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Hazardous waste review in the EU-28, Iceland, Norway, Switzerland and Turkey

Generation and treatment

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Summary

Hazardous waste is a waste stream of high concern due to the potential risks it poses to human health and the environment if not managed properly. It is therefore subject to intensive regulation in Europe and beyond. This report aims to shed some light on the generation and management of hazardous waste in Europe, based on the data provided by countries through the EU Waste Statistics Regulation, and published by Eurostat.

A review of the data was performed to assess the sources and types of hazardous waste and their treatment. The study includes data from 2006, 2008, 2010 and 2012 for EU-28 plus EEA member countries Iceland, Norway, Switzerland and Turkey.

1. Hazardous waste generation

a. The estimated total generation of hazardous waste in EU-28 + NO, IS, CH and TR for all the economic activities, including households, was largely unchanged from 103 to 105 million tonnes between 2006 and 2012 (an increase of 1.4 %).

b. 20 countries[1] increased their hazardous waste generation, while 12 countries[2] showed reductions between 2006 and 2012. The increase in hazardous waste generation is probably due to an increase in separation from mixed waste and better identification and reporting.

c. Hazardous waste per capita has remained almost stable between 2006 and 2012, at EU-27 level, but large variations are observed between countries (e.g. 593 kg per capita in Luxembourg to 27 kg in Greece in 2012).

d. Estonia (6 925 kg/cap) and Bulgaria (1 835 kg/cap) generated the highest amount in the EU, due to large shale oil extraction[3] and mining activities, respectively.

e. Three sectors produced the highest absolute amounts of hazardous waste - the waste, construction and mining sectors. Hazardous waste from the waste sector increased by 41 % between 2006 and 2012, while waste from the manufacture of coke and refined petroleum products increased by 82 %.

f. Large variations in the hazardous waste generation data reported by countries were observed between 2006 and 2012. These fluctuations were mostly due to national changes to the reporting methodology or the reporting of waste that was not previously reported. The changes were caused by few waste categories (mineral and solidified waste, chemical and medical waste).

2. Hazardousness of waste

a. In the period 2006-2012, the hazardousness of waste – defined as hazardous waste as a share of total waste generated – was highest in the coke and oil refinery sector but varied from 13 % to 94 %, depending on the country.

b. A reduction of fossil fuel production and use would thus have the double benefit of reducing greenhouse gas emissions and hazardous waste generation.

[1] Austria, Cyprus, Czech Republic, Denmark, Belgium, Estonia, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Norway, Sweden, Slovenia, Switzerland, Turkey, United Kingdom.

[2] Bulgaria, Croatia, Iceland, Finland, Hungary, Malta, Netherlands, Poland, Portugal, Slovakia, Spain, Romania.

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c. Large differences between countries on the hazardousness of waste were observed. However, the EU-28 average has remained constant at about 4 %.

d. Policy efforts have been made to reduce the hazardousness of waste in Europe, through the development of a number of regulatory instruments, such as the IPPC/IED Directive and the RoHS Directive.

3. Waste management

a. Disposal, excluding incineration, remained consistently the most widely used single management route for hazardous waste. At the same time, about half of the countries reduced their landfill rate between 2006 and 2012.

b. In 2012, the disposal rate of hazardous waste ranged from 100 % (Bulgaria) to 0 % (Luxembourg, Malta).

c. Germany and Bulgaria reported the largest quantities of hazardous waste treated in absolute terms. Whereas only a small proportion (23 %) was landfilled in Germany, landfill disposal was virtually the only treatment method in Bulgaria

d. Significant gaps have been observed between the reported data for generated and treated amounts of hazardous waste. The currently reported statistical data do not allow to follow generated waste through the waste management system, as they do not give any information about the complex steps between generation and final treatment.

e. Most of the countries have reported higher amounts of generated compared to treated hazardous waste for acid, alkaline or saline waste, chemical wastes as well as combustion wastes but this gap is not consistent across all countries, indicating that countries possibly use different methodologies for their reporting.

1 Introduction

Hazardous waste is a waste stream of high concern due to the potential risks it poses to human health and the environment if not managed properly. It is therefore subject to intensive regulation in Europe and beyond. The EU Waste Framework Directive (EU, 2008) requires hazardous waste to be duly classified, labelled and kept separate from non-hazardous waste, and EU Member States have to make sure proper management and traceability from its production to final destination. Imports and exports of hazardous wastes from one country to the other require specific notification and control procedures according to the EU Waste Shipment Regulation (EU, 2006) and the Basel Convention on the Control of Transboundary Movements of Waste and their Disposal (UNEP, 1989).

But what do we know about hazardous waste on a European level? How much hazardous waste is generated and where, how is it managed and what are the hotspots? Is Europe moving towards generating less hazardous waste and towards environmentally more favourable management of hazardous waste? While countries might have good insights about the generation and fate of hazardous waste nationally, a European-wide overview and systematic assessment currently does not exist. This report aims to shed some light on the situation, using the data provided by countries through the regular EU waste statistics.

2 Scope

The scope of this short review is to analyse the generation and treatment of hazardous waste in the EU-28, Norway, Iceland, Switzerland and Turkey for the years 2006, 2008, 2010, and 2012[4]. Liechtenstein, Albania, the Former Yugoslav Republic of Macedonia, Montenegro, Bosnia and Herzegovina, Serbia and Kosovo under UN SCR1244/99 have been excluded from this review because of incomplete data coverage.

The review includes the assessment of all the waste types for all sectors of the economy (NACE version 2), including households. For instance, the analysis includes different hazardous waste types from households, commercial and industrial activities, construction and demolition, mining and quarrying, agriculture and fisheries, etc.), for 2006, 2008, 2010, and 2012. The paper addresses waste reported under the EU Waste Statistics Regulation and thus excludes hazardous nuclear waste. The aim is to assess the data on a relatively aggregated level, and to identify potential issues of concern (colloquially called 'hot spots' in this report), that could be used as a basis for more detailed investigation at a later stage.

Hazardous waste is defined according to Annex III of the Waste Framework Directive (2008/98/EC) and the Commission Decision for the List of Waste (2014/955/EU). The Waste Framework Directive also indicates that 'Member States should encourage the separation of hazardous compounds from waste streams if necessary to achieve environmentally sound management'. All hazardous waste generated (including exported amounts) should be reported to Eurostat by Member States according to the Waste Statistics Regulation (2150/2002/EC). In addition, all the hazardous waste managed by Member States (including imported amounts) should also be reported to Eurostat.

The report includes an overview of the situation of hazardous waste generation and hazardous waste management. It identifies knowledge gaps and makes recommendations for further work.

[4] No data was reported by Croatia for 2006, therefore the EU averages given in this report refer to the EU-27. Data for Switzerland is reported in a different format, but is included in this report where possible.

3 Hazardous waste generation

Hazardous waste generation trends have been derived solely from Eurostat datasets in this chapter. It is important to note that 2004 was the first year where EU Member States had to report data on hazardous waste and non-hazardous waste, according to the EU Waste Statistics Regulation. The first reporting year is therefore characterised by larger uncertainties compared to later years. In addition, ten countries became EU members in 2004, where they had to change their classification system of hazardous waste to the EU classification system. Two Member States became members of the EU in 2007 and finally, Turkey and Croatia, included in this study, also had to develop their data systems. This leads to some uncertainties in the dataset.

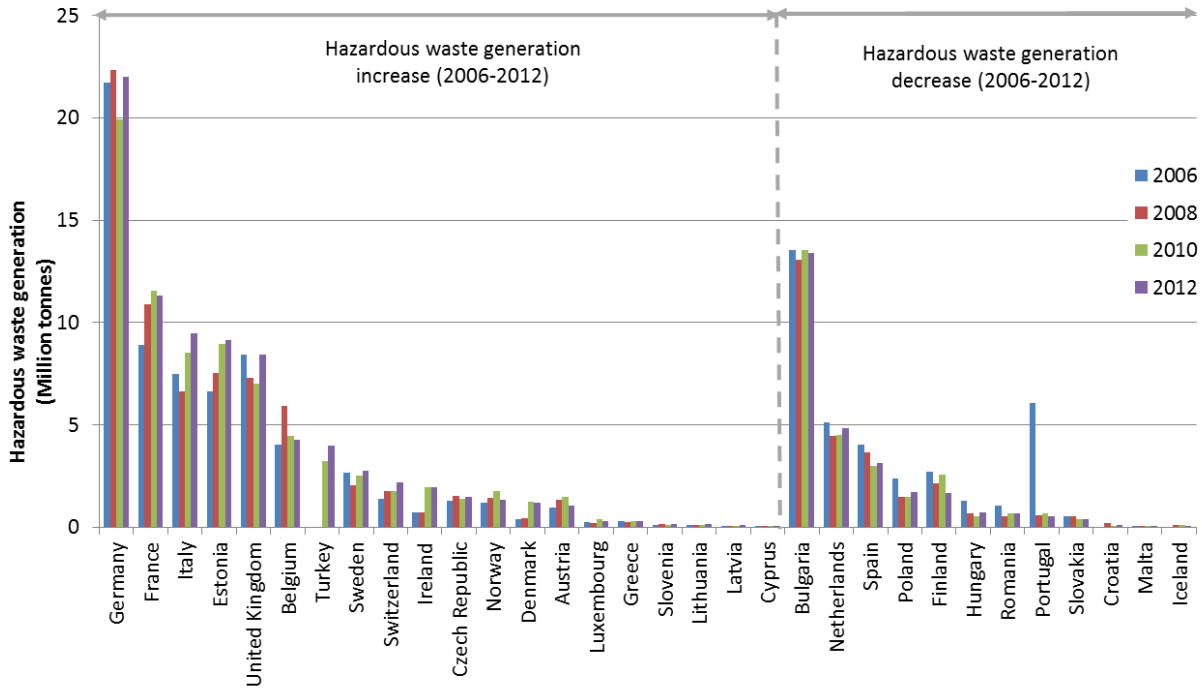
It should also be noted that Member States have to report the amount of hazardous waste generated in their country in relation to different economic activities and waste types. In contrast, the waste treatment data reported to Eurostat by the Member States is only related to waste types and not to economic activity, but includes the different treatment types. Therefore, it is not possible to analyse which waste treatment is used for waste generated by a specific economic activity.

The Waste Statistics Regulation only requests Member States to report the treatment of waste managed domestically, which means that it is not possible to know whether the treated waste originates directly from the Member State or if it is imported. Finally, the exported waste should not be included in the reported treated amount. These reporting rules add to the differences between the amount of generated hazardous waste and the amount of treated waste.

3.1 Total hazardous waste generation

The total generation of hazardous waste in the EU-28, NO, IS, CH and TR for all NACE activities, including households, was 103, 98, 104 and 105 million tonnes for 2006, 2008, 2010 and 2012 respectively, equivalent to an increase of 1.4 % between 2006 and 2012. During this period, 20 countries increased their generation of hazardous waste and 12 countries reduced it. However, important fluctuations were observed for each reporting period (2006, 2008, 2010 and 2012), as indicated in Figure 3-1.

Figure 3-1 Hazardous waste generation in EU-28 member states, CH, IS, NO, TR



Note: Countries grouped by hazardous waste generation increase between 2006 and 2012 (on the left inside of the graph) and hazardous waste generation decrease between 2006 and 2012 (on the right inside). For each group, countries have been ranked from the largest quantity generated to the lowest in 2012. Total hazardous waste generated from all NACE activities, including household waste.

Source: Eurostat [env_wasgen], 2015. Switzerland: Statistik Schweiz (2015).

Figure 3-1, and subsequent graphs in this chapter, provide two levels of information that include the ranking of countries for a given indicator in 2012 (here, the generation of hazardous waste) and the grouping of countries based on whether a given indicator shows an increase or a decrease of hazardous waste generation between 2006 and 2012. For example, according to Figure 3-1, Germany is the country reporting the highest amount in 2012 for the group of countries which experienced an increase in generation between 2006 and 2012. France and Italy are ranked second and third for this indicator. Conversely, Bulgaria generated a high amount of hazardous waste in 2012, but reported a small decrease between 2006 and 2012.

When considering the countries that had the largest relative changes between 2006 and 2012 (ratio of 2012/2006), it is interesting to note that the change is linked to few types of hazardous waste, as summarised in Table 3-1 for the top five countries with the highest increase and the top five countries with the highest decrease between 2006 and 2012. For example, while Denmark generated a relatively small quantity of hazardous waste, it was the country with the largest increase in hazardous waste generated between 2006 and 2012 (372 892 and 1 192 750 tonnes, respectively). This is due to a change in the national reporting procedure, and the inclusion of hazardous waste from soils (473 238 tonnes in 2012), not reported previously.

Table 3-1 Countries with the largest increase and largest decrease of hazardous waste generation between 2006 and 2012

Member State *	2006	2012	Ratio 2012/2006	Waste types contributing most to the change
Top 5 Member States with the highest relative increase				
Denmark	372 892	1 192 750	3.2	Mineral and solidified wastes (88 %), of this 60 % are soils
Ireland	708 791	1 972 204	2.8	**
Cyprus	16 961	31 288	1.8	Discarded vehicles (96 %)
Latvia	65 333	95 114	1.5	Mineral and solidified waste (> 99 %), of this 82 % are soils
Lithuania	95 178	136 785	1.4	Equipment (71 %)
Top 5 Member States with the highest relative decrease				
Portugal	6 063 104	544 963	0.1	Chemical and medical waste (72 %), of this 57 % are used oils
Hungary	1 300 126	700 246	0.5	Mineral and solidified waste (99 %), of this > 99 % are soils and dredging spoils
Croatia ***	221 145	122 541	0.6	Mineral and solidified waste (> 99 %)
Malta	51 012	29 326	0.6	Chemical wastes (90 %)
Finland	2 710 948	1 653 942	0.6	Mineral and solidified waste (57 %), Chemical and medical waste (17 %), Equipment (16 %)

Note: The percentage in the last column represents the waste types contributing the most to the change observed between 2006 and 2012.

