

Marine Litter: Problems & Recommendations in the Mediterranean Basin

Introduction

The year 2017 saw a rapid proliferation of media focus on the issue of marine litter, with a particular focus on plastics that are said to make up around 80% of all anthropogenic debris present in the world's oceans¹. World leaders at the United Nations (UN) and the European Union (EU) have recognised the problem at conferences such as *Our Ocean* and *COP23 Ocean Pathway*; commercial companies such as Sky and Volvo have teamed together to raise awareness by launching the 'Turn the Tide on Plastic' campaign²; and nature documentaries such as *Blue Planet II* presented the issue to a colossal 14.1 million viewers³.

Plastic usage has increased to around 320,000,000 tons a year⁴; with disposable plastics constituting around 40% of all plastic production and only 5% being successfully recycled⁵. The amount of plastic entering the oceans is estimated to be between four and twelve million tons annually⁶. Its lightweight and durable nature causes it to be a serious, continual threat to marine wildlife⁷, and causes difficulties in sourcing the material.

The Mediterranean basin is said to be one of the world's most polluted seas⁸ and has one of the top five concentrations of floating marine debris worldwide⁹. It attracts 25% of international tourism, 30% of the world's shipping traffic¹⁰, and holds 10% of the global coastal population¹¹, which all contribute to these facts.

This report will explore plastics in the context of anthropogenic marine litter within the Mediterranean Sea. It will discuss how the Mediterranean basin can be described as an area of accumulation, and how plastics arrive there; how this plastic poses serious dangers to wildlife within the region both physically and chemically; and how waste management can

¹ United Nations Environment Programme, *Valuing Plastics: The Business Case for Measuring and Disclosing Plastic Use in the Consumer Goods Industry*. (2014) <<https://www.unenvironment.org/resources/report/valuing-plastic-business-case-measuring-managing-and-disclosing-plastic-use>> p.17

² Volvo Ocean Race SLU. *Turn the Tide on Plastic*. (2017). <<http://www.volvooceanrace.com/en/teams/Turn-The-Tide-On-Plastic.html>>

³ Ruddick, G. *Blue Planet II is year's most watched British TV show*. (2017). <<https://www.theguardian.com/media/2017/nov/06/blue-planet-ii-years-most-watched-tv-show-david-attenborough>>

⁴ Sky News. 2017. *Special report: A Plastic Tide #OceanRescue*. <https://www.youtube.com/watch?v=D35YnZ7_WxM>

⁵ Sky News, 2017

⁶ Pham, C., et. al., Plastic ingestion in oceanic-stage Loggerhead sea turtles off the North Atlantic subtropical gyre. *Marine Pollution Bulletin*. 121(1-2). (2017). 222-229. <<http://www.sciencedirect.com/science/article/pii/S0025326X17304885>> p.222

⁷ Ibid.

⁸ Deudero, S., Alomar, C. Mediterranean marine biodiversity under threat: Reviewing influence of marine litter on species. *Marine Pollution Bulletin*. 98(1-2) (2015). 58-68. <<https://www.sciencedirect.com/science/article/pii/S0025326X15004324>>, (p. 59)

⁹ García-Rivera, S., et. al., Composition, spatial distribution and sources of macro-marine litter on the Gulf of Alicante seafloor (Spanish Mediterranean). *Marine Pollution Bulletin*. 121(1-2). (2017). 249-259. <<https://www.sciencedirect.com/science/article/pii/S0025326X17305027>> p. 250

¹⁰ Deudero, S., Alomar, C., 2015, p.59

¹¹ Cózar, A., et. al., Plastic Accumulation in the Mediterranean Sea. *PLoS ONE*. 10(4). (2015). <<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0121762#sec00>>

be considered as a recommendation for tackling marine litter through policies and on an individual level.

