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Report of the United Nations Economic Commission for Europe/Eurostat/European Environment Agency Workshop on Waste Statistics

Note by the secretariat

Summary

> This document presents the outcomes of the United Nations Economic Commission for Europe/Eurostat/European Environment Agency Workshop on Waste Statistics, which took place from 11 to 13 April 2012 in Geneva. The workshop focused on how to compile and disseminate waste statistics. In particular, it discussed practical challenges and problems in producing statistical data due to the lack of harmonization of waste classifications and terminologies. The workshop was intended for national experts involved in the production of waste statistics from countries of Eastern Europe, Caucasus and Central Asia and Western Balkans. Experts from international organizations and institutions were invited to share experience and broaden the exchange of knowledge and best practices.

Please recycle

I. Introduction

A. Background

1.   The United Nations Economic Commission for Europe (UNECE) Statistical Division launched a United Nations Development Account project on strengthening the statistical capacity of countries of Eastern Europe, Caucasus and Central Asia (EECCA) to produce environmental statistics and measure sustainable development. The project will include four workshops to be held in the period 2012–2013. The first workshop was dedicated to the topic of waste statistics.

2.   The UNECE/Eurostat/European Environment Agency (EEA) Workshop on Waste Statistics was held in Geneva, Switzerland, from 11 to 13 April 2012. The Workshop was jointly organized with Eurostat and the EEA.

3.   The workshop focused on how to compile and disseminate high-quality, harmonised and timely waste statistics. In particular, it discussed practical challenges and problems in producing statistical data due to the lack of harmonization of waste classifications and terminologies. The workshop was conducted in close collaboration with the Joint UNECE Task Force on Environmental Indicators. It aimed at national experts involved in the production of waste statistics. Experts from international organizations and institutions were invited to share experience and broaden the exchange of knowledge and best practices. All documents for the workshop are available online at the UNECE website: www.unece.org/stats/documents/2012.04.environ.html

B. Attendance

4.   Environmental experts and statisticians from the following UNECE member States attended the meeting: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Montenegro, Moldova, Russian Federation, Serbia, Tajikistan, Turkmenistan, The former Yugoslav Republic of Macedonia, Ukraine and Uzbekistan.

5.   The European Commission was represented by Eurostat and the EEA.

6.   The meeting was also attended by a number of experts invited by the Secretariat and the EEA, including the United Kingdom (UK) Department for Environment, Food and Rural Affairs (DEFRA), the UK Environment Agency, Statistics Netherlands, and the European Topic Centre on Sustainable Consumption and Production.

7.   In addition, representatives of the following intergovernmental organizations participated in the meeting: the United Nations Environment Programme (UNEP) secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention), the International Energy Agency (IEA), and the United Nations Statistics Division (UNSD).

8.   Representatives of the non-governmental organization Zoi Environmental Network attended the meeting.

II.   Recovery and recycling of waste

9.   There is no strictly agreed terminology with regard to waste operations. The differences start already with basic definitions, for example of what is understood by "waste management". In the European Union (EU) legislation "waste management" means the "collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker". At the same time, the UNSD questionnaire defines "waste management" as "collection, transport, treatment and disposal of waste, including after-care of disposal sites". The definitions, although similar, have one key difference: the EU uses the term "recovery", whereas the UNSD uses the term "treatment". Some other definitions of "waste management" also include supplementary operations, which are related to the prevention and reduction of waste.

10.   This Chapter focuses on the waste management with respect to the waste recovery and recycling operations and discusses the related terminology and approaches. Recent developments in collecting data on renewables and waste are also reviewed. This is a fairly new area, where countries need to build expertise in order to produce regular statistics.

A.   Recovery and recycling operations — the European Union perspective

1.   The meaning of recovery operations

11.   The issue of recovery and recycling of waste has become a major priority for European policymakers. In December 2005, the Commission published a Communication on the Thematic Strategy on the prevention and recycling of waste. The strategy states the long-term goal of the EU, which is to become a recycling society that seeks to avoid waste and uses waste as a resource.

12.   In its Resolution of 24 February 1997[1], the European Council calls for the need to distinguish more clearly between waste recovery and disposal operations. The need is further reiterated in the Waste Framework Directive:

> "The definitions of recovery and disposal need to be modified in order to ensure a clear distinction between the two concepts, based on a genuine difference in environmental impact through the substitution of natural resources in the economy and recognising the potential benefits to the environment and human health of using waste as a resource."

13.   According to the Waste Framework Directive **"recovery"** means "any operation the principle result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfill a particular function, or waste being prepared to fulfill that function, in the plant or in the wider economy". Recovery operations are considered to include **preparing for reuse, recycling, composting and recovering energy from waste**.

14.   It is important to distinguish between "reuse" and "preparing for reuse". **"Reuse"** is "any operation by which products or components that are _not waste_ are used again for the same purpose for which they were conceived". Materials that are reused are not considered waste as such. **"Preparing for reuse"** is a different term, and includes "checking, cleaning or repairing recovery operations, by which products or components of products that have

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[1]   Council Resolution of 24 February 1997 on a Community strategy for waste management (OJ C 76, 11.3.1997, p. 1–4)

become waste are prepared so that they can be reused without any other pre-processing". These are considered *waste recovery* operations;[2]

15.   **"Recycling"** is another recovery operation, which although similar is different from **"preparing to reuse". "Recycling"** is defined as "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations."

