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Reports, guidelines and recommendations prepared under the umbrella of the Conference: Waste statistics framework

Waste statistics framework

Prepared by the Task Force on waste statistics

Summary

This document is a short version of the "Waste Statistics Framework" including a) a conceptual framework for waste statistics; b) definition of key terms; c) recommendations for improving waste statistics and d) recommendations for further work.

The document has been developed by the Task Force on waste statistics chaired by Bosnia-Herzegovina, Canada and the Netherlands. The following national statistical offices and organizations participated in the work of the Task Force: Armenia, Azerbaijan, Israel, Kazakhstan, Mexico, Republic of Moldova, Russian Federation, German Corporation for International Cooperation (GIZ), Swiss Federal Institute of Aquatic Science and Technology, Basel Convention Secretariat, Eurostat, International Solid Waste Association (ISWA), Organisation for Economic Co-operation and Development (OECD), UN-Habitat, United Nations Environment Programme (UNEP), United Nations Statistics Division (UNSD), United Nations University, University of Leeds and United Nations Economic Commission for Europe (UNECE).

The short version of the Framework is prepared for translation purposes and does not include the executive summary, introduction, bibliographic references and annexes. The text of some sections has been shortened.

The full text of the draft Waste Statistics Framework was electronically consulted with all CES members and other stakeholders during March-April 2021 and is available on the web page of the 2021 CES plenary session at https://unece.org/statistics/events/CES2021. Summary of the feedback form the consultation will be provided in document ECE/CES/2021/4/Add.1. Subject to a positive outcome of the consultation, the CES plenary session will be invited to endorse the Framework.

I. Waste statistics – current status and emerging needs

A. Challenges with existing waste statistics

1. Providing high quality statistics on waste requires clear, widely accepted definitions and a good understanding of waste flows and their management all along the materials cycle. It further requires a good knowledge of waste-related policies and of the information needed to support them. These policies are increasingly oriented towards waste prevention, and circular strategies that place greater emphasis on aspects such as dematerialization, the reduction of primary mined materials by using waste as an input in manufacturing. This shift in orientation increases demand for reliable statistics on waste generation, treatment and disposal and on the life cycle of materials and products.

2. Although many countries produce waste statistics, the quality and availability of statistics vary greatly depending on the priority given to waste management and on the financial and human resources available for statistics. Some countries monitor waste only in major cities, leaving smaller cities and rural areas uncovered. Other countries have difficulties producing any waste statistics due to scattered data sources.

3. At international level, the quality and comparability of waste statistics are hampered by differences between countries in terms of the scope, definitions, classifications and methods used in their collection. Frequent changes in these attributes reduce the length and coherence of time series and the usefulness of waste statistics for international policy analysis.

4. In the paper of Statistics Netherlands and UNECE (2016) the following challenges have been identified with waste statistics:

- Collection of primary data from various sources and compilation of statistics at national and international level
- Harmonization of concepts and terminology
- Changing policy needs.

1. Problems in data collection and compilation

5. Some countries have also difficulty responding to international questionnaires with existing national statistics. Basic waste data may be not available in appropriate units of measure (for example, in volume rather than mass), the classifications and definitions used may be different from those used internationally and there may be insufficient guidance on conversion factors.

6. Consequently, waste statistics collected through international questionnaires also face problems of gaps and comparability. For example, even if the response rate of countries covered by the waste section of the *OECD/Eurostat Questionnaire on the State of the Environment* is nearly 100%, data quality has been an issue and many data gaps remain.

7. The majority of countries in the world have difficulties to respond to the simpler *UNSD/UNEP Questionnaire on Environment Statistics* (section waste statistics) for which the response rates are below 50 per cent.

8. While the role of international organisations is to provide technical guidance and platforms for exchange of knowledge and experience, problems related to data collection and production of official waste statistics require solutions at the national level.

2. Need for harmonization of concepts and terminology

9. The international statistical community, in particular Eurostat, OECD, UNECE and UNSD, in close cooperation with UNEP, the Basel Convention Secretariat and others, have initiated several activities to harmonise terms, definitions and classifications used in waste statistics. The waste statistics questionnaires of the mentioned organisations are harmonised to a large extent, however certain conceptual and terminological problems remain (for example, different definitions of some key terms, see section 0II).

10. Conceptual and terminological problems partly result from fragmented policies that look at specific aspects of waste management but not at the whole picture. Such fragmentation means that different expert communities or national institutions (e.g. NSOs, ministries, inspectorates) have developed their own technical terms, definitions and classifications.

3. Existing waste statistics focus on the formal waste management sector, and therefore do not tell the full story

11. Existing statistics and indicators usually focus only on wastes processed through formal waste management activities using survey and administrative data. Such statistics leave important parts of the "waste story" uncovered. For example, not taking into account the amounts of waste recycled by informal waste pickers may lead to waste recycling rates which significantly underestimate the actual situation.

12. The scope of the "waste story" is wider than the scope of traditional waste statistics, even if waste statistics provide fundamental input for it. For example, the amounts of products repaired or materials re-used before entering the waste stream are usually not part of waste statistics, but are important for measuring the circular economy. Conceptual links between waste statistics and statistics on product and material flows are important.

13. Statistics on specific waste streams and/or waste characteristics that are of interest for emerging policies, or that require special management approaches include those on:

- Food waste
- Electronic waste (or e-waste, or waste electronic and electrical equipment (WEEE))
- End-of-life vehicles (ELV), including used tires
- Illegally traded waste
- Infectious waste
- Construction and demolition waste, in particular those containing hazardous materials such as asbestos; and
- Economic value of waste as a source of raw materials or energy.

4. Lack of harmonised definitions

14. National definitions vary among countries and sometimes even among institutions of the same country and are often difficult to harmonise. These include, among others, the terms "municipal solid waste", "recycling", "re-use", "recovery" and "waste management".

15. This negatively affects time series consistency and comparability across countries, between institutions of the same country, and over time.

16. Significant progress has been made in the European Union by revising the Directive on Waste (Waste Framework Directive, 2008/98/EC) in 2018. The new waste legislation includes a definition of "municipal waste", a revision of municipal waste recycling targets and a number of new measures and rules related to the monitoring process, thus solving most comparability problems related to monitoring waste generation or calculation of recycling rates. To enable effective monitoring of progress based on reliable and comparable data these measures are laid down in legally binding implementing acts.

5. The scope of waste statistics is not always well defined or harmonised

17. The scope of official waste statistics in terms of the types of materials and waste-related activities covered is not always well defined and harmonised worldwide. Some countries have difficulties to adjust national definitions to international ones and consequently include or exclude materials and activities in their statistics in different ways. This is often due to differences in national waste management plans and laws that steer data collection, and the difficulty to estimate some types of materials, waste streams and waste-related activities.

18. Waste material which is imported or exported is often not classified as waste. Customs officers look at the 'objective characteristics' of the wastes, which is sometimes inconsistent with the general waste definition in environmental policies and statistics. For a customs officer, a discarded fridge can still function, and he or she cannot judge whether it is different from a new fridge, a second-hand fridge or a wasted fridge. It might even be the case that the same good is categorized differently by the importer and the exporter. The same problem is typical for vegetal and industrial wastes. The Harmonized Commodity Description and Coding System (HS) is designed to deal with goods, and wastes are not reflected consistently throughout the nomenclature. Solutions need to be found to better adapt the HS for monitoring of transboundary movements of waste.

19. In addition, the scope of official waste statistics usually covers only regulated activities and does not capture or partially captures informal waste handling. This is discussed in detail in previous section I.A.3.

