EUROPEAN COMMISSION
EUROSTAT

Directorate E – Sectoral and regional statistics
E.2 – Environmental statistics and accounts; sustainable development

Country-specific notes referring to data on Packaging and Packaging Waste

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General notes

(1) This paper provides additional information on specific aspects such as methodologies of data collection and related changes in the methodologies.

(2) Compliance or non-compliance with targets of the Packaging and Packaging Waste Directive (Directive 94/62/EC) is not addressed in this document.

(3) Failure in submission by a Member State of all or some data (missing obligatory cells or missing voluntary cells) is not addressed in this document.

(4) Some countries do not provide data on the location of the recycling activities (recycling in the Member State, recycling in other Member States and recycling outside the EU), since this data is not required under the old calculation rules. Consequently, the Member States in 2019 reported this data either because they applied the new calculation rules or because they could provide split data even if it was reported under old calculation rules. Until reference year 2019, the provision of separate data for steel and aluminium packaging waste is optional (when reporting according to the old calculation rules).

(5) Steel and aluminium recycled after their separation from incineration bottom ash (IBA) shall be reported separately only by the Member States that include those amounts in the recycling rates.

(6) The information summarised here is based on information and data that the countries provide in their Quality Reports submitted to Eurostat.

(7) The explanations per country provided below are in chronological order from least to most recent.

Please consider that the countries below are in protocol order, which is not the same as alphabetical order in English.

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1. AUSTRIA

Packaging waste generation data for Austria comes from waste analysis from mixed household and mixed business and bulky waste, with the exception of wood packaging. Wood packaging placed on the market (PoM) data is taken as a combination of EPR (extended producer responsibility) data and the self-declaration of producers via an electronic register.

Packaging waste management data for Austria comes from a combination of EPR data (EPR schemes report annually the amounts sent to recycling/recovery facilities), waste analysis, administrative reporting and self-reporting via the electronic register.

2. BELGIUM

Packaging waste generation data for Belgium comes from reporting made by producers/importers to PROs, Fost Plus for household packaging waste and Valipac for commercial packaging waste, with the data then verified by the Interregional Packaging Commission. Producers/importers are required to report PoM data through the EPR scheme over 300 kg in total of all packaging. Data from producer responsibility organisations (PROs) do not cover the total market; an extrapolation was made based on the estimate of the total market including de minimis and free-riders.

Packaging waste management data for Belgium comes from reporting made by waste operators and recyclers and inter-municipal companies to the accredited compliance organisations. Various declaration systems are possible and applicable. Fost Plus systematically audits all household packaging waste recyclers and Valipac systematically audits all non-packaging waste collectors and sorters.

Notable changes in reporting:

- **2013-15 wooden packaging**: Between 2013 and 2015 extensive audits of the national system were established to fulfil the obligations defined by law and to stimulate the recycling of industrial packaging waste. The audit caused methodological breaks in the time series between ref. years 2013 and 2015 of wooden packaging for the treatment categories ‘recycling’, ‘energy recovery (R1)’ and ‘incineration with energy recovery at waste incinerators’.

- **2013-14 plastic packaging**: The increase in the recycling of plastic packaging between reference years 2013 and 2014 is due to the recycling of a greater amount of plastic packaging stock in 2014.

3. BULGARIA

Packaging waste generation data for Bulgaria is received and collated by the National Statistics Institute, other parties involved in the data collection are not specified. Waste generation data is predominantly PoM based on EPR with supplemental data provided from administrative reporting different from EPR. Bulgaria’s verification process includes cross-checks and time-series checks.

Packaging waste management data for Bulgaria is quantified and reported (by R/D codes) by waste operators to the Executive Environment Agency (EEA). The EEA performs cross-checks of the reported data at different points during the treatment chain, comparing it to data from EPR schemes and municipalities. Time-series checks are performed on the reported data and annual audits are performed by financial auditors on the activities and data provided under EPR obligations from collective schemes.

Notable changes in reporting:

- **2013-14 plastic packaging:** From 2013 to 2014, reported data on recycled plastic packaging increased significantly. The main reason for this increase is that a bigger amount of recyclable plastics was in stock.

- **2016-17 metal and plastic packaging:** From 2016 to 2017, the EPA confirmed that recycled volumes of metal and plastics increased thanks to the biggest recycling companies, which processed greater amounts of the increased amount of collected waste in 2017.

4. CZECHIA

Packaging waste generation data for Czechia is the sum of two producer/importer databases; one is the national packaging EPR system (EKO-KOM) and the other is the Ministry of the Environment database managed by CENIA. The threshold for producer reporting is 300 kg PoM/yr or a turnover of CZK 4.5 million, and estimates are used to cover the whole market with the exception of free-riders and private importers. Waste data is then cross-checked quarterly with samples taken through waste analysis.

Packaging waste management data for Czechia comes from a range of sources, including EPR data, administrative reporting, and data from waste operators and municipalities. Percentages of packaging and non-packaging waste in Czechia's waste streams are determined from the quarterly waste analyses of household waste.

Notable changes in reporting:

- **2011-13 paper/cardboard energy recovery:** The amount of plastic and paper & cardboard packaging 'incinerated at waste incinerators with energy recovery' fluctuated between 2011 and 2013 as one of the three Czech incinerators was reconstructed.

- **2013-14 wood recycling:** From reference year 2013 to 2014, a break in the time series of wooden packaging recycling took place as the dominant wood waste processor in the Czech Republic was refocused. Another significant accelerator of wooden packaging recycling was the development of a final sorting of bulky waste including a packaging share.

- **2016-17 metal recycling:** The 2017 increase in recycling of metal packaging is caused by the extension of the collection network for steel materials and also the proportion of packaging components is growing. That is important in the Czech system because there is an integrated collection system within which both packaging and non-packaging waste are collected.

- **2016-17 wood recycling:** The 2017 decline in wood packaging recycling is caused by the ongoing bark beetle calamity in the Czech Republic, which causes problems with recycling of waste wood due to its excess.

- **2017-18 aluminium recycling:** The increase in recycling of aluminium packaging in 2018 is caused by a significantly increased density of the collection network in relation to metal packaging within the EPR system.

5. DENMARK

Packaging waste generation data for Denmark is collected, validated, and consolidated by the Danish Environmental Protection Agency (DEPA). Waste generation data is PoM calculated from production and foreign trade statistics (provided by Danish institutions such as Statistic Denmark and SKAT), and final values are calculated by consultants. Estimates are only used for 'private imports /exports by private parcels' and 'internet imports and exports i.e. online sales'.

Packaging waste management data (classified by the national treatment codes) for Denmark is reported by waste operators and importers/exporters to the Danish waste data system (Affaldsdatasystemet - ADS) which is managed by the DEPA.

Notable changes in reporting:

- **Wood packaging:** The amount of wooden waste generated tends to fluctuate from year to year, as in Denmark the amount of wooden packaging waste depends greatly on the supply of wooden pallets, which itself varies depending on the replacement of reused wooden pallets. The recovery rate may vary because the waste generation (considered equivalent to PoM) may not take place in the same year as the recovery activity.

