments to annual instead of quarterly; and
- h) extension of the list of companies whose charge payments are to be recycled for local environmental projects as well as allowing the accumulation of related revenues from year to year.

At the same time, a proposal of the MFE to include environmental charges under the Tax Code, thus turning them into taxes and providing a stronger enforcement mechanism while precluding earmarking does not seem to have much support at the MNP. The MNP is promoting the establishment of a national environmental fund to make sure that all the revenues from the pollution and product charges are spent on environmental programmes. In principle, earmarking (in a budget law) of a certain percentage of the general budget revenue for environmental purposes could be a viable alternative to an environmental fund. This would decrease the risk of environment-related revenues being diverted for non-environmental

expenditure<sup>29</sup>. Earmarking a share of the budget revenue for environmental expenditure would also provide tighter control over spending compared to the environmental fund option. However, this scenario is open to the possibility that the percentage of earmarked revenues would be subject to political lobbying and not be based on environmental needs. Presently, either earmarking option is likely to face resistance in the government and parliament. The MFE and the STS are strongly against fragmentation of budget revenues.

There are ongoing stakeholder consultations on the development of charges (fees) for water resource use that are required by the Water Code of 10 October 2002. The Water Code stipulates three water resource charges: a water abstraction charge, a volume-based effluent charge, and pollutant-specific charges (the equivalent of the present water pollution charges). The first draft of a Water Resource Fee Strategy was elaborated by the USAID-supported Sustainable Water Resources Management Project and presented in April 2004 (USAID, 2004). That draft proposed to establish effluent charges with a fixed and a variable component, taking into account the volume and the quality of discharges. In considering effluent quality, the USAID consultants recommended to limit the charge base to just BOD and suspended solids, while significantly increasing the charge rate per tonne. This proposal is generally consistent with the OECD/EAP TF recommendations presented in Section 5.1 but may be politically difficult to implement in Armenia within 5 years, as recommended in the Water Resource Fee Strategy. However, it is important to ensure that any changes to the water pollution charges designed to bring them in line with the Water Code simplify rather than further complicate the system.

Several other fundamental changes to the environmental charge system are likely to face different degrees of opposition within the Armenian government. For instance, elimination of the charges for mobile sources based on engine horsepower, while supported by the MNP, is unlikely to happen because of the MFE opposition to a compensatory increase of the excise tax on petrol (MFE, 2004).

In summary, the changes that have been made in the Armenian system of environmental charges since 1998 correspond, to some extent, to the international recommendations for reform but they do not fully meet them. To make further progress in line with these recommendations, Armenia needs to:

- *further reduce the number of pollutants charged to a few priority pollutants;*
- *exclude hazardous pollutants from the charge system;*
- *replace pollution charges on industrial waste with waste management user fees;*
- *replace charges on mobile sources based on engine power by product charges on fuel (possibly to be collected together with the excise taxes on fuel);*
- *increase charge rates for priority pollutants to a level where they provide incentives for pollution reduction; and*
- *increase collection rates of charges to increase the incentive effect of this instrument as well as the credibility of the pollution charge system.*

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<sup>29</sup> In Armenia, the share of revenues from environmental charges in the general budget revenues amounted to only 0.8% in 2002 and 1.4% in 2003 (MFE, 2003; MNP, 2004).



## **6. LESSONS LEARNED FROM THE REFORM PROCESS IN ARMENIA**

The analysis of the adjustments that have been undertaken in the system of environmental charges in Armenia since 1998 shows that they are insufficient to meet the primary objectives of environmental charges in Armenia, i.e., to raise revenue in order to finance environmental improvements. Nor have the adjustments affected the system's incentive impact, and revenues continue to be raised in an economically and administratively inefficient way (with the exception of a number of product charges).

A general conclusion that can be drawn from the past evolution of Armenia's environmental charge system is that any substantial improvement is difficult to obtain without changing the system radically. Otherwise, to transfer the current system into one that is both environmentally and economically effective is likely to take a long time. Moreover, a reform of the system of economic instruments of environmental policy should be linked to reforms of other environmental policy instruments, such as permitting, monitoring, and enforcement. It should be guided by a policy that provides clear and realistic environmental priorities and targets.