16.   The waste management operations follow a certain hierarchy depending on their impact on environment. With the current level of scientific and technological progress, "preparing for reuse" and "recycling" are considered to be the options preferred over "energy recovery from waste", where and insofar as they are the best choice from the environmental point of view. The hierarchy ranks the operations in the order from most to least favored operations, as follows:

        (a)   Prevention;

        (b)   Preparing for reuse;

        (c)   Recycling;

        (d)   Other recovery, e.g., energy recovery;

        (e)   Disposal.

2.   Recovery and disposal operations

17.   The requirement to compile statistics on recovery and disposal operations is stated in Regulation (EU) No 849/2010. The recovery operations are marked with "R-codes" that range from R1 to R11, and belong to or are part of the economic activities (NACE Rev. 2). Figure 1 provides the list with the recovery operations as defined by the Regulation.

Figure 1
Recovery operations according to the European Union legislation

Incineration		
	R1	Use principally as a fuel or other means to generate energy
Recovery operations (excluding energy recovery)		
3a	R2 +	Solvent reclamation/regeneration
	R3 +	Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes)
	R4 +	Recycling/reclamation of metals and metal compounds
	R5 +	Recycling/reclamation of other inorganic materials
	R6 +	Regeneration of acids or bases
	R7 +	Recovery of components used for pollution abatement
	R8 +	Recovery of components from catalysts
	R9 +	Oil refining or other reuses of oil

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[2] In general, manure and slurry are only covered by waste statistics if they are treated in waste treatment facilities, e.g., in biogas plants. The huge amounts that are reused in agriculture are not reported as wastes.

	R10 +	Land treatment resulting in benefit to agriculture or ecological improvement
	R11	Use of wastes obtained from any of the operations numbered R1 to R10
3b		Backfilling 1/

Source: Extract from the Regulation (EU) No 849/2010

Note: 1/ In general, backfilling is defined as the practice of returning some or all of the waste produced into worked-out underground voids.

18.   Disposal operations are designated with "D codes", ranging from D1 to D7, and D10 and D12. They include, for example, "deposit into or onto land" (D1), "release into a water body except seas/oceans" (D6), "deep injection" (D7), "incineration on land" (D10), "permanent storage" (D12), etc.

19.   Eurostat collects data on waste recovery and disposal, as follows:

   (a)   By waste category;

   (b)   By treatment operation.

20.   The waste categories are specified in the statistical waste nomenclature EWC-Stat Version 4, which is a mainly substance-oriented aggregation of the waste types defined in the European List of Wastes. The treatment operations include energy recovery, recovery other than energy recovery, incineration without energy recovery and disposal (deposit onto or into land, and land treatment and release into water bodies).

21.   Figures 2a and 2b show the Eurostat reporting structure. Two forms are available for reporting the data sets. Figure 2a organizes the data by waste categories (0.1.1 — Spent solvents, etc.) and by the type of treatment operation (incineration, recovery, and disposal). Figure 2b adds information on the number of treatment facilities and their capacity.

Figure 2a

Reporting structure — Waste recovery and disposal

Description	Haz	Incineration		Recovery	Disposal	
		(R1)	(D10)	(R2 - R11)	(D1, D3 - D5, D12)	(D2, D6, D7)
01.1 - Spent solvents	H					
02 - Chemical preparation wastes	H					
03.1 - Chemical deposits/residues						
….						
05 - Health care /biological wastes						
06 - Metallic wastes						
07.1 - Glass wastes						
07.2 - Paper / cardboard wastes						
07.3 - Rubber wastes						
07.4 - Plastic wastes						
08 - Discarded equipment						
08.1 - Discarded vehicles						
...						
Total						

   Source: Eurostat

Figure 2b
Reporting structure — Facilities

Regions, NUTS 2 level	1 Energy recovery (R1)		2 Waste incineration (D10)		3 Recovery (R2-R11) 3a / 3b	4 Landfilling (D1, D5, D12) haz waste			non-haz waste			inert waste			landfills total	
	no. of facilities	cap. t/a	no. of facilities	cap t/a	no. of facilities	no. of facilities	rest cap m³	closed	no. of facilities	rest cap m³	closed	no. of facilities	rest cap. m³	closed	no. of facilities	rest cap m³
Region 1																
Region 2																
Region 3																
…																
…																
…																
National total																

Source: Eurostat

B. Recovery and recycling operations — the United Nations perspective

1. The terms "treatment", "recovery" and "disposal"

22. In general, the UNSD does not define "treatment" alone and makes no particular distinction between "treatment" and "disposal". For example, the UNSD considers "incineration without energy recovery" as "treatment or disposal". While this is clearly a disposal operation according to the EU, here it is not obvious whether it is considered a "treatment" or "disposal" operation.

23. One should be also careful not to make a direct analogy between "treatment" and "recovery". In the definitions provided by the UNSD, there is no definition of "recovery" as such. If the EU definition of "treatment" is applied, then "treatment" should be the general term that includes both "recovery" and "disposal" operations (Waste Framework Directive).

2. The term "recycling"

24. The UNSD has a distinct definition of "recycling", which is close to the EU definition of the same term. A recycling operation is "any reprocessing of waste material in a production process that diverts it from the waste stream, except reuse as fuel. Both reprocessing as the same type of product, and for different purposes should be included."

25. It is interesting to notice that the UNSD, like the EU, excludes the "reuse as fuel" from the recycling operation. "Reuse as fuel" is not, however, defined by the UNSD, whereas according to the EU it is a type of incineration under recovery operations (see Figure 1, code R1).

26. Recycling within industrial plants, i.e., at the place of generation, is excluded from both the European and the United Nations definitions.