- **2010 all data:** In 2010, Denmark introduced a new waste database system to manage all waste streams. Denmark let the data from 2009 be representative for 2010 and consequently data for reference year 2010 were flagged as estimates, as it was decided that the quality of the reported data for reference year 2010 was not sufficient for validation.

- **2013-14 metal generation:** The decrease of reported data on waste generated from metal packaging between reference years 2013 and 2014 was due to the fact that the calculation methods for packaging and packaging waste generated were updated for the reference years from 2014 onwards. The amount of metal slags from incineration going to recycling was adjusted.

- **1997-2014 incineration and energy recovery:** Denmark reported incineration of packaging for some years in the category "incineration/energy recovery R1" and for other years "Recovery - incineration with energy recovery". Since 2014, incineration is completely reported as "incineration/energy recovery R1" following a discussion with Eurostat on the correct classification.

- **2016-17 paper/cardboard energy recovery:** The amount of paper/cardboard incinerated with energy recovery increased considerably from 2016 to 2017. According to DK authorities, the amount of paper/cardboard POM has increased for 2017, while the amount collected for recycling has decreased.

6. GERMANY

Packaging waste generation data for Germany is collected by GVM Gesellschaft für Verpackungsmarktforschung mbH and quality is controlled by the Umweltbundesamt. The data is compiled and cross-checked from different sources including production, foreign trade statistics and specific surveys.

Packaging waste management data is compiled and cross-checked from a variety of sources including administrative reporting, surveys, waste analysis, data from waste operators and municipalities.

Notable changes in reporting:

- **2011 recovery**: For reference year 2011 a new methodology was introduced and resulted in a break in time series of certain recovery operations. Therefore, data for the treatment operation 'energy recovery (R1)' and 'incineration with energy recovery at waste incinerators' were indexed with the flag 'B' (=break in time series) for reference year 2011.

- **2018 plastic generation:** For reference year 2018 onwards, the approach to obtain data on plastic waste generated 'relies not on data from EPR-schemes, there a correction for free riders was not necessary. Online sales are included.' Additionally, 'estimations have been made for gross-sale packaging and for tertiary packaging.'

- **2018 packaging waste management:** For reference year 2018 onwards, the sources for data on packaging waste management are: 'data from EPR-schemes, data from waste management companies, data from bottom ash analysis (metals), data from surveys (wood), data from sorting plants, data from paper industry, data from foreign trade statistics.'

- **2019 packaging waste management:** The new calculation methods were applied for reference year 2019, causing significant changes in the calculation methodology applied by Germany. Among these changes were 1) shifting the point of calculation for the recycled amount of packaging waste further down in the process chain and, as a consequence, increasing energy recovery through treatment of losses from the recycling process, 2) assignment of organic recycling to recycling quantities instead of "other recovery", and 3) assignment of the materials of composite packaging into different packaging materials.

7. ESTONIA

Packaging waste generation data for Estonia is based on waste analysis (96 samples are taken from mixed household waste 4 times a year) and recorded in the national waste electronical system (WDMS). Estonian Environment Agency is responsible for data collection and analysis and reporting.

Packaging waste management data is compiled and cross-checked from a variety of sources including surveys, electronic registry, waste analysis and waste operators.

Notable changes in reporting:

- **2010-11 metal packaging**: A break in the time series between reference years 2010 and 2011 took place for metal packaging waste generated and for the treatment category 'material recycling' due to a change in the assessment of quantities by responsible undertakings. The proportion of metal packaging was estimated to be 15% and the data on metal packaging for the reference year 2011 were indexed with the flag 'B' (=break in time series).
- **2012-13 paper and plastic recovery:** From reference year 2012 to 2013, a break in the time series took place for the amounts for paper & cardboard and plastic packaging for 'energy recovery (R1)', which rose extraordinarily, as for the first time, in 2013, municipal solid waste was incinerated in a waste incineration block.
- **2013-14 wooden packaging**: From reference year 2013 to 2014, a break in the time series can be observed for wooden packaging. Wooden packaging generated and wooden packaging in the category 'material recycling' increased significantly. These increases were due to the following facts:
    - Separately collected waste quantities increased.

- Packaging waste auditing procedures were specified in the year 2014, resulting in a significant improvement in data quality.
- In 2014 the national recovery operation 'preparing for reuse of products or their components, consisting mainly organic materials' increased. Previously, this activity was not accurately reported. The reporting on this operation affects both the volumes of generation and recycling.

- **2017 wooden energy recovery**: The increase in energy recovery (R1) for wooden packaging in 2017 is due to the fact that power plants are expanding their capacity for waste wood (based on power plant report).

- **2017 energy recovery**: In 2017 for the first time Estonia reported quantities treated in the category "Incineration at waste incineration plants with energy recovery" because there is one plant classified as a waste incineration plant in the country (in previous years it has been included in energy recovery (R1)). Communication on whether this plant does really not fulfil R1 criteria and is hence correctly placed with "Incineration at waste incineration plants with energy recovery" is ongoing.

- **2018 plastic recycling**: In 2018 the large increase in the recycling of plastic packaging waste is due to the following changes: new operators have entered the recycling market and the largest plastic recycling plant started operating full-time in 2018.

- **2018 wooden recycling**: In 2018 the increase of recycling of wooden packaging is due to one company starting to use packaging waste in the production of particleboard and packaging waste recyclers who already operated in the market increased their recycling volumes.

- **2018 wooden packaging generation**: In 2018 an increase in generation of wooden packaging waste was observed. According to waste handlers, the amounts of separately collected wooden packaging waste increased.

- **2018 paper energy recovery**: The decrease of paper and cardboard energy recovery in 2018 is mostly affected by a change in methodology. Paper and cardboard packaging that has been incinerated among mixed municipal waste was previously overestimated.

- **2019 all packaging waste streams:** For reference year 2019 onwards, Estonia reports packaging data in accordance with the new calculation rules. For data from reference year 2019, the results of the new study[1] are applied. As a consequence, the amounts of generated packaging materials in 2019 are not comparable with those in 2018. The most significant changes can be seen in generated metal packaging.

- **2019 plastic packaging recycling:** The increase in recycling of plastic packaging comes from the increase in the production of plastic recycling companies in reference year 2019.

- **2019 energy recovery of wooden packaging:** Energy recovery of wooden packaging increased in 2019 'due to the increase of generation of wooden packaging. Also one of the largest companies has set a goal to increase the amount of biomass (including wood waste) burned and to replace oil shale with biomass as much as possible.'

[1] Study on the composition of mixed municipal waste, separately collected waste paper and packaging waste and WEEE.

- **2019 glass recovery:** The significant increase of total recovery of glass packaging in 2019 is due to the decrease of temporarily stored glass waste.

8. IRELAND

Packaging waste generation data for Ireland is based on waste analysis. Ireland operates a three-bin system for municipal waste (residual, mixed dry recyclables and organic), the system is run solely by private companies. Waste is weighed on collection and brought to a waste facility. The Environmental Protection Agency applied waste characterisations to the residual waste stream to identify the packaging it contained. Recyclables are measured at output from recycling facilities, final treatment in Ireland or on export. Some pure streams of recyclables from facilities outside the NWCPO scheme are measured on final treatment in Ireland or on exported. Small additions are made for data collected from local authorities. Pure packaging streams are discounted according to a packaging percentage provided by the waste operator, where this is not available a percentage based on Repak (packaging PRO) output studies is applied.