Sources and Accumulation of Litter in the Mediterranean Sea

The routes by which anthropogenic litter arrives at the ocean can be separated into two categories: land-based and sea-based sources. The European Commission have identified rivers, industrial outflows, untreated municipal sewerage, and beach littering as a result of tourism, as the main routes of terrestrial sources¹², as well as ineffective waste management schemes¹³; and the fishing industry, shipping routes, offshore mining and illegal dumping at sea constitute the ocean-borne sources¹⁴. But sourcing plastics can be challenging due to its physical properties. The durability of plastics increases the longevity; it fragments into smaller particles (microplastics) due to continual exposure to sunlight, oxidation and the abrasion/erosion from ocean waves and currents¹⁵, but still remains within the environment. This, in addition to the buoyancy of plastics permit them to travel for long distances, and implies that those found in the Mediterranean region could have potentially entered the ocean anywhere in the world. Despite the consequences of these physical properties, it can be argued that the litter found in the Mediterranean has originated from the surrounding area and has created an accumulation zone.

Globally, once plastics arrive at the ocean, they accumulate on the seabed, along shorelines, and within the five subtropical gyres (North Atlantic, South Atlantic, North Pacific, South Pacific, Indian Ocean)¹⁶, due to circular ocean currents created by wind patterns and forces generated by the rotation of the Earth¹⁷. The average density of plastic (1 item per 4m²) and the frequency of plastic present in the Mediterranean basin is comparable to that of the five gyres¹⁸. Its enclosed nature, limited water export to the Atlantic Ocean¹⁹, numerous islands, and mesoscale surface circulation also support the entrapment of plastics within the basin²⁰, explaining that the Mediterranean Sea can be considered as an accumulation zone in itself²¹.

Around 160 million people reside along the Mediterranean coastline; this, added to the 25% of international tourism that is attracts²², are considered to be the major terrestrial sources of marine pollution within the region²³. It is also estimated that only twenty countries are responsible for around 83% of plastic debris that arrives in the oceans worldwide (see Appendix, Figure 1), due to mismanaged plastic waste alone²⁴. Four of these states (Egypt, Algeria, Turkey, Morocco) border the Mediterranean Sea, indicating a high outage of pollution from neighbouring states.

¹²European Commission. *Our oceans, Seas and Coasts*. (2017). <http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm>

¹³Prevenios, M., et. al., Beach litter dynamics on Mediterranean coasts: Distinguishing sources and pathways. *Marine Pollution Bulletin*. (2017). <<https://www.sciencedirect.com/science/article/pii/S0025326X17308305>> p.1

¹⁴European Commission. *Our oceans, Seas and Coasts*. (2017).

¹⁵Tibbetts, J., 2015.

¹⁶5 Gyres Institute. *Frequently asked questions*. (2018). <<https://www.5gyres.org/faq/>>

¹⁷National Geographic, *Great Pacific Garbage Patch*. (2018). <<https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/>>

¹⁸Cózar, A., et. al., 2015

¹⁹Ibid.

²⁰Prevenios, M., et. al., 2017, p.1

²¹Cózar, A., et. al., 2015

²²Deudero, S., Alomar, C., 2015, p.59

²³Prevenios M., et. al., 2017, p.1

²⁴Tibbetts, J. Managing marine plastic pollution initiatives to address wayward waste. *Environ Health Perspective*. (2015). <<https://ehp.niehs.nih.gov/123-A90/>>

Moreover, the highest concentrations of microplastics occur in the Mediterranean Sea and the North Pacific Ocean, and these abundances are relatively high in comparison with other water basins²⁵. A proportion of these microplastics are those found in consumer products such as cosmetics that reach the ocean via sewerage²⁶. The United Kingdom has recently imposed the ban of sales and production of plastic microbeads within its borders²⁷, but the majority of states bordering the Mediterranean Sea, with the exception of France, have not applied the same bans²⁸, establishing another source of plastic pollution in the region.

With respect to ocean-borne sources, the basin has one of the busiest shipping routes around the globe²⁹ that is said to contribute a large proportion of litter into the sea via malpractices in waste disposal and mishaps during shipment³⁰; the Grand Harbour of Valletta alone contains a fundamental shipping trade waterway, with traffic of around 10,000 vessels each year³¹.