27. The UNSD collects data on the recycling of hazardous wastes and municipal wastes. It introduced changes to its questionnaire in 2008, suspending the use of the table on generation and recycling of selected waste materials due to the lack of data.

C. Recovery operations — the International Energy Agency perspective

28.   In its work on renewables and waste, the IEA takes a different perspective on waste terminology and waste data collection. For example, the IEA collects data on waste in energy units (net calorific value) rather than in mass (e.g., tonnes) or in volume (e.g., cubic metres). The IEA also uses the term "acquisition of renewable energy by combusting waste", which could be perhaps analogous to the term "incineration with energy recovery" used by Eurostat and the UNSD.

29.   According to the Energy Statistics Manual, waste is "a fuel consisting of many materials coming from combustible industrial, institutional, hospital and household wastes such as rubber, plastics, waste fossil oils and other similar commodities. It is either solid or liquid in form, renewable or non-renewable, biodegradable or non-biodegradable." For the purpose of energy statistics, "waste" is considered materials that are no longer required by their holders and refers only to the portion of industrial and municipal solid wastes, which can be used as fuels.

30.   Waste (industrial and municipal) is categorized in renewables and non-renewables, as follows:

        (a)   Industrial wastes (non-renewables): Wastes of industrial non-renewable origin (solids or liquids) combusted directly for the production of electricity and/or heat;

        (b)   Industrial wastes (renewables): Renewable industrial waste should be reported in the solid biomass, biogas and/or liquid biofuels categories. *Note*: Industrial wastes (renewables) are not considered waste as such;

        (c)   Municipal solid wastes (non-renewables): Waste produced by households, industry, hospitals and the tertiary sector that contains non-biodegradable materials incinerated at specific installations;

        (d)   Municipal solid wastes (renewables): Waste produced by households, industry, hospitals and the tertiary sector, which contains biodegradable materials incinerated at specific installations.

31.   The distinction between non-renewable and renewable wastes is important because the non-renewable component is counted when calculating CO_2 emissions. This is the reason why the IEA collects data on industrial wastes (non-renewables) and municipal solid wastes (non-renewables), even if they are not used to produce renewable energy.

32.   The definition of municipal solid waste in the context of energy statistics is clear. In practice, however, it is difficult to distinguish between non-renewable and renewable municipal solid wastes as often they both contain components that are biodegradable and non-biodegradable. According to the Energy Statistics Manual, if it is not possible to distinguish between renewable and non-renewable municipal solid wastes, then the total quantity should be divided equally between both categories.

33.   The IEA collects data through the Renewables and Waste Questionnaire, which is one of the five Joint IEA/Eurostat Annual Questionnaires. Currently, the data collection on renewables and waste faces a number of challenges. Estimation methodologies for accounting for the use of renewables are not standardised. They differ for each country and for each renewable energy source. For renewables, many statistical methods are based on estimations, and not on measurements. Estimations are made, for example, using alternative data sources (e.g., industry reports); or using sales figures, present value or average efficiencies for technologies (e.g., to assess capacity). Often assumptions are needed to evaluate the energy consumption for non-energy uses (e.g., fuels like lubricants and greases that are used for their "slippery" properties and not for energy consumption).

34.   There are also some challenges specific for the EECCA region. They include problems in determining the breakdown of electricity and heat from combustible fuels, lack of harmonization of measurement units across countries, and difficulties to match national with international (IEA, EU, etc.) statistical classifications.

III.   Classifications and definitions related to waste statistics

35.   The topic of classifications was found to be the most difficult as well as the most useful at the Workshop. In the evaluation feedback, more than two thirds of the participants ranked the session on classification issues as excellent. Among the main concerns of the EECCA countries were the use of different classification methods and definitions, the introduction of new classifications, inconsistencies in the terminology, e.g., defining toxic versus hazardous waste. It was noted that clear definitions and a common understanding of waste classifications are necessary in order to produce comparable and reliable data.

36.   The European experience shows that classification issues also exist at the EU level. While the Waste Statistics Regulation (EU) No 849/2010 specifies the waste categories (EWC-Stat) that have to be used for reporting to Eurostat, it does not prescribe a specific classification to be used during data collection. The EU Member States are free to use any waste classification as long as they can report to Eurostat in the defined formats and with the required quality. The room for flexibility is much appreciated by the countries. In practice, however, issues frequently arise with the reported data. In most cases these issues are due to differences in classifications.

A.   Waste classifications

1.   Classifications related to waste generated by economic activities

(a)   Global and European classifications of waste generated by economic activities

37.   Two main classifications are used when reporting to international organizations on waste generated by economic activities. These are the "International Standard Industrial Classification of All Economic Activities" (ISIC) and "Statistical Classification of Economic Activities in the European Community" NACE[3].

38.   In reporting to the UNSD questionnaire, countries should follow ISIC Rev. 4. The data reported to Eurostat is compiled according to NACE Rev. 2 (Regulation (EU) No 849/2010 on European Waste Categories). In the previous version of Eurostat's Manual on Waste Statistics, NACE Rev. 1.1 was used. From the 2008 reporting round onwards countries have been required to use NACE Rev. 2.

39.   According to the UNECE survey replies (Annex II) the majority of the EECCA countries follow the NACE classification. Armenia and Azerbaijan use NACE Rev. 2. Kazakhstan and Ukraine follow NACE Rev. 1.1. Georgia replied that they use the NACE classification and Kyrgyzstan indicated that they follow a national classification, which is based on NACE, without, however, specifying which revision of NACE. Moldova and the Russian Federation have their own national classification, which is based on NACE Rev. 1. Uzbekistan and Belarus have their own national classifications.