Last but not least, any further reform of the environmental charge system in Armenia should be based on a clear decision on the system's objectives (incentive or revenue-raising function) and the adequate instruments to be used, made through a dialogue involving all relevant stakeholders. The discrepancy between the overarching goal of revenue-raising (strongly supported by the MFE) and the attempts to achieve it through applying the charges for a wide range of parameters to a broad base of polluters (as advocated by the MNP) is the main constraint to a more profound reform of the environmental charge system. For the reforms to be successful, it will be necessary to separate the incentive objective of the system from the revenue-raising one. One reason for this is that an incentive environmental charge, if it functions effectively, will lead to pollution reduction and, therefore, to lower revenues over time. Another consideration is that in order to gain political acceptance for a high rate of an incentive charge, the government often has to recycle the revenues back to industry for investments into pollution prevention and control. While the incentive objective can be achieved by combining the reduction of the number of pollutants charged with an increase of charge rates for the remaining parameters, generating a stable flow of revenues for public environmental programmes should rely on product charges (e.g., on motor fuels) that have a predictable charge base.

The findings of this report show many similarities with those for other countries of the EECCA region. Even where reforms have taken place or are underway, the pollution charge systems are still dominated by the features introduced during the Soviet era, resulting in inadequate incentives for improved environmental behaviour, poor revenue-raising capacity, and administrative inefficiency (see EAP TF, 2003 and OECD, 2004).

Given that similar conclusions were reached in other reports, the lessons drawn from the Armenian process of adjustments in the pollution charge system apply to other EECCA countries as well: the need for radical changes of the pollution charge system and the role it should play in an environmentally effective and cost-efficient environmental management framework.

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## INTERVIEW PARTNERS

Mr. Ashot Harutyunyan, Head of Economic Department, Ministry of Nature Protection, 23-29 April 2004.

Mr. Yuri Poghosyan, State Council for Statistics, 23 April 2004.

Ms. Anahit Aleksandryan, Head of Hazardous Substances and Waste Management Department, Ministry of Nature Protection, 23 April 2004.

Mr. Vladimir Narimanyan, Deputy Head, Water Resources Management Agency, Ministry of Nature Protection, 26 April 2004.

Mr. Aram Gabrielyan, Head of Environmental Protection Department, Ministry of Nature Protection, 26 April 2004.

Mr. Artur Manukyan, Head of Department for Property Taxes and Non-Tax Revenue, State Tax Service, 26 April 2004.

Mr. Marzpet Khamalyan, Deputy Head, State Inspection of Nature Protection, Ministry of Nature Protection, 27 April 2004

Ms. Anahit Galstyan, Head of Department for State Budget Revenue Planning, Ministry of Finance and Economy, 27 April 2004.

Mr. Suren Karayan, Head of Department of Tax Policy, Ministry of Finance and Economy, 27 April 2004.

Mr. Mher Mkrtumyan, Head of Financial-Economic Department, State Committee for Water Management, 28 April 2004.