* Only EU-28 countries are included in this analysis.
** Ireland only reported total hazardous waste and hazardous waste excluding major mineral wastes in 2012.

*** For Croatia comparison is made between 2008 and 2012 as data is not available for 2006.

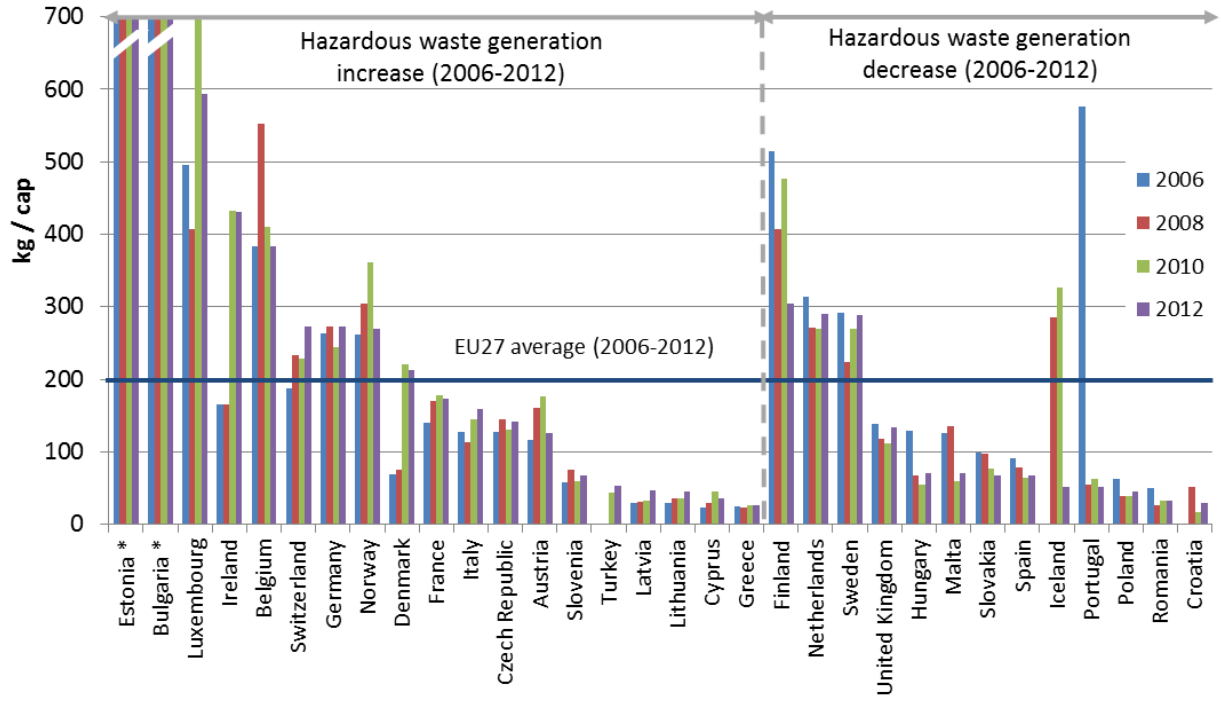
Source: Eurostat [env_wasgen], 2015.

The large changes observed in Table 3-1 may be due to a number of factors that can be attributed to methodological changes made between 2006 and 2012. Argus (2011) in its validation report also identified other factors for the changes of hazardous waste generation such as misreporting and under-reporting. It is difficult to interpret the reasons why countries are subject to large reductions in their hazardous waste generation. It can be caused by a slowdown of the economic activity or the closure of mines. Other reasons could be improvements of manufacturing processes (e.g. resulting from the implementation of the IPPC/IED or the RoHS Directives for example).

3.2 Total hazardous waste generation per capita

The generation of hazardous waste is also presented on a per capita basis to remove demographic bias. The EU-27 average of generated hazardous waste per capita was found to have stayed rather stable in the period 2006-2012, ranging from 190 to 204 kg/cap. Results for the EU-28, CH, IS, NO, and TR are presented in Figure 3-2.

Figure 3-2 Hazardous waste generated per capita in EU-28 member states, CH, IS, NO, TR



Note: Estonia: 4 914 kg/cap (2006), 5 638 kg/cap (2008), 6 731 kg/cap (2010), 6 925 kg/cap (2012). Bulgaria: 1 760 kg/cap (2006), 1 741 kg/cap (2008), 1 833 kg/cap (2010), 1 835 kg/cap (2012). Countries grouped by hazardous waste generation increase between 2006 and 2012 (on the left inside of the graph) and hazardous waste generation decrease between 2006 and 2012 (on the right inside). For each group, countries have been ranked from the largest quantity generated to the lowest in 2012. Hazardous waste generated from all NACE activities, including households.

Source: Eurostat [env_wasgen], 2015. Switzerland: Statistik Schweiz (2015). Population data for Switzerland: Eurostat [demo_pjan], 2015.

For 2006, 2008, 2010 and 2012, the generation of hazardous waste per capita in the EU-27 remained almost constant, averaging 198 kg per capita over the four reporting periods. For comparison, the total generation of waste including non-hazardous and hazardous waste averaged 5 062 tonnes per capita for EU-27 over the same period. Out of the 18 countries which increase in hazardous waste generation per capita between 2006 and 2012, 9 countries generated more than the EU-27 average. Only 3 countries (Finland, Netherlands, Sweden) generating more hazardous waste per capita than the EU-27 average reported a decrease in generation between 2006 and 2012. In Switzerland, where data is available until 2013 the hazardous waste generation per capita slightly increased in 2011, following with further increases in 2012 and 2013. Between 2011-2013 hazardous waste generation per capita increased by 26 % in Switzerland.

Estonia and Bulgaria have, by far, the highest amount of hazardous waste generation per capita and this amount increased between 2006 and 2012. For Estonia, this is mostly due to the production of coke and refined petroleum products (oil shale[5]) and electricity, gas, steam and air conditioning supply, together representing 98 % of the total amount of hazardous waste. This is a perfect example where a decarbonisation policy of the energy system of the country could generate two significant environmental benefits, namely a significant reduction in greenhouse gas emissions and a large reduction in hazardous waste generation. For Bulgaria, this is mostly due to the mining and quarrying sector, representing 99 % of the total reported amount by the country. Bulgaria has large mining activities, namely coal and lignite, metallic minerals (e.g. iron, manganese, copper, chromium, zinc) and non-metallic minerals, mostly by open-pit excavation.

3.3 Hazardousness of waste (share of hazardous waste in total waste)

Policy efforts have been made to reduce the hazardousness of waste in Europe, through the development of a number of regulatory instruments, such as the IPPC/IED Directive and the RoHS Directive. Hazardousness is here calculated by dividing hazardous waste generation by the total waste generated by a country. There are several (policy) developments pulling hazardous waste generation in two different directions:

- More policy effort is being directed towards eco-design, ban of certain hazardous substances (e.g. the recent Minamata Convention on mercury) in the manufacturing of electronic and electric equipment, and generally more efficient technologies. This can be expected to lead to a decrease in the 'hazardousness' of waste over time. In other words, one can expect that a 'detoxification' of the waste will occur as a consequence of the implementation of these various policy instruments.

- On the other hand, EU policies for cleaning air, water and soil, aiming to decrease air emissions and waste water emissions from different industrial activities, including waste management, generally lead to higher amounts of hazardous waste. Due to these requirements and due to improved standards, linked to end of pipe solutions, one can infer an increase in hazardous waste generation from certain sectors (manufacturing, energy, mining etc.), rather than a reduction of the hazardousness of the waste.

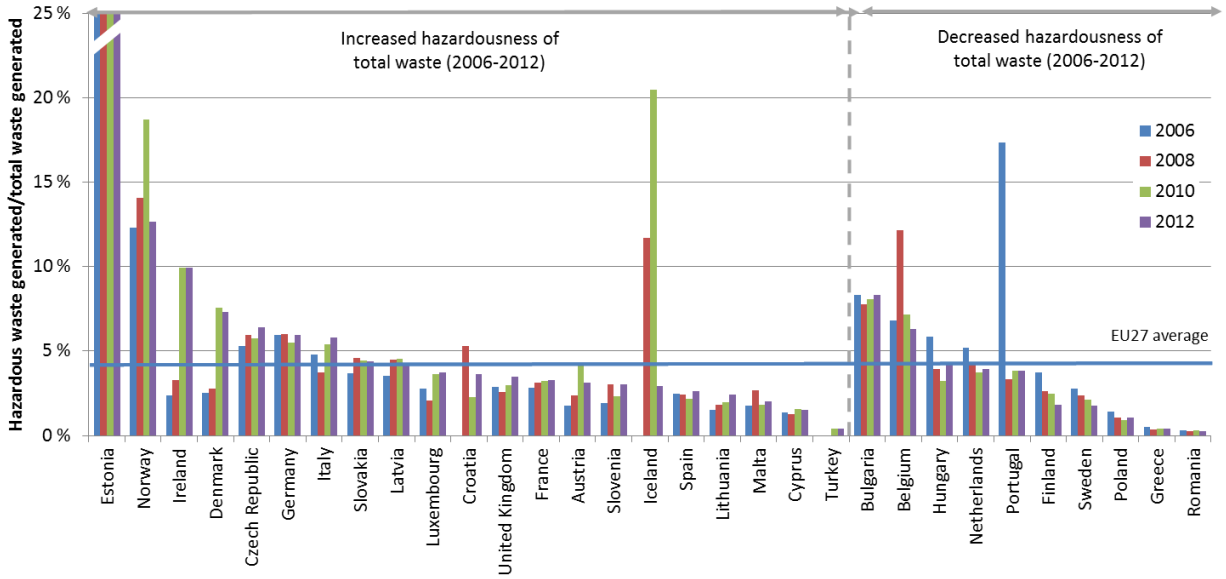
- In addition, the EU has set minimum collection targets for WEEE and battery waste, which will increase the collected amounts and hence increase the amount of hazardous waste generated.

- Finally, where industrial activities are relocated out of the EU, the result might be a reduction in hazardous waste in the EU, while in fact the burden is rather shifted out of the EU.

While it is not possible to draw particular conclusions regarding the change in the hazardousness of waste for a particular country because of the reasons mentioned above, it may help us to question why countries with similar features may have such high disparities. Hazardousness is presented in Figure 3-3.

[5] Oil shale ash is hazardous waste in Estonia not due to the content of different hazardous substances, but due to the free lime content. In contact with water the oil shale ash becomes alkaline. In fact there are many ash types which are alkaline (e.g wood and peat ashes), but those are considered non-hazardous waste in the European List of waste. The application of the hazardousness property's 'corrosive' for oil-shale ash is therefore strict implementation of the somehow flexible property. Estonia produces most of its energy from domestically sourced oil shale, and thereby generates a great amount of waste. Countries who produce their energy from imported gas or petrol do not produce the related waste in their own country because the waste is generated elsewhere and this waste generation is not taken into account in European waste statistics (Estonian Ministry of the Environment and Estonian Environment Agency, 2015).

Figure 3-3 Evolution of hazardousness in EU-28 member states, IS, NO and TR



Note: Estonia: 35 % (2006), 38 % (2008), 47 % (2010) and 42 % (2012). Hazardousness calculated by dividing total hazardous waste generation by the total generated amount of waste by a country. Countries grouped by hazardousness increase between 2006 and 2012 (on the left inside of the graph) and hazardousness decrease between 2006 and 2012 (on the right inside). For each group, countries have been ranked from the largest hazardousness to the lowest in 2012. Hazardous waste generated from all NACE activities, including household waste.

Source: Eurostat [env_wasgen], 2015.

Estonia is the country with the highest hazardousness level. This is due to very high hazardousness for some NACE activities, as summarised in Table 3-2.

Table 3-2 Highest level of hazardousness in Estonia

NACE activity	Hazardousness
D - Electricity, gas, steam and air conditioning supply	99 %
C19 - Manufacture of coke and refined petroleum products	94 %
C20-C22 - Manufacture of chemical, pharmaceutical, rubber and plastic products	42 %
C23 - Manufacture of other non-metallic mineral products	41 %
G4677 - Wholesale of waste and scrap	22 %

Note: For this table, the hazardousness is calculated as the amount of hazardous waste divided by the amount of total waste for each NACE activity.

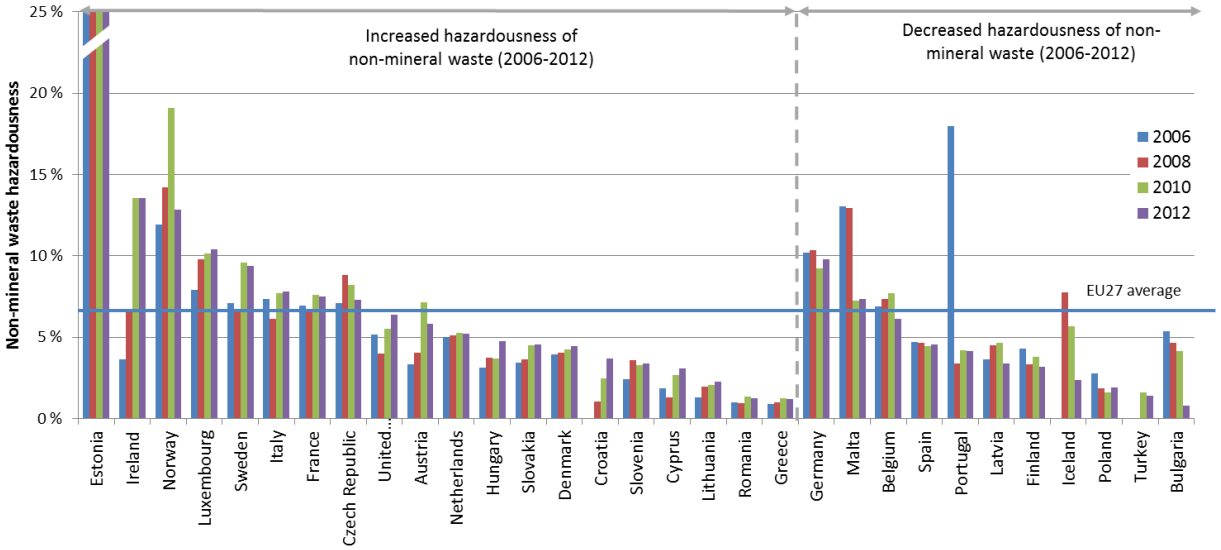
Source: Eurostat [env_wasgen], 2015

The hazardousness is influenced by several factors. Obviously it depends on the structure of the country's economy, but also on the eco-efficiency of the economic activities as well as the quality of the reporting. An increase in hazardousness can be attributed to a decrease in total waste generated, an increase in hazardous waste generation or a combination of the two.

