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PROBLEMS WITH WASTE STATISTICS AND A PROPOSAL FOR ACTION

Note by UNECE and the Netherlands

The paper is presented to the Bureau of the Conference of European Statisticians (CES) at the request of the Joint Task Force on Environmental Statistics and Indicators (JTF). JTF asked the secretariat to bring the conceptual and methodological problems related to waste statistics to the attention of the CES Bureau, seeking for a decision how to address the issues raised.

The paper is prepared by UNECE and the Netherlands. It has been consulted with Armenia, Kazakhstan, Mexico, Ukraine, Eurostat, OECD and UNSD.

The CES Bureau reviewed the proposed actions and decided on the way forward.

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I. EXECUTIVE SUMMARY

1. The paper is presented to the CES Bureau at the request of the Joint Task Force on Environmental Statistics and Indicators (JTF). JTF has repeatedly discussed the conceptual problems with waste statistics. At its latest meeting on 30 June – 1 July 2016, JTF requested the secretariat to bring conceptual and methodological problems related to waste statistics to the attention of the CES Bureau, seeking for a decision how to address the issues raised.

2. The paper is prepared by UNECE and Statistics Netherlands. It has been consulted with Armenia, Kazakhstan, Mexico and Ukraine, as well as with Eurostat, OECD and UNSD.

3. Waste statistics are of high policy interest in the context of SDGs, green economy, resource efficiency, Sustainable Consumption and Production, climate change and many other policy initiatives. Special attention is paid to reuse and recycling of waste, use of waste for generating energy, and hazardous waste. Emerging issues include food waste, electronic waste or end-of-life vehicles.

4. While there is an increasing demand for waste statistics, there are important conceptual and methodological problems. The lack of internationally harmonised concepts, definitions and methodologies leads to incomparability of data. The main guiding documents on environment statistics and environmental-economic accounts, such as the Framework for Development of Environment Statistics (FDES) and the System of Environmental-Economic

Accounting (SEEA) give only general guidance and leave a lot open to different approaches and interpretations.

5. There is no international classification of waste statistics outside the European Union. Waste can be classified according to its sources, generating process, composition, characteristics, waste generation and collection streams, etc.. In practice, different ways of classifying wastes are used depending on the purpose for which the data are to be used, and it is often not clear what the underlying principles are, and the concepts are overlapping. Adding to the confusion is that the same terms are sometimes used to denote different concepts.

6. Eurostat and the DG Environment of the European Commission are actively working to improve waste statistics in the EU countries¹. However, the problems are even bigger in countries outside EU.

7. OECD has been working with its member and partner countries to improve the quality of waste data and indicators since many years, but a number of quality issues remain.

8. Furthermore, important aspects of waste management, such as illegal waste collection and trade, illegal dumping, informal waste picking and waste management by private sector are not included in official waste statistics and difficult to capture statistically. Recycling figures may be largely underestimated when the informal waste collection is not considered. Emerging issues, such as the recovery value of waste, food waste and electronic waste are not or only partly covered.

9. To address these problems, the paper proposes to set up a Task Force to develop a framework for waste statistics that would provide a basis for harmonising the concepts and definitions, and for developing methodological guidance. The Task Force should include experts on waste statistics from national statistical offices, other involved national agencies and international organizations. It should build upon existing concepts and definitions used and the current work of Eurostat, OECD, UNECE, UNSD and other international organisations on that topic.

II. INTRODUCTION

10. The paper is presented to the CES Bureau at the request of the Joint Task Force on Environmental Statistics and Indicators (JTF). JTF has discussed the conceptual problems with waste statistics² at several meetings, most recently in May 2015 and June-July 2016. In 2015, JTF recommended to establish an international process to develop a framework for waste statistics. At its latest meeting on 30 June – 1 July 2016, JTF requested the secretariat to bring conceptual and methodological problems related to waste statistics to the attention of the CES Bureau, seeking for a decision on how to address the issues raised.

¹ Guidelines, Manuals and classifications on particular waste streams and on waste statistics in general are available for the European Union.

² The paper focuses on solid waste, that is, discarded materials that are no longer required by the owner or user. Solid waste includes materials that are in a solid or liquid state but excludes wastewater and small particulate matter released into the atmosphere. (UNSD, 2012)

11. The JTF members are countries from Eastern Europe, Caucasus and Central Asia and South-East Europe. Representatives of international organizations dealing with waste statistics, such as the CIS Statistics Committee, Eurostat, European Environment Agency (EEA), the International Energy Agency (IEA), the Organization of Economic Co-operation and Development (OECD), the United Nations Environment Programme (UNEP), the United Nations Statistics Division (UNSD), and the secretariat of the Basel Convention, regularly participate in the meetings. The aim of the Task Force is to improve the quality and availability of environmental statistics in EECCA and SEE countries. However, when discussing the production of waste statistics in these countries, the methodological and conceptual questions that come up are valid for all CES countries.

12. The paper was drafted by UNECE and Statistics Netherlands. It has been consulted with Armenia, Kazakhstan, Mexico, Ukraine, Eurostat, OECD and UNSD. Comments received during this consultation process have been incorporated.

13. Waste statistics are of high policy interest in the context of SDGs, green economy, resource efficiency, Sustainable Consumption and Production, climate change and many other policy initiatives. A special policy attention is paid to reuse and recycling of waste, use of waste for generating energy, and hazardous waste (related to the Basel Convention). The user demand is growing and more information on solid waste than currently produced is needed. Among the emerging issues are statistics on food waste, electronic waste or end-of-life vehicles. In addition, waste collection by the informal sector and waste traded or dumped illegally are also important but difficult to collect through surveys or administrative data. Such data are often only available from ad-hoc studies, expert estimates or from customs services and inspectorates.

14. The paper shows that currently official waste statistics do not or only partly address the growing information demand on solid waste.

15. Conceptual and methodological problems of statistics on solid waste have been identified for a long time. International organisations (such as UNSD, OECD, Eurostat, UNECE, Basel Convention) have been discussing them, but due to the complexity of the subject the issues cannot be addressed by individual organizations separately.

16. Key documents on environment statistics and environmental-economic accounts, such as the *UN Framework for the Development of Environment Statistics* (FDES, UNSD, 2013) and the *SEEA Central Framework* (SEEA-CF, UNSD, 2012) provide only very general guidance on waste statistics given their wider scope, leaving important conceptual and methodological questions open to interpretation and different approaches.

17. Eurostat and the DG Environment of the European Commission are in a process of developing solutions for several of the mentioned problems for the countries of the European Union. For example, the Eurostat *Rolling review of waste generation and treatment statistics* (Eurostat, 2014) recommends to investigate ways of improving the harmonisation of methodology and data compilation between countries.

18. However, the problems are even bigger in countries outside EU, and would need solutions that can be applied also in other countries of the region.

19. OECD has been working with its member and partner countries to improve the quality of waste data and indicators since many years, and uses its country environmental performance review programme to fill gaps and better understand the circumstances of individual countries. However a number of quality issues remain.

20. The paper includes four substantive sections. Chapter III summarises the policy needs for waste statistics. Chapter IV provides an overview of the main methodological guidance available and involvement of international organizations in the methodological and data work on waste statistics. The main problems with waste statistics are explained in Chapter V based on a number of examples. Chapter VI proposes actions how to address the problems. More detail on the relevant policy frameworks, international data collection and databases, and examples of problems with waste statistics are provided in the Annexes.

