STUDY ON COLLECTION RATES OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

POSSIBLE MEASURES TO BE INITIATED BY THE COMMISSION AS REQUIRED BY ARTICLE 7(4), 7(5), 7(6) AND 7(7) OF DIRECTIVE 2012/19/EU ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

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Disclaimer

Note of the authors[1]

The data on the quantities of EEE placed on the market in each Member State (POM data) used in the electronic tool developed in the context of this study for the calculation of the quantity of WEEE generated (WG) is based on calculations made on the basis of the "apparent consumption methodology", as described in this report.
This data is used for the purposes of the study and does not necessarily reflect EEE/WEEE data made public by the Member States or industry associations. The data used in the tool may be subject to changes and updates by Member States on the basis of National Register data, sound available data and the expertise of relevant stakeholders.

The calculation of the quantity of WEEE Generated made in the context of the study is based on the initial allocation of individual UNU-KEYs to collection categories. Results might slightly differ when allocating UNU-KEY 0501 to Small Equipment collection category and when changing lifetime profiles for specific products such as LED lamps as agreed during the stakeholder consultation carried out after the completion of this study and the release of this report.

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[1] Note added in the final report on September 2015 following stakeholder consultation carried out after the completion of this study.

Executive Summary

In 2012, the European Parliament approved the new WEEE Directive 2012/19/EU. One of the main changes introduced by the Directive, subject to considerable debate during all phases of the Recast, concerns the re-definition of the collection targets. In the new Directive, the collection targets for Member States changed from a "flat-rate" of 4 kg per inhabitant to a percentage-based approach related to products placed on the market (POM), or alternatively, WEEE Generated (WG). This is despite that the WEEE Directive and the Waste Framework Directive fail to provide a formal definition of waste generated.

After the publication of the WEEE Directive and during the early stages of transposition and implementation of new provisions by Member States, the European Commission is expected to launch different studies and activities aimed at supporting or reviewing certain provisions contained in the Directive's legal text to enhance its effectiveness.

The current study covers an area where the legislative provisions of collection targets to be individually achieved by each Member State will potentially affect operations (i.e. collection and treatment) at the national level as well as the capability of national monitoring and enforcement bodies to gather evidence of compliance and achievement of the target.

The desired environmental, economic and social benefits of the altered collection target definition can only be achieved if: (1) separate collection of WEEE is ensured, monitored and tracked, (2) once collected, it is properly treated according to best available technologies, applicable standards and (3) downstream fractions are properly recovered or disposed of.

Given the legislative background and the demand for a harmonized approach to determine the collection rates, the aim of this study is to support the Commission in meeting the requirements of Article 7 and enhancing collection and environmental performance of the WEEE Recast in practice. This is done by developing common methodologies for the calculation of the quantities of POM WG based on comprehensive data gathering, scientific modelling, sensitivity analysis and conducting an impact assessment that analyses the potential for individual targets within collection categories. Finally, implementation difficulties of Member States and the necessity of derogations in deadlines for target achievement are analysed.

Common methodology for POM

Proper tracking of POM is fundamental for different reasons. It is a clear provision of the WEEE Directive's legal text linked; It is not only the basis for calculating each Member State's collection targets from 2016 onwards but, if Member States opt for a WG-based target, also a fundamental input for these WG calculations. Additionally, the WEEE Directive's legal text is linked to financing obligations and proper monitoring of overall country collection performances.

Several methodologies and data sources are available to retrieve or determine POM information. National Registers are the primary entities from which POM data can be retrieved and assessed, but limitations might exist in the use of data, such as: the absence of time series prior entry into force of original WEEE Directive in 2006 (historic POM), the absence of coverage of products previously not included in the scope (like PV panels) or the potential presence of free-riders and unavailability of data in candidate countries. In addition, non-uniformity in product categories among the countries and the public availability of data from individual registers also represents limitations to their use as the only source for an EU-wide common determination of POM data.

A common methodology based on the apparent consumption approach is thus presented to calculate the historical POM data (up to 2012) and to complement and allow validation of the National Registers' data in the future. The methodology is based

on internationally-recognized and standardized statistics available for national domestic production and import/export of all the products included in the scope of the WEEE Directive. This includes future additions of potentially new EEE products that were previously non-existent or out-of-scope.
Calculations show that the amount of POM has increased from 4,8 Mt in 1980 to around 11 Mt in 2012 for the EU-28. After 2004, a decrease in weight is visible, mainly linked to market shifts to lighter products, such as: CRT replaced by flat panels, and laptops and tablets replacing desktops in sales. Due to the economic crisis in the EU-28 after 2008 a further decrease of POM is visible; the lowest point was reached in 2009 with 10,4 Mt. In recent years, some major fluctuations (up by more than 10 kg/inh. in individual countries over two consecutive years) are attributed to the dynamics of PV panels sales, particularly in countries where they are driven by subsidies.

Common methodology for WG

The methodology for calculating WG is selected from among those existing in literature for simplicity, accuracy and potential of harmonization; data availability is also a primary concern. The "Sales-lifespan" methodology selected for the context of this study is based on two simple and straightforward datasets that are linearly aligned with WG: POM and lifespan data.
The POM dataset is reconstructed using apparent consumption methodology from years prior the setup of National Registers (1980-2012), and then it is double-checked with data reported from Member States between 2006 and 2012. This dataset was the basis from which the POM was forecast from 2012 to 2024, which, in turn, needed to forecast WG. The lifespan distribution reflects the probability of a product batch being discarded over time, thus matching the definition of waste according to Article 3 of the Waste Framework Directive. Lifespan is obtained from available data from consumer surveys accompanied by desk research.
Results forecast an increase of WG across EU-28 from 9,5Mt in 2014 up to 10,4Mt in 2024, with an average margin of error of 10 per cent on the basis of uncertainly on POM forecast and lifespan variability. The WG for large equipment is expected to grow by 21 per cent to 3,3 ± 0,3 Mt in 2024. Of this, it is expected that 0,3 Mt of PV are present. The second-largest category, in terms of weight, is small equipment. This category is projected to grow by 20 per cent to 2,9 ± 0,5 Mt. Temperature exchange equipment is expected to grow at a faster pace of 33 per cent, mainly due to air-conditioners, to increase to 1,9 ± 0,1 Mt. The weight of screens is expected to decrease slightly to 1,3 ± 0,1 Mt, mainly due to the emergence of lighter equipment. Small information technology (IT) is expected to decline slightly as well (by about 10 per cent) to 0,7 ±0,2 Mt. The waste of lamps, the smallest category in terms of weight, is expected to double, mainly due to increasing popularity of fluorescent lamps.
The calculation of WG in the coming 10 years also depends greatly on the forecast of the POM in the coming period. Due to unforeseen conditions in markets and economies, errors in forecasting POM information will inevitably introduce uncertainty to the WG in the coming decade. Margin of errors can be eliminated in the future, when actual POM data becomes available and methodology is applied to calculate the WG for the subsequent year on the basis of a consolidated POM dataset from each Member State. A detailed sensitivity analysis has been carried out to estimate the margin of error related to the potential variation in lifespan. Such margin is around 10 per cent at the EU-28 level. Depending on the individual country, this margin can vary between 5 and 19 per cent in extreme cases. Further research on product lifespan at the Member State level can further improve reliability of future estimates.

Estimation of POM (2012-2024) allows a comparison of the potential target from 2019 onwards considering the two different target setting principles: 65 per cent POM versus 85 per cent WG.

	2019	2020	2021	2022	2023	2024
Target on 65% POM (kt)	7.732	7.843	7.954	8.128	8.301	8.473
Target on 85% WG (kt)	8.410	8.454	8.512	8.595	8.707	8.855

Table 1: Comparison of calculated collection targets based on POM and WG for EU-28.

It should be noted that the calculations of POM targets are only based on a forecast of future POM trends and thus have a higher margin of error. Calculations of WG targets are, on the other hand, more accurate, as they are not only based on POM trends for 2012-2024, but also on consolidated POM data up to 2012. The table shows that the two approaches used to calculate collection targets eventually lead to very similar results regarding the total amount of WEEE needed to be collected that fall within the bandwidth of calculations. However, the evolution of the different targets varies per country and will be also affected by the economic and market conditions within a country which are currently forecasted.

Setting individual collection targets

The economic, environmental and social impacts of setting individual collection targets to WEEE categories are compared with the baseline scenario of an overall target for all categories. Two different scenarios are investigated:

- In the first scenario, it is assumed that the collection target will be achieved mostly by increasing the collection of heavy and easily accessible waste that has a positive economic value and is less expensive (or profitable) to treat than other WEEE. (baseline scenario)
- In the second scenario, an individual collection target is set equal for each category.

The two scenarios are based on the previous estimates of WG amounts over the years and vary only in the collection rates achieved per category.
As the market dynamics differ for each category and Member State (in terms of sales, lifespan of products, consumer habits, etc.), individual targets based on POM cannot be set at the same level for all categories and Member States. In addition, a category composed mostly of equipment newly put on the market (e.g., PV panels) cannot have the same collection target of a category characterized by constant sales over the years in a saturated market (e.g., freezers and cooling appliances). Technological and significant average weight changes, in conjunction with technological transitions (e.g., from CRT to flat panels), are also hampering the POM-based targets. Due to these reasons, it is concluded that a WG-based collection target is more suitable for the analysis on individual collection targets.

Analysis shows that setting individual collection targets could lead to environmental and economic benefits while maintaining similar costs for collection and treatment. However, it is difficult to assess the feasibility of setting individual collection targets for each category and each Member State. In a context where there are significant efforts to be made by Member States in reaching the general collection target set out in Directive 2012/19/EU, introducing mandatory individual collection targets at the EU level may therefore be counterproductive. In addition, it may come with a significant administrative burden due to the necessary revision of the WEEE Directive and change in reporting process. For all these reasons introducing at EU level mandatory individual collection targets for one or more categories of WEEE it is not recommended.

Nevertheles, at national level, Member States can set individual targets, on a voluntary basis, as a measure to achieve the general collection target set out in the Directive. The main benefit for Member States would be that individual collection targets could increase the collection of WEEE in specific categories (e.g., lamps, small equipment and small IT) otherwise relatively neglected. An increase in collection of those categories of WEEE could also lead to a decrease of net treatment costs (mainly due to the impact of small equipment and small IT) and an increase in the potential recovery of materials contained in those waste streams that have higher economic value and environmental relevance. These economic and environmental benefits can only be achieved if they are paired with the development of suitable technologies that increase the effectiveness of recovery and the development of a proper channelling and monitoring system that ensures the relevant fractions are handled by those recyclers with the technical capability of maximizing such these benefits along the recycling chain.

Difficulties of Member States and impact on target achievement

Most Member States face challenges in achieving the targets, and in some cases, this achievement might be unfeasible. The main difficulties reported by Member States and key stakeholders are linked to the high rate of unaccounted collection which is further amplified by the limited enforcement and monitoring capacities of Member States. These two related difficulties might seriously hamper the Member States' capability of achieving the target or of demonstrating the real amount of WEEE collected in their territory.

Considering the latest reported collection performances of Member States (2010 and in some cases, 2012 data), and the actual WG calculations, only four countries have a collection rate above 50 per cent; seven countries are between 40 and 50 per cent and 16 are below 40 per cent.

This means that 22 countries will have to double or triple the quantities of WEEE they collect in order to reach the new targets; Member States cannot continue a "business as usual" approach, particularly looking at the pace and the performances of last few years.

While 85 per cent of Member States need to increase their collection by more than 10 per cent annually to reach the targets, only 18 per cent of them had increased collection by more than 10 per cent over the last two years reported. This means up to 20 Member States will have to at least double the pace at which they increase their collection rate.

Regardless of the strategy chosen, both an extension of the deadline and a decrease of the collection target may result in a decrease of WEEE collected by 2019. This would mean that the environmental benefits of collecting, treating and recycling most of the WEEE generated will not increase. In addition, this would come with a potential loss of resources and revenue from the recycling of valuable materials. It is recommended to analyse each Member State's WEEE flows in more detail to improve the separate collection and reporting of all WEEE flows handled by all actors.

With the information currently available, it is impossible to recommend additional derogations or revisions to the collection target, but it is strongly recommended to analyse in more detail the WEEE flows of each Member State and to improve the tracking and registration of all the flows handled. By analysing the destinations of WEEE from each Member State, implementing techniques to enhance reporting in the collection (and treatment) chain, and reducing the amounts of discarded small appliances, one could better assess the feasibility of reaching the target for each Member State.

Conditions for success

Various companies with different business and financing models can collect WEEE. Years of monitoring and enforcement reveal that others besides just producer's compliance schemes and their contracted recyclers active across EU have access to waste generated. In many cases, other economic operators have access to the waste and treat it. In some cases, that waste might be processed by waste operators but mislabelled as metal (or sometimes plastic) scrap and thus, it is not identifiable in general WEEE statistics of the country. Sometimes, WEEE and mixed WEEE plus used EEE is illegally treated or shipped outside the EU where the value or the potential second-market for the disposed equipment is high, and often, a share of WG ends up (mixed) with municipal solid waste (waste bin).

All those activities need to be specifically traced by individual Member States to ensure the reported figures reflect the real collection and treatment of WG through all those routes. For these reasons, a consolidated and common reporting framework for WG needs to be developed and adopted accordingly by the stakeholders involved:

- WEEE Generated needs to be calculated annually, on the basis of last POM data available.
- Amount of WEEE collected by different economic operators (Compliance Schemes, Recyclers and other player authorised to handle WEEE), including appliances that are prepared for reuse needs to be tracked.
- Amount of EEE exported for reuse needs to be tracked as well, as it represents appliances leaving the internal market of the Member States and could help in preventing illegal exports. A consistent and common approach should also take into account the future results of the study launched by the Commission on recycling and recovery targets.
- Estimations of WEEE in waste bin should be improved using sorting analysis of residual household waste and should serve as an instrument to target specific awareness raising activities.
- Estimation of WEEE collected as metal/plastic scrap should also serve as a basis for the strengthening of the enforcement efforts channelling WEEE collected to the proper recycling facilities.

Synthèse

En 2012, le Parlement européen a adopté la nouvelle Directive DEEE 2012/19/UE. L'un des principaux changements introduits par la Directive, objet d'un débat considérable lors de la révision, concerne la redéfinition des objectifs de collecte. Dans la nouvelle Directive , les objectifs de collecte pour les États membres sont passés d'un obejctif « forfaitaire » de 4 kg par habitant à une approche basée sur un pourcentage des quantités de produits mis sur le marché (QMM), ou, de façon alternative, des quantités de DEEE générés (QDG). Ce dernier objectif a été retenu sans que la Directive DEEE, ou la Directive Cadre Déchets, ne donnent une définition formelle des déchets générés.

Après la publication de la directive DEEE et au cours des premiers stades de la transposition et de la mise en œuvre des nouvelles dispositions par les États membres, la Commission Européenne devait lancer différentes études visant à soutenir ou réviser de certaines de ces dispositions, afin d'en améliorer l'efficacité.

La présente étude couvre les dispositions législatives relatives aux objectifs de collecte à atteindre par chaque État membre, dispositions qui affectent directement les opérations de collecte et de traitement, ainsi que la capacité des organismes nationaux de contrôle à vérifier et prouver l'atteinte de ces objectifs.

Les bénéfices environnementaux, économiques et sociaux attendus à travers l'application du nouvel objectif de collecte ne pourront être atteints que si : (1) la collecte séparée des DEEE est assurée, suivie et contrôlée, (2) une fois collectés, les DEEE sont effectivement traités selon les meilleures technologies disponibles et normes applicables, et (3) les fractions issues du traitement sont correctement valorisées ou éliminées.

Compte tenu du contexte législatif et du besoin d' une approche harmonisée pour déterminer les taux de collecte, l'objectif de cette étude est d'aider la Commission à répondre aux exigences de l'article 7 et à améliorer la collecte, et de façon générale la performance environnementale de la nouvelle Directive DEEE. Ceci passe par l'élaboration de méthodologies communes pour le calcul des GMM et le calcul des QDG, basés sur une collecte exhaustive de données, le développement d'une méthodologie scientifique et robuste, des analyses de sensibilité et une étude d'impact sur la possibilité d'établir des objectifs individuels pour certaines catégories d'équipements. Enfin, les difficultés de mise en œuvre des objectifs de collecte pour les États membres et l'éventualité de dérogations à l'échéance pour l'atteinte de ces objectifs, sont analysées.

Une méthodologie commune pour calculer les mises sur le marché d'EEE

Un bon suivi des QMM est fondamental pour plusieurs raisons.Tout d'abord, il représente, en tant que tel, une disposition claire de la Directive. Deuxièmememt, il est non seulement la base du calcul des objectifs de collecte à partir de 2016, mais est aussi indispensable pour effectuer le calcul des QDG. Enfin, il détermine les obligations de financement et permet le suivi des performances de la filière.

Plusieurs méthodes et sources de données sont disponibles pour établir les QMM. Les Registres nationaux en constituent les principales sources de données, mais ceux-ci peuvent présenter un certain nombre de limites, telles que : l'absence de séries historiques préalablement à l'entrée en vigueur la directive DEEE en 2006, l'absence d'informations sur des produits non précédemment inclus dans le champ d'application (comme les panneaux photovoltaïques), la présence potentielle de free-riders et l'absence de données dans les pays candidats à l'entrée dans l'UE. En outre, le manque d'hamonisation dans les catégories de produits utilisées par les Registres, et dans le niveau de transparence des données de ces Registres, représente également une limite pour leur utilisation comme unique source pour déteminer les QMM au niveau de l'UE.

Une méthodologie commune, basée la consommation apparente, est donc présentée pour calculer les QMM historiques (i.e. jusqu'en 2012) et pour compléter et permettre la validation des données des Registres nationaux. Cette méthodologie est basée sur des statistiques normalisées et reconnues au niveau international : production domestique nationale et importation / exportation pour tous les produits inclus dans le champ d'application de la directive DEEE. Cette approche permet en outre d'inclure de nouveaux produits ou des produits précédemment non inclus dans le champ de la Directive.

Les calculs montrent que les QMM sont passées de 4,8 Mt en 1980 à environ 11 Mt en 2012 (UE 28) . A partir de 2004, une diminution du poids est observée, celle-ci étant principalement liée à l'évolution du marché vers des produits plus légers (remplacement des écrans à tube cathodique par des écrans plats, remplacement des ordinateurs de bureau par des ordinateur portables ou des tablettes). Après 2008, et en raison de la crise économique, une nouvelle baisse de QMM est visible. Le point le plus bas a été atteint en 2009 avec 10,4 Mt. Au cours des dernières années, des fluctuations importantes (par exemple des hausses de plus de 10 kg/hab pour un pays donnés et sur deux années consécutives) sont observées et peuvent être attribuées à la dynamique fluctuante du marché des panneaux photovoltaïques, en particulier dans les pays où les ventes sont tirées par des subventions.

Une méthodologie commune pour calculer les quantités de DEEE générées

La méthode pour le calcul des QDG a été sélectionnée parmi celles existantes dans la littérature pour sa simplicité, sa précision et son potentiel d'harmonisation ; la disponibilité des données est également une préoccupation majeure. La méthodologie dites de «Ventes-durées de vie » retenue pour cette étude est basée sur deux ensembles de données simples à appréhender et auxquelles les QDG sont directement liées de façon linéaire : les données de mise sur le marché et la durée de vie des produits.

La base de données des QMM a été constituée en utilisant la méthodologie de la consommation apparente sur la période 1980-2012. A partir de 2006, les données issues des Registres nationaux sont utilisées pour affiner et vérifier la base. Sur cette base, des projections des QMM de 2012 à 2024 ont été effectuées.

La durée de vie est traduite par une courbe de distribution qui reflète la probabilité, pour un groupe de produits donné, qu'il devienne déchet (conformément à la définition des déchets, à l'article 3 de la directive cadre sur les déchets). Cette durée de vie est obtenue à partir de résultats d'enquêtes de consommation, complétées par une recherche documentaire.

Les résultats prévoient une augmentation des DEEE générés dans l'UE-28, de 9,5 Mt en 2014 à 10,4 Mt en 2024, avec une marge d'erreur moyenne de 10 %, liée à l'incertitude sur les prévisions QMM et de durée de vie. Le gisement de déchets pour les gros équipements devrait croître de 21 %, à 3,3 ± 0,3 Mt en 2024. Sur ce total, les panneaux photovoltaïques représenteraient 0,3 Mt. Les petits équipements constituent la deuxième catégorie en poids. Les QDG pour cette catégorie devraient croître de 20 % à 2,9 ± 0,5 Mt. Les QDG pour les équipements d'échange thermique devraient croître à un rythme plus rapide, de 33 % environ à 1,9 ± 0,1 Mt en 2024 (cette augmentation rapide étant principalement due aux climatiseurs). Les QDG pour les écrans devraient diminuer légèrement à 1,3 ± 0,1 Mt, principalement en raison de l'émergence d'équipements plus légers. Les QDG de petits équipements informatiques et de télécommunications devraient diminuer légèrement (d'environ 1 %) à 0,7 ± 0,2 Mt. Les QDG de lampes, la plus petite catégorie en termes de poids,

devraient doubler, principalement en raison de la popularité croissante des lampes fluorescentes.
L'estimation des QDG au cours des 10 prochaines années dépend fortement des prévisions de QMM. En raison des incertitudes liées aux marchés des EEE et au contexte économique en général, les possibles erreurs dans les prévisions de QMM introduisent inévitablement une incertitude sur les prévisions de QDG. Cette marge d'erreur sera réduite à l'avenir, à mesure que les données de QMM seront renseignées à partir de mesures réelles.
Une analyse de sensibilité a été réalisée pour estimer la marge d'erreur liée aux incertitudes sur les durées de vie. Cette marge est d'environ 10 % au niveau de l'UE-28, et varie de 5 % à 19 % en fonction des Etats membres. Des recherches plus poussées sur la durée de vie des produits au niveau de chaque Etat membre pourraient contribuer à réduire cette incertitude.
Les projections effectuées (2012-2024) permettent de comparer le niveau de collecte qui sera nécessaire pour atteindre les obectifs fixés à partir de 2019 (65 % des QMM ou 85 % des QDG).

	2019	2020	2021	2022	2023	2024
65% des QMM (kt)	7.732	7.843	7.954	8.128	8.301	8.473
85 % des QDG (kt)	8.410	8.454	8.512	8.595	8.707	8.855

Tableau 1 : Comparaison of des quantités à collecter pour atteindre les objectifs de collecte, au niveau de l'UE-28.

Il est à noter que les calculs des objectifs basés sur les QMM sont uniquement basés sur les projections futures de mises sur le marché, et donc soumis à une incertitude importante. Le calcul des objectifs basés sur les QDG sont eux, moins incertains, dans la mesure où leur calcul repose également sur des données de mises sur le marché historiques. La comparaison montre cependant que les deux approches devraient conduire, à terme, à des quantités assez similaires.

Objectifs de collecte individuels

Les impacts économiques, environnementaux et sociaux liés à l'introduction d'objectifs de collecte individuels pour certaines catégories de DEEE ont été évalués et comparés avec le scénario de base d'un objectif général pour l'ensemble des catégories (celui de la Directive actuelle). Deux scénarios différents sont étudiés:

- Dans le premier scénario (de référence), on suppose que l'objectif de collecte sera réalisée principalement par l'augmentation de la collecte des déchets pondéreux et facilement accessibles, dont les coûts de collecte et de traitement son aujourd'hui relativement moins élevés, voire rentables.
- Dans le second scénario, des objectifs de collecte individuels, identiques pour toutes les catégories de DEEE (et les panneaux photovoltaïques) sont étudiés.

Les deux scénarios sont basés sur les estimations de QDG effectuées dans le cadre de cette étude, et ne diffèrent que par les taux de collecte réalisés pour chaque catégorie.
Etant donné que les dynamiques de marchés des EEE sont différentes, pour chaque catégorie et pour chaque Etat membre (en termes de ventes, de durée de vie des produits, d' habitudes de consommation, etc.), il n'est pas possible de fixer des objectifs de collecte sur la base des QMM qui soient identiques pour chaque catégorie.
En particulier, une catégorie composée principalement de matériel nouvellement mis sur le marché (par exemple les panneaux photovoltaïques) ne peuvent pas avoir le

même objectif de collecte qu'une catégorie caractérisée par des ventes constantes au fil des ans, sur un marché saturé (par exemple, des congélateurs et les réfrigérateurs). Les innovations technologiques, les importantes variations de poids moyens, couplées à des remplacements technologiques rapides (par exemple, les écrans à tubes cathodiques remplacés par les écrans plats), entravent la pertinence d'objectifs individuels basés sur les QMM. Pour ces raisons, ce sont des objectifs de collecte basés sur les QDG qui ont été retenus pour analyser la pertinence d'objectifs individuels.

L'analyse montre que des objectifs de collecte individuels pour chaque catégorie de l'annexe 3, plus les panneaux photovoltaïques, pourraient conduire à des bénéfices environnementaux et économiques substantiels, sans pour autant augmenter les coûts opérationnels (collecte et traitement). Cependant, il est difficile d'établir la faisabilité réelle de tels objectifs individuels, pour chaque catégorie et pour chaque Etat-membre. Dans un contexte où des efforts significatifs doivent déjà être mis en œuvre par les Etats-membres pour atteindre l'objectif global de collecte de la Directive 2012/19/EU, contraindre à l'application, au niveau européen, d'objectifs individuels, pourrait s'avérer contre-productif. De plus, la mise en place d'objectifis individuels dans la Directive pourrait entrainer des charges administratives supplémentaires importantes, dues à la refonte de la Directive et aux changements en termes d'obligations de déclaration. Pour toutes ces raisons, il n'est pas recommandé d'introduire des objectifs de collecte individuels au niveau européen.

Cependant, au niveau national, les Etats-membres ont la possibilité de mettre en place des objectifs individuels, à titre volontaire, de façon à atteindre l'objectif général de collecte de la Directive. L'analyse développée dans ce rapport apporte des premiers éléments directeurs pour les Etats-membres qui souhaiteraient s'engager dans cette voie.

Pour les Etats-membres qui en feraient le choix, ces objectifs individuels de collecte permettraient d'augmenter la collecte des DEEE de certaines catégories (lampes, petits équipements et petit équipement informatiques) qui risqueraient d'être davantage négligées avec le seul objectif de collecte global. Une augmentation de la collecte des DEEE de ces catégories conduirait à une diminution des coûts nets moyens de collecte et de traitement et une augmentation importante du potentiel de valorisation des matières contenues dans ces flux de déchets, qui ont une plus grande valeur économique et représentent une bénéfice environnemental accru.

Ces bénéfices économiques et environnementaux ne peuvent être atteints qu'à condition que l'augmentation de la collecte s'accompagne du développement de technologies qui améliorent l'efficacité du recyclage, et d'un système de suivi et de contrôle strict, assurant que les fractions issues du traitement sont orientées vers les acteurs de la valorisation les plus à même d'en maximiser les bénéfices.

Difficultés rencontrées par les Etats membres et consequence sur les objectifs

La plupart des États membres sont confrontés à des défis dans l'atteinte des objectifs de collecte, et dans certains cas, ceux-ci paraissent même inaccessibles. Les principales difficultés signalées par les États membres et les parties prenantes clés sont liées au taux élevé de collecte non comptabilisée, qui est encore amplifié par les capacités de suivi et de contrôle limités de certains États membres. Ces deux difficultés connexes peuvent compromettre gravement la capacité des Etats membres à atteindre l'objectif ou à déterminer les quantités réelles de DEEE générés et collectés sur leur territoire.

Compte tenu des dernières performances de collecte déclarées par les États membres (données 2010 et, dans certains cas, 2012) et le calcul de QDG, seuls quatre pays ont un taux de collecte supérieur à 50 %; sept pays se situent entre 40 % et 50 %, et 16 sont en dessous de 40 %.

Cela signifie que 22 pays devront doubler, voire tripler les quantités de DEEE qu'ils collectent pour atteindre les nouveaux objectifs; ces États membres ne peuvent plus se contenter de poursuivre leurs efforts historiques, car cela suppose dans la majorité des cas une accélération importante de l'augmentation des taux.

Alors que 85 % des États membres devront augmenter leur collecte de plus de 10 % par an pour atteindre les objectifs, seuls 18 % d'entre eux affichaient un tel rythme d'augmentation lors des deux dernières années de déclaration. Une vingtaine d'États membres devront doubler le rythme auquel les quantités collectées ont progressé historiquement.

Des dérogations à l'objectif de collecte, qu'elles concernent l'échéance ou le niveau d'objectif, ne peuvent aboutir qu'à des performances de collectes plus faible en 2019 (par rapport à un maintien strict de l'objectif). Outre la perte des bénéfices environnementaux liés à la collecte et au recyclage des DEEE, cela conduirait à une perte potentielle de ressources et de recettes provenant du recyclage des matériaux contenus dans ces équipements.

Dans ce contexte, et avec les informations actuellement disponibles, il est impossible de recommander des dérogations ou modifications de l'objectif de collecte, mais il est fortement recommandé d'analyser plus en détail les flux de DEEE de chaque État membre et d'améliorer le suivi et la traçabilité de tous les flux traités. En analysant les destinations des DEEE dans chaque État membre, en mettant en œuvre tous les efforts nécessaires pour le suivi de ces flux, et en identifiant clairement les pistes pour améliorer les quantités collectés, ainsi que les coûts associés à ces mesure, il sera possible d'évaluer avec davantage de robustess et de pertinence la faisabilité de la réalisation de l'objectif pour chaque État membre.

Recommandations

La collecte des DEEE peut être effectuée par divers acteurs économiques, avec des modèles d'affaires et de financement différents. Plusieurs années d'application de la Directive et de suivi montrent que d'autres acteurs, outre les systèmes mis en place par les producteurs et les opérateurs autorisés dans le cadre de l'application de la Directive, ont accès au gisement. Dans certains cas, les DEEE sont traités en tant que ferrailles (ou plastiques) et ne sont donc pas comptabilisés dans les statistiques nationales DEEE. Il arrive également que les DEEE sont traités illégalement et exportés hors de l'UE. Enfin, une partie du gisement est collectée en mélange avec d'autres déchets solides municipaux.

Toutes ces activités doivent être tracées par les différents États membres de façon à consolider les chiffres de collecte, et à identifier les différentes destinations du gisement. Pour ces raisons, un cadre de reporting consolidé et commun pour le suivi des DEEE générés doit être adopté:

- Les QDG doivent être établis annuellement, sur la base des dernières données de mises sur le marché disponibles.
- Les quantités de DEEE collectés par les différents opérateurs économiques autorisés (systèmes mis en place par les producteurs et autres opérateurs autorisés à collecter et traiter les DEEE) doivent être suivies, y compris les quantités destinées à une préparation en vue du réemploi
- Les quantités d'EEE exportés pour réemploi doivent également être suivies, car il s'agit de produits qui quittent le marché intérieur et ne peuvent plus contribuer au gisement, et afin de mieux prévenir les exportations illégales. Une approche cohérente et commune devra tenir compte des résultats futurs de l'étude lancée par la Commission sur les objectifs de recyclage et de valorisation, qui aborde en particulier cette question.
- Les estimations des quantités de DEEE collectés en mélange avec les autres déchets municipaux devraient être améliorées, à partir de caractérisations des ordures résiduelles, et ce pour mieux cibler les actions visant à les réduire.

- Enfin, des estimations des DEEE collectés en tant que ferraille devraient également être conduites et contribuer à un renforcement du contrôle pour orienter les DEEE uniquement vers les installations de recyclage appropriées.

1 Introduction and structure of the report

In 2012, the European Parliament approved the new WEEE (Waste Electrical and Electronic Equipment) Directive 2012/19/EU. Amongst other relevant changes, the collection target for each Member State changed:

- Until 2015: a rate of collection of 4 kg/person/year should be reached;
- In 2016: the minimum collection rate shall be 45 per cent, calculated as a percentage of the average weight of EEE placed on the market (POM) in the three preceding years;
- From 2019 onwards: the minimum collection rate to be achieved annually shall be 65 per cent of the average weight of EEE placed on the market in the three preceding years, or alternatively 85 per cent of WEEE generated (WG) on the territory of that Member State.

Article 7 of the Directive not only sets the collection targets to be achieved on the territory of the Member States (Article 7(1)), but it also outlines:

- Reporting requirements (Article 7(2)),
- Derogations from Article 7(1) for some Members States (Article 7(3)),
- Potential transitional requirements (Article 7(4)) to address difficulties faced by the Member States in adhering to collection targets,
- Establishment (Article 7(5)) of a common methodology for the calculation of the weight of EEE placed on the national market and a common methodology for the calculation of the quantity of WEEE generated by weight in each Member State,
- Potential re-examination (Article 7(6)) of the deadlines for collection rates and potential setting of individual collection rates for individual categories, and
- Potential revision (Article 7(7)) of collection rate based on WEEE generated.

Given the legislative background and the demand for a harmonized approach to determining collection rates, the aim of this study is to support the Commission in meeting the requirements of Article 7 and enhancing collection and environmental performance of the WEEE Recast in practice. This is done by:

- Developing common methodologies for POM calculation and WG calculation based on comprehensive data gathering, scientific modelling, sensitivity analysis as well as practical experiences (Task A and B in Figure 1);
- Conducting impact assessment, analysing the potential for individual targets in Task C; and
- Analysing implementation difficulties in Task D.

Based on this, the study offers a pragmatic translation into necessary delegated and implementing acts in order to establish accurate and meaningful collection targets.

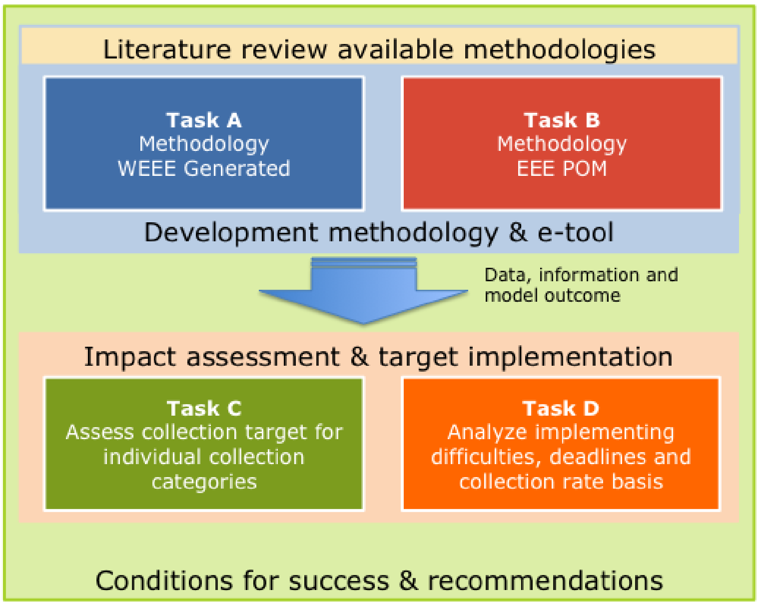

Figure 1: Tasks of the study.

The scope of this study comprises EU27 plus Croatia (from now on referred to as EU28) and the EU Candidate Countries (Iceland, Montenegro, Serbia, the Former Yugoslav Republic of Macedonia and Turkey), Norway, Liechtenstein and Switzerland.

1.1 Background

Over the last decades, the electronics industry has revolutionized the world; electrical and electronic equipment (EEE) has become ubiquitous in today's life. Without these products, modern life would not be possible. The production of EEE is one of the fastest growing industries, and as a result, increased obsolescence and replacement of products makes the volume of European WEEE increase each year. Compared to traditional waste streams, WEEE quantification (and handling) poses unique and complex challenges, including:

- The heterogeneity of EEE, in terms of size, weight, function and material composition (most of these properties change over time), and subsequently, in environmental impact at end-of-life;
- The continuous introduction of new products and features, such as the shift from heavy Cathode Ray Tube (CRT) to Liquid Crystal Display (LCD) televisions, introduction of tablets, along with a progressive reduction in average lifespans of products;
- The presence or phasing out of certain constituent elements or potentially hazardous substances in EEE, such as ozone-depleting substances, mercury and other heavy metals, that require proper treatment;
- The relatively high use of certain precious metals and critical resources in EEE (e.g., gold, silver, ruthenium, indium, platinum group metals, rare earth elements) and the challenges in their recovery due to the "dissipated" nature of the low-concentration elements and the technological complexity involved in recovering them in recycling process;
- The large and diverse group of actors involved in various end-of-life activities, such as collection, recycling and treatment, reuse, refurbishment, waste disposal and export of products and fractions.

One of the main changes introduced by the Directive 2012/19/EU, which was a subject of considerable debate during all phases of the Recast, concerns the re-definition of the collection target for Member States from a "flat-rate" 4 kg per inhabitant to a percentage-based approach related to EEE POM, or alternatively, WEEE Generated (WG). This is despite the fact that neither the WEEE Directive nor the Waste Framework Directive provides a formal definition of waste generated. But the desired environmental, economic and social benefits can only be achieved if separate collection of WEEE is ensured, monitored and tracked, and WEEE collected is properly treated according to the best available technologies and applicable standards and that downstream fractions are properly recovered or disposed of.

As shown in Figure 2, numerous Member States have already reached (or were very close to reaching) the current WEEE collection target of 4 kg per capita. In addition, the estimate is likely low, given some WEEE is still collected, treated and registered as metal/plastic scrap instead of WEEE, or it is not being registered at all.

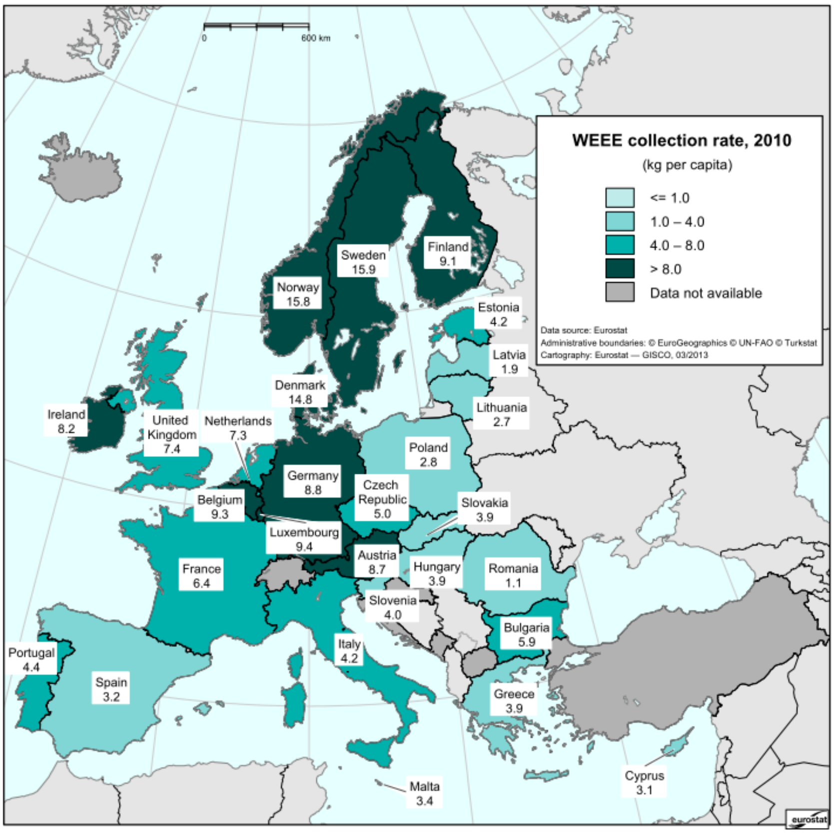

Figure 2: 2010 Collection rates for Member States (Eurostat, 2013)

The advantage of the new target-setting mechanism, either based on POM or WG, is that it is more directly related to actual quantities, and thus it better represents differences between EU Member States' economic conditions. However, in terms of practical and legal compliance, both the POM and WG targets require further detailing, with the development of a common methodology for calculation, in particular for WG.
Although it seems straightforward, the POM target does not necessarily reflect the amounts of EEE becoming waste for some categories. This is due to the delay between the purchase of a new product and the moment that product is discarded (product lifespan), particularly for products like PV panels with recent high market penetration and long lifespans. Similarly, CRT appliances are making a rapid transition to flat panels, which make the amount of WG substantially greater than the market input on a weight basis, due to the much lower unit weights.

The 85 per cent WG target, although in theory directly related to actual amounts of waste, is in practice more difficult to determine by country over time, as discarding behaviour per country is undetermined.

Regardless of which target is selected, both are more complicated to describe than the original 4 kg target. In practice, the amounts to be collected are not simple statistical averages that can be applied to all individual products, product categories or collection categories for all countries.

Therefore, improved data gathering, analysis and understanding as well as a common methodology need to be developed in order to derive a clear, well-defined and achievable legal target that subsequently stimulates higher collection of WEEE in Europe.

1.2 Broader context of the study

After the publication of the new WEEE Directive (2012/19/EU) and during the early stages of transposition and implementation of new provisions by Member States, the European Commission is expected to launch different studies and activities. Such studies and activities will be aimed at supporting or reviewing certain provisions contained in the Directive's legal text to enhance its effectiveness. In addition to the current study, such activities include:

- Review the open scope and the distinction between small and large equipment (Article 2(5)) by August 2015;
- Develop criteria to assess the equivalent conditions ensuring compliance of shipment of WEEE outside EU for treatment (Article 10(3)) by February 2014;
- Re-examine recovery and recycling targets, especially the opportunity of introducing a specific target for reuse preparation (Article 11(6)) by August 2016;
- Request (by February 2013) the development of standards for proper treatment according to Best Available Technologies (BAT) from EU standardization organization (Article 8(5)),
- Investigate the opportunity to develop criteria aimed at incorporating real end-of-life costs into WEEE financing (Article 12(6)) by August 2015; and
- Increase harmonization of registration and reporting procedures for EEE placed on the market by Producers (Article 16(3)).

All these activities streamline the Commission's efforts in different, sometimes complementary fields covered by different provisions of legal text in the WEEE Directive. At the same time, they highlight the interaction expected with Member States in achieving the environmental, economic and social benefits anticipated from the new WEEE Directive. Member States are now requested to report to the Commission at three-year intervals on the transposition and implementation of the Directive into their territories; the first report, covering the period February 2014 – December 2015 is due by September 2016.

This study covers how the legislative provisions of the targets assigned to Member States potentially affect operations (i.e. collection and treatment) at national level as well as the capability of national monitoring and enforcement bodies to gather evidences of compliance and fulfilment of the target set. The main two logical pillars of the study support (1) developing a common methodology (task A and B in Figure 1) to calculate POM and WG and (2) investigating the opportunity of having individual targets for selected collection categories or changing the deadlines or Member States (task C and D in Figure 1). But the actual difference between the target set in coming years, when solely based on POM, or the target from 2019 on, which may apply WG methodology, and the reported performances by individual Member States will depend on different elements:

- Improvement of data quality, particularly regarding the completeness and accuracy of POM data and control over potential free riders. This is of particular relevance in the case of the target directly based on POM, but also when the target is based on WG, as actual (and past) amounts of EEE placed on market directly impact WEEE generation.
- Acknowledgement that different players are active in WEEE collection and treatment across Member States. In many cases, Producers set up Compliance Schemes for collection and treatment, which are complemented by other economic operators. All quantities of WEEE handled in the territory of the Member State in compliance with the requirements of the WEEE Directive must be properly reported.
  Products are sometimes handled outside the waste framework, particularly in the case of professional equipment collected and/or being prepared for reuse by specialized operators. Those quantities need to be traced, or at least estimated, as these products might undermine the collection performances.
  Export of equipment for reuse or treatment is sometimes difficult to track. Those quantities need to be properly traced and reported accordingly, particularly in the case where export occurs before any formal, traceable and accountable data collection.
  Consumers' bad habit of improperly disposing of particularly small equipment, is still a challenge in many Member States, because those appliances are sometimes discarded in the residual waste, instead being separately collected. Those quantities need to be minimized and at least estimated.
- Monitoring flows and activities above, ideally using a clear reporting framework implemented on national level tracking flows handled by all economic operators involved in the chain. Strict monitoring and enforcement of national provisions by competent national authorities is paramount.

1.3 Structure of report

The structure of the report reflects the four main tasks of this study. The main sections of the report include:

- Chapter 2: A literature review of approaches used to classify EEE and WEEE. This will serve as a basis for the literature review of existing methodologies to calculate the quantities of EEE POM (Chapter 3.1) and WG (Chapter 4.1).
- Chapter 3: A methodology is developed to calculate the quantity of EEE placed on the market prior to the WEEE Directive and National Registers of Producers. Such a methodology can be used by individual Member States to develop estimates to complement data already collected through National Registers, according to Article 16(4) of WEEE Directive.
- Chapter 4: Calculations of WG based on sales-lifespan methodology for the individual territories in the EU-28, EEA countries and candidate Member States. This chapter also discusses a sensitivity analysis for the sales-lifespan approach, margins of error in actual forecasts and in the context of future use of the methodology with more up-to-date data.
- Chapter 5: Implications of WEEE collection with regards to socio-eco-environmental burdens with an emphasis on the option of setting individual collection rates for some key product categories. Results from Chapters 3 and 4

are taken into account in the Impact Assessment carried out according to Commission's Guidelines[2].

- Chapter 6: Challenges resulting from deadlines and national boundary conditions that different Member States may face in meeting the collection target, either defined on the POM or WG bases. Next steps are presented based on a cost-benefit assessment of different options, taking into account potential changes in the deadlines or target setting mechanism.
- Chapter 7: Conditions for success and recommendations. The study should be considered in the wider context of national transposition of the WEEE Directive with a series of activities/studies/implementing acts referenced in the legal text of the Directive itself. Those elements are intended to provide the reader with a wider picture, focusing on the implications of options or alternatives derived from the study itself in the broader context of implementing the WEEE Directive.

[2] Commission's internal Guidelines on IA as updated on 15 January 2009 http://ec.europa.eu/governance/impact/docs/key_docs/iag_2009_en.pdfhttp://ec.europa.eu/governance/impact/docs/key_docs/iag_2009_en.pdf

2 Classification and groupings of EEE and WEEE

This chapter presents a brief overview of the existing classifications of EEE and WEEE, which will be judged on criteria needed for determining EEE POM and WG calculations in this study.

2.1 WEEE Directive Annexes

The original WEEE Directive classified EEE primarily according to its Industry sector. It was determined that these 10 categories did not base the categories according to the actual environmental impact (Huisman et al. 2008). The categories are:

- Category 1: Large Household appliances,
- Category 2: Small Household appliances,
- Category 3: IT and telecommunications equipment,
- Category 4: Consumer equipment,
- Category 5: Lighting equipment,
- Category 6: Electrical and electronic tools (with the exception of large-scale stationary industrial tools),
- Category 7: Toys, leisure and sports equipment,
- Category 8: Medical devices (with the exception of all implanted and infected products),
- Category 9: Monitoring and control instruments,
- Category 10: Automatic dispensers.

In Annex 1 and 2 of WEEE Directive, products within the same category may have very different characteristics, such as average weights, product lifespans and material composition. The new WEEE Directive introduced (in Annex III and IV) six categories, close to collection and treatment practice. These categories are:

- Category 1: Temperature exchange equipment,
- Category 2: Screens and monitors,
- Category 3: Lamps,
- Category 4: Large equipment,
- Category 5: Small equipment,
- Category 6: Small IT and telecommunication equipment with an external dimension of no more than 50 cm.

According to this framework, one product category can still be comprised of products with different average weights, lifespans as well as environmental relevancy. In addition, in some cases, the same product type can belong to multiple categories (particularly in the case of Categories 4 and 5) depending on the size, like for small and large ventilators or ovens. In practice, products may be collected in one single waste stream (like for large and small printers, which still are often collected and treated in the same stream).