Figure 3-3 also provides important information regarding countries with low level of hazardousness. It would require a more in-depth analysis and comparison with structural economic factors to find out if countries with low hazardousness level (e.g. Lithuania, Malta, Poland, Greece, Turkey and Romania) are under-reporting their hazardous waste generation, for example because this waste is not separated from other waste, or if the level of activity generating hazardous waste is low.

A similar exercise was undertaken by assessing the hazardousness for all the hazardous waste excluding major mineral wastes for all the NACE activities, in order to exclude mining and quarrying waste (Figure 3-4), and for households, as defined in NACE (Figure 3-5).

Figure 3-4 Evolution of hazardousness of waste excluding major mineral wastes in EU-28 member states, IS, NO and TR



Note: Estonia: 57 % (2006), 68 % (2008), 78 % (2010) and 80 % (2012).

Source: Eurostat [env_wasgen], 2015.

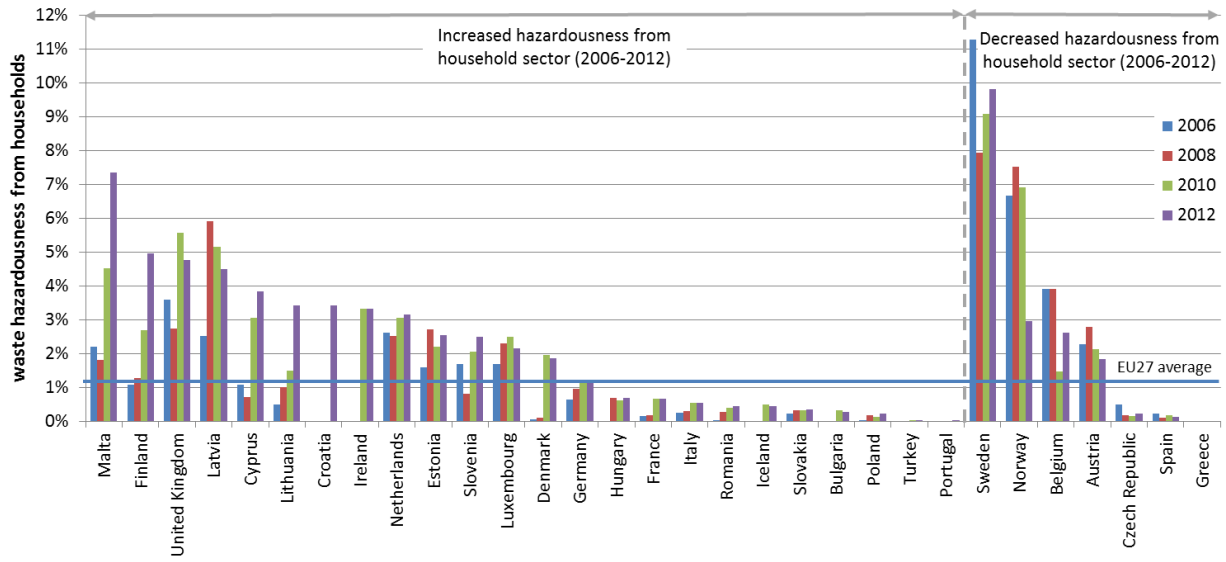
Figure 3-4 shows that 16 countries are consistently below the EU-27 average, whether their hazardousness increased or not. 20 countries show an increase in hazardousness. This could be an indication that the waste management system is capturing more hazardous waste that was previously unaccounted for (due to better sorting). It could be due to a better reporting system with more control. It could also be due to an increase in activities generating more hazardous waste per tonne of waste generated (for example, air pollution control residues, residues from scrap metal and recycling centres).

When the hazardousness of household waste is plotted, as presented in Figure 3-5, on EU-27 level, an average of 1.6 % of the household waste is reported as hazardous. However, there are large differences between countries that are unlikely to be explained by differences in household consumption patterns only. The low level of hazardousness of waste from households in some countries might be an indication that the collection system for households provides only weak incentives to separate hazardous from non-hazardous waste. Conversely, the higher level of hazardousness observed in countries such as Sweden, Norway, Belgium, Malta, Finland and the UK might indicate that this type of waste is better segregated. In e.g. Sweden and Norway where the hazardousness of household waste is high, there are a few waste categories (mineral and solidified wastes, discarded equipment, wood waste, chemical and medical waste) with significantly higher hazardousness compared to EU-28 average. Increases in hazardousness over time might also indicate improving collection of hazardous waste from households and improved reporting. This is for example the case in Malta, where increased collection of WEEE increased the hazardousness of waste from households (Malta Environment and Planning Authority, 2015).

The composition of the reported hazardous waste from households might also help to explain some of the differences. Figure 3-6 shows that countries report very differently on hazardous waste from households: In Croatia, Cyprus, Finland, Ireland, Malta and the United Kingdom – all countries with a hazardousness rate above the average – more than 60% of hazardous household waste is categorised as discarded vehicles, while 13 countries do not report any discarded vehicles as hazardous waste from

households. In any case, the enormous differences in hazardousness of household waste and composition of hazardous household waste are probably caused by both differences in the collection systems for hazardous household waste and differences in reporting methodologies between countries.

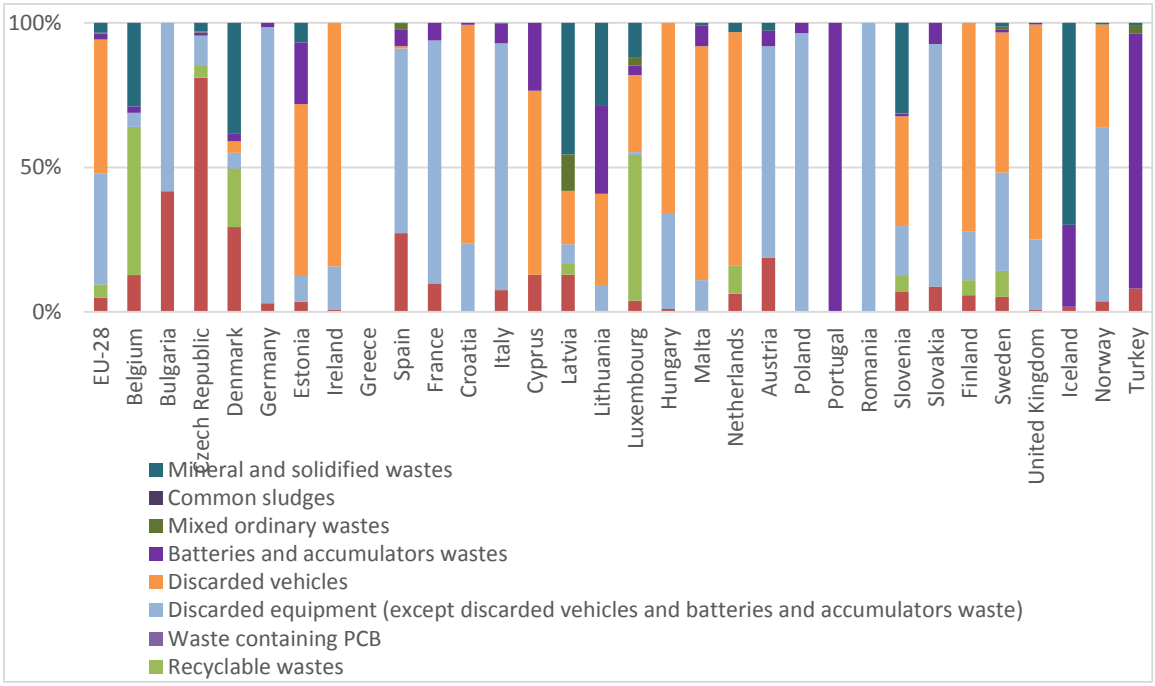
Figure 3-5 Evolution of household waste hazardousness in EU-28 member states, IS, NO and TR



Note: Hazardousness is calculated as the share of hazardous waste in all household waste.

Source: Eurostat [env_wasgen], 2015

Figure 3-6 Composition of hazardous household waste in EU-28 member states, IS, NO and TR, 2012



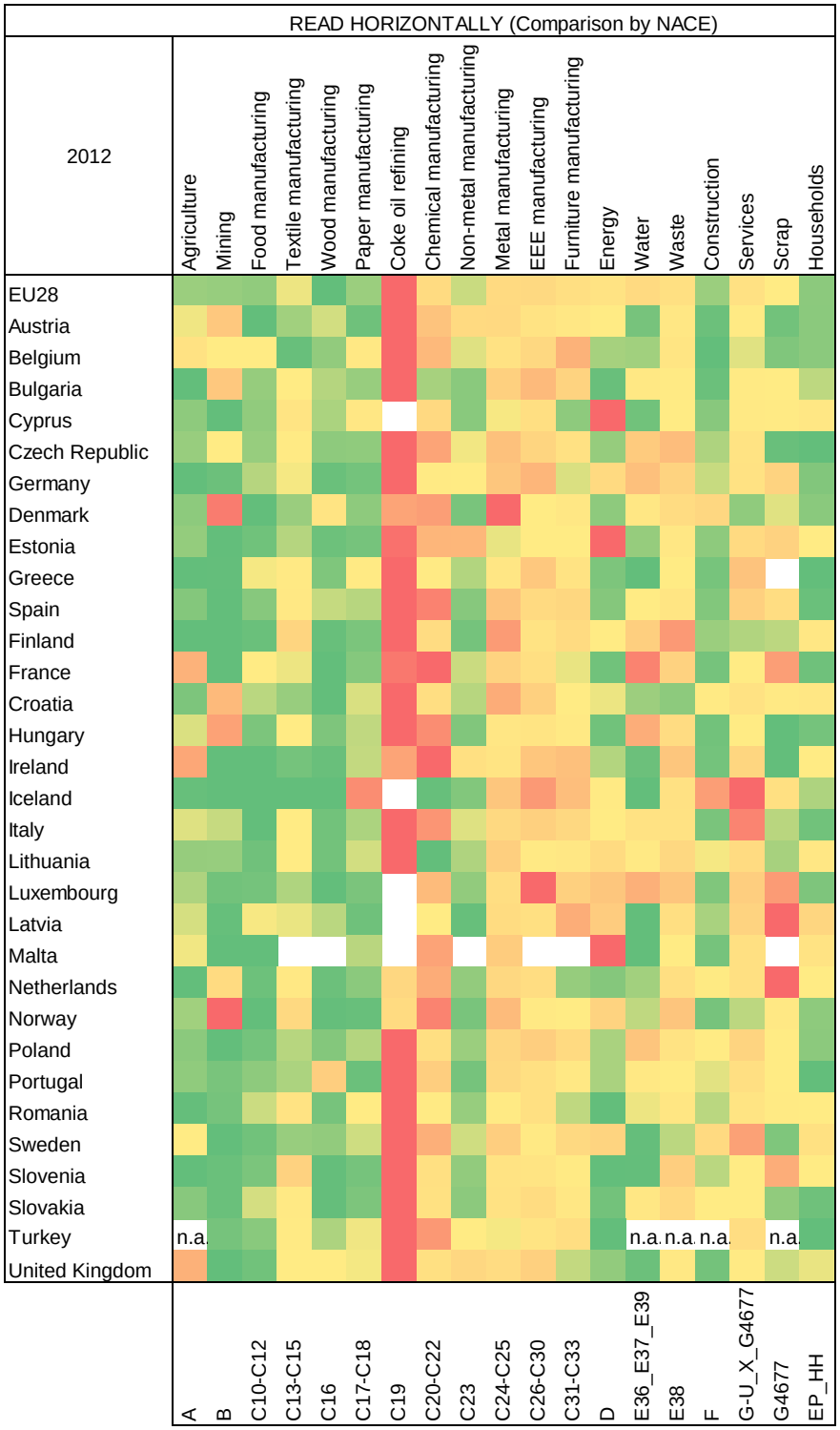
Source: Eurostat [env_wasgen], 2015

3.4 Identification of hazardousness hot spots

A qualitative screening has been developed to identify ‘hot spots’ across Europe. In order to illustrate this, a conceptual map of Europe was made with hot spots indicated in red. The hazardousness for each NACE sector was assessed, in order to identify the more ‘dirty’ NACE activities within each country, as indicated in Figure 3-7 with numerical values presented in Annex I.