III. POLICY NEEDS FOR WASTE STATISTICS

21. Statistics on waste are crucial to inform different international policy frameworks and for regional, national and sub-national waste management policies. The main policy frameworks that require comparable waste statistics are the following:

- a) Sustainable Development Goals (7 waste-related indicators);
- b) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention);
- c) European Union: 7th Environment Action Programme, resource efficient Europe and its circular economy package;
- d) OECD: Recommendation of the Council on the Environmentally Sound Management of Waste;

22. These policy frameworks require data on the amounts (mass) of waste generated and waste managed (which include collection, recycling and disposal), with a specific focus on municipal waste, industrial waste, hazardous waste and recycling rates. Waste statistics and indicators are required to evaluate national and international waste-related policy goals (e.g. waste generation per capita, national recycling rate, etc.) and to assess its trend over time. Annex I provides more detail on the listed policy frameworks.

23. There are other international initiatives where waste is an important consideration requiring the availability of waste statistics. These include the *green economy initiatives*, the OECD Green growth strategy; Recommendations of the OECD Council on material flows and resource productivity; and the OECD framework for country environmental performance reviews; *UNEP 10-year framework programme on Sustainable Consumption and Production*, reporting under the *United Nations Framework Convention on Climate Change (UNFCCC)*³, the *European Sustainable Consumption and Production Action Plan*, the *Regulation 2150/2002/EC on waste statistics* and the *European Agreement concerning the International Carriage of Dangerous Goods by Road*.

24. These policies aim to reduce the environmental and health impacts of waste and improve resource efficiency, with the long-term aim to reduce the amount of waste

³ Waste is one of six emission source categories for the reporting of greenhouse gas emissions under UNFCCC.

generated. When waste generation is unavoidable, it is promoted as a resource to achieve higher levels of recycling.

25. Waste statistics are crucial for the waste management policies at the regional, national and sub-national level. Proper waste management presents an opportunity to recover resources, realise environmental, economic and social benefits and to take a step towards sustainable future (see UNEP, 2013). Special attention is paid to hazardous wastes to ensure their safe disposal. Waste management policies also aim to reduce illegal trade and illegal dumping of waste and to find socially acceptable ways to integrate informal waste collection in the formal waste management.

IV. WHO IS INVOLVED IN WASTE STATISTICS AT INTERNATIONAL LEVEL?

A. Methodological work and international guidance

26. The main documents providing guidance on environment statistics and environmental-economic accounts, including statistics on solid waste, at global level are the Framework for the Development of Environment Statistics (FDES) which is the basis for developing all environmental statistics, and the System of Environmental-Economic Accounts Central Framework (SEEA-CF) which is an international standard.

27. FDES considers solid waste in Section 3 ‘Residuals’, Sub-component ‘3.3 Generation and Management of Waste’ (UNSD, 2013). The text is concise and gives very few recommendations on statistics on solid waste, leaving a lot of freedom for countries to decide how to build up this statistical area. Given the broader coverage of the FDES, a Manual on the Basic Set of Environment Statistics based on the FDES is being developed, of which one chapter on waste statistics provides more information on existing waste methodologies.

28. There is no international standard classification of waste outside the European Union, therefore it is left up to the countries and organizations how to classify it. FDES includes the following text: “The waste lists that countries and international organizations use for waste statistics are usually based either on the generating process or the material content of the waste, or on the combination of the two. In many cases, the origin of the waste (the economic activity) generally determines the material content of the waste.” (para 3.183) and “The broad waste categories frequently used in waste statistics, such as municipal, industrial and hazardous waste, combine many different waste materials into categories based on the similarity of their collection, treatment and disposal.” (para 3.184).

29. The way waste data are defined and classified often depends on the purpose for which they are to be used, and has long followed a “management” approach; hence the combinations of materials and origins.

30. The SEEA Central Framework (SEEA-CF, UNSD, 2012) includes a section on Solid waste accounts (Section 3.6.5) under physical flow accounts. As SEEA notes, there is no standard classification of solid waste and therefore the example tables of the accounts include an indicative listing of solid waste based on the European Waste Catalogue.

31. Methodological work related to statistics on solid waste is mainly carried out by Eurostat and UNSD, but also by the OECD. It takes into consideration the work of the

Secretariat of the *Basel Convention on the control of transboundary movements of hazardous wastes and their disposal* (Basel Convention) and the European Commission (*Commission Decision 2014/955/EU on the list of waste, Commission Regulation 1357/2014/EU on the hazardousness properties of waste*) for hazardous waste, and where necessary of the *Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade* (Rotterdam Convention).

32. The methodological work of Eurostat, OECD and UNSD is aligned to a great extent with the aim to provide complementary data at the global level.

33. FDES lists the following as the main methodological references related to statistics on solid waste:

- a) European Commission: European List of Waste, pursuant to European Waste Framework Directive;
- b) Eurostat: European Waste Classification for Statistics (EWC-Stat), version 4 (waste categories);
- c) Eurostat: Manual on Waste Statistics;
- d) Eurostat: guidance on classification of waste according to EWC-Stat categories;
- e) SEEA Central Framework (2012);
- f) UNSD Environment Statistics Section: UNSD/UNEP Waste Questionnaire;
- g) Basel Convention: Waste categories and hazardous characteristics;
- h) Rotterdam Convention.

34. In November 2012 Eurostat also published the Guidance on municipal waste data collection

B. Waste data collection and dissemination

35. The main international data collections are those carried out by Eurostat, OECD and UNSD (in cooperation with UNEP):

- a) OECD/Eurostat Questionnaire section on waste (part of a broader questionnaire on the state of the environment, and coordinated with the Basel Convention Secretariat);
- b) UNSD/UNEP Questionnaire on Environment Statistics (includes a Section on waste);
- c) Eurostat data collection via the EU waste statistics regulation;
- d) Eurostat data collection on certain waste streams and shipments of waste.

36. In addition the Electronic Reporting System of the Basel Convention is used to collect data on the generation and transboundary movement of hazardous waste.

37. Most of the international users (including EEA, OECD, UNECE, UNEP) refer to these data collections and the underlying concepts, classifications and definitions.

38. The main differences of the questionnaires listed above are the country coverage (they are complementary with each other), the reporting frequency and the level of detail for which data are requested.

39. The statistics collected by all these surveys include:

- a) Generation of waste (total, per economic activity and households);
- b) Management of municipal waste (collection, treatment, disposal, etc.);

c) Management of hazardous waste.

40. Additionally, Eurostat collects and publishes statistics for waste treatment by waste category and type to treatment, number and capacity of recovery and disposal facilities and national population served. Eurostat also collects and publishes statistics for specific important waste streams such as packaging waste, waste of electrical and electronic equipment (WEEE) and end-of-life vehicles (ELV).

41. OECD publishes time series on food waste for which several types of data sources are used. OECD collects data on the management of non-hazardous industrial waste, the number and capacity of recovery and disposal facilities, national population served, specific waste streams such as packaging waste, waste of electrical and electronic equipment (WEEE) and end-of-life vehicles (ELV) (in OECD/Eurostat questionnaire).

42. For more information on international data collections and databases see Annex II.

V. THE MAIN PROBLEMS WITH STATISTICS ON SOLID WASTE

43. This section highlights the main problems with waste statistics using a number of examples. More detail on the examples is provided in Annex III.

44. The examples come mostly from the European Union due to the fact that data and reports on solid waste are available for the EU countries but not so much for other countries. The European Commission (Eurostat and DG Environment) is working actively to find solutions for most of these problems within the EU context. The comments received from other countries (Armenia, Kazakhstan, Ukraine and Mexico) during the consultation process on this report show that the problems described here are of global concern and are even bigger in countries outside EU.

45. Furthermore, waste is one of six emission source categories for the reporting under the UN Framework Convention on Climate Change. In the context of a recent UNECE survey, several agencies in charge of greenhouse gas emission inventories considered that the currently available waste statistics do not meet the needs of inventory compilation. National statistical offices reported that waste statistics is an area that needs most improvement among the statistics needed for inventory compilation.