2.2 WEEE Forum classification

The WEEE Forum classification, also used in the UNU WEEE Review study's environmental impact assessment (Huisman et al. 2008), has been developed to improve the comparability between the national WEEE Compliance Schemes in order to trace different management costs and performances. It is comprised of 17 product categories. However, within these 17 categories, one product category can contain products with very different product characteristics, market behaviours and environmental impacts. Therefore, this classification is unsuitable for application in this study to harmonize the calculation of collection targets with high accuracy.

2.3 Statistical classification: PRODCOM and Combined Nomenclature

In the EU, domestic production of products is registered under the Community Production system (with PRODCOM codes). This integrated system allows the comparison of statistics produced in different statistical domains. Each year, all Member States discuss the list of codes at Eurostat. The PRODOM codes change over time, and they include 4.000 to 6.000 codes for all commodities. From this, there are about 160 to 250 PRODCOM codes relevant to EEE; the exact number fluctuates by year. In most cases, one PRODCOM code corresponds to one or more codes in trade statistics (the Combined Nomenclature codes), and a coding table is available for each year in the EU Ramon database (Ramon 2012). This classification can provide a very detailed description for all the types of EEE placed in the EU market.

2.4 UNU-KEYs

The classification of "UNU-KEYs" has been developed by the United Nations University (UNU). It is organized based on three essential perspectives: product type, waste management and legislative relevancy. This classification list is divided into 54 categories by linking all possible WEEE items (about 660 product types in all) to various conventional categorizations. The UNU-KEYs is a classification that can establish relationships between the previously described classifications, thereby harmonizing available data sources. Additionally, a link between statistical codes has been developed (Wang et al. 2012), aligning the classifications applied in trade statistics, custom authorities and national statistical offices. This categorization enables consistent performance comparison between regions and compliance schemes. Most of the UNU-KEYs align with one or more PRODCOM and CN codes enabling a relationship with harmonized and internationally accepted statistical data. UNU-KEYs are able to address various classification methods, such as the EU-6 and the EU-10 categories, as well as the WEEE Forum classification and the PRODCOM codes. By using the UNU-KEYs, it is possible to convert results among different classification methods. The classification is currently used also in the context of the Partnership on Measuring ICT for Development.

2.5 Criteria to selection classification for common methodology

Due to extensive application of EEE in all aspects of modern life, the number of products with distinct functions amounts to more than 660 (Huisman et al. 2012). Considering the variety of product types, classifying EEE and WEEE into groups with similar attributes is vital. This can greatly improve the assessment efficiency by using a generic categories framework as opposed to relying on the numerous product types.
Proper EEE and WEEE classification is necessary to harmonize and simplify the calculation of POM and WG, and it needs to fulfil the following criteria:

- The properties of the EEE, such as average weight and lifespan profile, are uniform within the same category.
- Market behaviour of the EEE products within the category is uniform. For instance, new products and phase-out products shall not be combined into the same category (e.g., CRT screens versus Flat Panels).
- Environmental relevancy, such us the content of hazardous materials and environmental impacts, is uniform within the same category. This will enable separate monitoring of the equipment harmful to the environment and better treatment quality.
- The classification should allow clustering and be easily linked to Annexes I through IV of WEEE Directive. It also needs to be able to convert the product categories from the original 10 product categories (Annexes I and II) to the six collection categories of Annexes III and IV.

- The number of categories in the classification should be kept to a minimum to limit administrative burden.

2.6 Comparison classifications

The different methodologies for classification have been compared considering five criteria identified in the previous paragraphs, and the overview is presented in Table 2.

Classification	Uniform market behaviour	Uniform average weight/lifespan	Convertible to 6 collection cats in WEEE Directive	Uniform Environmental relevancy	Number of EEE categories	Compatible with task A and task B of present study
PRODCOM and CN statistical classification	+	+	+	+	160 – 250 (PRODCOM)	+
WEEE Forum classification	+	-	+	-	17	+/-
10 category in old WEEE Directive	-	-	-	-	10	-
6 collection categories in Recast WEEE Directive	-	-	+	-	6	-
UNU-KEYs	+	+	+	+	54	+

Table 2: Comparison of methods for EEE/WEEE classification.

According to the criteria above, UNU-KEYs and PRODCOM and CN codes score positively for all the criteria. The UNU-KEYs are preferred, as the number of categories is constrained to 54 codes, which simplifies the calculation of this study. Another incentive is that UNU-KEY codes can be more easily adjusted by TAC members and the DG Environment than the official statistical classifications, which may be necessary in the future. Within each UNU-KEY, the market behaviour and end-of-life attributes of included products are uniform. By applying the UNU-KEYs, it is possible to link the 10 product categories of Annex I and II to the six categories of Annexes III and IV and to translate data and results across distinct data formats. However in some cases, there is no distinct of size in the same type of product in the UNU-KEYs (e.g., ventilators, ovens). The UNU-KEY classification system is openly available to the public. The current version of the UNU-KEYs is provided in the following table. In annex 9.1, the corresponding CN codes for each UNU-KEY are provided in detail.

UNU-KEY	Description	Annex I	Annex III
0001	Central Heating (household installed)	1	4
0002	Photovoltaic Panels (incl. inverters)	4	4
0101	Professional Heating & Ventilation (excl. cooling equipment)	1	4
0102	Dishwashers	1	4
0103	Kitchen (e.g. large furnaces, ovens, cooking equipment)	1	4
0104	Washing Machines (incl. combined dryers)	1	4
0105	Dryers (wash dryers, centrifuges)	1	4
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	1	4
0108	Fridges (incl. combi-fridges)	1	1
0109	Freezers	1	1
0111	Air Conditioners (household installed and portable)	1	1
0112	Other Cooling (e.g. dehumidifiers, heat pump dryers)	1	1
0113	Professional Cooling (e.g. large air conditioners, cooling displays)	1	1
0114	Microwaves (incl. combined, excl. grills)	1	5
0201	Other Small Household (e.g. small ventilators, irons, clocks, adapters)	2	5
0202	Food (e.g. toaster, grills, food processing, frying pans)	2	5
0203	Hot Water (e.g. coffee, tea, water cookers)	2	5
0204	Vacuum Cleaners (excl. professional)	2	5
0205	Personal Care (e.g. tooth brushes, hair dryers, razors)	2	5
0301	Small IT (e.g. routers, mice, keyboards, external drives & accessories)	3	6
0302	Desktop PCs (excl. monitors, accessoires)	3	6
0303	Laptops (incl. tablets)	3	2
0304	Printers (e.g. scanners, multi functionals, faxes)	3	6
0305	Telecom (e.g. (cordless) phones, answering machines)	3	6
0306	Mobile Phones (incl. smartphones, pagers)	3	6
0307	Professional IT (e.g. servers, routers, data storage, copiers)	3	4
0308	Cathode Ray Tube Monitors	3	2
0309	Flat Display Panel Monitors (LCD, LED)	3	2
0401	Small Consumer Electronics (e.g. headphones, remote controls)	4	5
0402	Portable Audio & Video (e.g. MP3, e-readers, car navigation)	4	5

UNU-KEY	Description	Annex I	Annex III
0403	Music Instruments, Radio, Hi-Fi (incl. audio sets)	4	5
0404	Video (e.g. Video recorders, DVD, Blue Ray, set-top boxes)	4	5
0405	Speakers	4	5
0406	Cameras (e.g. camcorders, photo & digital still cameras)	4	5
0407	Cathode Ray Tube TVs	4	2
0408	Flat Display Panel TVs (LCD, LED, Plasma)	4	2
0501	Lamps (e.g. pocket, Christmas, excl. LED & incandescent)	5	3
0502	Compact Fluorescent Lamps (incl. retrofit & non-retrofit)	5	3
0503	Straight Tube Fluorescent Lamps	5	3
0504	Special Lamps (e.g. professional mercury, high & low pressure sodium)	5	3
0505	LED Lamps (incl. retrofit LED lamps & household LED luminaires)	5	3
0506	Household Luminaires (incl. household incandescent fittings)	5	5
0507	Professional Luminaires (offices, public space, industry)	5	5
0601	Household Tools (e.g. drills, saws, high pressure cleaners, lawn mowers)	6	5
0602	Professional Tools (e.g. for welding, soldering, milling)	6	4
0701	Toys (e.g. car racing sets, electric trains, music toys, biking computers)	7	5
0702	Game Consoles	7	6
0703	Leisure (e.g. large exercise, sports equipment)	7	4
0801	Household Medical (e.g. thermometers, blood pressure meters)	8	5
0802	Professional Medical (e.g. hospital, dentist, diagnostics)	8	4
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	9	5
0902	Professional Monitoring & Control (e.g. laboratory, control panels)	9	4
1001	Non Cooled Dispensers (e.g. for vending, hot drinks, tickets, money)	10	4
1002	Cooled Dispensers (e.g. for vending, cold drinks)	10	1

Table 3: UNU-KEYs with descriptions and linkage to Annexes I and III of WEEE Directive[3].

[3] Please refer also to the Note of Authors in the beginning of the report.

3 Determining EEE Placed on Market[4]

Properly tracking EEE annually POM in each Member State is fundamental for different reasons. Producers should comply with provisions of the WEEE Directive, including registration and reporting of EEE POM (Article 16); the aim of such a provision is linked not only to financing obligations, but also to proper monitoring of overall national performances.
In addition, from 2016 to 2019, POM data will serve as a basis for the calculation of collection targets in each Member State. From 2019 onwards, POM data would serve as the basis for the calculation of the POM-based collection target if Member States opt for a POM-based target, or at least will be a fundamental input for the WG calculations in case Member States opt for this alternative.

3.1 Literature review for methodologies to determine POM

This section analyses available data and methods for detrmining the weight of EEE POM. There are several methodologies and data sources available to retrieve or calculate this value. The criteria considered in selecting the best one for the study were:

- Consistency in calculations across all countries in the scope and
- Compatibility of results with the subsequent calculations of WG.

Different approaches have been reviewed and are described in the following paragraphs.

3.1.1 National WEEE registers

POM data can be derived from information available in the National Registers of Producers setup since 2006, according to WEEE Directive's legal provisions. National Registers are entities responsible for tracking and reporting EEE POM in each Member State. This resource is the most obvious starting point for retrieving quantities placed on the market in the various countries, however:

- National Registers are not yet established in all candidate countries and in other non-EU countries in the scope of this study.
- Data can be incomplete, due to free-riding effects, for certain products and are not yet harmonised in terms of scope and data classification (each National Register asks Producers to report EEE POM in different clustering). For instance, in the Dutch study (Huisman et al. 2012), a total gap of 4.5 kg/inh was found when comparing the register data with the amount of POM calculated with the statistical approach.
- National Register data does not include POM data for products that were not in the scope of the original WEEE Directive (e.g., PV panels) necessary to calculate WG.
- Individual National Register data are not always publicly available for consultation. National Register data are annually reported and publicly available through Eurostat at Annex 1 of WEEE Directive level of detail.

3.1.2 Industry data

POM can also be retrieved from data available from national compliance schemes, industry associations or market research companies. However, data may not be complete due to insufficient coverage of all producers or product types on the market, and product categories and data compilation methods might not be harmonised across

[4] Please refer also to the Note of Authors in the beginning of the report.

all countries. In addition, those datasets cost money to access, and the temporal and geographical coverage might not match the scope of this study.

3.1.3 Correlation method

Correlation methodologies are based on hypothesized relationships between socio-economic factors, like population size and income level, and the amount of EEE placed on the market from one of multiple data sources (Beigl et al. 2003; Beigl et al. 2008). Several studies have explored the correlation between purchasing power parity (PPP) and the quantity of EEE POM (Huisman et al. 2008; Huisman 2010).
This is a simple method for estimating total EEE amounts. It is far from precise in determining the purchase of individual EEE appliances, due to complex factors such as demographic structure, economic level and consumer behaviours. In practice, this method demands extensive verification from existing data and advanced modelling methods. In addition, the relationship between socio-economic factors and individual type or specific category of EEE is not established yet, if at all present, for all categories.

3.1.4 Apparent consumption method

POM can also be calculated with the "Apparent Consumption" methodology. This method was used by the Nordic Council (TemaNord 2009), which uses available statistical data as the central data source:

- In the EU, the figures of domestic production can be taken from the PRODCOM statistics.
- EEE products produced domestically can be sold also abroad, thus need to be corrected by subtracting for exports.
- Imports of EEE, on the other hand, can also be consumed in the country of import, thus need to be added to the total.

The import and export data can be retrieved from CN codes. Within CN codes, the legally reported import and export of second-hand goods are included along with the new products. For each PRODCOM code has one or more corresponding trade codes. With these codes, the EEE POM for a certain type of equipment in a territory can be calculated with the following equation:

Apparent consumption = Domestic Production + Import – Export

Statistical data are needed for all the relevant PRODCOM and CN codes to apply this methodology. The relevant codes for EEE have been identified according to the 2012 classification for CN codes, and they are listed for each UNU-KEY in Annex 9.1 The CN codes can be linked to PRODCOM codes using correspondence tables published by Eurostat to the EU Ramon database. For some PRODCOM and CN codes, the data is available in weight; in other cases, pieces are used as the primary unit. In such cases, a conversion to weight is needed. In the context of this study, the average weight has been retrieved from a detailed analysis carried out by previous country studies in the Netherlands (Huisman et al. 2012), Italy (Magalini et al. 2012), Belgium (Wielenga et al. 2013) and France (Monier et al. 2013) and is detailed in Annex 9.3.
The PRODCOM and CN codes are revised annually, and the year-to-year changes are also published to the EU Ramon Database. National Statistical Institutes collect, process and publish statistics on manufactured goods and international trade. These are published periodically to their respective online databases.
Data from the National Statistical Institutes are also published on the EUROBASE (the Eurostat dissemination base), which is operated by Eurostat. For the non-EU countries, data can be retrieved from the United Nations Statistical Division, particularly from the COMTRADE database.

3.2 Selection criteria for POM calculation methodology

The methodologies presented for calculating POM data are reviewed with two sets of criteria: data quality for different sources and strength of the methodology itself.
The first set of criteria is related to data quality of sources, and it includes:

- Data availability: in the countries covered by the study, data should be frequently accessible, at least on the national level;
- Data harmonization: data should be consistent and comparable among Member States in terms of acquisition method, product scope, time frame etc.;
- Level of detail: data should cover all types of EEE placed on the EU market and data should be detailed enough to be used for the calculation of WG (preferably at the UNU-KEY level);
- Time series: data should cover historic time series in order to be useful for the calculation of WG
- Future data availability: data should be easily retrievable for future compilation.

The second set of criteria includes:

- Harmonization: the methodology should lead to comparable results across different countries by relying on a consistent dataset;
- Simplicity: the methodology should be relatively easy to use;
- Suitability: the methodology should generate useful results for the calculation of POM for all countries;
- Accuracy: the methodology outcome can accurately describe the actual quantity of EEE POM, by including all producers and excluding second-hand equipment, and the method should be accurate on the category level.

3.3 Methodology selection for determining POM

Table 4 summarizes the data requirement for different methods. The national register data is too aggregated (Annex 1 level) and lacks temporal coverage of years prior 2006. The correlation method is not reliable on the desired UNU-KEY level. Industry data from compliance schemes or associations are usually country- or sector-dependent, which is hardly harmonised within the EU and usually publicly unavailable. The apparent consumption method for applying the statistical data fits best with the entire set of criteria, due to the high level of detail and accessibility. One of the consequences of the Apparent Consumption Approach is that it needs to be updated when new PRODCOM and CN codes are introduced or changed. However, this is needed anyway, due to the development of new technologies and EEE products.

Methodology	Data availability	Data harmonisation	Level of detail	Time series past	Accuracy	Simplicity	Suitable for WG calculations	Future data availability
National Registers data	+	+/-	-	-	+/-	+	-	+
Industry data	-	-	+/-	+/-	+/-	+	-	+/-
Correlation method	+/-	-	-	+/-	-	-	-	+/-
Apparent consumption	+	+	+	+	+/-	+/-	+	+

Table 4: Comparison of POM calculation methods based on data quality.

Apart from the data criteria, Table 4 also compares the methods across intrinsic strength. From the perspective of harmonisation, both the apparent consumption method and the National Registers are harmonised in terms of EEE classification and data collection approach in the EU. Therefore, each is suitable to be used as a common methodology for calculating the collection target. With the detailed result obtained at the product level (UNU-KEY), only the apparent consumption method is suitable for use calculating WG, while including a historic time series. Regarding accuracy of results, the correlation method generates the least reliable outcome, because it may only be accurate for the total POM data. The National Registers data can be incomplete when free-riders do not report in the national system. In addition, register data at the EU-10 level is too aggregated to provide sufficiently accurate data at the UNU-KEY level.
However, in order to obtain accurate results at the UNU-KEY level, the apparent consumption method needs a calculation module to process the statistical data into the right format of POM data. This usually involves extracting data from national statistical offices and further processing the data, which requires substantial effort.

3.4 Calculation of POM using Apparent Consumption methodology

Since the enactment of the original WEEE Directive, National Registers have been set up to collect and report on information, particularly on the weight of EEE POM. Despite this, no common definition of weight was specified in the original WEEE Directive's legal text. It is recommended that subsequent versions adopt the definition already agreed upon by the European Network of WEEE Registers to increase future harmonization in reporting requirements and increase comparability of data across Member States:

> **Weight** is the gross (shipping) weight of the product, including all electrical and electronic accessories, but excluding packaging, batteries/accumulators, instructions, manuals, non-electric/electronic accessories and consumables.

The non-uniformity in product categories between the countries, the public availability of data and the time range (data prior 2006) reported from individual National Registers were major limitations in determining EEE POM in this report.
In addition to that, Article 16(4) specifies "Member States shall collect information, including substantiated estimates, on an annual basis, on the quantities and categories of EEE placed on their markets".
For these reasons, a common methodology is presented and applied in the context of this study. The aim of the methodology is not to replace the role of National Registers in future years, but to complement and provide through the apparent consumption approach and the available statistics on PRODCOM and CN an alternative to double-check, compare and validate data. This may be helpful, particularly in those cases where the National Register data may be incomplete or unavailable.
The methodology is based on the apparent consumption. The following are specific data sources used in this study:

- Domestic production data may be obtained from the Community Production system (PRODCOM codes) on Eurostat, which classifies goods produced in each Member State.
- Import and export statistics are classified by the Combined Nomenclature codes (CN codes) on Eurostat. These statistics can be linked to the PRODCOM classification through the translation table with coding details which are annually updated in the EU Ramon Database (Ramon, 2012).

Average weights for PRODCOM/CN codes that are reported in pieces as primary unit in the original statistics are derived from UNU country studies (Huisman et al. 2012; Magalini et al. 2012; Wielenga et al. 2013).
Some key elements that need to be taken into account when applying the Apparent Consumption approach are:

- When using the Eurostat data, confidentiality restrictions may apply, particularly with PRODCOM data and, to a lesser extent, with the International Trade data. For this study, the confidential data values were estimated. However, these limitations will not exist when the national statistical institutes at the Member State level process data.
- Consistency checks may be necessary when reviewing time series to detect any potential poorly reported data.

Because the PRODCOM and CN codes are so specific, in some cases they may include appliances out of the scope of the old WEEE Directive (e.g., in the case of gas-run boilers or cookers and photovoltaic panels). For photovoltaic panels, EEE POM was calculated using data on the increase of the installed photovoltaic capacity from energy statistics published by Eurostat. The installed photovoltaic capacity was converted to weight using the conversion factors that were slightly adapted from the conversion factors obtained from the industry association PV Cycle (CYCLE (Clyncke and Acoleyen 2014). Those were 150 t per MW installed in 1998 and preceding years. After 1998, the conversion factor decreased incrementally to 83,5 t per MW installed in 2013. Due to the long lifetimes and recent market introduction of PV panels it was assumed that the WG of PV panels were negligible compared to the POM. In cases where better data sources were available in the consortium, those were used. For desktop PCs (UNU-KEY 0302), data was used from the EITO report (EITO, 1996-2012). For LED lamps (UNU-KEY 0505), no useful statistical codes yet exist, and therefore data is absent.

In order to create a consistent dataset, without implausible and missing data, regular statistical techniques were applied. The techniques and tools used for estimating confidential PRODCOM data and detecting and replacing outliers with consistent values can be found in Annex 9.3. From the total of 30.734 data points used, after all statistical routines:

- 22.305 (72,6 per cent) data points retained their original value,
- 3.316 (10,8 per cent) data points were missing before and have an estimated value afterwards,
- 5.113 (16,6 per cent) data points were detected as an outlier by the statistical techniques and have been corrected in the process.

When looking at the total weight of EEE POM between 2000 and 2012, more than 71 per cent results from original values. The remaining data on POM had been corrected or was missing in the original dataset. No substantial changes over the years have been observed. The lowest percentage of original POM in one single year is 65 per cent, while the highest was 78 per cent.

3.5 POM results using apparent consumption methodology

The methodology described has been used to process international statistics and create a historical EEE POM dataset for each country in the scope of the study from 1995 to 2012. Data from 1980 to 1995 has been extrapolated, considering product introduction on the market, and if the products were on the market the whole period, the data is extrapolated assuming a standard annual growth rate of 2 per cent. The impact of the extrapolation on the WG from 2019 (to be discussed in Chapter 4) onwards is very small, typically below 1 per cent, as most products placed on the market prior to 1995 have already reached the waste phase.

The calculated POM data included all products in the current scope of the WEEE Directive. In Annex 9.10, the total EEE POM data is provided for each country investigated in the study.

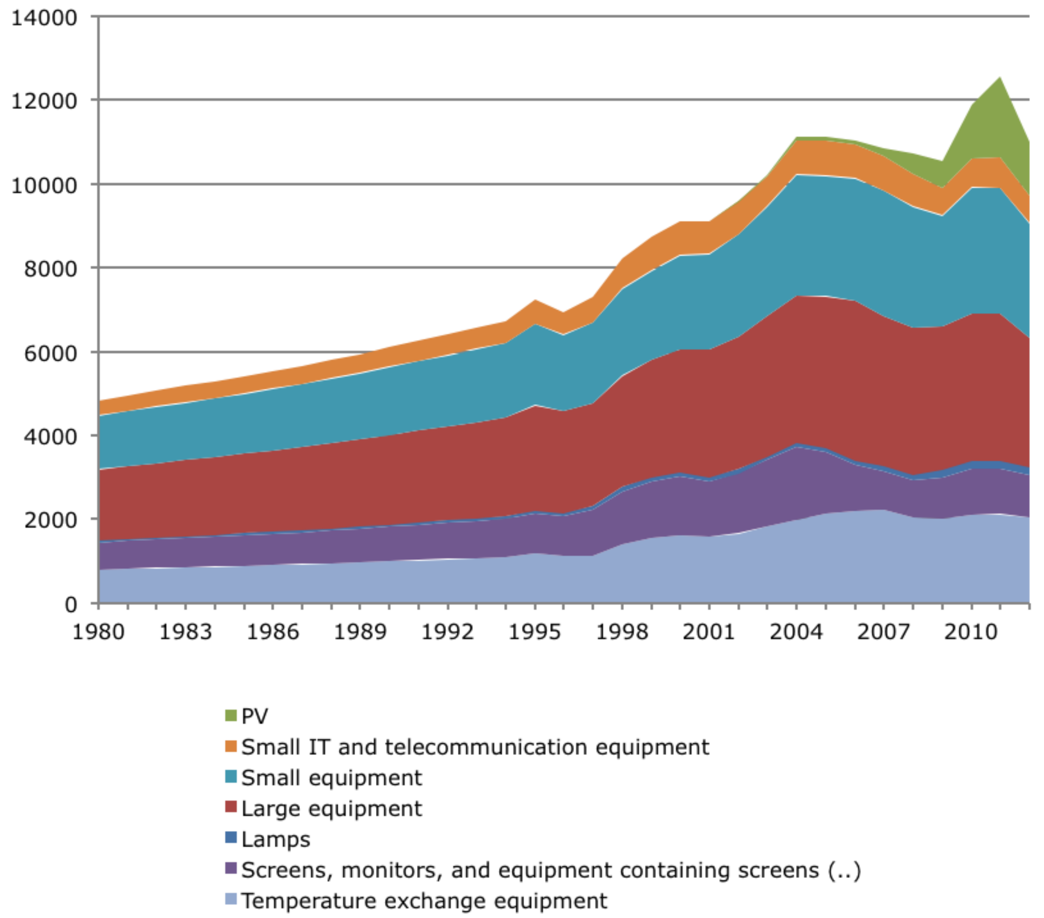

Figure 3: EEE POM in the six categories using the common methodology for EU-28.

POM has increased from around 4.8 Mt of EEE equipment in 1980 to around 11 Mt. in 2012 for the EU-28. After 2004, excluding PV, a decrease of the EEE POM is visible; reasons for this decline are linked to market shifts to lighter products, such as flat panels replacing CRTs or desktops becoming lighter and being replaced by laptops and tablets. Due to the economic crisis in the EU-28 area after 2008, a further decrease of the EEE POM is visible, and the lowest point was reached in 2009. In 2010 and 2011, the POM increased, which was largely caused by the sales of large household equipment and PV panels, but it decreased again in 2012.
It is particularly noticeable that the sales of PV have rapidly increased since 2006 (see Figure 3), which has caused an increase of the overall POM. It was found that the sales of PV panels may considerably fluctuate between countries and years. In most countries, those sales are driven by subsidies. The fluctuations can be as great as the change between 2011 and 2012, over which time, Italy's sales declined from 14,3 kg/inh to 4,3 kg/inh. Another example of this occurred in that there were 12 kg/inh sales for Czech Republic in 2010, which declined to 0,8 kg/inh sales in 2011. More information can be found in a report from the corresponding industry association PV-CYCLE (Clyncke and Acoleyen 2014).

3.6 Eurostat and methodology: comparison of results

Results of the common methodology calculations based on apparent consumption can be compared with official data reported by Member States to Eurostat, usually based on National Registers data. The aim of such a comparison is to evaluate the consistency of the approach selected. Therefore, the scope of the products was matched as much as possible with the scope that is available from Eurostat. This mainly involved Centralized Heating (UNU-KEY 0001) and Photovoltaic Panels (UNU-KEY 0002). Those products are therefore excluded from the comparison in Table 5.

Country	Common Methodology (with the exception of UNU-KEY 0001 and 0002)			Eurostat WEEE Directive data			Overall matching
	Year			Year			
	2008	2010	2012	2008	2010	2012	
AT	21,4	21,4	20,9	20,6	19,8	18,8	Good
BE	22,7	23,9	22,3	27,6	27	29,6	Medium
BG	14,5	11,4	11,5	13,6	6,9	7,3	Poor
CY	23,2	22,4	16,7	22,7	23,1		Good
CZ	17,9	18,9	16,9	20,1	15,9	16,1	Good
DE	18,2	22,1	20,3	22,9	21,2	22,1	Good
DK	26,6	24,4	21,9	29,7	26,7		Medium
EE	15,7	12,7	12,7	26,4	9,9	11,4	Medium
EL	19,7	17,3	12,4	18,8	16		Good
ES	19,4	19,8	15,5	16,8	16		Medium
FI	23,4	24,4	24,9	30,6	27,6	25,4	Medium
FR	24,6	26,4	23,3	26	25,2		Good
HU	13,8	12,8	11,6	13,5	12,4	8,4	Medium
IE	24,5	20,3	19,5	25,6	21,1	18,5	Good
IT	18,5	20,5	17,7	23,7	18,9	15	Good
LT	13,9	9,8	10,2	13,3	7,7	9,5	Medium
LU	25,8	24,4	22,1	24	33,6	23,3	Medium
LV	11,9	7	8,3	13	7,3	8,3	Good
MT	17,8	18,6	16,9	24,4	34,5	24,3	Poor
NL	26,2	26	24,8	4,8	3,7		Poor
NO	36,4	34,9	34,3	43,6	37,1	37,1	Medium
PL	14	11,7	12,6	15,6	12,8	12,5	Good
PT	18,4	18,1	13,9	16,5	14,9	11,1	Medium
RO	11,2	10,2	9,5	11,9	7,4		Good
SE	25,9	25,9	25,2	25,4	24,8	23	Good
SI	18	17,9	17,9	16,6	13,9	13,8	Poor
SK	15,3	14,3	12,6	11,2	9,1	8,9	Poor
UK	25,4	25	23,8	21,9	24,4	22,4	Good

Overall matching:
Good: less than 10% deviation as average 3 years
Medium: deviation between 10% and 20%
Poor: deviation higher than 20%

Table 5: POM comparison with WEEE Directive data from Eurostat (unit kg/inh).

Table 5 shows deviations in the data. In some cases these deviations are negligible, while in other cases, they are more relevant. The main reasons behind the deviations are:

- The effect of free-riders on National Registers might be more substantial given the fact that registration and reporting is linked to financial obligations (registration costs, buy particularly financing obligations for WEEE take back). Reporting for PRODCOM and international trade data to the National Statistical Institutes is mandatory and occurs under strict confidentiality as laid out in national statistical laws. There are no financial consequences when a company reports to the statistical office.
- Differences in national interpretation when allocating the products to a category can result in reporting inconsistencies between categories. For instance, microwaves can be reported as small household or large household appliances, depending on the country. This should not lead to differences in the totals, as shown in Table 5, but only on a more detailed data category level.
- Inaccuracy in National Registers data, particularly, but not limited to the first years of reporting (2005 and 2006) can also lead to inaccuracies. In a detailed study conducted by the UNU, an underestimation of 1,4 kg/inh was found due to incorrectly classified entries and wrong average weights in the Dutch registry (Huisman et al. 2012). On the contrary, in Belgium where an incorrect average weight for one individual product was found, an overestimation of 2,4 kg/inh in POM data occurred (Wielenga et al. 2013).
- Statistical databases may also contain errors. Statistical routines by the national statistical offices should detect and correct incorrect or strange data during the collection, processing and publication the data. In the calculations performed during the study, the routines described in Annex 9.3 were also applied to minimize potential errors in the data. However, on a detailed level, the statistical routines might also introduce errors.
- The data reported for the WEEE Directive, also contains jumps as large as 10 kg/inh per year. The data from the Apparent Consumption approach and the applied statistical technique provided smoother time series.

3.7 Conclusions on POM methodology

In general, the Apparent Consumption methodology provides a smoother time series than the WEEE Directive National Registers' data. Additionally, the scope is expected to be more harmonized for the Apparent Consumption approach, since all products are included in the calculations for all the countries within the study's scope. Thus, the calculated result is more harmonized than the data in Eurostat for the WEEE Directive reporting.

Another asset from Apparent Consumption methodology is that the data has a higher resolution, and it can be broken down into 54 individual product categories (UNU-KEYs). The time series of the data range is longer and meets the requirement of this study. Due to longer time series, outliers can be more easily detected and corrected.

In addition, the data in this report is now internationally harmonized for the first time, allowing for the identification and correction of structural mismatches in reporting.

This was done by clustering countries into comparable groups based on purchasing power parity.
Therefore, the Apparent Consumption approach serves as the primary method for this study to determine WG in Chapter 4, and it may also be suitable for future reporting of POM data complementing National Register data.

4 Determining WEEE Generated (WG)[5]

Calculation of WG will be necessary from 2019 onwards, in the case Member States opt for the target setting principle. One of the key elements is to define WG, as is not available in the WEEE Directive's legal text or in the Waste Framework Directive. The definition of WG used in the context of the study is the following:

> **WEEE Generated** in a Member State corresponds to the total weight of discarded products (waste) as a result of consumption within the territory of that Member State in a given reporting year, prior to any activity (collection, preparation for reuse, treatment, recovery (including recycling) or export) after discarding.

4.1 Literature review of methodologies to calculate WG

There is a variety of distinct methodologies for determining WG in literature and in practice. These methodologies apply different mathematical functions, and thus they require different parameters and data input for computation.
Through an extensive screening of literature, a number of methodologies have been identified. They can be classified into two groups:

- Disposal-related analysis (Walk 2004)
- Input–Output Analysis (Walk 2004; Beigl et al. 2008; Lau et al. 2012).

4.1.1 Disposal-related analysis

Disposal-related analysis uses WEEE data obtained from collection channels, treatment facilities and disposal sites. The calculation requires empirical data from parallel disposal streams, together with their mass ratios versus the overall WEEE stream. The accuracy of this method mainly depends on the ratio assumption between the known WEEE flows and the total WG. In addition, the actual gap between traceable WEEE and real WEEE generation could undermine these calculations. The result has low consistency over time, due to dynamic changes between disposal, trading channels and trans-boundary movement of WEEE.

4.1.2 Input-output analysis (IOA)

IOA methodologies quantitatively describe the dynamics, magnitude and interconnection of product sales, stocks, lifespans and WEEE generated (Brunner and Rechberger 2004; Gregory et al. 2009). They are also occasionally referred to as Dynamic Material Flow Analysis. By combining different variables (sales, stock, lifespan), variations of IOA methodologies can construct mathematical relations based on the "law of conservation of mass", to calculate WG.

Compared to the previous two groups of methodologies, IOA is the most frequently used, and seven different approaches have been found:

- Time step methodology: With this model, the change of stock within a period in a system equals the difference between the total inflows (EEE sales) and outflows (WG). Therefore, to calculate the weight of WG, this method entails

[5] Please refer also to the Note of Authors in the beginning of the report.

two types of data input: sales in the evaluation year and stock data for two consecutive years. This method has a high level of accuracy to measure the dynamic change of WG only when accurate POM and WG data are available.

- Sales – average lifespan (simple delay) model: This model calculates WG based on the product sales in one specific historical year (van der Voet et al. 2002). This method applies the "average lifespan" of products to identify the historical year. For instance, if a washing machine have an estimated average lifespan of 15 years, then the WG in the current year equals the washing machine sold 15 years ago.
- Sales – distributed lifespan methodology: This model calculates WG from time series product sales over all historical years with their respective obsolescence rates (expressed in lifespan distribution) in the evaluation year (Streicher-Porte et al. 2005; Jain and Sareen 2006; Oguchi et al. 2008; Dwivedy and Mittal 2010).
- Carnegie Mellon methodology: This model applies both historical sales and average lifespan as the basis to calculate WG (Matthews et al. 1997). 1997). It quantifies material flows separately through different lifecycle stages, such as storage, reuse, recycling and landfilling (Dwivedy and Mittal 2010). Different product lifespans are assigned to separate stages, and calculations are made on the quantities flowing through each of the existing end-of-life (EoL) alternatives. This method requires both a comprehensive mapping of material flows in a specific society and an accurate estimation of average lifespans for all types of products in different EoL stages.
- Leaching methodology: This model calculates WG as a fixed percentage of the total stock divided by the average product lifespan (van der Voet et al. 2002; Robinson 2009; Chung 2011; Araújo et al. 2012). This model requires little data input, and is therefore convenient when data is extremely scarce. However, the model is not suitable for all market types due to oversimplification and loss of dynamic elements. It can only be used for products with a relatively short lifespans in a saturated market (van der Voet et al. 2002; Walk 2009).
- Stock and Lifespan distribution methodology: This model combines time series stock data in all historical years with lifespan distributions of products to calculate the weight of WG (Binder et al. 2001; Müller et al. 2009; Walk 2009). This method indirectly deduces the historical sales figures through continuous stock amounts and lifespan information, and then the WG is calculated accordingly.
- Multivariate IOA: This model is an advanced and flexible method, which can be used when multiple datasets are available. It links product sales, stock and lifespan data to construct mathematical relationships between various data points, based on best available data to calculate WEEE generated. By applying this method, the data consolidation steps facilitate the production of more comprehensive time series datasets from the available datasets, which increases the reliability of WEEE estimates (Wang et al. 2013).

4.2 Selection criteria for WG calculation methodology

For harmonised application in different countries, the presented methodologies were reviewed with two specific sets of criteria: data availability and strength of the methodology (Simplicity, accuracy and harmonization potential):

- Data availability: in the countries covered by the study data is accessible to apply the methodology annually.
- Simplicity: relies on a small number of variables and is easy to collect data, maintain and update

- Accuracy: matches well with market and technological dynamics, diverse user behaviours and different WEEE flows peculiarities.
- Harmonisation: leads to comparable results across Member States.

4.3 Methodology selection for WG calculation

The selection criteria listed in previous chapter have been used to rank the identified methodologies. From a general data availability perspective:

- High quality data of historical WG in the form of complete collection and WEEE flows data is scarce due to a lack of harmonised methods and measurement.
- Stock levels of appliances in households and businesses are generally unavailable, especially in a harmonized manner. There is data on the penetration rates of household appliances within Member States (percentage of households that own a specific appliance) published by Eurostat in the context of the EU-SILC statistics, but this data is not easily convertible to the absolute stock amount, because multiple appliances are occasionally owned by one household (such as TVs and laptop computers).
- Lifespan is an important parameter for assisting in the assessment of WG, and it can be determined by consumer and/or business surveys per product category with representative sample size. However, such in-depth investigations feeding and enabling the most comprehensive Multivariate IOA are only carried out in a limited number of Member States (Huisman et al. 2012; Magalini et al. 2012; Monier et al. 2013; Wielenga et al. 2013).

From a methodology accuracy perspective:

- Disposal-related analysis has low accuracy, because accurate ratios between different waste-handling channels are very difficult to obtain, they are often inconsistent over time, and they are not interchangeable between countries.
- The correlation methodology is not sophisticated enough for calculating WG of obsolete EEE, and the methodology may have low accuracy when the actual WG is not fully synchronised with the economic level. It is also inaccurate on the product category level.
- The Time Step Mode can be very accurate if reliable POM and stock data are available for each type of product.
- Regarding different variations of IOA, both the Sales – average lifespan (simple delay) methodology and the leaching methodology have relatively low accuracies, because they are only suitable for saturated markets or products; comparatively, the Sales – lifespan distribution methodology, the Carnegie Mellon and the Stock and Lifespan distribution methods are more accurate by applying time-dependent lifespan parameters; Multivariate IOA is the most accurate method because it applies comprehensive mathematical functions and best available data to consolidate model output. However, it requires multiple datasets which are generally unavailable (as of yet) for all countries.

From a simplicity perspective:

- In general, methodologies that apply more variables (with a higher degree of freedom) can result to better accuracy, but this also introduces more computation complexity, as more parameters have to be estimated. This lowers its applicability for wider users.
- Over-simplified methodologies (such as disposal-related analysis, correlation methodologies and time step methodology) rely heavily on availability and quality of data, which may restrict its applicability.
- Complex methodologies (such as Carnegie Mellon, stock and lifespan distribution and multivariate IOA) require multiple steps to process and consolidate data, which are difficult to use or update.

From a harmonization perspective:

- It is critical for the EU Member States to have a consistent and comparable method for calculating the weight of WG. This requires the method to be reliable, consistent in time and geography, and easy to implement by Member States.
- The disposal-related analysis requires too much local data and the interpretation of "disposal data" could vary greatly by country. Therefore, it is unsuitable for the purpose of harmonised application in the EU.
- Methodologies with high complexity, particularly using complex and comprehensive datasets will increase the difficulties of applicability at the national level, jeopardizing the availability of harmonized and comparable results across Member States.

Table 6 summarizes the characteristics of all mentioned methodologies.

Methodology	Data availability	Accuracy on collection category	Simplicity	Harmonisation
Disposal-related analysis	+	- -	++	--
Time step	--	++	+	+
Sales – lifespan distribution	+	+	+	+
Sales – average lifespan (simple delay)	+	-	+	+
Carnegie Mellon	+/-	+	-	-
Leaching	+	--	++	+
Stock and lifespan distribution	-/+	+	-	-
Multivariate IOA	+	++	--	--

Table 6: Comparison of different methodologies to calculate WG based on selected criteria

Based on Table 6, the most appropriate methodology to calculate the WG for all EU Member States is the "Sales – lifespan distribution". The main advantages of applying this method are:

- The required parameters (POM and lifespan distribution) match well with data availability,
- The quality level of accuracy at both product category and collection category levels,
- Non complex calculation process, and
- High potential of harmonization/compatibility across all countries in the scope of the study.

In a sensitivity analysis, discussed in Chapter 4.6, it is also demonstrated that this model is sophisticated enough to estimate the general scale of the WG.

4.4 Calculation of WG using a common methodology

According to the methodology selected, the quantity of WG in a specific year is calculated by a collective sum of discarded products that were placed on the market in all historical years multiplied by the appropriate lifespan distribution.

The lifespan distribution reflects the probability of a product batch being discarded over time, thus matching the definition of waste according to Article 3 of the Waste Framework Directive.

Such a methodology is aligned and consistent with the definition of WG provided in the beginning of the chapter.

To apply the methodology selected, for each type of product, the following data are needed for each country:

- Historical EEE POM data for product type by weight (1980 to 2012) from Chapter 3, and
- Lifespan distribution per product type.

UNU-KEYs are used as the minimum product type clustering level for the calculations. A detailed description of this method is presented in Annex 9.2, with explanatory diagram, formulas and introduction of model parameters.

In addition to the historic POM for the years 1980 through 2012, three different scenarios for projections for the years 2012 to 2024 were taken into account:

- In the first scenario, long economic downturn was simulated. In this scenario, the decline or growth in sales per inhabitant was calculated for each country and each UNU-KEY from 2008 to 2012. As a next step, the outcome of all countries were weighted equally and averaged, such that a single annual growth or decline rate was determined for each UNU-KEY.
- In a second scenario, economic growth was simulated. The decline or growth in sales per inhabitant was calculated between 2001 and 2008 using the same procedure as described in the first scenario.
- A more realistic scenario, based on growth or decline in sales per inhabitant was determined for the period of 2001 to 2012 using the same procedure as described in the first scenario.

The lifespan for the various UNU-KEYs were taken largely from previous country studies (Huisman et al. 2012; Magalini et al. 2012; Wielenga et al. 2013, Monier et al. 2013). This was the French lifespan data for the high-income countries (Switzerland, Norway, Netherlands, United Kingdom, Finland, Sweden, Ireland, Austria, Luxemburg, and Belgium). Here, the assumption was made the lifetime profiles are uniform and comparable between those countries. For the remaining countries, lifespan data was used from Italy. For cooling and freezing equipment, a division was made according to climate. Warm climate countries (south European countries) were assigned Italy's lifespan data, and the countries with colder climates were assigned the Netherland's lifespan data (as detailed in Annex 9.2). For washing machines, representing in Europe roughly 10 per cent of the WG, country-specific lifespan profiles were calculated using available stock data from households (deduced from the penetration rate published in the context of EU-SILC statistics in Eurostat); the "sales-stock-lifespan model" was used to determine the lifespan for each country, individually. Table 7 provides an overview of lifespan used for different countries; for more details, please refer to the explanation in Annex 9.2.

<table>
<tr><th>Country cluster</th><th>0104 Washing machines</th><th>Product categories with dramatic lifespan changes[6]</th><th>Other UNU-keys</th><th>Cooling and freezing equipment (UNU-KEYS 0108, 0109, 0111, 0112 and 0113)</th></tr>
<tr><td>Stratum 1 (purchasing power > 35.784 Int$): AT, NL, IE, SE, BE, DK, DE, UK, FI, FR, LU, CH, NO, IS, LI</td><td rowspan="3">Country-specific data</td><td>France time-dependent lifespan data</td><td>France lifespan data in 2007</td><td rowspan="3">France lifespan data in 2007 is used for cold climate countries: AT, NL, IE, SE, BE, EE, DK, DE, UK, FI, FR, LT, LU, LV, CH, NO, CZ, SK, PL, IS;

Italy lifespan data in 2007 is used for hot climate countries: ES, SI, CY, EL, MT, PT, IT, HU, HR, BG, RO, RS, ME, FYROM, TR</td></tr>
<tr><td>Stratum 2 (purchasing power 23.068 - 30.289 Int$): ES, SI, CY, EL, CZ, MT, PT, SK, IT</td><td rowspan="2">Italy time-dependent lifespan data</td><td rowspan="2">Italy lifespan data in 2007</td></tr>
<tr><td>Stratum 3 (purchasing power 13.396 - 22.747 Int$): PL, HU, EE, HR, LT, LV, BG, RO, RS, ME, FYROM, TR</td></tr>
</table>

Table 7: Overview of product lifespan used for different countries.

The impact of such hypothesis, particularly the influence of lifespan parameters on the WG results, is analysed and discussed in Chapter 4.6.

4.5 WG projections for the decade 2014 -2024

Future projections of WG aggregated at country level are presented in Table 8 below. Results are calculated taking into account the realistic scenario for 2012 through 2024 EEE POM estimations. Upper and lower limits are used as a bandwidth for the forecast, which is discussed in the sensitivity analysis chapter.
Detailed country data, per collection category, is displayed in Annex 9.11.

Country	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
AT	188	188	188	188	188	187	188	188	189	190	192
BE	242	246	249	252	254	256	258	260	263	266	271

[6] Product categories with dramatic lifespan changes in France include 0114; 0304; 0308; 0309; 0401; 0407; 0001; In Italy include 0102; 0105; 0114; 0201; 0407

Country	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
BG	77	79	81	82	83	85	86	87	89	90	92
CH	213	218	221	224	226	227	228	229	230	232	234
CY	14	15	15	15	15	15	15	16	16	16	16
CZ	157	161	165	168	172	175	179	184	188	194	200
DE	1772	1782	1786	1788	1787	1787	1792	1804	1826	1861	1908
DK	135	136	137	138	137	137	136	136	135	136	136
EE	19	19	19	19	19	19	19	20	20	20	20
EL	171	171	171	171	170	170	170	170	170	172	174
ES	818	822	825	826	828	830	833	838	845	854	866
FI	118	120	122	124	126	127	129	130	132	134	136
FR	1419	1446	1466	1481	1492	1499	1504	1511	1520	1535	1555
FYROM	13	13	14	15	15	16	16	17	17	18	19
HR	48	48	49	49	49	49	49	50	50	50	50
HU	125	126	128	128	129	130	130	131	132	132	133
IE	92	93	94	94	94	94	93	93	93	94	94
IS	9	9	9	9	9	9	9	9	9	9	9
IT	1077	1090	1101	1111	1121	1133	1146	1163	1184	1211	1244
LI	1	1	1	1	1	1	1	1	1	1	1
LT	34	34	35	35	35	35	35	36	36	36	36
LU	12	12	12	12	12	12	12	13	13	13	13
LV	22	22	22	22	22	21	21	21	21	21	21
ME	4	5	5	5	5	5	5	5	6	6	6
MT	6	6	6	6	7	7	7	7	7	7	7
NL	395	401	406	410	413	416	419	421	425	429	434
NO	146	149	152	154	156	157	158	160	161	163	165
PL	397	409	420	431	441	450	460	469	478	487	496
PT	171	170	170	169	168	168	168	168	168	169	171
RO	197	201	204	206	209	211	213	216	218	221	225
RS	56	57	58	59	60	61	62	62	63	64	64
SE	215	220	224	227	229	231	232	234	236	238	241
SI	31	32	33	33	34	35	36	37	38	39	40
SK	62	64	66	67	69	70	72	73	75	76	78
TR	503	523	542	560	578	594	610	626	642	657	672
UK	1511	1528	1540	1545	1546	1544	1542	1542	1545	1553	1567
EU-28	**9523**	**9641**	**9730**	**9797**	**9849**	**9894**	**9946**	**10014**	**10111**	**10244**	**10417**

Table 8: Projections of WEEE Generated for the decade 2014-2014 (unit: kt)

In Table 8, it can be seen that the largest economies in the EU (France, Great Britain, Germany and Italy) represent 60 per cent of the amount of WEEE in the EU-28. For the region as a whole, the amount of WEEE is expected to increase from 9,5 Mt in 2014 to 10,4 Mt in 2024, with a growth of 9 per cent over the period.

