



An EU funded project

3rd Workshop

Development of the Integrated Hazardous Waste Management Plan

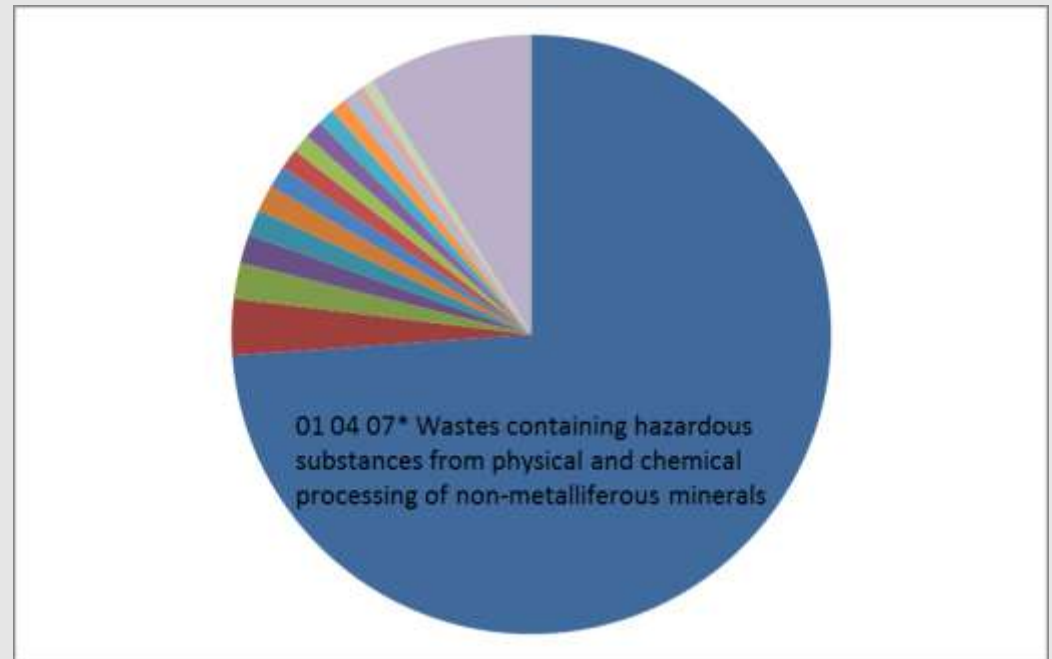
29th of March 2017

Current status of generation and management of hazardous waste in Serbia

- I. Quantities of hazardous waste generated**
- II. Quantities of hazardous waste landfilled**
- III. Quantities of hazardous waste used for energy recovery**
- IV. Quantities of hazardous waste used/prepared for material recovery**
- V. Quantities of hazardous waste exported**
- VI. Summary of the waste streams**
- VII. Collection of hazardous waste**
- VIII. Treatment facilities for hazardous wastes**

Quantities of hazardous waste generated

- Total quantity of hazardous wastes generated in 2014, based on data reported to SEPA by companies: 209,900 t
- The biggest part (155,000 t): wastes from mining and quarrying