Packaging waste management data for Ireland is compiled and cross-checked from a variety of sources including surveys, electronic registry, waste analysis and waste operators. The data collected are supplemented and cross-checked with and against data from the National Waste Collection Permit Office (NWCPO). The NWCPO manages an electronic registry to which waste collection and facility permit holders report the transport of waste from kerbside to waste facilities and between waste facilities; and the acceptance and transfer of waste at waste facilities. Data are also cross-checked against Repak's (the only packaging compliance scheme in Ireland) data. Exports identified in EPA and NWCPO data are cross-checked against data from the National Transfrontier Shipment Office (NTFSO). The Environmental Protection Agency surveys waste operators, local authorities and waste brokers annually.

Notable changes in reporting:

- **2008-12 packaging waste generation:** Ireland reported a steady reduction of packaging waste generated from 2008 to 2012, which may be due to the long-term impacts of the 2008 financial crisis on the Irish economy.

- **2013 paper recycling**: 2013 was the first year Ireland reported values for paper and cardboard packaging for the treatment category 'other forms of recycling'. The change is partly due to the inclusion of the tonnage of paper packaging sent for composting in 2013, which was not reported in previous years.

- **2012 plastic recycling**: 2012 was the first year Ireland reported values for plastic packaging for the treatment category 'other forms of recycling'. The rise in recycling is due to the following facts:

    - The tonnage of plastic packaging sent for composting in 2013 was not reported in previous years. This biodegradable portion of plastic packaging is an estimate.

    - The tonnage of plastic packaging waste accepted by an industrial facility for recycling increased.

- **2012 paper packaging energy recovery**: 2012 was the first year Ireland reported values for paper & cardboard packaging for the treatment category 'incineration with energy recovery at waste incinerators. This rise is due to the significant increase of the tonnage of municipal

waste being sent for energy recovery, both within Ireland and, to a greater extent, exported to other EU countries.

- **2012 plastic energy recovery**: 2012 was the first year Ireland reported values for plastic packaging for the treatment category 'incineration with energy recovery at waste incinerators'. This is due to the more municipal waste being sent for energy recovery, both within Ireland and, to a greater extent, exported to other EU countries.

- **2013-14 paper and plastic energy recovery:** An increase of reported data on paper & cardboard and plastic packaging in the category 'incineration with energy recovery at waste incinerators'. These increases can be explained by a rise in the tonnage of residual waste sent for energy recovery in 2014, in particular the increase in exports.

- **2015-16 wooden packaging**: In reference year 2016 values for wooden packaging for the treatment operation 'energy recovery (R1)' increased in comparison to 2015. Most of the increase was due to a new biomass power plant in Northern Ireland starting operation in December 2015. Another facility also had an approximately 50% increase in the tonnage accepted for recovery. The increase going toward recovery is reflected by a decrease in tonnes recycled in 2016.

- **2017 wooden packaging generation:** In 2017 the generation of wooden packaging waste increased as a detailed survey of wood recycling and recovery at pallet merchants allowed to estimate packaging wood waste more accurately.

- **2018 energy recovery all packaging**: The second municipal waste incinerator in Ireland reached full capacity in 2018 resulting in increased volumes of packaging waste in energy recovery.

- **2019 all packaging**: From reference year 2019, Ireland reports according to the new calculation rules with some exceptions. Among these, allocation of the composite materials was done to the material stream that represents the greatest proportion. As well, Ireland did not obtain recycling tonnages at end destinations abroad; however, 'Ireland adjusted these tonnages of materials sent abroad to only reflect packaging material'.

- **2018-19 paper and plastic packaging treatment**: Due to methodological changes, plastic as well as paper and cardboard incorporated into cement clinker are reported in reference year 2019 as energetically recovered and not as recycled, as was previously done. Consequently, data on energy recovery and recycling for plastic as well as paper and cardboard between 2018 and 2019 are not comparable.

- **2019 other recovery:** For reference year 2019, Ireland allocated packaging waste contained in daily cover at landfills as disposal rather than backfill recovery, as it was previously reported. Consequently, data on 'other recovery' for all waste packaging materials between reference years 2018 and 2019 are not comparable.

9. GREECE

Packaging waste generation data for Greece is based on a PoM survey delivered to the Ministry of the Environment and Energy (MEE) in 2006 which was thought to represent 20% of the total municipal waste produced that year. Since then, "large and representative samples" monitored by PROs have been used to estimate the fluctuation in packaging waste generation, with an update for 2018

and 2019 in which Greece now uses packaging quantities declared in the National Producers Registry to estimate packaging waste generation.

Packaging waste treatment data for Greece comes from EPR schemes. The Hellenic Recycling Agency (EOAN) is responsible for the collection and verification of recycling data reported by PROs, and submits annual reports to the MEE. HERRCo is Greece's largest PRO (oversees 92% of total packaging recycling) and carries out periodical checks and inspections on the quantity and quality of recyclables at sorting centres.

Notable changes in reporting:

- **2015-17 plastic and paper/cardboard energy recovery:** From 2015 to 2016 the quantities of plastic and paper & cardboard packaging waste sent for 'energy recovery (R1)' increased. In 2016, reported amounts of packaging waste used as refuse-derived fuel increased in particular for paper and plastic, because the downstream facilities accepting the non-recyclable fraction of collected waste to produce secondary fuel doubled from 2 facilities in 2015 to 4 facilities in 2016. What made this option attractive was a subsidy, which was abolished in mid-2017. Still for 2017 there was a further increase in paper and cardboard as well as plastic packaging waste treated by incineration/energy recovery (R1). It can be mainly attributed to one of the RDF plants responding to the increased demand of the cement industry.

- **2016-17 steel recycling:** The increase in steel recycling reported in 2017 is not only due to enhanced material recycling performance but also a change in data collection. The data for 2017 are of improved reliability because it includes quantities coming from all metal scrap facilities (sampled at the input of the 3 Greek steel manufacturing facilities). In 2016 only the steel scrap output of the metal scrap collecting and sorting facilities which had a contract with PRO HERRCO was taken into consideration (flagged "b").

- **2018-19 energy recovery**: There are no data available on energy recovery for Greece for 2018 and 2019. 'In the past, HERRCo subsidized the production of RDF from non-recyclable packaging waste, a practice that was abolished in mid-2017.'

10. SPAIN

Packaging waste generation data for Spain is determined based on EPR data (57%) and other than EPR (43%) such as production and foreign trade statistics. Ministry for the Ecological Transition and the Demographic Challenge is responsible for the management of the national registry of producers of products associated with waste management.

Packaging waste management data for Spain is based on R/D codes and based on the results of the studies carried out by the Material Entities in order to know the situation in each sector. However, the data provided by the Materials Entities are also compared with other sources such as the data available from Spanish packaging PROs (ECOVIDRIO, ECOEMBES, SIGRE, AEVAE and SIGFITO).