**ANNEX 1. CONTRIBUTION OF SELECTED LARGE ARMENIAN ENTERPRISES TO OVERALL EMISSIONS AND DUE REVENUES IN 2002**

2002	Country Totals			Sum over 9 Individual Plants			Non-ferrous Metallurgy			Thermal Power		
	Volume tonnes	Payment 1000 AMD	Payment USD	Volume tonnes	Payment 1000 AMD	Share in country revenues %	Volume tonnes	Payment 1000 AMD	Share in country revenues %	Volume tonnes	Payment 1000 AMD	Share in country revenues %
<b>Total Air Emissions</b>	<b>35 773.9</b>	<b>34 739.8</b>	<b>60 413.9</b>	<b>17 300.1</b>	<b>19 554.2</b>	<b>56.3</b>	<b>7 322.2</b>	<b>4 739.6</b>	<b>13.6</b>	<b>1 631.8</b>	<b>12 075.3</b>	<b>34.8</b>
SO2	7 243.0	4 345.8	7 558	7 119.0	4 271.4	98.3	6 857.1	4 114.3	94.7	0.0	0.0	0.0
Particulates	13 500.0	8 100.0	14 086	459.5	275.7	3.4	304.9	182.9	2.3	0.0	0.0	0.0
NOx	2 703.8	20 008.0	34 795	1 767.0	13 075.8	65.4	58.7	434.2	2.2	1 631.8	12 075.3	60.4
CO	12 283.8	982.7	1 709	7 921.0	633.7	64.5	101.5	8.1	0.8			
Chloroprene	28.7	1 291.5	2 246	28.7	1 293.3	100.1						
Toluene	13.8	6.9	12	4.5	2.2	32.5						
Chlorine	0.8	5.0	9	0.4	2.2	43.4						
<b>Total Wastewater Discharges</b>	<b>104 053.3</b>	<b>887 020.6</b>	<b>1 542 564.0</b>	<b>7 747.2</b>	<b>19 058.7</b>	<b>2.1</b>	<b>3 954.0</b>	<b>12 701.5</b>	<b>1.4</b>	<b>58.3</b>	<b>44.9</b>	<b>0.0</b>
BOD	40 788.0	750 493.7	1 305 138	222.8	4 099.2	0.5	99.9	1 838.5	0.2	1.3	23.2	0.0
Suspended solids	14 587.0	77 313.2	134 451	2 005.2	10 627.8	13.7	1 769.1	9 376.2	12.1	0.0	0.0	0.0
Sulphates	25 168.0	2 516.8	4 377	3 440.5	344.0	13.7	2 003.4	200.3	8.0	52.3	5.2	0.2
Copper	27.5	28 126.5	48 913	3.2	3 295.7	11.7	0.7	670.7	2.4			
Zinc	0.9	890.8	1 549	0.1	146.4	16.4	0.1	146.4	16.4			
Oil products	34.9	7 133.6	12 406	2.3	467.0	6.5	2.3	467.0	6.5			
Chlorides	23 392.0	701.8	1 220	2 072.9	62.2	8.9	78.5	2.4	0.3	4.6	0.1	0.0
Detergents	20.4	2 090.0	3 635	0.2	16.4	0.8				0.2	16.4	0.8
Salts of heavy metals	34.7	17 754.2	30 875	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total waste</b>	<b>36 152.6</b>	<b>22 212.6</b>	<b>38 628.5</b>	<b>375.6</b>	<b>576.6</b>	<b>2.6</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
Class I	5.5	197.7	344	0.0	0.0	0.0						
Class II	0.0	0.0	0	0.0	0.0		0.0	0.0		0.0	0.0	
Class III	108.1	389.3	677	106.8	384.5	98.8	0.0	0.0	0.0	0.0	0.0	0.0
Class IV	3.6	4.3	8	51.4	61.7	1427.8	0.0	0.0	0.0	0.0	0.0	0.0
Non-hazardous	36 035.4	21 621.2	37 600	217.4	130.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0

2002	Cement Manufacturing			Iron Processing			Chemical Industry		
	Volume, tonnes	Payment 1000 AMD	Share in total country revenues, %	Volume, tonnes	Payment, 1000 AMD	Share in total country revenues, %	Volume, tonnes	Payment, 1000 AMD	Share in total country revenues, %
<b>Total Air Emissions</b>	<b>7 997.4</b>	<b>1 238.9</b>	<b>3.6</b>	<b>312.1</b>	<b>191.3</b>	<b>0.6</b>	<b>36.5</b>	<b>1 309.2</b>	<b>3.8</b>
SO2				261.9	157.1	3.6			
Particulates	145.2	87.1	1.1	8.0	4.8	0.1	1.5	0.9	0.0
NOx	71.5	529.3	2.6	3.6	26.3	0.1	1.4	10.6	0.1%
CO	7 780.7	622.5	63.3	38.7	3.1	0.3			
Chloroprene							28.7	1 293.3	100.1
Toluene							4.5	2.2	32.5
Chlorine							0.4	2.2	43.4
<b>Total Wastewater Discharges</b>	<b>15.3</b>	<b>17.4</b>	<b>0.0</b>	<b>17.0</b>	<b>83.2</b>	<b>0.0</b>	<b>3 702.6</b>	<b>6 211.6</b>	<b>0.7%</b>
BOD	0.7	13.6	0.0	2.9	53.0	0.0	118.0	2 170.8	0.3
Suspended solids	0.5	2.8	0.0	3.9	20.5	0.0	231.8	1 228.3	1.6
Sulphates	7.8	0.8	0.0	6.2	0.6	0.0	1 370.9	137.1	5.4
Copper				0.0	9.0	0.0	2.6	2 616.1	9.3
Zinc									
Oil products									
Chlorides	6.3	0.2	0.0	4.1	0.1	0.0	1 979.4	59.4	8.5
Detergents									
Salts of heavy metals									
<b>Total Waste</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>103.7</b>	<b>62.2</b>	<b>0.3</b>	<b>168.2</b>	<b>452.2</b>	<b>2.0</b>
Class I									
Class II									
Class III							106.8	384.5	98.8
Class IV							51.4	61.7	1427.8
Non-hazardous	0.0	0.0	0.0	103.7	62.2	0.3	10.0	6.0	0.0

*Note: no values indicate that the plant(s) covered were not regulated for the respective substance, while 0 indicates that no data were reported in 2002. – Penalties are excluded from due payments in order to assess the contribution of specific enterprises to overall emissions and charge revenues. – Source: data provided by the SINP; own calculations.*