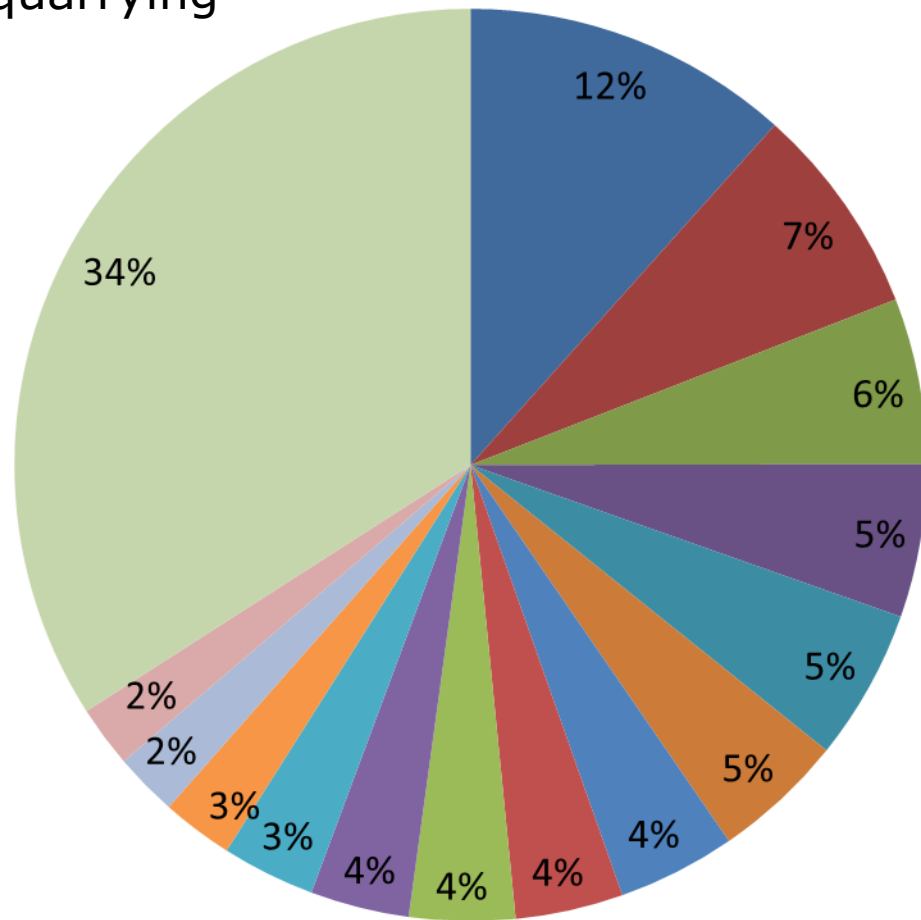


Source: SEPA (2015)

Quantities of hazardous waste generated by industry and commerce

| Waste type | | Amount (t) 2014 |
|--------------|--|--------------------|
| 01 04 07* | Wastes containing hazardous substances from physical and chemical processing of non-metalliferous minerals | 155,044 |
| 10 02 07* | Solid wastes from gas treatment containing hazardous substances | 6,370 |
| 10 02 13* | Sludges and filter cakes from gas treatment containing hazardous substances | 4,099 |
| 16 03 03* | Inorganic wastes containing hazardous substances | 3,222 |
| 05 01 06* | Oily sludges from maintenance operations of the plant or equipment | 2,975 |
| 13 01 05* | Non-chlorinated emulsions | 2,940 |
| 05 01 03* | Tank bottom sludges | 2,555 |
| 13 01 11* | Synthetic hydraulic oils | 2,294 |
| 16 07 08* | Wastes containing oil | 2,096 |
| 13 05 06* | Oil from oil/water separators | 2,055 |
| 16 01 07* | Oil filters | 1,923 |
| 17 05 03* | Soil and stones containing dangerous substances | 1,812 |
| 12 01 09* | Machining emulsions and solutions free of halogens | 1,385 |
| 16 02 15* | Hazardous components removed from discarded equipment | 1,229 |
| 16 01 04* | End-of-life vehicles | 1,197 |
| | Other waste types | 18,680 |
| total | | 209,876 |

Hazardous waste generated, without wastes from mining and quarrying



- 10 02 07* Solid wastes from gas treatment
- 10 02 13* Sludges and filter cakes from gas treatment
- 16 03 03* Inorganic wastes
- 05 01 06* Oily sludges from maintenance operations of the plant or equipment
- 13 01 05* Non-chlorinated emulsions
- 05 01 03* Tank bottom sludges
- 13 01 11* Synthetic hydraulic oils
- 16 07 08* Wastes containing oil
- 13 05 06* Oil from oil/water separators
- 16 01 07* Oil filters
- 17 05 03* Soil and stones containing
- 12 01 09* Machining emulsions and solutions free of halogens
- 16 02 15* Hazardous components removed from discarded equipment
- 16 01 04* End-of-life vehicles
- Other waste types