All countries are plotted with the level of hazardousness of waste generated by the different NACE 2 levels. The hazardousness was calculated by dividing the hazardous waste generated by the total amount of waste. The higher the percentage, the higher the proportion of generated hazardous waste, compared to total waste generation, within the NACE category. This type of visualisation should however be interpreted with caution since the hazardousness can also be influenced by the quality of the reporting. This indicates the relative ‘dirtiness’ of different activities within a country, i.e. the hazardousness hot spots for each country. The level of hazardousness also provides some information regarding the disparity between countries within the same NACE activities. For instance, it appears that the manufacture of coke and refined petroleum products (C19) consistently generates the highest level of hazardousness in most countries. However, the hazardousness of this sector varies from 13 % (NL) to 94 % (EE), with an EU-28 average of 72 %.

Figure 3-7 Mapping of hazardousness per NACE activity in EU-28 member states, IS, NO and TR, 2012



Note: Red cell indicates the highest level of hazardousness across NACE categories and the green cells the lowest. Matrix is colour-coded across each row, using conditional formatting. Blank cells represent cases where no waste of this type is reported to be generated, n.a. represents missing data.
A: Agriculture, forestry and fishing
B: Mining and quarrying
C10-C12: Manufacture of food products; beverages and tobacco products
C13-C15: Manufacture of textiles, wearing apparel, leather and related products
C16: Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials

C17_C18: Manufacture of paper and paper products; printing and reproduction of recorded media
C19: Manufacture of coke and refined petroleum products
C20-C22: Manufacture of chemical, pharmaceutical, rubber and plastic products
C23: Manufacture of other non-metallic mineral products
C24_C25: Manufacture of basic metals and fabricated metal products, except machinery and equipment
C26-C30: Manufacture of computer, electronic and optical products, electrical equipment, motor vehicles and other transport equipment
C31-C33: Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment
D: Electricity, gas, steam and air conditioning supply
E38: Waste collection, treatment and disposal activities; materials recovery
F: Construction
G-U_X_G4677: Services (except wholesale of waste and scrap)
G4677: Wholesale of waste and scrap
EP_HH: Households

Source: Eurostat [env_wasgen], 2015.

Other hot spots, indicated in red, in Figure 3-7 can be used to identify disparities between countries. For instance, one may wonder why the UK generates agricultural waste with a hazardousness of 40 %, while the hazardousness of the same activity in Germany is lower than 1 %. It is not possible to determine from the reported data whether this is caused by different reporting methodologies, or whether more efficient technologies/policies are responsible for these differences.

Additional analysis could also be performed to assess whether the level of hazardousness changes with time for each activity and each country. This information could be used at policy level for monitoring progress towards a reduction in hazardousness.

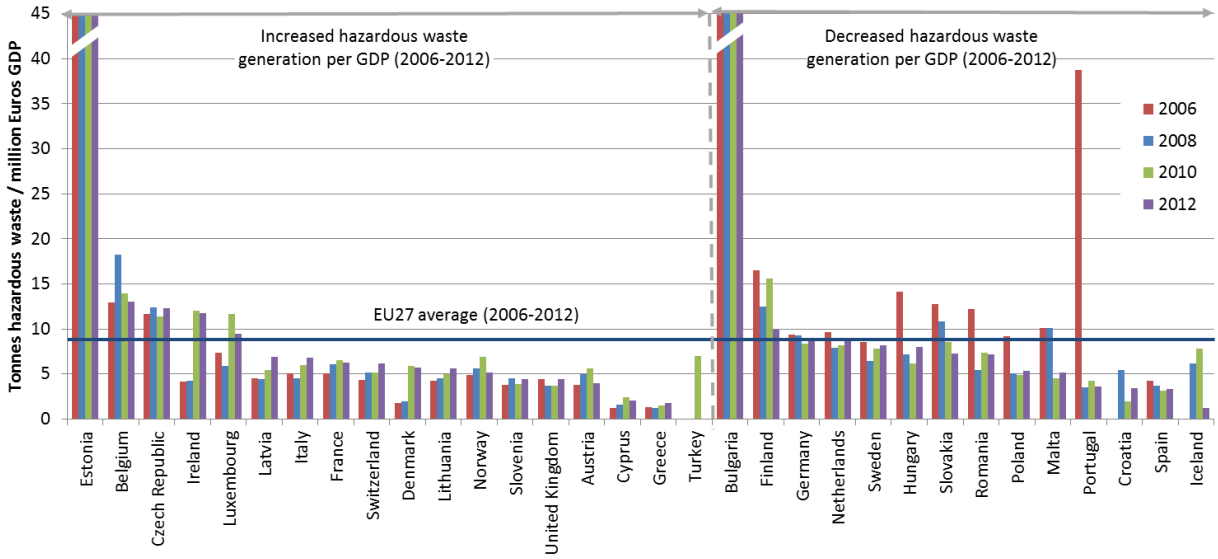
3.5 Hazardous waste generation by economic output

Hazardous waste generation can be analysed based on the economic output of the country, in order to compare the countries' performance. This approach removes the difference between countries with very different economic situations. The total hazardous waste generated is divided by the total GDP for each country and summarised in Figure 3-8, showing the hazardous waste intensity of the countries' economy. Theoretically, a country with a small ratio is a good performer, but a small ratio can also be due to poor reporting of hazardous waste generation, or a low level of hazardous activity. GDP is used because the total waste generation data represents all the activities including households.

Figure 3-8 indicates the hazardous waste intensity per GDP for each country. Estonia and Bulgaria followed by Belgium were the countries with the highest hazardous waste generation per economic output in 2012.

Regarding the grouping on the left inside of Figure 3-8 (increased hazardous waste generated per GDP between 2006 and 2012), most countries are below the EU-27 average, which is encouraging, since it could demonstrate a more efficient society for a given level of economic output. However, countries from this grouping show an increasing amount of hazardous waste per GDP between 2006 and 2012, which goes against one of the objectives of the Waste Framework Directive to reduce hazardous waste generation.

Figure 3-8 Hazardous waste generated per economic output in EU-28 member states, CH, IS, NO and TR



Note: Estonia: 537 t/million € (2006), 594 t/million € (2008), 796 t/million € (2010), 716 t/million € (2012); Bulgaria: 547 t/million € (2006), 466 t/million € (2008), 510 t/million € (2010), 493 t/million € (2012). Hazardous waste intensity is calculated by dividing total hazardous waste generation by the GDP for each country. GDP: Gross domestic product at market prices, millions of euro, chain-linked volumes, reference year 2005 (at 2005 exchange rates). Countries grouped by increase of hazardous waste per GDP between 2006 and 2012 (on the left inside of the graph) and decrease of hazardous waste per GDP between 2006 and 2012 (on the right inside). For each group, countries have been ranked from the largest amount of hazardous waste per GDP to the lowest in 2012. Hazardous waste generated from all NACE activities, including household.

Source: Eurostat [env_wasgen], [nama_gdp_k], 2015. Switzerland: Statistik Schweiz, 2015. GDP data for Switzerland: Eurostat [nama_gdp_k], 2015.

For countries that have experienced a decrease in hazardous waste generation per GDP output, this is encouraging since it could be inferred that the country as a whole is becoming more eco-efficient. Another valid reason, however, might be that production of goods associated with high hazardous waste generation has been relocated outside the EU, as indicated by the trade deficit (imports larger than exports) between 2006 and 2012[6,7]. Finally, in 2012 Estonia generated about 80 times and Bulgaria about 60 times more hazardous waste per GDP than the average. Another reason can be changes in the reporting methodology. For example, the decrease of hazardous waste per GDP in Malta can be mainly attributed to an actual decrease in the amount of waste oils (bilges) which originated from shipping and to a change in the reporting methodology for hazardous waste. Up to 2008, hazardous waste data, except for waste oils and discarded vehicles, was estimated on the basis of GDP figures; from 2010 onwards hazardous waste data originated from waste exports declarations and waste inputs into waste treatment facilities (Malta Environment and Planning Authority, 2015).

3.6 Hazardous waste generation per NACE activity

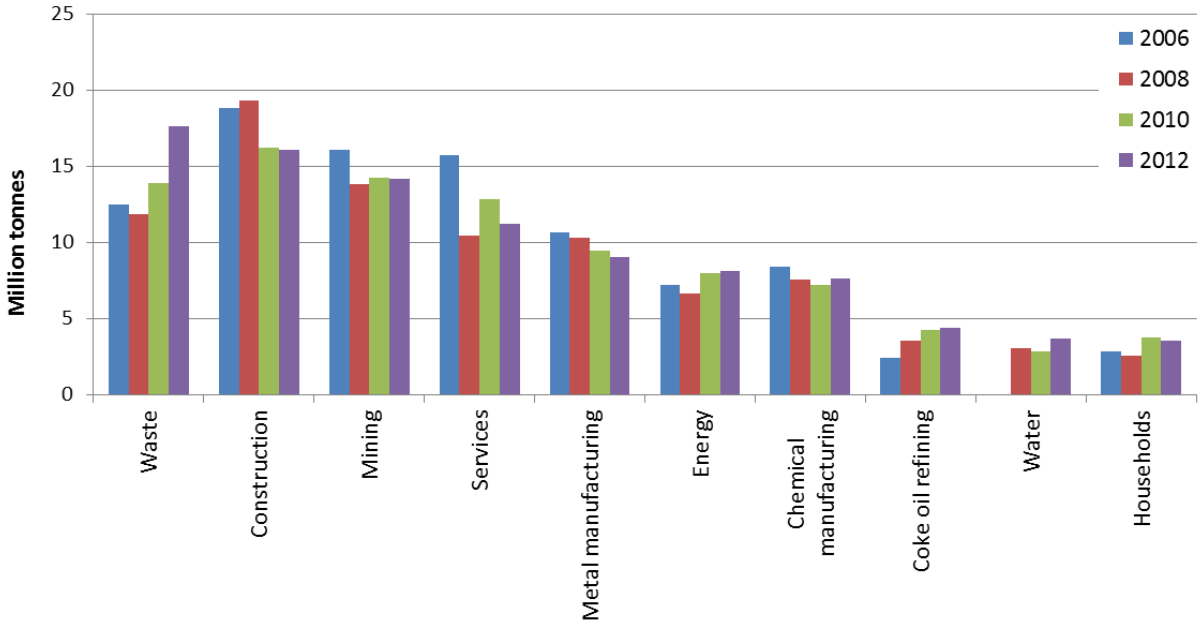
The waste sector (waste collection, treatment and disposal activities; materials recovery) generated the highest amount of hazardous waste in the EU-27 and NO in 2012, as indicated in Figure 3-9, and these amounts have grown by 41 % between 2006 and 2012, as presented in Table 3-3. Hazardous waste from the construction industry closely followed the large economic increase in the building sector (2006 to 2008), and experienced a significant decline in 2010, following the economic crisis.

6 Eurostat (2013). EU28 trade by SITC product group [ext_st_eu28sitc].

7 EEA (2012). The European environment - State and outlook 2010. Update 2012. Material resources and waste - Update 2012. Copenhagen, Denmark. 50 pp.

The coke oil refining sector experienced the highest relative increase between 2006 and 2012. Hazardous waste generation from households also increased markedly (25 %) (Figure 3-9 and Table 3-3). This upward trend in hazardous waste generation can be explained by the fact that more waste is separated (from households and container parks) allowing for the correct identification of hazardous waste and therefore a better reporting. It can also be explained by the WEEE collection target in the WEEE Directive where a minimum of 4 kg per capita from households must be collected. The increase in hazardous waste generation from households mostly originates from discarded vehicles and discarded equipment. These waste types represented 44 % and 38 %, respectively, of the total hazardous waste generated in 2012 by households. The data are heavily influenced by the different ways of allocating discarded vehicles and discarded equipment to NACE categories between countries.

Figure 3-9 Hazardous waste generation per NACE activity in EU-27 member states and NO



Note: NACE activities representing 90 % of the total hazardous waste generation in EU-27 + NOand ordered by the largest amount generated in 2012, for each NACE category. Data sets are not complete for Croatia, Iceland and Turkey and therefore not included in the graph.

Source: Eurostat [env_wasgen], 2015.

While the total amount of hazardous waste generated remained rather stable at around 100 million tonnes in the period 2006 to 2012, significant changes can be observed within a number of sectors, as indicated in Table 3-3.

Table 3-3 Generated amount of hazardous waste by NACE category for EU-27 and NO

	2006 (tonnes)	2012 (tonnes)	% change	Main contributors to the change
Waste	12 472 898	17 639 544	+ 41 %	Germany, France, UK *
Construction	18 779 853	16 078 577	- 14 %	Germany, Portugal, Netherlands **
Mining	16 091 965	14 151 233	- 12 %	Bulgaria, Norway, UK ***
Services	15 714 340	11 215 428	- 29 %	Portugal, UK****
Metal manufacturing	10 665 033	9 048 106	- 15 %	Bulgaria, Poland, Spain+
Energy	7 212 589	8 083 140	+ 12 %	Estonia, Germany ++
Chemical manufacturing	8 388 094	7 639 353	- 9 %	UK, Italy, Finland
Coke oil refining	2 392 107	4 361 286	+ 82 %	Estonia
Water	-	3 657 872	-	NA
Households	2 806 580	3 512 227	+ 25 %	Germany, France, UK

Note: 90 % of the generated amount is represented in the table.
* Germany 48 % increase, France more than doubled and the UK more than tripled.
** Germany, Portugal and the Netherlands decreased while Denmark increased over 36 times and the UK by 80 %
*** Bulgaria +4 %; Norway over 8 times higher, UK over 9 times higher**** Portugal and the UK decreased while Italy increased by 85 %
+ Bulgaria, Poland and Spain decreased whereas Finland close to tripled and Italy increased by 21 %
++ Estonia and Germany increased while in the UK there was a decrease of 74 %

Source: Eurostat [env_wasgen], 2015

At EU-27 level, specifically for the waste sector, the increase of hazardous waste generation between 2006 and 2012 was mostly attributed to sorting residues (W103), mineral and solidified wastes (W12-13), chemical and medical wastes (W01-05) and recyclable wastes, mainly wood waste (W075) most of which was generated in Germany. In contrast, a large decrease of hazardous combustion waste was reported for the waste sector in the same period. This is due to change in the reporting. Hazardous waste allocated to 'combustion waste' in 2006 has been reallocated to 'Mineral wastes from waste treatment and stabilised wastes' in 2012. Because of this change, it is not possible to draw conclusions regarding a potential variation of hazardous waste generation due to a variation of incineration activity. However, it seems quite clear that the increase of recycling activities (better sorting, collection of treated wood and collection of some industrial chemical wastes) generated increased amounts of hazardous waste. The hazardous waste was probably already in the waste but was not reported as hazardous because it was mixed with other waste types. This increase is not necessarily a problem, provided that the generated hazardous waste is managed appropriately to minimise harm to the environment and human health.

