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Serbian Integrated Hazardous Waste Management Plan

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Integrated Hazardous Waste Management Plan

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Chapter 7.1 Collection options

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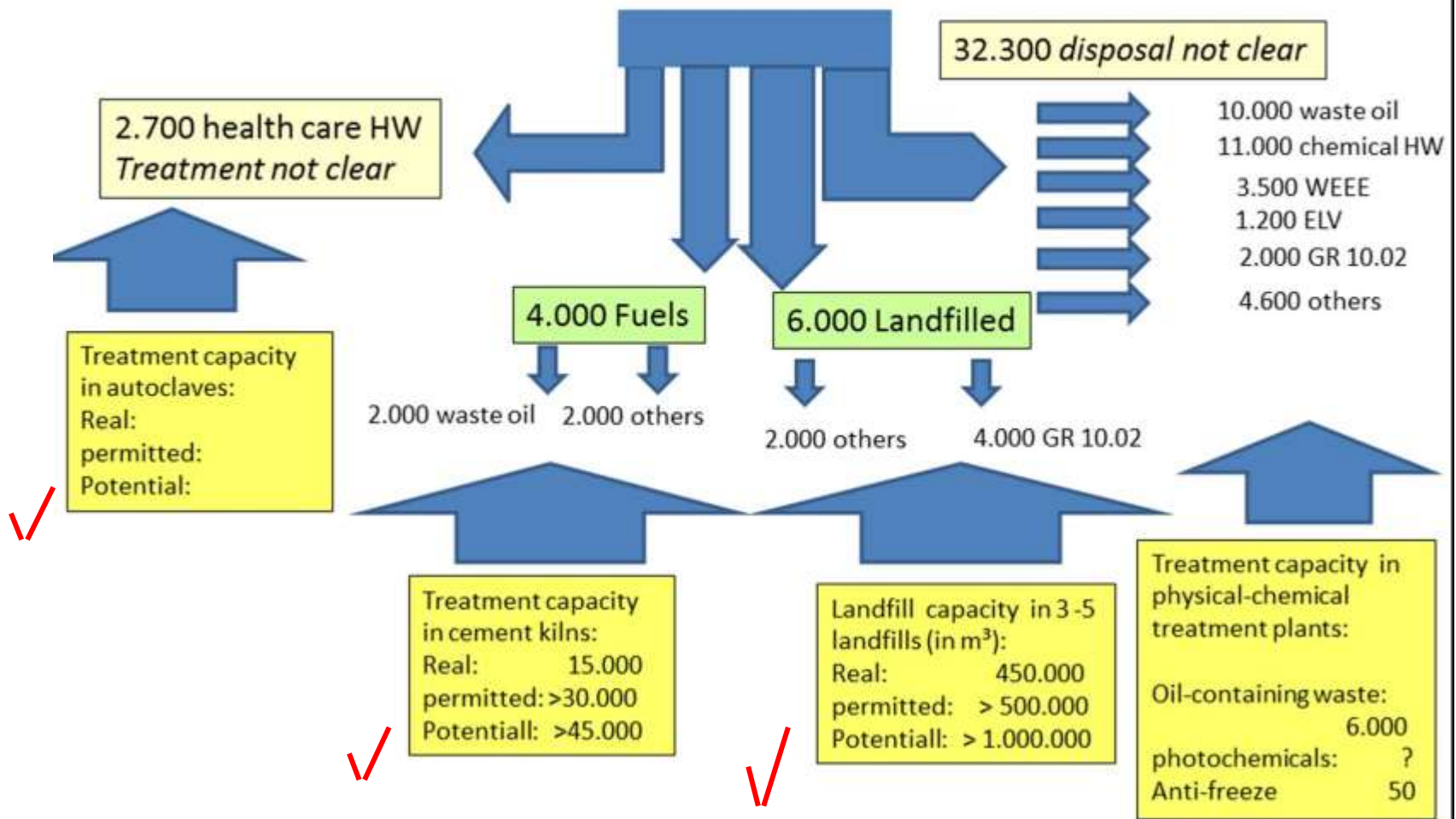
Chapter 7.1 Collection options