Almost all countries show a projected increase of WG. Only in Latvia, the amount of WEEE is expected to decline. This is mostly due a relatively late phasing out of CRT displays in the waste stream. In Denmark and Ireland the amount of WEEE is expected to be stable throughout the decade. The fastest growths of WG were projected for the unsaturated markets. For instance, in Turkey, Montenegro, Slovenia, FYROM and the Czech Republic a growth rate of more than 25 per cent is expected. Those markets showed high growth rates of EEE POM in the past years and are at the also becoming increasingly saturated. This explains the rapid increase of WG.

The expected growth rates of WG per collection category are displayed in Figure 4.

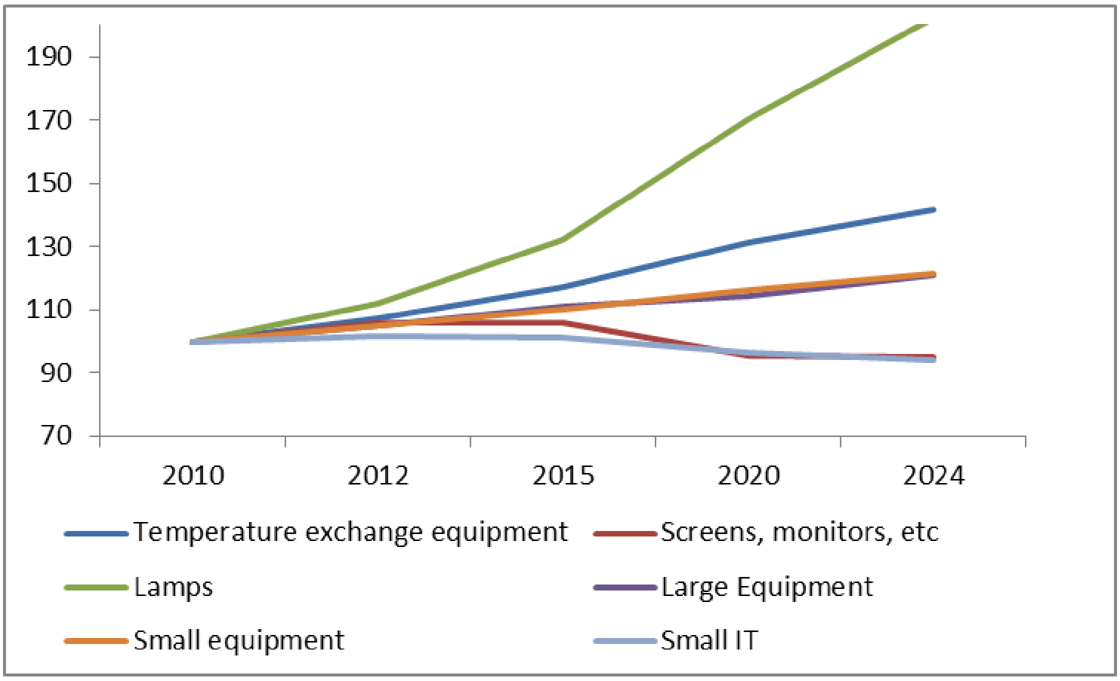

Figure 4: WEEE Generated per collection categories. 2010 is indexed as 100

The main findings regarding future WG can be summarized as follows:

- Small equipment is expected to increase in the coming years, like most other categories.
- In contrast, small IT equipment is expected to decline the coming years. This is mostly due to the decline of waste arising from desktop computers and telecommunications equipment. Mobile phones, smartphones and printers contrarily show increasing waste arising but this represents a relatively little increase in terms of weight.
- The temperature exchange equipment is expected to grow by 33 per cent. This growth mainly originates from growth in air conditioners in the waste stream.
- The weight of screens in WG is expected to decline in the coming years, mainly due to the transition from heavy CRT to light flat panel displays.
- The smallest category in terms of weight is lamps. Waste arising from lamps is expected to grow by 51 per cent in the next decade. This is mostly (in terms of weight) attributed to fluorescent lamps.

- Large equipment shows a projected increase of 21 per cent in the next ten years. In this waste stream, the most noticeable increase was attributed to PV panels. The relative share of PV panels increases from barely 0,5 per cent of the waste stream of large equipment to almost 10 per cent in 2024.

4.6 Sensitivity analysis

In any calculation or modelling process, uncertainty is inevitable. This because the collected data for each variable could potentially deviate, or because missing parameters had to be estimated. Usually, when the data of a variable is not 100 per cent accurate or certain, it can introduce errors to the calculation. Therefore, a sensitivity analysis can help examine the reliability of the calculation results by looking into the accuracy of the collected data for each variable.

In the present study, calculations of WG are based on two key variables:

- EEE POM over time and
- Product lifespan

Uncertainty or inaccuracy in these two variables can introduce errors or large confidence intervals in the total weight of WG calculations.

4.6.1 Impact of future POM on WG

The impact of POM on WG is straightforward, because the amount of historical POM would eventually become obsolete after a certain period of use. From the WG methodology perspective, POM from all historical years collectively influences the magnitude of WG generated in a target year. From a market perspective, the quantity of POM in the present year can directly influence the generation of WEEE in the same year. That is, more sales of new products generally lead to replacement and thus more unused or obsolete products. However, due to complicated socioeconomic and technological changes, the relationship between POM and WG is not always constant. For instance, in both "new product" market conditions (for instance LCD TVs and monitors) and "phase out" market conditions (like CRT TVs and monitors), the trend of WG is the reverse of the trend of POM within the same product types. This requires further analysis by applying the flow modelling on specific product category. Also in the case of "non-saturated" market conditions and for products with long lifespans, like PV panels, the effect of POM on WG is diluted in future years.

The overall results of WG considering the three different economic trends are shown in Figure 5. The calculated growths and declines were checked for consistency. For instance, the EEE of CRT appliances POM are expected to phase out, regardless of the three scenarios. The calculated growth rates are expected to be lowest in the crisis scenario and highest in the growth scenario. If this pattern was inconsistent, it was manually modified such that the series is more consistent on a micro level. For PV panels, data and scenarios from the industry association PV-CYCLE is used (Clyncke and Acoleyen 2014).

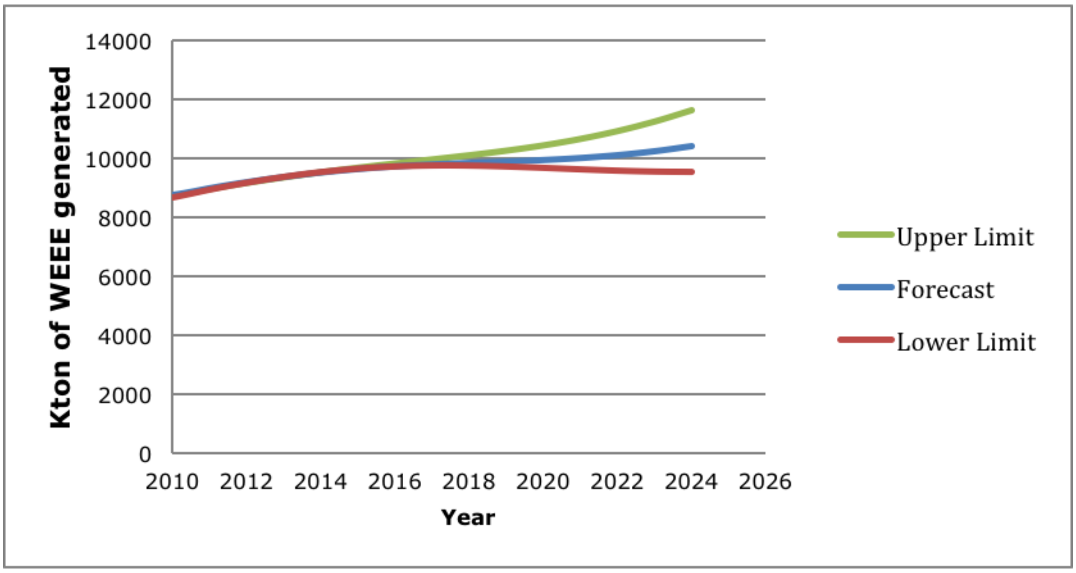

Figure 5: Future scenarios for the evolution of WEEE generated in the EU-28.

From a more general perspective, the uncertainty of current WG estimation linked to POM forecast is supposed to lessen when adopting the methodology for subsequent years when actual POM data becomes available.

4.6.2 Uncertainty in lifespan

The influence from the lifespan profile of products on waste generated is more complex. This is because the lifespan distribution is only expressed as a statistical function (such as the Weibull Distribution in this study), which is not linear. As indicated in the previous section, the lifespan data from many EU Member States are unavailable, due to lack of statistics or national surveys. So far, only the lifespan data for France, Italy, the Netherlands and Belgium have been obtained from national studies via specific consumer surveys. Product lifespans are regarded to be different among Member States, due to diverse socioeconomic conditions. However, there are very few statistically-harmonised data or surveys that provide the lifespan data for typical EEE in all Member States. In this study, when the lifespan data from one target country is unavailable, the lifespan data from a reference country was used as a proxy. Therefore, a sensitivity analysis for the reference lifespan is needed, because:

- Differences in lifespan exists between target and reference countries;
- Future lifespan fluctuation (which is unpredictable at this point) will introduce uncertainty in the forecast of the WG for the coming ten years. Due to the market dynamics and socioeconomic conditions, the lifespan of products can change accordingly. For instance, during the recession period, people tend to postpone the purchase of new products while prolonging the use of existing products, or resorting to purchasing second-hand equipment. This situation could be reversed during an economically booming period or for newly introduced technologies.

Considering the uncertainty of lifespan data used, a sensitivity analysis has been carried out based on two rather extreme scenarios:

- 30 per cent longer average lifespan than the reference average lifespan for all products (54 UNU-KEYs), and
- 30 per cent shorter average lifespan than the reference average lifespan for all products (54 UNU-keys)

The 30 per cent margin range was devised by studying the lifespans of washing machines in most EU Member States. In practice, it is quite unlikely that the lifespans of all products in a country will fluctuate uniformly compared to a reference country. Also, it will be unlikely that all lifespans will deviate in the same direction (all lifespan extension or shorting). Due to distinct geographical and socioeconomic conditions, the lifespan of each type of product may have a different level of change. The scenario of ± 30 per cent lifespan difference in all products simply indicates the maximal margin of error.

After running the calculation of WG based on the standard lifespan profiles and the two extreme scenarios, the WG result was obtained. The margins of error are provided in detail in Annex 9.11 for all Member States.

The following figure illustrates the calculated margins of error in WG, by comparing the baseline and the two extreme scenarios for the 2012 lifespan profiles.

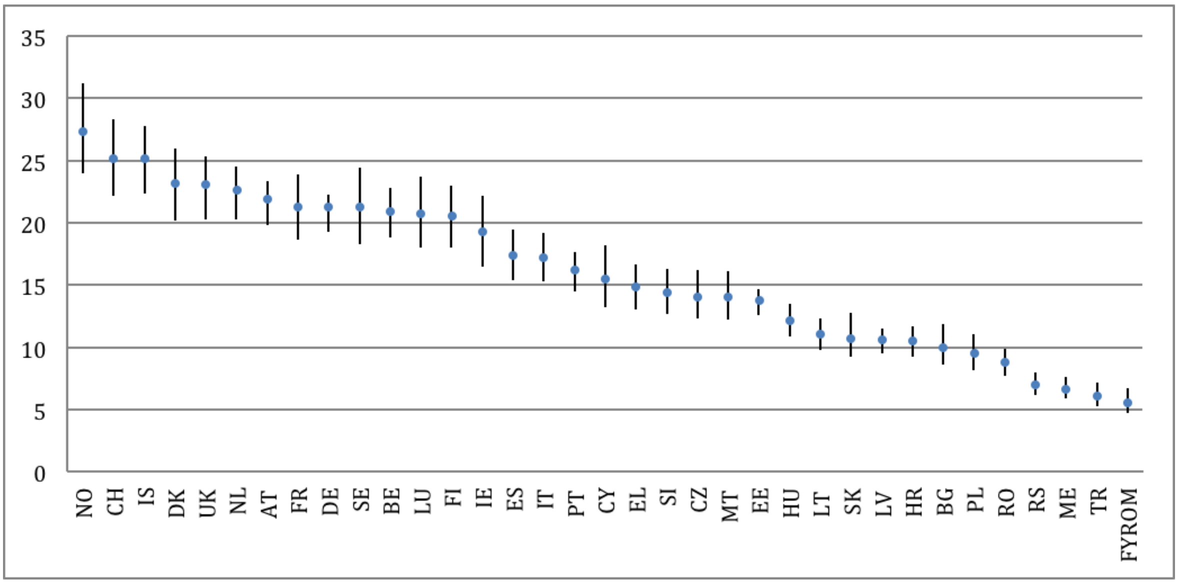

Figure 6: Sensitivity analysis of lifespan profile on the amount of WG in 2012

Due to different historical rates of POM, the impact of lifespan differs by country. The countries with most impact from lifespan are Bulgaria, Cyprus, Slovakia, FYROM, Turkey and Ireland, in which the margin of errors can reach more than ±15 per cent of the WG compared to the baseline scenario. This may be caused by the dramatically changing trends of the amount of POM over the past ten years in these countries. Countries with more stable POM rates (such as Germany, Austria or Estonia) have tended to experience less impact from the changing lifespan; the margins of error in these countries is lower than ±10 per cent. The lowest margin of error is 5 per cent, and the highest was 19 per cent. Seven countries had a margin between 5 and 10 per cent, and 21 countries had a margin of error between 10 and 15 per cent.

The margin of error analysed here primarily arises from the lack of accurate data at the national level, and it represents deviations from the lifespan data. If properly designed possession surveys are carried out in Member States, the uncertainty from the lack of lifespan data could be reduced significantly.

In addition, the use of lifespan profile for calculating WG is statistically allocating the historical POM amount to future WG. The influence of the lifespan profile may lead to a different calculation of WG in a specific year, but for a longer timeframe, the past POM will eventually become WEEE, and the total weight of WG within a longer period is not substantially influenced by the choice of lifespan profiles.

4.7 Targets based on WG

By applying the designed common methodology, the weight of WG in each EU-6 category is calculated for all Member States. The detailed result is present in Annex 9.11. Table 9 provides a brief summary of the total WG for EU-28 countries.

For EU-28, the WG is expected to increase from 9,5 Mt in 2014 to 10,4 Mt in 2024, with an annual growth rate of around 1 per cent.

In Table 9, the margin of the POM forecast is not included in the target estimations, as this margin would decrease when actual POM data becomes available. The last column provides the cumulative margin of error, including the POM forecast as upper and lower bound scenarios.

From the time-series data, the margin of error is around ±10 per cent during the years 2014 to 2024 due to the uncertainty in lifespan profiles in Member States, despite the fact that on the national level this, margin can be lower.

Overall for the target setting, 85 per cent of WG is expected to be 8,9 Mt with a margin of 0,9 Mt in 2024.

Year	WEEE generated EU-28 (kt)	Margin on WG from lifespan (kt)	85% of WEEE generated (kt)	Margin on 85% WG target from lifespan (kt)
2014	9.523	± 982	8.094	± 835
2015	9.641	± 996	8.195	± 846
2016	9.730	± 1.007	8.271	± 856
2017	9.797	± 1.015	8.328	± 863
2018	9.849	± 1.022	8.371	± 869
2019	9.894	± 1.028	8.410	± 874
2020	9.946	± 1.034	8.454	± 879
2021	10.014	± 1.042	8.512	± 886
2022	10.111	± 1.053	8.595	± 895
2023	10.244	± 1.066	8.707	± 906
2024	10.417	± 1.084	8.855	± 921

Table 9: WG in EU-28 and 85 per cent WG target.

The estimation of POM (between 2012 and 2024) allows comparing the potential target from 2019 onwards, considering the two different target setting principles: 65 per cent POM, versus 85 per cent WG. It should be noted that the actual calculations of the POM target are only based on forecast of future POM trends, and thus have a margin of error (calculated as the total deviation between the two extreme scenarios presented in Chapter 4.2), which is higher. Calculations of the WG target are, on the other hand, more accurate as they are not only based on POM trends for 2012 to 2024, but also on consolidated POM data from up to 2012. Table 10 shows how the two approaches, neglecting the impact of POM forecast error, and thus assuming the realistic scenario of POM as non-differential, lead to very similar results.

Target setting principle	2019	2020	2021	2022	2023	2024
Target on 65% POM (kt)	7.732	7.8435	7.954	8.128	8.301	8.473
Margin of error (kt)	± 1.600	± 1.800	± 2.100	± 2.300	± 2.500	± 2.700
Target on 85% WG (kt)	8.410	8.454	8.512	8.595	8.707	8.855
Margin of error (kt)	± 900	± 900	± 900	± 900	± 900	± 900
Difference between Target based on WG and Target based on POM (kt)	678	611	558	467	406	382

Table 10: Comparison of actual forecast of POM target versus WG.

4.8 Conclusions on WG methodology

The methodology for calculating WG is selected from among those existing in literature for simplicity, accuracy and potential of harmonization; data availability was also a primary concern. The "Sales-lifespan" methodology selected for the context of this study is based on two simple and straightforward datasets that are linearly aligned with WG: POM and lifespan data. The benefits of using WG as the basis for target-setting is that it reflects the potential for waste products to become obsolete in a given national market.

In order to obtain a more accurate baseline for future target-setting, national data on both POM and lifespan need to be obtained with consistent approach among Member States. For POM, it is best that data can be collected per UNU-KEY. When only National Register data is available for POM, fractions must be determined to further allocate the aggregated POM data on the EU-10/EU-6 levels to the UNU-KEYs. Such fractions can be obtained by studying past empirical POM data, which may be subject to change in the future.

In conclusion, it is recommended that Member States carry out in-depth national surveys in order to obtain more accurate lifespan profiles for different types of product categories. By using up-to-date country-specific data on both POM and lifespan for each UNU-KEY, the margin of errors in the calculation can be substantially reduced. This would greatly improve the reliability of the WG calculation by applying the selected common methodology. When limited resources are available, efforts can focus on critical equipment categories with relatively high economic, environmental and social impacts.

5 Setting individual targets for collection categories

Article 7(6) of the Directive states that "the Commission shall… present a report… on possibly setting individual collection rates for one or more categories set out in Annex III, particularly for temperature exchange equipment, photovoltaic panels, small equipment, small IT and telecommunication equipment and lamps containing mercury. The report shall, if appropriate, be accompanied by a legislative proposal."

The objective of this task is to assess the economic, environmental and social impacts of setting individual collection targets for WEEE categories set out in Annex III of the WEEE Directive, as compared to a general target. While it is assumed that setting specific collection targets for the most polluting WEEE or those containing critical materials will result in significant environmental benefits, it may not be feasible from an economic point of view. Therefore, this task aims to demonstrate the relevance or non-relevance of setting individual targets by assessing potential economic, environmental and social impacts.

5.1 Categories considered

The Directive advocates for studying the feasibility of setting individual targets on one or several of the WEEE categories as set out in Annex III, "particularly for temperature exchange equipment, photovoltaic panels, small equipment, small IT and telecommunication equipment and lamps containing mercury". When defining categories for setting individual collection targets, an important criterion is whether these categories are collected separately or likely to be segregated at some point during treatment. Generally speaking, the six categories of Annex III represent actual collection flows, despite the fact that some Member State might still enact a merger or split of category 6 (Small IT and telecommunication equipment) in current collection practices.

On the other hand, the six collection categories include products with different environmental relevance. Setting even more detailed individual targets with subcategories (i.e. product clusters) with similar environmental profiles could ensure the minimisation of their negative impacts on the environment (e.g., avoiding pollution due to the improper disposal of equipment containing hazardous substances, avoiding resource depletion by ensuring the recycling of equipment containing critical metals, etc.). However, this could also lead to an additional reporting burden, as it is difficult to distinguish between the different types of equipment within a certain collection category. It would also be difficult to properly calculate the waste generated in these subcategories in order to measure completion of collection targets. Individual collection targets on too many WEEE categories may require setting up additional separate collection streams, generating substantial additional costs.

The rationale behind setting individual targets at the collection category level is to secure the collection of both valuable and non-valuable products (and to deter collectors from focusing on "easy products") and focus on the most problematic streams (such as hazardous waste ending up in the waste bin) in order to reduce the detrimental environmental impacts of WEEE. Interestingly, France is already willing to implement individual collection targets for categories similar to the ones in the WEEE Directive, and they have proposed a draft legislative text.

The six categories in the WEEE Directive have therefore been retained for the analysis, as they are relatively easy to track and report, and setting ambitious collection targets based on them can lead to significant environmental and economic benefits. In addition, PV panels have been analysed apart from the category 4 (large equipment), as this equipment is handled through specific logistic and treatment processes.

On the other hand, while the Directive cited lamps that contain mercury as a priority for study, they were not analysed separately from the rest of category 3 (lamps). This is because lamps containing mercury cannot easily be distinguished from the rest of the lamps when collected, and the setting of a target on lamps containing mercury only (based on WG or POM) would mean that POM should be tracked individually. The implementation of new reporting procedures and sorting processes in order to distinguish lamps containing mercury from the other lamps would significantly increase the reporting burden. Setting an individual target on the whole category could, on the other hand, ensure that this waste flow is treated appropriately, without changing the industry’s organisation scheme, as lamps are already reported separately.

The categories studied are thus:

- Annex III categories: temperature exchange equipment, screens and monitors, lamps, large equipment, small equipment, small IT equipment;
- Other product group (as explicitly mentioned in the Directive): Photovoltaic panels.

5.2 Setting individual targets based on WG versus POM

The collection targets analysed in this task are based on WG rather than on POM. Setting achievable individual targets on EEE POM is considered less feasible, due to the different market dynamics of the EEE categories that can vary significantly by Member State (in terms of sales, lifespan of products, consumer habits, etc.). A category composed mostly of equipment newly put on the market (e.g., PV Panels) cannot have the same collection target as a category characterized by constant sales over the years (e.g., freezers & cooling appliances). In the first case, the quantities put on the market do not reflect the quantities of WEEE available for collection. An identical collection target based on POM would thus be irrelevant. Similarly, equipment that is no longer put on the market in a country but disposed of by households in the case of equipment replacement can still be put on the market in another Member State and be unavailable for collection. A similar collection target for these two Member States based on POM would not equally allow them to achieve the target.

On the other hand, setting collection rates based on WG requires a proper assessment in each Member State, as the target is set before being able to measure the actual WG.

The collection rates, based on EEE POM that should be set in order to achieve a collection rate of 85 per cent of the WG, show that there is a significant difference between the collection rates achievable per category to have the same amount of WEEE collected. These differences largely depend on the different trends of POM versus WG in each Member State.

Similarly, the collection rates based on WG that should be set in order to reach a collection rate of 65 per cent of the POM (average over the three preceding years) show that, for most categories individually, the collection rates based on POM are less ambitious, even if overall, the two approaches are close in terms of WEEE to be collected. However, it can significantly vary between Member States and correspond to a 100 per cent or higher collection rate when based on WG in some Member States, which is impossible to achieve in reality.

Given the same amount of WG and POM for year 2010 and year 2019, Table 11 shows, for each collection category, the corresponding target that would lead (if met) to the same amount of WEEE collected.

Category	2010		2019 (targets based on WG)		2019 (targets based on POM)	
	Collection rate based on WG	Collection rate based on POM	Collection rate based on WG	Correspo nding coll. Rate POM	Collection rate based on POM	Correspo nding coll. Rate WG
Cat 1	38%	24%	85%	68%	65%	82%
Cat 2	47%	69%	85%	89%	65%	62%
Cat 3	12%	9%	85%	71%	65%	78%
Cat 4 exc. PV	38%	30%	85%	80%	65%	69%
Cat 5	26%	22%	85%	78%	65%	71%
Cat 6	49%	49%	85%	91%	65%	61%
PV Panels	3%	0%	85%	2%	65%	2895%[7]
Total EU	**37%**	**30%**	**85%**	**67%**	**65%**	**83%**

Table 11: Comparison of target levels leading to same amount of WEEE collected in 2010 and in 2019.

In addition, further differences between Member States can make targets based on POM unachievable.

To overcome these market dynamics, individual WG targets have been retained for the following analysis. Similar collection efforts, regardless of their respective category and Member State, are thus considered. All Member States can potentially collect all WEEE available for collection.

5.3 Scenarios assessed

In order to assess the impacts of setting individual collection targets, as compared to setting a general target, two scenarios have been defined:

- **The first scenario, or base scenario, considers a general collection target and no individual collection targets per category of EEE**, like in the WEEE Directive. The general collection rate of 85 per cent of WG contained in the Directive for 2019 is used. In this scenario, it is assumed that the general collection target of 85 per cent will be achieved mostly by increasing the collection of heavy and easily accessible waste that has a positive economic value and that is less expensive (or profitable) to treat than other WEEE.

[7] This percentage can be explained by the high amount of PV Panels that will be put on the market in 2019, compared to the amount of PV Panels reaching their end-of-life. If 65% of PV Panels POM were to be collected in 2019 (based on the average POM during the 3 preceding years), this would correspond to 1.245 kt. Compared to the 45kt of PV Panels waste that are expected to be generated in 2019, this would correspond to a 2895% collection rate based on WG

Because the collection target is high, other WEEE categories may be collected more as well, but to a lesser extent.

- **The second scenario considers individual collection targets**, per category of the WEEE Directive. The same collection target of 85 per cent for each category of the Directive is used. In this scenario, all WEEE categories reach a collection rate of 85 per cent, unless they were already collected at a higher rate.

5.4 Current collection rates per category

In order to estimate the collection rates per category to be reached in the two scenarios, the current collection rates have to be determined. Two data sets are thus needed:

- Current quantities of WG
- Current quantities of WEEE collected

Data on WG is obtained, in Chapter 4 of the study, for the six categories in Annex III of the WEEE Directive.

Data on collection is not presently available per collection category. Eurostat provides data on the quantities of WEEE collected in the EU level every year, but the last available data for all EU countries is from 2010 (2011 and 2012 data are only available for a limited number of countries to date), and can be retrieved according to the 10 categories of Annex I only. In order to use this data, it is necessary to convert collection performances based on Annex I to the level of detail of Annex III. Several methods to perform this conversion are discussed below.

5.4.1 Breakdown according to collection sampling

Data on the average composition of WEEE collected in Europe could be used for this conversion. The 2008 study carried out by the UNU that reviewed Directive 2002/96 broke down WEEE collected into 17 categories, close to the 10 categories of Directive 2002, which could be allocated to the six categories of Directive 2012.

By applying the same split factors to the quantities of WEEE collected in 2010 declared on Eurostat, it would be possible to estimate the collected quantities for each category in 2010. By comparing this data with the quantities of WG calculated in Chapter 4, collection rates per category in 2010 could be calculated.

A major drawback of this method is that there are uncertainties. For example, some of the 17 subcategories identified (e.g., electronic tools) in the UNU 2008 Report belong to a certain category of Directive 2012 (e.g., small equipment), and they may contain products of very different sizes, some of them belonging to the category 4 (large equipment category).

5.4.2 Breakdown according to WG calculations

Chapter 4 presented anaylytical the calculation of the quantities of WEEE generated in 2010 according to the six categories. Assuming that the breakdown WEEE collected in a given year is similar to breakdown of WG, it is possible to apply the repartition of WG to the total amount of WEEE collected in 2010 reported to Eurostat and calculate the corresponding collection rates.

This method has the advantage of being simple. However, it is also highly theoretical, as it is not based on any collection evidence. Some WEEE categories are traditionally collected at a higher rate than others because of their size (e.g., freezers compared to mobile phones) as consumers tend to look for a disposal solution. In this method, the difference between WEEE generated and collected is not accounted for.

5.4.3 Breakdown according to UNU-KEY split factors

The third option is also based on WG but uses more precise split factors to distribute the 10 categories across the six categories.
The total amount of WEEE collected, reported according to the 10 product categories in Annex I of the WEEE Directive can be broken down by country according to the split factors of individual UNU-KEYs within the different categories on the basis of WG amount. Then the individual UNU-KEYs amounts can be regrouped according to the six product categories of Annex III. Despite being more precise in allocation, such a method sill assumes that the share of WEEE collected of the WG is the same for all UNU-KEYs.

This last option is used as a basis for the scenarios, for the following reasons:

- UNU-KEYs are a more precise way to allocate quantities collected into the six categories rather than the former categories of the WEEE Directive, since two products belonging to the same category according to Annex I can belong to two different categories according to Annex III; and
- It is based on individual collection performances of each Member State according to individual WG calculations.

This method leads to the following collection rate estimations:

Category	Estimated quantities collected in 2010 (kt)	Percentage of the category in the total	WEEE Generated in 2010 (kt)	Collection rates in 2010
Cat 1	509	16%	1.349	38%
Cat 2	630	20%	1.350	47%
Cat 3	15	0%	131	12%
Cat 4 exc. PV	1.056	33%	2.782	38%
Cat 5	620	20%	2.382	26%
Cat 6	362	11%	737	49%
PV Panels	0,08[8]	0%	3	3%
Total	**3.192**	**100%**	**8.734**	**37%**

Table 12: 2010 collection rates according to UNU-KEY WG calculations (2010).

[8] Data on collected PV panels were not estimated given that they were outside the scope of WEEE Directive and therefore unreported by Member States, but the datat was retrieved from PV Cycle (2011 Annual report), implemented in nine countries in 2010. This data is therefore underestimated.

5.5 Impact of hypothesized collection rates in 2019

The two scenarios vary in the collection rates projected for 2019, depending on the strategy selected to reach the targets. The collection rates achieved in the two scenarios are discussed in this section.

In the first scenario, because of the generic collection target, it is assumed that the collection efforts will be mostly dedicated to categories 1 (temperature exchange equipment), 4 (large equipment) and 2 (screens & monitors) due to the high quantity of waste available and their average weight (ease of access and high potential contribution in reaching the target). However, these alone will not be enough to reach the overall 85 per cent collection target. It is thus assumed that the collected quantities of equipment of category 5 (small equipment) and 6 (small IT equipment), which are usually collected together, will increase as well in order to reach the target, but to a lesser extent. The high revenue potential of this equipment can encourage complementary collectors to focus on them as well, even if they are not as accessible as equipment from categories 1, 2 and 4. On the other hand, the category 3 (lamps) that do not contribute significantly, due to its weight, in reaching the targets and which has high treatment costs, is assumed to be collected only slightly more in 2019. Finally, it is assumed that the collection rate of PV panels will increase significantly in 2019, as PV panels are generally taken back during their replacement and may therefore be easily collected. The 2010 collection rate for this category is also underestimated due to the new entry of PV panels into the scope of the Directive; PV panels were not reported in the past, and the European collective scheme for PV panels, PV Cycle, was only a few months old in 2010 and was not implemented in every Member State (PV panels were collected in DE, IT, ES, PL, BE, FR, NL and UK in 2011).

In the second scenario, the WEEE categories are all assumed to be collected to a rate of 85 per cent in 2019. The collection rates considered in the two scenarios in 2019 are summarised below. The collection rates of the first scenario were estimated through simulation in order to reach a global collection rate of 85 per cent by increasing the collection of high value WEEE first.

Categories	Current collection rate	Collection rates to be achieved for the considered general collection target in scenario 1	Collection rates to be achieved for the considered individual targets in scenario 2
Cat 1	38%	95%	85%
Cat 2	47%	95%	85%
Cat 3	12%	16%	85%
Cat 4 exc. PV	38%	95%	85%
Cat 5	26%	70%	85%
Cat 6	49%	70%	85%
PV Panels	3%	85%	85%
Total	37%	85%	85%

Table 13: Collection rates in 2019 for the two scenarios analysed.

While there is a huge gap between rates achieved in 2010 and those aimed to be achieved in 2019, it is important to note that some equipment may already be collected at a higher rate today than it was in 2010.
In addition, the scenarios are designed to highlight differences among collection strategies. The feasibility aspects of the targets are discussed later in the report (Chapter 5.10).
From these collection rates, it is possible to calculate (Figure 7) the amount of WEEE to be collected in 2019 per category depending on the scenario (WEEE generated multiplied per the assumed collection rate achieved per category). There are interesting differences that result in terms of economic, environmental and social impacts of collecting, treating and recycling this WEEE (Figure 8).
The following analysis focuses on:

- Assessing the quantities of WEEE at stake in 2019, if targets per category were to be defined (step 1); and
- Assessing the impacts of collecting different amounts and types of WEEE, depending on the collection strategy chosen (step 2).

This will eventually determine whether individual targets are relevant in terms of economic, environment and social benefits.
The methodology of these two steps is presented in the following Figures 7 and 8:

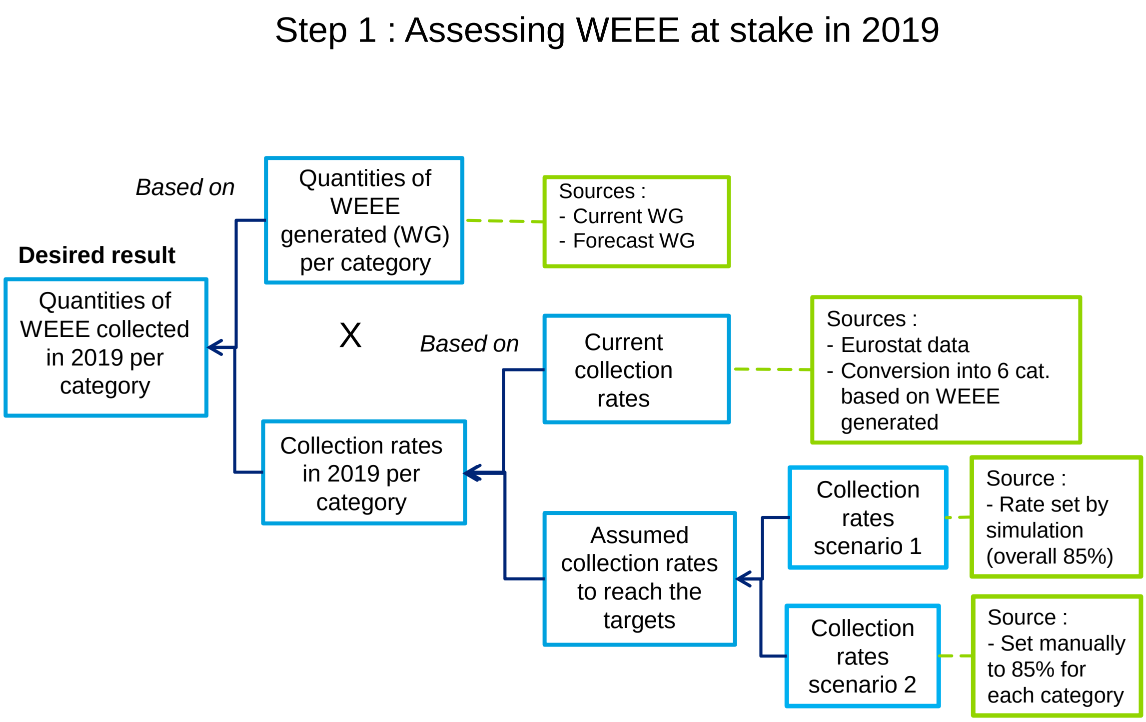

Figure 7: Assessment of quantities (to be) collected in 2019.

Step 1 focuses on assessing the different amounts of WEEE that will be collected in 2019 per category in the two scenarios if the collection targets are reached. This is done in order to quantitatively assess the impact differences between the two scenarios. As seen above, the two scenarios vary in the collection rates achieved per category, since scenario 1 considers a high collection rate on categories 1,2 and 4 and lower collection rates on other categories to reach an overall collection target of 85 per cent, and scenario 2 considers a compulsory collection rate of 85 per cent for each category. WEEE collected in 2019 in each scenario is therefore retrieved by multiplying the assumed collection rate for each category in both scenarios and the quantities of WEEE generated per category in 2019. The collection rates reached per category in scenario 1 were estimated through simulation by taking into account current collection rates (as estimated in paragraph 5.4 through a conversion of Eurostat data into six categories) and necessary collection rates on the most important categories in terms of volume to reach the 85 per cent global collection target. Data on WG were retrieved from Chapter 4 (estimations based on current WG and forecasts).

Step 2, on the other hand, aimed at identifying the economic, environmental and social impacts associated with the different amounts of WEEE collected per category assessed in step 1.

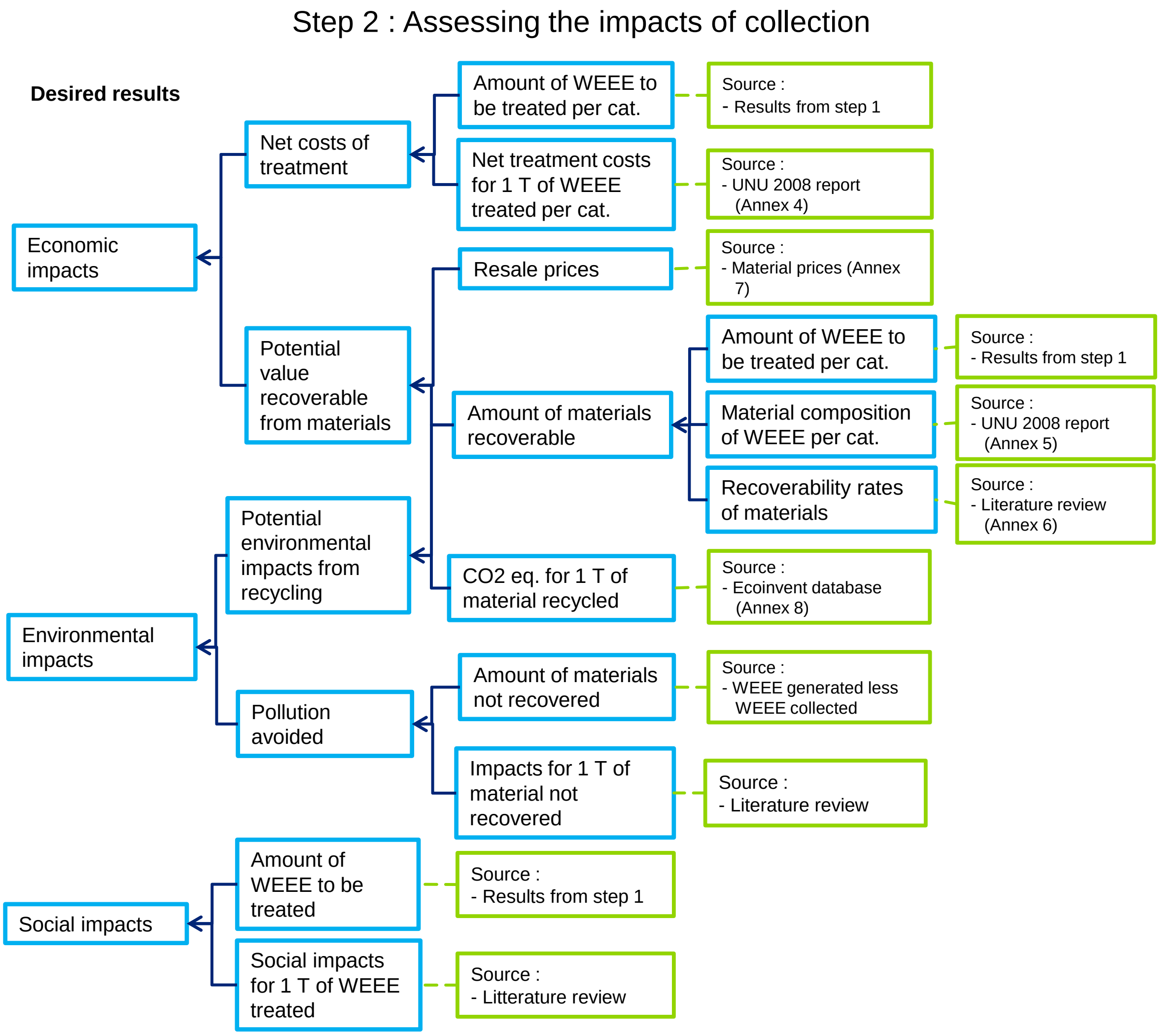

Figure 8: Definition of impacts of collected (and treated) quantities.

Data was as much as possible looked for specific tonne of WEEE collected and treated and per category, in order to multiply these indicators by the total WEEE collected per category in each scenario, and to identify any significant difference in impact between the two scenarios.
The two scenarios have been compared using the four following criteria:

- Net logistics and treatment costs,
- Potential value recoverable from the materials collected,
- Environmental impact due to recycling as a result of the recycling process as well as avoided pollution or production of primary materials, and

- Social impacts resultant from WEEE collection and treatment.

These criteria are discussed in more details below.

5.5.1 Logistics and treatment costs

Individual targets will lead to a change of the types of WEEE collected. In scenario 2, all equipment, including the most expensive to treat, will be collected in order to reach the individual targets. Scenario 1 and scenario 2 therefore differ in the costs assumed by industries to comply with the targets.

In order to compare the two scenarios, the costs of collecting and treating the different categories of WEEE were identified. Logistics and treatment costs were retrieved from the UNU 2008 Review of Directive 2002/96 on WEEE, and they are presented in Annex 9.4. Treatment costs used in this study correspond to costs estimated in 2008, as a baseline scenario. Over the years, costs can vary with the development of new technology, the need to collect less accessible WEEE or economies of scale. In order to take into account the potential evolution of costs, a sensitivity analysis has been conducted.

This analysis was conducted in order to identify the costs that may hamper the collection of WEEE in the future and to understand any significant differences of costs if the individual targets were implemented.

5.5.2 Potential value of materials recoverable from WEEE

While the individual targets may lead to an increase of treatment costs due to the collection of equipment previously not collected, they may ensure the collection and recycling of equipment containing valuable materials that were not collected and/or recovered before. The increase in the collection of such equipment may lead to the development of technologies capable of recovering the valuable materials contained in them. The two scenarios have therefore been compared based on the potential value that could be gained if the equipment collected in both scenarios was recycled.

The potential value of WEEE was calculated for each category based on the amount of materials that could be recovered in each category, multiplied by the resale prices of the corresponding raw materials.

The material composition of the WEEE categories was retrieved from the UNU 2008 Review of Directive 2002/96 on WEEE, and they are presented in Annex 9.5.

In Annex 9.6, the assumed recoverability of these different materials is detailed, while in Annex 9.7, the resale price of each material that can be recovered is indicated. This data served to estimate the amount of materials that could be recycled for each category and their corresponding values.

It is important to highlight that resale prices are subject to changes, similar to treatment costs, and may not be representative of the economic context in 2019. In addition, the resale prices correspond to the price for the recycled material after all transformation and refining of the material. The treatment costs necessary to achieve a high-quality product at the end of the value chain are not taken into account, so those values could be used as a proxy for potential economic benefits rather than actual profits along the recycling chain.

This analysis is thus aimed to identify the potential value loss if individual targets were not implemented and recycling processes were not improved.

5.5.3 The environmental impacts

The environmental impacts of collecting, treating and recycling WEEE is most closely linked to the avoidance of material production due to recycling. The two scenarios have therefore been compared in terms of the carbon dioxide (CO_2) emissions they could each avoid by recycling the maximum amount of materials included in WEEE.

The impacts of recycling one tonne of the materials identified are presented in annex 9.8. It is expressed in CO_2 eq. and distinguishes impacts due to the avoided material production and impacts due to the recycling process. The balance was used to estimate the difference of impacts between the two scenarios.

Other indicators could be considered within the environmental impact assessment, notably the impacts of WEEE recycling on resource depletion and the toxicity of WEEE materials if landfilled instead of properly treated and recycled. A simplified approach focusing on CO_2 eq. emissions has, however, been used. The pollution potential of WEEE is discussed qualitatively in the report, and the impact of WEEE recycling on resource depletion is partly addressed in the economic assessment of the potential value of recovered materials.

The environmental analysis aims to identify the environmental impacts that could be avoided, if individual targets were implemented and valuable materials were recycled.

5.5.4 Social impacts

The implementation of individual targets could also result in differing social impacts. The number of jobs created per tonne of WEEE collected and treated has been studied, for example, but there seems to be little evidence in the literature that the number of jobs created vary significantly depending on the WEEE category treated. The context of different Member States, in particular, the degree of manual disassembly compared to the adoption of more automated technologies, is more likely to impact the number of jobs created to reach the targets. The two scenarios are thus considered equal on these aspects.

However, dangerous components such as CFC/HCFC in temperature exchange equipment, mercury in lamps and screens, lead and cadmium in PV panels may impact human health, and they are not collected to the same extent in two scenarios. This aspect is assessed qualitatively later in the report.

5.6 Assessing the amount of WEEE at stake in 2019

As seen above, the calculations of WG detailed in Chapter 4, along with the assumed collection rates by category in 2019, make it possible to calculate the projected amount of WEEE collected per category in both scenarios in 2019. These amounts "at stake" are presented in Tables 14 and 15.

For the sake of comparison, the collection rates leading to the collection of same amount of WEEE but expressed on a POM basis for each category are included in the table. The POM calculations in Chapter 3 were used to calculate the collection rate achieved in 2010 based on POM (weight of WEEE collected in 2010 divided by the average POM in 2007, 2008 and 2009), and the 2019 collection rate is based on the average POM forecasted for the years 2016 to 2018.

Scenario 1: GENERIC collection rate of 85% of WG in 2019								
Category	Quantities of WEEE generated (kT)		Collection rate		Quantities Collected (kT)		Corresponding coll. rate POM	
	2010	**2019**	**2010**	**2019**	**2010**	**2019**	**2010**	**2019**
Cat 1	1.349	1.740	38%	95%	509	1.653	24%	76%
Cat 2	1.350	1.314	47%	95%	630	1.248	69%	100%
Cat 3	131	213	12%	16%	15	34	9%	13%
Cat 4 exc. PV	2.782	3.126	38%	95%	1.056	2.970	30%	90%
Cat 5	2.382	2.737	26%	70%	620	1.916	22%	64%
Cat 6	737	719	49%	70%	362	503	49%	75%
PV Panels	3	45	3%	85%	0,08	38	0%	2%
Total EU	**8.734**	**9.894**	**37%**	**85%**	**3.192**	**8.362**	**30%**	**66%**

Table 14 – Quantities at stake in 2019, if an overall collection rate of 85% of WEEE generated was to be reached in 2019.

Scenario 2: INDIVIDUAL collection rate of 85% of WG per category in 2019								
Category	Quantities of WG		Collection rate		Quantities collected		Corresponding coll. rate POM	
	2010	**2019**	**2010**	**2019**	**2010**	**2019**	**2010**	**2019**
Cat 1	1.349	1.740	38%	85%	509	1.479	24%	68%
Cat 2	1.350	1.314	47%	85%	630	1.117	69%	89%
Cat 3	131	213	12%	85%	15	181	9%	71%
Cat 4 exc. PV	2.782	3.126	38%	85%	1.056	2.657	30%	80%
Cat 5	2.382	2.737	26%	85%	620	2.327	22%	78%
Cat 6	737	719	49%	85%	362	611	49%	91%
PV Panels	3	45	3%	85%	0	38	0%	2%
Total EU	**8.734**	**9.894**	**37%**	**85%**	**3.192**	**8.410**	**30%**	**67%**

Table 15 - Quantities at stake in 2019, if a collection rate of 85% of WG per category was to be reached in 2019.

Based on the WEEE collected data in 2019 per category, an impact assessment per category has been carried out.

5.7 Economic, environmental and social impacts of WG collection and treatment

5.7.1 Comparison of scenarios on net treatment costs

The use of the net treatment costs per category presented in Annex 9.4, multiplied by the different quantities of WEEE collected in the two scenarios, equates to the following results.

Net treatment costs (in M€)					
	Scenario 1	Per cent collected	Scenario 2	Per cent collected	Scenario 2 compared to scenario 1
Cat 1	929	95%	831	85%	-98
Cat 2	1.029	95%	920	85%	-109
Cat 3	23	16%	120	85%	97
Cat 4 exc. PV	699	95%	625	85%	-74
Cat 5	280	70%	340	85%	60
Cat 6	191	70%	232	85%	41
PV Panels	6	85%	6	85%	0
Total EU	**3.157**	**85%**	**3.074**	**85%**	**-83**

Table 16: Comparison of scenarios on net treatment costs (M€).