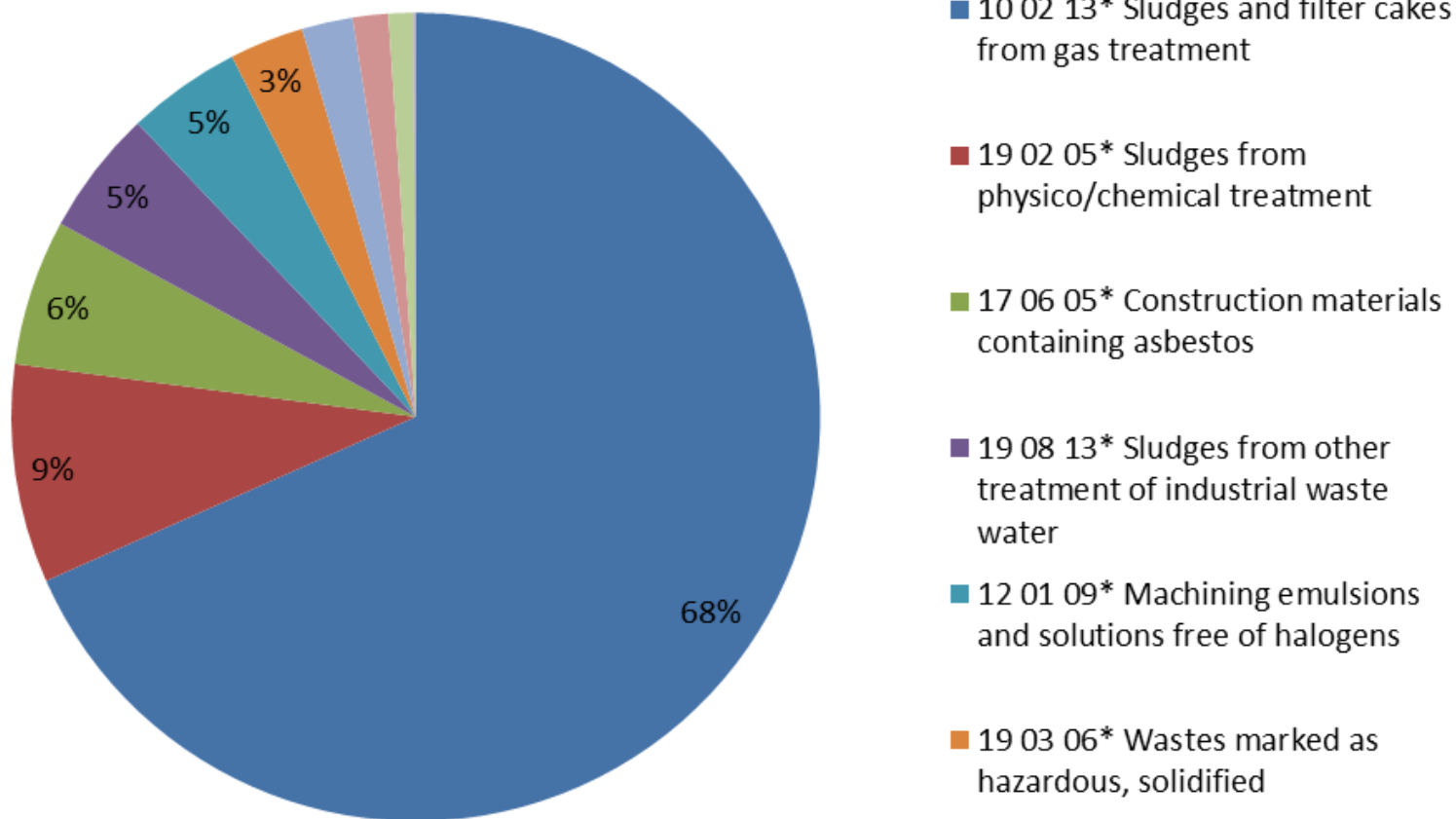
Source: SEPA (2016)

Quantities of hazardous waste landfilled

| Waste type | | Amount (t) 2014 |
|--------------|---|--------------------|
| 10 02 13* | Sludges and filter cakes from gas treatment containing hazardous substances | 4,097 |
| 19 02 05* | Sludges from physico/chemical treatment containing hazardous substances | 524 |
| 17 06 05* | Construction materials containing asbestos | 350 |
| 19 08 13* | Sludges containing hazardous substances from other treatment of industrial waste water | 300 |
| 12 01 09* | Machining emulsions and solutions free of halogens | 273 |
| 19 03 06* | Wastes marked as hazardous, solidified | 178 |
| 12 01 12* | Spent waxes and fats | 122 |
| 17 06 03* | Other insulation materials consisting of or containing hazardous substances | 85 |
| 17 09 03* | Other construction and demolition wastes (including mixed wastes) containing hazardous substances | 60 |
| 17 06 01* | Insulation materials containing asbestos | 5 |
| total | | 5,995 |