- Collection of **hazardous waste from industry and commerce** by private companies
- Collection system for **asbestos containing waste**. Demand of the construction sector increases due to C&D recycling.
- Transportation need for **infectious material** increases; transport distance and logistics demands increase.
- Handing over of **hazardous waste from households** to municipal collection and recycling centers should be free of charge.
- Complete collection and reporting of **waste oil** is necessary. Retailers, service stations and trading companies play an important part (producers responsibility). No fee should be charged from end consumers.
- Separate collection of **end-of-life products (WEEE, batteries and ELV)** needs completed formal sector infrastructure. Licensed operators should be encouraged to increase their activities. Municipal collection centres play an important part. Take-back of end-of-life-products should be cost-free for the last owner. Separate collection requires additional storage capacities.
- Lack of infrastructure for hazardous waste treatment will increase the need for **export** in near future. Waste metal export, should be restricted for proper re-use (Pb-batteries, ELV, metal-scrap).

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10.000 treated hazardous waste (HW) 2014 in tons/year



The figure shows the present state of formal hazardous waste treatment and disposal practice in Serbia. This status quo is the basis for additional infrastructural elements to be defined below.

Chapter 7.2 Treatment options

Necessary integrated infrastructure consists of:

1. **Separate collection and storage facilities** for hazardous household waste, operated by municipalities within “recycling yards – **medium term option**.
2. **Regional storage facilities**, operated by private operators of the sector, often in the context with treatment facilities – **short term option**.
3. **Physical- chemical treatment facility** for inorganic and organic liquid hazardous waste and sludge combined with storage units for solvents, acids, bases etc. and for oily wastes and emulsions – **short term option**.
4. **Additional capacities for incineration of organic industrial and medical waste**, combined with capacities for the preparation of „residues derived fuels“ (**RDF**) – **short and medium term options**.
5. Additional **capacities for landfilling of inorganic industrial hazardous waste**, eventually combined with capacities for the solidification of pasty inorganic waste – **short and medium term options**.
6. Creation of a **management system (collection, storage, dismantling and other treatment, final disposal) for all special waste streams** regulated by European and national waste legislation like used batteries and accumulators, waste oil, end-of-life-vehicles (ELV), waste from electric and electronic equipment (WEEE), etc – **short and medium term options**.

Chapter 7.2 Treatment options

Mechanical treatment of WEEE

Sorting into 5 to 7 WEEE categories

Small WEEE devices

Big household appliances

Cooling freezing appliances

Electronic devices

IT devices

Others...

Manual dismantling of hazardous components
Manual removal, extraction of CFCs, outgassing of foams etc.

Shredder for
small appliances
and components

Hand sorting

Manual dismantling of
printed circuits

Complete
dismanteling

Partial
dismanteling

Shredding of bigger
shells and racks

Air separator

Magnetic sorting (FE)
Whirler type separator
(NE)