These figures highlight the high costs of significantly increasing the collection rates of lamps and small equipment. However, the implementation of individual targets does not lead to a significant cost difference between the two scenarios. It can be explained by the relative high treatment costs of categories 1 and 2 compared to the quantities to be treated in scenario 1 needed to reach the target by collecting the most accessible WEEE.

The graph below illustrates the contribution of each category in the total treatment costs. It can be noted that the high global collection target requires a significant increase in the quantities of equipment collected, regardless of the scenario. Therefore, a variety of equipment must be collected, which will lead to a global increase in treatment costs.

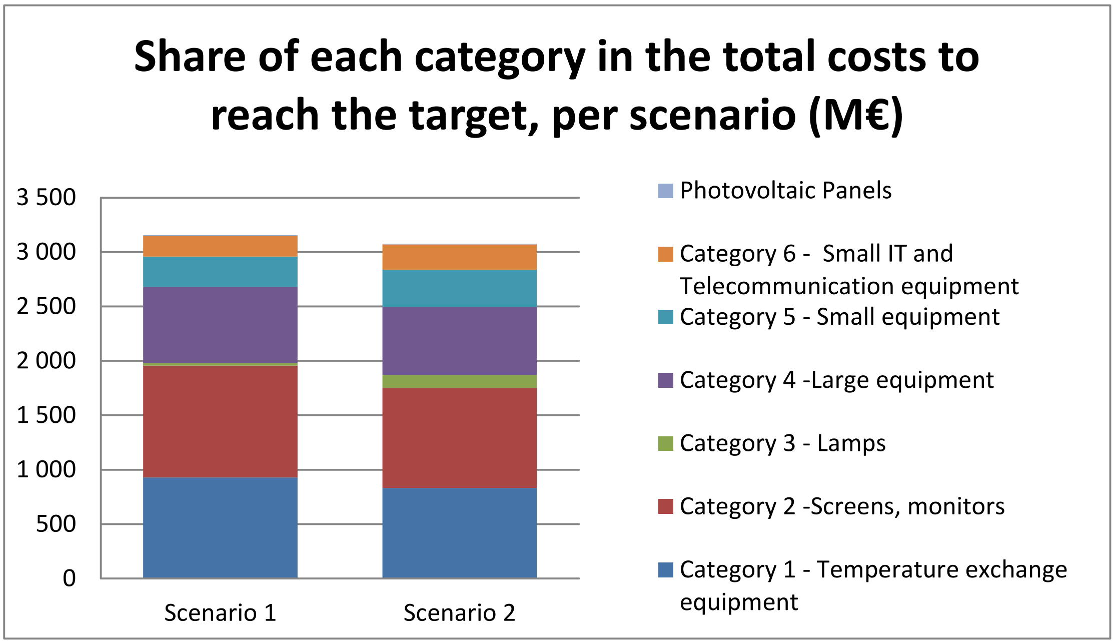

Figure 9: Comparison of scenarios on net treatment costs (M€).

These net treatment costs are, however, significantly out-dated. According to recyclers, the net treatment costs of WEEE may have decreased by as much as 50 per cent between 2008 and today. A sensitivity analysis was carried out simulating a 60 per cent decrease as well as a 10 per cent increase of costs in 2019 compared to 2008 for each scenario. By varying the treatment costs in the simulation, it was confirmed that the differences between the two scenarios would remain small in the future, as the collection target to be reached in the two scenarios is high, regardless of the types of equipment collected i.e. regardless whether individual collection targets are introduced or not.

Net treatment costs (in M€)				
	Scenario 1 (-60%)	Scenario 1 (+10%)	Scenario 2 (-60%)	Scenario 2 (+10%)
Cat 1	371	1.022	332	914
Cat 2	412	1.132	368	1.013
Cat 3	9	25	48	132
Cat 4 exc. PV	280	769	250	688
Cat 5	112	308	136	374
Cat 6	76	210	93	255
PV Panels	2	7	2	7
Total EU	**1.262**	**3.473**	**1.229**	**3.383**

Table 17: Sensitivity analysis net treatment costs (M€).

It is important to note that the costs for collection could significantly increase with the higher collection targets, as it will be more difficult to get access to the waste flow. However, economies of scale are also expected to occur, and that could compensate the investment costs necessary to access the waste flows.

The table below summarises the differences between the two scenarios.

Net treatment costs (in M€)			
	Scenario 2 compared to scenario 1 baseline	Scenario 2 compared to scenario 1 (decrease 60% net costs compared to 2008)	Scenario 2 compared to scenario 1 (increase 10% net costs compared to 2008)
Cat 1	-98	-39	-108
Cat 2	-109	-44	-119
Cat 3	97	39	107
Cat 4 exc. PV	-74	-30	-81
Cat 5	60	24	66
Cat 6	41	17	45
PV Panels	0	0	0
Total EU	**-83**	**-33**	**-90**

Table 18: Comparison scenarios with variation in net costs collection and treatment.

5.7.2 Comparison of scenarios on potential value of materials recoverable from WEEE

Identifying the different materials that can be recovered from the categories (Annex 9.5 and 9.6) and their resale prices (Annex 9.7) enable a comparison of the scenarios based on the potential value that could be gained from recycling materials that may be lost if no individual targets are implemented.

Potential value of materials (in M€)					
	Scenario 1	Per cent collected	Scenario 2	Per cent collected	Scenario 2 compared to Scenario 1
Cat 1	758	95%	678	85%	-80
Cat 2	904	95%	809	85%	-95
Cat 3	18	16%	93	85%	76
Cat 4 exc. PV	1.211	95%	1.083	85%	-127
Cat 5	1.591	70%	1.932	85%	341
Cat 6	439	70%	534	85%	94
PV Panels	25	85%	25	85%	0
Total EU	**4.946**	**85%**	**5.154**	**85%**	**208**

Table 19: Comparison scenarios on the basis of potential value of materials recovered (M€).

The differences between the two scenarios are illustrated in Figure 10.

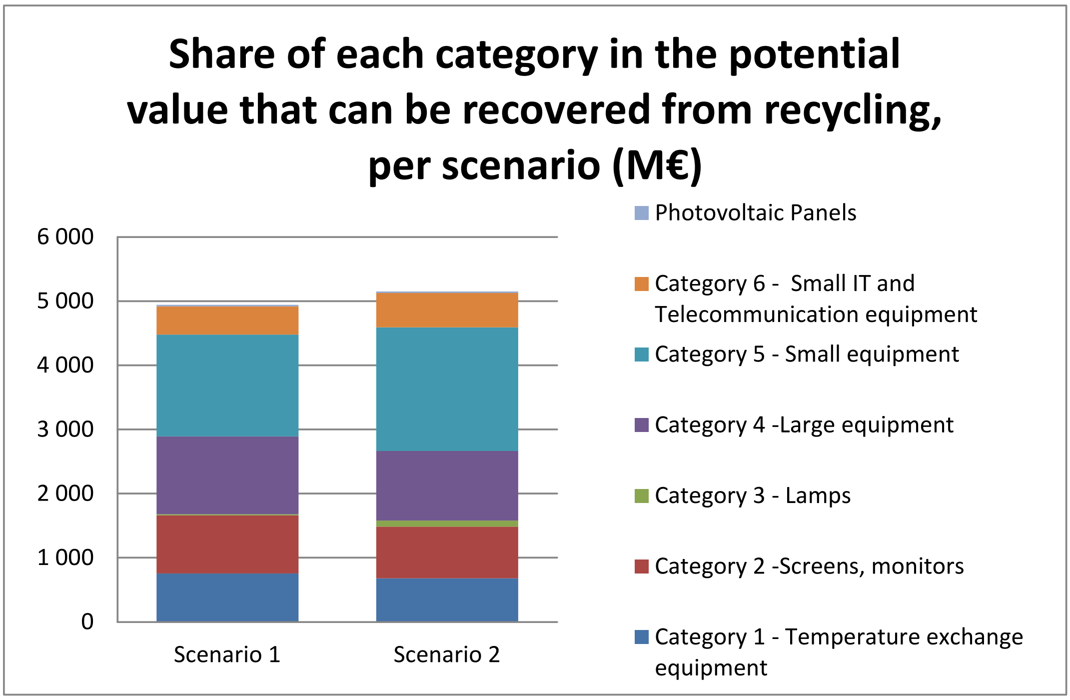

Figure 10: Comparison of scenarios on the potential value of materials recovered (M€).

There is a high potential benefit in increasing the collection of small and small IT and telecommunication equipment, due to the high value of their components.
More generally, scenario 2 highlights the fact that there is a significant potential benefit in products that are not collected today that individual targets could secure, particularly for categories 5 and 6, where a crucial role is also played by some of the critical materials contained in specific products. Individual collection targets may further increase the opportunity to enable an effective resource management strategy across the EU.

5.7.3 Comparison of scenarios on environmental impacts

The two scenarios were also compared in terms of the potential CO_2 emissions that could be avoided through the recycling of the materials collected in each scenario. Results are presented in Table 20.

MCO2 eq. emissions avoidable					
	Scenario 1	Per cent collected	Scenario 2	Per cent collected	Scenario 2 compared to scenario 1
Cat 1	-3,8	95%	-3,4	85%	0,4
Cat 2	-2,3	95%	-2,1	85%	0,2
Cat 3	0,0	16%	-0,2	85%	-0,2
Cat 4 exc. PV	-5,1	95%	-4,6	85%	0,5
Cat 5	-3,9	70%	-4,8	85%	-0,9
Cat 6	-1,0	70%	-1,2	85%	-0,2
PV Panels	-0,1	85%	-0,1	85%	0,0
Total EU	**-16,2**	85%	**-16,4**	85%	**-0,2**

Table 20: Comparing scenarios on environmental impacts.

The slight differences between the two scenarios are illustrated below:

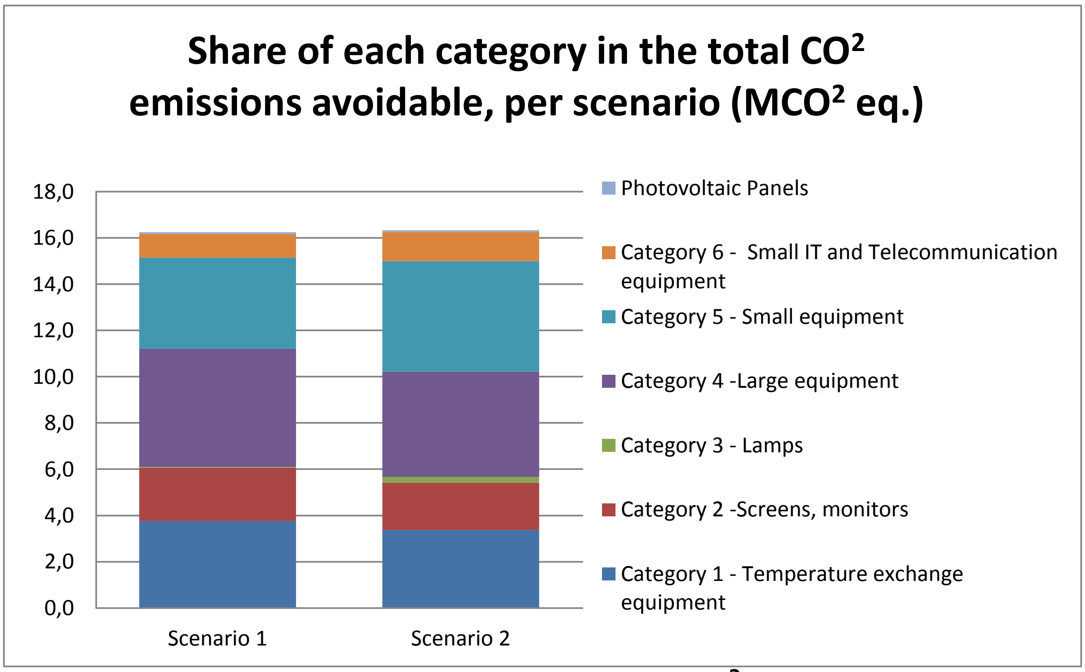

Figure 11: Comparison scenarios on the basis of CO^2 emissions avoidable (MCO^2 eq.).

Other factors should be taken into account, such as the pollution avoided due to the proper treatment of hazardous substances contained in temperature-exchange equipment, lamps and PV panels, in particular. The risks related to this equipment are discussed below.

Category at risk	Qualitative assessment	Scenario 1	Scenario 2
Temperature exchange equipment	Contains CFC with high Global Warming Potential. CFC 11 have a GWP of 4750 (CO2=1/100), CFC 12 of 10 900[9]. According to the UNU 2008 Report, Cooling & Freezing appliances contain 245g of CFC-11 and CFC-12, 97g. However, the CFC content of refrigerators is expected to decrease in the future as more hydrocarbon refrigerants are used. These refrigerants are non-toxic and have minimal GWP.	Low risk due to high collection rate and replacement of CFC by HC refrigerants	Low risk due to high collection rate and replacement of CFC by HC refrigerants
Lamps	May contain mercury. It can be estimated that 84% of lamps put on the market in 2012 contained mercury[10]. FL Tubes contains approximately 16 mg of Hg per tube or 80 mg per kilo. Energy-saving lamps (ESL) contain about 5 mg/unit. Mercury is released when lamps are broken or landfilled. It is a toxic heavy metal that disperses rapidly into soil or water, accumulates in fish, and damages the nervous system when inhaled (Human toxicity : $2{,}75^{-7}$CTUh/kg when landfilled).	High risk (lamps are hazardous when broken); in practice, lamps are probably oftentimes still disposed of in unsorted household waste, that is incinerated or landfilled in Europe.	Low risk due to high collection rate

[9] ADEME, 2012 Annual report on Fluorinated refrigerants

[10] Estimated by retrieving POM data of lamps from category 0502 to 0504 compared to the calculation of the total quantity of lamps put on the market in 2012 in the EU28. Lamps containing mercury may be contained in other codes, but to a lesser extent.

Category at risk	Qualitative assessment	Scenario 1	Scenario 2
PV panels	Contains lead and cadmium with risks of leaching if disposed of improperly; approximately 12.67 g of lead is contained in an average c-Si panel (which weighs about 22 kg), representing a potential for lead leaching into the environment of between 1.64 g and 11.4 g per panel, or 75 g and 518 g per t of panel disposed of. Approximately 4.60 g of cadmium is contained in an average CdTe panel (which weighs about 12 kg and represents the new generation of panels), representing a potential for cadmium leaching into the environment of between 0.32 g to 1.84 g per panel or 27 g and 153 g per t of panel disposed of. Mercury, lead and cadmium accumulate in humans and the environment and are toxic.	Low risk due to high collection rate	Low risk due to high collection rate

Table 21: Qualitative assessment of environmental risk for individual categories.

Because temperature exchange equipment and PV panels should be collected at a high rate in the two scenarios due to their value and easy access, they are not critical for individual targets. However, the appropriate collection and treatment of lamps should be encouraged to avoid any mercury leakage.

5.7.4 Social impacts

Increasing collection targets will lead to the creation of jobs, to the extent that at least one job will be created per 150 tonnes of WEEE collected annually(based on the situation in France)[11]. In eastern Member States, there may be as many as twice that number of jobs created if more manual disassembly takes place. It is expected that this will not vary significantly according to the type of WEEE treated. Therefore, the two scenarios are assumed equal on these aspects. The loss of jobs in other sectors has not been assessed. Another difference between the scenarios may be attributed to the population exposure to health risks.

[11] ADEME, 2013 Annual report on the WEEE industry

5.8 Comparison of the overall results of the two scenarios

The global impacts of the two scenarios are presented in the Table 22.

Total, in M€ and MCO_2 eq.				
	Scenario 1	Scenario 2	Difference between scenarios 1 and 2	Per cent difference
Net treatment costs (M€)	3.157	3.074	-83	-3%
Potential value recoverable from materials (M€)	4.946	5.154	208	4%
Environmental benefit (MCO_2-eq)	-16,2	-16,4	-0,2	1%

Table 22: Overall comparison of the two scenarios.

Scenario 2 proves to be interesting because of the high potential value that could be recovered from the equipment, with a small decrease in net costs, as well as the avoided CO_2 emissions that it would enable.
The table below summarizes the impacts of each category according to the three indicators analysed quantitatively (net treatment costs, potential value recoverable and CO_2 emissions avoided). Setting individual collection targets to ensure appropriate collection of the equipment is particularly relevant for those categories having high environmental benefits or intrinsic value (sometimes associated also with lower net treatment costs).

Category	Average collection and treatment costs	Potential revenues from materials	Environmental benefits from recycling	Relevance of an individual target
Cat 1	High	Medium	High	Medium
Cat 2	High	High	Medium	Medium
Cat 3	High	Medium	Medium	Medium
Cat 4a exc. PV	Medium	Medium	Medium	Medium
Cat 5	Low	High	High	High
Cat 6	Medium	High	High	High
Cat 4b PV Panels	Low	High	High	High

Table 23: Overall comparison of the two scenarios by individual categories.

5.9 Limits of the analysis

The figures presented above are to be analysed with caution. The method used to do the impact assessment presents the following drawbacks, mostly because some data for the analysis could change in the future:

- Treatment costs and prices for recycled materials represent averages observed at a given point in time and are expected to vary over time, with the evolution of technology and demand for raw materials, and by country;
- The value of materials as it corresponds to the value of the final product can vary significantly over time, depending on the demand for the raw material; and
- The access to the potential value of material recoverable, particularly when it comes to precious and special metals, largely depends on the development of future technologies or proper channelling of the relevant fractions to those recyclers who possess the technical capability of maximizing such environmental and economic benefits along the recycling chain. This information should never be decoupled from the proper enforcement of quality standards aimed at protecting human health and the environment while assessing the economic value of the waste streams.

5.10 Feasibility criteria for individual collection targets

Setting individual targets could lead to a range of impacts on different stakeholders, such as:

- Increasing the administrative burden and the reporting burden for stakeholders: If individual collection rates are set at EU level, Member States will have to report to the European Commission on the achievement of individual targets, and accordingly at national level companies specialised in collection and treatment will have to track and report the quantities of WEEE per category, including PV panels apart. This means that the administrational burden for national authorities will increase.

  For many Member States it also means that the reporting framework would need to be changed. This would hold true for France, which aims to implement individual targets, but based on the following collection flows: temperature exchange equipment, large equipment, screens, lamps, PV panels and other equipment. This means that IT and telecommunication equipment are not tracked separately from small equipment. If Member States decide to set individual collection targers for specific categories they can do so and they have the possibility to make choices according to their experience and their national needs. However, if individual collection rates are set at EU level, Member States will not have the possibility to differentiate and the administrative cost will increase. Additional costs are likely to come from the need to train stakeholders on the new reporting framework and establish new sorting procedures in order to distinguish the new (6+1) categories to be reported. This is a significant drawback of individual targets, especially if it is taken into consideration the resources that have already been involved in making a general collection target accepted. Furthermore, administrative costs associated with a revision of the WEEE Directive and implementation of the new system would need to be further assessed.

  On the other hand, stakeholders were already required to report recycling and recovery rates according to the 10 categories, and they are expected to report them according to the six categories in the future. Reporting collection according to the six categories + PV panels might not lead to a real increase in reporting burden once the new system is in place.

- Increasing costs of collection, due to the necessary development of collection points to achieve the individual targets, and associated logistics, especially for the categories that are far from the target. These costs can be minimised through the optimisation of the flows and collaboration of all stakeholders.

- Increasing investments in monitoring, enforcement and control at all levels of the industry to ensure the WG is collected and reported to the authorities accordingly. This is likely to be a major issue if the quantities collected increase in the categories that have a higher potential value, as they may be subject to cherry-picking or illegal exports as well. On the other hand, more monitoring is recommended to be able to achieve the high collection targets (whether generic or individual), notably by ensuring that all the stakeholders handling WEEE report the amount collected and treated.

- Increasing costs for awareness raising, in order to ensure WEEE is disposed properly by households and businesses. This is going to be an issue if the categories that are concerned by the individual targets are more difficult to collect. Small WEEE for instance are often disposed of through the residual waste collection system. In 2012, around 1 kg of WEEE/inhab. in France (compared to the 17kg-24kg of WEEE generated) is not sorted properly by households12. No data is yet available on the effectiveness of consumer awareness raising campaigns in terms of WEEE collected compared to the budget invested.

- Increasing current research and development costs to create the technologies to treat the valuable materials that are difficult to access or recover in order to maximise the revenue generated from recycling.

- Increasing costs to eliminate non-recoverable materials (e.g., mercury) or fractions disposed of due to the higher quantities to be disposed (especially if categories subject to individual targets, and collected in higher quantities as a consequence, contain non-recoverable components, such as lamps).

This increase in costs is expected to be (at least partly) compensated with economies of scale and an increase of revenue from recycling, as more materials will be recovered. In addition, the industry's image may benefit from the development of technology and focus on environmental impact minimisation.

It is also worth mentioning that some countries (France, UK) have already considered implementing individual targets. In France specifically, the latest Producer Responsibility Organisations' agreement include such targets.

The 2014 draft proposal of the new specifications for approval of the collective schemes in France introduces collection targets based on EEE put on the market. The proposed approach already includes individual targets for collection categories and it sets tolerances for certain categories in the first three years as illustrated in Table 24. The legislative text (in French) is presented in Annex 9.9.

[12] Monier, V., M. Hestin, A. Chanoine, F. Witte and S. Guilcher (2013). Study on the quantification of waste of electrical and electronic equipment (WEEE) in France, BIO Intelligence Service S.A.S.

Year	Collection rate	Tolerance	Tolerance applicable to Categories
2015	40%	10%	- Category 1 - Category 2 - Category 4 (excl. PV) - Category 5 and 6
		0%	- Category 3
2016	45%	7%	- Category 1 - Category 2 - Category 4 (excl. PV) - Category 5 and 6
		0%	- Category 3
2017	52%	5%	- Category 1 - Category 2 - Category 4 (excl. PV) - Category 5 and 6
		0%	- Category 3
2018	59%	0%	- Category 1 - Category 2 - Category 4 (excl. PV) - Category 5 and 6
		0%	- Category 3
2019	65%	0%	- Category 1 - Category 2 - Category 4 (excl. PV) - Category 5 and 6
		0%	- Category 3
2020	65%	0%	- Category 1 - Category 2 - Category 4 (excl. PV) - Category 5 and 6
		0%	- Category 3

Table 24: Individual collection rate proposal for France.

This tolerance has been proposed in order to take into account potential difficulties for stakeholders to collect certain types of WEEE.
Thus, at national level, individual collection targets are likely to be well-accepted by some stakeholders, especially recycling companies in need of additional input. The stakeholder consultation confirmed this assumption.

However, at EU level, with the information available, it is not possible to determine if the individual target of 85 per cent is feasible for every category. While in theory, 100 per cent of WEEE generated could be collected, various parameters may make it more difficult for a category to reach the target, due to a greater risk of illegal exports, sorting errors, thefts at collection sites, etc. More information would have to be available on the destinations of the WEEE flows per category and Member State, in order to estimate the part of WEEE that could effectively be collected and the associated costs.

5.11 Conclusion individual collection targets

The table summarises below the quantitative and qualitative analysis. The first part of the table is a summary of the impact assessment analysis. The second part assesses the feasibility of the individual targets based on the ease of access to waste, the availability of technologies and the level of monitoring needed to track the category and ensure appropriate reporting.

Indicators			Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	Cat 6	PV
Impact Assessment	Scenario 1	Treatment costs (M€)	929	1.029	21	699	280	191	6
		Value of materials (M€)	759	904	16	1.211	1.592	439	25
		$C0_2$ emissions avoided	-3,8	-2,3	0	-5,1	-3,9	-1,0	-0,1
	Scenario 2	Treatment costs (M€)	831	921	120	626	341	232	6
		Value of materials (M€)	679	809	93	1.084	1.933	534	25
		$C0_2$ emissions avoided	-3,4	-2,1	-0,2	-4,6	-4,8	-1,2	-0,1
	Other environmental factors		High global warming potential of refrigerants, minimised in scenario 1	-	Mercury toxicity, minimised in scenario 2	-	-	-	Lead and cadmium toxicity, minimised in scenario 1 and 2
	Social impacts		-	-	Health risks, minimised in scenario 2	-	-	-	Health risks, minimised in scenario 1 and 2
Feasibility assessment	Relevance of individual targets		Med.	Med.	Med.	Med.	High	High	High
	Distance to target		Med.	Med.	High	Med.	High	Med.	High
	Ease of access		High	High	Med.	High	Low	Low	High

Indicators		Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	Cat 6	PV
	Availability of technology	High	Med.[13]	Low[14]	High	Med.	Med.	Low
	Potential toxicity	High	Med.	High	Med.	Med.	Med.	High
	Monitoring needed	Low	Low	Med.	Low	High	High	Low

Table 25: Overall comparison of two scenarios

The distance from target row indicates the gap between the collection rate achieved in 2010 and the collection rate to be achieved in 2019 if an 85 per cent collection target was set for each category. If the relevance of an individual target is assessed as "high", but the category is under-collected in 2010, intermediary targets may be considered. The high distance from target may also indicate that an individual collection target of 85 per cent is less, or even not, feasible for some categories. However, as seen above, data is missing on the quantities of WEEE that are not currently, but could be, collected in the future if the appropriate actions were put in place per category. Thus, the feasibility of the target cannot be precisely assessed.

The analysis showed that scenario 2 is leading to slightly lower net costs, and its economic advantages could further increase over the long term due to the development of technology able to recover the high-valuable materials present in the WEEE collected. These highly valuable materials will not necessarily be recovered if individual targets are not implemented, resulting in a significant loss of revenue. To some extent, they may be collected and recycled due to their high economic value, but it is impossible to predict whether a free market will lead to the same collection rate

It is important to note that, while the environmental benefits due to individual targets are less significant than one could have expected, compared to a general target, the potential recovered value is important. Some categories prove to be particularly relevant when setting individual targets, because of the global economic, environmental and social benefits they would bring if they were better collected.
As a consequence, it may be summarised that setting individual targets may be beneficial from an economic, environmental and social point of view, however, it is hard to draw conclusions regarding the actual feasibility of the targets at EU level. Conditions vary across Member States, and in some cases the distance from the target is very important. In addition, there is a significant administrative burden related to a revision of the WEEE Directive that should be taken into account. Indeed, it may be seen as counterproductive to implement individual collection targets when the general collection target already agreeded during the negotiations for the review of the WEEE Directive has not been implemented yet and tested.

Given the high uncertainty related to the feasibility of individual targets, for each category and each Member State, and the significant administrative burden related to the revision of the Directive, it is not recommended to introduce individual collection targets in the WEEE Directive.

The analysis yet showed that setting individual collection targets at national levelmay be beneficial from and environmental and economic point of view. Therefore,at

[13] Notably regarding the recovery of indium in LCD screen
[14] Recovery of rare earth is developing.

national level, Member States can set individual targets, on a voluntary basis, as a method/ mesure in order to achieve the general collection target set out in the Directive. The following paragraphs provide preliminary guidance for Member States who consider setting such individual targets.
The analysis showed that:

- Individual collection targets based on WG are preferable to collection targets based on POM, and can be applied for each category of Annex III, plus PV panels;
- If Member States choose to calculate collection targets based on WG, the individual targets could be set at the same level. A target of 85 per cent per category would ensure the overall target currently set in the Directive is reached, while ensuring collection efforts are allocated to every category; and
- If Member States choose to calculate collection targets based on POM, as currently proposed in the Directive, the individual targets should be set at the national level, and adapted to the national (W)EEE market, ensuring that the same collection effort is reached by each category.

Based on this analysis, two approaches can be recommended to Member States if they choose to implement individual collection targets at the national level in order to reach the overall collection target set out in the Directive:

- a same collection target of 85% of WEEE generated per category;
- a percentage of EEE POM per category, to be defined individually by each MS and calculated for each category, under the condition that the overall target of 65% is reached, and that the individual POM targets are set to be equivalent to a 85% collection of WEEE generated. This would ensure the different market trends between the categories are taken into account.

6 Implementation difficulties, deadline and target revision

This chapter evaluates the difficulties that Member States may experience in meeting the requirements of Article 7(1), highlights potential solutions to overcome these difficulties and assesses benefits and detriments related to a deadline revision and collection targets set by Article 7(1).

6.1 Implementation difficulties

The first part of the chapter focuses on the identification and evaluation of possible difficulties that EU Member States might face in adhering to the requirements laid down in Article 7(1) of the Directive.

6.1.1 Methodology and approach

The study used three steps:

- Desk research,
- Consultation Process, and
- Analysis

The desk research included a literature review and bilateral interviews. The literature review focused on key issues related to collection difficulties, such as management structures, market conditions, informal collection, illegal trade and insufficient reporting. More than thirty sources, including impact assessments, country reports and surveys were explored and analyzed. Although there is limited information on Member States' implementation difficulties, the findings were sufficient to provide an initial overview of the difficulties that they experienced in meeting the WEEE collection targets. Potential difficulties obtained from this literature review were grouped under main categories and subcategories.

To ensure that the process followed the participatory approach with stakeholder engagement, bilateral meetings were organized with key stakeholder (industry associations, compliance schemes, NGOs and independent experts). The outcomes of the meetings were used to adjust and complete the findings from the literature review and were integrated into the questionnaire developed for the consultation process.

The second step was a consultation process involving the main stakeholders: the consultation process consisted of an online questionnaire and a workshop.

The online questionnaire was prepared in order to validate the results of the desk research. The online questionnaire[15] was sent to representatives of Member States and key stakeholders in Europe. The questionnaire was formed based on the outcomes of the literature review and the bilateral meetings. The content section of the questionnaire had two parts; the first part included a set of questions aimed at evaluating the seven main groups of identified difficulties, and the second part aimed at assessing sub-difficulties (reasons within the main difficulties). This part included seven sets of questions that corresponded to each main difficulty and its sub-difficulties. In total, there were 32 sub-difficulties. Main and sub-difficulties were listed in alphabetical order so as not to channel respondents to particular difficulties. Moreover, there was an "other" open response option for every section, enabling the respondent to add additional difficulties not listed in the question form.

[15] www.jotformeu.com/weee_art7/questionnaire

Forty-eight respondents from 25 EU countries filled out the questionnaire. Respondents included Technical Adaptation Committee Members, and representatives from Compliance Schemes and National Registries of several Member States, Industry associations and Non-Governmental Organizations (NGOs) (Figure 12).

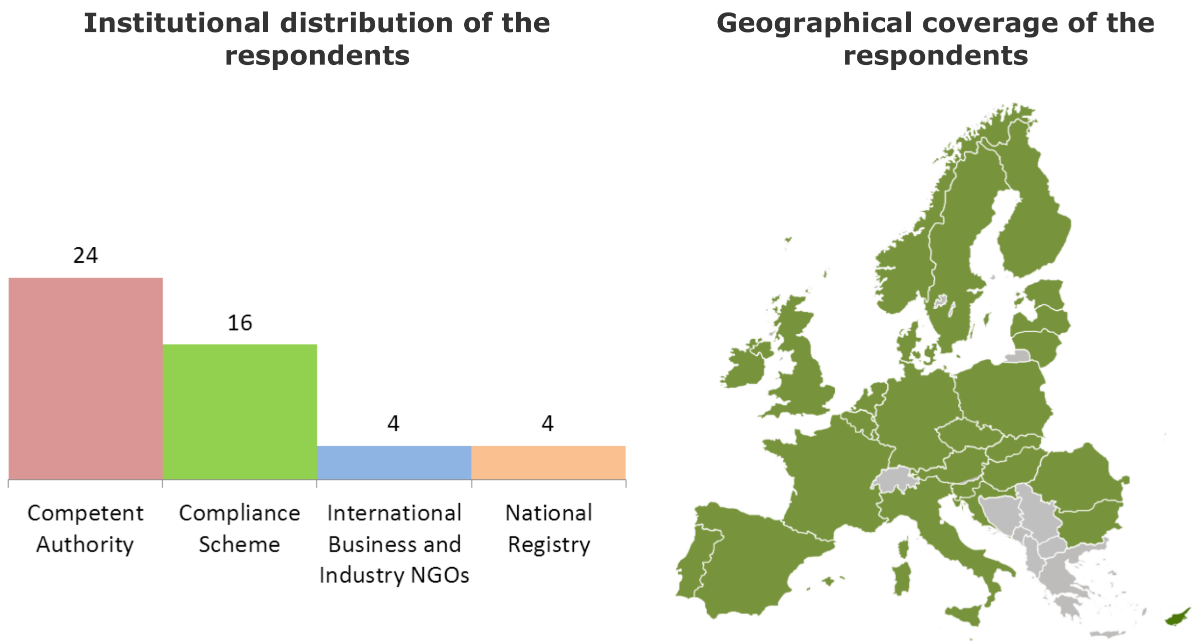

Figure 12: Distribution of respondents of the online questionnaire.

Difficulties identified and the preliminary results of the questionnaire have been discussed and analyzed in an interim workshop with representatives from Member States, Industry associations and NGOs.
In the third and the last step, information and data obtained in the first two steps were analyzed. Difficulties identified were ranked in order of importance. In order to systemically visualize findings, a Draft Matrix Structure has been formed. The matrix structure designed for difficulties and solutions was developed based on factual and verified information obtained from the previous steps.

6.1.2 Potential implementation difficulties identified

During the above-described methodological approach, seven main implementation difficulties, which may hamper the achievement of the collection rates set by the recast WEEE Directive, have been identified. Two of these difficulties were identified as of primary importance for the implementation of the Directive:

- High rate of unaccounted collection, and
- Limited inspection and enforcement capacities

These two primary potential difficulties identified throughout the study are considered significantly related. In fact, limited inspection and enforcement capacities may also influence the rate of unaccounted collection. Thus, the solutions for these two difficulties would be interrelated as well.
The remaining five difficulties were identified as secondary challenges to reach collection rates:

- Complex market structure,
- Complications concerning calculation of specific collection targets,
- Limited public awareness,

- Legal uncertainties, and
- Inadequate collection infrastructures

As presented in Figure 13, the questionnaire results have confirmed the findings of the desk research:

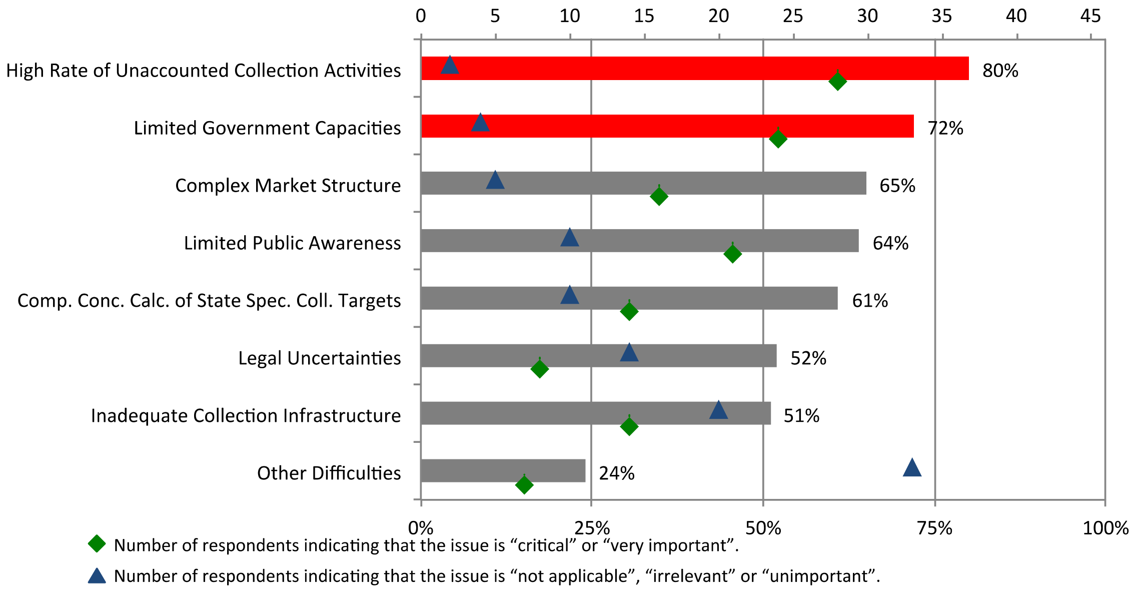

Figure 13: Ranking of main difficulties.

Bars in the figure represent the average valuation of difficulty based on the perceptions of the respondents. Diamonds (green) represent the number of respondents that selected the difficulty as critical or very important. Triangles (blue) represent the number of respondents that selected the difficulty as un-applicable, irrelevant or unimportant. Over half of the total respondents selected "High rate of unaccounted collection activities" and "Limited government capacities" as critical or very important. Red bars in the figure represent the primary difficulties.

One relevant finding is that different stakeholders gave equal importance to most of the potential difficulties except in two cases: "Limited public awareness" and "Inadequate collection infrastructure". As it is presented in Figure 14, governmental officers considered these two issues more important than industry associations or compliance schemes reported. Moreover, the consultation meeting discussions validated these different positions among stakeholders.

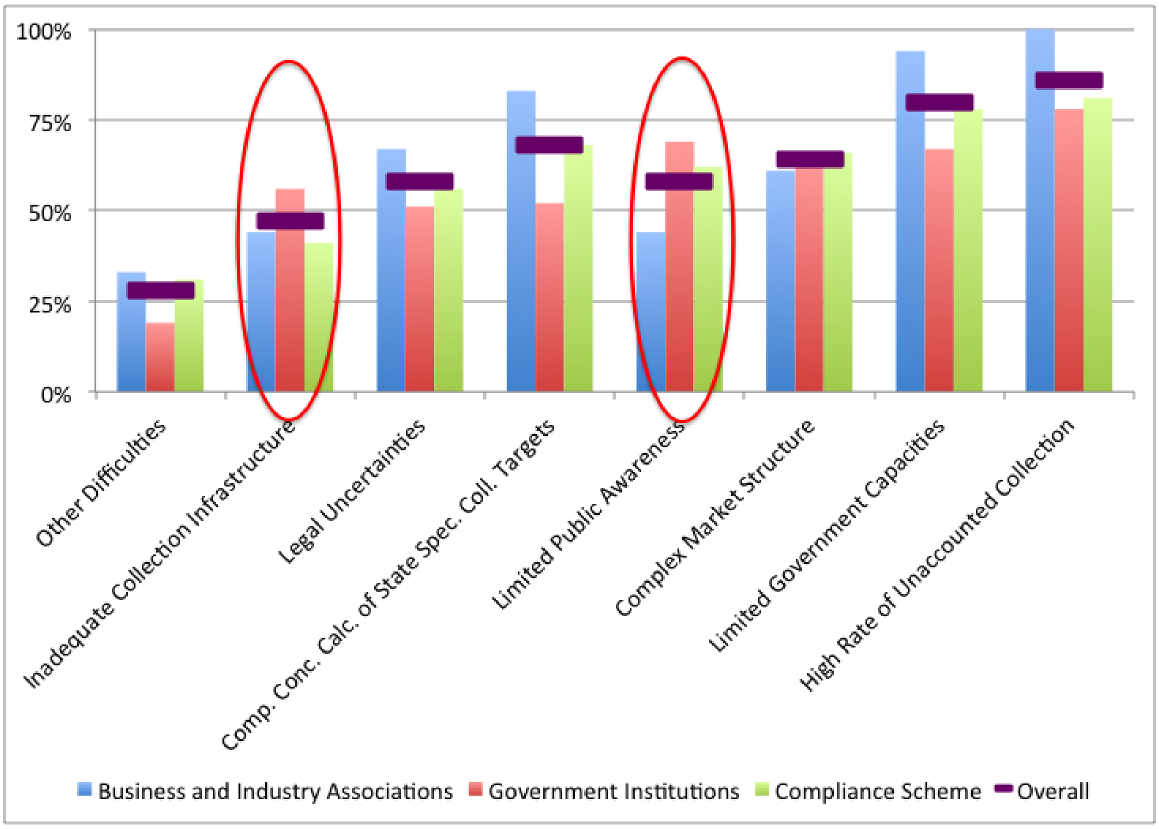

Figure 14: Evaluation of main difficulties by different stakeholders.

6.1.3 Impact of unaccounted collection

Throughout the implementation of the WEEE Directive in Member States, economic operators are involved in collection activities; in some cases, these actors' activities are unaccounted for in WEEE collection statistics, particularly when they occur outside the framework of Producers' compliance schemes or authorized WEEE recyclers.

The European Commission's 2008 Impact Assessment on the WEEE Directive estimated that only 33 per cent of WEEE collected in the EU was treated according to the Directive's requirements. The remaining 67 per cent was unaccounted for, either landfilled, sent to substandard treatment facilities, or illegally exported (EC Impact Assessment, 2008).

In recent years, studies have been carried out in individual Member States aimed at quantifying the size of those flows; in all those cases (Netherlands (Huisman et al. 2012), Italy (Magalini et al. 2012), Belgium (Wielenga et al. 2013), France (Monier et al. 2013), Germany (Sander et al., 2012)), the role of unaccounted flows emerged as substantial.

The main reasons behind these unaccounted flows identified are:

- "Cherry picking" (selective collection of profitable WEEE):
  Cherry picking is selectively collecting whole or component parts of WEEE that generate higher revenues. Cherry picking is done by economic operators different from those officially responsible of handling the consolidated waste collected. Cherry picking may also result in unaccounted collection (particularly if it occurs prior the registration of the total weight of waste collected), sub-standard or unaccounted treatment. Thus there is a need for strong and efficient enforcement practices to abolish the activities related to cherry picking (Euractiv, 2014).

- Lack of Reporting

  WEEE collection and treatment without reporting is not necessarily illegal or hazardous to the environment. However, it threatens the effective functioning of the market. The activities of the operators who do not report their WEEE amounts remain unaccounted, and the volume of WEEE collected but unreported will remain as an unfulfilled requirement of Member States to collect. Thus, unaccounted collection hampers the overall reporting of Member States' performances. It is therefore necessary to improve control mechanisms and to record and report WEEE managed outside of the current producers' Compliance Schemes (particularly in the non-household streams) (IPR, 2012).

- Illegal collection

  Illegal activities are those in explicit violation of existing national (WEEE) or international legislation (Basel) and/or those that enable illegal activities under the disguise of a legal business. Illegal collection is one of the main factors preventing the Member States from reaching their collection targets, as it decreases the amount of WEEE reported. In general, small distributors and second-hand sellers informally purchase, or collect at no cost, a significant portion of the WEEE and sell it to scrap dealers. At the same time, a smaller proportion of the WEEE might also be collected by street collectors and sold to the scrap dealers. One important step to combat this trend is the establishment of national database for registered operators (Ciocoiu, C.N, and Târłiu, V., 2012). It is also important for Member States to tackle these activities with strong and efficient legal enforcement (REC, 2011). Tracing WEEE that might vanish into illegal flows of waste, including illegal collection, is difficult (Magalini et al., 2012).

- Unaccounted treatment

  Despite that they may not be carried out in illegal ways, unaccounted treatment activities have an impact on the WEEE Directive reporting, though they do not directly impact the collected amount. In many cases, unaccounted treatment may be a result of unaccounted collection. Therefore, it is important to improve the current reporting framework and include unaccounted treatment quantities (according to applicable standards) from all economic operators (WEEE Forum, 2012).

- Illegal treatment

  It is vital that the collected WEEE is treated in authorized facilities that adopt the applicable standards, to achieve the societal benefits foreseen by the WEEE Directive. Illegal treatment is unaccounted by definition. When illegal treatment is the motivation for the involved economic operator, it might also trigger illegal or unaccounted collection efforts that further hamper the efforts of Member States in achieving their collection targets.

- Illegal Shipments (unaccounted WEEE exchange among countries)

  In addition to the consequences in the destination countries of illegal shipments (in many cases non-OECD countries), there are two major consequences for Member States. These shipments directly hamper the achievement of collection targets when they occur prior to the tracking of the collected amounts. Illegal shipments may also result from illegal or unaccounted collection activities; when they occur after a proper and recorded collection, they could directly hamper achievement of the Directive's treatment requirements.

Two questionnaire respondents also mentioned theft from collection points and use of fake evidence notes (valid for the former UK model). Rankings from the questionnaire results are shown in Figure 15.

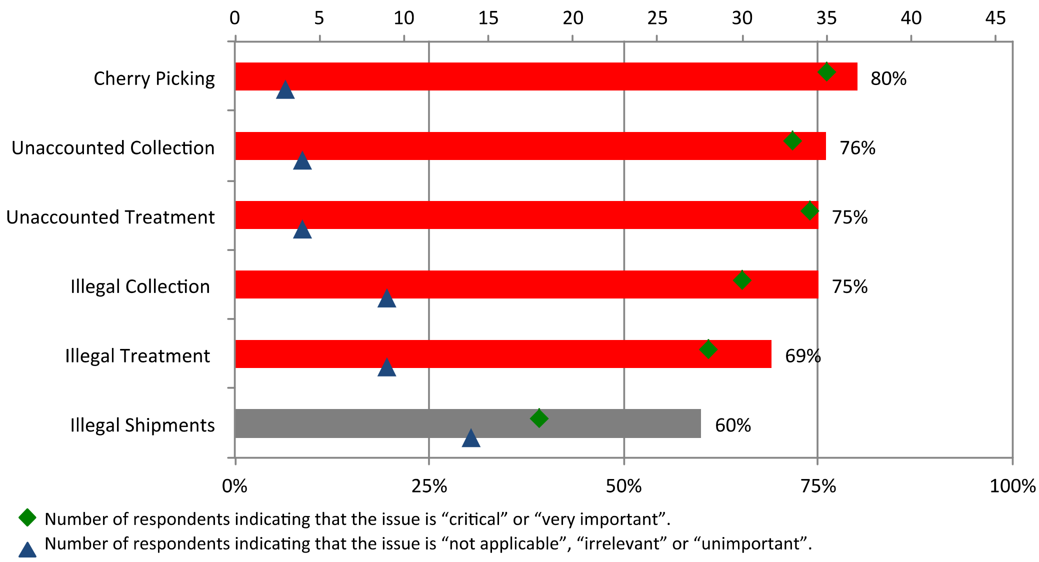

Figure 15: High rate of unaccounted collection.

6.1.4 Impact of limited inspection and enforcement capacities

Improvement of the responsible governmental institutions' inspection and enforcement capacities is important to ensure that the actors dealing with WEEE on different levels comply with the Directive's collection targets.
This study identified three key aspects:

- Strong enforcement practices
  Enforcement is needed to increase compliance. This is a crucial step in decreasing illegal or unaccounted activities. In this case, the objective of the enforcement practice is to increase the collection of WEEE by improving the compliance of various operators involved in WEEE collection and treatment according to Directive requirements. Enforcement practices may include mechanisms to encourage compliance by providing rewards or "incentives", or to encourage compliance by outlining (and administering) punishments or "disincentives". Results of the study reveal that there are not enough mechanisms that facilitate WEEE collection, enhance cooperation among stakeholders or improve public awareness. Local authorities sometimes have different ways of managing WEEE, which leads to increased complexity for the implementation process at the national level. The questionnaire responses revealed the need for more mechanisms to share best practices and information among Member States.
- Strong inspection capacities
  Without a high level of inspection capacity, other enforcement practices would be insufficient to comply with the Directive. Successful inspection practices face several difficulties. For instance, it is difficult to detect the leaks in collection, recycling and monitoring systems, as not all of these are illegal. The inspection system should ensure complete traceability of all the unaccounted WEEE streams (IMPEL, 2009). Moreover, inspections require more coordination and harmonization concerning controls and related policies (EPR Seminar, 2013). Identifying and tracing all the WEEE that currently vanishes into illegal waste flows is a prerequisite for the success of the Directive (Magalini et al., 2013).