Source: SEPA (2016)

Hazardous wastes landfilled



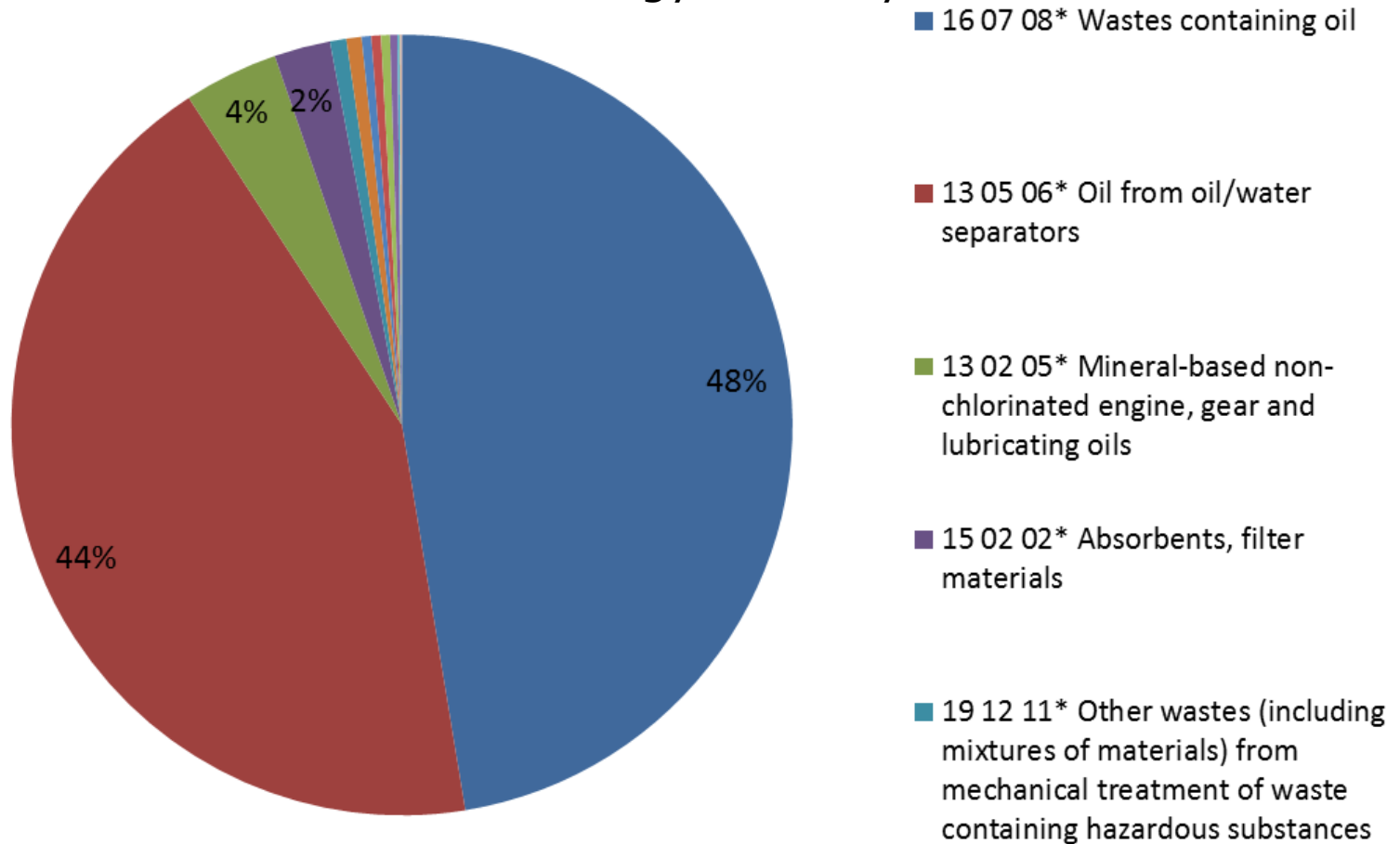
Source: SEPA (2016)