Chapter 7.2 Treatment options

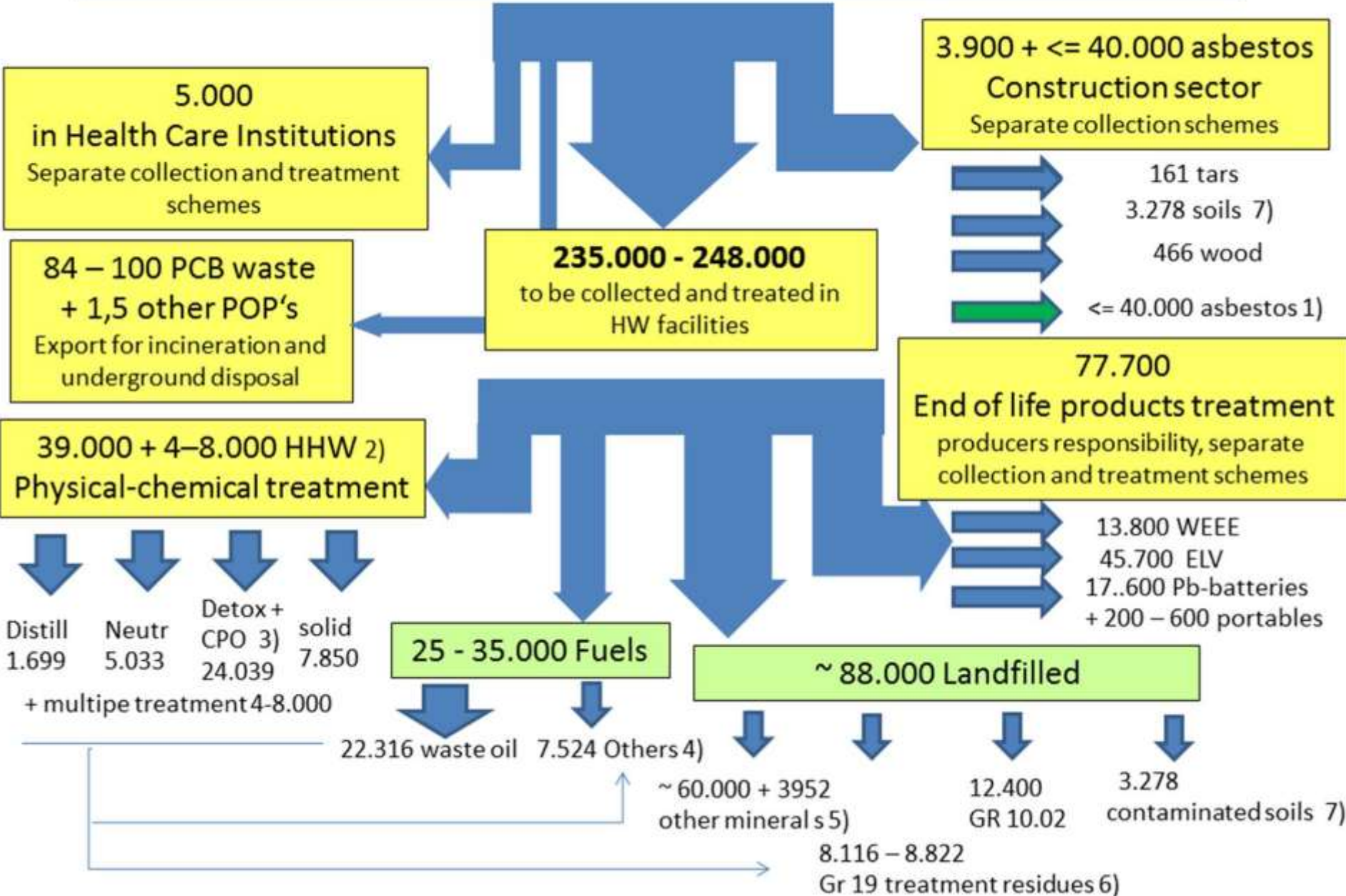
Development of **modular systems** and **in stages**:

1. **basic components** in first stage, and
2. *additional components or more sophisticated solutions during next stages.*

Parallel to the “end-of-life products” management systems (= mechanical dismantling and shredding facilities), the **priority** should be given to:

1. **More source separation and in-house storage capacities in industry,**
2. New regional **storage capacities**, driven by the private sector and - if possible – connected with treatment facilities,
3. Additional **physical-chemical treatment** capacities for **inorganics** from industry and commerce,
4. Additional **physical-chemical treatment** capacities for **organics** namely solvents, oily sludge and oil-water mixtures and subsequent preparation of “residue derived fuels” **RDF** for cement kilns and other thermal industrial processes,
5. Additional disposal capacities for inorganic fractions in **hazardous waste landfills or technically equivalent compartments of other licensed landfills**, if necessary combined with solidification processes.