A. Waste statistics are not easily comparable due to different methods and definitions used

46. As a result of different methods and definitions used in countries, the data are often difficult to compare internationally. For example, official statistics on key indicators, such as municipal waste generation and collection per capita, or the national municipal waste recycling rate can differ by 100% and more depending on the method used. See the following two examples:

- Example 1 - Generation of municipal waste per capita in EU-27 in 2014: According to Eurostat, in 2014 the municipal waste generation per capita in Denmark was 758 kg and in Sweden 438 kg. This raises the question why the two countries with similar economic and demographic characteristics are so different in terms of waste generation. Looking at the definitions used in Sweden and Denmark

(CIWM/SOENECS, 2015), it comes out that Denmark's definition of municipal waste is wider than Sweden's.

- Example 2: The EU Recycling rate harmonisation project (CIWM/SOENECS, 2015) showed for 10 pilot municipalities that the recycling rates calculated by EU Member States can differ up to 15 percent points, depending on the calculation methodology chosen and the definition used for municipal waste. Therefore, an important element of the European Circular Economy Strategy is the legislative proposal on waste which suggests only one calculation method for the municipal waste recycling rate in the future.

47. In addition, Eurostat points out that the reported quantities of waste generated and treated do not match for some Member States for the following reasons: different estimates of the population covered by waste collection schemes, weight losses due to dehydration, double counts of waste undergoing two or more treatment steps, exports and imports of waste, and time lags between generation and treatment (temporary storage).

B. Official waste statistics do not tell the full story

48. Important aspects of waste management, such as legal imports and exports, illegal waste collection and trade, illegal dumping, informal waste picking and waste management by private sector are not included in official waste statistics. Recycling figures may be largely underestimated when the informal waste collection is not considered. Emerging issues such as the recovery value of waste, food waste and electronic waste are not or only partly covered.

49. Furthermore, waste statistics leave open some conceptual questions. For example, while there is a lot of interest in statistics on waste reuse and recycling, the boundary between waste and product in statistics is often not clear (e.g. when does waste become raw material).

50. It is difficult to quantify the problems, because only some case studies exist. The situation largely depends on the legal, economic and social situation of a country.

51. The following examples show, that the **proportion of generated waste which is not covered by regulated waste management can be more than 50%** in some CES member countries. They also show that **informal waste management can supply 40% or more of the recycled materials**.

- Electronic waste
 - Example 3: Official statistics in the Netherlands do not provide the answer what happens to more than 50% of the generated electronic waste which is not recorded as officially collected or part of mixed wastes. It remains unclear whether the missing amounts are mixed with other wastes, collected informally, traded illegally or stored at home. (Balde, 2015)
 - Example 4: A study carried out by the University of Salamanca (Queiruga et. al., 2016) shows that in 2010 Spain generated an estimated 13.86 kg of WEEE per person, but only 2.55 kg were processed using companies registered under the country's integrated management systems program. The study says that only about 1,000 manufacturers, out of an estimated 10,000, are registered in

Spain, resulting in payment evasion of approximately 15 million Euros per year.

- Example 5: In EU only 35% of electronic waste ends up in the officially reported amounts of collection and recycling systems, as found out by the research undertaken by the Countering WEEE Illegal Trade (CWIT) Project (Husman et.al., 2015).
- Illegal and informal waste handling
 - Examples 6 and 7: Illegal waste trade and dumping is a big problem for many countries. This is conceptually not considered in waste statistics. According to a report of the European Environment Agency (EEA, 2009) the reported annual illegal shipments (discovered instances) vary between 6,000 and 47,000 tonnes with an average of about 22,000 tonnes. EEA concludes that the number of illegal shipments is rising⁴. In UK, 1175 illegal sites for waste dumping were found in 2012.
 - Example 8: Informal waste picking can be literally observed in all countries of the world and there are registered waste picking organisations in the following countries of the CES: Brazil, Colombia, Canada, Chile, France, Mexico, South Africa and the United States of America (Global Alliance of Waste Pickers, 2016). Data on the amount of informal waste collection in CES Member Countries currently exists only from some studies such as the European TransWaste project:
 - Bulgaria (Sofia): 30,000 tonnes of recyclables salvaged annually by 2,000 people (Tasheva, 2012);
 - Serbia: In Belgrade 2,350 families (12,000 men, women and children) are involved in collecting as their sole income source. For Serbia, this number goes from 6,000 to 10,000 families (35,000-55,000 of men, women and children) (Nešić, 2012);
 - In Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, and Serbia waste pickers supply at least 40% of the raw materials that industry recycles in the region (Medina, 2008).
- Different data due to different methodologies and sources used
 - Example 9: In the Czech Republic both the statistical office and Ministry of Environment publish data on municipal waste generated. The difference in data is about 65 percent, showing also different dynamics.

C. The main reasons for problems with waste statistics

52. There are a lot of reasons for the difficulties with waste statistics. Some of the main reasons are provided below but the list may not be exhaustive:

- a) There is no international framework for waste statistics;
- b) There is no standard international waste classification;

⁴ The European Commission is working on improving the situation: As of mid-2016, a new tool became available to customs officials to help them identify waste crossing illegally EU borders as non-waste. The tool, which concerns goods with customs headings that can be correlated with a waste code, serves as an alert for customs that waste may be crossing EU borders illegally. Thus, the new measure is expected to assist in the curbing of illegal exports of waste but also in preventing the leakage of valuable raw materials out of the EU. Despite the Regulation, illegal shipments of waste are still a significant problem (some estimates suggest that the overall non-compliance rate with the Regulation could be around 25 %). To strengthen Member States' inspection systems, the Regulation was amended in 2014 through Regulation (EU) No 660/2014 of 15 May 2014. Member States are required to apply the new changes in the years 2016/17. For more information see: <http://ec.europa.eu/environment/waste/shipments/index.htm>

- c) The process of waste management is not fully covered;
- d) Key terms and definitions are not harmonised (e.g. *municipal solid waste*, *recycling*, *reuse*, *recovery*, *waste management*, etc.);
- e) There are several conceptual misunderstandings on both the producer and user side of waste statistics:
 - o *Waste generation* is not the same as *waste management*;
 - o *Recycling* is not the same as *reuse*;
 - o *Municipal waste* is not the same as *household waste* (the SDG indicator 11.6.1 uses the term *urban solid waste* which is not used anywhere in waste statistics, but in some countries)
 - o *Hazardous waste* (as defined by the Basel Convention) is not mutually exclusive with *municipal waste* or *waste from households* (both can contain hazardous waste).
- f) The boundary between *waste*, *products* and *secondary raw materials* is not clearly defined;
- g) The data collection process involves a variety of data sources
- h) Several waste flows are difficult to measure and thus sometimes included or excluded in the total figures (e.g. imports and exports of waste)
- i) The population covered is differently estimated (e.g. for municipal waste)
- j) Different conversion factors are used (e.g. from volume to weight)
- k) Different ways to measure the amounts of waste

53. The following two sections explain in more detail the different concepts to measure generation and management of solid waste, the missing parts to tell the full story, and how the data collection process has an impact on official waste statistics.