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[3] NACE is the acronym for "Nomenclature statistique des activités économiques dans la Communauté européenne".

40.   In reporting the data on waste generated by economic activities to the UNECE questionnaire, the EECCA countries were asked to follow the ISIC Rev. 4. Thanks to the correspondence tables, the matching codes are easy to find between the two classifications and for most of the EECCA countries it was not a problem to make the conversion from NACE to ISIC. There were, however, some difficulties for countries using national classifications and for countries still using previous revisions where correspondence tables were not readily available.

41.   The EECCA countries that send data to both Eurostat (reporting on ISIC) and UNECE (reporting on NACE) should note that the "total waste generated" may be different in the two cases. The difference could be due to the issue of residues from waste treatment. In reporting to UNECE, code E38 of ISIC Rev. 4 is excluded. This is not the case when reporting to Eurostat, where the matching code E38 of NACE Rev. 2 is included. In general, the residues need to be reported to Eurostat (see section 2.2.1. of the EU's Manual on Waste Statistics), thus, it is important to determine the cases in which the reporting of residues leads to double counting. There are, for example, some types of pre-treatment which do not change the structure of the waste, for instance re-packaging and temporary storage. The inclusion of waste from these pre-treatment operations would result in double counting of the same unaltered waste. Facilities performing such operations should therefore not report waste originating from such operations but only residues generated as a result of other activities (e.g., consumption residues).

(b)   Eastern Europe, Caucasus and Central Asia countries term "waste from consumption and production"

42.   In the EU Member States, waste generation is categorized by economic activities that generate the waste, and household waste. When referring to waste, the EECCA countries use the term "waste generated by consumption and production". According to the Russian federal law on "waste generated by production and consumption", this term is defined as waste generated in the process of production and consumption. One understanding could be that waste generated by production corresponds to waste generated by economic activities, whereas waste generated by consumption would be equivalent to household waste. While this is a plausible supposition, without a detailed and clear definition, it is difficult to specify an exact relationship between the terminology used in the EU Member States and the EECCA countries.

2.   Classifications related to waste categories and types

43.   In addition to the breakdown by economic activities, Eurostat also collects data on waste generation and waste treatment by waste category and type.

44.   In practice, most of the EU countries collect their data by type following the List of Wastes. They subsequently make the correspondence between the waste types and the EWC-Stat categories using the transposition table in Annex III of the Waste Statistics Regulation. The direct use of the EWC-Stat for data collection is applied by only a few countries.

45.   Some EECCA countries have adopted, or are in the process of adopting, the List of Wastes in their data reporting on waste types. An example of how Ukraine has made the transition to the European standards is presented in Box 1.

Box 1
Ukraine: Example of transition to the European standards

In 2010 Ukraine adopted new standards of waste statistics based on the European standards. In the transition, Ukraine followed the Waste Statistics Regulation — Regulation 2150/2002/EC (later amended by Regulation 849/2010).

In order to better respond to the European standards, a new reporting form, Form 1 — Waste, was developed and put in place in 2010. Form 1 kept national specificities while integrating the European standards. The new form replaced three already existing forms, one of which (Form 1 — Hazardous waste) served as a basis for the former.

To develop the new form, Ukraine used, among others, the following classifications:
• The classification of economic activities harmonized with the NACE classification Rev. 1.1–2002
• State Classification of Waste DK 005-96
• Toxicity classification (4 classes of hazard level; radioactive waste is not covered by Form 1)

At the same time, in order to make its national waste statistics compatible with the European statistics, in 2010 the State Statistics Service of Ukraine developed and introduced two lists related to waste:
• List of waste categories by material, including 31 categories that correspond to 48 categories of the European Waste Classification for Statistics EWC-Stat, Version 3
• List of waste recycling and disposal operations: in order to facilitate the transition to the new form the list contains the codes used in Ukraine and their correspondence to the R- and D-codes of Eurostat

As a result, the reporting process has been significantly streamlined: according to the State Statistics Service of Ukraine it is now possible to account for almost all the positions of international statistical questionnaires on waste.

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[1] When compared to international waste statistics, the waste of the fourth class (in accordance with the Ukrainian toxicological classification — low-hazard waste) is considered as non-hazardous.

3. **Classifications related to hazardous waste**

(a) **Global and European classifications of hazardous waste**

46. Internationally, there are two main classifications of hazardous waste: the Basel Convention and the European Union classifications. The two classifications are not easily comparable. They use their own coding systems that have no direct correspondence: the codes differ in defining the hazardous properties and the level of aggregation.

i. *Hazardous properties (H-codes) — the Basel Convention and the European Union classifications*

47. According to the Basel Convention, countries have to report on the quantity of wastes that possess any hazardous characteristics (H-codes) and classify them according to the waste categories (Y-codes). Article 1.1 of the Basel Convention specifies "hazardous wastes" subject to transboundary movement, as follows:

"Wastes that belong to any category contained in Annex I (Y-codes), unless they do not possess any of the characteristics contained in Annex III (H-codes)."

48. Furthermore, the EU Waste Framework Directive defines "hazardous waste" as waste which displays one or more of the hazardous properties listed in Annex III of the Directive. These hazardous properties, again called H-codes, are used to define the waste as hazardous or non-hazardous and to classify it according to the EU waste categories (EWC-Stat).