280.000 -293.000 tons/year total generated hazardous waste (HW) in 2020



5.000
in Health Care Institutions
Separate collection and treatment schemes

3.900 + <= 40.000 asbestos
Construction sector
Separate collection schemes

84 - 100 PCB waste
+ 1,5 other POP's
Export for incineration and underground disposal

235.000 - 248.000
to be collected and treated in HW facilities

161 tars
3.278 soils 7)
466 wood
<= 40.000 asbestos 1)

39.000 + 4-8.000 HHW 2)
Physical-chemical treatment

77.700
End of life products treatment
producers responsibility, separate collection and treatment schemes

Distill 1.699
Neutr 5.033
Detox+ CPO 3) 24.039
solid 7.850
+ multiple treatment 4-8.000

13.800 WEEE
45.700 ELV
17..600 Pb-batteries + 200 - 600 portables

25 - 35.000 Fuels

~ 88.000 Landfilled

22.316 waste oil
7.524 Others 4)

~ 60.000 + 3952 other mineral s 5)
8.116 - 8.822 Gr 19 treatment residues 6)
12.400 GR 10.02
3.278 contaminated soils 7)

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Chapter 7.3 Investment & operational costs

1. No important additional investment costs for **collection infrastructure**.
 - Equipment will be adjusted step by step with increasing demand and revenues by private operators.
2. **Investment costs for storage and transfer facilities: 3 to 6 Mio €** for a small scale store and **10 – 15 Mio €** for a large scale storage facility.
 - Connected or even **integrated** into corresponding, privately operated treatment facilities.
 - Capacities will develop step by step with increasing capacity of treatment facilities.
3. **Investment costs for physical-chemical treatment** plants depend on the technology applied and the complexity / variety of waste to be treated. The design of the processes depends on the required “quality” of the output. Investment costs range from **5 to 10 Mio €** for a small scale facility and **10 to 20 Mio €** for a large scale treatment facility.
 - Considerable reduction of the operational costs can be achieved by good choice and follow-up of process steps.
 - Further investment into existing, privately operated similar facilities could decisively decrease the investment costs needed.

Chapter 7.3 Investment & operational costs

4. Investment costs of a new **incineration plant** are in the range of **50 to 80 Mio €**, depending predominantly from the exhaust gas treatment required. **Cement industry** starts from lower investment costs of **15 to 30 Mio €**, depending on the exhaust gas treatment system required. Investment costs for the **preparation of secondary fuels** (RDF) for cement kilns amounts to approx. **4 Mio €**, additionally.
5. Investment costs for a **hazardous waste landfill** depend from the site installation costs and from the technology applied. Sufficient capacity of the facility ($> 1 \text{ Mio m}^3$) reduces future operational costs decisively. Overall investment costs for a new hazardous waste landfill in Serbia are in a range of about **5 to 10 Mio €**.
 - Limited capacity for landfilling of hazardous waste in separate compartments of **existing Serbian landfills** in the range of 15.000 tons per year can be made available in near future; this could **reduce urgency** and **decrease** necessary total investment volume.
 - New landfill capacities could also be located within **industrial areas**. They might be docked to **industrial facilities** where necessary experience in hazardous substances' handling, space and equipment are available. This can **decrease** the total investment volume as well.

Hazardous waste treatment installations	Short term investment	Medium term investment
collection infrastructure	Neglected, see chapter 7.3.1.1	Neglected, see chapter 7.3.1.1
storage and transfer facilities	3 to 6 Mio € = (5x5)	10 – 15 Mio € = (2x10)
physical-chemical treatment	5 to 10 Mio € = (1x10)	10 – 20 Mio € = (1x10)
incineration plant	0	50 to 80 Mio € = (1x80)
Cement industry, preparation of secondary fuels	15 - 30 Mio € cement kiln adjustments + 4 Mio € RDF preparation = (1x15) + (1x4)	0
hazardous waste landfill	5 Mio € landfill adjustment = (1x5)	10 Mio € + 2 Mio € Stabilisation platform = (1x10) + (1x2)
Total	59 Mio €	122 Mio €