6. Lack of an internationally agreed classification of (non-hazardous) wastes

20. Currently, there is no globally agreed classification of non-hazardous wastes. However, most international waste and waste statistics frameworks, environment statistics frameworks (such as FDES) and accounting frameworks (such as SEEA), as well as many national frameworks reference or are compatible with the *European Waste Classification for Statistics, Revision 4* (EWC-Stat, European Commission, 2010). EWC-Stat is an official classification of waste used by Eurostat based on an aggregation of the very detailed classification found in the *European List of Wastes* that is used in the EU waste legislation and licensing, and describes hazardous and non-hazardous waste[1].

21. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention, Basel Convention Secretariat, 2019) provides an internationally agreed classification for hazardous wastes and is used for monitoring and controlling the transboundary movement of waste. However, this is not harmonized with the EWC-Stat classifications. The consequence is that in many countries two parallel datasets exist, one for reporting under the Basel Convention, and the other one using the EWC-Stat classification.

B. Emerging policy needs

22. In recent decades, waste-related policies have undergone a shift. Today, they aim not only to mitigate the environmental and human health impacts of waste, but also to improve resource efficiency and dematerialisation, with the long-term aim of reducing generation of waste.

23. Waste is now seen as a resource, particularly in the circular economy strategies that are becoming increasingly important. In the traditional view of the economy, waste is seen as the inevitable result of a linear chain of production and consumption activities. In contrast, the circular economy approach sees waste as an integral part of the production and consumption cycle.

24. In this more complex policy environment, better and more detailed waste statistics than those currently available are required. Waste statistics can no longer stand alone. Rather, they must be integrated with social and economic statistics, not to mention the need for greater coherence with other environmental statistics (for example, climate change-related statistics) and with other statistics e.g. materials, products, trade, to meet the new demands policy makers are creating.

[1] The *List of Wastes* is a non-statistical waste classification used in the EU for administrative purposes, forming part of the European Waste Framework Directive 2008/98/EC. See European Commission (2014) *Commission Decision of 18 December 2014 amending Decision 2000/532/ EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council (2014/955/EU)* Official Journal of the European Union 2014: L 370/44. Available at https://eur-lex.europa.eu/homepage.html (accessed June 18, 2018).

II. Main terms and definitions

25. Waste is defined differently in policy frameworks, laws and regulations of different countries, or sometimes even inconsistently defined in policies within the same country. This is one of the reasons why it has been difficult to harmonise waste statistics.

26. Huge efforts have been made to harmonise key terms and definitions used in international waste-related questionnaires and guidelines, in particular those used by Eurostat, OECD, UNSD and UNEP. These questionnaires also refer to the terminology and definitions used by the Basel Convention.

27. The terms "economic unit" and "household" in this chapter refer to institutional units as defined in national accounts[2]. They include households, private and public (government) entities, etc.

A. Definition of waste

1. Conceptual definition of "waste"

28. From the existing definitions in waste statistics, two international definitions are broad enough to be the basis of a conceptual definition of waste:

(a) Basel Convention: "Wastes are 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."

(b) EU Waste Framework Directive 2008/98/EC: "Waste means any substance or object which the holder discards or intends or is required to discard." It is mentioned that the scope of the EU Waste Framework Directive excludes wastewater.

29. These two definitions are very close. Basel Convention is a global convention with currently 188 countries as Parties to the Convention and is therefore a good basis for a globally valid definition.

30. Even if not spelled out directly, both definitions can be interpreted to exclude emissions to air, the residuals of substances released into ambient environment for a purpose other than final disposal (e.g. residuals of fertilizers and biocides) and wastewater.

31. Both definitions use the terminology "substances or objects" where other waste definitions use the term "material" (e.g. FDES, UNSD/UNEP and Eurostat/OECD questionnaires). For the purpose of this framework the term "material" will be used as this allows alignment with the terminology used in related frameworks, such as material flow accounts. For the purpose of the framework the terms "material" and "substances or objects" are considered to be synonyms.

32. The definition used in the Basel Convention (Basel Convention Secretariat, 2019) uses the term "disposed of" where the EU Waste Framework Directive (European Commission, 2008) uses both terms "discard" and "dispose of". For the purpose of this framework the two terms are understood as synonyms and the term "discard" will be used, because this term is also used in international questionnaires of UNSD/UNEP and Eurostat/OECD.

33. Therefore, it is proposed to use the following conceptual definition of waste:

Waste is any material which the holder discards or intends or is required to discard.

34. The following aspects must be taken into account in defining waste for measurement purposes:

[2] See para. 2.16 in SNA (United Nations et.al., 2009)

(a) **State of matter**

Often waste definitions refer only to solid, semi-solid or liquid material. Common examples include waste generated by a household, sludge from a sewage treatment plant and debris from building construction.

(b) **Radioactivity**

Radioactive waste, even if conceptually being "waste", is excluded from many international and national waste definitions, including the Basel Convention. Radioactive waste requires specific treatment which is covered by special regulations and procedures, and is therefore out of the scope of waste statistics. In some cases, difference is made between low and highly radioactive waste.

(c) **Source**

Source here means the economic activity (according to ISIC classification) or households that generate the waste. Some waste definitions, without further specifying that, exclude material from certain economic activities. For example, some waste definitions exclude material from mining, quarrying or construction, others exclude organic material originating from agricultural production that are left on the field. The Basel Convention for example excludes wastes originating from the normal operation of ships (article 1, paragraph 4).

(d) **Recycling or re-use at the place of generation**

Definitions used in international waste statistics exclude material directly recycled or reused at the place of generation which can be both an establishment or a household. For example, paper "cutting" wastes produced during paper making and collected within the mill for re-use within its own operations are not considered waste, as they are part of the integral functioning of the paper mill.

(e) **Value**

Value of the material is sometimes used for determining whether it is waste. In this case, the waste is defined as having no value for the holder who disposes or has to dispose the material, regardless of whether it has value for someone else.

(f) **The moment when something becomes waste**

The different moments in time when material becomes waste can lead to differences in waste statistics, e.g. when measuring "waste generation".

(g) **The moment when waste ceases to be waste**

As waste can become a product or raw material, it is also needed to define when it ceases to be waste. The EU Waste Framework Directive defines "end-of-waste" when waste has undergone a recovery operation (including recycling) and has been converted into a product or raw material.

2. Operational "waste" definitions used in international questionnaires, guidelines and frameworks

35. Several definitions of the term *waste* exist in international statistics (table 1Table), which are harmonised to a large extent.

Table 1
"Waste" definitions used by international organisations

Source	*Operational definition*
UNSD/UNEP (Questionnaire 2020 on Environment Statistics)	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.

Source	*Operational definition*
Eurostat/OECD	It excludes material directly recycled or reused at the place of generation (i.e., establishment) and waste materials that are directly discharged into ambient water or air as wastewater or air pollution.
OECD supplement (see https://stats.oecd.org/glossary/detail.asp?ID=2896)	Wastes may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities. Residuals recycled or reused at the place of generation are excluded.
FDES	Waste is discarded material for which the owner or user has no further use, generated by human activities in the course of production and consumption processes.
Basel Convention	"Wastes" are 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.
SEEA-CF	Materials that are not prime products (that is, products made for the market) for which the generator has no further use for own purposes of production, transformation or consumption, and which he wants to dispose of. Wastes may be generated during the extraction of raw materials, during the processing of raw materials to intermediate and final products, during the consumption of final products, and during any other human activity. Residuals recycled or reused at the place of generation are excluded. Also excluded are waste materials that are directly discharged into ambient water or air.
EU Waste Framework Directive	Waste means any substance or object which the holder discards or intends or is required to discard

36. Table 1 reveals a few differences between the internationally used definitions:

(a) Use of the term "material" versus "substances or objects", but the terms are used as synonyms;

(b) It remains unclear whether the terms "generator", "owner or user" and "holder" should be seen as synonyms. The Basel Convention does not refer to a holder in its waste definition (or generator, user, owner);

(c) Use of the term "discard" versus "dispose of" – the terms are used as synonyms;

(d) In most definitions, the moment when something becomes waste is defined as the moment when a material (substance or object) is discarded (disposed of), intended to be discarded (disposed of) or required to be discarded (disposed of). However, in SEEA-CF it is the moment when the user "wants to dispose it" and in FDES it is defined as the moment when the material is being discarded.