- Level of management (execution) capacities
  Along with the necessary improvement in enforcement and inspection capacities, the Member States should have enough execution capacity to be able to manage an efficient WEEE system. Member States should establish and enact the required organizational bodies at all governance levels. While most of the Member States have sufficient management capacity, some have less execution capacity, which in the short run may delay the full implementation of the Directive's requirements.

The questionnaire results also support these findings as presented in Figure 16.

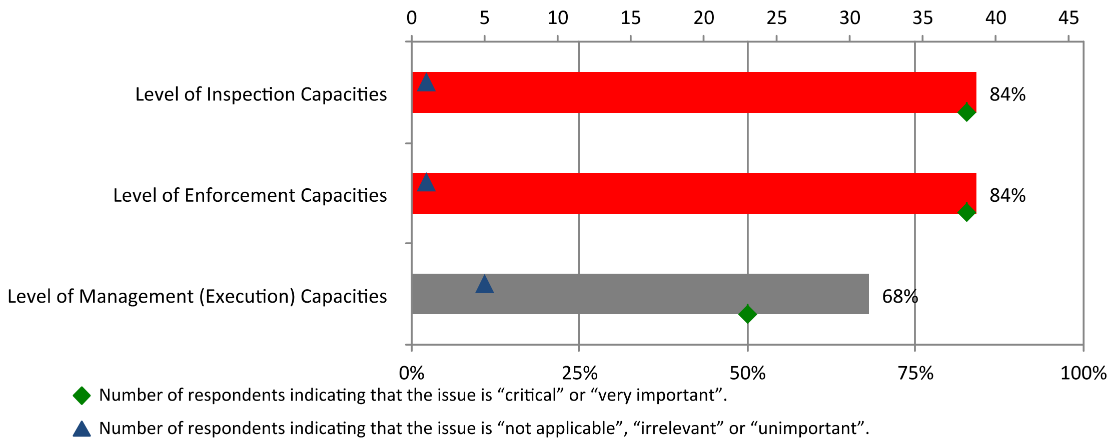

Figure 16: Limited inspection and enforcement capacities.

6.1.5 Overview of Member State ranking of difficulties

In order to clearly see the primary difficulties faced by each Member State, findings of the questionnaire have been translated into a matrix in Table 26. Information provided in Table 26 was compiled from the feedback of 25 Member States and Norway. A complete overview, including other stakeholders' responses, is presented in Annex 9.2.

MS	High rate of unaccounted collection activities	Limited government capacities	Complex market structure	Limited public awareness	Comp. Conc. Calc. Of state spec. Coll. Targets	Legal uncertainties	Inadequate collection infrastructure	Other difficulties
AT	4	3	1	0	0	0	0	0
BE	5	5	4	2	4	2	2	1
BG	4	5	5	5	5	4	4	0
CY	6	5	3	5	1	3	5	0
CZ	5	4	4	5	3	5	5	0
DE	5	3	2	5	2	0	3	0
DK	4	2	5	2	5	2	2	0
EE	4	6	5	6	4	4	6	4
FI	4	4	4	3	2	1	2	2
FR	4	1	1	4	4	3	2	0
HR	5	3	4	5	3	3	4	5

MS	High rate of unaccounted collection activities	Limited government capacities	Complex market structure	Limited public awareness	Comp. Conc. Calc. Of state spec. Coll. Targets	Legal uncertainties	Inadequate collection infrastructure	Other difficulties
HU	4	5	4	6	6	5	4	3
IE	4	2	5	4	4	4	5	4
IT	6	4	5	4	3	2	4	0
LT	4	5	4	6	3	4	5	0
LU	3	3	2	1	1	1	1	0
LV	6	5	5	6	5	5	4	3
MT	6	4	5	5	3	4	3	0
NL	5	3	4	2	4	2	2	0
NO	4	4	5	3	5	3	1	0
PL	6	5	3	4	3	1	2	0
PT	6	4	4	5	3	4	5	0
SE	5	3	4	2	3	3	5	0
SI	4	5	6	3	4	4	2	3
SK	5	5	3	5	2	3	3	2
UK	3	3	4	5	2	4	2	0
ES								
EL								
RO								

Legend for Difficulty Level:
0 Not Applicable
1 Irrelevant
2 Unimportant
3 Slightly Important
4 Important
5 Very Important
6 Critical

Table 26: Matrix Presentation of Member State difficulties.

In order to highlight differences between them, Member States who replied to the questionnaire have been clustered into two groups as shown below according to their level of difficulties:

- The first group includes 14 Member States (EE, LV, HU, IE, BG, HR, CZ, LT, PT, SI, MT, CY, IT, SK) that have an overall score above 25 points. Countries in this group have significant implementation difficulties, experience serious problems in meeting the collection targets and face almost all identified potential difficulties. This group of countries represents 28 per cent of the total WG in EU.
- The second group includes 12 Member States (BE, SE, NO, PL, UK, DK, FI, NL, DE, FR, LU, AT) that have an overall score of 25 points or less. Countries in this group have fewer difficulties in meeting the collection targets. Some of the Member States have face only few problems, and in many cases, they considered many of the potential difficulties listed in the questionnaire as unimportant or not applicable for their country. Unaccounted collection activities and enforcement, and inspection issues are the primary difficulties for these countries. The second group of countries represents 43 per cent of the total WG in EU.

Difficulties	Group 1	Group 2
High rate of unaccounted collection activities	4,93	4,33
Limited government capacities	4,43	3,25
Complex market structure	4,43	3,25
Limited public awareness	5,00	2,75
Complications concerning calculation of specific collection targets	3,50	2,92
Legal uncertainties	3,86	1,83
Inadequate collection infrastructure	4,21	2,00
Other difficulties	1,71	0,25

Table 27: Clustered Presentation of Member State difficulties.

Table 26 ranks Member States according to the difficulties perceived, as reported in the questionnaire. Group 1 countries graded all identified difficulties as higher than three, whereas only Group 2 countries graded only three difficulties over three.
Figure 17 shows a strong correlation between the GDP level of the Member States (stratum) and the difficulties they face. There are some exceptional cases. For instance, Ireland with over $40.000 in per capita income has more difficulties compared to Poland, which has less than $25.000 in per capita income.

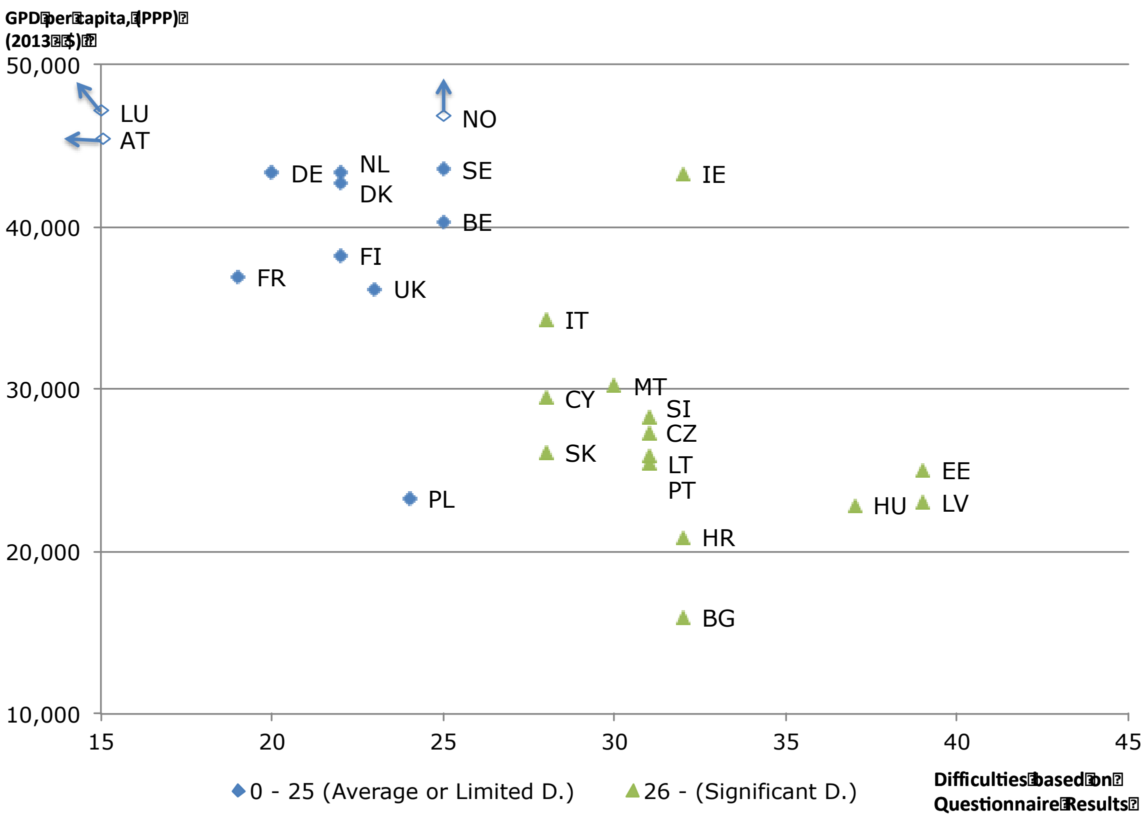

Figure 17: Comparison of MS Difficulties with MS GDP (PPP) Per Capita

The data also support the study's findings and show a correlation between the actual collection level of a Member State and the difficulties they face. Whereas Group 1 countries collected 28 per cent of the WG, Group 2 countries, with limited difficulties, collected 43 per cent of WG. Average collection percentage estimations were

calculated using the total collection data and the total WG numbers of the Member States within a group. Calculations disregard the countries where there is no collection data for 2012.
The results also show consistency with the assessment of waste management performances carried out in 2012 (BiPRO 2012).

Country	Screening waste management[16]	Difficulties	Classification	Comments	Estimation of quantities collected on WG 2012	Estimation of quantities collected on WG 2012
EE	17	39	Group 1 - Significant implementation difficulties (countries above 25 points)	- High rate of unaccounted collection activities - Limited government capacities - Limited public awareness - Inadequate collection infrastructure	30%	28%
LV	14	39			22%	
HU	19	37			37%	
IE	19	32			47%	
BG	8	32			53%	
HR	N.A.	32			No data	
CZ	18	31			36%	
LT	9	31			43%	
PT	21	31			23%	
SI	25	31			32%	
MT	9	30			No data	
CY	11	28			No data	
IT	15	28			22%	
SK	17	28			39%	
BE	34	25	Group 2 - Average or limited implementation difficulties (countries 25 points or below)	- High rate of unaccounted collection activities - Limited government capacities	50%	43%
SE	35	25			83%	
NO	N.A.	25			77%	
PL	18	24			47%	
UK	32	23			35%	
DK	37	22			59%	
FI	31	24			47%	
NL	39	22			No data	
DE	36	20			40%	
FR	31	19			No data	
LU	33	12			46%	
AT	39	8			No data	N/A
EL	3	0	No data		No data	
RO	11	0			No data	
ES	21	0			No data	

Table 28: Comparison of Member States' difficulties with actual collection rates.

[16] Screening of waste management performance of EU Member States (BiPRO, 2012). The higher the value, the better the performances.

The study identified some major differences between the two groups regarding their difficulties. Whereas Member States in Group 2 mainly face the difficulties of a high rate of unaccounted collection and limited inspection and enforcement capacities, this is not the case for first group countries.

For the Member States in Group 1 that reports to have significant collection difficulties, "Limited public awareness" and "Inadequate collection infrastructure" are also primary problems.

Stakeholders have conflicting experiences regarding public awareness issues. Some of the respondents mentioned that their implemented public awareness campaigns had not increased the quantities collected. Other respondents found awareness-raising campaigns instrumental in increasing the quantities collected.

6.1.6 Options to tackle primary difficulties identified

In this section, potential solutions to overcome identified potential difficulties are presented. Alternatives have been identified based on a detailed literature review and interactions with key stakeholders during the study.
Solution suggestions are identified to tackle primary difficulties. The two primary difficulties are interrelated. Options recommended are also naturally interrelated

- Enforcement and Inspection
  In order to improve effectiveness to tackle illegal shipments, cooperation with customs, police and other regulatory authorities should be improved, for example, via formal agreements. Reporting of administrative and physical inspections should be monitored closely to ensure reliability and consistency of data. Final recovery site for waste shipments should be verified to ensure that waste is handled in an environmentally-sound manner (IMPEL, 2014). Additionally, complementary flows should be regularly monitored in cooperation with the compliance schemes and recycler associations.

- Unaccounted Collection
  In order to decrease leaks, an information system that can trace WEEE flows from retailers should be implemented. Scrap metal collectors at WEEE collection points should be included in order to account for complementary WEEE collection. Volume of WEEE that passes through the "broker" market, its final destinations and the way this equipment is transported should be identified (Ademe, 2013). Proximity of collection facilities to consumers should be increased in order to increase collection of smaller e-waste, which consumers currently dispose of along with their household waste (UNU, 2011). Moreover, cash transactions should be banned for scrap dealers.

  In order to track different flows, mixed scrap metal should be investigated to identify the exact quantity of WEEE it contains (Ademe, 2013). Shares of WEEE in pre-shredder material should be represented accurately. Refurbishing and export of devices, such as screens and professional devices for reuse should be analysed. Amount of WEEE disposed of with commercial residual waste should be identified.

The implementation of the new WEEE Directive is expected to improve European border controls regarding the export of used EEE and WEEE by providing in Article 23 and Annex VI the necessary tools for border inspectors. In order to put these solution options into practice, potential effects of them should be assessed in detail.

6.1.7 Secondary potential difficulties identified

Five difficulty categories were identified as secondary challenges in reaching collection rates. See Annex 9.12 for the detailed reasons behind the secondary potential difficulties identified.

- Complex market structure

  A large and diverse group of actors are involved in various EEE end-of-life activities, such as collection, recycling and treatment, reuse, refurbishment, waste disposal and export of products and fractions. Market structure complexity was identified as a difficulty by both Group 1 and Group 2 countries. Two interesting findings should be noted from the questionnaire. First, respondents acknowledge that having many compliance schemes may result in an inefficient and disorganized system that prevents some Member States from efficiently implementing the requirements of the Directive. Secondly, the proliferation of compliance schemes creates even more difficulties where no clearinghouse system is in place to ensure consistent operations and the proper collection and treatment of WEEE.

- Complications concerning state-specific collection target calculations

  No common methodology for calculating the amount of WG exists. This knowledge gap is perceived by Member States as a serious detriment to first calculating the target and then demonstrating the achievement of the target. In particular, the role of appliances discarded and prepared for reuse or reused needs to be further investigated, as these amounts could undermine the overall performances of Member States (WRAP, 2011). Questionnaire results show that 28 responses (on a total of 48) graded the difficulty of accurate calculation of the amount of WG as "critical" or "very important".

- Limited public awareness

  Consumers are one of the most important stakeholders for WEEE collection as they discard the products and are responsible for bringing and dropping of their WEEE to the collection points. Thus, increasing awareness remains a crucial step in reaching the required collection targets, particularly by minimizing the fractions of WEEE that may be improperly discarded by consumers. In most Member States, public awareness regarding the negative impact of poor waste management practices is very low (Ciocoiu, C.N, and Târłiu, V., 2012). Awareness is especially important for the collection of small WEEE and its impact to the collection rate of large WEEE is limited. In some Member States, operational information, such as locations of collection facilities, is not provided to the citizens (REC, 2011). This problem is especially valid for Group 1 countries. This group's representatives graded limited public awareness to the very high, rated "very important" or "critical". On the other hand, Group 2 countries do not cite limited public awareness as a major problem.

- Legal uncertainties

  Most of the Member States find it difficult to comply with Directive's often-complex collection requirements that leave stakeholders unsure of their legal obligations. Therefore, it is important to clear up the uncertainties regarding the Directive and its requirements. Producer responsibility is not often applied uniformly across Member States, particularly in regard to the responsibility of achieving collection targets (IPR, 2012). Findings from this study reveal that Group 2 countries mostly overcame this difficulty while Group 1 countries still struggle with this challenge.

- Inadequate collection infrastructure

  This study revealed that a lack of WEEE collection facilities, particularly in Group 1 countries, is one of the challenges preventing the fulfillment of required collection targets. Without a proper and widely-accessible collection infrastructure, it would be impossible to treat, recycle or recover WG. Improving the existing collection systems is required, since a lack of infrastructure prevents the use of other implementation instruments. A widely-accessible and straightforward collection information infrastructure for consumers, as well as an optimized network for WEEE collection are priorities in ensuring that the system is efficient (IPR, 2012). Moreover, in order to guarantee that retailers carry out the required activities in the Directive, they must be highly involved in the WEEE management system (REC, 2011). Another challenge is that there are explicit regional differences in some Member States regarding the number of municipal collection points, which directly affects the efficiency of collection activities (EPR Seminar, 2013).

6.2 Revision deadlines and targets

The objective of this task is to assess the feasibility of the collection targets set out in the Directive as well as the advantages and disadvantages of revising the deadlines to reach these targets or the collection rates themselves.

Five years after the impact assessment that led to a revision of the WEEE Directive, the relevance of the collection targets and their deadlines needs to be questioned, especially in light of the difficulties faced by Member States in reaching the targets, as previously highlighted in the report. Given their lack of infrastructure (and their low level of EEE consumption), some Member States can already derogate from the 2019 deadline laid out in Article 7(1) of the Directive and achieve their collection rates by August 14, 2021, as mentioned in Article 7(3).

The current analysis thus aims to estimate the collection rates achieved today by Member States, in order to assess the collection rates that can be achieved by 2019 and provide recommendations, in terms of target level and deadlines, to assess the feasibility of targets and the difficulties faced by Member States.

6.2.1 Current collection rates of Member states

The achievement of collection targets is measured as a percentage of WG as determined in Chapter 4. The collection rates calculated with this method provide a more reliable base for the comparison of Member States' performances, since WG takes into account the different market dynamics of Member States, which influence the quantities of WEEE available for collection (sales, lifespan of products, etc.) and thus the collection performance of Member States.

The calculation of the quantities of WG in each Member State in Chapter 4, in addition to the Eurostat data on the quantities of WEEE collected per Member State, make it possible to calculate the collection rates of each Member State based on WG. These are presented below. Member States can thus be classified into several categories, depending on their performance levels in 2010 and 2012.

Country	Estimation of quantities collected of WG in 2010	Estimation of quantities collected of WG in 2012	Classification	Comments	Derogation admitted according to Article 7(3)
SE	86%	83%	Countries above 50%	Countries potentially able to achieve the target	No
DK	68%	59%			No
BG	68%	53%			No
IE	54%	47%		The progression of Ireland has been decreasing these last years	No
FI	49%	47%	Countries above 40%	These countries must increase collection by more than 100%	No
BE	48%	50%			No
LU	47%	46%			No
DE	46%	40%			No
AT	41%	42%			No
SK	41%	39%			Yes
CZ	38%	36%	Countries above 30%	Countries far from the target. Only NDL has increased collection constantly over the last years.	Yes
NL	36%				No
HU	35%	37%			Yes
UK	35%	35%			No
FR	34%				No
PL	33%	47%			Yes
EE	32%	30%			No
SI	31%	32%			Yes
EL	29%		Countries above 20%	Countries far from the target and characterized by irregular collection rates.	No
LT	28%	43%			Yes
PT	28%	23%			No
MT	28%				Yes
IT	27%	22%			No
CY	21%				No
ES	21%				No
LV	20%	22%			Yes
RO	15%		Countries below 20%		Yes
HR	No data available on collection				

Table 29: Collection rates based on WG and derogation to targets.

Table 29 shows that the deadline derogations are not necessarily related to collection performance.
The graph below further illustrates the gap between the 2010 collection rates and the rate to be reached in 2019.

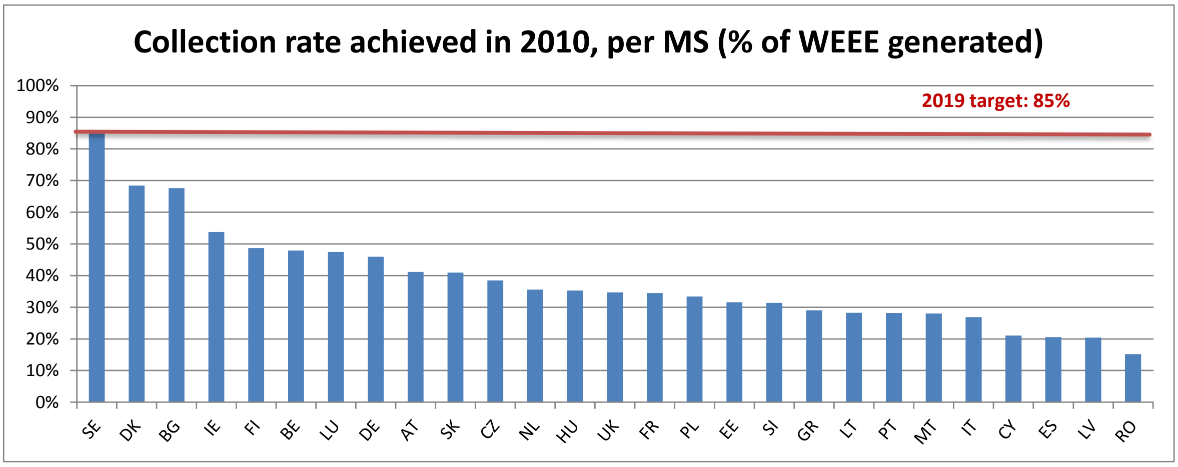

Figure 18: Collection rate achieved in 2010 (% on WG).

If we use the latest collection rates available (2012 or 2010, depending on Member State):

- Four countries have a collection rate above 50 per cent;
- Seven countries have a collection rate between 40 per cent and 50 per cent; and
- Sixteen countries have a collection rate below 40 per cent.

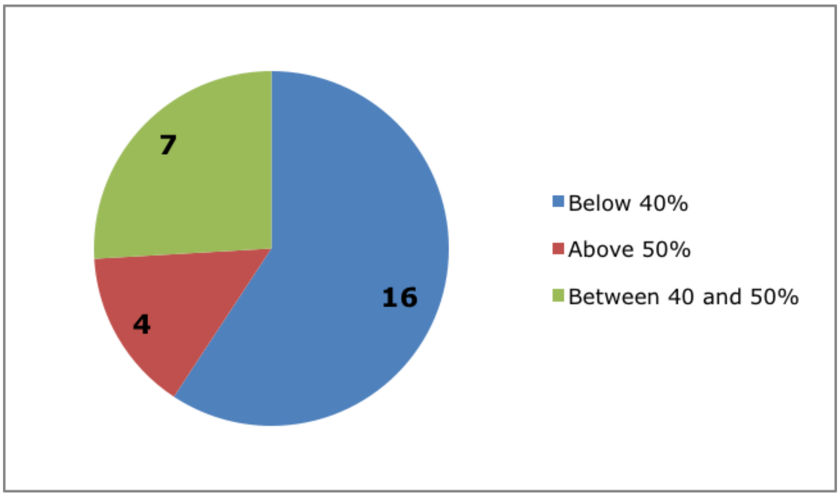

Figure 19: Distribution of Member States per collection rate achieved.

This means that 22 countries will have to double or triple the quantities of WEEE collected in order to reach the targets. These countries will have to significantly increase their collection efforts or completely change the way collection is organized. Except for Sweden, which reached a collection rate of 86 per cent in 2010 and 83 per cent in 2012, the Member States will not be able to function under a "business as usual" strategy.

The feasibility of the targets is therefore challenged by the fact that many Member States are far behind the targets. However, it is necessary to look at the collection progress of Member States these last years, in order to identify countries that are likely to "catch up" in the coming years, thus demonstrating the fact that targets are achievable.

6.2.2 Progress of member states regarding collection

The table below presents the gap between the situation today and the collection rates to be achieved by 2019. In addition, it indicates whether Member States are achieving sufficient progress to reach the target, and it displays the dynamic of collection over the two last years, in order to identify countries that have failed to boost collection.

Country	Quantities to be collected in 2019	Necessary increase in collection, from last reported data to 2019	Necessary annual increase based on latest data available	Average annual progress between 2006 & latest available data*	Average annual progress in the two last reported years	Progression compared to necessary progression
AT	161	108%	11%	4%	2%	Low
BE	224	93%	10%	7%	5%	Low
BG	75	96%	10%	17%	-8%	Medium
CY	13	402%	20%	-10%	5%	Low
CZ	156	191%	16%	11%	1%	Low
DE	1.616	134%	13%	0%	-6%	Low
DK	119	56%	7%	8%	-5%	Medium
EE	16	201%	17%	0%	0%	Low
EL	150	222%	18%	59%	5%	Low
ES	715	352%	18%	-11%	-19%	Low
FI	107	103%	11%	5%	2%	Low
FR	1.282	196%	17%	38%	21%	High
HR	42	N/A	N/A	N/A	N/A	N/A
HU	110	149%	14%	13%	5%	Low
IE	80	95%	10%	-4%	-3%	Low
IT	1.019	342%	24%	30%	-7%	Low
LT	30	110%	11%	11%	27%	High
LU	11	114%	11%	5%	2%	Low
LV	18	287%	21%	-6%	5%	Low
MT	6	275%	16%	-3%	4%	Low
NL	358	179%	12%	8%	12%	Medium
PL	383	118%	12%	52%	25%	High
PT	143	260%	20%	13%	-5%	Low
RO	179	584%	24%	23%	23%	Medium
SE	198	17%	2%	5%	2%	High
SI	30	219%	18%	13%	4%	Low
SK	62	171%	15%	20%	2%	Low
UK	1.325	163%	15%	29%	3%	Medium
EU	8.630	170%	12%	25%	7%	Medium

Table 30: Analysis of progressions needed by Member States to achieve the target.

Countries that progressed significantly over the last years can potentially reach the targets, if they continue their efforts. However, that will be highly dependent on the market and collection infrastructure.
The Figures 20, 21 and 22 below summarise the gap between the necessary annual progress needed to reach the target and the last progress realised by Member States.

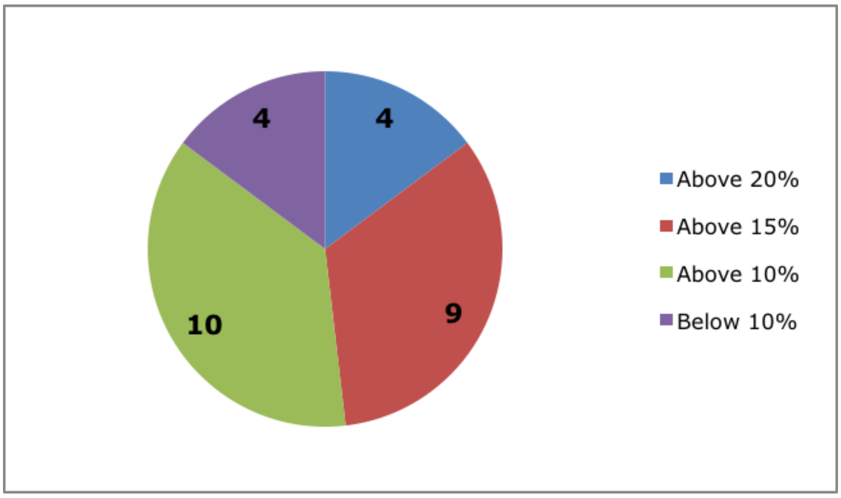

Figure 20: Distribution of Member States depending on necessary annual increase in collection.

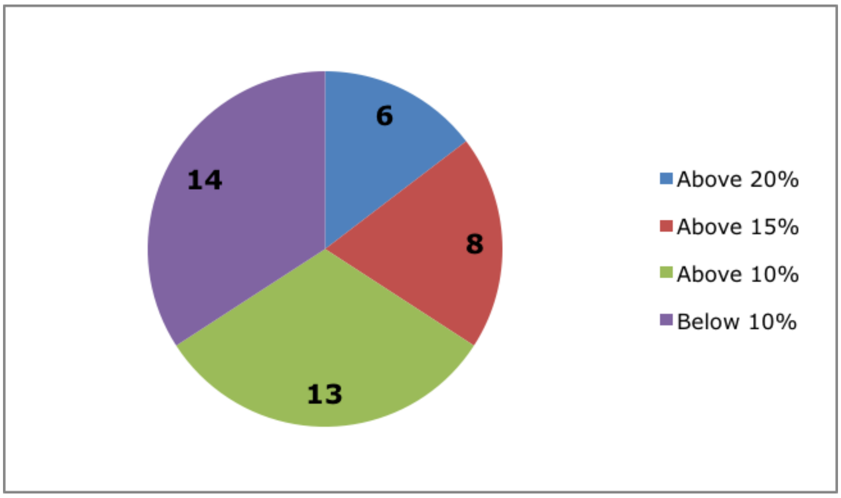

Figure 21: Distribution of Member States depending on annual collection progress, in percentage (average annual progress from 2006 to last reported data, either 2010 or 2012 when available).

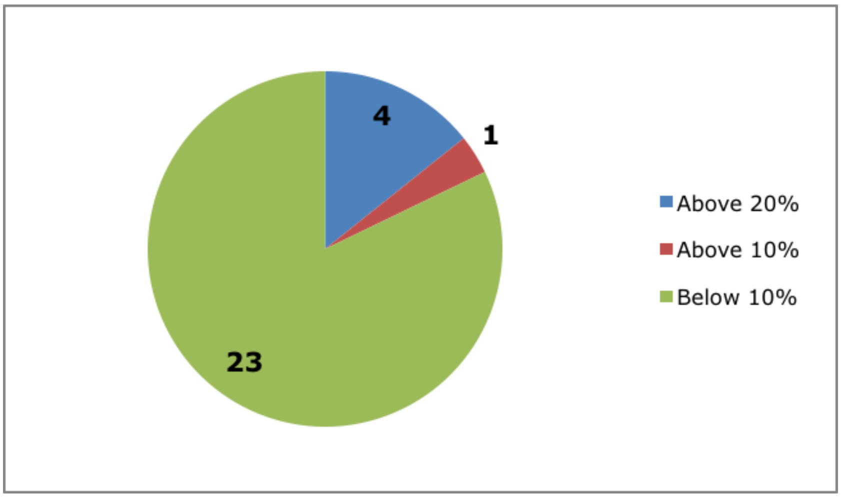

Figure 22: Distribution of MS depending on annual collection progress (average progress over the two last reported years, either 2009-2010 or 2011-2012 when available).

While 85 per cent of Member State needs to increase their collection by more than 10 per cent annually to reach the targets, only 18 per cent of them had increased collection by this rate over the last two years reported. Up to 20 Member States will have to at least double the pace at which they increase their collection rate.
This analysis confirms the previous assessment that the collection target will be very difficult to achieve for most of the Member States, as they will need to considerably increase the pace at which they improve collection. The sooner this can be accomplished, the better, since the necessary annual increase of collection becomes harder to reach each year the opportunity to increase collection is wasted. However, a higher amount of WEEE is currently collected in practice than actually reported. Therefore, Member States may reach the collection targets, partially or totally, by ensuring that waste flows are reported appropriately.

6.2.3 Global analysis of feasibility

Two aspects determine whether a Member State is likely to reach the target: both distance from target and pace of progression. These have been compared with the level of implementation difficulties that Member States face in order to identify those that may have additional difficulties in reaching the target, due to issues related to the amount of unofficial activities in the country, limited enforcement capacities, complex market structure, etc. The survey that identified and assessed Member State difficulties has enabled a classification that ranks the importance of implementation difficulties they face. This classification is used in the table below.

Country	Current level of collection rates	Progression compared to necessary progression	Level of implementation difficulties	Overall feasibility of target
AT	Medium	Low	Average or limited (Group 2)	Medium
BE	High	Low	Average or limited (Group 2)	Medium
BG	High	Medium	Significant (Group 1)	Medium
CY	Low	Low	Significant (Group 1)	Low
CZ	Low	Low	Significant (Group 1)	Low

Country	Current level of collection rates	Progression compared to necessary progression	Level of implementation difficulties	Overall feasibility of target
DE	Medium	Low	Average or limited (Group 2)	Medium
DK	High	Medium	Average or limited (Group 2)	High
EE	Low	Low	N/A	Low
EL	Low	Low	Significant (Group 1)	Low
ES	Low	Low	Average or limited (Group 2)	Low
FI	Medium	Low	Average or limited (Group 2)	Medium
FR	Low	High	Average or limited (Group 2)	Medium
HR	N/A	N/A	N/A	N/A
HU	Low	Low	Significant (Group 1)	Low
IE	Medium	Low	Significant (Group 1)	Low
IT	Low	Low	Significant (Group 1)	Low
LT	Medium	High	Significant (Group 1)	Medium
LU	Medium	Low	Significant (Group 1)	Medium
LV	Low	Low	Average or limited (Group 2)	Low
MT	Low	Low	Significant (Group 1)	Low
NL	Low	Medium	Significant (Group 1)	Medium
PL	Medium	High	Average or limited (Group 2)	High
PT	Low	Low	Average or limited (Group 2)	Low
RO	Low	Medium	Significant (Group 1)	Low
SE	High	High	N/A	High
SI	Low	Low	Significant (Group 1)	Low
SK	Low	Low	Significant (Group 1)	Low
UK	Low	Medium	Average or limited (Group 2)	Low
EU	Low	Medium	Average or limited (Group 2)	Low

Table 31: Feasibility of collection target in 2019.

According to the horizontal analysis, 15 Member States are likely to have serious difficulties reaching the target (CY, CZ, ES, EE, UK, EL, HU, IE, IT, LV, MT, PT, RO, SK and SI), while 3 Member States have a good chance of reaching it (DK, PL, SE) if they continue at the same pace. It is difficult to predict if these countries will be further able to improve collection in the future, as the more a country collects WEEE, the more difficult it is to reach and collect the remaining waste.

In order to take into account the difficulties some Member States face in reaching the target, two potential adjustments are discussed below:

- Extend the deadline to enable more countries to reach the target, aside from than the ones that already benefit from a derogation;

- Decrease the collection rates to be achieved by all Member States by 2019.

Regardless of the individual decision, either an extension of the deadline or a lowering of the collection target will result in a decrease of WEEE collected in 2019. This means that some of the environmental benefits of collecting, treating and recycling WG will decrease. In addition, this also comes with an important potential loss of resources and revenue from recycling valuable materials.

On the other hand, it will decrease the costs associated with the treatment of a higher quantity of WEEE, which is potentially more difficult to treat and recycle. However, Chapter 5 demonstrated that global treatment costs will not significantly vary depending on the types of WEEE collected to reach the target. Chapter 5 described the economic, environmental and social impacts associated with collecting a higher and more diverse quantity of WEEE.

This would also give Member States more time to implement the infrastructure needed to collect and treat the new flow of WEEE by increasing collection points, optimising logistics between collection and treatment centres, developing capacities to treat precious materials and maximise benefits, and in particular, increasing the monitoring of flows being collected.

The impacts associated with a revision of the deadlines or collection targets of the WEEE Directive could not be assessed quantitatively, as there are too many uncertainties regarding what would happen to WEEE that is not collected and treated.

There would be an important loss of economic and environmental benefits resulting from a revision of the Directive WEEE collection target, to be put in parallel to the feasibility of the target.

6.2.4 Conclusion

This study highlighted the economic, environmental and social benefits of implementing an 85 per cent collection target base of WG. However, analysis shows that reaching the target is challenging and even unfeasible for some Member States if the current pace is maintained. Therefore, it is crucial that Member States tackle with the difficulties identified during the study.

The main difficulties reported by Member States and key stakeholders are linked to the high rate of collection that is unaccounted, which is further amplified by the limited enforcement and monitoring capabilities of Member States. Those two interlinked difficulties may seriously hamper the Member States' capability of achieving the target or to demonstrate the real amount of WEEE collected in their territories.

With the information available, it is impossible to recommend additional derogations or a revision of the collection target. To have a better understanding of the situation, it would be necessary carry out a more detailed analysis of the WEEE flows for each Member State to identify the destinations of the WEEE that is not collected.

By analysing the destinations of WEEE that is not collected, and the potential capture of this WEEE, in each Member State, one could better assess the feasibility of reaching the target for each Member State. Several studies aimed at identifying the real amount of WEEE available for collection have been launched or are on-going in different countries (UK, FR, DE, IT, NL, BE and PT). However, not all of these studies have been able to identify all the destinations for WEEE and the extent to which this WEEE could be captured and at what costs. It is also known that to further increase this accuracy level requires very costly surveying and analysis, as well as proper reporting on the national level. For instance, while it is possible to have an estimation of the WEEE disposed of in waste bins by a population, it is harder to estimate the amount of awareness-raising required to change this habit of improper disposal, the costs of such activities and the results in terms of WEEE sorted and properly disposed of, that could be finally recovered.

Similarly, it is difficult to estimate the amount of WEEE that could be collected by preventing theft or illegal export or the investment needed to achieve this result. These studies do not completely fill the knowledge gap between what can theoretically be collected and what can be collected in practice and at what cost. Such an analysis should be done for each Member State or in selected, representative ones in order to carry out a complete analysis of the achievability of collection targets.

More information is thus needed to take a position on revising the deadlines or the current collection target levels in the WEEE Directive.

7 Conclusions and recommendations

This study aims to support the European Commission in accomplishing the requirements of Article 7 and enhance the collection and environmental performance of the WEEE Recast in practice. A common methodology to calculate the quantity of EEE POM has been proposed and applied in order to create the initial dataset for application of the common methodology developed to calculate the quantity of the WG. Those two tasks were accomplished through comprehensive data gathering, statistical techniques, scientific modelling, sensitivity analysis and practical experience. An impact assessment, analysing the potential for individual collection target categories was also carried out, complemented by an analysis of the implementation difficulties currently faced by Member States and the impact that those difficulties might have on achieving the new, challenging targets defined in the WEEE Directive.

Defining and achieving any target is only the first step to ensuring the desired societal improvements; they need to be analysed in the broader context of the Commission's activities in supporting Member States as they implement the WEEE Directive. The main conclusions and recommendations derived from this study are grouped according tasks, but also areas of intervention.

7.1 POM relevance and reliability

It is of paramount importance that POM is accurately measured; it is the primary step in enforcing that producers abide by regulations concerning registration and reporting on the market and the fundamental of level playing field for Industry. Furthermore POM data is the basic parameter for target computation of WG from 2016 onwards, and potentially even after 2019, when Member States may decide not to base the target on WG. For those Member States that opt for the WG-based target after 2019, the POM data is needed to determine WG. Finally, this data can provide guidance to track overall performances of Member States when observing the entire lifecycle of EEE, from the production and distribution through the final recovery and recycling.

In the future, National Registers will play a crucial role in ensuring registration and reporting EEE POM. Unfortunately, National Registers are not in place in all the countries in the scope of the study, and the presence of free-riders might jeopardize the consistency of figures. In addition, the creation of a consistent dataset for EEE POM prior to the establishment of National Registers is necessary to predict WG, particularly for those products that have longer lifespans (like large household appliances) or those not previously covered in the scope of WEEE Directive (like PV panels).

The "apparent consumption approach" has been proposed as methodology to calculate the quantity of EEE POM. Such a methodology is based on a complete and consistent dataset from temporal and geographical perspective. It is also based on official datasets that individual Member State can process. National statistical institutes can process this data on a company level, and this information can complement or double-check the data from National Registers. Therefore, the method could be used to check for free-riding or to create an additional data set.

The apparent consumption approach, despite being a calculation technique, and thus subject to data quality concerns, proved to match, in many cases, the official data from Eurostat (which is mostly comprised of data form the National Registers). The apparent consumption approach also provided smoother time series than the data from Eurostat.

For these reasons, the approach is recommended to increase the reliability and consistency of POM data in the future. The apparent consumption methodology and National Registers data can provide a complementary dataset to achieve this, or they could even be used together

7.2 WG calculations

The methodology developed in the study for calculating the quantity of WG in each Member State is based on two simple and straightforward datasets: POM and lifespan data. The POM dataset is reconstructed for the years prior to National Registers, double-checked with reported data from Member States until 2012 and based on a forecast from 2012 to 2024. Lifespan is obtained from available data from consumer surveys and research done in recent years.

The methodology output is aligned with the definition of WG used in the study, which is the amount of waste discarded by a holder, available prior any further activity (collection, preparation for reuse, treatment, export).

Results show an increase of WG across EU-28 from 9,5Mt in 2014 up to 10,4Mt in 2024, with an average margin of error of 10 per cent based on uncertainly of the POM forecast and lifespan variability.

- For temperature exchange equipment, the WG is expected to be 1,9 ± 0,1 Mt.
- For screens, the WG is expected to decrease to 1,3 ± 0,1 Mt.
- For lamps, the WG is expected to increase to 0,26 ± 0,04 Mt.
- For large equipment, the WG is expected to increase to 3,3 ± 0,3 Mt
- For small equipment, the WG is expected to increase to 2,9 ± 0,5 Mt
- For small IT, the WG is expected to be 0,7 ± 0,2 Mt

Margins of error can be further reduced in the future when the actual POM data is available and a methodology is applied to calculate the WG for the subsequent year based on a consolidated POM dataset from each Member State.

A detailed sensitivity analysis has been carried out to estimate the margin of error related to the potential variation in lifespan. Such a margin averages 10 per cent at the EU-28 level; depending on the individual country, it can vary between 5 per cent and 15 per cent. Additional research on both product lifespan and up-to-date POM at Member State level can further improve the reliability of future calculations.

The methodology is developed to allow Member States to obtain results according to an Annex I or Annex III level of detail (keeping PV as separate stream). Background calculations are done at the UNU-KEY level of detail, allowing for better data tracking and quality in the future. The sensitivity analysis carried out also demonstrated the robustness of the results when simulating changes in the coefficients used to convert Annex I or Annex III data into UNU-KEY data. When other coefficients were used in the conversion of POM in 10 categories to the UNU-KEYs, the outcomes deviated by only about 4 per cent.

The target can be set on the basis of WG calculations, but the actual achievement of the target for each individual Member State largely depends on proper enforcement and reporting of all on-going activities once the target is formulated (ideally, before the beginning of the reference year, synchronized with the collection of POM data) and the computation of the achievement rate is done last.

7.3 Individual targets for collection categories

Analysis shows that setting individual collection targets for each category of EEE set out in Annex III to Directive 2012/19/EU could lead to environmental and economic benefits, while maintaining the overall costs for collection and treatment, when stakeholders are reporting according to the new collection categories of Annex III (plus PV as a separate flow).

Individual targets could work when based on WG, rather than on POM, as WG better reflects the specific dynamics of each Member State. For those reasons, if assigned on the basis of POM, individual targets should be set tailored to each Member State.

Individual collection targets could increase the collection of specific categories (lamps, small equipment and small IT). An increase in collection of those categories could lead to decrease of net treatment costs (mainly due to the impact of small equipment and small IT) and an increase in the potential recovery of materials with higher economic value and environmental relevance, particularly those contained in those waste streams.

Achievement of such economic and environmental benefits cannot be decoupled from the development of suitable technologies to increase the effectiveness of recovery. It also requires a proper channelling and monitoring system so that the relevant fractions are handled by those recyclers that have the technical capability to maximize such environmental and economic benefits along the recycling chain.

While the introduction of individual collection targets may lead to environmental and economic benefits, it is difficult to assess the feasibility of such targets at EU level . Conditions vary across Member States, and in a context where there are significant efforts to be made by Member States in reaching the general target set out in Directive 2012/19/EU, introducing mandatory individual targets at EU level may therefore be counterproductive. In addition, it will lead to a significant administrative burden due to the necessary revision of the WEEE Directive and change in reporting process. It is therefore not recommended to introduce individual collection targets in the WEEE Directive. Nevertheless, Member States, at national level, can set individual targets, on a voluntary basis as a method/ mesure in order to achieve the general collection target set out in the Directive. The analysis presented in this report provides preliminary guidance for those Member States who consider setting such targets.

7.4 Derogations for targets and change of the target

The study’s analysis showed that it is challenging to reach the target, and even unfeasible for some Member States, if the current pace is maintained. Regardless of the individual decision, extending the deadline and decreasing of the collection target will both result in a decrease of WEEE to be collected in 2019. This means that some of the environmental benefits of collecting, treating and recycling most of the WG will decrease. In addition, this also comes with an important potential loss of resources and revenue from failing to recycle valuable materials.

The main difficulties reported by Member States and key stakeholders are linked to the current high rate of unaccounted collection, which is further amplified by the limited enforcement and monitoring capabilities of Member States. Those two interlinked difficulties may seriously hamper Member States’ ability to achieve the target or to demonstrate the real amount of WEEE collected in their territory.

With the information available, it is impossible to recommend additional derogation or a revision of the collection target, but it is instead recommended to analyse the WEEE flows of each Member State in greater detail, so as to improve the tracking of all the flows handled.

By analysing destinations of WEEE that is not collected in each Member State, and the potential capture of this WEEE, one could better assess the feasibility of reaching the target for each Member State.

7.5 Reporting all WEEE collected

Various economic operators can collect WG. Experiences of past years in enforcing the WEEE Directive show that not only producer's Compliance Schemes and their contracted recyclers, active across the EU, have access to waste generated. In many cases, other economic operators have access to the waste, and they treat it.

In some cases, those quantities might be processed by waste operators but mislabelled as metal (or sometimes plastic) scrap and thus not identified in that Member State's general WEEE statistics.

Illegal treatment (or shipment) is more cumbersome to measure and track directly due to its nature, but a share of WG might also end up in generally-collected waste (the waste bin). This fraction is most likely incinerated or landfilled without material recycling, depending on the waste management infrastructure in the country. The fraction of WEEE generally disposed of may vary from county to country. The amount can be estimated by sorting analysis of the generally-collected waste, which is sometimes performed by national governments or municipalities.

In practice, WG can be handled "outside the waste framework", particularly in those cases where the value or the potential second-market for the disposed equipment is high.

All these elements need to be specifically traced by individual Member States to ensure that the reported figures reflect the real collection and treatment of WG and to identify where the potential for improvement lies. For these reasons, a consolidated and common reporting framework for WG needs to be developed and adopted accordingly by the stakeholders involved:

- WEEE Generated needs to be calculated annually, on the basis of last POM data available.
- Amount of WEEE collected by different economic operators (Compliance Schemes, Recyclers and other player authorised to handle WEEE), including appliances that are prepared for reuse needs to be tracked.
- Amount of EEE exported for reuse needs to be tracked as well, as it represents appliances leaving the internal market of the Member States and could help in preventing illegal exports. A consistent and common approach should also take into account the future results of the study launched by the Commission on recycling and recovery targets.
- Estimations of WEEE in waste bin should be improved using sorting analysis of residual household waste and should serve as an instrument to target specific awareness raising activities.