In addition to that, it is worth noting that while still representing only 1.3 % of the total hazardous waste amount, the hazardous waste generation from wholesale of waste and scrap has increased by 41 % in this period. This is possibly also due to an increased separation of hazardous waste from non-hazardous waste.

3.7 Hazardous waste generation hot spots per NACE activity

A mapping of the hot spots of hazardous waste generated across 19 NACE sectors, including households, is presented in Figure 3-10. Numerical values are presented in Annex II. The graph should be read horizontally, comparing NACE sectors within each country. Thus, the graph shows which sectors generate the largest amounts of hazardous waste within the country. This figure should be distinguished from Figure 3-7, which maps the proportion of hazardous waste in comparison to the total amount of waste generated in each NACE sector.

Figure 3-10 shows that the highest absolute amount of hazardous waste generated originates mostly from the waste, construction and service sectors. One reason for this is that Member States report WEEE, discarded vehicles and batteries mostly in these three categories. Mining is the sector generating

most hazardous waste in Bulgaria, Norway and Turkey. A number of countries report the highest amount of hazardous waste in the household sector.

Figure 3-10 Mapping of hazardous waste generation per NACE activity in EU-28 member countries, IS, NO and TR, 2012

Note: Red cell indicates the highest level of hazardous waste generated and the green the lowest. Matrix is colour-coded across each row, using conditional formatting. N.a represents missing data.
A - Agriculture, forestry and fishing
B - Mining and quarrying
C10-C12 - Manufacture of food products; beverages and tobacco products
C13-C15 - Manufacture of textiles, wearing apparel, leather and related products

C16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17_C18 - Manufacture of paper and paper products; printing and reproduction of recorded media
C19 - Manufacture of coke and refined petroleum products
C20-C22 - Manufacture of chemical, pharmaceutical, rubber and plastic products
C23 - Manufacture of other non-metallic mineral products
C24_C25 - Manufacture of basic metals and fabricated metal products, except machinery and equipment
C26-C30 - Manufacture of computer, electronic and optical products, electrical equipment, motor vehicles and other transport equipment
C31-C33 - Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment
D - Electricity, gas, steam and air conditioning supply
E36_E37_E39 - Water collection, treatment and supply; sewerage; remediation activities and other waste management services
E38 - Waste collection, treatment and disposal activities; materials recovery
F - Construction
G-U_X_G4677 - Services (except wholesale of waste and scrap)
G4677 - Wholesale of waste and scrap
EP_HH - Households

Source: Eurostat [env_wasgen], 2015.

4 Hazardous waste treatment

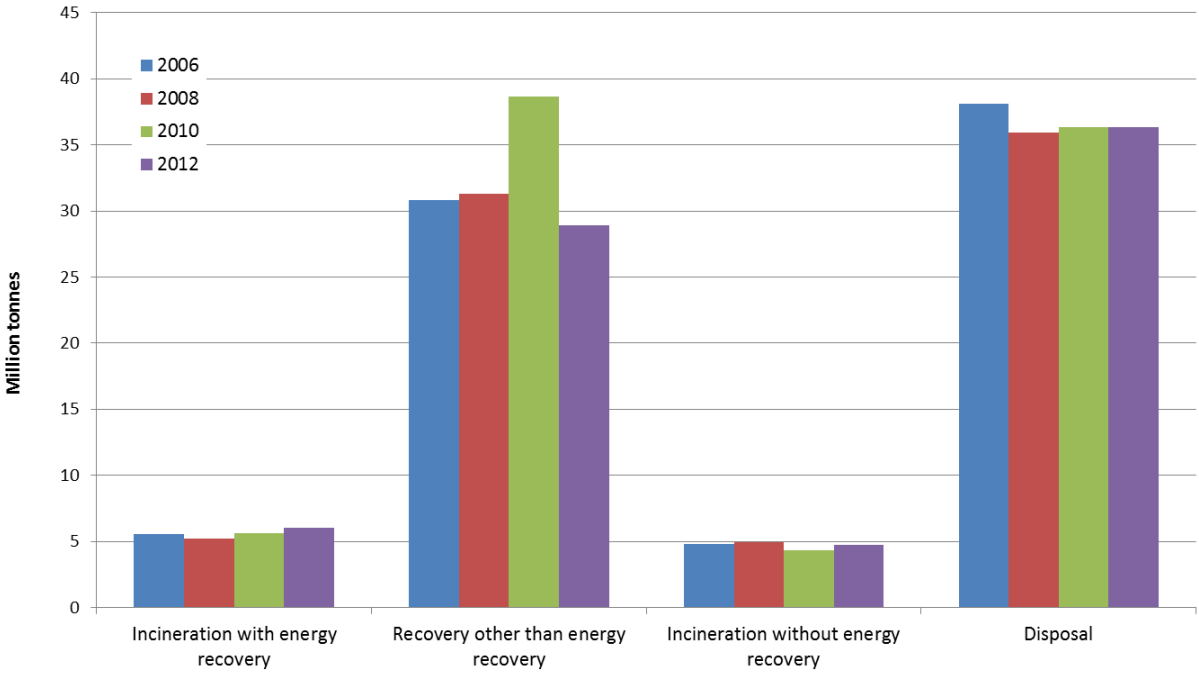
Next to hazardous waste generation, it is equally important to analyse how this generated waste is being managed across Europe. In theory, hazardous waste is an environmental and health problem, if its management is not adequate (if hazardous waste is dispersed in the environment). The Eurostat data on hazardous waste treatment include imported hazardous waste and exclude exported hazardous waste. The two data sets on generated and treated hazardous waste are thus not directly compatible.

4.1 Hazardous waste treatment in EU-27 and NO

Each country is required to report to Eurostat on the type of management of hazardous waste, as well as the exports and imports to and from countries within Europe and outside Europe. Management of hazardous waste is reported using the categories incineration with energy recovery, incineration without energy recovery, recovery other than energy recovery (with/without backfilling), and disposal (divided into deposit onto or into land, and land treatment and release into water bodies).

The evolution of hazardous waste treatment is summarised in Figure 4-1. Between 2006 and 2012, the amount of hazardous waste treated through incineration without energy recovery remained almost unchanged. Recovery other than energy recovery increased until 2010 but dropped in 2012. Incineration with energy recovery increased steadily, in 2012 accounting for close to 8 % of total hazardous waste treatment. Disposal decreased by 5 % in the period 2006 to 2012; however, it is still the most important management option on an aggregated level. It should be noted, however, that the objective to reduce harm to health and environment can justify the controlled disposal in hazardous waste landfills as the most sustainable option in certain cases.

Figure 4-1 Evolution of hazardous waste treatment in EU-27 member states and NO, million tonnes of hazardous waste treated



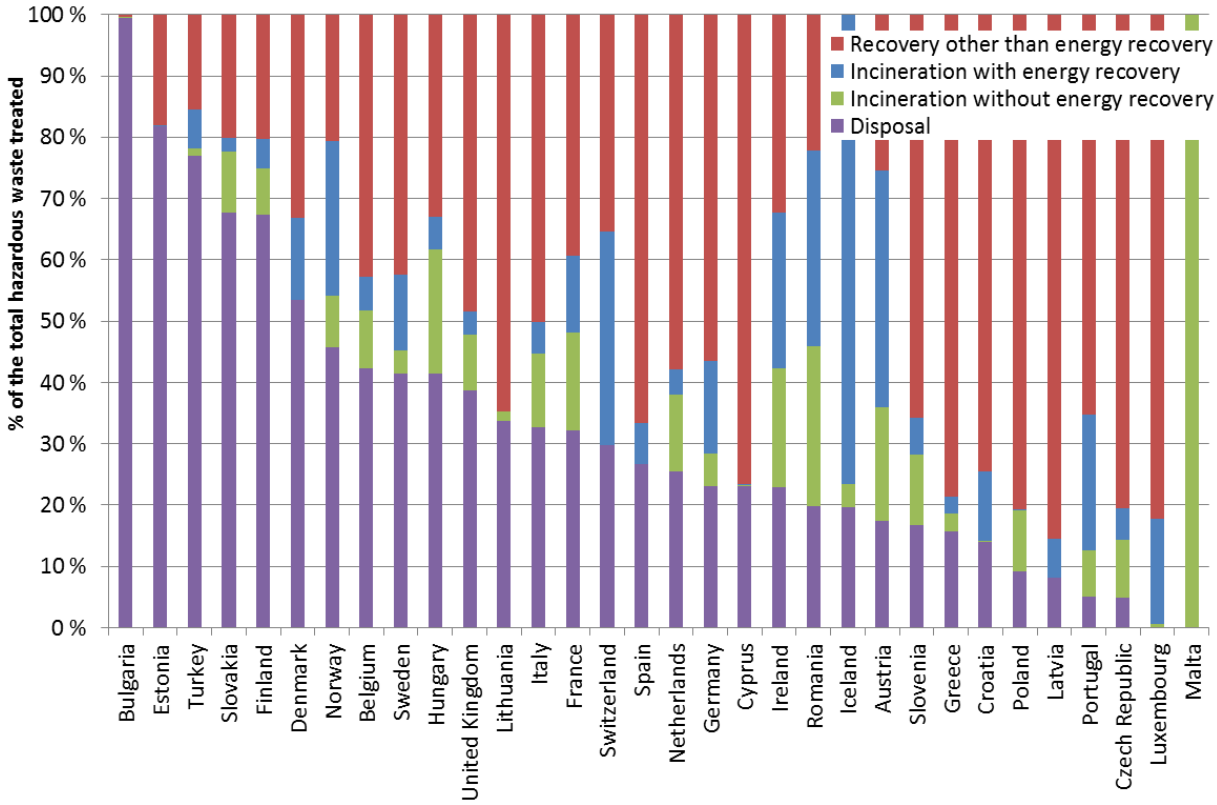
Note: A category called 'recovery other than energy recovery - backfilling' is included in the recovery section and not the landfilling section. At the EU-27 level, this category represents 3% of the total treated hazardous waste. Depending on the interpretation of backfilling, recovery data might be overestimated. Data sets are not complete for Croatia, Iceland and Turkey and therefore not included in the graph.

Source: Eurostat, [env_wastrt], 2015.

4.2 Hazardous waste treatment by country

When considering the proportion of the different hazardous waste management types by country, the picture is much more contrasted, as illustrated in Figure 4-2. In 2012, for EU-28, the share between different treatments was 8 %, 38 %, 6 % and 48 % for energy recovery, recovery other than energy recovery, incineration without energy recovery and disposal (landfill), respectively. Six countries reported a higher landfill rate than the average EU-28, ranging from 53 % in Denmark to 100 % in Bulgaria. It has to be kept in mind that Figure 4-2 only shows hazardous waste treated in the respective country's territory, i.e. including waste imported for treatment and excluding waste exported for treatment. For example, Malta exports the bulk of the hazardous waste generated in the country for final treatment but Figure 4-2 only shows hazardous waste incinerated in the country.

Figure 4-2 Hazardous waste treatment share for EU-28, CH, IS, NO, TR in 2012, % of total treated hazardous waste



Note: A category called 'recovery other than energy recovery - backfilling' is included in the recovery section and not the landfilling section. At the EU-28 level, this category represents 3% of the total treated. Depending on the interpretation of backfilling, recovery data might be overestimated.

Source: Eurostat, [env_wastrt], 2015. Switzerland: Statistik Schweiz, 2015. For Switzerland, it is assumed that 100 % of incineration is performed with energy recovery, and physical-chemical treatment is allocated to the category 'recovery other than energy recovery'.