Special waste stream	Short term investment	Medium term investment
Infectious waste	0	5 Mio € sterilization via autoclave or incinerator
Waste oil	1,5 Mio € + storage = 3 Mio €	1,5 Mio € + storage = 3 Mio €
Asbestos contaminated C&D waste	storage compartment, 10.000 to 15.000 € per storage unit + landfilling 10 €/m ³ to 25 €/m ³ = 1 Mio €	storage compartment, 10.000 to 15.000 € per storage unit + landfilling 10 €/m ³ to 25 €/m ³ = 1 Mio €
WEEE	Adjustment measures 2 Mio €	New facility 5 Mio €
Portable batteries	0	sorting facility <= 1 Mio €
ELV	2 Mio € for dismantling, shredding adjustments	4 Mio € for new dismantling, shredding facility
Total	~ 8 Mio €	19 Mio €

Chapter 7.3 Investment & operational costs - Conclusions

1. Estimated costs for **short term investment program** = **59 Mio € ***
 2. Additional costs for a medium term investment program = **122 Mio €**,
 3. Additionally about **8** (short term) **and 19** (medium term) **Mio €** are related to the establishment of new infrastructure for **specific waste streams** like mentioned above (without PCB elimination program).
 4. = In total **208 Mio €**
-

***)** Such investment can be reduced by concentrating such activities in one **central treatment and disposal facility** (e.g. **34 Mio €** for a center in Morocco, without thermal treatment unit).

But: Such new sites demand long preparation phases for **assessment procedures** – often with **unpredictable results**. Another approach seems to be more promising:

Integrating hazardous waste management activities – storage, treatment and incineration units – into **industrial complexes and process lines**. This is a more **decentralized approach** with **modular systems** to be added step by step with increasing demand and know-how. Knowledge about hazardous substances handling usually exists within these industries. Costs decrease.

Chapter 8 Financing

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Chapter 8 Financing investments: 1 Financial resources

1. Investment needs for hazardous waste management in Serbia amount to a total of approx. **208 million €**. Related to the estimated total investment need of **958 Mio €** for municipal solid waste management this is a rather limited volume.
2. The system will be financed from a combination of the following **financial resources**:
 - Capital grants from the former Serbian Environmental Protection Fund (EPF)
 - Funds from the private sector realizing such projects as PPP projects;
 - Capital grants through European Pre-Accession Assistance (EU IPA);
 - Funds from national or regional governments and public utility companies
 - Long-term loans from international financial institutions (IFI);
 - Capital grants from bilateral donors.
3. At this moment it is not possible to specify in detail the contribution of these funds, but:.
 - **IPA and later Cohesion and other EU funds** will contribute the largest part of **public funds** for such investments in Serbia.
 - Another essential part has to be taken by the **private sector** from its own capital and/or long-term commercial loans. This includes: national industry, international and national operators and national private institutions/organizations (collective schemes)

Generally, **70%** of financing is **IPA** and other international support funds and **30%** is national co-financing, mostly from **private sector**.

Chapter 8 Financing investments: 2 EU financing scheme

Based on the experience of other new MS, the **financial resources** from EU financing of **environmental investments** are as follows:

- 90% of EU funds for environment are directed to **infrastructure investment**
- 70% of investment funds will be allocated for **water sub-sector projects**
- **30% of investment funds will be allocated for waste management sub-sector.**
- **Co-financing from national resources shall be at least 30%.**

Under such assumptions the total funds for waste sector may be expected as presented in the table from the Serbian WM Strategy. This means, that most of investment into **hazardous waste management infrastructure** can be completed during next **two financing periods (up to 2027)**.