Quantities of hazardous waste used for energy recovery

| Waste type | | Amount (t) 2014 |
|------------|---|--------------------|
| 16 07 08* | Wastes containing oil | 2,038 |
| 13 05 06* | Oil from oil/water separators | 1,866 |
| 13 02 05* | Mineral-based non-chlorinated engine, gear and lubricating oils | 168 |
| 15 02 02* | Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by hazardous substances | 100 |
| 19 12 11* | Other wastes (including mixtures of materials) from mechanical treatment of waste containing hazardous substances | 29 |
| 13 08 99* | Wastes not otherwise specified | 27 |
| | Other waste types | 68 |
| | total | 4,296 |

Source: SEPA (2016)

Hazardous wastes used for energy recovery



Source: SEPA (2016)

Quantities of hazardous waste treated in recovery operations other than energy recovery (R2-R11)

| | Waste type | Amount (t) 2014 |
|-----------|---|--------------------|
| 06 01 04* | Phosphoric and phosphorous acid | 23,902 |
| 05 01 06* | Oily sludges from maintenance operations of the plant or equipment | 9,900 |
| 20 01 35* | Discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components | 9,442 |
| 16 02 13* | Discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12 | 8,542 |
| 10 02 07* | solid wastes from gas treatment containing dangerous substances | 6,086 |
| 05 01 03* | Tank bottom sludges | 3,456 |
| 01 05 05* | Oil-containing drilling muds and wastes | 3,000 |
| 01 05 06* | Drilling muds and other drilling wastes containing dangerous substances | 1,750 |
| 18 01 03* | Wastes whose collection and disposal is subject to special requirements in order to prevent infection | 1,540 |
| 16 06 01* | Lead batteries | 1,434 |
| 13 08 99* | Wastes not otherwise specified | 1,053 |
| | Other waste types | 5,038 |
| | total | 75,143 |

Quantities of hazardous waste treated in recovery operations other than energy recovery – recovery operations

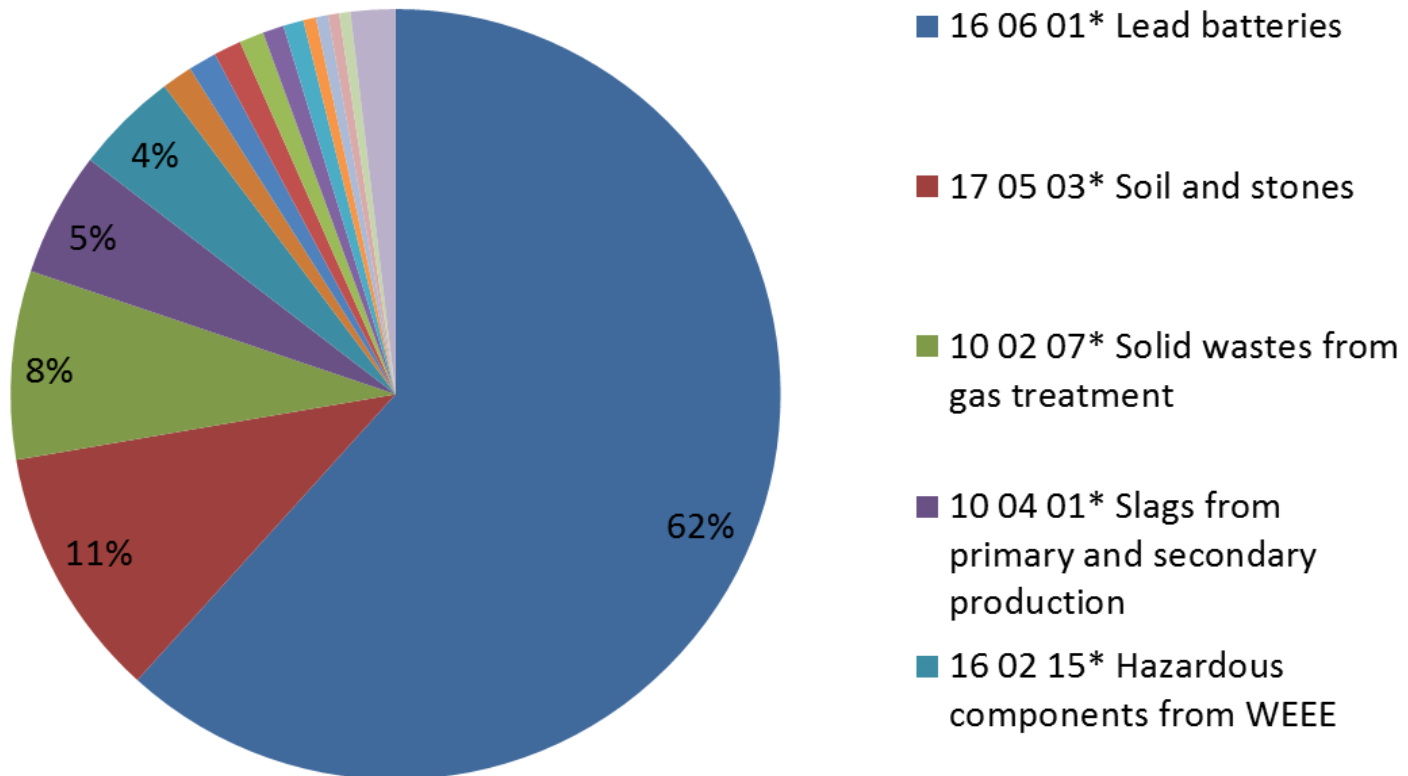
| Code | Type of recovery operation | Amount (t) 2014 |
|------|--|--------------------|
| R2 | Solvent reclamation/regeneration | 348 |
| R3 | Recycling/reclamation of organic substances which are not used as solvents | 658 |
| R4 | Recycling/reclamation of metals and metal compounds | 26,579 |
| R5 | Recycling/reclamation of other inorganic materials | 24,559 |
| R7 | Recovery of components used for pollution abatement | 4,164 |
| R9 | Oil re-refining or other reuses of oil | 2,646 |
| R10 | Land treatment resulting in benefit to agriculture or ecological improvement | 15,907 |
| R11 | Use of wastes obtained from any of the operations numbered R1 to R10 | 280 |
| | total | 75,143 |