Notable changes in reporting:

- **2014-16 glass recycling**: Between reference years 2014 and 2016 values for glass packaging in the treatment category 'other recycling' fluctuated. Data for 2014 and 2016 include data from five waste treatment plants, while data for 2015 only includes data from four waste treatment plants. In Spain, the reported data in this treatment category includes glass from glass

packaging waste present in waste incineration bottom ashes, which are recovered and used for construction purposes.

- **2011-2016 glass recovery**: The amounts reported for glass packaging within the treatment category "other recovery" between 2011 and 2016 are attributable to packaging glass waste used in landfills (in the construction of the slopes) considering it as material recovery but not as recycling. As it is not accountable for recycling, Ecovidrio, the Spanish EPR scheme has ceased to characterize and certify this flow. As a consequence, the value is not statistically known anymore but this does not mean that packaging glass waste is not used in landfill construction any longer.

- **2014-16 paper treatment**: Between reference years 2014 and 2016 values for paper & cardboard packaging in the treatment category 'incineration with energy recovery at waste incinerators' fluctuated strongly. 2014 and 2016 data include household, commercial and industrial paper & cardboard packaging waste, while 2015 data only includes paper & cardboard packaging waste from households.

- **2016-17 plastic energy recovery:** In reference year 2016, plastic increased for the category 'energy recovery (R1)' in comparison to 2015. This increase is due to the increase of waste co-incineration in cement plants. The increase continued in 2017.

- **2019 wooden packaging**: To obtain data for wooden packaging for reference year 2019, Spain applied a new extrapolation method.

11. FRANCE

Packaging waste generation data for France is PoM data and comes from a combination of production statistics from the French National Statistics Institute (INSEE) and foreign trade statistics from Customs on the import/export of both empty and filled packaging goods. Assumptions are used to estimate the amounts of packaging associated with product flows.

Packaging waste management data for France comes from a combination of surveys and EPR schemes. Commercial and industrial data is collected from surveys sent to sector-specific manufacturer organisations e.g., the French Glass Federation (CSVMF) and the Association of French Paper Industries (COPACEL). Household waste management data is accessed from the European Recycling Platform.

Notable changes in reporting:

- **2009-10 steel generation:** For the reference year 2010, France reports a significant decline in steel waste generation, which is explained by better utilisation of steel packaging and reduced consumption.

- **2019 wood recycling and energy recovery:** For reference year 2019, for wooden packaging, a new data source was available, 'allowing both the inclusion of energy recovery and a deep review of the recycling data.' Thus, this data was flagged "b".

- **2019 aluminium generation and recycling:** Following a thorough survey of can-makers, the amount of generated aluminium packaging increased significantly in reference year 2019. The recycled amounts also increased due to more aluminium being extracted from IBA.

12. CROATIA

Packaging waste generation data for Croatia is PoM based on EPR data and does not involve any estimations because there is "no threshold in reporting, only in paying the fee related to PoM". The institution responsible for managing the EPR scheme is the Environmental Protection and Energy Efficiency Fund ("the Fund"), and the Ministry of Economy and Sustainable Development / Institute for Environment and Nature ("the Ministry") is responsible for the collection and EU reporting of national waste datasets. The State Inspectorate identifies any unregistered producers/importers by examining data from the Customs Administration and the Croatian Centre for Agriculture, Food and Rural Development.

Packaging waste management data for Croatia is submitted by waste operators at treatment facilities quarterly to the Fund, who in turn submits data annually to the Ministry. The Fund audits packaging waste management data by performing cross-checks, time-series checks, and periodic/regular inspections.

Notable changes in reporting:

- **Paper/cardboard generation:** For reference year 2019, all quantities of composite packaging placed on the market were included in the quantities of paper/cardboard.

13. ITALY

Packaging waste generation data for Italy is PoM data that comes predominantly from its EPR system managed by the National Packaging Consortium CONAI. Producers of packaging waste must join CONAI and submit POM data for each packaging material. To estimate the quantities of packaging materials included within unknown imports (making up 25.4% of total packaging waste in 2019), Italy conducted a survey of large-scale retailers. CONAI also carries out sector-specific surveys. Data is then communicated to the National Section of the Waste Register at ISPRA (Italian Institute for Environmental Protection and Research).

Packaging waste management data for Italy comes from data from municipalities and the national mandatory environmental declaration database (MUD). National legislation requires waste operators to declare annually quantities of packaging waste managed. Data on packaging waste sent abroad for recycling are estimated from foreign trade data. Verification of recycling/recovery data is managed by CONAI who contracts a specialist third-party to ensure compliance with their procedures.

14. CYPRUS

Packaging waste generation data for Cyprus is POM based and collected by Green Dot Cyprus through the EPR scheme. Producers that are not members of the Green Dot Cyprus are registered with the Ministry's database (electronic registry). Additional estimates are made for underreporting, free-riders, private imports and exports and online-sales.

Packaging waste management data for Cyprus is collected and submitted by waste operators to Green Dot Cyprus who is obliged to report to the component authority the waste quantities collected pre-sorted and exported for treatment.

Notable changes in reporting:

- **In 2018 steel packaging** recovery was higher than generation, this is explained by the greater amounts of waste steel that were stored previously and some producers that put packaging

steel on the market may underreport their data. Some producers failed to comply with the legislation and did not participate in the collective management scheme.

- **2019 other packaging:** For reference year 2019, packaging collected separately from households and sorted is reported under 'other packaging'. This waste is sent to a cement kiln for energy recovery.

- **2019 wood recycling**: Companies began to repair wooden pallets which led to an increase in recycling.

15. LATVIA

Packaging waste generation data for Latvia comes from reporting from producers to the six EPR schemes. The amount placed on the market is calculated based on the tax paid for non-managed packaging. In order to account for the producers who did not report in 2019, the State Environmental Service (SES) adjusted the placed on the market data based on the volume of packaging waste disposal in the landfills; this adjustment is around 0.5% of the total POM volumes. A certified auditor service has been used to verify the data.

Packaging waste management data for Latvia is also sourced by the SES from three main sources: 1) the EPR schemes, 2) estimates for companies generating less than 300 kg of packaging waste per year (based on State Revenue Service reports), and 3) direct reports to SES from companies with more than 300 kg of packaging waste per year and managing their own packaging waste. The sum of these three sources is contrasted with compositional analysis of municipal waste sent to landfills, and is also adjusted with freeriding estimates.

Notable changes in reporting:

- **2014 packaging generation**: In 2014, the amendments to the Natural Resources Tax Law came into force, which also included changes in the tax rates for packaging. The increased rates were differentiated depending on the type of packaging materials.

- **2014 plastic recycling**: In 2014, plastic packaging waste in the category 'material recycling' increased. In contrast, 'recovery other than energy recovery' decreased by almost the same amount. The market for plastic packaging fluctuates significantly in Latvia, as sorted packaging waste is sent to companies that offer the highest price.