37. All the above international definitions can be embedded into the broad conceptual definition which is presented in section II.A.1: "*Waste is any material which the holder discards or intends or is required to discard."*

B. Definition of key terms of waste-related activities

1. Conceptual definition of "waste management"

38. A key term for policies and measurement frameworks on materials and waste is "waste management".

39. For the purposes of this framework "waste management" is defined as "the set of lawful activities carried out by economic units of the formal sector, both public and private for the purpose of the collection, transportation, and treatment of waste, including final disposal and after-care of disposal sites."

40. The set of activities included in this definition is discussed in the following sections.

A. Waste collection

41. A definition can be found in the EU Waste Framework Directive. It means "*the gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility."*

42. The EU Waste Framework Directive furthermore defines the sub-category "separate collection" as "*the collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment."*

B. Transportation of waste

43. For the purpose of this statistical framework the conceptual definition of "transportation of waste" is "the movement of waste from one place to another for a purpose. This may be done by various powered vehicles (such as trains, buses, passenger cars, lorries, boats and aircraft), by human-powered means such as walking and cycling or by pipelines". For measurement purposes this usually only refers to movements of waste between two different economic units (i.e. establishments or households).

44. A sub-category of transportation of waste are transboundary movements, i.e. export and import of waste.

C. Waste treatment

45. The EU Waste Framework Directive defines it as "*recovery or disposal operations, including preparation prior to recovery or disposal.*"

46. According to the definition of the EU Waste Framework Directive waste treatment operations are divided into disposal and recovery operations.

47. "Disposal"**,** according to the EU Waste Framework Directive, means "*any operation which main purpose is not the recovery of materials or energy even if the operation has as a secondary consequence the reclamation of substances or energy".*

48. "Recovery", according to the EU Waste Framework Directive, means "*any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy".*

49. An important sub-category of waste recovery is "recycling". Recycling is defined slightly differently in different contexts, which requires the formulation of a broader conceptual definition for the purpose of this framework. Table 2 presents the different definitions used by international organisations.

Table 2
"Waste recycling" definitions used by international organisations

Source	*Operational definition*
UNSD/UNEP (Questionnaire 2020 on Environment Statistics)	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. Recycling within industrial plants i.e., at the place of generation should be excluded.
Eurostat/OECD	
FDES	No definition provided
Basel Convention	No definition provided
SEEA-CF	Division 37 of ISIC/NACE defines recycling as the processing of waste, scraps whether or not used, into a form feasible to be transformed in new raw materials. Typical is that, in terms of commodities, both input and output consist of waste and scrap, the input being sorted or unsorted but always unfit for further direct use in an industrial process whereas the output is made fit for further processing and is to be considered then as an intermediate good. A process is required, either mechanical or chemical. The main purpose of activities classified in division 37 of ISIC/NACE rev 1 is the manufacture of secondary raw materials but there may be important secondary waste management activities.
EU Waste Framework Directive	'Recycling' means 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;

50. For the purposes of this framework "recycling" is defined as "any activity by which materials are recovered from a waste stream for the purpose of providing material inputs for use in another production process (other than processes designed for energy recovery, the reprocessing into fuels or material for backfilling)".

2. Operational "waste management" definitions used in international questionnaires, guidelines and frameworks

51. Table 3 presents the definitions of "waste management" used by different international organisations. The definitions differ slightly from each other, but can be embedded in the broader conceptual definition presented in section 1: "*Waste management is the set of lawful activities carried out by economic units of the formal sector, both public and private, for the purpose of the collection, transportation, treatment and disposal of waste, including after-care of disposal sites."*

Table 3
"Management of waste" definitions used by international organisations

Source	*Operational definition*
UNSD/UNEP (Questionnaire 2020 on Environment Statistics)	Collection, transport, treatment and disposal of waste, including after-care of disposal sites.

Source	*Operational definition*
Eurostat/OECD	
FDES	This topic includes statistics on: (i) the amount of waste collected and transported to treatment facilities or to their final disposal; (ii) the amount treated by type of treatment or disposal (e.g., recycling, composting, incineration, landfilling); (iii) the physical infrastructure for waste treatment, including the number and capacity of treatment plants; and (iv) other relevant information. (Topic 3.3.2)
Basel convention	"Management" means the collection, transport and disposal of hazardous wastes or other wastes, including after-care of disposal sites.
SEEA-CF	Waste management refers to activities and measures aimed at the prevention of the generation of waste and the reduction of its harmful effect on the environment. Includes the collection and treatment of waste, including monitoring and regulation activities. It also includes recycling and composting, the collection and treatment of low-level radioactive waste, street cleaning and the collection of public litter.
EU Waste Framework Directive	'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
SDG indicator 11.6.1 (Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities) [3]	The indicator methodology now distinguishes between formal and informal waste management: Formal waste management relates to waste management activities undertaken by units working within the context of the formal governmental or non-state actors regulating and operating waste management; that is, organisations or individuals registered as economic units with government authorities and assumed to generally abide by local laws and regulations related to wastes and their management. Informal waste management, recycling and recovery refers to waste management and recovery activities undertaken by individuals, economic units, or enterprises which are not sponsored, financed, recognised, supported, organised or acknowledged by the formal solid waste authorities, or which operate in violation of or in competition with formal authorities (Scheinberg et al., 2010). Informal units are assumed to abide by local waste-related laws and regulations when it is in their interests to do so.

3. Conceptual definition of the "informal and illegal waste handling"

52. For the purpose of this framework informal waste handling is defined as collection, transportation, treatment and disposal of waste by the informal sector[4]. When informal workers are involved in waste management (a legal activity carried out by an economic unit of the formal sector), then this falls in the category of "management of waste" (see section *0*).

[3] Metadata of SDG indicator 11.6.1 (version of September 2020): https://unstats.un.org/sdgs/metadata/files/Metadata-11-06-01.pdf

[4] ILO definition of informal sector: A group of production units comprised of unincorporated enterprises owned by households, including informal own-account enterprises and enterprises of informal employers (typically small and non-registered enterprises). See ILO (2017) section 4.5 on informal economy workers

53. The term “informal” is defined differently in different contexts. Furthermore, distinguishing between the “informal economy”, “informal sector” or “informal employment” is important when describing waste management. For example, when someone with an informal job (as defined by ILO) is working for the municipal waste collection, his work contributes to the formal sector according to national accounts. However, due to the lack of a formal working agreement, no income taxation etc., he may be considered as part of the informal economy as defined by ILO.

54. The informal sector can operate at all stages of waste flows from collection, transport, disposal and recycling.

55. “Illegal activities”, according to SNA 2008, are defined as activities carried out by unauthorised persons (e.g. unlicensed practitioners) and activities that are against national law regardless of who carries them out (e.g. illegal transportation in the form of smuggling of goods). For the purpose of this framework “illegal waste handling” includes both illegal transactions and illegal dumping of waste.

56. “Lawful activities”, in the context of this framework, are understood as activities carried out by authorised persons operating fully within the law.