  Estimation of WEEE collected as metal/plastic scrap should also serve as a basis for the strengthening of the enforcement efforts channelling WEEE collected to the proper recyclers adopting technologies and processes compliant with applicable standards

Abbreviations

BAT	Best Available Techniques
BIO	BIO Intelligence Service by Deloitte
CBS	Statistics Netherlands
CN	Combined Nomenclature (statistics on imported and exported goods)
CRT	Cathode Ray Tube
EEA	European Economic Area
EEE	Electrical and Electronic Equipment
EoL	End-of-Life
GDP	Gross Domestic Product
IOA	Input-Output Analysis
IT	Information Technology
LCD	Liquid-crystal Display
LED	Light-emitting Diode
POM	Placed on the Market
PPP	Purchasing Power Parity
PRODCOM	Community Production (statistics on the production of manufactured goods)
PV	Photovoltaics
R&D	Research and Development
REC	Regional Environmental Center
TAC	Technical Adaptation Committee
UNU	United Nations University
UNU-KEY	Classification of Electrical and Electronic Equipment by UNU
WEEE	Waste Electrical and Electronic Equipment
WG	WEEE generated

Country Abbreviations

AT	Austria
BE	Belgium
BG	Bulgaria
CH	Switzerland
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
ES	Spain
EE	Estonia
FI	Finland
FR	France
UK	United Kingdom of Great Britain and Northern Ireland
EL	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IS	Iceland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
FYROM	The former Yugoslav Republic of Macedonia

MT	Malta
ME	Montenegro
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
RS	Serbia
SK	Slovakia
SI	Slovenia
SE	Sweden
TR	Turkey

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9 Annexes

9.1 UNU-KEYs and CN Links

UNU KEY	CN Code	Description	Note
0001	84031010	Central heating boilers, non-electric, of cast iron (excl. vapour generating boilers and superheated water boilers of heading 8402)	Non electric central heaters contact electric parts, and are therefore considered to be EEE
0001	84031090	Central heating boilers, non-electric (excl. of cast iron, and vapour generating boilers and superheated water boilers of heading 8402)	Non electric central heaters contact electric parts, and are therefore considered to be EEE
0002		PV Panels	No specific codes are actually defined. Data can be retrieved from Installed capacity.
0101	84511000	Dry-cleaning machines for made-up textile articles	
0101	84513000	Ironing machines and presses, incl. fusing presses (excl. calendars)	
0102	84221100	Dishwashing machines of the household type	
0103	85166010	Electric cookers incorporating at least an oven and a hob, for domestic use	
0103	85166080	Electric ovens for building in, for domestic use	
0104	84501111	Fully-automatic household or laundry-type front-loading washing machines, of a dry linen capacity <= 6 kg	Corresponding PRO DCOM code links to multiple UNU-KEYS
0104	84501119	Fully-automatic household or laundry-type top-loading washing machines, of a dry linen capacity <= 6 kg	Corresponding PRO DCOM code links to multiple UNU-KEYS
0104	84501190	Fully-automatic household or laundry-type washing machines, of a dry linen capacity > 6 kg but <= 10 kg	Corresponding PRO DCOM code links to multiple UNU-KEYS
0104	84501200	Household or laundry-type washing machines, with built-in centrifugal drier (excl. fully-automatic machines)	
0104	84501900	Household or laundry-type washing machines, of a dry linen capacity <= 6 kg (excl. fully-automatic machines and washing machines with built-in centrifugal drier)	
0104	84502000	Laundry-type washing machines, of a dry linen capacity > 10 kg	

UNU KEY	CN Code	Description	Note
0105	84211200	Centrifugal clothes-dryers	
0105	84512100	Drying machines, of a dry linen capacity <= 10 kg (excl. centrifugal driers)	Corresponding PRODCOM code links to multiple UNU-KEYS
0105	84512900	Drying machines for textile yarns, fabrics or made-up textile articles (excl. machines of a dry linen capacity <= 10 kg and centrifugal driers)	
0106	84146000	Hoods incorporating a fan, whether or not fitted with filters, having a maximum horizontal side <= 120 cm	
0106	85162100	Electric storage heating radiators, for space-heating	
0106	85162910	Liquid filled electric radiators, for space-heating and soil-heating	
0106	85162950	Electric convection heaters, for space-heating and soil-heating	
0106	85162991	Electric space-heating and soil-heating apparatus, with built-in fan (excl. storage heating radiators)	
0106	85162999	Electric space-heating and soil-heating apparatus, without built-in fan (excl. convection heaters and liquid-filled radiators)	
0108	84181020	Combined refrigerator-freezers, of a capacity > 340 l, fitted with separate external doors	
0108	84181080	Combined refrigerator-freezers, of a capacity <= 340 l, fitted with separate external doors	
0108	84182110	Household refrigerators, compression-type, of a capacity > 340 l	
0108	84182151	Household refrigerators, compression-type, table model	
0108	84182159	Household refrigerators, compression-type, building-in type	
0108	84182191	Household refrigerators compression-type, of a capacity <= 250 l (excl. table models and building-in types)	
0108	84182199	Household refrigerators, compression-type, of a capacity > 250 l but <= 340 l (excl. table models and building-in types)	
0108	84182900	Household refrigerators, absorption-type	
0109	84183020	Freezers of the chest type, of a capacity <= 400 l	
0109	84183080	Freezers of the chest type, of a capacity > 400 l but <= 800 l	
0109	84184020	Freezers of the upright type, of a capacity <= 250 l	
0109	84184080	Freezers of the upright type, of a capacity > 250 l but <= 900 l	

UNU KEY	CN Code	Description	Note
0111	84151010	Window or wall air conditioning machines, self-contained	
0111	84151090	Window or wall air conditioning machines "split-system"	
0111	84158100	Air conditioning machines incorporating a refrigerating unit and a valve for reversal of the cooling-heat cycle "reversible heat pumps" (excl. of a kind used for persons in motor vehicles and self-contained or "split-system" window or wall air conditioning	
0111	84158200	Air conditioning machines incorporating a refrigerating unit but without a valve for reversal of the cooling-heat cycle (excl. of a kind used for persons in motor vehicles, and self-contained or "split-system" window or wall air conditioning machines)	
0112	84186100	Heat pumps (excl. air conditioning machines of heading 8415)	
0113	84158300	Air conditioning machines comprising a motor-driven fan, not incorporating a refrigerating unit but incorporating elements for changing the temperature and humidity (excl. of a kind used for persons in motor vehicles, and self-contained or "split-system"	
0113	84185011	Refrigerated show-cases and counters, with a refrigerating unit or evaporator, for frozen food storage	
0113	84185019	Refrigerated show-cases and counters, with a refrigerating unit or evaporator, for non-frozen food storage	
0113	84185090	Refrigerating furniture with a refrigerating unit or evaporator (excl. combined refrigerator-freezers, with separate external doors, household refrigerators, refrigerated show-cases and counters)	
0114	85165000	Microwave ovens	
0201	63011000	Electric blankets of all types of textile materials	
0201	84145100	Table, floor, wall, window, ceiling or roof fans, with a self-contained electric motor of an output <= 125 W	
0201	84231010	Household scales (excl. personal weighing machines and baby scales)	
0201	84231090	Personal weighing machines, incl. baby scales	
0201	84521011	Sewing machines "lock-stitch only" of the household type, with heads weighing <= 16 kg without motor or <= 17 kg with motor, having a value "not incl. frames,	

UNU KEY	CN Code	Description	Note
		tables or furniture" of > € 65 each	
0201	84521019	Sewing machines "lock-stitch only" of the household type, with heads weighing <= 16 kg without motor or <= 17 kg with motor, having a value "not incl. frames, tables or furniture" of <= € 65; heads for these machines, weighing <= 16 kg without motor or <=	
0201	84521090	Sewing machines and heads, of the household type (excl. lock-stitch sewing machines with heads weighing <= 16 kg without motor or <= 17 kg with motor and heads weighing <= 16 kg without motor or <= 17 kg with motor)	
0201	85098000	Electromechanical domestic appliances, with self-contained electric motor (excl. vacuum cleaners, dry and wet vacuum cleaners, food grinders and mixers, fruit or vegetable juice extractors, and hair-removing appliances)	
0201	85164000	Electric smoothing irons	
0201	91011100	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, electrically operated, with mechanical display only (excl. with backs made of steel)	
0201	91011900	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, electrically operated, with opto-electronic display and with combined mechanical and opto-electronic display (excl. with backs made o	
0201	91012100	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, with automatic winding (excl. with backs made of steel)	
0201	91012900	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, with hand winding only (excl. with backs made of steel)	
0201	91019100	Pocket-watches and the like, incl. stop-watches, of precious metal or of metal clad with precious metal, electrically operated (excl. with backs made of steel and wrist-watches)	

UNU KEY	CN Code	Description	Note
0201	91019900	Pocket-watches and the like, incl. stop-watches, of precious metal or of metal clad with precious metal, with hand or automatic winding (excl. with backs made of steel and wrist-watches)	
0201	91021100	Wrist-watches, whether or not incorporating a stop-watch facility, electrically operated, with mechanical display only (excl. of precious metal or of metal clad with precious metal)	
0201	91021200	Wrist-watches, whether or not incorporating a stop-watch facility, electrically operated, with opto-electronic display only (excl. of precious metal or of metal clad with precious metal)	
0201	91021900	Wrist-watches, whether or not incorporating a stop-watch facility, electrically operated, with combined mechanical and opto-electronic display (excl. of precious metal or of metal clad with precious metal)	
0201	91022900	Wrist-watches, whether or not incorporating a stop-watch facility, with hand winding only (excl. of precious metal or of metal clad with precious metal)	
0201	91029100	Pocket-watches and the like, incl. stop-watches, electrically operated (excl. of precious metal or of metal clad with precious metal)	
0201	91059100	Clocks, electrically operated (excl. wrist-watches, pocket-watches and other watches of heading 9101 or 9102, clocks with watch movements of heading 9103, instrument panel clocks and the like of heading 9104, alarm clocks and wall clocks)	
0201	91070000	Time switches with clock or watch movement or with synchronous motor	
0201	91081100	Watch movements, complete and assembled, electrically operated, with mechanical display only or with a device to which a mechanical display can be incorporated	
0201	91081200	Watch movements, complete and assembled, electrically operated, with opto-electronic display only	
0201	91081900	Watch movements, complete and assembled, electrically operated, with combined opto-electronic and mechanical display, whether or not with dial and hands	
0201	91082000	Watch movements, complete and	

UNU KEY	CN Code	Description	Note
		assembled, with automatic winding	
0201	91091000	Clock movements, complete and assembled, electrically operated (excl. watch movements)	
0202	85094000	Domestic food grinders and mixers and fruit or vegetable juice extractors, with self-contained electric motor	
0202	85166050	Electric cooking plates, boiling rings and hobs, for domestic use	
0202	85166070	Electric grillers and roasters, for domestic use	
0202	85166090	Electric ovens, for domestic use (excl. space-heating stoves, electric cookers incorporating at least an oven and a hob, microwave ovens and electric ovens for building in)	
0202	85167200	Electric toasters, for domestic use	
0202	85167920	Electric deep fat fryers, for domestic use	
0202	85167970	Electro-thermic appliances, for domestic use (excl. hairdressing appliances and hand dryers, space-heating and soil-heating apparatus, water heaters, immersion heaters, smoothing irons, microwave ovens, ovens, cookers, cooking plates, boiling rings, grill	
0203	85161011	Electric instantaneous water heaters	
0203	85161080	Electric water heaters and immersion heaters (excl. instantaneous water heaters)	
0203	85167100	Electro-thermic coffee or tea makers, for domestic use	
0204	85081100	Vacuum cleaners, incl. dry cleaners and wet vacuum cleaners, with self-contained electric motor, power <= 1 500 W and having a dust bag or other receptacle capacity <= 20 l	
0204	85081900	Vacuum cleaners, incl. dry cleaners and wet vacuum cleaners, with self-contained electric motor (excl. of a power <= 1 500 W and having a dust bag or other receptacle capacity <= 20 l)	
0204	85086000	Vacuum cleaners, incl. dry cleaners and wet vacuum cleaners (excl. with self-contained electric motor)	
0205	85101000	Shavers, electric	
0205	85102000	Hair clippers with self-contained electric motor	
0205	85103000	Hair-removing appliances with self-contained electric motor	
0205	85163100	Electric hairdryers	

UNU KEY	CN Code	Description	Note
0205	85163200	Electro-thermic hairdressing apparatus (excl. hairdryers)	
0205	85163300	Electric hand-drying apparatus	
0301	84690010	Word-processing machines (excl. automatic data-processing machines and units thereof of heading 8443 and laser, thermal and electrosensitive printers)	
0301	84690091	Typewriters, electric (excl. units for automatic data-processing machines of heading 8443 and laser, thermal and electrosensitive printers)	
0301	84701000	Electronic calculators capable of operation without an external source of electric power and pocket-size "dimensions <= 170 mm x 100 mm x 45 mm" data recording, reproducing and displaying machines with calculating functions	
0301	84702100	Electronic calculating machines incorporating a printing device, with mains connection (excl. data-processing machines of heading 8471)	
0301	84702900	Electronic calculating machines not incorporating a printing device, with mains connection (excl. data-processing machines of heading 8471)	
0301	84716060	Keyboards for automatic data-processing machines, whether or not containing storage units in the same housing	
0301	84716070	Input or output units for automatic data-processing machines, whether or not containing storage units in the same housing (excl. keyboards)	
0301	84717020	Central storage units for automatic data-processing machines	
0301	84717030	Disk storage units for automatic data-processing machines, optical, incl. magneto-optical "e.g. CD-ROM drives" (excl. central storage units)	
0301	84717050	Hard disk storage drives for automatic data-processing machines, neither optical nor magneto-optical (excl. central storage units)	
0301	84717070	Disk storage units for automatic data-processing machines, neither optical nor magneto-optical (excl. hard disk storage drives and central storage units)	
0301	84717080	Magnetic tape storage units for automatic data-processing machines (excl. central storage units)	
0301	84717098	Storage units for automatic data-processing machines (excl. disk, magnetic	

UNU KEY	CN Code	Description	Note
		tape and central storage units)	
0301	84718000	Units for automatic data-processing machines (excl. processing units, input or output units and storage units)	
0301	84719000	Magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, n.e.s.	
0301	85437010	Electrical machines with translation or dictionary functions	Corresponding PRO DCOM code links to multiple UNU-KEYS
0302	84714100	Data-processing machines, automatic, comprising in the same housing at least a central processing unit, and one input unit and one output unit, whether or not combined (excl. portable weighing <= 10 kg and excl. those presented in the form of systems and	
0302	84714900	Data-processing machines, automatic, presented in the form of systems "comprising at least a central processing unit, one input unit and one output unit" (excl. portable weighing <= 10 kg and excl. peripheral units)	
0302	84715000	Processing units for automatic data-processing machines, whether or not containing in the same housing one or two of the following types of unit: storage units, input units, output units (excl. those of heading 8471.41 or 8471.49 and excl. peripheral unit	
0303	84713000	Data-processing machines, automatic, portable, weighing <= 10 kg, consisting of at least a central processing unit, a keyboard and a display (excl. peripheral units)	
0304	84433120	Machines having digital copying as principal function, where the copying is performed by scanning the original and printing the copies by means of an electrostatic print engine, capable of connecting to an automatic data processing machine or to a network	
0304	84433180	Machines which perform two or more of the functions of printing, copying or facsimile transmission, capable of connecting to an automatic data processing machine or to a network (excl. those having digital copying as principal function, where the copying	

UNU KEY	CN Code	Description	Note
0304	84433210	Printers capable of connecting to an automatic data processing machine or to a network	
0304	84433230	Facsimile machines capable of connecting to an automatic data processing machine or to a network	
0304	84433291	Machines only performing a copying function by scanning the original and printing the copies by means of an electrostatic print engine capable of connecting to an automatic data processing machine or to a network	
0304	84433293	Machines only performing a copying function incorporating an optical system capable of connecting to an automatic data processing machine or to a network (excl. those performing a copying function by scanning the original and printing the copies by means	
0304	84433299	Machines only performing a copying function incorporating a non-optical system capable of connecting to an automatic data processing machine or to a network	
0305	85171100	Line telephone sets with cordless handsets	
0305	85171800	Telephone sets (excl. line telephone sets with cordless handsets and telephones for cellular networks or for other wireless networks)	
0305	85176910	Videophones	
0305	85176931	Portable receivers for calling, alerting or paging	
0305	85176939	Reception apparatus for radio-telephony or radio-telegraphy (excl. portable receivers for calling, alerting or paging)	
0305	90304000	Instruments and apparatus for measuring or checking electrical quantities, specifically for telecommunications, e.g. cross-talk meters, gain measuring instruments, distortion factor meters, psophometers	
0306	85171200	Telephones for cellular networks "mobile telephones" or for other wireless networks	
0306	85176100	Base stations of apparatus for the transmission or reception of voice, images or other data	
0306	85176920	Entry-phone systems	

UNU KEY	CN Code	Description	Note
0306	85176990	Apparatus for the transmission or reception of voice, images or other data, incl. apparatus for communication in a wired or wireless network [such as a local or wide area network] (excl. telephone sets, telephones for cellular networks or for other wireless	
0306	85195000	Telephone answering machines	
0307	84431200	Offset printing machinery, sheet fed [office type], using sheets of a side <= 22 x 36 cm in the unfolded state	
0307	84433910	Machines performing a copying function by scanning the original and printing the copies by means of an electrostatic print engine (excl. those capable of connecting to an automatic data processing machine or to a network)	
0307	84433931	Machines performing a copying function incorporating an optical system (excl. capable of connecting to an automatic data processing machine or to a network and those performing a copying function by scanning the original and printing the copies by means o	
0307	84433939	Machines only performing a copying function incorporating a non-optical system (excl. capable of connecting to an automatic data processing machine or to a network)	
0307	84705000	Cash registers incorporating a calculating device	Corresponding PRODCOM code links to multiple UNU-KEYS
0307	84709000	Accounting machines, postage-franking machines, ticket-issuing machines and similar machines, incorporating a calculating device (excl. calculating machine, cash registers and automatic vending machines)	Corresponding PRODCOM code links to multiple UNU-KEYS
0308	85284100	Cathode-ray tube monitors of a kind solely or principally used in an automatic data-processing machine of heading 8471	Corresponding PRODCOM code links to multiple UNU-KEYS
0308	85284910	Cathode-ray tube monitors, black and white or other monochrome, not incorporating television reception apparatus (excl. of a kind solely or principally used in an automatic data-processing machine of heading 8471)	
0308	85284980	Cathode-ray tube monitors, colour, not incorporating television reception apparatus (excl. of a kind solely or principally used in an automatic data-processing system of heading 8471)	

UNU KEY	CN Code	Description	Note
0308	85285910	Monitors, black and white or other monochrome, not incorporating television reception apparatus (excl. with cathode ray tube and those of a kind solely or principally used in an automatic data-processing machine of heading 8471)	
0309	85285100	Monitors of a kind solely or principally used in an automatic data-processing machine of heading 8471 (excl. with cathode ray tube)	Corresponding PRO DCOM code links to multiple UNU-KEYS
0309	85285940	Monitors, colour, not incorporating television reception apparatus, with LCD screen (excl. those of a kind solely or principally used in an automatic data-processing system of heading 8471)	
0309	85285980	Monitors, colour, not incorporating television reception apparatus (excl. with LCD screen or cathode ray tube and those of a kind solely or principally used in an automatic data-processing system of heading 8471)	
0309	85312020	Indicator panels with light emitting diodes "LED" (excl. those of a kind used for motor vehicles, cycles or traffic signalling)	
0309	85312040	Indicator panels with matrix liquid crystal devices "LCD", active (excl. those of a kind used for motor vehicles, cycles or traffic signalling)	
0309	85312095	Indicator panels with liquid crystal devices "LCD" (excl. active matrix liquid crystal devices and those of a kind used for motor vehicles, cycles or traffic signalling)	
0401	85181030	Microphones having a frequency range of 300 Hz to 3,4 kHz, of a diameter <= 10 mm and a height <= 3 mm, of a kind used for telecommunications	
0401	85181095	Microphones and stands therefor (excl. microphones having a frequency range of 300 Hz to 3,4 kHz, of a diameter <= 10 mm and a height <= 3 mm, of a kind used for telecommunications, and cordless microphones with built-in transmitter)	
0401	85183020	Line telephone handsets, whether or not incorporating a microphone, and sets consisting of a microphone and one or more loudspeakers	
0401	85183095	Headphones and earphones, whether or not combined with microphone, and sets consisting of a microphone and one or more loudspeakers (excl. line telephone handsets, telephone sets, hearing aids	

UNU KEY	CN Code	Description	Note
		and helmets with built-in headphones, whether or not incorporated	
0402	85271210	Pocket-size radio cassette players [dimensions <= 170 mm x 100 mm x 45 mm], with an analogue and digital reading system, with built-in amplifier, without built-in loudspeakers, capable of being operated without an external source of power	
0402	85271290	Pocket-size radio cassette players [dimensions <= 170 mm x 100 mm x 45 mm], with built-in amplifier, without built-in loudspeakers, capable of being operated without an external source of power (excl. with analogue and digital reading system)	
0402	85271310	Radio-broadcast receivers capable of operating without an external source of power, combined with sound-reproducing apparatus with laser reading system (excl. pocket-size radio cassette players)	
0402	85271391	Cassette radios, capable of operating without an external source of power, combined with sound recording or reproducing apparatus, with an analogue and digital reading system (excl. pocket-size radio cassette players)	
0402	85271399	Radio-broadcast receivers capable of operating without an external source of power, combined with sound recording or reproducing apparatus (excl. pocket-size radio cassette players, with laser reading system and cassette decks with an analogue and digital	
0402	85271900	Radio-broadcast receivers capable of operating without an external source of power, not combined with sound-reproducing apparatus	
0402	85279111	Cassette radios, only mains-operated, with, in the same housing, one or more loudspeakers, combined with sound recording or reproducing apparatus with an analogue and digital reading system	
0402	85279119	Radio receivers, only mains-operated, with, in the same housing, one or more loudspeakers, combined with sound recording or reproducing apparatus (excl. cassette decks with an analogue and digital reading system)	

UNU KEY	CN Code	Description	Note
0402	85279135	Radio-broadcast receivers, for mains operation only, without built-in loudspeaker, combined with sound-reproducing apparatus with laser reading system (excl. those of a kind used in motor vehicles)	
0402	85279191	Cassette radios, only mains-operated, without built-in loudspeakers, combined with sound recording or reproducing apparatus with an analogue and digital reading system (excl. of a kind used in motor vehicles)	
0402	85279199	Radio receivers, only mains-operated, without built-in loudspeakers, combined with sound recording or reproducing apparatus (excl. with laser reading system, cassette decks with an analogue and digital reading system and equipment of a kind used in motor	
0402	85279210	Alarm clock radios, for mains operation only, not combined with sound recording or reproducing apparatus	
0402	85279290	Radio-broadcast receivers, for mains operation only, not combined with sound recording or reproducing apparatus but combined with a clock (excl. those of a kind used in motor vehicles and alarm clock radios)	
0402	85279900	Radio-broadcast receivers, for mains operation only, not combined with sound recording or reproducing apparatus and not combined with a clock (excl. those of a kind used in motor vehicles)	
0402	85198195	Sound recording or sound reproducing apparatus, using magnetic, optical or semiconductor media (excl. those operated by coins, banknotes, bank cards, tokens or by other means of payment, turntables, telephone answering machines, dictating machines and mag	
0403	84721000	Duplicating machines "hectograph or stencil" (excl. printing machines and photocopying or thermo-copying machines)	
0403	84723000	Machines for sorting or folding mail or for inserting mail in envelopes or bands, machines for opening, closing or sealing mail and machines for affixing or cancelling postage stamps	
0403	84729010	Coin-sorting, coin-counting or coin-wrapping machines	
0403	84729070	Office machines, n.e.s.	

UNU KEY	CN Code	Description	Note
0403	85176200	Machines for the reception, conversion and transmission or regeneration of voice, images or other data, incl. switching and routing apparatus (excl. telephone sets, telephones for cellular networks or for other wireless networks)	
0403	85184080	Audio-frequency electric amplifiers (excl. telephonic or measurement amplifiers)	
0403	85185000	Electric sound amplifier sets	
0403	85192010	Coin-operated or disc-operated record-players	
0403	85192091	Sound recording or sound reproducing apparatus, operated by coins, banknotes, bank cards, tokens or by other means of payment, with laser reading system (excl. coin-operated or disc-operated record-players)	
0403	85192099	Sound recording or sound reproducing apparatus, operated by coins, banknotes, bank cards, tokens or by other means of payment, without laser reading system (excl. coin-operated or disc-operated record-players)	
0403	85193000	Turntables "record-decks"	
0403	85198111	Transcribing machines "play only", incl. cassette-players, using magnetic, optical or semiconductor media, without sound recording device	
0403	85198115	Pocket-size cassette players "play only" [dimensions <= 170 mm x 100 mm x 45 mm], using magnetic, optical or semiconductor media, without sound recording device (excl. transcribing machines)	
0403	85198121	Cassette-tape players "play only" using magnetic, optical or semiconductor media, with an analogue and digital reading system, without sound recording device (excl. transcribing machines and pocket size)	
0403	85198125	Cassette-tape players "play only" using magnetic, optical or semiconductor media, without sound recording device (excl. players with an analogue and digital reading system, transcribing machines and pocket size)	
0403	85198131	Sound-reproducing apparatus with laser reading system "CD-players", of a kind used in motor vehicles, for discs of a diameter <= 6,5 cm, without sound recording device	

UNU KEY	CN Code	Description	Note
0403	85198135	Sound-reproducing apparatus with laser reading system "CD-players", without sound recording device (excl. of a kind used in motor vehicles for discs of a diameter <= 6,5 cm)	
0403	85198145	Sound-reproducing apparatus, using magnetic, optical or semiconductor media, without laser reading system, without sound recording device (excl. those operated by coins, banknotes, bank cards, tokens or by other means of payment, turntables, transcribing	
0403	85198151	Dictating machines using magnetic, optical or semiconductor media, incorporating sound reproducing apparatus, not capable of operating without an external source of power (excl. transcribing machines [play only])	
0403	85198155	Magnetic tape cassette recorders, with built-in amplifier and one or more built-in loudspeakers, capable of operating without an external source of power (excl. dictating machines)	Corresponding PRODCOM code links to multiple UNU-KEYS
0403	85198161	Magnetic tape cassette recorders, with built-in amplifier and one or more built-in loudspeakers, operating only with an external source of power	Corresponding PRODCOM code links to multiple UNU-KEYS
0403	85198165	Magnetic tape pocket size cassette recorders "dimensions <= 170 mm x 100 mm x 45 mm" incorporating sound reproducing apparatus (excl. those with built-in amplifier and one or more built-in loudspeakers)	Corresponding PRODCOM code links to multiple UNU-KEYS
0403	85198175	Magnetic tape cassette recorders incorporating sound reproducing apparatus (excl. those with built-in amplifier and one or more built-in loudspeakers and pocket-size)	Corresponding PRODCOM code links to multiple UNU-KEYS
0403	85198181	Magnetic tape recorders using magnetic tapes on reels, allowing sound recording or reproducing either at a single speed of 19 cm per second or at several speeds if those comprise only 19 cm per second and lower speeds	Corresponding PRODCOM code links to multiple UNU-KEYS
0403	85198185	Magnetic tape recorders incorporating sound reproducing apparatus (excl. those operated by coins, banknotes, bank cards, tokens or by other means of payment, telephone answering machines, dictating machines, cassette recorders and apparatus using magnetic	Corresponding PRODCOM code links to multiple UNU-KEYS

UNU KEY	CN Code	Description	Note
0403	85198911	Record players (excl. using magnetic, optical or semiconductor media record players operated by coins, banknotes, bank cards, tokens or by other means of payment)	
0403	85198915	Transcribing machines "play only", without sound recording device (excl. using magnetic, optical or semiconductor media)	
0403	85198919	Sound reproducing apparatus, without sound recording device (excl. using magnetic, optical or semiconductor media those operated by coins, banknotes, bank cards, tokens or by other means of payment, turntables, telephone answering machines, record players	
0403	85198990	Sound recording or sound reproducing apparatus (excl. using magnetic, optical or semiconductor media, those operated by coins, banknotes, bank cards, tokens or by other means of payment, turntables, telephone answering machines and sound reproducing apparatus	Corresponding PRODCOM code links to multiple UNU-KEYS
0403	85272120	Radio-broadcast receivers capable of receiving and decoding digital Radio Data System signals, of a kind used in motor vehicles, only capable of being operated with an external source of power, combined with sound recording or reproducing apparatus incorporated	
0403	85272152	Cassette-radio-broadcast receivers capable of receiving and decoding digital Radio Data System signals, of a kind used in motor vehicles, only capable of being operated with an external source of power, combined with sound recording or reproducing apparatus	
0403	85272159	Radio-broadcast receivers capable of receiving and decoding digital Radio Data System signals, of a kind used in motor vehicles, only capable of being operated with an external source of power, combined with sound recording or reproducing apparatus (excl.	
0403	85272170	Radio-broadcast receivers of a type used in motor vehicles, only capable of being operated with an external source of power, combined with sound recording or reproducing apparatus incorporating a laser reading system (excl. those capable of receiving and	

UNU KEY	CN Code	Description	Note
0403	85272192	Cassette-radio-broadcast receivers of a kind used in motor vehicles, only capable of being operated with an external source of power, combined with sound recording or reproducing apparatus incorporating an analogue and digital reading system (excl. those	
0403	85272198	Radio-broadcast receivers of a kind used in motor vehicles, only capable of being operated with an external source of power, combined with sound recording or reproducing apparatus (excl. sound-reproducing apparatus incorporating a laser reading system	
0403	85272900	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles, not combined with sound recording or reproducing apparatus	
0403	92071010	Keyboard organs, the sound of which is produced, or must be amplified, electrically	
0403	92071030	Digital pianos, with keyboard	
0403	92071050	Synthesisers with keyboard	
0403	92071080	Musical instruments, the sound of which is produced, or must be amplified, electrically, with keyboard (excl. organs, digital pianos, synthesisers and accordions)	
0403	92079010	Guitars, the sound of which is produced, or must be amplified, electrically	
0403	92079090	Accordions and musical instruments without keyboards, the sound of which is produced, or must be amplified, electrically (excl. guitars)	
0404	85211020	Video recording or reproducing apparatus, whether or not incorporating a video tuner, for magnetic tape of a width of <= 1,3 cm and allowing recording or reproduction at a tape speed of <= 50 mm/s (excl. video camera recorders)	
0404	85211095	Magnetic tape-type video recording or reproducing apparatus, whether or not incorporating a video tuner (excl. video camera recorders and those using magnetic tape of a width of <= 1,3 cm and allowing recording or reproduction at a tape speed of <= 50 mm/	
0404	85219000	Video recording or reproducing apparatus, whether or not incorporating a video tuner (excl. magnetic tape-type and video	

UNU KEY	CN Code	Description	Note
		camera recorders)	
0404	85256000	Transmission apparatus for radio-broadcasting or television, incorporating reception apparatus	
0404	85258011	Television cameras, with 3 or more camera tubes	
0404	85258019	Television cameras (excl. those with 3 or more camera tubes and video recorders)	
0404	85258091	Video camera recorders only able to record sound and images taken by the television camera	
0404	85258099	Video camera recorders able to record television programmes and sound and images taken by the television camera	
0404	85286100	Projectors of a kind solely or principally used in an automatic data-processing machine of heading 8471	Corresponding PRODCOM code links to multiple UNU-KEYS
0404	85286910	Projectors, operating by means of flat panel display [e.g. a liquid crystal device], capable of displaying digital information generated by an automatic data-processing machine	
0404	85286991	Projectors, black and white or other monochrome, not incorporating television reception apparatus (excl. of a kind solely or principally used in an automatic data-processing machine of heading 8471 and those operating by means of flat panel display	
0404	85286999	Projectors, colour, not incorporating television reception apparatus (excl. of a kind solely or principally used in an automatic data-processing machine of heading 8471 and those operating by means of flat panel display [e.g. a liquid crystal device]	
0404	90066100	Electronic discharge lamp flashlight apparatus for photographic purposes	
0404	90066900	Photographic flashlights and flashlight apparatus (excl. with electronic discharge lamps)	
0404	90071000	Cinematographic cameras	
0404	90072000	Cinematographic projectors	
0404	90085000	Image projectors, and photographic enlargers and reducers (excl. cinematographic and parts)	

UNU KEY	CN Code	Description	Note
0404	90101000	Apparatus and equipment for automatically developing photographic or cinematographic film or paper in rolls or for automatically exposing developed film to rolls of photographic paper	
0404	90105000	Apparatus and equipment for photographic or cinematographic laboratories, n.e.s.; negatoscopes	
0404	90106000	Projection screens	
0405	85182100	Single loudspeakers, mounted in their enclosures	
0405	85182200	Multiple loudspeakers, mounted in the same enclosure	
0406	85258030	Digital cameras	
0407	85287220	Reception apparatus for television, colour, incorporating a video recorder or reproducer	Corresponding PRODCOM code links to multiple UNU-KEYS
0407	85287300	Reception apparatus for television, black and white or other monochrome, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus, designed to incorporate a video display or screen	Corresponding PRODCOM code links to multiple UNU-KEYS
0408	85287299	"Reception apparatus for television, colour, with screen, with a screen width/height ratio >= 1,5 (excl. with integral tube or incorporating video recording or reproducing apparatus and monitors)"	
0408	85287291	"Reception apparatus for television, colour, with screen, with a screen width/height ratio < 1,5 (excl. with integral tube or incorporating video recording or reproducing apparatus and monitors)"	
0501	85131000	Portable electrical lamps designed to function by their own source of energy	
0501	85121000	Electric lighting or visual signalling equipment of a kind used for bicycles (other than lamps of heading 8539)	
0502	85393190	Discharge lamps, fluorescent, hot cathode (excl. with double ended cap)	
0503	85393110	Discharge lamps, fluorescent, hot cathode, with double ended cap	
0503	85394100	Arc lamps	
0503	85394900	Ultraviolet or infra-red lamps	
0504	85393220	Mercury or sodium vapour lamps	
0504	85393290	Metal halide lamps	
0504	85393900	Discharge lamps (excl. flourescent, hot	

UNU KEY	CN Code	Description	Note
		cathode lamps, mercury or sodium vapour lamps, metal halide lamps and ultraviolet lamps)	
0505			No clear codes exist
0506	94053000	Electric lighting sets of a kind used for Christmas trees	
0506	94051021	Electric ceiling or wall lighting fittings, of plastics, used with filament lamps	
0506	94051040	Electric ceiling or wall lighting fittings, of plastics or of ceramics (excl. of plastics if used with filament lamps)	Code could also be linked to UNU-KEY 0507
0506	94051050	Chandeliers and other electric ceiling or wall lighting fittings, of glass	
0506	94051091	Electric ceiling or wall lighting fittings, used with filament lamps (excl. lights of plastics, ceramics or glass)	Code could also be linked to UNU-KEY 0507
0506	94051098	Electric ceiling or wall lighting fittings, used with discharge lamps (excl. lights of plastics, ceramics or glass)	Code could also be linked to UNU-KEY 0507
0506	94052011	Electric table, desk, bedside or floor-standing lamps, of plastics, used for filament lamps	
0506	94052040	Electric table, desk, bedside or floor-standing lamps, of plastics or ceramic materials, used for discharge lamps	
0506	94052050	Electric table, desk, bedside or floor-standing lamps, of glass	
0506	94052091	Electric table, desk, bedside or floor-standing lamps, used with filament lamps (excl. of plastics, ceramics and glass)	
0506	94052099	Electric table, desk, bedside or floor-standing lamps, used with discharge lamps (excl. of plastics, ceramics and glass)	
0506	94054031	Electric lamps and lighting fittings, of plastics, used with filament lamps, n.e.s.	Code could also be linked to UNU-KEY 0507
0506	94054035	Electric lamps and lighting fittings, of plastics, used with tubular fluorescent lamps, n.e.s.	Code could also be linked to UNU-KEY 0507
0506	94054039	Electric lamps and lighting fittings, of plastics, n.e.s.	Code could also be linked to UNU-KEY 0507
0506	94054091	Electric lamps and lighting fittings, used with filament lamps, n.e.s. (excl. of plastics)	Code could also be linked to UNU-KEY 0507
0506	94054095	Electric lamps and lighting fittings, used with tubular fluorescent lamps, n.e.s. (excl. of plastics)	Code could also be linked to UNU-KEY 0507
0506	94054099	Electric lamps and lighting fittings, n.e.s. (excl. of plastics)	Code could also be linked to UNU-KEY

UNU KEY	CN Code	Description	Note
			0507
0507	94054010	Electric searchlights and spotlights (excl. for aircraft, motor vehicles or bicycles, and searchlight lamps)	
0601	84331110	Electric motor mowers for lawns, parks or sports grounds, with the cutting device rotating in a horizontal plane	
0601	84331910	Electric motor mowers for lawns, parks or sports grounds, with the cutting device rotating in a vertical plane or with cutter bars	
0602	84672110	Drills of all kinds for working in the hand, with self-contained electric motor capable of operation without an external source of power	
0602	84672191	Electro pneumatic drills of all kinds for working in the hand	
0602	84672199	Drills of all kinds for working in the hand, with self-contained electric motor operating with an external source of power (excl. electro pneumatic drills)	
0602	84672210	Chainsaws for working in the hand, with self-contained electric motor	
0602	84672230	Circular saws for working in the hand, with self-contained electric motor	
0602	84672290	Saws for working in the hand, with self-contained electric motor (excl. chainsaws and circular saws)	
0602	84672920	Electromechanical tools for working in the hand, with self-contained electric motor capable of operation without an external source of power (excl. saws and drills)	
0602	84672951	Angle grinders for working in the hand, with self-contained electric motor, operating with an external source of power	
0602	84672953	Belt sanders for working in the hand, with self-contained electric motor, operating with an external source of power	
0602	84672959	Grinders and sanders, for working in the hand, with self-contained electric motor, operating with an external source of power (excl. angle grinders and belt sanders)	
0602	84672970	Planers for working in the hand, with self-contained electric motor, operating with an external source of power	
0602	84672980	Hedge trimmers and lawn edge cutters, for working in the hand, with self-contained electric motor operating with an external source of power	

UNU KEY	CN Code	Description	Note
0602	84672985	Electromechanical tools for working in the hand, with self-contained electric motor operating with an external source of power (excl. saws, drills, grinders, sanders, planers, hedge trimmers and lawn edge cutters)	
0602	85151100	Soldering irons and guns, electric	
0602	85151900	Brazing or soldering machines (excl. soldering irons and guns)	
0602	85152100	Fully or partly automatic machines for resistance welding of metals	
0602	85152900	Machines for resistance welding of metals, neither fully nor partly automatic	
0602	85153100	Fully or partly automatic machines for arc welding of metals, incl. plasma arc welding	
0602	85184030	Audio-frequency electric telephonic and measurement amplifiers	
0701	95030030	Electric trains, incl. tracks, signals and other accessories therefor; reduced-size "scale" model assembly kits	
0701	95030035	Construction sets and constructional toys, of plastics (excl. scale model assembly kits)	
0701	95030039	Construction sets and constructional toys (excl. of plastic and scale model assembly kits)	
0701	95049010	Electric car racing sets, having the character of competitive games	
0701	95030081	Toy weapons	
0701	95030079	Toys and models, incorporating a motor (excl. plastic, electric trains, scale model assembly kits, and toys representing animals, human or non-human creatures)	
0701	95030075	Plastic toys and models, incorporating a motor (excl. electric trains, scale model assembly kits, and toys representing animals, human or non-human creatures)	
0701	95030070	Toys, put up in sets or outfits (excl. electric trains, incl. accessories, scale model assembly kits, construction sets and constructional toys, and puzzles)	
0701	95030055	Toy musical instruments and apparatus	
0702	95045000	Video game consoles and machines (excl. operated by any means of payment)	
0703	85437050	Sunbeds, sunlamps and similar sun tanning equipment	
0801	90214000	Hearing aids (excl. parts and accessories)	
0802	90181100	Electro-cardiographs	

UNU KEY	CN Code	Description	Note
0802	90181200	Ultrasonic scanning apparatus	
0802	90181300	Magnetic resonance imaging apparatus	
0802	90181400	Scintigraphic apparatus	
0802	90181910	Electro-diagnostic monitoring apparatus for simultaneous monitoring of two or more physiological parameters	
0802	90181990	Electro-diagnostic apparatus, incl. apparatus for functional exploratory examination or for checking physiological parameters (excl. electro-cardiographs, ultrasonic scanning apparatus, magnetic resonance imaging apparatus, scintigraphic apparatus and mon	
0802	90184100	Dental drill engines, whether or not combined on a single base with other dental equipment	
0901	85311030	Burglar or fire alarms and similar apparatus, for use in buildings	
0901	85311095	Burglar or fire alarms and similar apparatus (excl. those for use in motor vehicles or buildings)	
0901	85318020	Electric sound or visual signalling apparatus, with flat panel display devices (excl. indicator panels with liquid crystal devices or light emitting diodes, burglar or fire alarms and similar apparatus and apparatus for cycles, motor vehicles and traffic	
0901	85318095	Electric sound or visual signalling apparatus (excl. with flat panel display devices, indicator panels with liquid crystal devices or light emitting diodes, burglar or fire alarms and similar apparatus and apparatus for cycles, motor vehicles and traffic	
0901	85437060	Electric fence energisers	Corresponding PRODCOM code links to multiple UNU-KEYS
0901	90158019	Electronic instruments and appliances used in geodesy, topography, hydrography or oceanography (excl. compasses, rangefinders, theodolites, tachymeters "tacheometers", levels and photogrammetrical surveying instruments and appliances)	
0901	90173000	Micrometers, callipers and gauges (excl. gauges without adjustable devices of subheading 9031.80)	
0901	90241011	Electronic machines and appliances for universal testing of mechanical properties	

UNU KEY	CN Code	Description	Note
		of metals or for tensile testing of metals	
0901	90241013	Electronic machines and appliances for testing the hardness of metals	
0901	90241019	Electronic machines and appliances for testing the mechanical properties of metals (excl. for universal, tensile or hardness testing)	
0901	90248011	Electronic machines and appliances for testing the mechanical properties of textiles, paper or paperboard	
0901	90248019	Electronic machines and appliances for testing the mechanical properties of materials (excl. metals, textiles, paper or paperboard)	
0901	90251920	Thermometers and pyrometers, not combined with other instruments, electronic	
0901	90258040	Hydrometers, areometers and similar floating instruments, hygrometers and psychrometers, whether or not combined with each other or with thermometers or barometers, electronic	
0901	90258080	Hydrometers, areometers and similar floating instruments, hygrometers and psychrometers, whether or not combined with each other or with thermometers or barometers, non-electronic	
0901	90261021	Electronic flow meters for measuring or checking the flow or level of liquids (excl. meters and regulators)	
0901	90261029	Electronic instruments and apparatus for measuring or checking the flow or level of liquids (excl. flow meters, meters and regulators)	
0901	90262020	Electronic instruments and apparatus for measuring or checking pressure of liquids or gases (excl. regulators)	
0901	90268020	Electronic instruments or apparatus for measuring or checking variables of liquids or gases, n.e.s.	
0901	90271010	Electronic gas or smoke analysis apparatus	
0901	90278011	Electronic pH meters, rH meters and other apparatus for measuring conductivity	
0901	90278013	Electronic apparatus and equipment for performing measurements of the physical properties of semiconductor materials or of LCD substrates or associated insulating or conductive layers during the semiconductor wafer production process	

UNU KEY	CN Code	Description	Note
		or the LCD production	
0901	90278017	Electronic instruments and apparatus for physical or chemical analysis or for measuring viscosity, porosity, expansion, surface tension or the like, or for measuring heat, sound or light, n.e.s.	
0901	90302091	Electronic oscilloscopes and oscillographs, without recording device (excl. cathode ray oscilloscopes and oscillographs)	
0901	90303310	Electronic instruments and apparatus for measuring or checking voltage, current, resistance or electrical power, without recording device (excl. multimeters, and oscilloscopes and oscillographs)	
0901	90308930	Electronic instruments and appliances for measuring or checking electrical quantities, without recording device, n.e.s.	
0901	90318032	Electronic instruments, apparatus and machines for inspecting semiconductor wafers or devices or for inspecting photomasks or reticles used in manufacturing semiconductor devices	
0901	90318034	Electronic instruments, apparatus and machines for measuring or checking geometrical quantities (excl. for inspecting semiconductor wafers or devices or for inspecting photomasks or reticles used in manufacturing semiconductor devices)	
0901	90318038	Electronic instruments, apparatus and machines for measuring or checking, n.e.s. in chapter 90	
0901	90321020	Electronic thermostats	
0902	90151010	Electronic rangefinders	
0902	90152010	Electronic theodolites and tachymeters "tacheometers"	
0902	90154010	Electronic photogrammetrical surveying instruments and appliances	
0902	90158011	Electronic meteorological, hydrological and geophysical instruments and apparatus (excl. compasses, rangefinders, theodolites, tachymeters "tacheometers", levels and photogrammetrical surveying instruments and appliances)	
1001	84762900	Automatic beverage-vending machines, without heating or refrigerating devices	

UNU KEY	CN Code	Description	Note
1001	84768900	Automatic goods-vending machines, without heating or refrigerating devices; money changing machines (excl. automatic beverage-vending machines)	
1002	84762100	Automatic beverage-vending machines incorporating heating or refrigerating devices	
1002	84768100	Automatic goods-vending machines incorporating heating or refrigerating devices (excl. automatic beverage-vending machines)	

Table 32: Correspondence table UNU-KEY CN in 2012.

9.2 Sales-lifespan detailed description

With this method, WG can be calculated from the historical EEE POM and lifespan parameters. In this model, the quantity of WG in a specific year is calculated by a collective sum of discarded products which were sold in all historical years (sales), multiplied by the appropriate lifespan distribution (lifespan distribution reflects the probability of a product batch being discarded over time).
The method is represented by the following formula:

$$W(n) = \sum_{t=t_0}^{n} POM(t) \cdot L^{(p)}(t,n)$$

Where (Melo 1999; Murakami et al. 2010; Oguchi et al. 2010):

- $W(n)$ is the quantity of generated e-waste in evaluation year n;
- $POM(t)$ is the product sales in any historical years t prior to year n;
- t_0 is the initial year that a product was put on the market;
- $L^{(p)}(t,n)$ is the discard-based lifespan profile for the batch of products sold in historical year t, which reflects its probable obsolescence rate in evaluation year n (discarded equipment in percentage to total sales in year n).

The following figure presents a simple illustration of the calculating mechanism of the selected method. The case is for calculating the WG for a specific product in year 2010. It is presumed that this type of product was initially put on the market in year 1990. Then the WG of obsolete products in 2010 is a cumulative sum of waste generated from all historical years. For a batch of products sold in one year, the amount of products that become waste is dependent on their use time. For instance, in the case of products sold in 1990, its WG will firstly increase to the peak until 1997, and then the WG will gradually slow down between 1998 and 2020. For every historical year before 2010, the corresponding products becoming obsolete are different in amount. Following the method, the total WG for this type of products in 2010 is a sum of obsolete amount that comes individually from each historical year during 1990 – 2010.