- **2014 wooden treatment**: Fluctuations for the different treatment options for wooden packaging can be observed over the years. The fluctuation for reference year 2014 can partially be explained through the amendments to the Natural Resources Tax Law. Treatment of wood depends on the quality of materials and market demands in a particular moment (refurbished pallets, mulch, fuel or anything else), and on the current price.

- **2018 plastic waste generation**: The increase in plastic waste generation in 2018 is due to the State Environmental Service of the Republic of Latvia terminating the contract with the EPR scheme company in the 4th quarter of 2017. As a result, the contractors of the mentioned EPR scheme company had to enter into an agreement with other EPR scheme companies. Due to this change some of the contractors reported at the beginning of 2018 rather than at the end of 2017.

- **2019 plastic and wooden treatment**: In 2019 the purchase price of plastic secondary packaging decreased due to low demand. In order to ensure the overall achievable recovery target for all types of packaging, operators increased the recovery of wooden packaging.

16. LITHUANIA

Packaging waste generation data for Lithuania comes from EPR scheme data which has a threshold of 0.5 t/yr of packaging waste. Estimates are used on all packaging wastes that exceed this threshold, and plastic packaging waste has been complemented by an agricultural survey. Statistics Lithuania and the Waste Licensing Division of the Environment Protection Agency (EPA) are responsible for data collection, with the EPA inspecting 10% of companies per year. Estimations on generated steel and aluminium packaging for reference year 2019 are based on waste recycling data: "the amount of generated total metal packaging is split into amounts of aluminium and ferrous metals packaging in proportion to the recycling of the relevant packaging waste."

Packaging waste management data for Lithuania comes from administrative reporting, which is mandated under their Waste Statistics Regulation. In addition, data on ferrous metals and aluminium packaging waste management is estimated from data provided by waste operators at MBT plants. As with generation data, Statistics Lithuania and the EPA are responsible for verifying packaging waste management data, performing time-series checks upon receiving data as well as annual audits of companies. The estimation on energy recovery of aluminium for reference year 2019 is based on data of waste composition analysis: 'the amount of incinerated metal packaging waste = the amount of metal packaging waste in mixed municipal waste - the amount of metal packaging waste sorted from mixed municipal waste.'

Notable changes in reporting:

- **2012-14 wood recycling:** The break in the time series between 2012 and 2014 for wooden packaging recycling is because one of the biggest biodegradable waste recycling companies terminated its activity in 2013. In 2014, the company recommenced its activity.

- **2015-16 plastic recycling:** In 2016, the global system for the collection of packaging waste was partly replaced with a deposit return system. As a result, collection as well recycling increased.

- **2015-16 wood recycling:** The amount of recycled wooden packaging waste depends on the production volumes of one key producer in Lithuania. This producer also makes products from wooden packaging, which is attributed as recycled (please also consider note for wooden packaging waste recycling in 2017 below).

- **2016-17 wood recycling:** In 2017, the volume reported for material recycling of wooden packaging waste decreased by 50%. Simultaneously the volume of wooden packaging waste reported as treated by "incineration/energy recovery R1" increased commensurately. This is supported by a survey among wooden packaging treatment companies made in 2018. It showed that approx. 50% of the wooden packaging waste reported as recycled is used as fuel. The volumes were adapted accordingly (flagged "b").

- **2016-17 glass recycling:** In 2017 the volume reported for material recycling of glass packaging decreased (the reported generated volume of glass packaging remained approx. constant). This was reported because of significant changes in the waste management system (flagged "b").

- **2018-19 plastic export for incineration:** In 2019 the amount of plastic packaging waste exported for incineration significantly increased. This 'can be explained by the fact that, due to technical problems of the new information system for collection of data on waste generation and treatment, some companies could not declare waste imports/exports in 2018. On the other hand, it is expected that the amount of plastic packaging waste for incineration will increase in the future, as 2 new cogeneration waste incineration plants will start operating in 2019-21.'

17. LUXEMBOURG

Packaging waste generation data for Luxembourg is managed by the 'Administration de l'environnement' and comes from waste analysis samples that are taken every 5 years. 32 samples are taken for 'Mixed household and similar waste' and 24 samples are taken for 'Others' (which is unspecified). Correction factors are used to account for impurities and humidity, and the final numbers are then scaled up using estimates from waste collectors and waste treatment operators to derive national generation data. Part of the verification process is a comparison with EPR data.

Packaging waste management data for Luxembourg comes from administrative reporting, waste analysis, and data from waste operators. Waste operators provide waste flow data in their annual reports, from which packaging waste is estimated using EWC codes and waste analysis. Part of the verification process is a comparison with EPR data.

Notable changes in reporting:

- **2002-03 all packaging generation:** Since 2003, the reporting system in Luxembourg has referred to data on packaging waste arising and not to data on packaging waste PoM. Data on packaging waste arising is based on analyses of the respective treatment paths and estimates.

- **2013-14 wood recycling and energy recovery:** In 2014, wooden packaging treated in the category 'material recycling' decreased, while simultaneously an increase in the category 'energy recovery (R1)' occurred. This is due to the fact that since 2014 a new plant is in operation. Nearly 80-90% of waste wood is recovered in Luxembourg and is therefore no longer exported.

- **2017-18 steel and aluminium generation:** Data related to steel packaging prior to 2017 includes both aluminium and steel.

- **2017-18 wood:** In 2018 a major wood panel producer started using wood waste in its panel production. This has led to a higher demand for high quality wood (like pallets) which in turn led to a better sorting. The improved sorting process led to a better identification of wood packaging.

18. HUNGARY

Packaging waste generation for Hungary comes through the EPR scheme, the National Tax and Customs Administration is responsible for the collection of PoM data from the producers who are obliged to report the environmental product fee (tax). Cross-checks are carried out with figures from the Hungarian Association of Packaging and Material Handling.

Packaging waste treatment data for Hungary is based on data from EPR schemes ad waste operators, administrative reporting, waste analysis and surveys. All waste treatment companies are obliged to report to the National Environmental Information System (OKIR).

Notable changes in reporting:

- **2014 wooden packaging**: In 2014, wooden packaging waste generated decreased, as data was based on other methods than in previous years.

- **2013-15 plastic treatment**: Between 2013 and 2015 plastic packaging waste treated in the category 'incineration with energy recovery' declined. There is only one mixed municipal waste incineration plant in Hungary, which assesses the quantity of the waste streams from the mixed municipal waste. This facility changed the way of examination in 2014 and used bigger samples, which caused a change in packaging waste share. Furthermore, the door-to-door collection system was introduced in 2014. Both changes caused the reduction of the plastic packaging waste in the mixed municipal waste resulting in a decline in the plastic packaging waste incinerated.

- **2014-16 glass recycling**: Amounts for material recycling of glass packaging fluctuated between 2014 and 2016, as one of the processing facilities collected and stored a significant amount of glass waste in 2014. This facility recycled those amounts in 2015, which caused an increase for reference year 2015.

- **2016 paper energy recovery**: In 2016, treatment of paper & cardboard packaging in the category 'energy recovery (R1)' increased as the establishment of systems for the mechanical and biological sorting of mixed municipal waste has accelerated since 2014, and new facilities were put into operation. From these facilities, a large part of packaging waste is sorted into the light fraction (refuse derived fuel, RDF) to be incinerated, so the amount of RDF has also increased.