Overlapping concepts

54. One important issue for both users and producers is that official waste statistics combine different conceptual understandings. Looking at the same topic from different perspectives often leads to confusion. The following Figure 1 presents the main breakdowns used in waste statistics, which are overlapping:

- **Sources** of waste: Sources of waste are economic activities (classified according to ISIC) and households. A conceptual problem is related to imports of solid waste: In the SEEA-CF imports are included in the definition of generation of waste (i.e. the “Rest of the World” is a source of waste), whereas in other waste statistics imports are not included in generation but in the management of waste;
- **Types** of waste: Types of waste are defined based on the composition of waste (i.e. types of materials included). It is a different concept than sources of waste but sometimes the same terms are used. E.g. the waste type *household or similar waste* can originate from different sources (households, manufacturing industries, commercial activities, government etc.).
- **Management** of waste: Management of waste includes formal (regulated) management, informal management and illegal management. Currently waste statistics only include formal management of waste. Formal management can be broken down into different waste streams (e.g. *municipal*, *industrial*, *clinical*, *construction and demolition*, etc.). These waste streams may be linked to specific sources (e.g. hospitals) and types of waste (e.g. infectious waste). Sometimes waste can go through different treatment stages and can therefore be double counted. Furthermore, the organizations responsible for the management of waste can be

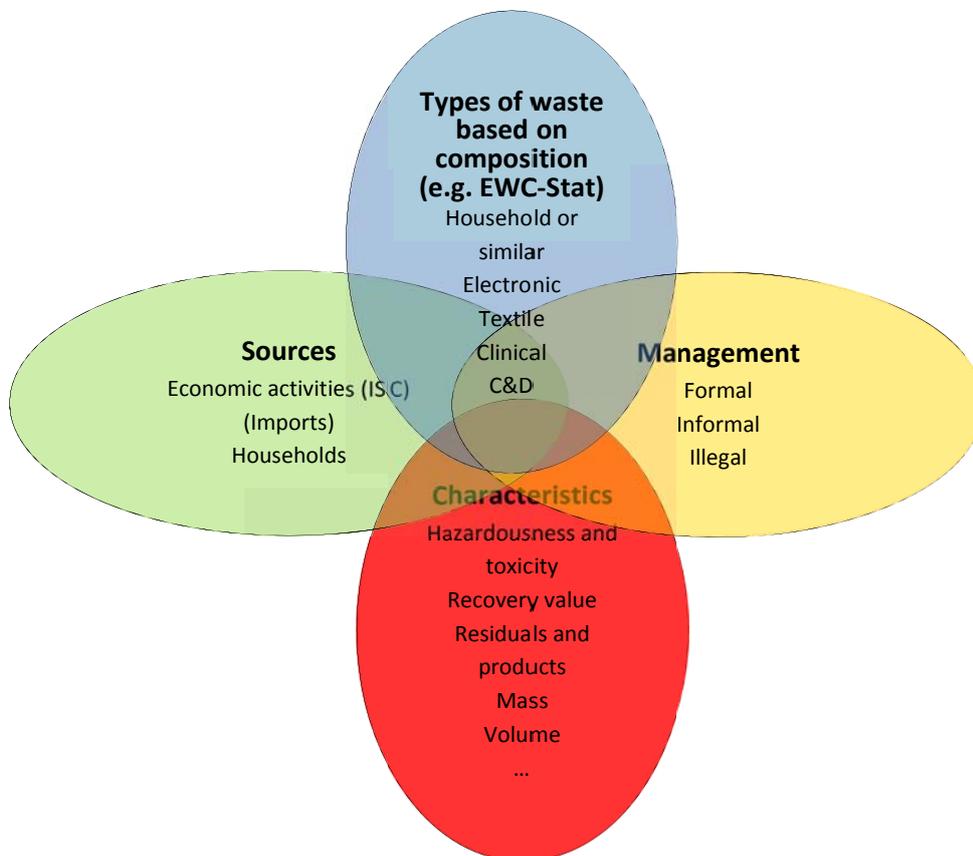
different levels of government or private sector. Waste management by the private sector may be covered or not covered depending on the data source and data collection method.

- **Characteristics** of waste: The characteristics of waste describe other important aspects of waste, including:
 - Hazardousness and toxicity
 - Mass: the weight of waste
 - Volume: The volume of waste can be an important information for different waste policies (e.g. planning of landfill sites etc.); this is not covered by official statistics
 - Recovery value: economic value of waste; not covered by official statistics.
 - Residuals and products: Is the waste destined for final disposal or for reuse?

55. As cited before, FDES which is the main guiding document on environmental statistics, gives only very general guidance on waste statistics. According to FDES, countries can classify waste according to the origin of the waste, generating process, material content, or a combination of these. Furthermore, the broad waste categories used (such as municipal, industrial and hazardous waste) combine different wastes based on similarity of their collection, treatment and disposal. This leaves open how the waste is classified and can lead to different lists because of a lack of a common approach.

56. Furthermore, SEEA-CF introduces its own categorisation distinguishing waste residuals and waste products. This kind of breakdown is not used in waste statistics.

Figure 1: Different concepts of waste statistics are overlapping



57. The conceptual distinction is important, because official waste statistics often give the wrong impression that those concepts are mutually exclusive. For example, in many waste reports the figures on municipal waste generation are presented next to figures on generation of hazardous waste, not mentioning that parts of municipal waste (e.g. batteries, household chemicals sorted out during waste treatment etc.) are also hazardous waste.

58. Municipal waste is one of the most problematic terms where currently countries and institutions use different definitions. To address this problem, Eurostat's *Guidance on municipal waste data collection* (Eurostat, 2012) discusses in detail 4 different definitions used in Europe for "municipal waste" and gives a non-binding recommendation on which definition to use for statistical purposes.

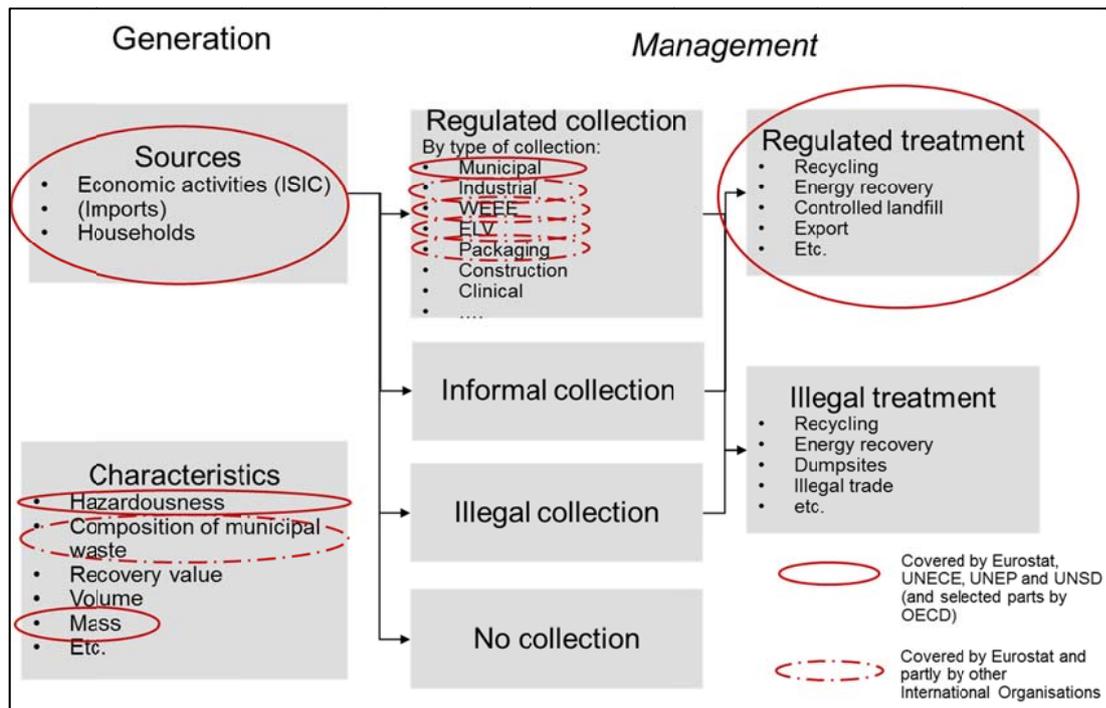
59. Certain terms are used to denote different concepts. For example, if statistics for 'industrial waste' are published, it usually remains unclear whether this refers to the source (ISIC "manufacturing industries"), to certain types of waste or a specific waste stream. 'Household waste' can mean waste generated by households, or a type of waste that can originate also from commercial activities, government, etc.