49. The challenge to the reporting countries comes from the fact that the H-codes of the Basel Convention do not match the H-codes of the EU Waste Framework Directive. Figures 4a and Figure 4b illustrate the extent to which the H-codes differ with a few examples.

Figure 4a

Example of hazardous properties (H-codes) as according to the Basel Convention

Extract of the Basel Convention H-codes, Annex III of the Basel Convention: List of hazardous characteristics

6.1	H6.1	Poisonous (Acute)
		Substances or wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact.
6.2	H6.2	Infectious substances
		Substances or wastes containing viable microorganisms or their toxins which are known or suspected to cause disease in animals or humans.
8	H8	Corrosives
		Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport; they may also cause other hazards.
9	H10	Liberation of toxic gases in contact with air or water
		Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
9	H11	Toxic (Delayed or chronic)
		Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity.

Figure 4b

Example of hazardous properties (H-codes) as according to the European Union

Extract of the European Union H-codes, Annex III of Waste Framework Directive 2008/98/EC: Properties of wastes which render them hazardous

H 6:	'Toxic': substances and preparations (including very toxic substances and preparations) which, if they are inhaled or ingested or if they penetrate the skin, may involve serious, acute or chronic health risks and even death.
H 7:	'Carcinogenic': substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence.
H 8:	'Corrosive': substances and preparations which may destroy living tissue on contact.

H 9:	'Infectious': substances and preparations containing viable micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms.
H 10:	'Toxic for reproduction': substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce non-hereditary congenital malformations or increase their incidence.
H 11:	'Mutagenic': substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce hereditary genetic defects or increase their incidence.

ii. The level of aggregation — the Basel Convention and the European Union classifications

50.   Annex I of the Basel Convention gives 45 waste categories (Y-codes). At the same time, the EU has its own 51 waste categories (EWC-Stat), which are divided according to whether they are hazardous or non-hazardous. Thirty six categories can be either hazardous or non-hazardous, three categories are only hazardous and 12 categories are only non-hazardous.

51.   The 45 Y-codes of the Basel Convention are different from the 51 EU waste categories (EWC-Stat). At the Workshop, countries mentioned that the Y-codes are too general, i.e., do not specify further the waste type to be allocated under each of them.

52.   The EU classification, however, do provide the necessary level of aggregation. The EU has its own List of Wastes that defines 839 waste types, which are structured into 20 chapters. Each waste type is characterized by a six-digit code and further defined as hazardous or non-hazardous. The transposition table between the EU List of Wastes and the 51 EU waste categories (EWC-Stat) allows easy identification of the correspondence of each *hazardous waste type* to each *hazardous waste category*.

(b)   National classifications of hazardous waste

(i)   National legislation

53.   The Basel Convention allows for wastes to be defined as hazardous wastes by the national legislation of the country of export, import or transit.

54.   In the EU, the List of Wastes is binding to the Member States as regards the determination of the waste as hazardous waste. The EU reviews proposals for changes and may amend (although it is not obliged to do so) the List of Wastes. Any change should be based on evidence provided by Member States on the hazardous properties of waste as defined by their national legislation. The following two paragraphs of Article 7 of the Waste Framework Directive discuss this possibility:

"A Member State may consider waste as hazardous waste where, even though it does not appear as such on the list of waste, it displays one or more of the properties listed in Annex III (of the Waste Framework Directive). The Member State shall notify the Commission of any such cases without delay. It shall record them in the report and shall provide the Commission with all relevant information. In the light of notifications received, the list shall be reviewed in order to decide on its adaptation."

"Where a Member State has evidence to show that specific waste that appears on the list as hazardous waste does not display any of the properties listed in Annex III, it may consider that waste as non-hazardous waste. The Member State shall notify the Commission of any such cases without delay and shall provide the Commission with

the necessary evidence. In the light of notifications received, the list shall be reviewed in order to decide on its adaptation."

(ii)   Hazardous waste classifications in the Eastern Europe, Caucasus and Central Asia countries

55.   One of the challenges for the EECCA countries is to define the correspondence of their hazardous waste classifications with those used by the Basel Convention and the EU. Majority of the EECCA countries use national classifications of hazardous waste according to which wastes are divided into several classes based on their level of toxicity (or hazard) such as extremely hazardous, highly hazardous, moderately hazardous and marginally hazardous. According to the UNECE survey (Annex II) Azerbaijan, Belarus, Moldova and Ukraine use four classes of toxicity (or hazard) in their national classification. The Russian Federation, in addition to the four classes, has an extra fifth class, which is "non-hazardous waste". Georgia collects data according to the classification of the Basel Convention. The new national classification in Kyrgyzstan defines the hazardous properties of wastes according to the Basel Convention. Armenia, Kazakhstan and Uzbekistan did not specify the number and definition of classes used. Tajikistan has yet to adopt a classification of hazardous waste.

56.   The hazardous waste definition in the UNECE questionnaire refers to the classification of the Basel Convention. It is not clear if countries managed to follow the classification correctly when reporting to the questionnaire. There were some wide differences in the reported share of hazardous waste in the total waste generated, which could be perhaps explained by the different approaches countries have to defining waste as hazardous.

B.   Waste related definitions

1.   Waste definition

57.   Each international entity has its own formal definition of waste. According to the EU legislation, waste "shall mean any substance or object in the categories set out in Annex I which the holder discards or intends or is required to discard" (Waste Framework Directive, see Figure 5).