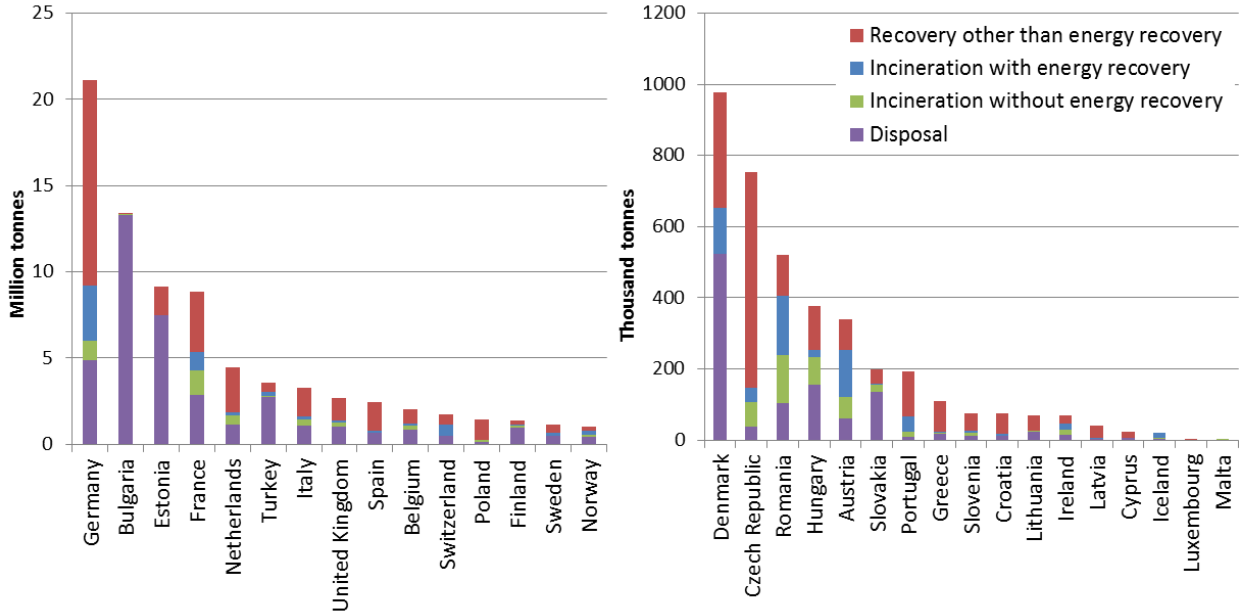
Figure 4-3 indicates the quantity of hazardous waste treated for each management type in the EU-28 countries, NO and TR in 2012. This shows a very large diversity of treatment shares for hazardous waste. A number of countries seem to follow the waste hierarchy for the management of hazardous waste. 20 countries have a higher recovery rate than other treatment types, although it is worth noting that no information is available on the type of recovery activities taking place. It is interesting, for instance, to see that Greece, relying mostly on landfill for non-hazardous waste, is recovering 79 % of its total amount of treated hazardous waste. However, it is important to bear in mind that Greece reportedly only treated 108 000 tonnes of hazardous waste in 2012, compared to 297 000 tonnes generated.

One of the reasons for these disparities are imports and exports of hazardous waste. According to EEA (2012)[8] and Eurostat (2013)[9], hazardous waste is increasingly shipped across national borders, but 93 % of this waste is shipped within the EU-27, depending on the availability of specialised treatment plants.

[8] EEA (2012). The European environment - State and outlook 2010. Update 2012. Material resources and waste - Update 2012. Copenhagen, Denmark. 50 pp.

[9] Eurostat (2013). Transboundary waste shipment. Accessed January 2014.

Figure 4-3 Hazardous waste treatment quantities for EU-28, CH, IS, NO and TR in 2012

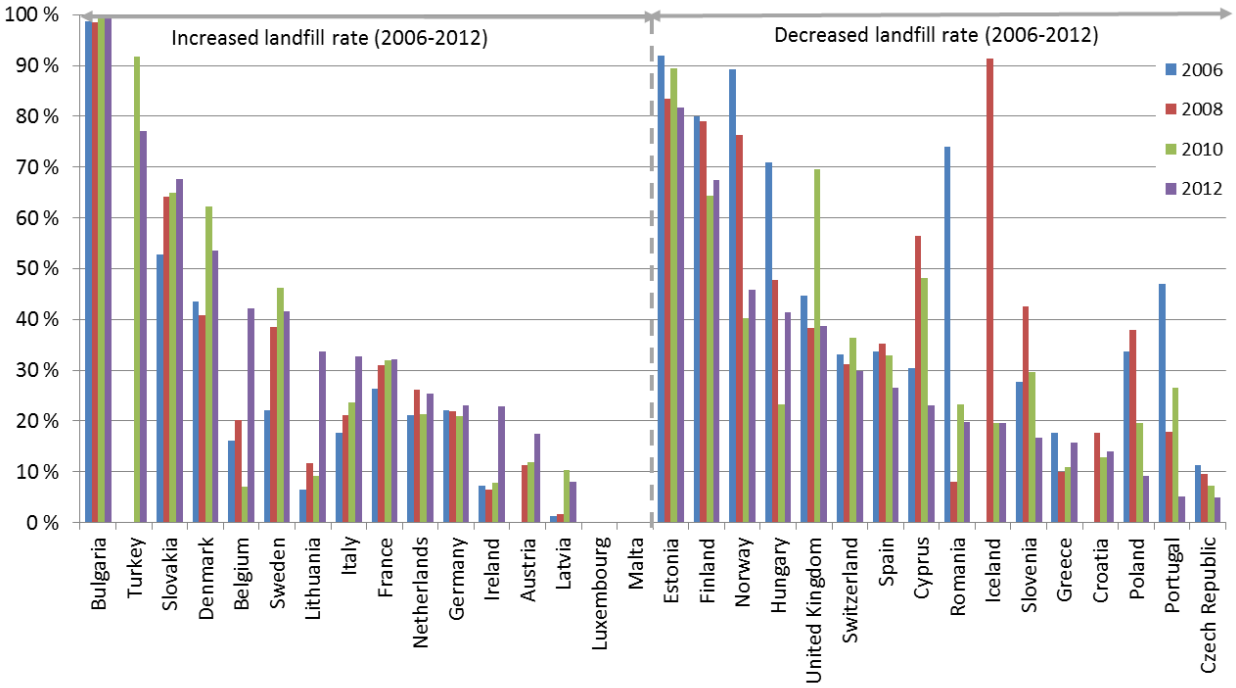


Note: Countries ordered by the amount of total treated hazardous waste in 2012. For Switzerland, it is assumed that 100 % of incineration is performed with energy recovery, and physical-chemical treatment is allocated to the category 'recovery other than energy recovery'.

Source: Eurostat, [env_wastrt], 2015. Switzerland: Statistik Schweiz, 2015.

Another interesting perspective is to assess the evolution of the treatment share on a country by country basis, indicating whether countries are actually moving in the right direction of reducing their reliance on landfill (i.e. moving up the waste hierarchy). A good proxy to analyse the change in treatment share, is to plot only the landfill rate (other treatments will vary accordingly). The evolution of the landfill share in total treatment for 2006, 2008, 2010 and 2012 is presented in Figure 4-4. The figure indicates that 16 countries have decreased their landfill rate between 2006 and 2012. However, the figure also indicates that a significant number of countries consistently landfilled more than 40 % of their treated hazardous waste. Again, the figure shows the treatment in the respective country's territory, not the management of the hazardous waste generated in the country, leading for example to a zero landfill rate for hazardous waste in Malta and Luxembourg while these countries do export waste to be landfilled in other European countries.

Figure 4-4 Hazardous waste landfill rate evolution for EU-28 + CH, IS, NO and TR, % of treated hazardous waste



Note: Countries ranked based on the highest landfill rate in 2012 and grouped between increased (left) and decreased landfill rate (right) between 2006 and 2012. Landfill rate calculated as per total hazardous waste treatment.

Source: Eurostat, [env_wastrt], 2015 Switzerland: Statistik Schweiz, 2015.

4.3 Hazardous waste generation and treatment

The total amount of hazardous waste that is reported as treated is lower than the total amount of hazardous waste generated, when considering the aggregated level of EU-27 and NO. This is summarised in Figure 4-5. For 2006, 2008, 2010 and 2012, the gap between the generated amount and the treated amount of hazardous waste was respectively 23, 19, 14 and 26 million tonnes (Figure 4-5), corresponding to treatment rates of 78 %, 81 %, 86 % and 74 % of the total amount of generated hazardous waste in the EU-27 and NO. The treatment gap could be explained by a number of factors:

- Generated hazardous waste is pre-treated. For example, hazardous waste is separated in a hazardous part and a non-hazardous part, water is extracted from the hazardous waste or similar pre-treatments. However, only the final treatment is then reported as treated according to the Waste Statistics Regulation.

- If exports out of the EU (and NO) are larger than imports, this would contribute to the gap. However, imports into the EU-28 exceeded exports with around 650 000 tonnes in 2006, 2008 and 2010[10], thus cannot explain the gap.

- Differences in the methodologies used for determining hazardous waste generation and treatment;

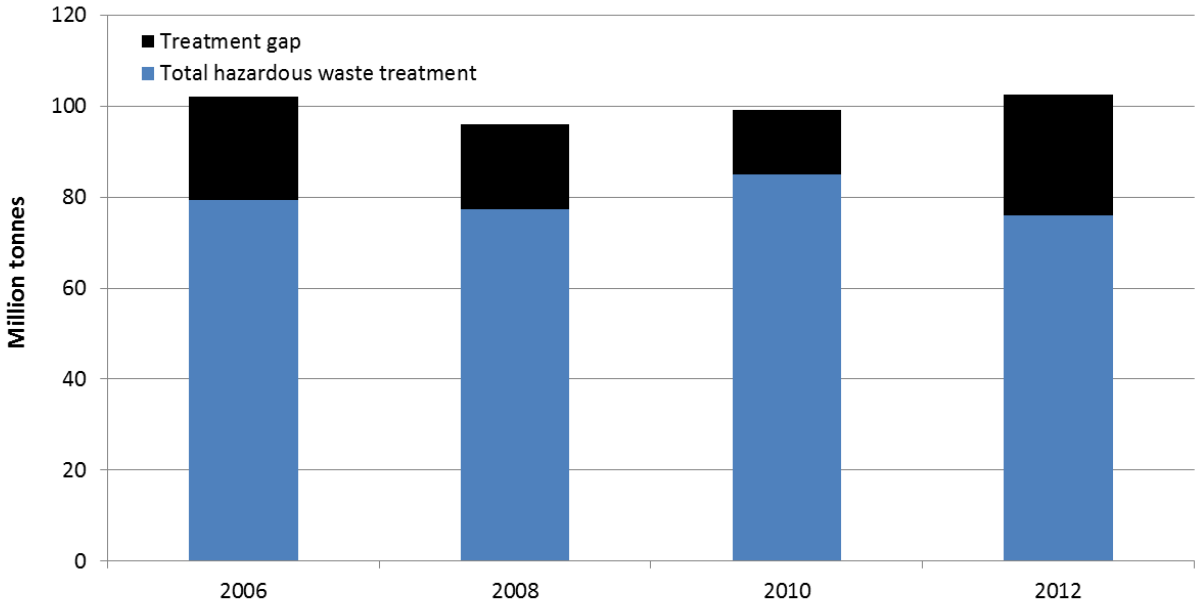
- Some of the generated hazardous waste is stored and later treated or exported.

[10] Calculated by the EEA based on data on waste shipments published by Eurostat. Accessed 4 March 2015.

- Some of the generated hazardous waste is disposed illegally within the country of production.
- Some of the hazardous waste is exported illegally.
- Some hazardous waste generated may have been treated but not reported.

The gap between the amounts of hazardous waste reportedly generated and amounts treated are probably from a combination of the above points. The problem is that we do not know in which proportion.

Figure 4-5 Hazardous waste generated and treated in EU-27 member states and NO



Note: Treatment includes incineration with energy recovery, recovery other than energy recovery, incineration without energy recovery, and disposal. Data sets are not complete for Croatia, Iceland and Turkey and these countries are therefore not included in the graph.

Source: Eurostat, [env_wasgen], [env_wastrt], 2015.

For finding explanations for this gap, it is useful to identify which types of waste are reported as generated in larger amounts than as treated. This is summarised in Table 4-1.

Table 4-1 Largest difference between generated and treated amounts in EU-28, IS, NO and TR, 2012

Waste types (tonnes)	Generation	Treatment	Difference
W02A - Chemical wastes	13 556 482	9 167 526	4 388 956
W081 - Discarded vehicles	6 142 978	2 064 594	4 078 384
W013 - Used oils	4 423 753	2 287 724	2 136 029
W124 - Combustion wastes	12 090 305	10 123 766	1 966 539
W121 - Mineral waste from construction and demolition	8 508 395	6 595 732	1 912 663
W012 - Acid, alkaline or saline wastes	3 810 012	2 063 558	1 746 454
W032 - Industrial effluent sludges	3 523 012	1 981 306	1 541 706
W126 – Soils	8 956 490	7 656 834	1 299 656
W128_13 - Mineral wastes from waste treatment and stabilised wastes	6 238 852	5 050 797	1 188 055
W12B - Other mineral wastes (W122+W123+W125)	20 376 436	19 398 617	977 819
W05 - Health care and biological wastes	1 700 798	794 760	906 038
W103 - Sorting residues	3 698 015	2 850 730	847 285
W011 - Spent solvents	2 558 755	1 852 706	706 049
W08A - Discarded equipment (except discarded vehicles and batteries and accumulators waste) (W08 except W081, W0841)	2 736 464	2 133 029	603 435
W033 - Sludges and liquid wastes from waste treatment	1 377 361	782 299	595 062

Source: Eurostat, [env_wasgen], [env_wastrt], 2015.

The largest differences between generated and treated amounts of hazardous waste in the EU-28, IS, NO and TR occur for chemical wastes, discarded vehicles, used oils and combustion wastes.

For discarded vehicles, the generated amount of hazardous waste is usually reported for the whole discarded vehicle. When the treatment data is reported to Eurostat, discarded vehicles may have been disassembled and only the hazardous part of the vehicle is accounted for. Because the proportion of hazardous waste in cars is very small compared to the weight of the car, this could lead to large differences between generated amounts and treated amounts of hazardous waste.

For used oils, it is possible that countries are reporting the generated amount of hazardous waste of all used oils mixes. When used oils are reported in hazardous waste treatment, it is possible that some countries may have pre-treated the used oil by removing water from the used oil mix. This could explain some of the discrepancies between generated amount and treated amount of hazardous used oil waste.