19. MALTA

Packaging waste generation data for Malta comes from EPR PoM data complemented with estimates to account for freeriding, on-line sales, and under-reporting. PROs provide PoM data to the Environment and Resources Agency (ERA). Producers placing less than 100 kg on the market of packaging or packaging material are exempt from reporting, but they still need to inform ERA. Packaging waste generation data is cross-checked against waste management data.

Malta does not possess the necessary treatment capacity to treat all waste streams generated locally, thus it relies significantly on the export of wastes. Since the current regulatory regime on exports of waste does not expressively provide authorities with details, which kind of 'other forms of recovery' was applied, no details are available on this treatment category. Packaging waste management data for Malta by R/D codes is compiled by ERA based on data from PROs, waste management facilities, waste brokers and waste carriers. The estimates used in the packaging waste generation data are taken into account to adjust the packaging waste management data. Equally, adjustments are made to account for the share of packaging in the separate collections.

Notable changes in reporting:

- **2013-14 plastic and glass recycling**: In 2014, the amount of recycled plastic packaging rose in comparison to 2013. Also a decrease in the amount of glass packaging waste recycled occurred between 2013 and 2014. Due to Malta's geographical location and small size, it is highly dependent on exports for several waste streams, including glass and plastic packaging waste. It may not always be feasible for local facilities to export such waste immediately, considering that shipments and exports of waste depend on favourable market prices.

20. NETHERLANDS

Packaging waste generation data for Netherlands comes from producers who have to report PoM packaging data above a threshold of 50,000 kg/yr to Stichting Afvalfonds Verpakkingen who are responsible for the EPR scheme. A survey is done to estimate quantities PoM by producers who fall under this threshold. The Inspectorate is responsible for verifying packaging waste generation data, and Rijkswaterstaat performs checks on waste data prior to submitting it to Eurostat.

Packaging waste management data comes from a wide variety of sources in the Netherlands, including administrative reporting, surveys, electronic registry, waste analysis, data from waste operators, data from municipalities, and data from EPR schemes, which are all used in conjunction with one another to cover the whole picture of packaging waste management, as well as to cross-check quantities from different data sources. As with generation data, the Inspectorate and Rijkswaterstaat are responsible for verifying packaging waste management data.

Notable changes in reporting:

- **2011 packaging energy recovery:** Since 2011 the main part of packaging waste treated in waste incinerators is classified in the treatment category ‘incineration with energy recovery'.

- **2013-14 paper/cardboard energy recovery:** In 2014 an increase of paper & cardboard packaging waste treated in the category ‘incineration with energy recovery at waste incinerators' could be observed, due to an improved monitoring system. The assumption was made that 95% of all the residual waste was incinerated. Therefore also 95% of the amount of paper put on the market minus the amount of recycling ended up in an incinerator.

- **2018-present all packaging:** From 2018 onwards, composite packaging waste is reported within the different materials available. This is especially the case for beverage cartons.

21. POLAND

Packaging waste generation data for Poland comes exclusively from EPR POM data. EPR organisations are obliged to report data on packaging and packaging waste to the marshals of the voivodeships through an electronic registry (BDO). EPR organisations or producers are obliged to obtain documents that prove recovery or recycling from waste operators. The data is validated by the marshals of the voivodeships and finally aggregated by the Ministry of Climate and Environment. There are no estimates or adjustments made.

Packaging waste management data for Poland is sourced exactly the same as packaging waste generation, from the EPR data without adjustments. Audits are conducted for facilities that recover or recycle more than 400 Mg of waste.

Notable changes in reporting:

- **2016 plastic treatment**: Poland indicated that in 2016 plastic packaging treated in the category ‘material recycling’ increased due to no specific reason.

- **2018 other recovery of wooden packaging**: In 2018 the decrease in ‘other recovery’ of wooden packaging might be linked to a law amendment. Poland prohibited PROs to include the recovery of wooden packaging from households to achieve their own targets for household packaging.

- **2018-19 all packaging waste streams**: Data between reference years 2018 and 2019 vary for every stream of packaging and packaging waste. These discrepancies are due to the fact that waste generated data must be reported to the electronic registry, which was implemented in 2018, and its functionality was expanded in 2019. Consequently, more entrepreneurs were identified as placing packaged products on the market than what is shown in the waste generation data. Those entrepreneurs signed deals with EPR organisations, which fulfilled their obligations, and this is shown in the waste recycled data.

22. PORTUGAL

Packaging waste generation data for Portugal, from reference year 2018 onwards, has been obtained from PoM based on EPR data reported from EPR schemes (SPV, Novo Verde and Electrão) to APA (*Agência Portuguesa do Ambiente*, Portuguese Environment Agency). Portugal estimates that the reported values represent 43% of the packaging POM, with large differences between the materials (e.g. 99% for glass and l% for paper). The EPR schemes audit their members to verify the reported data.

Packaging waste management data for Portugal (by R/D codes) is obtained from a combination of the four sources listed above and APA performs cross-checks.

For municipal waste packaging, quantities of waste packaging recycled from PROs (SPV, Novo Verde and Electrão) are reported to APA. It is cross-checked with data submitted to APA electronic platform MRRU (Map of Municipal Waste Register) where all the Municipal Waste Management Systems (SGRU) report the quantity of waste (including packaging), the destination (waste treatment operator) and operation, by ELW code. For non-municipal waste packaging, APA electronic platform MIRR (Integrated Map of Waste Register) is used where all the production of non-domestic waste is registered by its producer. Producers have to report information on quantity, operation, and waste treatment operator, by ELW code, on the waste treated in Portugal. The waste treated outside Portugal is obtained in the APA electronic platform MTR (transboundary movement of waste).

Notable changes in reporting:

- **2014 all packaging waste streams:** For reference year 2014 a change in the methodology was applied for data on packaging put on the market and for data on the recycling and recovery of plastic, paper, metal, other and wooden packaging. Up to 2013, the amount of packaging put on the market only included declarations from packers/fillers to the compliance system (The Green Dot Company), which in 2013 represented around 60% of the total packaging put on the market. As of 2014, estimates were introduced to calculate the total figures, using the percentages from 2013.

- **2013-14 wood recycling**: The recycling rate reached 130% for the reference year 2014. Portugal reported that this was because reusable and non-reusable packaging is often mixed, meaning that it was unable to obtain the correct separation in the recycling of reusable and non-reusable packaging. This would particularly impact wooden packaging because of reused wooden pallets and wooden boxes for transporting food products.

- **2017 incineration with energy recovery**: For paper and cardboard, plastic, and wooden packaging the volumes to "incineration with energy recovery" increased in 2017 due to a change in methodology (hence flagged "b"). Previously these volumes were calculated from the volume of packaging PoM including an estimate for the share of municipal waste packaging and subtracting recycled and landfilled quantities. Since 2017 the volumes to "incineration

with energy recovery" are calculated based on the characterisation of the waste entering the incinerators (reported by the Municipal Waste Management Systems (SGRUs)).