	Financing period 2014-2020	Financing period 2021-2027	Financing period 2028-2034	Total in Mio €
Water and waste management infrastructure financing EU	144	1.288	1.288	2.719
National co-financing 30%	62	552	552	1.165
Total funds	206	1.839	1.839	3.884
30% of funds for waste management	62	552	552	1165

Chapter 8 Financing investments: 3 private sector financing

1. It is expected that **private sector** will significantly participate in provision of capital and/or long-term commercial loans for **hazardous waste streams** which are under responsibility of the private sector.
2. Among **private investors**, there will predominantly be providers of waste **management services** and **major industrial waste generators**, as well as companies or organizations that were established in compliance with legal requirements or were established to meet obligations prescribed by law (**collective schemes**).
3. In most EU MS, **producers and importers** of special end-of-life-products (Batteries, ELV, WEEE, waste oil etc.) have to finance the collection and treatment of such specific waste streams. They are obliged to participate in **collective schemes**. They have to pay a fee to the collective scheme for any new product put on the market. The costs for the fee are in practice included in the retail price. The collected fees are used to finance the management (construction and operation) of such specific waste treatment facilities.
4. In many EU MS there exist **Environmental Support Schemes** for the continuous improvement of the environmental situation. The scheme shall influence decisions towards environmentally friendly and resource efficient investments and increasing the economic and technical rate of **innovation**. The budget of such Environmental Support Schemes (“Environmental Funds”) normally derives from the **general national budget**.



Chapter 8 Financing operational costs: 1 Economic constraints

1. Approved **economic instruments** help to decrease the expected financial deficit resulting from necessary investments. These instruments include a strict **cost recovery policy** and **additional disposal fees**.
2. Prices must reflect the **long-term costs**. Cash **flow** must cover:
 - loan servicing and repay;
 - regular expenses during operation, including replacement costs;
 - costs devoted to the plant shutting down,
 - costs to recover and to maintain investment, and
 - - in the case of private investors - generation of profit which recompenses opportunity costs and business risks.
3. **But:** In order not to overstress the **acceptability** of such new financing systems, they must be introduced gradually, enabling the users to adapt to higher prices. **Grants and subsidies** may help to facilitate the **transition** to full cost recovery system.
4. EU MS adopted individual procedures for finding **affordable prices** for waste management services: Often, an **upper limit** for the share from a household income or from other **economic indicators** (e.g. total turn over of industrial sectors' production) was defined.

Chapter 8 Financing operational costs: 2 Solutions

1. It is recommended to improve the current implementation of the **polluter-pays-principle** in Serbia in order to reduce the public burden.
2. The instrument of **extended producer responsibility** should include:
 - **Collective schemes** for all waste types where corresponding EU requirements exist (WEEE, batteries, ELV, waste oil, packaging waste).
3. An **Environmental Protection Fund** (EPF) should be re-established as a **separate non-profit organization** for **co-financing the infrastructure** for hazardous waste management and other issues like remediation of contaminated sites and stock-piles and innovative solutions.
4. Apart from “fees for products put on the market”, the income of the EPF could be secured by imposing:
 - “**fees on the use of the environment**” (example from Poland),
 - “**fees on waste disposal activities**” (example from Austria) or
 - by allocating an **adequate budget** from the general budget and allocating **fees and fines for infringements** against environmental law (example from Germany).

Thanks for the opportunity to assist You!

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Action Plan (Strategy 2015) - excerpts concerning hazardous waste -

„Reforms in certain areas should be implemented in the upcoming period ...

- Encouraging competition and participation of **private sector** in the sphere of service provision, **particularly in the waste management sector.**“

„In the short-term period...

It is also necessary that the construction of the **plant for hazardous waste treatment** should be started.

- During the first phase it will refer to **physical-chemical treatment of inorganic waste** and the construction of several regional storages for hazardous waste.
- Based on the Law on Waste Management, the system of specific waste streams management is established and economic instruments are introduced.
- As one of the priorities for resolving the problems of hazardous waste, it is necessary that the possibilities and conditions for **using the existing plants and installations** should be taken into consideration (cement plants, thermal plants, heating plants, steelworks plants) for the purpose of hazardous waste treatment.

In the long-term period Serbia should focus on the achievement of the **objectives** in...

- constructing a plant for energy recovery from municipal waste, as well as construction of a **central plant for hazardous and medical waste incineration.**“.

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