Source: SEPA (2016)

Quantities of hazardous waste exported

| Waste type | | Amount (t) 2014 |
|------------|---|-----------------|
| 16 06 01* | Lead batteries | 15,427 |
| 17 05 03* | Soil and stones containing hazardous substances | 2,645 |
| 10 02 07* | Solid wastes from gas treatment containing hazardous substances | 1,978 |
| 10 04 01* | Slags from primary and secondary production | 1,308 |
| 16 02 15* | Hazardous components removed from discarded equipment | 1,084 |
| 08 01 13* | Sludges from paint or varnish containing organic solvents or other hazardous substances | 321 |
| 16 08 02* | Spent catalysts containing hazardous transition metals or hazardous transition metal compounds | 297 |
| 10 04 02* | Dross and skimmings from primary and secondary production | 290 |
| 07 05 13* | Solid wastes containing hazardous substances | 256 |
| 20 01 35* | Discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components | 222 |
| 08 01 11* | Waste paint and varnish containing organic solvents or other hazardous substances | 213 |
| | Other waste types | 963 |
| | total | 25,004 |

Hazardous wastes exported



Source: SEPA (2016)

| Waste category (EWC-Stat) | Generation (t) | Energy recovery (t) | Landfilling (t) | Export (t) | R2-R11 (t) |
|---|----------------|---------------------|-----------------|---------------|---------------|
| 1 Spent solvents | 98 | | | 5 | |
| 3 Acid, alkaline or saline wastes | 1,359 | | | 67 | 23,927 |
| 4 Used oils | 12,415 | 2,072 | 395 | | 20,858 |
| 6 Chemical Wastes | 11,296 | 144 | | 1,458 | |
| 8 Industrial effluent sludges | 2,762 | 2,038 | 300 | | |
| 10 Sludges and liquid wastes from waste treatment | 595 | | 524 | 74 | 29 |
| 12 Health care and biological wastes | 2,682 | 13 | | | 1,544 |
| 17 Glass wastes | 0 | | | | |
| 22 Wood wastes | 397 | | | | |
| 24 Wastes containing PCB | 72 | | | 128 | |
| 26 Discarded equipment | 4,824 | 2 | | 1,306 | 18,065 |
| 28 Discarded vehicles | 1,197 | | | | 720 |
| 30 Batteries and accumulators wastes | 753 | | | 15,427 | 1,434 |
| 36 Mixed and undifferentiated materials | 3,348 | | | 117 | 36 |
| 38 Sorting residues | 231 | 29 | | 128 | 14 |
| 41 Mineral waste from construction and demolition | 335 | | 145 | | 2 |
| 43 Other mineral wastes | 155,155 | | 354 | | 1,750 |
| 45 Combustion wastes | 10,513 | | 4,099 | 3,649 | 6,112 |
| 47 Soils | 1,812 | | | 2,645 | 652 |
| 51 Mineral waste from waste treatment and stabilised wastes | 32 | | 178 | | |
| Total | 209,876 | 4,296 | 5,995 | 25,004 | 75,143 |