- **2018-ongoing other waste generation**: From reference year 2018 onwards, Portugal has not reported on 'generated other waste', since no data is available. Additionally, 'Portugal reported under 'recycling of other materials' packaging waste classified as 150105, 150106 and 150110, which are recycled.'

23. ROMANIA

Packaging waste generation data for Romania is obtained solely through their EPR scheme, all producers that placed packaging on the national market are obliged to report. The Local Environmental Protection Agencies (LEPAs) receive the data and after preliminary validation forward it to the National Environmental Protection Agency (NEPA) which performs the final data compilation and validation.

Packaging waste treatment data for Romania is from administrative reporting and from waste operators. Companies permitted for packaging waste collection and treatment are obliged to report on an annual basis, the reported quantities are cross-validated.

Notable changes in reporting:

- **2018-ongoing plastic packaging**: In 2018 the national legislation on packaging and packaging waste (Law 249/2015) underwent important changes by Emergency Ordinance 74/2018 which offered exclusivity to local authorities for packaging waste collection, and private economic operators authorised to collect packaging waste from the population have the obligation to register at the local public administration where they carry out their activity. Many local authorities have kept their exclusivity for packaging waste collection by sanitation companies and have not registered other private companies. This has led to a decrease in the quantities of plastic packaging waste collected, energetically recovered and recycled. The most significant decrease was for energy recovery of PET waste.

24. SLOVENIA

Packaging waste generation data for Slovenia is POM data that comes from its EPR scheme, which has a threshold of 15 t/yr. There is no mechanism in place to estimate packaging waste that falls under this threshold. Data is collected by the Ministry of Finance, Financial Administration of the Republic of Slovenia (EURS) in addition to PPWD data collected by the Environment Agency of the Republic of Slovenia (ARSO).

Packaging waste management data for Slovenia also comes from its EPR scheme, with little additional information given in the Quality Report.

Notable changes in reporting:

- **2012-15 plastic and other energy recovery:** Between 2012 and 2013, the amount of plastic and other packaging for the treatment category 'energy recovery (R1)' increased significantly. Between 2013 and 2014, the 'other packaging' value decreased as packaging waste management companies provided instructions on how to report the management of collected packaging waste In order to improve the quality of data collected from the packaging waste management companies, a revised and optimised reporting form with more detailed guidelines was

introduced in 2015. Changes in legislation concerning the recycling of non-hazardous waste into refused derived fuel contributed to the noted decrease.

- **2018 glass:** In reference year 2018, the 'total recycling' and 'recovery' of glass packaging exceeded generation due to the fact that glass recycling and recovery of packaging glass waste does not only include glass packaging waste, but also other glass waste from households.

25. SLOVAKIA

Packaging waste generation data for Slovakia is based on EPR PoM data (reported by packaging producers who meet their specified obligations individually and PROs) complemented with estimates, but these are not detailed by the Ministry of Environment.

Packaging waste management data for Slovakia is based on R/D codes and uses the same data source as packaging waste generation.

Notable changes in reporting:

- **2010-11 paper recycling**: From 2010 to 2011 a significant increase of paper & cardboard packaging in the treatment category 'material recycling' took place. This can be explained by market recoveries: it might be caused by an increase in the purchase price of paper and cardboard packaging waste or in the purchase price of recycled paper and cardboard.

- **2012-13 plastic treatment**: From 2012 and 2013, values within the treatment category 'energy recovery (R1)' increased substantially, especially for plastic packaging. The increase in the amount of energy recovery from plastic packaging in the year 2013 could be affected by a legislative change which came into force on 1 January 2013. The Act on Packaging was supplemented with a provision relating to supporting energy recovery if it has environmental and cost-benefit advantages in comparison to material recycling.

- **2015-16 energy recovery of 'other packaging'**: From reference year 2015 to 2016 the following particularities in the time series were reported: Values within the treatment category 'energy recovery (R1)' for 'other' packaging increased. Also values for metal packaging within the treatment category 'other recovery' increased. The increases might have been caused by the implementation of special provisions on waste and on the amendment of acts in 2016.

- **2016 other packaging generation**: Data for reference year 2016 reported for 'other' packaging generated is much lower than values for 'other' packaging treated. The higher amount of the packaging treated could be due to packaging produced in 2015 but treated in 2016.

- **2019 reuse packaging**: For reference year 2019, the Ministry notes: 'The amount of packaging put on the market also includes the amount of reusable packaging, which were put on the market or into rotation. The amount of reusable packaging was accounted for just once at the time of their first use. The amount of recovered and recycled packaging waste was calculated based on data reported by producers who met their specified obligations individually and producer responsibility organisations.'

- **2019 ferrous metal packaging**: For reference year 2019, higher recovery of ferrous packaging waste than the generation of the ferrous packaging could be caused by treatment of the waste stored in the previous period.

26. FINLAND

Packaging waste generation data for Finland comes from producer organisations with minimum turnovers of €1 million who report to the country's EPR scheme. PoM data is submitted to and verified by the Finnish Packaging Recycling RINKI Ltd, with the Centre for Economic Development, Transport and the Environment acting as the "main public institution returning the quality check report." Estimates are not used on below-threshold data and no corrections are made for free-riders, online sales or private imports/exports.

Packaging waste management data for Finland comes from EPR data, administrative reporting, electronic registry, and data from waste operators, as well as waste analyses that are undertaken to estimate the split between ferrous metals and aluminium. There are individual organisations that collect recycling data for different waste streams, for example, Finnish Plastics Recycling Ltd collects recycling data for plastic packaging and Puupakkausten Kierrätys PPK Oy collects recycling data for wood packaging. Suomen Palautuspakkaus Oy is responsible for collecting data from Finland's deposit return system (DRS) for beverage containers.

Notable changes in reporting:

- **2008-present paper/cardboard recovery:** The recovery rate for paper & cardboard packaging for the years 2008 to 2018 is more than 100%. The Finnish figures figures only cover those forms of packaging which are put on the market by the members of producer organisations and do not cover the rest. The amounts of waste generated from the producers with a turnover of less than 1 million euro, online sales, imports by private consumers and free-riders are missing. Additionally, the amounts of recovered packaging derive from recovery companies which include also packaging waste that is not included in the statistics of packaging put on the market.

- **2010-present plastic, paper/cardboard, glass, and wood energy recovery:** Finland reports no data for the treatment category 'energy recovery (R1)' for the materials plastic, paper & cardboard, glass and wood for the reference years from 2010 onwards. This is because some of the biggest heating plants were shut down. Some packaging waste is incinerated in small industrial plants, but there is no exact data on the amounts nor estimates. However, it has been possible to report the amount for plastic packaging within the treatment category 'energy recovery (R1)' since reference year 2015 (see below).

- **2013-2015 plastic energy recovery:** For plastic packaging in the category 'incineration with energy recovery at waste incinerators' a significant increase took place between 2014 und 2015 due to an increased capacity of waste incineration. The Waste Act banned landfilling of organic waste beginning 1 January 2016. In response, new waste incineration plants with energy recovery were constructed.