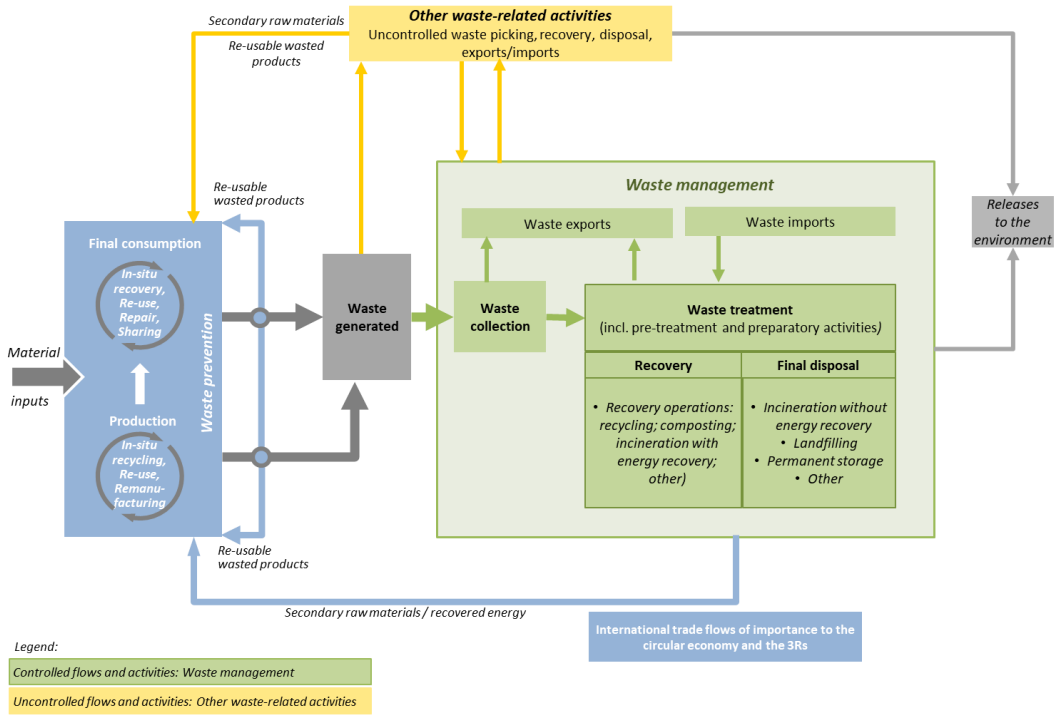
III. Waste statistics framework

A. Conceptual framework and the scope of official waste statistics

57. The conceptual framework was designed to apply to the national level but can equally be used to characterise waste statistics at sub-national level. It gives a simplified overview of the main waste-related activities (boxes) and flows (arrows), and their connection with production and consumption activities.

58. The following figure 1Figure presents the main conceptual understanding of waste flows, starting with material inputs for production and consumption, continuing with waste generation, waste collection and waste management. This traditional linear economy-based approach is complemented with important elements of a circular economy, such as waste prevention, re-use of products, and waste recovery. It is furthermore complemented by other waste-related activities which are usually not monitored but may contribute significantly to waste handling in many countries, such as uncontrolled waste picking or illegal waste disposal.

Figure 1
Conceptual framework for waste statistics, embedded in a broader context



Blue box and arrows	Production and consumption activities, and related trade; the flows of used and end-of-life products diverted from the waste stream for re-use, remanufacturing, repair or trade; and the flows of secondary raw materials and energy recovered from waste and that are used as inputs into the economy or traded
Grey box and arrows	Flows of materials to the economy, i.e. material inputs (inputs of raw materials and of derived products), their use in production and consumption and related flows of waste generated. Flows of residuals (releases) from the economy to the environment (pollutant emissions from waste management and related activities, waste dumped, etc.).
Green box and arrows	Waste management activities and related flows, i.e. controlled activities, including waste collection, transport, treatment (including recovery and final disposal), and related transboundary movements
Yellow box and arrows	Other waste-related activities, i.e. uncontrolled (informal and illegal) activities, and related flows.

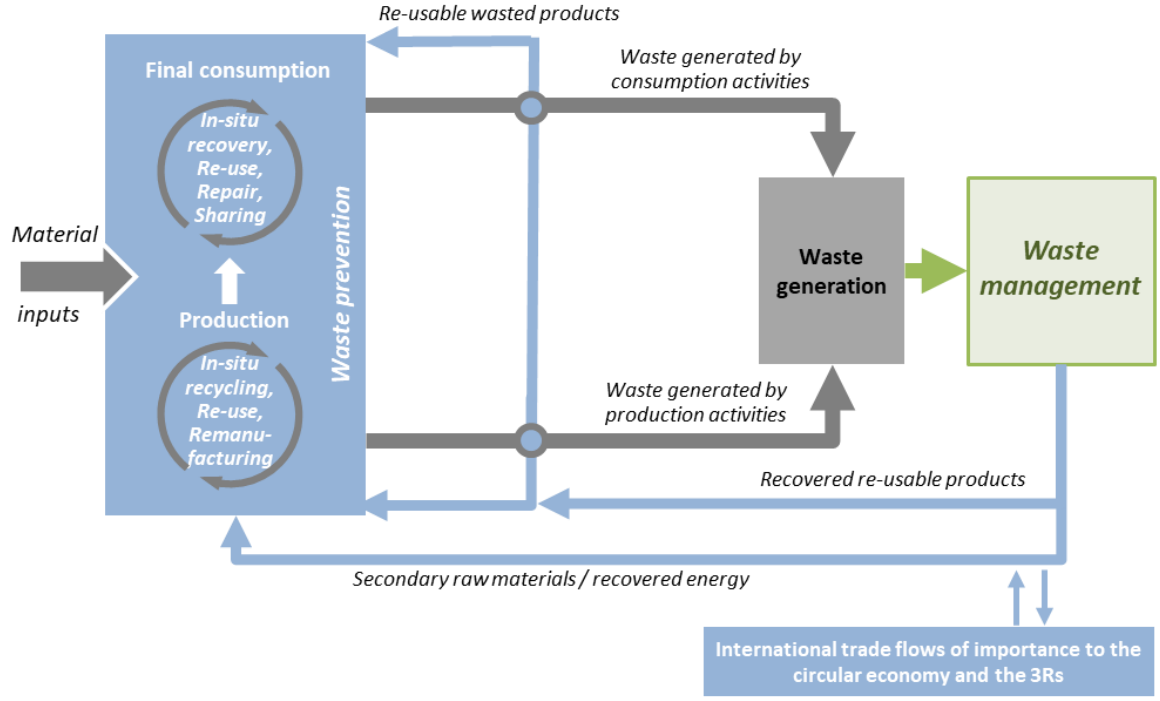
1. Component "production and consumption activities"

59. Data on production and consumption and on related material and product flows are not part of official waste statistics, but are important "waste-related statistics", which can be useful to measure aspects of the circular economy. Therefore, the conceptual waste statistics framework has to take into account production and consumption activities, as they provide the link with accounting of materials and products.

60. Figure 2Figure presents in more detail the activities related to production and consumption:

- The blue box represents consumption and production activities and the related material and product flows in the economy
- The blue arrows represent "products" that are diverted from the waste stream for re-use, and materials or energy recovered from waste that return to production and consumption or are traded
- The grey arrows represent flows of material inputs into production and consumption as well as flows of waste generated by production and consumption.