Source: SEPA (2016)

Some conclusions and remarks

- There are discrepancies between generated and treated quantities. Reasons for the discrepancies include:
 - **Temporary storage**
 - Data of SEPA on waste generation covers only wastes from industrial/commercial sources. There is no exact information available on the generation of **hazardous wastes from households**. The treated quantities of hazardous wastes sometimes also include wastes from households.
 - The quantities of hazardous wastes reported as recycled/recovered may include double countings because of subsequent treatment steps (e.g. dismantling of WEEE followed by recycling)
 - Quantities of hazardous wastes treated in recovery operations other than energy recovery partly remain unclear. Sometimes the allocation of **R-codes** seems to be questionable (R10 for hazardous waste?).
- The data on waste generation 2014 includes 155,044 t of wastes from **mining and quarrying** (category “Other mineral wastes”).
- Comparisons with the data from other countries indicate, that the generated quantities of certain waste categories are low in Serbia.

Collection systems for hazardous wastes in Serbia

- Currently the collection system for hazardous wastes from industry and commerce is primarily based on the economic value of the waste.
- Certain hazardous wastes from households are collected in the context of special waste streams (WEEE, batteries, etc.). For other hazardous wastes from households (e.g. waste oil, medical waste, varnishes) no regular collection system has been established.
- According to the database of SEPA, about 250 permits for the collection of hazardous waste have been issued by 20.9.2016. Furthermore, 140 permits have been issued for the storage of hazardous waste.

Existing treatment facilities for hazardous waste - Incineration

- **Waste incineration:** No plants
- **Co-Incineration:**
 - Two **cement plants** have permits for the thermal treatment of hazardous wastes.
 - The third cement plant is in the procedure of obtaining a permit.
 - Between 2006 and 2014 nearly 210,000 t of non-hazardous and hazardous waste were used as an alternative fuel in the Serbian cement plants.

Existing treatment facilities for hazardous waste - Landfills

- There are **4 landfills**, on which specific hazardous wastes can be disposed of.
 - **Three** are regional sanitary landfills for non-hazardous waste, which have **cells for wastes containing asbestos**
 - **One** landfill, belonging to a steel company, has a permit for disposing of their **own hazardous wastes**.

Existing treatment facilities for hazardous waste - Chemical-physical treatment

- At least **8 facilities** can be classified as chemical-physical treatment plants
 - Mainly physical pretreatment of waste oils / emulsions
 - Total capacity > 7.000 t

Existing treatment facilities for hazardous waste – further facilities

- At least 47 facilities for the treatment of hazardous medical wastes
- Several companies have permits for the pre-treatment of hazardous WEEE
 - Total capacity in 2012 > 66.000 t /year
- In 2016 about 130 companies had permits for the treatment of ELV – most of them for the treatment of non-hazardous ELV
- One company has a permit for re-refining of waste oils – but not operating
- One company has a permit for recycling of lead batteries – but not operating
- At least two plants for the cleaning und solidification of contaminated soils
- At least one facility had a permit for the treatment of asbestos waste and two facilities for the packing of asbestos waste.

20

Expected types and quantities of hazardous waste in Serbia

I. Introduction

II. Extrapolations of specific waste categories based on waste statistics of selected EU MS

III. Forecasts for other selected waste streams

IV. Summary

Introduction

- Objectives of the estimation:
 - To get a full picture of the hazardous wastes generated
 - To make prognosis of future quantities (2020 →)
- The current status of waste quantities serves as basis
- Future quantities depend above all on:
 - Developments of separate waste collection
 - &
 - Developments of economy and population

Extrapolations of specific waste categories based on waste statistics of selected EU MS

- In comparison with the data from other countries, the quantities of 1) spent solvent, 2) acid, alkaline and saline wastes, 3) chemical wastes, 4) industrial effluent sludges and 5) waste oils seem to be low.
- Extrapolations were made, based on waste statistics of selected countries

Extrapolations of specific waste categories based on waste statistics of selected EU MS