- **2014-2017 glass other recovery:** Glass packaging waste reported under 'other recovery' (e.g. in 2015 and 2016) is separately collected glass which does not fulfil the quality requirements for material recycling and is used as construction material e.g. in landfill constructions. In 2017 zero was reported for glass packaging waste under "other recovery" because all separately collected glass could be processed to material recycling.

- **2017-2019 plastic recycling:** A new recycling facility started in 2016 which led to a continuous increase in the collection and recycling of plastic packaging from households. Further to that, recycling of BtoB packaging also increased due to efforts by the producers.

27. SWEDEN

Packaging waste generation data for Sweden is determined based on EPR data plus a minor amount of individual producer responsibility which is reported directly to the Swedish Environmental Protection Agency (EPA). The Swedish EPA commissions the waste statistics and documentation to SMED, a consortium of four research and academic organisations. The total amount of packaging POM consisting of glass, plastic, paper, metal and wood is increased by 1% and regarded as "others". There are no freeriding estimates and the EPA believes that the PoM is probably underestimated.

Packaging waste management data for Sweden is also calculated based on EPR data. SMED cannot verify the information but does ask the EPR schemes to explain major time-series changes.

Notable changes in reporting:

- **2010-14 recovery of wooden packaging**: For the years 2010 to 2014, the recovery rate of wooden packaging is over 100%. In 2010 the rate is even more than 1000%. The reason is that the figures for wooden packaging are highly unreliable because there is an unknown number of free-riders. Additionally, values for wooden packaging are mostly based on box pallets that can be easily produced by off-market companies.

- **2014-ongoing wooden packaging generation**: A methodological change took place for wooden packaging generated beginning with the reference year 2014. Previously, companies were asked to estimate amounts of wooden packaging put on the market. Although the estimated amounts were judged to be not 100% reliable, they were included in the statistics. However, it was decided not to include the estimates from 2014 onwards. Additionally, a data correction corresponding to the new methodology was made for wooden packaging generated beginning in 2010.

- **2015-16 recycling**: Between 2015 and 2016 the Swedish government clarified for the two producer responsibility organisations how to fill in the questionnaire regarding recycling versus other forms of recycling (preparation before re-use). This resulted in a general shift from material recycling toward more ‘other forms of recycling’. In 2017 the data for wooden packaging waste were still affected by changes in reporting routines leading to large differences in statistics (hence flagged “b” also for 2017).

- **2017 plastic packaging treatment**: For plastic packaging waste a change in reporting occurred in 2017 for the category “Recovery – incineration with energy recovery” (hence flagged “b”). In general, the reported amount of packaging waste sent to energy recovery is based on the amount reported by the producer responsibility organisations (PROs). This means that only the amount of (separately collected) packaging waste collected by the PROs is included. And because almost all separately collected plastic packaging waste is delivered to a materials recovery facility, the amount of waste sent to energy recovery is expected to be low (as seen in 2017 data). However, up until reference year 2016 the leading PRO included commercial plastic packaging, sent to energy recovery, collected by other waste management companies in their reporting.

- **2018-ongoing energy recovery**: From the reference year 2018 onwards, in terms of the packaging and packaging waste statistics, the reported amount of packaging waste sent to energy recovery is based on the amount reported by the producer responsibility organisations. This means that only the amount of separately collected packaging waste collected by the producer responsibility organisations is included and not the amounts of packaging waste collected through the municipal waste collection of mixed household waste, which is not included in the EPR scheme.

- **2018 wooden packaging treatment**: From the reference year 2018 onwards, Sweden has data on 'repair' of wooden packaging that was previously allocated to 'recycling'.

28. UNITED KINGDOM

Packaging waste generation data for the United Kingdom is based 80% on EPR POM data and 20% on surveys. The methodology is published on material flow reports which have been reviewed by a steering group of key stakeholders for each packaging material. Estimates have been used for units below *de minimis* thresholds, units legally exempt from reporting, freeriding and private imports/exports (for glass only).

Packaging waste management data for the United Kingdom is based on R/D codes and uses a combination of electronic registries (national packaging waste database, NPWD), waste analysis, data from waste operators and from PROs.

Notable changes in reporting:

- For all packaging materials put on the market breaks in the time series took place due to an update in the respective methodology:
    - for glass the update took place in 2013,
    - for plastics in 2014,
    - and for paper & cardboard, metal and wooden packaging in 2015.

- Reported amounts for plastic and paper & cardboard packaging waste within the treatment category 'incineration with energy recovery at waste incinerators' dropped by more than one third between 2013 and 2014. The reason is that the number of accredited sites for energy recovery (R1) went up from one to two. Furthermore, the number of Energy from Waste (EFW) facilities dropped from 18 in 2013 to 11 in 2014.

- For packaging waste generated, the same data for all packaging materials was reported for 2014, 2015 and 2016, except for plastic packaging. The reason is that data on packaging generated is based on 0% growth. In 2012 and 2013 a process of assessing the waste of each stream was undertaken, which has led to new baselines for each packaging material and adjustments of the expected projected growth rates.

29. ICELAND

Packaging waste generation data for Iceland is submitted by producers and waste collectors to the Icelandic Recycling Fund and/or the Iceland Environment Agency (IEA) where it is stored on an electronic registry. From here, data is sent to Statistics Iceland.

Packaging waste management data for Iceland comes from administrative reporting. Licensed waste agents produce data on quantity and type of packaging waste and submit it to the Icelandic Recycling Fund. The IEA is responsible for the verification process.

30. LIECHTENSTEIN

Packaging waste generation data for Liechtenstein is estimated using collected data from waste collectors, waste treatment operators and municipalities.

In Liechtenstein no treatment of packaging waste takes place. All packaging waste is exported.

Notable changes in reporting:

- **2015-2019 wooden packaging**: Between 2014 and 2015 a significant decrease of the reported volume of wooden packaging waste generated can be observed which is due to missing data. Liechtenstein announced that the data quality for reference year 2016 would be improved. However, values for wooden packaging waste generated have been comparably low since 2015.

31. NORWAY

Packaging waste generation data for Norway comes from both EPR data (approx. 70%) and non-EPR data (approx. 30%), depending on the waste stream. PROs provide data for packaging PoM by their members, but this leaves gaps which are filled using additional approaches:

- For paper and cardboard, estimates are used based on information on PRO coverage and market share.

- For the remaining packaging waste streams ('Plastics', 'Wood', and 'Other'), COWI AS (consultant company) are contracted to estimate data based on surveys and trade data.

Packaging waste management data for Norway comes from the same sources as the generation data, namely its EPR scheme and COWI AS, with the latter including estimates of free-riders for 'Paper and cardboard' and 'Plastics' packaging. As part of the verification process for both generation and management data, Norway contracts a third party to audit beverage packaging.

Notable changes in reporting:

- **2019 paper/cardboard generation and recovery:** In reference year 2019, the recovery of paper and cardboard packaging is higher than generation. This could be because the current methodology used for estimating waste generation does not account for private imports or free-riders and cardboard and paper to recycling/recovery is not corrected for moisture.