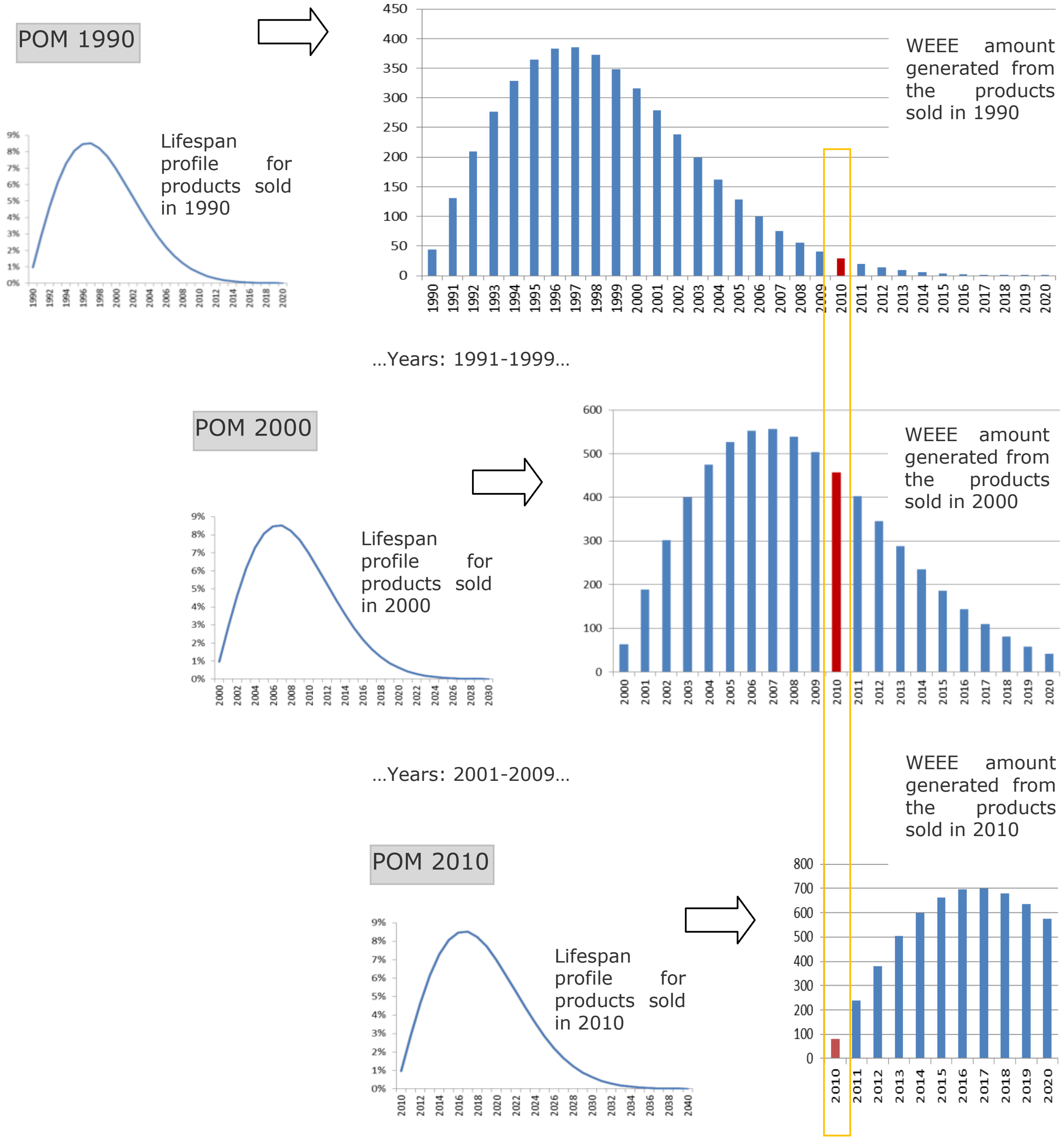

Figure 23: Illustration of the method for calculating the WG of 2010 for a specific product in this study.

From this figure, it is demonstrated that two important variables and datasets are required for computation:

- Continuous dataset of historical POM for a specific product, and
- Their corresponding lifespan profiles based on each historical sales year. The historical POM data are directly obtained from Chapter 3 of this study, and the following section explains the data source of lifespan.

The lifespan of a product takes the form of a probability distribution for a given population (Murakami et al. 2010). Due to social and technical developments, the lifespan of a product is time-dependent, so lifespan distributions have to be modelled for each historical sales year. In this study, the Weibull distribution function is applied to model the lifespan profile, defined by (van Schaik and Reuter 2004; Polák and Drápalová 2012) a time-varying shape parameter $\alpha(t)$ and a scale parameter $\beta(t)$:

$$L^{(p)}(t,n) = \frac{\alpha(t)}{\beta(t)^{\alpha(t)}}(n-t)^{\alpha(t)-1} e^{-[(n-t)/\beta(t)]^{\alpha(t)}}$$

In many cases, time-variant parameters of product lifespan are very difficult to obtain. Therefore, when the same lifespan parameters are applied over time, the distribution of product lifespan can be simplified into the following formula:

$$L^{(p)}(t,n) = \frac{\alpha}{\beta^{\alpha}}(n-t)^{\alpha-1} e^{-[(n-t)/\beta]^{\alpha}}$$

In Microsoft Excel, the Weibull Function is ready to use, it is expressed in the form of WEIBULL(x; alpha; beta; cumulative):

- "x" represents the length between the evaluation year and the year product is sold
- "alpha" is the shape parameter
- "beta" is the scale parameters
- When cumulative is set to "false", then the function is probability density function; and when it is set to "true", then it is accumulative density function.

In this study, lifespan data has been searched extensively from preliminary desktop research, including various literatures, consumer surveys, national WEEE projects, data from industrial association and expert interviews. However, the data is not widely available for all Member States under a harmonised measurement. Most lifespan data from the mentioned sources cannot be applied directly for this study for the following reasons:

- There are many definitions and interpretations related to product lifespan, and the scope and timeframe defining product lifespan differs per study. There is no uniform or consistent methodology to align them;
- In many cases, product lifespan is not expressed in a probabilistic manner (different obsolete rate over time); most studies simply use the "average lifespan" for products, such as 10 years for washing machines. This average lifespan cannot be applied in the selected method for calculating WG in the present study. In addition, the reliability of such data is usually low, due to unclear source and measurement method;
- Product lifespan is not available for all types of products;
- There are structural disadvantages from certain approaches to obtain lifespan data; lifespan data obtained from waste sampling in recycling facilities are not representative to reflect the overall waste streams. This is because usually, the products in the recycling facilities are the oldest appliances and have little reuse value. Lifespan obtained from the Delphi method (interview the expert or stakeholder) is potentially not objective.

For those reasons in past years, while carrying out detailed country assessment studies (Belgium, Italy, the Netherlands, and France) the UNU started creating lifespan profiles from consumer surveys with uniform methodology. The lifespan data from these four studies were obtained from national survey in households and business uses, with data validation from local expert and industrial partners (Huisman et al. 2012; Magalini et al. 2012; Wielenga et al. 2013).

In the present study, reference data have to be applied from the known country to the unknown country. This provides an initial value and result to generate the preliminary result of WG for each Member State. Future updates of lifespan profiles by individual

Member State can contribute to increase the accuracy of the results. A sensitivity analysis has been carried out to evaluate the impact of deviations in lifespan from the default values.
Countries with similar socioeconomic conditions are grouped into clusters (called "stratum"), and they are presumed to have the same lifespan parameters per UNU-KEY (Table 33).

	Purchasing Power rage (IMF 2013 data)	Countries
Stratum 1	> 35.784 Int$	AT NL IE SE BE DK DE UK FI FR LU CH NO IS LI
Stratum 2	23.068 - 30.289 Int$	ES SI CY EL CZ MT PT SK IT
Stratum 3	13.396 - 22.747 Int$	PL HU EE HR LT LV BG RO RS ME FYROM TR

Table 33: List of countries by stratum.

Lifespan for most UNU-KEYs are constant over time. Exceptions are made for a few UNU-KEYs where lifespan changes dramatically (such as CRT Monitors and TVs). Here, the lifespan data of 2007 is applied to replace the original time-dependent lifespan. It has been tested that the difference of WG is within 4 per cent if the France 2007 lifespan is used, compared to the result from using time-variant lifespan.
One exception is washing machines. From Eurostat, there is data available for penetration rates for most Member States during 2005 to 2011. It is assumed that most families have at most one washing machine per household, so that penetration rate can be easily converted into the total stock number of washing machines being stored in the household. With the historical POM data, the lifespan profile can be deduced by applying the Model 3-7 multivariate IOA (Wang et al. 2013).

UNU-KEY	Reference lifespan	Average deviation within the Stratum	Extreme margin compared to the reference data	
			Max	Min
Stratum 1	FRA 2007	13%	26,9%	-16,8%
Stratum 2	ITA 2007	7%	12,4%	-26,0%
Stratum 3	ITA 2007	14%	32,1%	-12,0%

Table 34: Disparity of average lifespan for washing machines in different stratum groups.

With the consideration from above, the following summarizes the lifespan data used for all Member States in this study.

UNU- KEY	0104 Washing machines	Product categories with dramatic lifespan changes[17]	Other UNU-keys
Stratum 1	Country-specific data	France time-dependent lifespan data	France lifespan data in 2007

[17] Product categories with dramatic lifespan changes in France include 0114; 0304; 0308; 0309; 0401; 0407; 0001; In Italy include 0102; 0105; 0114; 0201; 0407

Stratum 2		Italy time-dependent lifespan data	Italy lifespan data in 2007
Stratum 3			

Table 35: Overview of lifespan data used in the present study .

UNU- KEY	Countries	Other UNU-keys
Cold climate countries	AT, NL, IE, SE, BE, DK, DE, UK, FI, FR, LU, CH, NO, CZ, SK, PL, IS, LI, EE, LT, LV	France lifespan data in 2007
Hot climate countries	ES, SI, CY, EL, MT, PT, IT, HU, HR, BG, RO, RS, ME, FYROM, TR	Italy lifespan data in 2007

Table 36: Overview of lifespan data used in the present study for cooling and freezing equipment (UNU-KEYS 0108, 0109, 0111, 0112 and 0113).

9.3 Statistical routines for POM

9.3.1 Step 1 Estimating PRODCOM confidential

When retrieving data from EUROBASE, confidentiality restrictions on individual data may apply. Those confidentiality restrictions do not apply when individual statistical offices of the countries process data.

Confidential PRODCOM records are estimated using the international trade statistics. First, a number of manual corrections are being done; among those are about 150 unreliable values concerning the number of units in the PRODCOM for EU27 aggregate. There are also a number of manual corrections for the number of units produced in certain countries and a few concerning unreliable number of units exported.

The estimation of the confidential PRODCOM record are carried out in the following way:

- First, the ratio between units exported and units produced are calculated in case both values are not confidential for every PRODCOM code, country and year. For every PRODCOM code and country, the median of these ratios (all the years) is calculated. This median ratio is used to estimate confidential PRODCOM units: export units / ratio = PRODCOM units.
- Then, the same median values are calculated, but this time countries are assigned to 3 groups based on purchasing power (see Table 38). Values that could not have been estimated with the previous step are now being estimated based on the median ratio of the aggregated values of similar countries.
- As a final step, the estimated values are checked for reliability using the EU27 aggregate. If the sum of the estimated values is larger than the difference between the EU27 aggregate and the sum of the non-confidential values for the EU-27 countries, the estimated values are scaled downwards proportionally.

9.3.2 Step 2 Calculate the POM from statistical data

The historical POM data is calculated from the method of apparent consumption methodology. EEE POM in a territory can be calculated with the following equation:

POM = Domestic production + Import – Export

EEE relevant statistical codes (both PRODCOM and CN) have been compiled and uniquely assigned to a UNU-KEY.

9.3.3 Step 3 Data processing by statistical routines

The calculated EEE POM results from previous steps need further processing due to the presence of the following issues:

- POM for some products or years may be missing due to a lack of statistical records. Sometimes, only one year is missing, in other cases, two consecutive years are missing. Or in other examples, the whole time series is lacking.
- POM for some products may be unrealistic, such as a dramatic increase or decrease compared to neighbouring years, or negative sales, or incorrect due to mistakes in the original data.

Data gaps need to be filled in, and the potentially unrealistic data need to be corrected. The quality of POM data can be checked by both comparing the time-series for the same country over time, or by comparing with other EU Member States. Unrealistic data are identified when an individual value is too high (as high outlier) or too low (as low outlier). Such outliers need to be amended with more realistic data. This is a complex procedure where many steps need to be taken in order to complete this.

The following techniques are used to detect outliers and to estimate them with more realistic values. It should be noted that for each step, only a part of the missing values or outliers are detected. Thus all steps are needed, and the sequence of the steps is also important. This sequence is described in the paragraphs below with examples.

- Time-series analysis
  Checking the recent years around the missing data point can fill data gaps. Applying extrapolation or taking average of neighbouring years can create realistic estimation for the gap.
- Group comparison
  It is generally assumed that countries with similar economic levels have similar POM quantities. In this study, the countries are grouped into three strata, mainly according to their purchasing power. Statistical analysis of the consistency in time series in countries is checked for all countries within the scope of the study. The following content explains the detailed steps of both automatic correction and manual correction.
- Automatic corrections
  Remove unreliable data by comparing with other years from the same country and product category. The outlier detection is done using the median absolute deviation (MAD) method. For this outlier detection method, the median of the data (all years of a specific country and product category) is calculated. Then, the difference is calculated between each historical value and this median. These differences are expressed as their absolute values, and a new median is calculated of those absolute values. This is the MAD. If a value is four times the MAD away from the median of the data points, that value is classified as an outlier.
  The following example reveals that the sales for 2008 were identified as an outlier, since the deviation from the median was 1,92, which is larger than four times the MAD (0,43 in this example).

year	2005	2006	2007	2008	2009	2010	2011	median
POM in kg/inh	3,08	3,04	3,50	4,96	2,71	2,60	2,47	3,04
deviation from median	0,04	0,00	0,46	1,92	0,33	0,43	0,56	0,43
factor:	4							

lower threshold	1,30	(= 3,04 - 4 * 0,43)
upper threshold	4,78	(= 3,04 + 4 * 0,43)

Table 37: Example of outlier detection using the median absolute deviation (MAD) technique.

The value of 2008 (4,96) is regarded as an outlier as it exceeds the upper threshold of four times the median absolute deviation. There have to be at least six values for calculating the median. When there are less than six values, no outliers are being determined.

- Remove unreliable data by comparing data on a specific year and product category with other countries
  This outlier detection is also done using the MAD. The only difference is that the data from a specific year and product group is compared with data from similar countries (given by the stratum).
- Calculate years by using the average of other years.
  In case one year is missing (in original data or after removal of outliers) it is calculated with the average of the previous and following year.
  For instance, when 2007 was missing it will be calculated in the following way:

Year	2005	2006	2007	2008
POM in kg/inh	1,20	1,20	1,40	1,60

With two consecutive missing years a missing year gets two-thirds of the value of the adjacent year and one-third of the value of the year next to the other missing year.
For instance, when 2006 and 2007 were missing they will be calculated in the following way:

Year	2005	2006	2007	2008
POM in kg/inh	1,20	1,33	1,47	1,60

If the missing year is the last available year, then it is calculated by adding the difference of the two preceding years to the previous year. This way the trend of the previous two years is continued.
For instance, when 2012 (the last year for which we have data) is missing, they will be calculated in the following way:

Year	2009	2010	2011	2012
POM in kg/inh	1,30	1,40	1,70	2,00

- Calculate missing years by using the average of other similar countries
  First, the average kilos per inhabitant and average units per inhabitant are calculated for each stratum. Also the average purchasing power of each stratum is calculated (purchasing power per country multiplied with inhabitants of each country, then divided by total inhabitants in stratum).
  The purchasing power of the country with the missing data is also known. When the purchasing power is between the average of two strata, the missing value is calculated by taking the difference between the kilos/units per inhabitant of the higher stratum and the lower stratum. This will then be divided by the difference in purchasing power between the higher stratum and the lower stratum. After this, it will be multiplied with the difference in purchasing power between the country with the missing data and that of the

lower stratum. Finally, this outcome will be added to the average kilos/units per inhabitant of the lower stratum.
The following example demonstrates this procedure.

Country	A	B	C	D	E	F	stratum	lower stratum
purchasing power	19.500	21.928	22.028	23.193	18.023	21.344	21.307	17.480
kilo's per inhabitant	0,81	1,20	0,70	1,15	0,85	1,10	1,00	0,6

Table 38: Purchasing power for countries in the same stratum.

All countries A to F are from the same stratum. Country A had missing data. The average kilos per inhabitant for the stratum is 1,00 based on the known values from countries B to F. The average purchasing power is a weighted average using the number of inhabitants of each country.
The last column shows the averages for countries in the next lower stratum.
The calculation is as follows:
0,6 + (1,00 – 0,6) / (21.307 – 17.480) * (19.500 – 17.480) = 0,81
A value will be calculated based on the stratum average, but adjusted for its purchasing power. The country with the lowest purchasing power in this dataset is Romania. This country is used to adjust for the purchasing power for countries that have a purchasing power that lies between Romania and the average of the lowest stratum. The country with the highest purchasing power is Luxemburg. This country is used to adjust for the purchasing power of countries that have a purchasing power that lies between the average of the highest stratum and Luxemburg.

- Eliminate big changes between years

After the last calculations, there can be big changes from year to year. These are corrected in two ways.
The first check is to see if a specific outcome considering the kilos per inhabitant differs by more than 50 per cent from the previous year (t-1) while the previous year and the next year (t+1) don not differ more than 20 per cent. This is only done if the value that will possibly be corrected is higher than 0,3. Below this value, there is only little impact of the changes on the outcome of the collection categories.
The second check is to see whether a specific outcome is more than 20 per cent below the minimum of the two surrounding years and more than 40 per cent below the maximum value of those years. Also, if a specific outcome is more than 20 per cent higher than the maximum of the two surrounding years and more than 40 per cent higher than the minimum of those years. This check is not done if the value of year t+2 is within 20 per cent of the year that might be corrected. The reason for this is that in this case the year t+1 might be the one with an unreliable outcome. Just as the first check, the second check is only done if the value that will be corrected is higher than 0,3.
Once a check has had a positive outcome, the corresponding value will be deleted.
After this, the empty values will be again calculated in the same way as described in "Calculate years by using the average of other years" above. So they will be replaced by the average of surrounding years.
Sometimes, manual correcting is also used when external data sources are used to correct the data.

- Manual corrections

A number of manual corrections are being carried out. This is usually conducted after the automatic corrections. When there are a few years in a row with unreliable data, the automatic procedures cannot correct them. In this case, manual correct have to correct these unreliable records.
Some unreliable data is corrected using knowledge of the market. For instance, CRT TVs have not been sold in recent years, so they are set to 0; flat panel TVs were hardly sold before 2000, so they are set to 0 for that period.

9.3.4 Average weight per UNU-KEY

UNU-KEY	1995	2000	2005	2010	2011	2012
0001	34,7	32,3	30,9	30,9	30,9	28,1
0002	12,0	12,0	12,0	20,0	20,0	20,0
0101	59,9	57,0	52,7	49,5	50,0	48,9
0102	76,8	49,5	45,5	43,3	43,3	42,7
0103	47,3	47,8	45,4	47,7	47,7	45,9
0104	72,6	73,1	71,4	72,4	72,4	71,5
0105	59,6	46,9	43,2	45,9	46,0	43,5
0106	7,6	5,9	5,6	5,3	5,1	5,2
0107	No longer used					
0108	40,2	47,0	52,3	55,0	55,2	54,1
0109	50,6	44,1	43,9	44,1	44,1	43,3
0110	No longer used					
0111	33,4	47,3	26,6	26,6	26,6	25,2
0112	46,2	42,5	41,2	41,0	41,0	38,8
0113	162,3	99,0	109,0	90,2	92,8	90,5
0114	17,6	19,2	20,6	22,9	22,9	22,2
0201	0,8	0,9	0,8	0,8	0,9	0,8
0202	3,1	5,0	4,5	3,0	2,7	2,6
0203	1,8	2,7	1,3	2,8	2,9	2,8
0204	5,3	5,5	5,5	5,9	5,9	5,8
0205	0,7	0,6	0,5	0,5	0,5	0,5
0301	0,6	0,6	0,9	0,3	0,4	0,3
0302	15,0	10,2	9,2	8,8	8,8	8,8
0303	4,9	4,3	3,7	3,2	3,2	3,0
0304	7,8	8,3	9,1	10,3	10,3	10,0
0305	0,9	0,6	0,5	0,5	0,5	0,4

UNU-KEY	1995	2000	2005	2010	2011	2012
0306	0,6	0,2	0,1	0,1	0,1	0,1
0307	40,0	40,0	40,0	40,0	40,0	40,0
0308	22,8	17,9	19,4	22,0	22,0	13,0
0309	5,0	5,6	5,3	5,5	5,5	5,4
0401	0,4	0,4	0,4	0,4	0,4	0,4
0402	0,3	0,3	0,3	0,2	0,2	0,2
0403	3,3	3,3	2,3	3,4	3,5	3,4
0404	4,9	4,2	4,0	2,6	2,9	2,7
0405	3,4	2,9	2,4	2,1	2,1	2,1
0406	1,0	0,9	0,5	0,3	0,3	0,3
0407	27,8	28,8	28,4			
0408			12,0	14,7	14,7	14,3
0501	0,1	0,1	0,1	0,1	0,1	0,1
0502	0,1	0,1	0,1	0,1	0,1	0,1
0503	0,1	0,1	0,1	0,1	0,1	0,1
0504	0,1	0,1	0,1	0,1	0,1	0,1
0505				0,08	0,08	0,08
0506	0,6	0,5	0,5	0,5	0,5	0,5
0507	3,1	4,9	2,7	2,7	2,7	2,6
0601	16,7	15,9	15,2	15,2	15,2	14,4
0602	2,8	3,0	3,0	3,5	3,4	3,3
0701	0,5	0,5	0,5	0,5	0,5	0,5
0702	2,4	2,1	2,0	2,0	2,0	1,9
0703	52,0	52,0	52,0	52,0	52,0	52,0
0801	0,3	0,2	0,2	0,2	0,2	0,2
0802	67,1	67,1	67,1	67,1	67,1	67,1
0901	0,8	0,3	0,3	0,4	0,3	0,3
0902	8,5	6,2	5,5	5,5	5,5	5,4
1001	51,0	46,4	44,0	44,0	44,0	43,2
1002	166,0	93,8	92,2	92,2	92,2	90,6

Table 39: Average weight per UNU-KEY.

9.4 Operational costs per WEEE category

The table below presents the total costs and revenues from the collection and treatment of a 1 tonne of WEEE, per category of the 2012 Directive. These costs and revenues were obtained using the costs and revenues provided in the UNU 2008 Review of Directive 2002/96/EC on WEEE, per category of the 2002 Directive and for long running compliance schemes. These costs and revenues were allocated to the new 2012 categories using a conversion table based on UNU-KEYs.

The total costs of the table include:

- Transport and collection (incl. access to WEEE),
- Shredding, sorting, dismantling, pre-treatment,
- Incineration and landfill of non-recoverable materials,
- Recycling processes,
- Recovery processes, and
- Other costs

The revenues are the revenues gained by the recycler from the sale of materials after treatment.

The net treatment costs summarises the net costs of treating 1 tonne of WEEE for every category (operational costs-revenues from the sale of materials).

Category	Total costs €/t	Total Revenues €/t	Net treatment costs
Cat 1	975	413	562
Cat 2	1284	459	824
Cat 3	804	141	663
Cat 4 exc. PV	420	184	235
Cat 5	757	611	146
Cat 6	685	305	380
PV Panels (data 2011)	175	15	160

Table 40: Net treatment costs from WEEE Review study (2008).

Regarding PV panels, treatment costs were retrieved from the European Commission’s 2011 “study on photovoltaic panels supplementing the impact assessment for a recast of the WEEE Directive”. The study assessed the logistics costs associated with PV panels to 150€/t and treatment costs to 25€/t, based on the assumption that recyclers recover only the glass included in PV panels in 2011 on a voluntary basis. Revenue earned from the low quality glass recovered is estimated at 15€/t.

9.5 Material composition per WEEE categories

The table below presents the composition of WEEE, per category of the 2012 Directive. The composition of WEEE was retrieved from the UNU 2008 Review of Directive 2002/96/EC on WEEE, which provided the composition of WEEE per category of the 2002 Directive. This composition per WEEE category was converted into the new 2012 categories using a conversion table based on UNU-KEY.

Material	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	Cat 6
ABS	0,0	1.345,2	0,0	0,0	0,0	0,0
Ag	0,0	0,6	0,0	0,0	0,0	0,5
Al (general)	1.255,0	482,5	8,1	910,0	116,8	58,1
As	0,0	0,0	0,0	0,0	0,0	0,0
Au	0,0	0,1	0,0	0,0	0,0	0,1

Be	0,0	0,0	0,0	0,0	0,0	0,0
Bi	0,0	0,3	0,0	0,0	0,0	0,0
Br	0,0	2,4	0,0	0,0	0,1	1,5
Cd	0,0	0,0	0,0	0,0	0,6	0,2
Ceramics	0,0	244,0	0,5	37,6	7,4	20,1
Cl	0,0	0,3	0,0	0,0	0,3	0,0
Co	0,0	0,1	0,0	0,0	0,2	0,3
Cr	0,0	1,3	0,0	0,0	0,0	0,6
CRT-glass cone	0,0	1.110,2	0,0	0,0	0,0	0,0
CRT-glass screen	0,0	2.241,7	0,0	0,0	0,0	0,0
Cu	958,0	536,6	2,8	1.736,0	540,9	159,0
Epoxy	0,0	60,4	0,2	0,0	6,0	0,0
Fe	7.848,0	766,8	0,1	4,9	291,8	80,3
Fluorescent powder	0,0	0,0	2,4	0,0	0,0	0,0
Glass (white)	285,0	945,6	0,0	403,0	2,1	0,0
Glass (white - low quality)	0,0	0,0	9,9	0,0	0,0	0,0
Hg	0,0	0,0	0,0	0,0	0,0	0,0
Glass (white - high quality)	0,0	0,0	114,0	0,0	0,0	0,0
Glass (LCD)	0,0	131,4	0,0	0,0	0,1	4,0
Liquid Crystals	0,0	0,0	0,0	0,0	0,0	0,2
Mn	0,0	0,0	0,0	0,0	0,0	0,0
Ni	0,0	5,5	0,0	0,0	1,2	3,2
Oil	205,0	0,0	0,0	1,7	3,2	0,0
Other/inerts	420,0	263,0	0,0	11.920,0	55,6	80,1
other plastics	0,0	0,0	0,0	0,0	1,3	1,0
Pb	0,0	8,6	0,1	0,8	0,7	1,1
PCB	0,0	0,0	0,0	0,7	0,0	0,0
Pd	0,0	0,0	0,0	0,0	0,0	0,0
Plastics general	3.260,0	1.866,3	3,0	8.514,0	1.854,5	1.240,0
PE (HD)	0,0	159,0	0,0	0,0	0,0	0,0
PET	0,0	31,8	0,0	0,0	0,0	0,0
PS (polystyrene)	2.660,0	0,0	0,0	0,0	0,1	0,0
PUR	3.750,0	0,0	0,0	169,0	0,2	0,0
PVC	24,0	106,9	0,0	191,0	6,4	8,6
Sb	0,0	1,3	0,0	0,0	0,1	0,2
Sn	0,0	4,1	0,1	25,5	1,1	4,0
Stainless steel	1.000,0	0,0	0,5	907,0	107,3	51,5
Steel low alloyed	16.415,0	2.071,2	2,3	29.411,0	1.599,4	2.470,0
Cyclopentane	47,0	0,0	0,0	0,0	0,0	0,0
Isobutaan	11,0	0,0	0,0	0,0	0,0	0,0
CFC11	245,0	0,0	0,0	0,0	0,0	0,0
CFC12	97,2	0,0	0,0	0,0	0,0	0,0
Wood	0,0	70,3	0,0	0,0	110,5	0,0
Zn	0,0	10,9	0,0	7,7	1,3	4,0
Total [g]	**38.480**	**12.468**	**144**	**54.240**	**4.709**	**4.188**

Table 41: Average material composition per collection category.

The composition of PV panels was retrieved from the 2011 study on photovoltaic panels supplementing the impact assessment for a recast of the WEEE Directive. According to the study, Crystalline Silicone panels, expected to represent 87 per cent of waste panels generated in 2030, are composed of 74 per cent glass, 10 per cent aluminium, 0,3 per cent rare metals (mainly silver) and 16 per cent other inert materials.

9.6 Recoverability rates of materials included in WEEE

The recoverability rates used to calculate the amount of materials recoverable per category of WEEE are presented in the table below.

Components	Recoverability rate[18]
Fe	100%
Steel low alloyed	100%
Stainless steel	100%
Al	100%
Cu	100%
Cr	100%
Zn	100%
Glass	95%
PS	60%
PET	60%
ABS	60%
PE	60%
Ag	50%
Au	50%
Pd	50%
La	30%
Ce	30%
Y	30%
Tb	30%
Eu	30%
Others	0%

Table 42: Recoverability rates.

[18] Recoverability corresponds to the theoretical capacity of recycling the material.

9.7 Prices of recycled materials

The prices of materials that can be recycled from WEEE are presented in the table below. They were used to calculate the potential value of materials recoverable from WEEE.

Components	Resale price €/t	Source
Fe	282	Value for scrap ferrous, metalprices.com
Steel low alloyed	357	metalprices.com
Al	1.522	Metalprices.com
Stainless steel	1.016	Metalprices.com
Cu	5.320	Metalprices.com
Cr	1.584	Ferrochrome HC, metaprices.com
Zn	1.736	Metalprices.com
ABS	1.696	PIE Web
PS	971	PIE Web (HIPS)
PE	823	PIE Web (average of LDPE)
Glass	44	Eurostat : Price developments and volume trade of glass waste EU-28[19]
Ag	554.469	Metalprices.com, with Ag = 17,244 €/toz, and a toz = 31,10g
Au	34.288.199	Metalprices.com, with Au= 1,066.363 €/toz
Pd	18.065.627	Metalprices.com, with Pd= 561,841 €/toz
Lanthanum	6.621	Metalprices.com
Cerium	7.663	Metalprices.com
Yttrium	46.280	Metalprices.com
Terbium	594.643	Metalprices.com
Gadolinium	24.213	Metalprices.com
Europium	600.754	Metalprices.com

Table 43: Average value material recovered.

9.8 Environmental impacts due to recycling

The environment impacts of recycling, in terms of GHG emissions avoidable due to the recycling of materials that would otherwise have been produced (Primary material), and GHG emissions generated in the recycling process (production of secondary material) are presented below.

19 http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/documents/websheet_glass.pdf

Components	GWP of Primary material (t CO2-eq /t)	GWP of Secondary material (t CO2-eq /t)	CO2 eq. Balance
Fe	2,73	0,50	-2,24
Steel low alloyed	2,73	0,50	-2,24
Al	16,86	0,50	-16,36
Stainless steel	2,73	0,50	-2,24
Cu	6,02	0,02	-6,00
Cr	24,72	0,50	-24,22
Zn	5,47	0,50	-4,97
ABS	4,47	0,43	-4,04
HIPS or PS	3,51	0,43	-3,07
LDPE	2,10	0,43	-1,67
Glass	1,30	1,15	-0,15
Ag	228,46	0,32	-228,14
Au	15.558,53	17,71	-15.540,83
Pd	8.776,31	0,32	-8.775,98
Lanthanum	22,78	0,32	-22,46
Cerium	7,45	0,32	-7,13
Yttrium	22,78	0,32	-22,46
Terbium	22,78	0,32	-22,46
Gadolinium	22,78	0,32	-22,46
Europium	22,78	0,32	-22,46

Table 44: Environmental impacts of recycling.

9.9 French draft proposal for an implementation of individual collection targets

Extract of the draft specifications for the accreditation of collective schemes in the household WEEE sector:

« 1.2 Taux de collecte

1.2.1 Taux de collecte à atteindre

1.2.2.1. Cas général

Le titulaire met en œuvre les actions nécessaires pour atteindre au moins les taux de collecte suivants :

Tableau 1 : taux de collecte

Année	Taux de collecte
2015	40 %
2016	45 %
2017	52 %
2018	59 %
2019	65 %
2020	65 %

Pour les années 2015 à 2017, les taux de collecte minimum du tableau 1 sont à atteindre par le titulaire :

• en moyenne sur l'ensemble des flux ci-dessous,

• et avec une tolérance pour chaque flux listés ci-dessous selon le tableau 2 :

Tableau 2 : tolérance

Année	Tolérance
2015	10 %
2016	7 %
2017	5 %

1. équipements usagés et déchets issus de gros appareils ménagers produisant du froid et relevant jusqu'au 14 août 2018 de la sous catégorie 1 A telle que définie au II. de l'article R. 543-172 du code de l'environnement, puis à compter du 15 août 2018 de la catégorie 1 ;

2. équipements usagés et déchets issus de gros appareils ménagers ne produisant pas de froid relevant jusqu'au 14 août 2018 de la catégorie 1 telle que définie au II. de l'article R. 543-172 du code de l'environnement, puis à compter du 15 août 2018 des catégories 1 ou 4 ;

3. équipements usagés et déchets issus d'écrans relevant jusqu'au 14 août 2018 des sous catégories 3 A ou 4 A telles que définies au II. de l'article R. 543-172 du code de l'environnement, puis à compter du 15 août 2018 de la catégorie 2 ;

4. équipements usagés et déchets issus des autres équipements électriques et électroniques relevant des catégories telles que définies au II. de l'article R. 543-172 du code de l'environnement, autres que les catégories 11 jusqu'au 14 août 2018 et 7 à compter du 15 août 2018.

Pour les années 2018 à 2020, les taux de collecte du tableau 1 sont à atteindre pour chaque flux tels que listés ci-dessus.

1.2.2.2. Taux de collecte : cas particulier des lampes

Le titulaire met en œuvre les actions nécessaires pour atteindre au moins les taux de collecte suivants :

Tableau 1 : taux de collecte

Année	Taux de collecte
2015	40 %
2016	45 %
2017	52 %
2018	59 %
2019	65 %
2020	65 %

1.2.2.3. Taux de collecte : cas particulier des panneaux photovoltaïques

Dans son dossier de demande d'agrément, le titulaire fournit pour chaque année civile de sa période d'agrément, l'estimation de la quantité de déchets d'équipements électriques et électroniques issus des panneaux photovoltaïques mis sur le marché et qu'il devra collecter, en prenant en compte :

• les quantités de panneaux photovoltaïques mis sur le marché les années précédentes ;

• la durée de vie desdits panneaux.

Le cas échéant, le titulaire transmet annuellement au ministère en charge de l'Environnement une mise à jour de cette estimation durant sa période d'agrément. »

9.10 POM evolution

Table 43 shows the historical evolution of POM for each Member State, from 1980 to 2012 using the apparent consumption methodology.

Country	1980	1985	1990	1995	2000	2005	2008	2009	2010	2011	2012
AT	104	115	129	153	179	211	184	172	191	203	184
BE	136	150	168	199	232	236	262	285	326	327	364
BG	38	42	45	48	51	121	114	88	90	99	162
CH	97	110	125	148	180	225	237	221	244	246	226
CY	5	5	6	8	13	19	19	19	20	19	15
CZ	75	83	92	106	130	175	197	236	331	211	184
DE	1064	1167	1338	1591	1904	1834	1690	2091	2525	2450	2247
DK	64	71	79	96	121	155	147	139	136	138	158
EE	12	14	16	16	17	22	22	15	17	18	17
EL	80	91	103	125	149	217	233	222	216	203	226
ES	390	443	496	572	817	1093	1171	861	975	905	730
FI	56	63	71	87	113	140	128	116	134	146	138
FR	657	747	847	1007	1344	1596	1536	1574	1750	1849	1598

Country	1980	1985	1990	1995	2000	2005	2008	2009	2010	2011	2012
FYROM	4	5	6	6	8	16	21	16	16	18	21
HR	27	31	35	36	39	67	56	43	46	49	46
HU	72	79	86	95	106	167	143	129	132	138	120
IE	36	42	46	57	86	122	111	92	93	97	91
IS	4	4	5	6	7	10	10	8	9	9	9
IT	560	622	689	876	1072	1354	1213	1225	1530	2056	1380
LT	18	20	23	26	28	48	48	32	34	34	33
LU	5	5	6	8	10	13	13	13	13	14	15
LV	13	15	17	18	18	31	27	16	15	20	18
ME	2	2	3	3	3	4	7	5	5	6	6
MT	3	3	4	4	6	8	7	7	8	9	8
NL	199	226	258	308	369	432	434	431	445	469	446
NO	68	76	86	99	121	159	167	151	165	165	165
PL	174	202	229	257	276	535	539	470	452	532	494
PT	89	101	111	127	179	203	201	189	200	184	154
RO	95	108	122	132	144	230	248	198	222	230	218
RS	28	31	34	38	42	62	94	52	59	58	58
SE	89	99	113	140	191	276	243	230	246	270	243
SI	14	16	19	21	27	38	38	35	40	46	47
SK	24	27	31	37	48	82	86	76	82	126	71
TR	143	184	217	265	344	527	763	529	621	682	663
UK	729	809	906	1074	1443	1703	1597	1526	1601	1715	1599
EU-28	4828	5397	6084	7223	9114	11128	10708	10532	11869	12555	11009
All countries	5172	5809	6560	7788	9820	12132	12006	11515	12988	13739	12157

Table 45: Historical POM using to apparent consumption methodology

Table 44 shows the forecast of POM according to realistic scenario described in Chapter 4. It should be noted that there may be some changes for some individual countries. This was mainly due to PV sales. For 1980-2012, PV sales were used from Eurostat (energy statistics) and for >2012, data was used from industry association PV Cycle.

Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
AT	204	235	238	241	244	247	250	253	266	269	272
BE	288	320	324	329	333	337	342	346	361	365	369

Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BG	107	135	136	137	138	139	140	141	152	153	154
CH	249	280	284	288	291	295	298	302	316	320	323
CY	34	62	62	61	61	61	61	60	71	70	70
CZ	207	237	240	243	246	248	251	254	267	270	272
DK	145	175	176	178	180	181	183	185	197	198	200
DU	1749	1813	1849	1884	1920	1956	1992	2027	2073	2109	2145
EE	37	65	64	64	64	64	64	64	74	74	73
EL	168	198	200	203	205	207	209	211	224	226	228
ES	764	806	820	835	849	863	877	891	916	930	944
FI	159	189	191	192	194	196	197	199	211	213	214
FR	1557	1612	1640	1667	1695	1722	1750	1777	1815	1842	1870
FYROM	40	68	68	68	68	68	67	67	78	77	77
HR	66	94	94	94	95	95	95	96	106	106	106
HU	140	170	172	173	175	176	178	180	192	193	195
IE	111	140	142	143	144	145	146	147	159	160	161
IS	28	56	55	55	55	54	54	54	64	63	63
IT	1161	1211	1233	1255	1277	1299	1322	1344	1376	1398	1420
LT	52	80	80	80	80	81	81	81	92	92	92
LU	31	59	59	59	58	58	58	58	68	67	67
LV	37	65	64	64	64	64	64	63	73	73	73
ME	25	53	52	52	51	51	51	50	60	60	59
MT	26	54	53	53	53	52	52	52	62	61	61
NL	454	488	495	502	508	515	522	528	545	552	558
NO	187	217	220	223	225	228	230	233	246	248	251
PL	521	556	562	569	576	583	590	597	614	621	628
PT	171	202	204	207	209	212	214	217	230	232	234
RO	238	269	273	276	280	283	287	290	304	308	311
RS	78	106	107	108	108	109	109	110	121	121	122
SE	265	296	300	303	307	310	314	317	331	334	338
SI	59	87	87	88	88	88	88	88	99	99	99
SK	92	121	122	123	124	125	126	127	138	139	140
TR	696	737	750	763	777	790	803	816	840	853	866
UK	1588	1644	1673	1701	1729	1758	1786	1814	1853	1881	1909
EU-28	10428	11384	11554	11725	11896	12066	12237	12408	12868	13036	13203
ALL COUNTRIES	11730	12901	13091	13281	13471	13661	13850	14040	14592	14778	14964

Table 46: Future trends of POM using to apparent consumption methodology.

9.11 WG Results per Country

Austria	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	27	27	27	28	28	29	29	30	30	30	31
Screens	29	28	28	27	26	25	24	24	24	24	24
Lamps	3	3	3	3	4	4	4	4	5	5	5
Large Equipment	60	60	60	59	59	59	58	58	58	58	59
Small Equipment	52	52	53	53	54	54	55	55	56	56	57
Small IT (...)	18	18	18	18	17	17	17	17	17	17	17
Total	188	188	188	188	188	187	188	188	189	190	192
Margin POM prediction	*± 1*	*± 1*	*± 2*	*± 3*	*± 5*	*± 6*	*± 8*	*± 11*	*± 14*	*± 17*	*± 20*
Margin lifespan	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*
Target (85% of WG)											
Temperature Exchange	23	23	23	24	24	25	25	26	26	26	26
Screens	25	24	24	23	22	21	20	20	20	20	20
Lamps	3	3	3	3	3	3	3	3	4	4	4
Large Equipment	51	51	51	50	50	50	49	49	49	49	50
Small Equipment	44	44	45	45	46	46	47	47	48	48	48
Small IT (...)	15	15	15	15	14	14	14	14	14	14	14
Total	160	160	160	160	160	159	159	160	161	162	164
Margin lifespan	*± 10*	*± 10*	*± 10*	*± 10*	*± 10*	*± 10*	*± 10*	*± 10*	*± 10*	*± 10*	*± 10*

Belgium	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
WEEE generated											
Temperature Exchange	43	44	46	47	48	49	50	52	53	54	55
Screens	34	33	32	31	30	29	28	28	27	27	28
Lamps	4	4	4	5	5	5	6	6	6	6	7
Large Equipment	78	79	81	82	83	83	83	83	84	85	87
Small Equipment	68	70	71	72	74	75	76	77	79	80	81
Small IT (...)	15	15	15	15	15	14	14	14	14	14	13
Total	242	246	249	252	254	256	258	260	263	266	271
Margin POM prediction	*± 1*	*± 2*	*± 3*	*± 5*	*± 8*	*± 11*	*± 14*	*± 19*	*± 24*	*± 29*	*± 35*
Margin lifespan	*± 22*	*± 22*	*± 22*	*± 23*	*± 23*	*± 23*	*± 23*	*± 23*	*± 24*	*± 24*	*± 24*
Target (85% of WG)											
Temperature Exchange	37	37	39	40	41	42	43	44	45	46	47
Screens	29	28	27	26	26	25	24	24	23	23	24
Lamps	3	3	3	4	4	4	5	5	5	5	6
Large Equipment	66	67	69	70	71	71	71	71	71	72	74
Small Equipment	58	60	60	61	63	64	65	65	67	68	69
Small IT (...)	13	13	13	13	13	12	12	12	12	12	11
Total	206	209	212	214	216	218	219	221	223	226	230
Margin lifespan	*± 18*	*± 19*	*± 19*	*± 19*	*± 19*	*± 20*	*± 20*	*± 20*	*± 20*	*± 20*	*± 21*

Bulgaria	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	22	23	24	24	25	26	27	28	28	29	29
Screens	12	12	12	12	11	11	11	11	10	10	10
Lamps	1	1	1	1	1	1	1	1	1	1	1
Large Equipment	23	24	25	26	27	27	28	29	29	31	32
Small Equipment	16	16	16	16	16	16	16	16	16	17	17
Small IT (...)	4	4	3	3	3	3	3	3	3	3	3
Total	77	79	81	82	83	85	86	87	89	90	92
Margin POM prediction	*± 0*	*± 1*	*± 1*	*± 2*	*± 2*	*± 4*	*± 5*	*± 6*	*± 8*	*± 10*	*± 12*
Margin lifespan	*± 14*	*± 15*	*± 15*	*± 15*	*± 15*	*± 16*	*± 16*	*± 16*	*± 16*	*± 17*	*± 17*
Target (85% of WG)											
Temperature Exchange	19	20	20	20	21	22	23	24	24	25	25
Screens	10	10	10	10	9	9	9	9	9	9	9
Lamps	1	1	1	1	1	1	1	1	1	1	1
Large Equipment	20	20	21	22	23	23	24	25	25	26	27
Small Equipment	14	14	14	14	14	14	14	14	14	14	14
Small IT (...)	3	3	3	3	3	3	3	3	3	3	3
Total	66	67	69	70	71	72	73	74	75	77	79
Margin lifespan	*± 12*	*± 12*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 14*	*± 14*	*± 14*	*± 14*

Switzerland	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	29	30	31	32	33	33	34	35	36	36	37
Screens	36	36	36	35	35	34	33	32	32	32	32
Lamps	3	3	3	3	3	3	3	3	3	3	3
Large Equipment	54	55	56	57	58	58	58	57	57	57	57
Small Equipment	72	74	76	77	79	80	82	83	84	85	86
Small IT (…)	19	19	19	19	19	19	19	19	19	19	19
Total	213	218	221	224	226	227	228	229	230	232	234
Margin POM prediction	*± 1*	*± 1*	*± 3*	*± 4*	*± 6*	*± 8*	*± 11*	*± 13*	*± 17*	*± 20*	*± 24*
Margin lifespan	*± 27*	*± 28*	*± 28*	*± 28*	*± 29*	*± 29*	*± 29*	*± 29*	*± 29*	*± 29*	*± 30*
Target (85% of WG)											
Temperature Exchange	25	26	26	27	28	28	29	30	31	31	31
Screens	31	31	31	30	30	29	28	27	27	27	27
Lamps	3	3	3	3	3	3	3	3	3	3	3
Large Equipment	46	47	48	48	49	49	49	48	48	48	48
Small Equipment	61	63	65	65	67	68	70	71	71	72	73
Small IT (…)	16	16	16	16	16	16	16	16	16	16	16
Total	181	185	188	190	192	193	194	195	196	197	199
Margin lifespan	*± 23*	*± 23*	*± 24*	*± 24*	*± 24*	*± 24*	*± 24*	*± 25*	*± 25*	*± 25*	*± 25*

Cyprus	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	2,4	2,5	2,6	2,7	2,8	3,0	3,1	3,2	3,2	3,3	3,4
Screens	2,1	2,1	2,1	2,1	2,0	2,0	2,0	2,0	2,0	2,0	2,1
Lamps	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,4	0,4	0,4	0,4
Large Equipment	4,7	4,8	4,9	5,0	5,1	5,1	5,2	5,2	5,2	5,2	5,3
Small Equipment	3,9	3,9	3,9	3,9	4,0	4,0	4,0	4,1	4,1	4,1	4,1
Small IT (...)	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9
Total	14	15	15	15	15	15	15	16	16	16	16
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 2*
Margin lifespan	*± 2*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*
Target (85% of WG)											
Temperature Exchange	2,0	2,1	2,2	2,3	2,4	2,6	2,6	2,7	2,7	2,8	2,9
Screens	1,8	1,8	1,8	1,8	1,7	1,7	1,7	1,7	1,7	1,7	1,8
Lamps	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Large Equipment	4,0	4,1	4,2	4,3	4,3	4,3	4,4	4,4	4,4	4,4	4,5
Small Equipment	3,3	3,3	3,3	3,3	3,4	3,4	3,4	3,5	3,5	3,5	3,5
Small IT (...)	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
Total	12	12	13	13	13	13	13	13	13	14	14
Margin lifespan	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*

Czech Republic	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	27	29	30	31	32	33	34	35	37	38	38
Screens	23	23	23	23	22	22	23	23	23	23	24
Lamps	3	3	3	3	4	4	4	4	4	4	4
Large Equipment	49	51	52	53	55	56	58	60	62	65	69
Small Equipment	44	45	46	47	48	49	50	51	52	53	53
Small IT (...)	11	11	11	11	11	11	11	11	11	11	11
Total	157	161	165	168	172	175	179	184	188	194	200
Margin POM prediction	*± 1*	*± 2*	*± 3*	*± 5*	*± 7*	*± 9*	*± 12*	*± 15*	*± 19*	*± 23*	*± 28*
Margin lifespan	*± 23*	*± 24*	*± 25*	*± 25*	*± 26*	*± 26*	*± 27*	*± 27*	*± 28*	*± 29*	*± 30*
Target (85% of WG)											
Temperature Exchange	23	25	26	26	27	28	29	30	31	32	32
Screens	20	20	20	20	19	19	20	20	20	20	20
Lamps	3	3	3	3	3	3	3	3	3	3	3
Large Equipment	42	43	44	45	47	48	49	51	53	55	59
Small Equipment	37	38	39	40	41	42	43	43	44	45	45
Small IT (...)	9	9	9	9	9	9	9	9	9	9	9
Total	133	137	140	143	146	149	152	156	160	165	170
Margin lifespan	*± 20*	*± 20*	*± 21*	*± 21*	*± 22*	*± 22*	*± 23*	*± 23*	*± 24*	*± 24*	*± 25*