Waste statistics miss important parts of the full waste story

60. Currently, official waste statistics include regulated waste streams, which are relatively simple to measure via surveys and administrative data. Important parts of the "waste story" remain untold. The following Figure 2 shows which parts of the "waste story" are usually covered by official statistics and which are not. This figure is one way⁵ to present the scope of waste management and waste flows. Its goal is to illustrate which data are missing in official statistics.

⁵ Other national and international flowcharts exist with the attempt to show the most relevant flows of solid waste (e.g. Mexican "[Flowchart of a system of solid waste management](#)" (Diagrama de flujo de un Sistema de manejo de residuos sólidos diferenciado, INEGI, 2015))

Figure 2: Scope of waste management, and what is actually covered by official statistics



61. Some parts of the waste story that can have negative impacts on the environment, human health and the economy are not or only partly covered by official statistics. The waste not covered by the official waste management include:

- Illegally traded waste
- Illegally dumped waste
- Theft of waste with economic value
- Informally collected waste
- Waste management by private sector

62. There is also not enough data on specific waste types:

- Areas that are of high policy interest, such as
 - Food waste
 - Electronic waste (WEEE)
 - End-of-life vehicles (ELV), including tire wastes
- Specific waste streams which require a special management, e.g.
 - Infectious waste
 - Construction and demolition waste, such as asbestos
- Waste characteristics other than mass, e.g.
 - Economic value of waste
 - Volume of waste

Impact of the data collection process on data availability and quality

63. Data on waste come from different information sources (government agencies, enterprises, households, administrative records) and are collected using different types of surveys and reports. A variety of situations need to be covered. Municipal solid waste is an especially problematic issue. This results in some of the following problems:

- It is difficult to know whether the data obtained for Municipal Solid Waste (MSW) covers all population and towns of the municipality.
- The degree of accuracy of the data collected is unknown.
- The type of waste reported: even when asked for MSW, it is not clear what the respondents cover in their replies (for example, whether the waste requiring special management is covered or not).

VI. PROPOSED ACTION

64. Many problems with waste statistics are due to the fact that there is no common framework on waste statistics that would provide a basis for harmonising the concepts and definitions, developing standard classifications and providing methodological guidance.

65. It is therefore proposed to set up a Task Force to develop a conceptual framework for waste statistics, and to review existing terms and definitions in waste statistics. The conceptual framework can provide the basis for drafting recommendations and methodological guidance in future.

66. The Task Force should include experts on waste statistics from NSOs, other involved national agencies and international organisations. The countries and organizations who have contributed to the current report (Armenia, Ukraine, Kazakhstan, Netherlands, Mexico, Eurostat, OECD, UNSD and UNECE) may be interested in this work.

67. The conceptual framework should:

- a) be consistent with UN-FDES and SEEA;
- b) build upon existing concepts and definitions used by Eurostat, UNSD and OECD;
- c) be consistent with the information needs of major international policy frameworks, namely the Sustainable Development Goals, Basel Convention and the EU Waste Strategy;
- d) take into consideration existing national frameworks on waste and waste statistics (e.g. such as the Mexican "[Flowchart of a system of solid waste management](#)" (INEGI, 2015))
- e) define the scope of waste statistics, covering also illegal trade, illegal dumping and informal waste management;
- f) define waste, and in particular describe the boundary with products and materials;
- g) define a general sequence of waste flows from generation of waste to its treatment or final disposal and the related key statistics;
- h) clearly distinguish and describe the different concepts "sources of waste", "types of waste", "management of waste" and "characteristics of waste";
- i) support a coherent integration of emerging issues (e.g. food waste and electronic waste) and other waste streams or waste characteristics (e.g. recovery value) in the future;
- j) be applicable to produce geo-referenced waste statistics.

68. As a next step the Task Force should link important terms (e.g. municipal waste, recycling, etc.) with that conceptual framework and improve definitions of the concepts. As far as possible, existing definitions and the outcomes of current activities of international organisations (e.g. Eurostat) should be used. A glossary on main terms and definitions could

be elaborated and be translated into all official UN languages. An assessment should be done on the possible impact on existing time series.

69. The conceptual framework could lead to follow-up activities, including:
- Harmonisation and improvement of existing waste classifications
 - Development of methodologies to fill important information gaps (e.g. informal or illegal waste collection and trade, food waste etc.)
 - Reviewing the existing and developing new methodological guidance and recommendations on waste statistics that would be applicable to all CES countries.
70. **The CES Bureau is invited to comment on the proposed actions and decide on the way forward.**

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ANNEX I: INTERNATIONAL POLICY FRAMEWORKS RELATED TO WASTE

A. Sustainable Development Goals

The importance of waste management for sustainable development is recognized by several targets and indicators of the Sustainable Development Goals:

Targets	Indicators
8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead	8.4.1 Material footprint, material footprint per capita, and material footprint per GDP 8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities
12.2 By 2030, achieve the sustainable management and efficient use of natural resources	12.2.1 Material footprint, material footprint per capita, and material footprint per GDP 12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	12.3.1 Global food loss index
12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	12.4.1 Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement 12.4.2 Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment
12.5. By 2050, substantially reduce waste generation through prevention, reduction, recycling and reuse	12.5.1 National recycling rate, tons of material recycled

B. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention)

The Basel Convention was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad.

The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” - household waste and incinerator ash.

The main aims of the Basel Convention are:

- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
- the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and
- a regulatory system applying to cases where transboundary movements are permissible.

Currently the Basel Convention has 184 parties (see also

<http://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx>).

C. **European Union**

The European Union's approach to waste management is based on the "waste hierarchy" which sets the following priority order when shaping waste policy and managing waste at the operational level: prevention, (preparing for) reuse, recycling, recovery and, as the least preferred option, disposal (which includes landfilling and incineration without energy recovery).

Based on the 2005 Communication on the Thematic Strategy on the prevention and recycling of waste the European Union, in line with this the 7th Environment Action Programme, (2014) sets the following priority objectives for waste policy:

- To reduce the amount of waste generated;
- To maximise recycling and re-use;
- To limit incineration to non-recyclable materials;
- To phase out landfilling to non-recyclable and non-recoverable waste;
- To ensure full implementation of the waste policy targets in all Member States.

See <http://ec.europa.eu/environment/waste/>.

The main legislation is the following (and it also includes reporting requirements):

- [Directive 2008/98/EC on waste \(Waste Framework Directive\)](#)
- [Directive 2012/19/EC on waste electrical and electronic equipment \(WEEE\)](#)
- [Directive 1999/31/EC on the landfill of waste](#)
- [Directive 94/62/EC on packaging and packaging waste](#)
- [Directive 86/278/EEC on sewage sludge](#)
- [Directive 2000/53/EC on End-of life vehicles](#)
- [Directive 2006/66/EC on batteries](#)
- [Regulation \(EC\) No 1013/2006 on shipments of waste](#)
- The European [Waste Statistics Regulation \(2150/2002/EC\)](#) (requires all EU Member States to report every second year statistics on the generation, recovery and disposal of waste to Eurostat.

Eurostat has established the European data centre on waste which contains links to waste statistics data bases, guidance document, legislation and other background documents.

D. OECD

In 2004, the OECD Council adopted its [Recommendation on the Environmentally Sound Management of Waste](#) and in 2007 the OECD published a [Guidance Manual on Environmentally Sound Management of Waste](#).

The overall purpose of the Council Recommendation envisages enhanced environmentally sound management of waste throughout the OECD area. The Council Recommendation also states three specific objectives:

1. Sustainable use of natural resources, minimisation of waste and protection of human health and the environment from adverse effects that may result from waste;
2. Fair competition between enterprises throughout the OECD area through the implementation of ‘core performance elements’ (CPEs) by waste management facilities, thus contributing to a level playing field of high environmental standards;
3. Through incentives and measures, diversion of waste streams to the extent possible from facilities operating with low standards to facilities that manage waste in an environmentally sound and economically efficient manner.