Figure 5
Annex I of Waste Framework Directive

Q1	Production or consumption residues not otherwise specified below
Q2	Off-specification products
Q3	Products whose date for appropriate use has expired
Q4	Materials spilled, lost or having undergone other mishap, including any materials, equipment, etc., contaminated as a result of the mishap
Q5	Materials contaminated or soiled as a result of planned actions (e.g., residues from cleaning operations, packing materials, containers, etc.)
Q6	Unusable parts (e.g., reject batteries, exhausted catalysts, etc.)
Q7	Substances which no longer perform satisfactorily (e.g., contaminated acids, contaminated solvents, exhausted tempering salts, etc.)
Q8	Residues of industrial processes (e.g., slags, still bottoms, etc.)

Q9	Residues from pollution abatement processes (e.g., scrubber sludges, baghouse dusts, spent filters, etc.)
Q10	Machining/finishing residues (e.g., lathe turnings, mill scales, etc.)
Q11	Residues from raw materials extraction and processing (e.g., mining residues, oil field slops, etc.)
Q12	Adulterated materials (e.g., oils contaminated with PCBs, etc.)
Q13	Any materials, substances or products whose use has been banned by law
Q14	Products for which the holder has no further use (e.g., agricultural, household, office, commercial and shop discards, etc.)
Q15	Contaminated materials, substances or products resulting from remedial action with respect to land
Q16	Any materials, substances or products which are not contained in the above categories.

58.   The Basel Convention defines waste as substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law.

59.   The UNECE and UNSD questionnaires define the waste as "materials that are not prime products (i.e., products produced for the market) for which the generator has no further use for his own purpose of production, transformation or consumption, and which he discards, or intends or is required to discard".

60.   The EU definition is the most comprehensive and precise. Meanwhile, the different wording in the definitions of the Basel Convention and UNECE/UNSD questionnaires creates debates. It is not clear whether the terms "dispose" and "discard" have the same meaning. Furthermore, the phrase "required to discard" does not specify by whom the waste should be discarded.
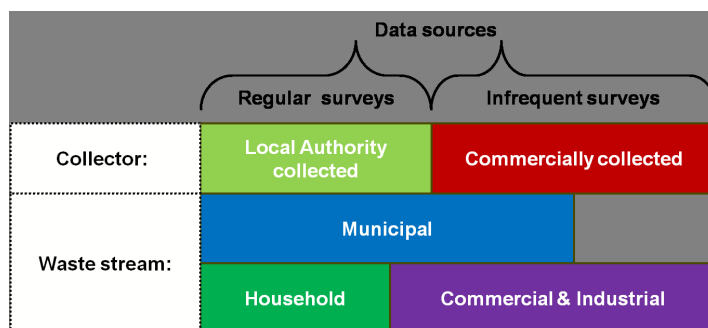
2.   Municipal waste definition

(a)   Comprehensive and clear definition

61.   The definition of municipal waste is consistent among the international entities that deal with collection of municipal waste data. The collection of data, however, remains difficult due to the interpretation of the term "municipal", which is used in different ways in the countries reflecting their country-specific waste management practices. The majority of the waste stream originates from households, although similar to household wastes, e.g., from sources such as commerce, offices and public institutions, are also included in the waste stream. Differences between countries are to some extent the result of the varying scope of these similar to household wastes.

62.   The definition of municipal waste can be illustrated by an example from the United Kingdom (Figure 6). Municipal waste consists of waste collected from households, and also includes waste generated by economic activities, which is collected together with the waste from households (e.g., commerce and trade, small businesses, office buildings, institutions).

Figure 6
Definition of municipal waste in the United Kingdom

Source: UK Department for Environment, Food and Rural Affairs (DEFRA)

Note: Excludes construction and demolition, and mining waste

(b) Need for data estimates

63.   Although the municipal waste definition is clear, it is not always possible to have complete data. The difficulty comes from producing annual estimates for the commercial and industrial waste stream, for which regular data collection is generally not available. Furthermore, the data on municipal waste are collected only in the areas where waste collection facilities exist, usually provided by the municipal authorities or by companies on their behalf. For areas not covered by municipal waste collection facilities, the amount of municipal waste needs to be estimated.

(c) The use of municipal or household waste terms

64.   In the various reporting systems, the terms *municipal* and *household* are used interchangeably. This makes data difficult to compare. For example, the UNECE questionnaire defines total waste generated as the sum of waste generated by economic activities and *municipal* waste. At the same time, the EU's total waste generated is calculated as the sum of waste generated by economic activities and *household* waste.

(d) Eastern Europe, Caucasus and Central Asia countries definitions

65.   Among the EECCA countries only Belarus has provided a definition of municipal waste (Annex III). The definition focuses more on the process of waste collection than on specific waste streams (e.g., households, small businesses, office buildings, etc.).

66.   Several EECCA countries have provided a definition of household waste: Azerbaijan, Kyrgyzstan, Moldova, Tajikistan and Ukraine (Annex III). They follow more or less the same definition, which is waste from consumption originating from the everyday activities of households.

67.   The EECCA countries did not provide a definition on hazardous household waste. A common definition does not exist also at the EU level. Box 2 discusses further the issue.

Box 2

Definition of hazardous household waste

Currently there are neither precise definitions nor common statutory controls within the European Union and countries have adopted their own approach to deal with hazardous household wastes.