Figure 2
Production and consumption activities (blue box and arrows; grey box and arrows)



61. Terms and definitions used (see also section II on key terminology used in waste statistics):

- **Material inputs:** For the purpose of this framework material inputs are defined as raw materials and the derived semi-processed and processed products that enter the economy for use in production and consumption processes. Material inputs stem from domestic activities or from imports.
- **Production (in situ recycling, re-use, re-manufacturing):** The use of materials and other products in production processes, including their internal circular use through in-situ (i.e. at the place of generation) recycling, re-use and remanufacturing of residuals, by-products and used goods (e.g. repair and remanufacturing of used electric equipment, of used motor vehicle engines).[5]
- **Final consumption (in situ recovery, re-use, repair, sharing):** The use of materials and other products in final consumption, including their internal circular use through in-situ recovery (e.g. home composting, donations to charity), re-use and repair, and the sharing of goods and services by final consumers (e.g. through sharing economy approaches like car-sharing).
- **Re-usable products**: Used and end-of-life goods (including second-hand goods) diverted from the waste stream for re-use, remanufacturing, repair or trade (e.g. electrical and electronic equipment or its components that can be used for the same purpose for which they were conceived). Re-usable products can be diverted from the waste stream after waste collection (thus ceasing to be waste), or before the products become waste.
- **International trade flows of importance to the circular economy and the 3Rs (reduce, re-use, recycle)**: Exports and imports of second-hand goods, goods for repair and remanufacturing (e.g. used electronic equipment, vehicles), secondary raw

[5] Materials and "by-products" recycled and re-used of at the place of generation are not considered "waste" for the purpose of waste statistics. The EU Communication from the Commission to the Council and the European Parliament on the Interpretative Communication on waste and by-products (European Commission, 2007) provides useful guidance for distinguishing non-waste by-products from waste.

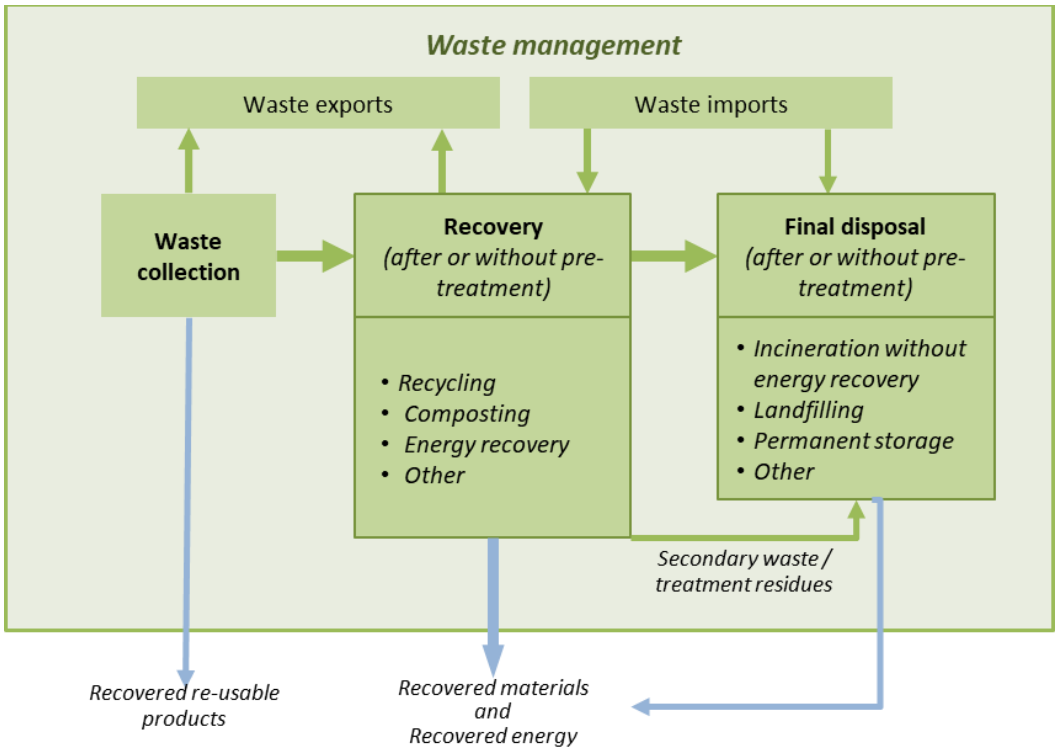
materials recovered after sorting or treatment. Such trade should not get mixed up with transboundary movements of waste for treatment and disposal.

2. Component "waste management activities"

62. The green box (figure 3) represents the waste management system (collection, recovery and disposal of waste) and related movements or flows, i.e. transport and transboundary movements (green arrows).

63. These activities and flows presented are typically carried out by formal units, sometimes also involving employees with informal jobs. These activities and flows are usually covered by waste statistics. The activities generate flows of recovered materials and products that can be used again in production and consumption (blue arrows).

Figure 3
Waste management activities (green box and arrows)



- **Waste collection:** Waste collection is generally defined as the gathering of waste, including the preliminary sorting and storage of waste for the purposes of transport. Thus, waste collection is an activity carried out by both the generating unit of waste (when it stores waste for the purpose of transport) and the transporting unit of waste (usually another economic unit, such as a municipal waste management company). It includes infrastructure and flows of waste that are collected (and transported) for further processing.
- **Sorting operations:** Sorting operations can take place at any stage of the waste management process, e.g. sorting by households for separate collection of their waste; sorting of recoverable materials before recycling, sorting of bulky waste collected before refurbishing.
- **Pre-treatment and preparatory activities**: Physical, thermal, chemical or biological processes applied prior to any recovery or disposal operation, and that change the characteristics of the waste to reduce its volume or hazardous nature, enhance recovery, and facilitate its handling or further treatment or disposal. It may also include temporary storage.
- **Exports and imports of waste** (transboundary movements): Movements of waste from a country to or through another country (the "rest of the world" in SNA terms).

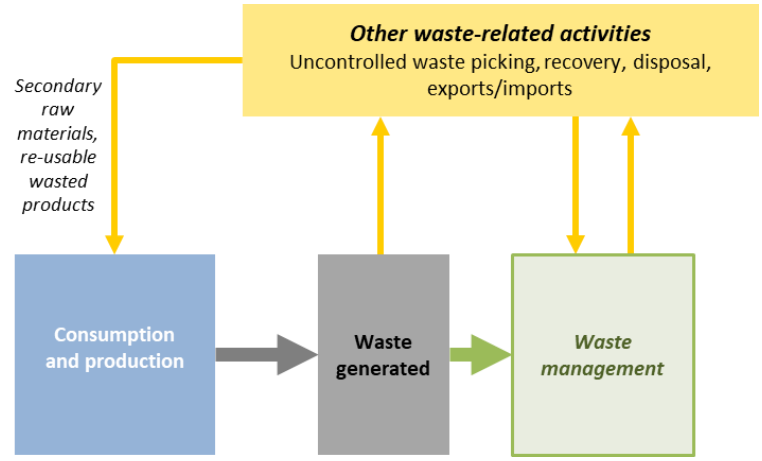
Waste can be exported or imported before or after treatment at their place of origin; they can be exported or imported for further treatment, for recovery or for disposal. N.B. Within a country, movements also occur between sub-national units (such as a province), or between a sub-national unit and another country.

- **Recovery operations**: Recovery is defined as any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. It includes recovery infrastructure and flows of waste sent to recycling, energy recovery, composting (after or without pre-treatment). These operations divert waste materials from final disposal and result in the recovery of materials and energy (e.g. secondary raw materials, other materials, energy) that are used again in production and consumption or traded. N.B. Biogas and heat can also be recovered from landfills (not shown on the diagram).
- **Recovered re-usable products**: End-of-life products and equipment (e.g. electrical and electronic equipment) or its components that can be used for the same purpose for which they were conceived. Re-usable products can be diverted from the waste stream after waste collection through sorting, or before the products become waste. See section 0 on production and consumption activities.
- **Waste disposal**: Waste disposal is defined as any operation which main purpose is not the recovery of materials or energy even if the operation has as a secondary consequence the reclamation of substances or energy. It includes incineration without energy recovery, deposit into or onto land (e.g. landfilling), deep injection, surface impoundment, release into water bodies and permanent storage.
- **Secondary waste**: Secondary waste consists of residual materials left over after treatment. It includes residual materials originating from recovery and disposal operations, such as incineration and composting residues. For the sake of simplicity, the diagram only shows the flows of residuals from waste treatment that go to final disposal; residuals from disposal operations such as incineration that are sent to landfills or material recovery are not shown, but need to be considered in waste statistics.