The [OECD Policy Guidance on Resource Efficiency \(2016\)](#) sees green growth and establishing a resource efficient economy as a major environmental, development and economic challenge. In this context, improving resource productivity and putting in place policies that implement the principles of reduce, reuse, recycle (the 3Rs) is crucial, as recognised by G7 Leaders in the Schloss Elmau’s declaration in June 2015.

In 2004 and 2008, the OECD Council adopted two Recommendations, one on material flows and resource productivity, and one on resource productivity. It requests OECD countries to improve information, indicators and accounts on material flows and resource productivity, and in particular to “Upgrade the extent and quality of data on material flows within and among countries and the associated environmental impacts, giving particular attention to the availability and international comparability of data on physical trade flows, including flows of recyclable materials and waste, and selected material flows that are of economic and environmental importance.” It also requests that countries “Promote integrated life-cycle-oriented approaches, such as 3R policies (Reduce, Reuse, and Recycle), sustainable materials management and sustainable manufacturing as an input to decision-making and to increasing coherence among policies.”

ANNEX II – MAIN INTERNATIONAL DATA COLLECTIONS AND DATABASES

Waste statistics are collected by different international organisations (main players are Basel Convention, UNSD/UNEP, UNECE, Eurostat, and OECD). These data collections follow the same conceptual understanding, thus the data sets are expected to be complementary, coherent and consistent.

International waste statistics usually focus on the following, in terms of mass (tonnes per year):

- a) Generation of waste (total, per waste type, per economic activity and households)
- b) Management of municipal waste (collection, recycling, incineration, disposal etc.)
- c) Management of hazardous waste
- d) Eurostat also collects statistics on packaging waste, waste electrical and electronic equipment (WEE) and end-of life vehicles.

A. United Nations

UNSD/UNEP: The UNSD/UNEP Questionnaire on Environment Statistics is sent biennially to National Statistical Offices and Ministries of Environment. The Questionnaire started with just UNSD, but since 2004 it has been conducted jointly with UNEP. The most recent data collection was carried out in 2013 requesting data from 173 countries and areas. These are mainly developing countries which are not covered by data collections of other international organisations (i.e. Eurostat and OECD). The questionnaire collects the following statistics on solid waste:

- Generation of waste by source
- Management of hazardous waste
- Management of municipal waste (national total and city data)
- Composition of municipal waste

UNSD publishes data on waste at the following website:

<http://unstats.un.org/unsd/ENVIRONMENT/qindicators.htm>

UNECE: The UNECE Guidelines which are used in the development of the pan-European Shared Environmental Information System (SEIS) ask countries to produce and publish at least the following statistics on national websites:

- Waste generation
- Management of hazardous waste
- Waste reuse and recycling
- Management of municipal waste
- Management of non-hazardous industrial waste

The data collection templates and the used terms and definitions are aligned with the UNSD/UNEP Questionnaire.

Secretariat of the Basel Convention: Data reported under the Basel Convention can be accessed via an online tool in the website:

<http://basel.int/Countries/NationalReporting/DataVisualizationTool/tabid/3216/Default.aspx>

Partnership on Measuring ICT for development: The United Nations University led the task group on e-waste statistics in the UN interagency group: Partnership on Measuring ICT

for development. The task group published a framework for global statistics to evaluate the fate of electronic products and the resulting e-waste flows (Balde, 2015a) The first dataset using the framework was published in the UNU's First Global E-waste Monitor.(Balde, 2015b) An Excel file with the data can also be found here:

<https://exp.unu.edu/media/project/174/United-Nations-University-Data-E-waste-Monitor-2014.xlsx>.

B. European Union

Eurostat collects the following statistics every second year from EU Member States via the EU Waste Statistics Regulation:

- Waste generated for each waste type (51 waste categories) per NACE activity and households
- Waste treatment by waste category and type of treatment
- Number and capacity of recovery and disposal facilities (per NUTS 2 region) and population served (national)

For other specific waste streams, the following statistics are available on an annual basis:

- Municipal waste
- Packaging Waste
- Waste electrical and electronic equipment (WEEE)
- End-of-Life Vehicles
- Shipments of waste

The Eurostat statistics on waste can be accessed via <http://ec.europa.eu/eurostat/web/waste>

C. OECD

OECD collects data on waste generation by sector and by waste stream, waste recycling by major waste streams, the management of non-hazardous industrial waste, the management of hazardous waste, the management of municipal waste, the number and capacity of recovery and disposal facilities, national population served (via the OECD/Eurostat questionnaire).

OECD publishes time series for [generation of waste](#) and [municipal waste generation and treatment](#), which are provided by Member and partner countries through the questionnaire on the state of the environment (OECD/Eurostat), and to Eurostat through the Waste Statistics Regulation.

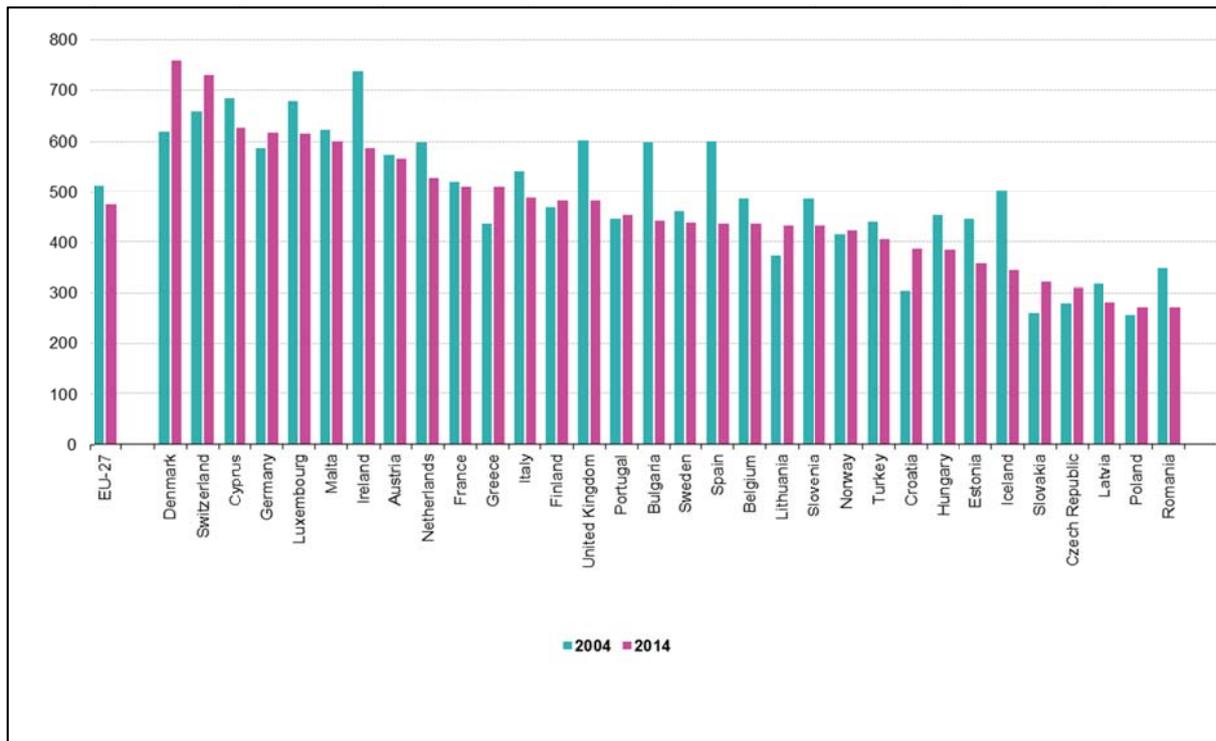
OECD also publishes time series on [food waste](#) for which several types of sources have been used.