A study[1] covering seventeen EU Member States showed that data on hazardous household waste are difficult to obtain and compare at the EU level. According to the study, the term "household hazardous waste" is defined as waste that could potentially increase the hazardous properties of municipal solid waste when landfilled, incinerated or composted. This definition is unfortunately too general. The study makes an attempt to further specify the scope. It lists the waste streams that are or will be subject to specific EC regulations concerning batteries, waste oils and waste of electronic and electrical equipment. It also identifies household products like paints, pesticides, arsenic-treated wood and fluorescent lamps, the monitoring of which is currently the most problematic for waste management and disposal routes.

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[1] Study on hazardous household waste with an emphasis on hazardous household chemical, commissioned by the Directorate General for the Environment of the European Union, July 2002

IV. Key issues and challenges, conclusions and recommendations

68.   The main problems with reporting data are due to classification issues. Data on waste statistics reported by the countries to the various international organizations often vary significantly. The differences are mainly due to the various classifications and definitions used by the international organizations or to the poor correspondence between national and international classifications and definitions.

69.   During the Workshop, the countries shared their experiences and exchanged views on matters of their concern. In particular, the key issues and challenges in the following areas were discussed: **data sources; data availability, time series**; **methodologies**; **comparability across countries; validation of data; and legal frameworks**. This Chapter summarizes the outcome of the discussions and concludes by providing some recommendations for improvement.

A. Key issues and challenges

1. Data sources: problems with data collection from enterprises and municipalities, from private or state sources, irregular reporting

70.   The most common problem stated by the EECCA countries is insufficient reporting by the enterprises collecting municipal waste. This occurs because of either a lack of binding legislative measures obliging such enterprises to report, or due to the absence of an officially defined list of the enterprises that should report data or be chosen as respondents to questionnaires and surveys.

71.   Some countries also mentioned the low quality of the data reported by enterprises, e.g., data contain numerous errors in measurement units and are not compatible with the data provided by other enterprises.

2. **Data availability, time series: where are the data gaps? Insufficient coverage of the data (are all sectors of economic activities covered? are all municipalities covered?); timeliness of the data**

72.   The comparison of data over time is challenging. Most of the EECCA countries reported breaks or gaps in their time series due to the transition to a new classification. In particular, Moldova harmonized its classification of economic activities with NACE in 2000, the Russian Federation in 2004, and Kyrgyzstan in 2010.

73.   The majority of the EECCA countries reported that, in general, rural areas are not covered by their data collection system and that the data on municipal waste includes, as a rule, only urban areas.

3. **Methodologies: inconsistencies in methodologies and how to cope with them, e.g., measurement units, estimations, etc.**

74.   Several countries, e.g., Kyrgyzstan, the Russian Federation, Tajikistan, and Uzbekistan reported their data on municipal waste in cubic metres (m^3) and not in tonnes, as requested. This made it difficult to compare the data among the countries. During the Workshop, this issue was discussed extensively. It was noted that conversion coefficients from cubic metres (m^3) to tonnes are not available and most EECCA countries calculate waste, including municipal waste in cubic meters (m^3). This is due to the difficulty of identifying the waste composition and the lack of measurement equipment to weigh the waste. Nevertheless, some countries tried to convert the data into tonnes for the purpose of reporting to international bodies. Participants in the Workshop noted that this conversion should be regarded more as an experiment and that the data are not fully reliable.

75.   Participants from Western countries and international organizations shared their experience on the issue. As a follow up to the Workshop, examples of conversion rates were provided from the Netherlands, Estonia and Germany (Bavaria). The information is now available to the countries on the Workshop's website.

4. **Comparability across countries: how does the use of different methods affect the comparability of the results across countries?**

76.   The comparison of data by economic sectors across countries raises questions. For example, according to the data, the total amount of waste generated by "agriculture, forestry and fishing" in Uzbekistan is close to or higher than the amount of waste generated by the same sector in the Russian Federation (see Figure 7a). The waste generated by the same sector in Moldova is reported several times higher than the amount generated in Kazakhstan. Furthermore, waste generated, again by "agriculture, forestry and fishing", in Uzbekistan was more than the waste generated by the same sector in the entire European Union in 2008 (see Figure 7b). The numbers seem unreliable given the size of economy, territory and population of these countries.

77.   These and other examples indicate that there are certainly inconsistencies in the methodologies and/or differences in classifications that currently make it difficult to compare the data produced by the countries. Cooperation among countries would help to improve the quality of the reported data.

Figure 7a

Total amount of waste generated by agriculture, forestry and fishing (International Standard Industrial Classification 01-03), in thousand tonnes

Agriculture, forestry and fishing	2002	2003	2004	2005	2006	2007	2008	2009	2010
Armenia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Azerbaijan	13	19	21	16	8	6	3	3	3
Belarus	..	..	..	..	..	..	304	235	364
Kazakhstan	3	38	15	24	46	78	69	..	86
Kyrgyzstan	..	..	..	..	..	..	..	..	18
Moldova	328	175	168	171	141	1,125	1,215	104	108
Russian Federation	..	..	15 154	14 339	17 532	26 654	68 030	77 483	..
Ukraine	..	..	..	193	257	224	216	231	8 575
Uzbekistan	46 151	48 258	50 365	52 365	54 367	56 267	58 267	60 264	62 166

Source: UNECE questionnaire

Figure 7b

Total amount of waste generated by "Agriculture, forestry and fishing" sector in selected European Union and Eastern Europe, Caucasus and Central Asia countries in descending order, 2008, in thousands tonnes

Agriculture, forestry and fishing	2008
Russian Federation	68 030
Uzbekistan	58 267
EU (27 countries)	44 420
EU (15 countries)	22 540
Romania	17 035
Spain	11 356
Ukraine 1/	8 575
Netherlands	3 464
Finland	2 739
Germany	1 351
Poland	1 350
France	1 313
Moldova	1 215
Slovakia	789
Lithuania	786
Bulgaria	754

Source: Eurostat, UNECE questionnaire

Notes: The EECCA countries are highlighted in blue.