3. Component “other waste-related activities”

64. Other waste-related activities as presented in Figure 4 refer to uncontrolled informal or illegal activities that handle waste arising from production and consumption. They include informal waste picking (collection), transport, recovery and disposal, as well as informal exports and imports. These activities are often carried out by the informal sector and they can be illegal. It needs to be noted that the term “uncontrolled” is used in different contexts in various waste and waste policy frameworks and no harmonised definition exists. When the term “uncontrolled” is used in this report, it refers to activities for which no legislative control is in place, including illegal activities and informal waste handling outside the scope of regulated waste management (see also section B.3).

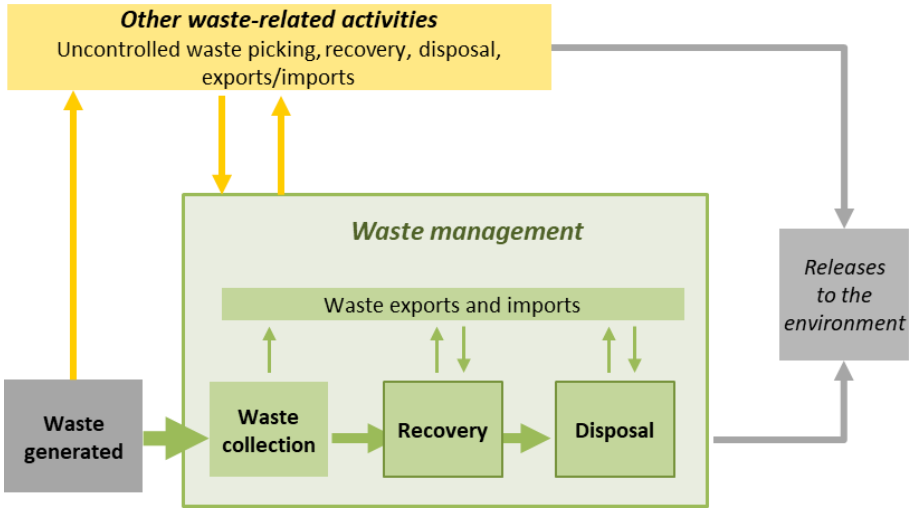
Figure 4
Other waste-related activities" (yellow box and arrows)



4. Component "releases to the environment"

65. The grey box on the right side of the diagram (see figure 5) represents releases to the environment originating from waste generation and management activities.

Figure 5
Releases to the environment (grey box and arrows, right side of the diagram)



66. Waste management and other waste related activities, even under regulated conditions, result in releases to the environment in form of gas (e.g. methane from decomposition processes or carbon dioxide from incineration), liquids (e.g. leachate infiltration into the soil) or solids (e.g. from illegal disposal or movement of waste by wind and water).

5. Waste stocks

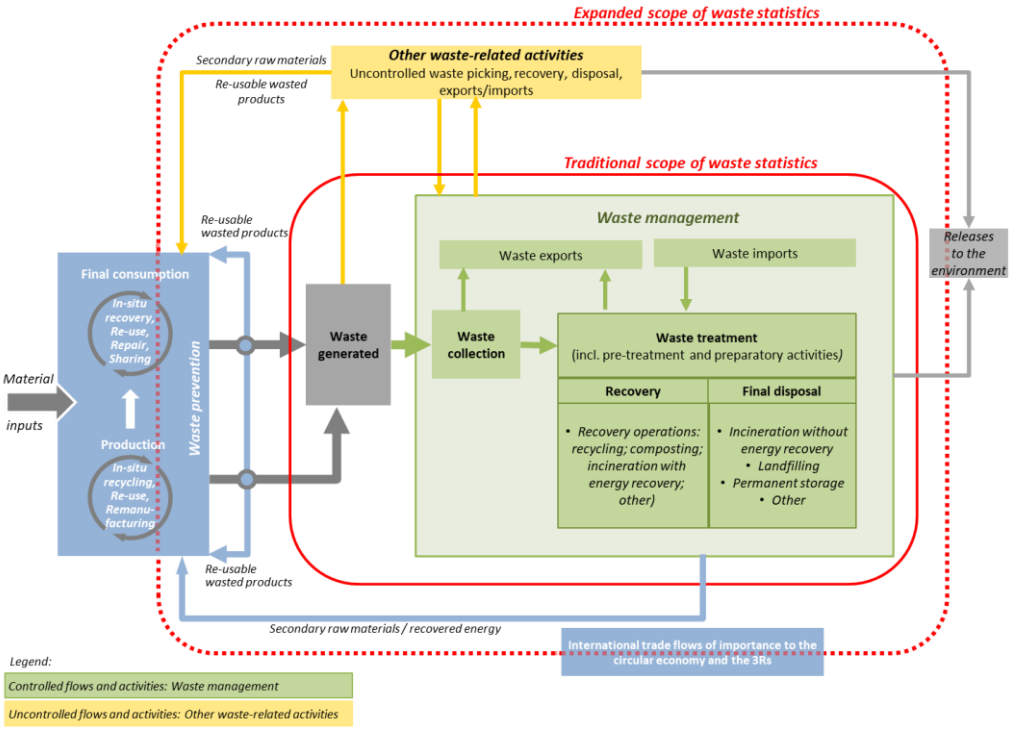
67. It is important to note that some waste-related activities increase the quantity of waste accumulated within the borders of the nation (waste stocks), either in controlled storage facilities that form part of the economy (such as managed landfills) or in the domestic environment. The main waste stocks of importance are:

- waste temporarily held by units carrying out waste treatment activities
- waste permanently stored in controlled waste disposal facilities such as managed landfill sites (these stocks are considered to remain within the economy)
- wastes from informal or illegal dumping in the environment.

6. Scope of waste statistics

68. Traditional waste statistics usually provide data on generation and management of waste. As uncontrolled waste collection and waste treatment activities can contribute significantly to waste handling, an expanded scope of waste statistics has to conceptually include them, even if they may be difficult to measure. In addition, the expanded scope is also needed for measuring the dependency of waste generation from production and consumption of goods, and circular economy aspects. For example, if the average lifespan of a good is known, waste generation can be calculated. This does not mean that waste statistics cover the production of goods, but that the production data and data on circular strategies (refuse, rethink, reduce, re-use, repair, refurbish, remanufacture, repurpose) may be needed for waste statistics. On the other end, the extended scope also has to consider waste-related emissions to the environment. Both the traditional scope and the expanded scope are presented in figure 6 and explained further in the following paragraphs.

Figure 6
Scope of waste statistics embedded in a broader context



A. Scope of traditional waste statistics (plain red border)

69. In the case of official waste statistics, the tradition has been to define the scope of measurement more-or-less in line with the scope of national and international policy and legal frameworks, thus covering waste management activities carried out by registered units in the business and government sectors (also called waste management, see section II.B). This choice of scope has also been driven by the consideration of data availability. In practical terms, the activities of informal units engaged in waste management (even if legal and following regulations) have generally not been measured in most countries.

70. Other activities, such as waste prevention activities, informal or illegal activities and waste-related product flows were excluded from waste statistics under this traditional scope.

71. Excluded in the traditional scope of waste statistics are:

- lawful waste-related activities undertaken by informal units
- illegal activities
- activities related to the use of secondary raw materials in production processes

- other waste prevention activities such as eco-design, eco-innovation and "sustainable production and consumption" processes.