ANNEX III – EXAMPLES OF PROBLEMS WITH OFFICIAL STATISTICS ON SOLID WASTE

Example 1: Municipal waste generation per capita in EU-27

Looking at the following Figure 3, one of the questions is why are countries such as Sweden and Denmark so different? The two countries have similar level of development and demographic characteristics.

Figure 3: Generation of municipal waste per capita in EU-27 (source Eurostat and Dr. Kees Balde (United Nations University, CBS Netherlands))



The diagram does not show that countries use different definitions for of municipal waste. This may explain some of the large differences.

Looking at the definitions⁶ used in Sweden and Denmark for municipal waste, one will see that different things are being compared in the diagram:

- Sweden has no definition in the legislation and in practice municipal waste is equal to household waste (generated by households and similar wastes from other businesses and enterprises).
- In Denmark municipal waste is defined as all waste from households collected by a municipal collection scheme and similar waste from ‘institutions, commerce and offices’, also collected by a municipal scheme in Denmark.

⁶ EU Recycling rate harmonisation project

Example 2: Recycling rates

The EU Recycling rate harmonisation project⁷ showed that EU Member States include different main material categories in their definition of Municipal Solid Waste, in one case even including waste from construction and demolition (C&D-waste).

Main Material category	Material Sub category	Number of countries that include material in MSW
Residual waste, bulky waste	Reuse	2
	Material recyclables (P&P, glass, metals, textiles, plastics and other recyclables, such as wood waste)	27
	Packaging	21
	Bio waste (food waste and garden waste)	27
	Hazardous household waste	26
Waste from municipal services comprises the following fractions:	Street sweepings	27
	Bio waste (garden and park waste, maintenance of roadsides, cemetery waste)	27
	Kitchen and canteen waste	27
	Ferrous metal recycling from back end of incineration	5 (data difficult to find)
Waste from commerce and trade, small businesses, office buildings and institutions	Collected with household or by the municipality	27
	Collected by private sector	24
Other waste from municipal services	C&D-waste	1
	Waste from municipal sewage network and treatment	2

In accordance with the European Waste Framework Directive the Member States can choose between four methods to calculate their national recycling rates:

- Method 1: The preparation for reuse and the recycling of paper, metal, plastic and glass household waste (2 countries chose that method)
- Method 2: The preparation for reuse and the recycling of paper, metal, plastic, glass household waste and other single types of household waste or of similar waste from other origins (15 countries chose that method)
- Method 3: The preparation for reuse and the recycling of household waste (3 countries chose that method);
- Method 4: The preparation for reuse and the recycling of municipal waste (8 countries chose that method).

The following example for one city of that study shows that, depending on the chosen method to calculate the recycling rate, there are large differences for both the resulting “amount of Municipal Solid Waste” (MSW) and the “Recycling rate”. The difference for

⁷ EU Recycling rate harmonisation project - National Definitions and Accounting Methods (Chartered Institution of Wastes Management (CIWM)/SOENECS Ltd, 2015)

MSW is more than 100% and the difference between the recycling rates is 14.9 percent points when method 1 is compared with method 4.

		Municipality 1
Method 1	Total MSW	17,655
	Recycled MSW	10,042
	Recycling rate	56.9%
Method 2	Total MSW	34,764
	Recycled MSW	15,926
	Recycling rate	45.8%
Method 3	Total MSW	38,579
	Recycled MSW	16,211
	Recycling rate	42.0%
Method 4	Total MSW	38,579
	Recycled MSW	16,211
	Recycling rate	42.0%
Difference between highest and lowest recycling rates		14.9%

The study carried out in 10 different cities summarises, that the difference between the methods is between 6 and 15 percent points (9 in average).

One of the conclusions of the report is that there is a need for more robust definitions, calculation methodologies and data capture frameworks.

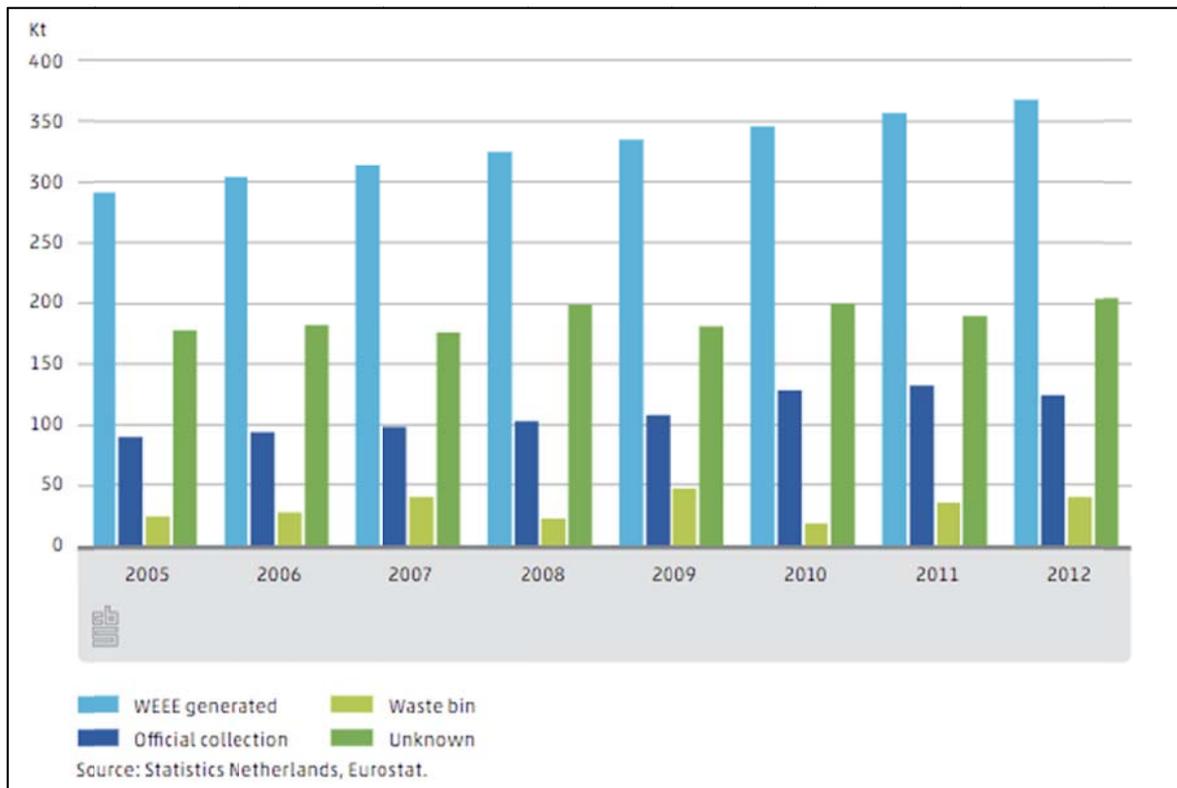
Example 3: Netherlands: Where does the electronic waste disappear?

The following example from the Netherlands⁸ shows that the figures of amounts on waste electrical and electronic equipment (WEEE) generated and WEEE collected do not match. The destination for more than 50% of the generated WEEE remains unknown.

It is assumed that the missing amounts are partly collected informally and partly traded illegally. However, there are no attempts so far to measure this systematically.

⁸ Source: Dr. Kees Balde, United Nations University and CBS Netherlands. Green Growth in the Netherlands 2015, 2015, Statistics Netherlands, Heerlen/Den Haag/Bonaire.

Figure 4: Generation and collection of Wastes electrical and electronic equipment (WEEE) in the Netherlands



Example 4: In Spain more than 70% of electronic waste management is unregulated

A study⁹ carried out by the University of Salamanca (2016) shows that informal and illegal waste management plays a non-negligible role even in developed countries, but it is currently not covered by official statistics.