1/ Data for Ukraine are for 2010. Data for earlier period do not show the total amount.

5. Validation of data: how is validation implemented, including validation against other sources (e.g., custom data on hazardous waste)?

78. Validation is an important tool to ensure the quality of the data. Two key validation mechanisms for national statistical agencies are comparing the data collected against the correspondent data from other countries and from other sources within the country (e.g., customs services or environmental agencies).

79. During the Workshop, it was recommended to verify the data on transboundary movement of waste by cross-checking the data on waste exported by one country with the data on waste imported by its counterpart.

80. Some examples of validation against data from other sources within the country were shared during the Workshop. They referred mainly to the municipal waste, where countries faced significant challenges.

(a) Countries should aim to obtain data on both *municipal waste generated* and *municipal waste collected*. In practice, this is not easy to do. Normally, the data are on information provided by the waste collecting agency. If the data both on *municipal waste generated* and *municipal waste collected* are available, the following validation check could be carried out:

municipal waste collected = proportion of population covered by the municipal waste collecting agency * *municipal waste generated*

Essentially, if 100 per cent of the population is covered by the municipal waste collecting agency the amount generated will be equal to the amount collected; if 80 per cent of the population is covered then the municipal waste collected should be 80 per cent of the municipal waste generated.

(b) Municipal waste per capita should be within a reasonable range, e.g., about 100–1000 kg per capita. A check should be done to see whether the data provided are within this range.

6. Legal framework: review of the national legal framework with respect to reporting requirements; legislation defining the needs and the procedures to collect information on waste

81. The legal framework for waste management at the national level is in general well developed. However, legal instruments regulating the waste statistics such as data generation, collection, compilation and processing are not always in place. Further information on countries' legislation related to waste is available in Annex I.

B. Conclusions and recommendations

82. Statistics plays an important role in identifying waste-related problems, assessing management priorities and formulating and achieving realistic objectives within the framework of waste management policies.

1. Interagency cooperation

83. The interagency cooperation is important. In some countries information on waste is scattered among different institutions. Therefore, cooperation needs to be strengthened in order to collect and to report statistical data of good quality. Data differ, for example, when the Ministry of Environment reports to the Basel Convention and when the National Statistical Office reports to Eurostat. In general, this is due to the use of different methods

in data compilation and waste classifications, and reflects a lack of coordination between the national institutions.

84. The cooperation mechanism between statistical agencies and customs services, necessary to ensure the data quality on transboundary movement of hazardous waste, is often not efficient (and sometimes non-existent) in the countries. The capacity of the statistical institutions to carry out data validation on their own is limited since in many cases it requires the expertise of environmental specialists. Annex IV provides a detailed presentation of interagency cooperation mechanisms in the EECCA countries.

2. Dissemination of data

85. Effective dissemination of data is essential to reach the users of waste statistics. The EECCA countries have well developed traditional tools for reaching the public. They include statistical publications and yearbooks, environmental compendiums, publications and reports. Several countries, e.g., Belarus and Kazakhstan, also publish specialized newsletters on waste, which is an example of a good practice to follow. Most of the countries publish their waste statistics on the websites of either statistical or environmental agencies. Further efforts to make the data readily available online and to keep it up-to-date should be encouraged. Annex V gives a review of the different methods of statistical data dissemination used by the EECCA countries.

3. Recommendations

86. The following recommendations have been identified based on the discussions and the work done in preparation for and during the Workshop.

(a) General recommendations

87. Cooperation between the international organizations dealing with different aspects of waste statistics, such as Eurostat, the European Environment Agency, the International Energy Agency, the United Nations Environmental Programme, the United Nations Statistics Division, and the secretariat of the Basel Convention, needs to be further strengthened in order to ensure correspondence between the various classifications, terms and definitions used at the international level.

88. Waste classifications and definitions used at the national level should be aligned with internationally-recognized classifications and terminology. This is to ensure that countries have the same understanding of the data and can interpret the data of the other countries. This will also help to develop regional and international cooperation on waste management.

89. National institutions, such as the National Statistical Office, the Ministry of Environment, environmental agencies and customs offices, should cooperate more closely in order to produce reliable and complete data on waste.

90. Quantitative targets aiming at reducing the amount of waste generated and at promoting sound practices, such as reuse and recycling, need to be in place to measure progress.

91. National institutions should provide regular training for personnel of enterprises who are responsible for reporting data. The training should cover the methods of measuring and estimating quantities of waste. Additionally, personnel should be trained to report the data correctly when asked to complete questionnaires and surveys. This would lead to improvement in the quality of reported data.

(b) **Specific recommendations**

92.   Reporting in the same measurement units will increase the likelihood of the data being comparable. Countries should try to develop their own list of conversion rates from one measurement unit to another in line with the specific features of their economies. This is needed since the waste composition under each waste type (e.g., according to the List of Wastes) is not uniform across countries.

93.   The area of waste statistics is relatively new and the European legislation is undergoing continuous changes. The countries referring to or introducing the EU legislation should follow the latest updates.

94.   Common methodology across countries and across national institutions in defining the list of enterprises reporting on waste is needed. National legislation should oblige these enterprises to report. To the extent possible, cooperation across countries is recommended to achieve common methodology.

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