B. Expanded scope of waste statistics (dotted red border)

72. It is desirable in many instances to define the scope of waste statistics more broadly than has been the tradition. When defined in this expanded sense, the scope of waste statistics covers, in addition to the activities and flows covered in the traditional scope:

- other waste-related activities (informal and illegal) and the related flows, and
- flows of waste-related products (secondary raw materials and energy, waste products and recycled materials) resulting from waste treatment and disposal, including international trade in such products, which is of importance in the context of the circular economy, and
- flows of wasted goods which went for repair and remanufacturing, including international trade in such products.

73. Most of the above activities and flows are difficult to measure. Further work is needed to develop methodologies and guidelines for addressing these data gaps with new statistics, estimations, modelling etc.

C. Links with other relevant (waste-related) statistics

74. Beyond expanding the scope of official waste statistics, it is also important to acknowledge the important links between the following upstream and downstream activities and those directly related to the processing of waste:

- material inputs to the consumption and production activities from the environment
- waste prevention activities such as *in-situ* re-use of scrap materials in production processes
- re-use of waste products
- releases of wastes and related emissions to the environment
- goods placed on the market and imported (needed for extended producer responsibility systems)
- flows of waste-related products (secondary raw materials and energy, waste products and recycled materials) resulting from waste treatment and disposal, including international trade in such products, which is of importance in the context of the circular economy.

B. Measurement considerations

1. Main international data collections and data bases

75. Waste statistics are collected by different international organisations (main players are Basel Convention, UNSD/UNEP, Eurostat, OECD and UNECE). These data collections all together ensure a global country coverage. They follow the same conceptual understanding; thus the data sets are expected to be complementary, coherent and consistent.

76. 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 (WEEE), portable batteries and accumulators, end-of life vehicles.

2. Disaggregation of waste statistics

77. Waste statistics are usually measured by a combination of type, source and composition, depending on how they are collected and governed in the country.

78. These categories are not mutually exclusive, for example industrial waste may or may not be hazardous, plastic and paper waste may originate from households or any economic activity.

79. Keeping track of both primary and secondary wastes is especially important in understanding the life cycle of materials in a circular economy, and to understand the resulting double-counting. The total amount of waste generated by an economy could thus constitute of both primary and secondary wastes and is then more than the sum of primary waste generated by its economic units, but also more than the waste which is managed or treated.

80. Taking into account the experience with existing international data collections and the expanded scope of waste statistics, statistics should be compiled for each stage of the value chain, from generation via collection and transport to treatment and disposal, including transboundary movements and other (e.g. informal and illegal) waste handling.

81. Statistics on “municipal waste” are relevant for many national and international policy questions and indicators (e.g. SDG indicators 11.6.1 and 12.5.1). Municipal waste consists to a large extent of waste generated by households but may also include similar wastes generated by small businesses and public institutions and collected by the municipality. The OECD/Eurostat and UNSD/UNEP definitions of municipal waste are harmonized. Both exclude municipal sewage waste and construction and demolition waste. Countries often use slightly different definitions and sometimes it is not clear what to include or to exclude (e.g. what if the industrial sector is also municipally managed?). Therefore, metadata on the used definition of “municipal waste” is key.

82. Statistics should be compiled at national level, as well as for selected sub-national units (for example, provinces or major cities).

83. In addition, it may be desirable to break statistics down further by waste stream, such as municipal waste, food waste, waste electric and electronic equipment, sewage sludge, used tires, bulky waste, construction and demolition waste.

84. Complementary data on, for example, waste management expenditures and employment in the waste management sector provide additional information of relevance to the design and assessment of waste-related policies.

3. Units of measure

85. Official waste statistics are usually reported in units of mass (kilograms or tonnes). However, respondents to waste surveys often use other measurement units; for example, volumetric units may be used for bulky wastes (such as construction debris) and simple counts may be used for wastes made up of homogenous, discrete items (such as waste tires).

4. Accounting for illegal activities

86. Accounting for illegal activities is not easy, as there are no internationally accepted definitions for such statistics. The data available in countries are limited, often scattered and rarely harmonised with official statistics. Data sources include national compliance and enforcement agencies, inspectorates and environment ministries. Availability is best for data on illegal transport and transboundary movements of waste that are controlled under national law and international commitments. Some countries have information systems that monitor waste movements and include information on illegal movements and on fines paid.

87. Illegal waste-related activities (including disposal and trade) are generally defined in national law. A major part of the activities is illegal waste disposal, such as dumping and burning of wastes in open areas. Other activities include illegal recycling and illegal trade.

Such activities can occur at any point during the processing of wastes, whether carried out by the formal or informal sector.

88. Countries are encouraged to take into account illegal waste activities and related flows in their waste statistics to obtain the most complete picture of waste generation and processing possible. As it is difficult to measure these activities and related waste flows, estimates should be provided if relevant in a country, e.g. in form of a footnote. Methodological development is needed at both the national and international level to better capture these activities in statistics. Estimates on illegal activities should be integrated into official waste statistics only once a robust methodology and clear definitions have been developed and agreed upon at international level.

89. As long as no internationally agreed upon definitions and classifications exist for illegal waste-related activities, countries may wish to use their own definitions and classifications as the basis for measuring these activities.

5. Accounting for waste-related activities by the informal sector

90. For the purpose of monitoring informal waste-related activities refer to the informal solid waste sector as "individuals" or "collectives of individuals" that are not officially registered and licensed, but who are involved in private sector waste handling activities. These occur outside of formal waste management regime, which could be, but not exclusively, not sponsored, financed, supported, organized by the formal solid waste authorities, or which even operate in violation of or in competition with formal authorities.

91. Key aspects of the informal sector to be monitored include types of waste materials collected and the estimated contribution to waste treatment. Other important aspects could serve as proxies, such as size, number of people involved, income and jobs.

92. The characteristics of informal waste sector are specific to each country and no internationally agreed upon definition exists.

93. The informal sector is active in almost all aspects of waste processing. It often interacts with the formal sector and can also carry out illegal waste-related activities.

6. Accounting for transboundary movements

94. Data on the imports and exports of waste are an important component of waste statistics.

95. Wastes that are imported or exported are often not classified as such in trade statistics. Customs officers consider the "objective characteristics" of the materials, which are sometimes inconsistent with the definition of waste in environmental policies and statistics. A customs officer cannot judge, for example, whether a used refrigerator is a second-hand refrigerator intended for continued use or a waste refrigerator intended for disposal.

96. It may be that the same good is categorized differently by the importer than by the exporter. The Harmonized Commodity Description and Coding System (HS) is designed to deal with products first and foremost. Wastes are not reflected consistently throughout the HS nomenclature. Solutions need to be found to better adapt HS for monitoring of transboundary movements of waste.

97. Data on trade in second-hand goods, goods for repair/remanufacturing and secondary raw materials[6] are important for integrated waste and materials management and the circular economy. Such data are rarely as separate statistics, because of the difficulty of distinguishing between second-hand products and other products in trade statistics. An OECD study on non-hazardous recyclable materials (OECD, 2008) identified the HS codes on metal scrap, scrap paper and plastic scrap that could be used as starting points. They could be complemented by the HS codes for waste compiled by Kellenberg (2012) and by the correspondence table made available by the Secretariat of the Basel Convention (2013). However, the nature and

[6] Eurostat publishes the secondary raw material price indicator for glass, paper and board and plastic under https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Recycling_%E2%80%93_secondary_material_price_indicator

magnitude of such trade flows are extremely complex and their measurement merits further investigation.

7. Links to statistics on raw material and product flows

98. For waste statistics to be fit for monitoring re-use, recycling, integrated waste and materials management policies and other circular economy approaches, they should be compatible with statistics on raw material and product flows (product sales, second-hand and remanufactured products). In particular, waste statistics should be consistent with statistics on:

- material inputs into the economy or into production processes from, for example, economy-wide and other types of material flow accounts
- secondary raw materials
- re-used and second-hand products.