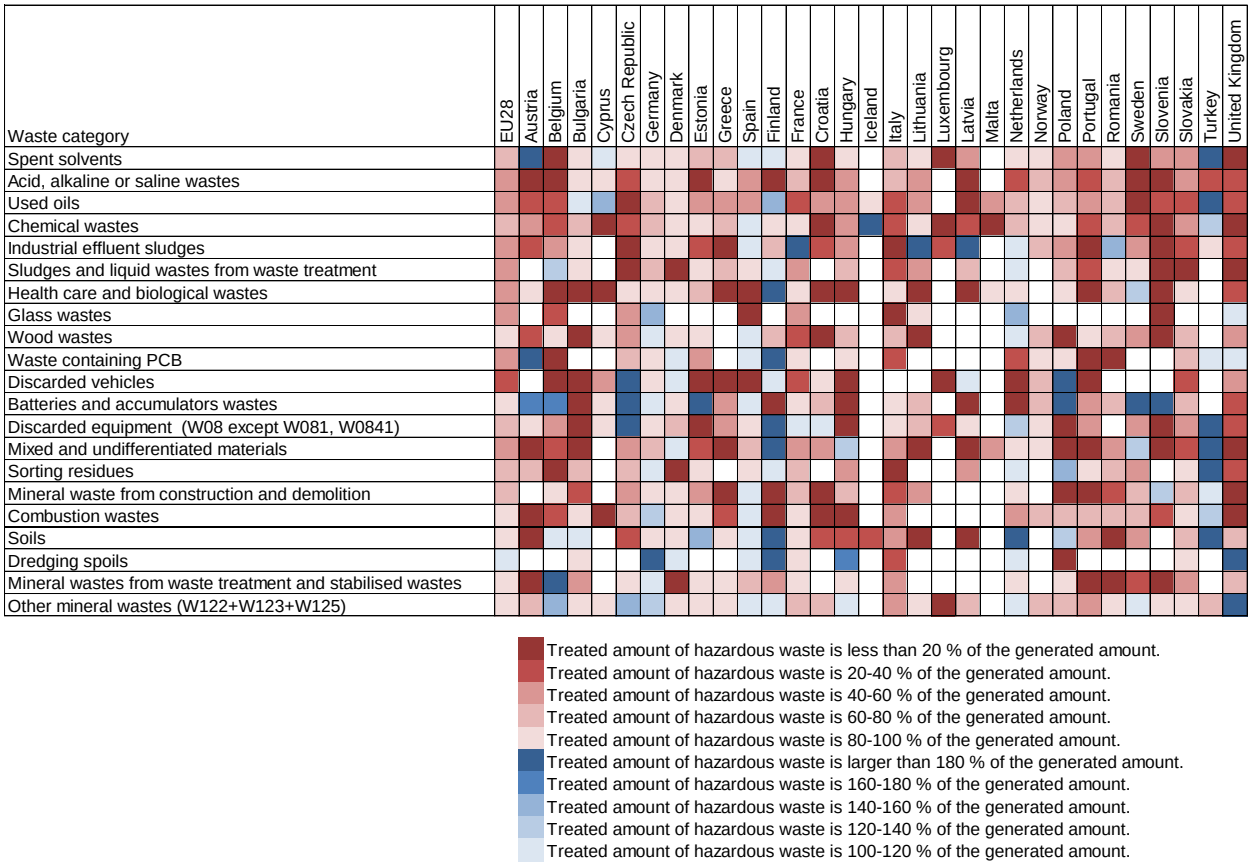
For the other waste types indicated in Table 4-1, it is possible that some pre-treatment, not visible in the Eurostat treatment data, has taken place, where the non-hazardous part of the waste has been removed before the hazardous waste is treated.

The large differences between generated and treated wastes are not always consistent across all the countries, as indicated in Figure 4-6. Figure 4-6 provides an additional level of information regarding the treatment gap of hazardous waste in each country. This figure summarises the difference between hazardous waste types generated and the hazardous waste types treated domestically (gap = generated - treated), where the red shaded cells show lower amounts of hazardous waste treated than generated. Conversely, the blue cells show a higher treated quantity than the generated amounts. Blank cells represent zero values or no data available. Figure 4-6 indicates that almost all the countries reported higher generated amounts than treated amounts for most waste categories and specifically large gaps are ob-

served in the categories healthcare and biological waste, discarded vehicles as well as mixed and undifferentiated materials in several countries. Some countries, for example Italy, Norway and Portugal are generating more waste in all categories compared to treated amounts.

For those waste streams where some countries generate more than they treat, and others treat more than they generate, it would be relevant to analyse if the data matches with waste shipments between countries. In the past, transboundary shipments of waste were reported based on a different classification of wastes than the classification used in the Waste Statistics Regulation, but recently, several countries started to complement their reporting with information based on the European list of waste codes, thus providing much more detailed information about the type of waste exported and imported. An analysis of this data was however beyond the scope of this study .

Figure 4-6 Differences between hazardous waste generation and hazardous waste treatment for EU-28 + IS, NO and TR, 2012



Note: Ireland is excluded due to lack of category level data.

Source: Eurostat, [env_wasgen], [env_wastrt], 2015.

5 Conclusions

Hazardous waste generation

The objective of this study was to undertake a review of the hazardous waste situation in the EU-28 + NO, IS, CH and TR, between 2006 and 2012. The EU-28, Norway, Iceland, Switzerland and Turkey together reportedly generated 103 million tonnes of hazardous waste in 2006 and 105 million tonnes in 2012, ranging from 16 791 tonnes in Iceland to 21 983 895 tonnes in Germany. A reduction of hazard-

ous waste generation between 2006 and 2012 was reported by 12 countries. The hazardous waste generation per capita remained rather stable between 2006 and 2012, with an average of 198 kg per capita. Large differences of hazardous waste generation per capita are observed, ranging from 6 925 kg per capita in Estonia to 27 kg per capita in Greece in 2012. 18 countries reportedly increased their hazardous waste generation per capita between 2006 and 2012, which can probably be interpreted as an improvement of the reporting (due to a better identification of the hazardous waste), rather than an actual increase in the generation of hazardous waste.

Another way to assess hazardous waste is to analyse the **hazardous waste intensity of the economy**, i.e. how much hazardous waste is generated for producing one unit of GDP. The average for the EU-28 ranged from 8 to 8.6 tonnes of hazardous waste generated per million euros of GDP between 2006 and 2012. In 2016, the hazardous waste intensity per economic output ranged from 1.2 in Iceland to 716 tonnes per million euro GDP in Estonia.

The **hazardousness of waste** (ratio between thegenerated amount of hazardous waste and the total waste generated) assesses the proportion of hazardous waste generated. Hazardousness is obviously dependent of the structure of the economy of a country, but still gives an important indication. On an aggregated EU-27 level, on average 4 % of the total amount of generated waste was hazardous across the period 2006 to 2012. An increase in the hazardousness of waste may not necessarily be interpreted as a degradation of the situation. Actually, countries with low hazardousness levels might have waste policy implementation gaps, indicating possible underestimations of hazardous waste generation in these countries. This would clearly need further investigation.

A ‘hot spot’ screening was performed, based on the amount of hazardous waste generated, compared to the amount of total waste generated for each country and for each industrial sector. This indicated that waste from the coke and oil refining sector is most hazardous compared to other sectors. This means that the current EU energy and climate policy (aiming at reducing fossil fuels and increasing low carbon energy) could have a double benefit, where both emissions of greenhouse gases and hazardous waste generation are reduced.

Hazardous waste generation per economic (NACE) activity indicates that the waste sectors (waste collection, treatment and disposal activities and materials recovery; wholesale of waste and scrap) had a significant increase in the amount of hazardous waste generated between 2006 and 2012. This is partly due to an increase in waste separation from the scrap recycling industry and household sector, indicatingbetter reporting of hazardous waste. For some countries, the increase of hazardous waste generation is linked to an increase in mineral and solidified waste (from increase in combustion outputs), contaminated soils and some chemical and medical waste.

Hazardous waste management

Regarding hazardous waste treatment, incineration with energy recovery increased slightly, accounting for close to 8 % of total hazardous waste treatment in 2012. Recovery other than energy recovery increased until 2010 but in 2012 there was a clear drop. However disposal to landfill is still the dominant management route for hazardous waste in Europe (48 % of the treated amount in 2012). On a country-by-country basis, for 2012, the treatment share of hazardous waste is highly heterogeneous with Bulgaria landfilling 100 % of the treated amount, whereas Malta and Luxembourg reported no landfilling on their territory. The recovery rate, excluding energy recovery, is relatively high, compared to incineration with and without energy recovery. Energy recovery and incineration without energy recovery have remained almost stable between 2006 and 2012. Austria, Ireland, Iceland, Malta and Romania are countries with a relatively high incineration share.

Progress has been made in 16 countries towards decreasing the rate of hazardous waste landfilled, between 2006 and 2012..

The current European-wide statistics do not allow to follow the waste through the ever more complex waste management system. When comparing the reported amounts of generated hazardous waste with the total hazardous waste treated, significant gaps are observed. In 2012, the gap between generated hazardous waste and treated hazardous waste was 26 million tonnes, equivalent to about 26 % of the total generated amount of hazardous waste. This gap calls for further analysis and explanation. In the best case, this is mainly due to pre-treatment, however, it is currently not possible to know for certain.

While hazardous waste is currently regulated under the Waste Framework Directive, 2008/98/EC (dilution and mixing ban, separation of hazardous waste from other waste, labelling, traceability and reporting obligation), no specific quantitative target has been set to reduce the amount of hazardous waste generation in Europe. Similarly, no European targets are currently in place for recycling levels. The only regulatory targets, related indirectly to hazardous waste, originate from the WEEE Directive (2012/19/EU) and the Battery Directive (2006/66/EC). However, other regulations, such as the RoHS Directive (2002/95/EC), have the overall aim of restricting six hazardous substances in the manufacture of various types of electronic and electrical equipment, which eventually should reduce the hazardousness in WEEE with regard to these regulated substances.

All countries have the obligation to address hazardous waste according to Art 28 of the Waste Framework Directive. All national waste prevention programmes analysed by the EEA in 2014 (except of the Portuguese one) address hazardous waste (EEA, 2014). Some countries, for example the UK, are developing specific national strategies for hazardous waste. The further development of hazardous waste strategies across Europe, including assessment of waste arising, estimation of future capacity, and quantitative targets could prepare the foundations for a reduction of hazardous waste generation and future planning of adequate infrastructure to promote safe hazardous waste management.

Further options for assessments that could provide more robust information for policy making include for example:

- Guidance clarifying the reporting of discarded vehicles and chemical waste, in order to harmonise the reporting between countries;

- Detailed sectorial study by economic (NACE) sector, using additional sources of information (e.g. from trade organisations). A sectorial review would provide further explanation on how much hazardous waste is generated and how it is treated. At the moment it is not possible to know which treatment is used by each sector;

- Identifying selected hazardous waste projections to evaluate the need for treatment capacity. This could potentially be performed by analysing sector specific GVA projections and trade statistics;

- Development of an environmental impact matrix to attribute key environmental pressures for key types of hazardous waste (based on their quantity and their level of hazardousness) and the environmental loads of their treatment types.

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Annex I

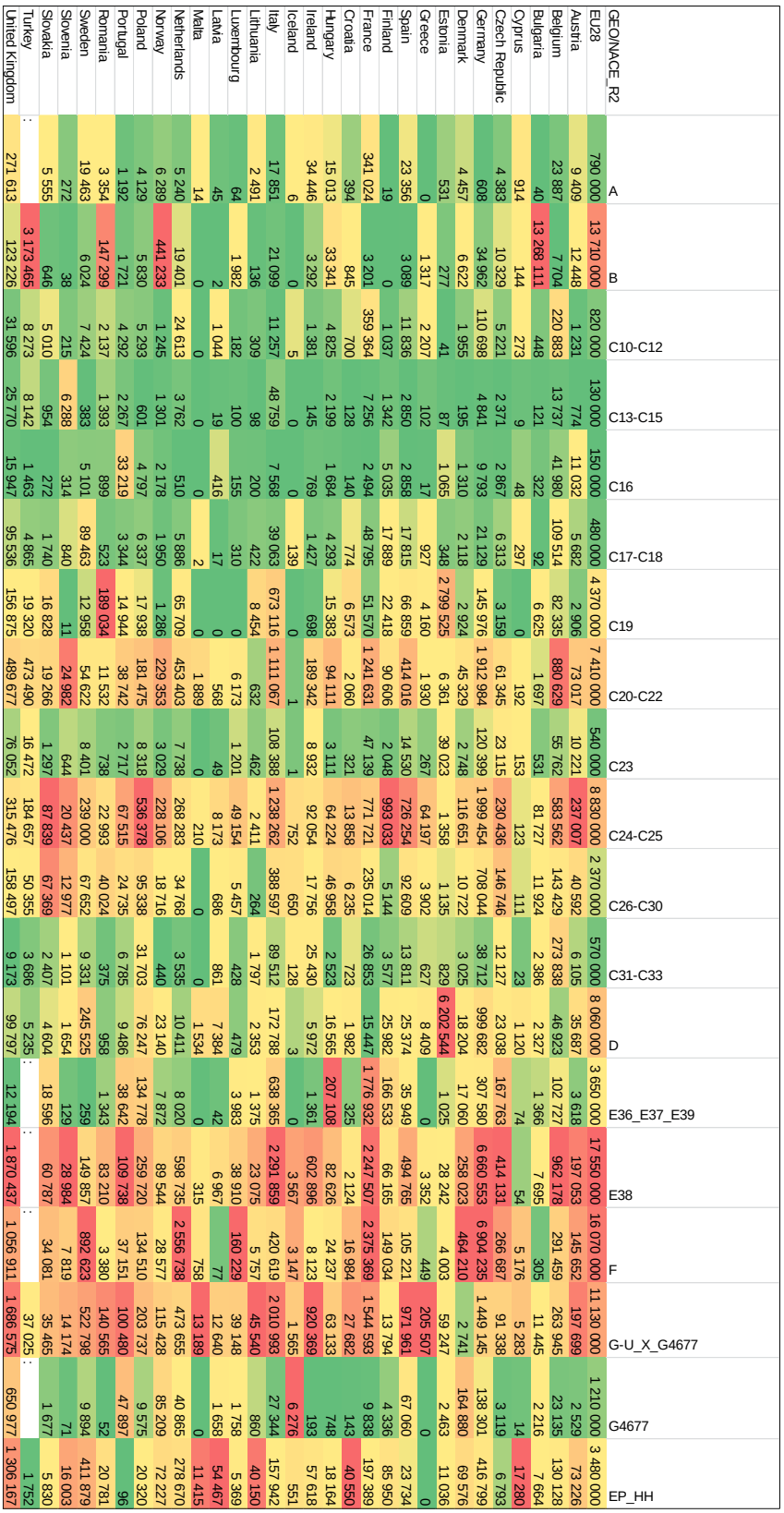
Mapping of hazardousness per NACE activity in EU-28 + NO, IS and TR