- Based on the data reported in accordance with the EU Waste Statistics Regulation by the following countries: Croatia, Hungary, Slovenia, Poland, Romania
- Extrapolations were based on the number of employees for the different manufacturing sectors and for mining and quarrying and on the number of inhabitants for other economic sectors

Extrapolations of chemical wastes, industrial sludges and used oils - Results

| Waste category | Extrapolated based on the waste statistics of Croatia, Hungary, Poland, Slovenia and Romania | | | |
|--|--|--|---|---------------------------|
| | Hazardous wastes from manufacturing (t) | Hazardous wastes from Mining and quarrying (t) | Hazardous wastes from other sectors (t) | Extrapolated total |
| 1 Spent solvents | 1.266 | 1 | 432 | 1.699 |
| 3 Acid, alkaline or saline wastes | 3.467 | 8 | 1.558 | 5.033 |
| 4 Used oils | 9.307 | 4.248 | 8.761 | 22.316 |
| 6 Chemical Wastes | 14.798 | 142 | 9.094 | 24.034 |
| 8 Industrial effluent sludges | 3.755 | 2.881 | 1.215 | 7.850 |

Forecasts for other selected waste streams

| Waste stream | Method / data source | Results / quantity in t |
|---|---|-------------------------|
| Healthcare waste (medical waste) | The National Plan for the Management of Waste Originating from Healthcare Facilities and Pharmaceutical | 5,000 t / year |
| WEEE | Collection target of the WEEE-Directive (2002/96/EC): 4 kg/ inhabitant from households. Assumption based on data from other countries: 50% of WEEE is hazardous | 13,800 t/ year |
| ELV | Calculations based on the statistics on registered passenger cars and extrapolations based on data from other countries. | 45,700 t / year |

Forecasts for other selected waste streams

| Waste stream | Method / data source | Results / quantity in t |
|--|--|-------------------------|
| Lead-acid accumulators | Data reported to SEPA by waste treaters and exporters. Assumption of the future development of the car fleet (+ 2,2% annually) | 17,600 t / year |
| Portable batteries and accumulators | Assumption, based on data from other countries, on the annual per capita quantity put on the market (200 g/ inhabitant). Collection target of 25% according to the Batteries and Accumulators Directive | 350 t/ year |
| Hazardous construction and demolition waste | Data of the draft Waste Management Plan for hazardous C&D waste | 4,087 t / year |

Challenging waste categories

- **Secondary wastes from waste treatment:**
 - Quantities depend strongly on the development of the waste management sector, which is difficult to forecast.
 - Assumption: 1 kg / capita of sorting residues and of mineral wastes from waste treatment based on the data from other countries (14,500 t in total)
- **Contaminated soils:**
 - Quantities depend strongly on the future remediation activities
 - Estimation is not possible!
- **Mineral wastes from mining and quarrying**
 - It remains unclear, which wastes are covered by the Waste Framework Directive and should thus be taken into account in the IHWMP
 - Assumption: 60.000 t/year
- **Asbestos wastes**
 - Generation depends strongly on the development of collection systems
 - Assumption: Quantity up to 40,000 t/ year based on the Waste Management Plan for Asbestos-containing waste
- „Historical wastes“

Summary and comparison with the current status

| | Prognosis |
|---|------------------|
| 1 Spent solvents | 1.699 |
| 3 Acid, alkaline or saline wastes | 5.033 |
| 4 Used oils | 22.316 |
| 6 Chemical Wastes | 24.034 |
| 8 Industrial effluent sludges | 7.850 |
| 10 Sludges and liquid wastes from waste treatment | 699 |
| 12 Health care and biological wastes | 5.000 |
| 17 Glass wastes | 0 |
| 22 Wood wastes | 466 |
| 24 Wastes containing PCB | 84 |
| 26 Discarded equipment | 13.800 |
| 28 Discarded vehicles | 45.700 |
| 30 Batteries and accumulators wastes | 18.000 |
| 36 Mixed and undifferentiated materials | 3.952 |
| 38 Sorting residues | 6.897 |
| 41 Mineral waste from construction and demolition | 530 |
| 43 Other mineral wastes | 100.000 |
| 45 Combustion wastes | 12.400 |
| 47 Soils | 3.278 |
| 51 Mineral waste from waste treatment and stabilised wastes | 6.897 |
| TOTAL | 278.635 |

Thank you!