Germany	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	247	250	253	256	258	260	262	265	267	269	272
Screens	257	254	249	243	237	232	228	226	226	228	232
Lamps	38	40	41	43	45	47	49	51	53	55	57
Large Equipment	569	573	575	574	572	571	571	576	589	611	643
Small Equipment	502	503	504	506	509	512	516	520	525	531	537
Small IT (...)	160	162	164	165	166	166	166	166	167	167	167
Total	1772	1782	1786	1788	1787	1787	1792	1804	1826	1861	1908
Margin POM prediction	*± 14*	*± 23*	*± 36*	*± 53*	*± 74*	*± 99*	*± 129*	*± 164*	*± 204*	*± 248*	*± 297*
Margin lifespan	*± 85*	*± 86*	*± 86*	*± 86*	*± 86*	*± 86*	*± 86*	*± 87*	*± 88*	*± 89*	*± 92*
Target (85% of WG)											
Temperature Exchange	210	213	215	218	219	221	223	225	227	229	231
Screens	218	216	212	207	201	197	194	192	192	194	197
Lamps	32	34	35	37	38	40	42	43	45	47	48
Large Equipment	484	487	489	488	486	485	485	490	501	519	547
Small Equipment	427	428	428	430	433	435	439	442	446	451	456
Small IT (...)	136	138	139	140	141	141	141	141	142	142	142
Total	1506	1514	1518	1519	1519	1519	1523	1533	1552	1581	1622
Margin lifespan	*± 72*	*± 73*	*± 73*	*± 73*	*± 73*	*± 73*	*± 73*	*± 74*	*± 75*	*± 76*	*± 78*

Denmark	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	20	20	20	20	21	21	21	20	20	20	20
Screens	21	21	21	21	21	20	20	20	20	20	20
Lamps	2	2	2	2	3	3	3	3	3	3	3
Large Equipment	43	44	44	44	43	42	42	41	40	39	39
Small Equipment	35	36	36	37	38	38	39	40	40	41	41
Small IT (...)	13	13	13	13	13	13	12	12	12	12	12
Total	135	136	137	138	137	137	136	136	135	136	136
Margin POM prediction	*± 0*	*± 1*	*± 1*	*± 2*	*± 3*	*± 4*	*± 6*	*± 8*	*± 10*	*± 12*	*± 15*
Margin lifespan	*± 16*	*± 16*	*± 17*	*± 17*	*± 17*	*± 17*	*± 16*	*± 16*	*± 16*	*± 16*	*± 16*
Target (85% of WG)											
Temperature Exchange	17	17	17	17	18	18	18	17	17	17	17
Screens	18	18	18	18	18	17	17	17	17	17	17
Lamps	2	2	2	2	3	3	3	3	3	3	3
Large Equipment	37	37	37	37	37	36	36	35	34	33	33
Small Equipment	30	31	31	31	32	32	33	34	34	35	35
Small IT (...)	11	11	11	11	11	11	10	10	10	10	10
Total	114	116	117	117	117	116	116	115	115	115	116
Margin lifespan	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*

Spain	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	141	143	145	147	149	150	151	153	154	155	157
Screens	126	125	123	120	117	114	112	110	109	109	110
Lamps	14	15	16	17	18	19	20	21	22	23	24
Large Equipment	258	261	264	267	269	271	274	278	282	288	294
Small Equipment	219	219	220	221	222	223	225	227	229	231	233
Small IT (...)	61	59	57	55	54	53	51	50	50	49	49
Total	818	822	825	826	828	830	833	838	845	854	866
Margin POM prediction	*± 4*	*± 8*	*± 13*	*± 19*	*± 26*	*± 35*	*± 46*	*± 57*	*± 70*	*± 84*	*± 99*
Margin lifespan	*± 97*	*± 98*	*± 98*	*± 98*	*± 98*	*± 99*	*± 99*	*± 99*	*± 100*	*± 101*	*± 103*
Target (85% of WG)											
Temperature Exchange	120	122	123	125	127	128	128	130	131	132	133
Screens	107	106	105	102	99	97	95	94	93	93	94
Lamps	12	13	14	14	15	16	17	18	19	20	20
Large Equipment	219	222	224	227	229	230	233	236	240	245	250
Small Equipment	186	186	187	188	189	190	191	193	195	196	198
Small IT (...)	52	50	48	47	46	45	43	43	43	42	42
Total	695	699	701	702	704	705	708	713	719	726	736
Margin lifespan	*± 83*	*± 83*	*± 83*	*± 83*	*± 84*	*± 84*	*± 84*	*± 85*	*± 85*	*± 86*	*± 87*

Estonia	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	4,3	4,4	4,5	4,5	4,5	4,6	4,6	4,6	4,6	4,6	4,6
Screens	2,8	2,7	2,7	2,7	2,7	2,7	2,7	2,7	2,8	2,8	2,9
Lamps	0,2	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,4	0,4
Large Equipment	6,0	6,1	6,1	6,1	6,1	6,1	6,1	6,1	6,1	6,2	6,2
Small Equipment	4,4	4,5	4,5	4,6	4,6	4,7	4,7	4,8	4,8	4,8	4,9
Small IT (...)	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
Total	19	19	19	19	19	19	19	20	20	20	20
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 1*	*± 2*	*± 2*
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*
Target (85% of WG)											
Temperature Exchange	3,7	3,7	3,8	3,8	3,8	3,9	3,9	3,9	3,9	3,9	3,9
Screens	2,4	2,3	2,3	2,3	2,3	2,3	2,3	2,3	2,4	2,4	2,5
Lamps	0,2	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Large Equipment	5,1	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,3	5,3
Small Equipment	3,7	3,8	3,8	3,9	3,9	4,0	4,0	4,1	4,1	4,1	4,2
Small IT (...)	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9
Total	16	16	16	16	16	16	17	17	17	17	17
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*

Finland	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	22	22	23	24	24	25	26	26	27	28	28
Screens	19	19	18	18	18	17	17	17	17	17	17
Lamps	2	2	2	2	3	3	3	3	3	3	3
Large Equipment	37	38	39	39	39	39	39	39	40	40	40
Small Equipment	29	30	31	32	33	34	35	36	37	38	39
Small IT (...)	9	9	9	9	9	9	9	9	9	9	9
Total	118	120	122	124	126	127	129	130	132	134	136
Margin POM prediction	*± 0*	*± 1*	*± 1*	*± 2*	*± 3*	*± 4*	*± 5*	*± 7*	*± 9*	*± 11*	*± 13*
Margin lifespan	*± 14*	*± 14*	*± 14*	*± 15*	*± 15*	*± 15*	*± 15*	*± 15*	*± 15*	*± 16*	*± 16*
Target (85% of WG)											
Temperature Exchange	19	19	20	20	20	21	22	22	23	24	24
Screens	16	16	15	15	15	14	14	14	14	14	14
Lamps	2	2	2	2	3	3	3	3	3	3	3
Large Equipment	31	32	33	33	33	33	33	33	34	34	34
Small Equipment	25	26	26	27	28	29	30	31	31	32	33
Small IT (...)	8	8	8	8	8	8	8	8	8	8	8
Total	100	102	104	105	107	108	109	111	112	114	115
Margin lifespan	*± 12*	*± 12*	*± 12*	*± 12*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 14*

France	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	236	245	255	265	275	284	294	303	312	321	329
Screens	223	220	215	208	202	196	191	187	185	185	186
Lamps	25	26	28	29	31	32	34	35	37	38	40
Large Equipment	449	460	468	472	473	471	468	464	462	463	468
Small Equipment	386	395	403	409	415	420	425	430	434	439	443
Small IT (...)	100	99	98	97	96	94	93	92	91	89	89
Total	1419	1446	1466	1481	1492	1499	1504	1511	1520	1535	1555
Margin POM prediction	*± 4*	*± 8*	*± 15*	*± 23*	*± 35*	*± 49*	*± 65*	*± 85*	*± 107*	*± 132*	*± 160*
Margin lifespan	*± 172*	*± 176*	*± 178*	*± 180*	*± 181*	*± 182*	*± 183*	*± 184*	*± 185*	*± 187*	*± 189*
Target (85% of WG)											
Temperature Exchange	201	208	217	225	234	241	250	258	265	273	280
Screens	190	187	183	177	172	167	162	159	157	157	158
Lamps	21	22	24	25	26	27	29	30	31	32	34
Large Equipment	382	391	398	401	402	400	398	394	393	394	398
Small Equipment	328	336	343	348	353	357	361	366	369	373	377
Small IT (...)	85	84	83	82	82	80	79	78	77	76	76
Total	1206	1229	1246	1259	1268	1274	1279	1284	1292	1304	1321
Margin lifespan	*± 147*	*± 149*	*± 151*	*± 153*	*± 154*	*± 155*	*± 155*	*± 156*	*± 157*	*± 159*	*± 161*

Great Britain	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	212	218	223	228	233	239	244	249	254	260	265
Screens	256	254	250	244	236	229	223	217	213	212	212
Lamps	24	26	27	28	30	31	32	34	35	37	39
Large Equipment	454	462	468	472	472	469	466	462	459	459	463
Small Equipment	436	443	448	453	459	464	469	474	479	485	491
Small IT (...)	129	127	123	120	116	113	109	106	103	100	98
Total	1511	1528	1540	1545	1546	1544	1542	1542	1545	1553	1567
Margin POM prediction	*± 4*	*± 8*	*± 14*	*± 23*	*± 34*	*± 48*	*± 64*	*± 83*	*± 105*	*± 129*	*± 156*
Margin lifespan	*± 151*	*± 153*	*± 154*	*± 155*	*± 155*	*± 155*	*± 155*	*± 155*	*± 155*	*± 156*	*± 157*
Target (85% of WG)											
Temperature Exchange	180	185	190	194	198	203	207	212	216	221	225
Screens	218	216	213	207	201	195	190	184	181	180	180
Lamps	20	22	23	24	26	26	27	29	30	31	33
Large Equipment	386	393	398	401	401	399	396	393	390	390	394
Small Equipment	371	377	381	385	390	394	399	403	407	412	417
Small IT (...)	110	108	105	102	99	96	93	90	88	85	83
Total	1284	1299	1309	1313	1314	1313	1311	1311	1313	1320	1332
Margin lifespan	*± 129*	*± 130*	*± 131*	*± 132*	*± 132*	*± 132*	*± 131*	*± 131*	*± 132*	*± 132*	*± 133*

Greece	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	27	28	28	29	30	30	31	31	32	32	33
Screens	27	26	25	24	22	21	20	19	18	18	18
Lamps	3	3	3	3	3	4	4	4	4	4	4
Large Equipment	56	56	57	57	57	57	58	58	59	60	62
Small Equipment	48	48	48	48	49	49	49	49	49	49	49
Small IT (...)	10	10	10	9	9	9	9	9	8	8	8
Total	171	171	171	171	170	170	170	170	170	172	174
Margin POM prediction	*± 1*	*± 1*	*± 2*	*± 4*	*± 5*	*± 7*	*± 9*	*± 12*	*± 15*	*± 18*	*± 22*
Margin lifespan	*± 21*	*± 21*	*± 21*	*± 21*	*± 21*	*± 21*	*± 21*	*± 21*	*± 21*	*± 21*	*± 21*
Target (85% of WG)											
Temperature Exchange	23	24	24	25	26	26	26	26	27	27	28
Screens	23	22	21	20	19	18	17	16	15	15	15
Lamps	3	3	3	3	3	3	3	3	3	3	3
Large Equipment	48	48	48	48	48	48	49	49	50	51	53
Small Equipment	41	41	41	41	42	42	42	42	42	42	42
Small IT (...)	9	9	9	8	8	8	8	8	7	7	7
Total	145	145	145	145	145	144	144	144	145	146	148
Margin lifespan	*± 18*	*± 18*	*± 18*	*± 18*	*± 18*	*± 17*	*± 17*	*± 17*	*± 18*	*± 18*	*± 18*

Croatia	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	12	12	13	13	13	13	13	13	14	14	14
Screens	8	8	8	8	8	8	7	7	7	7	7
Lamps	1	1	1	1	1	1	1	1	1	1	1
Large Equipment	14	14	14	15	15	15	15	15	15	16	16
Small Equipment	9	9	9	9	9	9	9	9	9	9	9
Small IT (...)	3	3	3	3	3	4	4	4	4	4	4
Total	48	48	49	49	49	49	49	50	50	50	50
Margin POM prediction	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 2*	*± 2*	*± 3*	*± 4*	*± 4*	*± 5*
Margin lifespan	*± 6*	*± 6*	*± 6*	*± 6*	*± 6*	*± 6*	*± 6*	*± 6*	*± 6*	*± 6*	*± 6*
Target (85% of WG)											
Temperature Exchange	10	10	11	11	11	11	11	11	12	12	12
Screens	7	7	7	7	7	7	6	6	6	6	6
Lamps	1	1	1	1	1	1	1	1	1	1	1
Large Equipment	12	12	12	13	13	13	13	13	13	14	14
Small Equipment	8	8	8	8	8	8	8	8	8	8	8
Small IT (...)	3	3	3	3	3	3	3	3	3	3	3
Total	40	41	41	41	42	42	42	42	42	42	43
Margin lifespan	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*

Hungary	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	26	27	27	28	29	29	30	31	31	32	32
Screens	19	18	18	18	17	17	17	17	16	17	17
Lamps	2	2	2	2	2	2	2	2	2	2	2
Large Equipment	41	41	42	42	42	42	42	42	42	41	41
Small Equipment	30	30	31	31	31	31	31	31	31	32	32
Small IT (...)	8	8	8	8	8	9	9	9	9	9	9
Total	125	126	128	128	129	130	130	131	132	132	133
Margin POM prediction	*± 0*	*± 1*	*± 1*	*± 2*	*± 3*	*± 4*	*± 6*	*± 7*	*± 9*	*± 11*	*± 13*
Margin lifespan	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 15*	*± 15*	*± 15*
Target (85% of WG)											
Temperature Exchange	22	23	23	24	25	25	26	26	26	27	27
Screens	16	15	15	15	14	14	14	14	14	14	14
Lamps	2	2	2	2	2	2	2	2	2	2	2
Large Equipment	35	35	36	36	36	36	36	36	36	35	35
Small Equipment	26	26	26	26	26	26	26	26	26	27	27
Small IT (...)	7	7	7	7	7	8	8	8	8	8	8
Total	106	107	108	109	110	110	111	111	112	113	113
Margin lifespan	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 13*

Ireland	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	13	13	13	14	14	15	15	15	16	16	16
Screens	15	15	14	14	14	13	13	12	12	12	11
Lamps	1	1	2	2	2	2	2	2	2	2	3
Large Equipment	30	31	31	31	32	31	31	31	31	32	32
Small Equipment	26	26	26	26	26	26	26	27	27	27	27
Small IT (...)	7	7	7	7	6	6	6	6	6	6	6
Total	92	93	94	94	94	94	93	93	93	94	94
Margin POM prediction	*± 0*	*± 0*	*± 1*	*± 1*	*± 2*	*± 3*	*± 4*	*± 5*	*± 6*	*± 8*	*± 9*
Margin lifespan	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*	*± 14*
Target (85% of WG)											
Temperature Exchange	11	11	11	12	12	13	13	13	14	14	14
Screens	13	13	12	12	12	11	11	10	10	10	9
Lamps	1	1	2	2	2	2	2	2	2	2	3
Large Equipment	26	26	26	26	27	26	26	26	26	27	27
Small Equipment	22	22	22	22	22	22	22	23	23	23	23
Small IT (...)	6	6	6	6	5	5	5	5	5	5	5
Total	78	79	80	80	80	80	79	79	79	80	80
Margin lifespan	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*	*± 12*

Island	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	1,1	1,2	1,2	1,2	1,2	1,3	1,3	1,3	1,4	1,4	1,4
Screens	1,3	1,3	1,3	1,3	1,2	1,2	1,2	1,1	1,1	1,1	1,1
Lamps	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Large Equipment	2,4	2,5	2,5	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6
Small Equipment	2,9	2,9	3,0	3,0	3,1	3,1	3,1	3,1	3,2	3,2	3,2
Small IT (...)	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,6
Total	9	9	9	9	9	9	9	9	9	9	9
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 1*
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*
Target (85% of WG)											
Temperature Exchange	0,9	1,0	1,0	1,0	1,0	1,1	1,1	1,1	1,2	1,2	1,2
Screens	1,1	1,1	1,1	1,1	1,0	1,0	1,0	0,9	0,9	0,9	0,9
Lamps	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Large Equipment	2,0	2,1	2,1	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2
Small Equipment	2,5	2,5	2,6	2,6	2,6	2,6	2,6	2,6	2,7	2,7	2,7
Small IT (...)	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,5
Total	7	7	8	8	8	8	8	8	8	8	8
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*

Italy	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	157	162	167	172	178	183	188	193	198	203	208
Screens	151	151	150	148	147	146	145	146	147	149	152
Lamps	18	19	20	22	23	24	26	27	28	30	31
Large Equipment	411	416	421	425	428	433	438	446	456	472	492
Small Equipment	268	270	272	274	277	279	281	284	287	290	293
Small IT (...)	72	71	70	70	69	68	68	68	68	68	67
Total	1077	1090	1101	1111	1121	1133	1146	1163	1184	1211	1244
Margin POM prediction	*± 5*	*± 11*	*± 18*	*± 28*	*± 41*	*± 57*	*± 76*	*± 98*	*± 123*	*± 152*	*± 183*
Margin lifespan	*± 121*	*± 123*	*± 124*	*± 125*	*± 126*	*± 128*	*± 129*	*± 131*	*± 133*	*± 137*	*± 140*
Target (85% of WG)											
Temperature Exchange	133	138	142	146	151	156	160	164	168	173	177
Screens	128	128	128	126	125	124	123	124	125	127	129
Lamps	15	16	17	19	20	20	22	23	24	26	26
Large Equipment	349	354	358	361	364	368	372	379	388	401	418
Small Equipment	228	230	231	233	235	237	239	241	244	247	249
Small IT (...)	61	60	60	60	59	58	58	58	58	58	57
Total	916	926	935	944	953	963	974	988	1007	1029	1057
Margin lifespan	*± 103*	*± 104*	*± 105*	*± 106*	*± 107*	*± 109*	*± 110*	*± 111*	*± 113*	*± 116*	*± 119*

Liechtenstein	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Screens	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Lamps	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Large Equipment	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Small Equipment	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Small IT (…)	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Total	1	1	1	1	1	1	1	1	1	1	1
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*
Margin lifespan	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*
Target (85% of WG)											
Temperature Exchange	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Screens	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Lamps	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Large Equipment	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Small Equipment	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Small IT (…)	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Total	1	1	1	1	1	1	1	1	1	1	1
Margin lifespan	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*

Lithuania	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	7	8	8	8	8	8	8	8	8	8	8
Screens	6	6	6	6	6	6	7	7	7	7	8
Lamps	0	1	1	1	1	1	1	1	1	1	1
Large Equipment	10	10	10	10	10	10	10	10	10	10	10
Small Equipment	9	9	9	9	9	9	9	9	9	9	9
Small IT (...)	2	2	2	2	2	2	2	2	2	2	2
Total	34	34	35	35	35	35	35	36	36	36	36
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 1*	*± 2*	*± 2*	*± 3*	*± 3*
Margin lifespan	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*
Target (85% of WG)											
Temperature Exchange	6	7	7	7	7	7	7	7	7	7	7
Screens	5	5	5	5	5	5	6	6	6	6	7
Lamps	0	1	1	1	1	1	1	1	1	1	1
Large Equipment	9	9	9	9	9	9	9	9	9	9	9
Small Equipment	8	8	8	8	8	8	8	8	8	8	8
Small IT (...)	2	2	2	2	2	2	2	2	2	2	2
Total	29	29	29	30	30	30	30	30	30	31	31
Margin lifespan	*± 3*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*

Luxembourgh	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	1,7	1,8	1,8	1,9	1,9	2,0	2,0	2,0	2,1	2,1	2,1
Screens	1,4	1,4	1,4	1,4	1,3	1,3	1,3	1,3	1,3	1,3	1,3
Lamps	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,3
Large Equipment	3,8	3,9	4,0	4,1	4,1	4,1	4,1	4,1	4,1	4,1	4,1
Small Equipment	3,4	3,4	3,5	3,6	3,6	3,6	3,7	3,7	3,8	3,8	3,9
Small IT (...)	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1
Total	12	12	12	12	12	12	12	13	13	13	13
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 2*
Margin lifespan	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*
Target (85% of WG)											
Temperature Exchange	1,4	1,5	1,5	1,6	1,6	1,7	1,7	1,7	1,8	1,8	1,8
Screens	1,2	1,2	1,2	1,2	1,1	1,1	1,1	1,1	1,1	1,1	1,1
Lamps	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,3
Large Equipment	3,2	3,3	3,4	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5
Small Equipment	2,9	2,9	3,0	3,1	3,1	3,1	3,1	3,1	3,2	3,2	3,3
Small IT (...)	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9
Total	10	10	10	10	10	11	11	11	11	11	11
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*

Latvia	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	5	5	5	5	5	5	5	5	5	5	5
Screens	3	3	3	3	3	3	3	3	3	3	3
Lamps	0	0	0	0	0	0	0	0	0	0	0
Large Equipment	7	7	7	7	7	7	7	7	7	7	6
Small Equipment	5	5	5	5	5	5	5	5	5	5	5
Small IT (...)	1	1	1	1	1	1	1	1	1	1	1
Total	22	22	22	22	22	21	21	21	21	21	21
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 2*
Margin lifespan	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*
Target (85% of WG)											
Temperature Exchange	4	4	4	4	4	4	4	4	4	4	4
Screens	3	3	3	3	3	3	3	3	3	3	3
Lamps	0	0	0	0	0	0	0	0	0	0	0
Large Equipment	6	6	6	6	6	6	6	6	6	6	5
Small Equipment	4	4	4	4	4	4	4	4	4	4	4
Small IT (...)	1	1	1	1	1	1	1	1	1	1	1
Total	19	19	18	18	18	18	18	18	18	18	18
Margin lifespan	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*	*± 2*

FYROM	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	2,2	2,3	2,4	2,6	2,7	2,8	3,0	3,1	3,3	3,4	3,6
Screens	2,0	2,0	2,0	2,0	2,0	2,0	1,9	1,9	1,9	2,0	2,0
Lamps	0,2	0,3	0,3	0,3	0,3	0,3	0,4	0,4	0,4	0,4	0,4
Large Equipment	3,7	4,0	4,3	4,6	4,9	5,2	5,5	5,7	6,0	6,3	6,5
Small Equipment	4,0	4,2	4,3	4,5	4,7	4,8	4,9	5,1	5,2	5,3	5,4
Small IT (…)	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Total	13	13	14	15	15	16	16	17	17	18	19
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 1*	*± 2*	*± 2*
Margin lifespan	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 4*	*± 4*
Target (85% of WG)											
Temperature Exchange	1,9	2,0	2,0	2,2	2,3	2,4	2,6	2,6	2,8	2,9	3,1
Screens	1,7	1,7	1,7	1,7	1,7	1,7	1,6	1,6	1,6	1,7	1,7
Lamps	0,2	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Large Equipment	3,1	3,4	3,7	3,9	4,2	4,4	4,7	4,8	5,1	5,4	5,5
Small Equipment	3,4	3,6	3,7	3,8	4,0	4,1	4,2	4,3	4,4	4,5	4,6
Small IT (…)	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Total	11	11	12	12	13	13	14	14	15	15	16
Margin lifespan	*± 2*	*± 2*	*± 2*	*± 2*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*	*± 3*

Maltha	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	1,3	1,4	1,4	1,5	1,5	1,6	1,6	1,7	1,7	1,7	1,7
Screens	0,8	0,8	0,8	0,7	0,7	0,7	0,7	0,8	0,8	0,8	0,8
Lamps	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
Large Equipment	1,9	1,9	2,0	2,0	2,0	2,0	2,1	2,1	2,1	2,2	2,2
Small Equipment	1,6	1,6	1,7	1,7	1,7	1,8	1,8	1,8	1,9	1,9	1,9
Small IT (...)	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,5	0,5
Total	6	6	6	6	7	7	7	7	7	7	7
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*
Target (85% of WG)											
Temperature Exchange	1,1	1,2	1,2	1,3	1,3	1,4	1,4	1,4	1,4	1,4	1,4
Screens	0,7	0,7	0,7	0,6	0,6	0,6	0,6	0,7	0,7	0,7	0,7
Lamps	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
Large Equipment	1,6	1,6	1,7	1,7	1,7	1,7	1,8	1,8	1,8	1,9	1,9
Small Equipment	1,4	1,4	1,4	1,4	1,4	1,5	1,5	1,5	1,6	1,6	1,6
Small IT (...)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,4	0,4
Total	5	5	5	5	6	6	6	6	6	6	6
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*

Montenegro	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	0,7	0,7	0,8	0,8	0,8	0,9	0,9	0,9	0,9	1,0	1,0
Screens	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
Lamps	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2
Large Equipment	1,2	1,2	1,3	1,3	1,4	1,5	1,5	1,6	1,6	1,7	1,7
Small Equipment	1,6	1,6	1,7	1,7	1,8	1,8	1,9	1,9	2,0	2,0	2,0
Small IT (...)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Total	4	5	5	5	5	5	5	5	6	6	6
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*
Target (85% of WG)											
Temperature Exchange	0,6	0,6	0,7	0,7	0,7	0,8	0,8	0,8	0,8	0,9	0,9
Screens	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
Lamps	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2
Large Equipment	1,0	1,0	1,1	1,1	1,2	1,3	1,3	1,4	1,4	1,4	1,4
Small Equipment	1,4	1,4	1,4	1,4	1,5	1,5	1,6	1,6	1,7	1,7	1,7
Small IT (...)	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Total	4	4	4	4	4	4	5	5	5	5	5
Margin lifespan	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*	*± 1*

Netherlands	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	55	56	58	60	61	63	65	66	68	69	70
Screens	63	61	59	57	55	53	52	50	50	49	49
Lamps	6	7	7	8	8	8	9	9	10	10	11
Large Equipment	107	108	110	111	111	111	111	110	110	111	111
Small Equipment	124	126	129	131	133	135	137	139	142	144	146
Small IT (...)	41	42	43	44	44	45	45	46	46	46	47
Total	395	401	406	410	413	416	419	421	425	429	434
Margin POM prediction	*± 1*	*± 2*	*± 4*	*± 7*	*± 10*	*± 14*	*± 18*	*± 24*	*± 30*	*± 37*	*± 44*
Margin lifespan	*± 33*	*± 34*	*± 34*	*± 35*	*± 35*	*± 35*	*± 35*	*± 36*	*± 36*	*± 36*	*± 37*
Target (85% of WG)											
Temperature Exchange	47	48	49	51	52	54	55	56	58	59	60
Screens	54	52	50	48	47	45	44	43	43	42	42
Lamps	5	6	6	7	7	7	8	8	9	9	9
Large Equipment	91	92	94	94	94	94	94	94	94	94	94
Small Equipment	105	107	110	111	113	115	116	118	121	122	124
Small IT (...)	35	36	37	37	37	38	38	39	39	39	40
Total	335	341	345	348	351	353	356	358	361	365	369
Margin lifespan	*± 28*	*± 29*	*± 29*	*± 29*	*± 30*	*± 30*	*± 30*	*± 30*	*± 31*	*± 31*	*± 31*

Norway	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	21	21	21	22	22	23	23	24	24	25	25
Screens	23	23	23	22	22	21	21	20	20	20	20
Lamps	2	2	2	2	2	2	2	3	3	3	3
Large Equipment	38	39	40	41	42	43	43	44	44	45	46
Small Equipment	51	52	53	54	56	56	57	58	59	59	60
Small IT (...)	12	12	12	12	11	11	11	11	11	11	11
Total	146	149	152	154	156	157	158	160	161	163	165
Margin POM prediction	*± 0*	*± 1*	*± 2*	*± 3*	*± 4*	*± 6*	*± 8*	*± 10*	*± 12*	*± 15*	*± 18*
Margin lifespan	*± 21*	*± 21*	*± 22*	*± 22*	*± 22*	*± 22*	*± 23*	*± 23*	*± 23*	*± 23*	*± 24*
Target (85% of WG)											
Temperature Exchange	18	18	18	19	19	20	20	20	20	21	21
Screens	20	20	20	19	19	18	18	17	17	17	17
Lamps	2	2	2	2	2	2	2	3	3	3	3
Large Equipment	32	33	34	35	36	37	37	37	37	38	39
Small Equipment	43	44	45	46	48	48	48	49	50	50	51
Small IT (...)	10	10	10	10	9	9	9	9	9	9	9
Total	124	127	129	131	132	134	135	136	137	138	140
Margin lifespan	*± 18*	*± 18*	*± 18*	*± 19*	*± 19*	*± 19*	*± 19*	*± 19*	*± 20*	*± 20*	*± 20*

Poland	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	87	91	95	99	102	106	109	112	115	118	120
Screens	47	48	49	49	50	50	51	52	54	56	58
Lamps	6	6	7	7	8	8	9	9	9	10	10
Large Equipment	122	125	129	132	135	138	140	143	146	148	151
Small Equipment	103	106	108	110	112	113	115	116	118	119	121
Small IT (...)	32	33	33	34	35	35	36	36	36	37	37
Total	397	409	420	431	441	450	460	469	478	487	496
Margin POM prediction	*± 2*	*± 3*	*± 6*	*± 9*	*± 13*	*± 17*	*± 23*	*± 29*	*± 36*	*± 43*	*± 51*
Margin lifespan	*± 64*	*± 66*	*± 68*	*± 70*	*± 72*	*± 73*	*± 75*	*± 76*	*± 78*	*± 79*	*± 81*
Target (85% of WG)											
Temperature Exchange	74	77	81	84	87	90	93	95	98	100	102
Screens	40	41	42	42	43	43	43	44	46	48	49
Lamps	5	5	6	6	7	7	8	8	8	9	9
Large Equipment	104	106	110	112	115	117	119	122	124	126	128
Small Equipment	88	90	92	94	95	96	98	99	100	101	103
Small IT (...)	27	28	28	29	30	30	31	31	31	31	31
Total	337	347	357	366	375	383	391	399	406	414	422
Margin lifespan	*± 55*	*± 56*	*± 58*	*± 59*	*± 61*	*± 62*	*± 63*	*± 65*	*± 66*	*± 67*	*± 68*

Portugal	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	38	39	39	40	40	41	41	41	42	42	43
Screens	25	25	24	23	23	23	22	22	23	23	23
Lamps	3	3	3	3	3	3	3	3	4	4	4
Large Equipment	52	52	52	52	52	52	52	51	51	51	51
Small Equipment	42	42	42	42	42	42	42	42	42	43	43
Small IT (...)	11	10	9	9	8	8	7	7	7	6	6
Total	171	170	170	169	168	168	168	168	168	169	171
Margin POM prediction	*± 1*	*± 1*	*± 2*	*± 3*	*± 4*	*± 6*	*± 7*	*± 9*	*± 11*	*± 14*	*± 16*
Margin lifespan	*± 16*	*± 15*	*± 15*	*± 15*	*± 15*	*± 15*	*± 15*	*± 15*	*± 15*	*± 15*	*± 16*
Target (85% of WG)											
Temperature Exchange	32	33	33	34	34	35	35	35	36	36	37
Screens	21	21	20	20	20	20	19	19	20	20	20
Lamps	3	3	3	3	3	3	3	3	3	3	3
Large Equipment	44	44	44	44	44	44	44	43	43	43	43
Small Equipment	36	36	36	36	36	36	36	36	36	37	37
Small IT (...)	9	9	8	8	7	7	6	6	6	5	5
Total	145	145	144	144	143	143	143	143	143	144	145
Margin lifespan	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*	*± 13*

Romania	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	55	56	57	58	59	60	61	61	62	62	63
Screens	24	25	25	25	25	26	26	26	26	27	27
Lamps	3	3	3	3	3	3	4	4	4	4	4
Large Equipment	65	66	66	67	67	68	68	69	69	70	72
Small Equipment	41	42	43	44	45	46	47	48	48	49	50
Small IT (...)	10	9	9	9	9	9	9	8	8	8	8
Total	197	201	204	206	209	211	213	216	218	221	225
Margin POM prediction	*± 1*	*± 1*	*± 2*	*± 4*	*± 5*	*± 7*	*± 10*	*± 12*	*± 15*	*± 19*	*± 23*
Margin lifespan	*± 26*	*± 26*	*± 27*	*± 27*	*± 27*	*± 27*	*± 28*	*± 28*	*± 28*	*± 29*	*± 29*
Target (85% of WG)											
Temperature Exchange	47	48	48	49	50	51	52	52	53	53	54
Screens	20	21	21	21	21	22	22	22	22	23	23
Lamps	3	3	3	3	3	3	3	3	3	3	3
Large Equipment	55	56	56	57	57	58	58	59	59	60	61
Small Equipment	35	36	37	37	38	39	40	41	41	42	43
Small IT (...)	9	8	8	8	8	8	8	7	7	7	7
Total	167	170	173	175	177	179	181	183	185	188	191
Margin lifespan	*± 22*	*± 22*	*± 22*	*± 23*	*± 23*	*± 23*	*± 24*	*± 24*	*± 24*	*± 24*	*± 25*

Serbia	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	11	11	11	12	12	12	12	12	12	12	13
Screens	8	8	8	8	8	8	8	8	8	8	8
Lamps	1	1	1	1	1	1	1	1	1	1	1
Large Equipment	16	17	17	18	18	19	19	19	19	19	20
Small Equipment	16	17	17	18	18	19	19	19	20	20	20
Small IT (...)	3	3	3	3	3	3	3	3	3	2	2
Total	56	57	58	59	60	61	62	62	63	64	64
Margin POM prediction	*± 0*	*± 0*	*± 1*	*± 1*	*± 2*	*± 2*	*± 3*	*± 4*	*± 5*	*± 6*	*± 7*
Margin lifespan	*± 8*	*± 8*	*± 8*	*± 8*	*± 8*	*± 8*	*± 8*	*± 8*	*± 9*	*± 9*	*± 9*
Target (85% of WG)											
Temperature Exchange	9	9	9	10	10	10	10	10	10	10	11
Screens	7	7	7	7	7	7	7	7	7	7	7
Lamps	1	1	1	1	1	1	1	1	1	1	1
Large Equipment	14	14	14	15	15	16	16	16	16	16	17
Small Equipment	14	14	14	15	15	16	16	16	17	17	17
Small IT (...)	3	3	3	3	3	3	3	3	3	2	2
Total	47	49	49	50	51	52	52	53	54	54	55
Margin lifespan	*± 6*	*± 7*	*± 7*	*± 7*	*± 7*	*± 7*	*± 7*	*± 7*	*± 7*	*± 7*	*± 7*

Slovakia	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	10	10	11	11	11	11	12	12	12	12	12
Screens	9	9	9	9	9	10	10	10	10	10	11
Lamps	1	1	1	1	1	2	2	2	2	2	2
Large Equipment	20	21	21	22	23	23	24	25	25	26	28
Small Equipment	17	18	18	18	19	19	19	19	20	20	20
Small IT (...)	5	5	5	5	5	5	6	6	6	6	6
Total	62	64	66	67	69	70	72	73	75	76	78
Margin POM prediction	*± 0*	*± 1*	*± 1*	*± 2*	*± 2*	*± 3*	*± 4*	*± 5*	*± 7*	*± 8*	*± 10*
Margin lifespan	*± 12*	*± 12*	*± 12*	*± 13*	*± 13*	*± 13*	*± 14*	*± 14*	*± 14*	*± 14*	*± 15*
Target (85% of WG)											
Temperature Exchange	9	9	9	9	9	9	10	10	10	10	10
Screens	8	8	8	8	8	9	9	9	9	9	9
Lamps	1	1	1	1	1	2	2	2	2	2	2
Large Equipment	17	18	18	19	20	20	20	21	21	22	24
Small Equipment	14	15	15	15	16	16	16	16	17	17	17
Small IT (...)	4	4	4	4	4	4	5	5	5	5	5
Total	53	54	56	57	58	60	61	62	63	65	67
Margin lifespan	*± 10*	*± 10*	*± 11*	*± 11*	*± 11*	*± 11*	*± 11*	*± 12*	*± 12*	*± 12*	*± 13*

Slovenia	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	5,6	5,8	6,0	6,3	6,5	6,7	7,0	7,2	7,4	7,6	7,9
Screens	4,3	4,2	4,2	4,2	4,1	4,1	4,2	4,2	4,3	4,5	4,6
Lamps	0,6	0,6	0,6	0,7	0,7	0,8	0,8	0,8	0,9	0,9	0,9
Large Equipment	10,7	11,1	11,5	11,9	12,3	12,7	13,1	13,5	13,9	14,4	14,9
Small Equipment	7,8	8,0	8,1	8,3	8,5	8,7	8,9	9,1	9,3	9,4	9,6
Small IT (...)	2,2	2,1	2,0	2,0	1,9	1,9	1,8	1,8	1,8	1,8	1,8
Total	31	32	33	33	34	35	36	37	38	39	40
Margin POM prediction	*± 0*	*± 0*	*± 0*	*± 1*	*± 1*	*± 1*	*± 2*	*± 2*	*± 3*	*± 4*	*± 4*
Margin lifespan	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*	*± 5*
Target (85% of WG)											
Temperature Exchange	4,8	4,9	5,1	5,4	5,5	5,7	6,0	6,1	6,3	6,5	6,7
Screens	3,7	3,6	3,6	3,6	3,5	3,5	3,6	3,6	3,7	3,8	3,9
Lamps	0,5	0,5	0,5	0,6	0,6	0,7	0,7	0,7	0,8	0,8	0,8
Large Equipment	9,1	9,4	9,8	10,1	10,5	10,8	11,1	11,5	11,8	12,2	12,7
Small Equipment	6,6	6,8	6,9	7,1	7,2	7,4	7,6	7,7	7,9	8,0	8,2
Small IT (...)	1,9	1,8	1,7	1,7	1,6	1,6	1,5	1,5	1,5	1,5	1,5
Total	26	27	28	28	29	30	30	31	32	33	34
Margin lifespan	*± 3*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*	*± 4*

Sweden	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	35	36	37	38	39	40	40	41	42	43	44
Screens	36	35	34	33	32	31	30	29	29	28	28
Lamps	4	4	4	4	5	5	5	5	6	6	6
Large Equipment	61	63	65	66	67	67	67	67	66	67	67
Small Equipment	58	60	62	64	66	68	69	71	73	75	76
Small IT (...)	21	21	21	21	21	21	21	20	20	20	20
Total	215	220	224	227	229	231	232	234	236	238	241
Margin POM prediction	*± 1*	*± 1*	*± 2*	*± 3*	*± 5*	*± 7*	*± 9*	*± 12*	*± 15*	*± 19*	*± 23*
Margin lifespan	*± 32*	*± 33*	*± 34*	*± 34*	*± 34*	*± 35*	*± 35*	*± 35*	*± 35*	*± 36*	*± 36*
Target (85% of WG)											
Temperature Exchange	30	31	31	32	33	34	34	35	36	37	37
Screens	31	30	29	28	27	26	26	25	25	24	24
Lamps	3	3	3	3	4	4	4	4	5	5	5
Large Equipment	52	54	55	56	57	57	57	57	56	57	57
Small Equipment	49	51	53	54	56	58	59	60	62	64	65
Small IT (...)	18	18	18	18	18	18	18	17	17	17	17
Total	183	187	190	193	195	196	197	199	200	202	205
Margin lifespan	*± 27*	*± 28*	*± 28*	*± 29*	*± 29*	*± 29*	*± 30*	*± 30*	*± 30*	*± 30*	*± 31*

Turkey	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
WEEE generated											
Temperature Exchange	59	62	65	67	69	72	74	76	78	79	81
Screens	88	90	90	91	91	91	91	92	93	94	96
Lamps	18	19	20	22	23	25	26	28	29	31	32
Large Equipment	123	131	138	145	152	158	164	170	175	181	185
Small Equipment	187	195	202	209	215	222	228	234	239	245	250
Small IT (...)	28	28	27	27	27	27	27	27	27	27	27
Total	503	523	542	560	578	594	610	626	642	657	672
Margin POM prediction	*± 2*	*± 5*	*± 8*	*± 12*	*± 18*	*± 24*	*± 32*	*± 40*	*± 50*	*± 60*	*± 71*
Margin lifespan	*± 87*	*± 91*	*± 94*	*± 97*	*± 101*	*± 103*	*± 106*	*± 109*	*± 112*	*± 114*	*± 117*
Target (85% of WG)											
Temperature Exchange	50	53	55	57	59	61	63	65	66	67	69
Screens	75	77	77	77	77	77	77	78	79	80	82
Lamps	15	16	17	19	20	21	22	24	25	26	27
Large Equipment	105	111	117	123	129	134	139	145	149	154	157
Small Equipment	159	166	172	178	183	189	194	199	203	208	213
Small IT (...)	24	24	23	23	23	23	23	23	23	23	23
Total	428	445	461	476	491	505	519	532	545	558	571
Margin lifespan	*± 74*	*± 77*	*± 80*	*± 83*	*± 85*	*± 88*	*± 90*	*± 93*	*± 95*	*± 97*	*± 99*

9.12 Result questionnaire on difficulties

Reasons behind potential difficulties			High rate of unaccounted activities						Limited enforcement & inspection capacities			Complex market structure							Comp. Conc. Calc. Of sta. Spec. Col. Tar.		Limited public awareness				Legal uncertainties				Inadequate collection infrastructure					
Country	Total Difficulty	Group	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	3.1	3.2	3.3	3.4	3.5	3.6	3.7	4.1	4.2	5.1	5.2	5.3	5.4	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	7.5	7.6
EE	39	Group 1 - Significant Implementation Difficulties (Countries above 25)	6	6	6	6	6	6	6	6	6	5	5	5	5	4	6	6	6	6	6	6	6	5	5	1	1	3	6	3	4	4	6	4
LV	39		5	6	6	1	4	4	5	5	5	3	4	5	5	5	2	3	4	6	5	5	5	5	6	4	5	3	6	5	5	5	4	6
HU	37		4	5	5	5	5	5	6	5	5	0	5	4	5	5	1	0	6	6	6	4	6	5	6	6	5	6	6	4	4	5	6	4
BG	32		5	3	3	5	5	5	5	5	5	0	2	2	0	2	2	0	5	0	5	4	4	4	5	5	5	5	5	3	3	5	5	5
HR	32		5	5	5	4	5	5	3	3	3	2	5	2	4	3	3	2	5	4	3	4	5	4	3	3	3	4	4	5	3	4	4	3
IE	32		3	4	4	5	5	5	5	5	4	4	4	2	4	4	2	4	5	6	4	4	4	4	4	4	5	5	5	4	5	5	5	3
CZ	31		5	4	5	4	5	5	5	5	3	4	5	5	4	2	1	4	4	4	3	4	4	3	3	2	3	2	5	4	5	5	6	5
LT	31		6	5	5	5	6	3	6	6	6	0	4	5	6	5	0	4	3	6	4	5	6	3	0	4	4	0	6	5	5	5	6	3
PT	31		5	6	3	5	6	3	5	6	5	0	4	3	4	3	1	4	3	3	2	2	2	2	4	5	4	4	2	2	2	2	2	0
SI	31		4	6	3	2	4	3	6	6	4	0	5	6	5	4	0	6	3	6	3	2	3	2	3	6	4	3	3	6	4	3		
MT	30		5	6	5	3	6	5	6	6	4	0	4	4	5	5	4	6	6	6	5	4	5	2	6	2	3	5	2	0	3	3	4	6

CY	28		6	6	4	3	6	5	5	6	5	0	4	0	3	3	0	0	1	4	4	5	5	2	2	5	1	1	4	1	3	1	4	3
IT	28		6	6	6	4	3	5	4	5	5	1	5	1	3	5	1	1	1	5	2	2	4	1	2	1	1	3	3	5	3	1	4	3
SK	28		5	6	6	4	3	3	3	6	5	0	3	5	3	4	0	5	2	6	3	3	6	2	3	3	6	2	3	5	2	2	3	3
BE	25	Group 2 - Average or Limited Implementation Difficulties (Countries 25 or below)	5	5	5	5	5	5	5	6	4	0	0	0	0	0	1	0	4	4	1	1	1	1	1	1	1	5	1	4	4	1	1	1
SE	25		5	5	5	5	5	4	4	5	3	6	3	3	5	4	5	0	5	2	3	2	3	1	4	4	4	4	6	4	3	3	5	3
NO	25		6	2	2	3	3	3	4	4	5	0	4	6	6	6	0	4	5	6	3	4	4	1	4	2	5	1	0	3	2	1	0	2
PL	24		2	2	2	1	1	0	5	5	5	0	4	3	1	1	1	2	1	5	3	3	5	3	1	2	1	1	2	2	2	1	1	0
UK	23		1	3	3	3	5	5	6	5	1	0	3	5	4	4	0	0	2	5	2	4	4	3	4	2	2	2	1	1	3	1	1	1
DK	22		5	3	3	3	5	3	5	5	0	3	6	2	4	4	2	3	6	6	5	4	4	3	4	4	4	4	5	3	3	3	5	3
FI	22		4	2	1	2	6	4	3	4	3	1	4	3	1	2	1	1	3	4	1	3	3	2	1	1	2	2	1	1	1	1	1	1
NL	22		5	4	3	3	5	5	3	3	3	5	3	4	3	3	0	0	3	5	2	2	1	2	2	2	2	0	2	2	3	3	2	2
DE	20		4	4	2	4	0	4	5	5	3	0	0	0	0	0	0	0	0	0	2	2	2	2	0	0	0	0	5	5	0	3	5	1
FR	19		5	4	3	3	3	3	3	3	3	0	1	1	1	1	1	0	1	4	2	2	4	2	1	1	1	1	1	2	1	1	1	1
LU	12		5	2	2	2	2	2	3	3	3	0	4	1	1	1	0	0	2	2	1	1	1	1	1	1	1	2	1	3	1	1	3	2
AT	8		5	3	0	2	3	0	3	3	0	0	1	0	0	0	0	6	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EL																																		
RO																																		
ES																																		

Legenda difficulties

1. High rate of unaccounted activities
   - 1.1 cherry picking
   - 1.2 illegal collection
   - 1.3 illegal treatment
   - 1.4 illegal shipments
   - 1.5 unaccounted collection
   - 1.6 unaccounted treatment
2. Limited enforcement & inspection capacities
   - 2.1 level of enforcement capacities
   - 2.2 level of inspection capacities
   - 2.3 level of management capacities
3. Complex market structure

3.1 existence of a clearing house
3.2 high number of various stakeholders
3.3 high number of compliance schemes
3.4 inefficient distribution of responsibilities among stakeholders
3.5 level of governance practices
3.6 low number of compliance schemes
3.7 non-existence of a clearing house

4. Comp. Conc. Calc. Of sta. Spec. Col. Tar.
   4.1 accuracy in calc. Eee put on the market
   4.2 accuracy in calc. Weee generated
5. Limited public awareness
   5.1 limited public information to citizens
   5.2 insufficient awareness raising act.
   5.3 low level of public awareness
   5.4 lack of transparency
6. Legal uncertainties
   6.1 conflicting provisions with rel. Nat. Leg.
   6.2 level of secondary legislation
   6.3 level of transposition
   6.4 variable producer resp. Req. Among ms
7. Inadequate collection infrastructure
   7.1 access to collection points
   7.2 inter-reg./mun. Differences in infra. Dev.
   7.3 level of retailer involvement
   7.4 no. And quality of collection equip. & veh.
   7.5 number of collection points
   7.6 no. Of licensed treatment facilities

Legenda rating:
0 Not Applicable
1 Irrelevant
2 Unimportant
3 Slightly Important
4 Important
5 Very Important
6 Critical