GEO/NACE_R2	A	B	C10-C12	C13-C15	C16	C17-C18	C19	C20-C22	C23	C24-C25	C26-C30	C31-C33	D	E36_E37_E39	E38	F	G-U_X_G4677	G4677	EP_HH
EU28	2 %	2 %	2 %	4 %	1 %	2 %	72 %	13 %	3 %	13 %	14 %	10 %	8 %	13 %	10 %	2 %	9 %	4 %	2 %
Austria	5 %	24 %	0 %	3 %	4 %	1 %	73 %	27 %	15 %	15 %	10 %	8 %	6 %	1 %	8 %	1 %	6 %	1 %	2 %
Belgium	11 %	7 %	7 %	1 %	3 %	9 %	69 %	31 %	6 %	11 %	16 %	34 %	4 %	3 %	10 %	1 %	6 %	2 %	3 %
Bulgaria	0 %	9 %	0 %	0 %	0 %	0 %	33 %	0 %	0 %	7 %	13 %	6 %	0 %	1 %	1 %	0 %	1 %	1 %	0 %
Cyprus	1 %	0 %	1 %	5 %	1 %	4 %		9 %	1 %	2 %	7 %	1 %	51 %	0 %	2 %	1 %	3 %	3 %	4 %
Czech Republic	2 %	6 %	2 %	6 %	2 %	2 %	35 %	22 %	6 %	16 %	11 %	8 %	2 %	13 %	17 %	3 %	8 %	0 %	0 %
Germany	0 %	0 %	3 %	5 %	0 %	1 %	59 %	6 %	5 %	21 %	27 %	4 %	12 %	24 %	16 %	3 %	9 %	15 %	1 %
Denmark	2 %	37 %	0 %	2 %	9 %	2 %	26 %	27 %	1 %	42 %	6 %	7 %	2 %	7 %	10 %	12 %	2 %	5 %	2 %
Estonia	1 %	0 %	0 %	1 %	0 %	0 %	94 %	42 %	41 %	2 %	2 %	2 %	99 %	1 %	5 %	1 %	15 %	22 %	3 %
Greece	0 %	0 %	0 %	1 %	0 %	1 %	43 %	1 %	0 %	2 %	12 %	3 %	0 %	0 %	0 %	0 %	14 %		0 %
Spain	0 %	0 %	0 %	3 %	1 %	1 %	49 %	40 %	0 %	16 %	8 %	9 %	0 %	2 %	4 %	0 %	12 %	7 %	0 %
Finland	0 %	0 %	0 %	14 %	0 %	0 %	69 %	10 %	0 %	44 %	7 %	11 %	3 %	17 %	45 %	1 %	1 %	1 %	5 %
France	26 %	0 %	7 %	6 %	0 %	2 %	46 %	51 %	5 %	15 %	11 %	6 %	1 %	43 %	16 %	1 %	7 %	33 %	1 %
Croatia	1 %	17 %	1 %	1 %	0 %	2 %	40 %	6 %	1 %	21 %	10 %	2 %	2 %	1 %	1 %	2 %	5 %	3 %	3 %
Hungary	3 %	37 %	1 %	5 %	1 %	3 %	62 %	46 %	1 %	7 %	8 %	6 %	1 %	32 %	11 %	1 %	4 %	0 %	1 %
Ireland	34 %	0 %	0 %	1 %	0 %	2 %	35 %	62 %	9 %	7 %	20 %	23 %	2 %	0 %	20 %	1 %	13 %	0 %	3 %
Iceland	0 %	0 %	0 %	0 %	0 %	24 %		0 %	0 %	10 %	21 %	12 %	1 %	0 %	3 %	20 %	33 %	4 %	0 %
Italy	4 %	3 %	0 %	5 %	1 %	2 %	54 %	37 %	4 %	12 %	15 %	12 %	5 %	8 %	8 %	1 %	44 %	3 %	1 %
Lithuania	1 %	1 %	0 %	1 %	0 %	1 %	53 %	0 %	1 %	13 %	2 %	3 %	8 %	2 %	9 %	1 %	8 %	1 %	3 %
Luxembourg	5 %	2 %	2 %	5 %	1 %	2 %		24 %	3 %	13 %	49 %	17 %	21 %	27 %	21 %	2 %	18 %	34 %	2 %
Latvia	2 %	0 %	2 %	2 %	1 %	0 %		2 %	0 %	4 %	3 %	9 %	6 %	0 %	4 %	1 %	5 %	16 %	4 %
Malta	1 %	0 %	0 %			0 %		56 %		25 %			100 %	0 %	1 %	0 %	10 %		7 %
Netherlands	0 %	11 %	0 %	5 %	0 %	1 %	13 %	34 %	1 %	12 %	10 %	1 %	1 %	1 %	9 %	3 %	9 %	65 %	3 %
Norway	4 %	94 %	0 %	22 %	0 %	1 %	21 %	77 %	2 %	41 %	12 %	10 %	26 %	6 %	35 %	2 %	6 %	12 %	3 %
Poland	0 %	0 %	0 %	0 %	0 %	0 %	27 %	3 %	0 %	5 %	7 %	4 %	0 %	9 %	3 %	1 %	5 %	1 %	0 %
Portugal	1 %	1 %	1 %	2 %	21 %	0 %	75 %	21 %	1 %	15 %	11 %	7 %	2 %	7 %	5 %	4 %	12 %	5 %	0 %
Romania	0 %	0 %	0 %	6 %	0 %	1 %	83 %	1 %	0 %	1 %	8 %	0 %	0 %	0 %	4 %	0 %	5 %	2 %	0 %
Sweden	7 %	0 %	1 %	2 %	2 %	5 %	41 %	23 %	5 %	15 %	8 %	12 %	13 %	0 %	4 %	12 %	26 %	1 %	10 %
Slovenia	0 %	0 %	1 %	15 %	0 %	0 %	69 %	8 %	1 %	7 %	7 %	4 %	0 %	0 %	18 %	1 %	3 %	34 %	2 %
Slovakia	1 %	0 %	3 %	6 %	0 %	1 %	81 %	10 %	1 %	10 %	14 %	7 %	0 %	7 %	15 %	4 %	5 %	1 %	0 %
Turkey	n.a.	0 %	1 %	3 %	1 %	2 %	52 %	34 %	3 %	2 %	5 %	8 %	0 %	n.a.	n.a.	n.a.	13 %	n.a.	0 %
United Kingdom	40 %	1 %	1 %	5 %	5 %	5 %	83 %	13 %	18 %	15 %	22 %	4 %	2 %	1 %	7 %	1 %	6 %	4 %	5 %

Note: Blank cells represent cases where no waste of this type is reported to be generated, n.a. represents missing data.

Annex II

Mapping of hazardous waste generated per NACE activity in EU-28 + NO, IS and TR



GEO/NACE_R2	A	B	C10-C12	C13-C15	C16	C17-C18	C19	C20-C22	C23	C24-C25	C26-C30	C31-C33	D	E36_E37_E39	E38	F	G-U_X_G4677	G4677	EP_HH
EU28	790 000	13 710 000	820 000	130 000	150 000	480 000	4 370 000	7 410 000	540 000	8 830 000	2 370 000	570 000	8 060 000	3 650 000	17 550 000	16 070 000	11 130 000	1 210 000	3 480 000
Austria	9 409	12 448	1 231	774	11 032	5 682	2 906	73 017	10 221	237 007	40 592	6 105	35 687	3 618	197 053	145 652	197 699	2 529	73 226
Belgium	23 887	7 704	220 883	13 737	41 980	109 514	82 335	880 629	55 762	583 562	143 429	273 838	46 923	102 727	962 178	291 459	263 945	23 135	130 128
Bulgaria	40	13 268 111	448	121	322	92	6 625	1 697	531	81 727	11 924	2 386	2 327	1 366	7 695	305	11 445	2 216	7 664
Cyprus	914	144	273	9	48	297	0	192	153	123	111	23	1 120	74	54	5 176	5 283	14	17 280
Czech Republic	4 383	10 329	5 221	2 371	2 867	6 313	3 159	61 345	23 115	230 436	146 746	12 127	23 038	167 763	414 131	266 687	91 338	3 119	6 793
Germany	608	34 962	110 698	4 841	9 793	21 129	145 976	1 912 984	120 399	1 999 454	708 044	38 712	999 682	307 580	6 660 553	6 904 235	1 449 145	138 301	416 799
Denmark	4 457	6 622	1 955	195	1 310	2 118	2 924	45 329	2 748	116 651	10 722	3 025	18 204	17 060	258 023	464 210	2 741	164 880	69 576
Estonia	531	277	41	87	1 065	348	2 799 525	6 361	39 023	1 358	1 135	829	6 202 544	1 025	28 242	4 003	59 247	2 463	11 036
Greece	0	1 317	2 207	102	17	927	4 160	1 930	267	64 197	3 902	627	8 409	0	3 352	449	205 507	0	0
Spain	23 356	3 089	11 836	2 850	2 858	17 815	66 859	414 016	14 530	726 254	92 609	13 811	25 374	35 949	494 765	105 221	971 961	67 060	23 734
Finland	19	0	1 037	1 342	5 035	17 889	22 418	90 606	2 048	999 033	5 144	3 577	25 982	166 533	66 165	149 034	13 794	4 336	85 950
France	341 024	3 201	359 364	7 256	2 494	48 795	51 570	1 241 631	47 139	771 721	235 014	26 853	15 447	1 776 932	2 247 507	2 375 369	1 544 593	9 838	197 389
Croatia	394	845	700	128	140	774	6 573	2 060	321	13 858	6 235	723	1 982	325	2 124	16 984	27 682	143	40 550
Hungary	15 013	33 341	4 825	2 199	1 684	4 293	15 383	94 111	3 111	64 224	46 958	2 523	16 565	207 108	82 626	24 237	63 133	748	18 164
Ireland	34 446	3 292	1 381	145	769	1 427	698	189 342	8 932	92 054	17 756	25 430	5 972	1 361	602 896	8 123	920 369	193	57 618
Iceland	6	0	5	0	0	139	0	1	1	752	650	128	3	0	3 567	3 147	1 565	6 276	551
Italy	17 851	21 099	11 257	48 759	7 568	39 063	673 116	1 111 067	108 388	1 238 262	388 597	89 512	172 788	638 365	2 291 859	420 619	2 010 993	27 344	157 942
Lithuania	2 491	136	309	98	200	422	8 454	632	462	2 411	264	1 797	2 353	1 375	23 075	5 757	45 540	860	40 150
Luxembourg	64	1 982	182	100	155	310	0	6 173	1 201	49 154	5 457	428	479	3 983	38 910	160 229	39 148	1 758	5 369
Latvia	45	2	1 044	19	416	17	0	568	49	8 173	686	861	7 384	42	6 967	77	12 640	1 658	54 467
Malta	14	0	0	0	0	2	0	1 889	0	210	0	0	1 534	0	315	758	13 189	0	11 415
Netherlands	5 240	19 401	24 613	3 762	510	5 886	65 709	453 403	7 738	268 283	34 768	3 535	10 411	8 020	598 735	2 556 738	473 655	40 865	278 670
Norway	6 289	441 233	1 245	1 301	2 178	1 950	1 286	229 353	3 029	228 106	18 716	440	23 140	7 872	89 544	28 577	115 428	85 209	72 227
Poland	4 129	5 830	5 293	601	4 797	6 337	17 938	181 475	8 318	536 378	95 338	31 703	76 247	134 778	259 720	134 510	203 737	9 575	20 320
Portugal	1 192	1 721	4 292	2 267	33 219	3 344	14 944	38 742	2 717	67 515	24 735	6 785	9 486	38 642	109 738	37 151	100 480	47 897	96
Romania	3 354	147 299	2 137	1 393	899	523	189 034	11 532	738	22 993	40 024	375	958	1 343	83 210	3 380	140 565	52	20 781
Sweden	19 463	6 024	7 424	383	5 101	89 463	12 958	54 622	8 401	239 000	67 652	9 331	245 525	259	149 857	892 623	522 798	9 894	411 879
Slovenia	272	38	215	6 288	314	840	11	24 982	644	20 437	12 977	1 101	1 654	129	28 984	7 819	14 174	71	16 003
Slovakia	5 555	646	5 010	954	272	1 740	16 828	19 266	1 297	87 839	67 369	2 407	4 604	18 596	60 787	34 081	35 465	1 677	5 830
Turkey	:	3 173 465	8 273	8 142	1 463	4 865	19 320	473 490	16 472	184 657	50 355	3 686	5 235	:	:	:	37 025	:	1 752
United Kingdom	271 613	123 226	31 596	25 770	15 947	95 536	156 875	489 677	76 052	315 476	158 497	9 173	99 797	12 194	1 870 437	1 056 911	1 686 575	650 977	1 306 167

Note : no data available