8. Criteria for high-quality international waste statistics

99. The quality of the data (that is, their fitness for purpose) is determined by a variety of characteristics. For waste statistics, particular attention should be paid to the following:

- Coherence over time
- Comparability and coherence across countries
- Timeliness
- Metadata.

9. Classifications – type of waste

100. There is no globally agreed classification of non-hazardous wastes. However, most international waste and waste statistics frameworks, environment statistics frameworks (such as FDES) and accounting frameworks (such as SEEA-CF), as well as many national frameworks refer to or are compatible with the European Waste Classification for Statistics, Revision 4 (EWC-Stat, European Commission (2010)).

101. The Basel Convention provides an internationally agreed classification for hazardous wastes and is used for controlling the transboundary movement of waste. However, this is not covering all hazardous waste and is not harmonized with the EWC-Stat classifications.

102. A classification for electronic wastes has been developed recently by the Partnership for Measuring ICT for Development (Forti V. et.al., 2018). It links to multiple data sources and data formats, such as the Harmonized Commodity Description and Coding System (HS) and the EU WEEE Directive reporting.

103. The Harmonised Commodity Description and Coding systems (HS codes) allows participating countries to classify traded goods on a common basis for customs purposes, and thus is relevant for statistics on imports and exports of waste. However, the actual imports and exports of wastes cannot be distinguished from products through the HS classification, thus posing a problem for producing official statistics. Solutions need to be found to better adapt the HS for monitoring of transboundary movements of waste.

10. Classifications – treatment of waste

104. Annex IV of the Basel Convention describes the recovery and disposal operations. This is also adopted in the EU Waste Framework Directive (European Commission, 2008), and is globally recognized and widely used for waste policies and waste statistics.

105. In the European Union the following grouping is used by Eurostat for reporting under the for the Waste Statistics Regulation (European Commission, 2002). The Task Force recommends using the same groupings also in countries outside the European Union:

(a) Disposal - incineration

(b) Disposal – landfill

(c) Disposal – other

(d) Recovery – energy recovery

(e) Recovery – recycling and backfilling

IV. Recommendations for improving waste statistics at national and international level

A. Recommendations for national producers of waste statistics

1. Review existing waste statistics and develop a national work plan on waste statistics

106. Given the increasing importance of waste-related polices in recent decades, the main recommendation to official national statistics providers is to develop a national work plan on waste statistics.

107. Any inconsistencies and gaps in existing statistics should be documented and prioritized in a national work plan on waste statistics. This should include a plan to systematically improve official waste statistics, beginning with those of highest priority. The work plan should also address the need to adequately fund the production of official waste statistics. Data producers, data users and other national stakeholders should be involved in developing the work plan. The process may be guided by international organisations. In preparing the work plan, NSOs should consider the specific recommendations laid out below, which are relevant for countries with varying degrees of experience with waste statistics.

108. The review of existing waste statistics should take into account:

- National user needs
- Quality of existing waste statistics
- Data needs of national and international waste-related legislation and policies
- Coherence of existing waste statistics with other statistics
- Geographic coverage of existing waste statistics
- Existing waste trade statistics
- Complementary statistics
- National definitions of key terms.

2. Consider widening the scope of national waste statistics

109. Existing waste statistics should be reviewed to identify their scope and document which waste-related activities, stocks and flows are included within the scope and which are not, in comparison with the expanded scope of waste statistics presented in section III.A.6.

110. In doing so, a distinction should be made between activities, stocks and flows excluded from official waste statistics for pragmatic reasons versus those excluded for conceptual reasons. For example, if the activities of informal units engaged in lawful waste management activities are not within the scope of existing statistics, is this for pragmatic reasons (perhaps there is simply no possibility to collect data from these units) or because informal units are conceptually excluded from the national definition of waste management? In particular, the review of the scope should include the following:

- Review the role of informal units in waste-related activities
- Assess the extent of illegal waste-related activities
- Consider linking waste statistics with statistics on releases to the environment
- Expand the practical scope of waste statistics in line with the resources and user needs.

3. Measurement considerations for waste statistics

111. To make waste statistics more suitable for multiple purposes and to increase international comparability, it is recommended to take into account the following measurement considerations:

- Ensure the consistency and clarity of different categorisations used in waste statistics
- Report wastes in mass units
- Report wastes in monetary or other units where relevant
- Use nationally appropriate definitions and classifications of informal and illegal activities.

4. Other recommendations to national providers of official waste statistics

- Consider developing national indicators for measuring the circular economy
- Consider compiling SEEA waste accounts if these do not exist.

B. Recommendations for international organisations

1. Ensure ongoing collaboration among international organisations and with country experts

112. Both existing collaborative mechanisms (such as the CES, Eurostat expert groups, the UNSD Expert Group on Environment Statistics, the Inter-secretariat Working Group on Environment Statistics (IWG-ENV), the UN Committee of Experts on Environmental-Economic Accounting, the OECD Working Party on Environmental Information and the OECD Working Party on Resource Productivity and Waste) and new partnerships with statisticians, policy makers, industry and academia should be used. Such partnerships allow various actors to come together and facilitate implementation of the new waste statistics framework.

2. Make guidelines available and support capacity development

113. Additional guidelines are needed for producers of waste statistics. The main objectives of the guidelines are to help countries in the development and implementation of their national work plan on waste statistics (see section IV.A.1, including widening the scope of waste statistics (see section IV.A.2). This could include, for example, guidelines on the measurement of informal waste-related activities.

3. Make reference to the waste statistics framework in existing data collections, frameworks and indicator methodologies

114. As far as possible, the expanded scope of waste statistics when defining waste-related indicators and reviewing methodologies should be taken into account. Waste-related SDG indicators and other relevant international indicators should be defined to be consistent to the extent possible with the definitions and scope of this framework (e.g. by considering recycling of waste by informal units) as well as with the contents of the joint OECD/Eurostat and UNSD/UNEP questionnaires. This will enhance international comparability of the indicators and provide an incentive for countries to broaden the scope of waste statistics.

115. Furthermore, this report identified a few minor discrepancies in terms and definitions used in international questionnaires. Whenever existing international data collections are reviewed or updated, these issues could be solved.

116. When formal revisions of international statistical frameworks (such as FDES or SEEA-CF), classifications and related documents are undertaken, the opportunity could be taken to align them with the concepts and definitions in the waste statistics framework.

V. Issues for further research

117. While conducting its work, the Task Force identified a number of issues that require further research to fully implement the proposed waste statistics framework. The following research agenda is proposed to address these issues.

- Development of new methods and tools for data collection
- Development of a waste classification for global use
- Better alignment of Harmonized Commodity Description and Coding System (HS)
- Guidelines for the practical distinction of wastes, resources and products
- Guidelines for distinguishing between waste management, informal and illegal activities
- Disposal in waterbodies.
- Further clarification of key terms:
    - Waste and generation of waste
    - Illegal waste-related activities: Further discussion is needed to define illegal waste-related activities. In this regard, it would be useful to examine the laws pertaining to solid waste management in UNECE member states to develop a list of activities and waste streams that can be considered as illegal
    - Informal waste handling
    - Secondary raw materials
    - Re-use.
    - Food waste, organic waste, biodegradable waste, wood waste, etc
    - Waste stream
    - Municipal waste.
- Filling data gaps
- Responding to emerging needs.

118. It is recommended that the issues for further research are addressed by international organisations in close collaboration with national waste statistics experts. As far as possible, existing expert groups and mechanisms already established by Eurostat, OECD, UNEP, UNSD or UNECE, should be used.