In 2010 Spain generated an estimated 13.86 kg of WEEE per person, but only 2.55 kg were processed using companies registered under the country's integrated management systems (SIG) program. In fact, the study says that only about 1,000 manufacturers, out of an estimated 10,000, are registered in Spain, resulting in payment evasion of approximately 15 million Euros (\$19.3 million) per year.

Example 5: In EU only 35% of electronic waste ends up in the officially reported amounts of collection and recycling systems

The research undertaken by the Countering [WEEE Illegal Trade \(CWIT\) Project](#) (Husman et.al., 2015) by Interpol, United Nations University, and others found that in Europe, only 35% (3.3 million tons) of all the e-waste discarded in 2012, ended up in the officially reported amounts of collection and recycling systems.

The other 65% (6.15 million tons) was either:

- exported (1.5 million tons),
- recycled under non-compliant conditions in Europe (3.15 million tons),

⁹ Evolution of the electronic waste management system in Spain (University of Salamanca, 2016)

- scavenged for valuable parts (750,000 tons)
- or simply thrown in waste bins (750,000 tons).

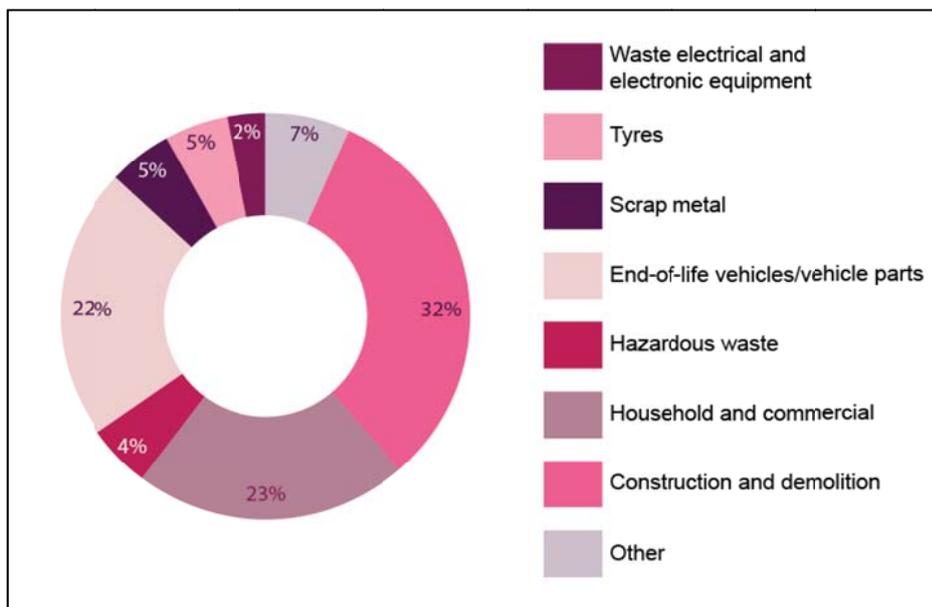
Example 6: Illegal trade of waste is an important issue in Europe

Illegal waste trade and dumping is a big problem for many countries. This is conceptually not considered in waste statistics. According to a report of the European Environment Agency (2009)¹⁰ the annual illegal shipments vary between 6,000 and 47,000 tonnes with an average of about 22,000 tonnes.

Example 7: Illegal waste dumping in the UK

In March 2012, 1,175 illegal waste sites were known in the United Kingdom¹¹. The largest number was for construction and demolition waste (32 per cent). There were a significant number of sites involving mixed household or commercial waste (23%) and end-of-life vehicles and vehicle parts (22%).

Figure 5: Type of waste at illegal dumping sites in the UK



Local authorities in England and Wales dealt with just over 860,000 incidents of smaller-scale and less organised illegal tipping of waste, known as fly-tipping, during 2010-2011. No figures are available in this report on the amounts of illegally dumped waste.

Example 8: Informal waste collection

It is very difficult to receive information about the significance of informal waste collection in the CES region as most of the available figures refer to developing countries.

However, informal waste picking can be literally observed in all countries of the world and there are waste picking organisations in the following countries of the CES region: Brazil, Colombia, Canada, Chile, France, Mexico, South Africa and the United States of America¹²

¹⁰ European Environment Agency Waste without borders in the EU (2009)

¹¹ UK Environment Agency [Waste crime report 2011-2012](#)

¹² <http://globalrec.org/waw/stats/>

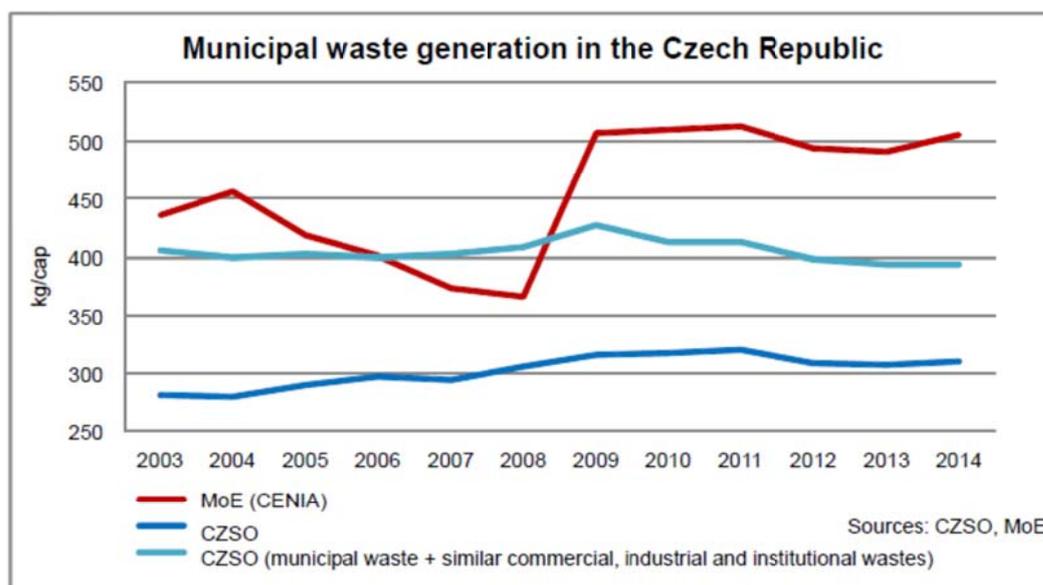
Data on the amount of informal waste collection in CES Member Countries currently exists only from individual studies¹³:

- Sofia: 30,000 tonnes of recyclables salvaged annually by 2,000 people (a very conservative estimate) (see <http://www.transwaste.eu/file/001644.pdf>)
- Serbia: In Belgrade 2,350 families (12,000 men, women and children) are involved in collecting as their sole income source. For Serbia, this number goes from 6,000 to 10,000 families (35,000-55,000 of men, women and children) (see <http://www.transwaste.eu/file/001668.pdf>)
- In Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, and Serbia waste pickers supply at least 40 percent of the raw materials that industry recycles in the region (see <https://www.ppiaf.org/sites/ppiaf.org/files/publication/Gridlines-44-Informal%20Recycling%20-%20MMedina.pdf>)

Example 9: Czech Republic: NSO and Ministry of Environment (MoE) publish different data for municipal waste generation

Due to differently used definitions and data coverage the Czech Ministry of Environment and the Czech Statistical Office published different time series on municipal waste generated¹⁴. The following Figure 6 shows that the time series published by the Ministry of Environment significantly differ from those published by the NSO.

Figure 6: Municipal waste generation in the Czech Republic



¹³ E.g. the European [TransWaste](#) project

¹⁴ Source: Czech Statistical Office