Furthermore, a study conducted in 2014 on the Gulf of Alicante seabed found that almost 30% of the marine litter collected derived from fishing activity, 68.1% of which were artificial polymers from fishing nets and longlines, as well as rubber and plastic fishing equipment³², causing the fishing industry to be known as another major contributor³³.

The physical properties of plastics create challenges when sourcing the material on a global scale, but the contributors identified here suggest that the litter found in the Mediterranean originates from neighbouring states and immersed industries that ultimately form an accumulation zone.

The Problematic Nature of Plastic Debris

The problems with the ubiquity of plastic stretch from the damage to industries to the threats presented to marine wildlife. Financially, industries face adverse economic impacts due to: the fouling of beaches³⁴; the cost of removing debris from harbours to avoid vessel damage; and loss of income for contaminated fish catches³⁵; whilst there are also inevitable problems for marine wildlife, as it is estimated that over two hundred animal species have been documented consuming plastics³⁶. However, this figure does not include the external, physical or chemical harm also caused by plastics within the ocean.

²⁵ Lusher, A., et. al., Microplastics in fisheries and aquaculture: Status of knowledge on their occurrence and implications for aquatic organisms and food safety. *FAO Fisheries and Aquaculture Technical Paper*. 615. (2017).1-126.
<<http://www.sciencedirect.com/science/article/pii/S0141113616301064>> p.30

²⁶ Romeo, T., et. al., 2015, p.13

²⁷ Carrington, D. *Plastic microbeads ban enters force in UK*. (2018). <<https://www.theguardian.com/environment/2018/jan/09/plastic-microbeads-ban-enters-force-in-uk>>

²⁸ Honcoop, S. *Sweden leads European ban on microbeads*. (2017). <<https://www.plasticsoupfoundation.org/en/2017/07/sweden-leads-european-ban-on-microbeads/>>

²⁹ Cózar, A., et. al., 2015

³⁰ Beeharry, Y., et. al., Sustaining anti-littering behaviour within coastal and marine environments: Through the macro-micro level lenses. *Marine Pollution Bulletin*. 199(2). (2017). 87-99. <<https://www.sciencedirect.com/science/article/pii/S0025326X17303387>> p.91

³¹ Romeo, T., et. al., Environmental quality assessment of Grand Harbour (Valletta, Maltese Islands): a case study of a busy harbour in the Central Mediterranean Sea. *Environmental monitoring and assessment*. 187(12). (2015). 1-21. <<https://search-proquest-com/docview/1749593893/D3B0C83CB92247B1PQ/2?accountid=130472>> p.2

³² García-Rivera, S., et. al., 2017, p.250

³³ European Commission. *Mediterranean Sea*. (2018)

³⁴ Beeharry Y., et. al., 2017, p. 87

³⁵ Newman, S., et. al., 'The Economics of Marine Litter', in *Marine Anthropogenic Litter*, ed. by Bergmann, M., Gutow, L., Klages, M. (New York, Springer Open, 2015), pp. 367-394, (p. 372)

³⁶ Parker, L. 2016. *Animal Eat Ocean Plastic Because it Smells Like Food*. <<https://news.nationalgeographic.com/2016/11/animals-eat-ocean-plastic-because-of-smell-dms-algae-seabirds-fish/>>

Drowning, ingestion, suffocation³⁷ and chemical contamination³⁸ are among some of the severe consequences inflicted by plastic pollution, with plastic bags, bottle caps, and fishing nets being identified as some of the most hazardous³⁹.

In terms of consumption, larger species such as Loggerhead turtles (*Caretta caretta*) within the Mediterranean, have a high ingestion rate (around 71% of all juveniles⁴⁰), but also have a high resistance rate as most plastics are able to pass through the digestive tract⁴¹. Nonetheless, this does not account for sheet plastic such as plastic bags, which are not easily passed in natural form⁴², nor does it account for chemical contamination whilst plastics are within the intestine.

Chemicals categorised as Persistent Bioaccumulative Toxic (PBT) chemicals, such as lipophilic chemicals and phthalates tend to have a low solubility rate in water and adsorb onto other hydrophobic materials such as plastic litter, forming a transportation system⁴³ that carries these contaminants worldwide. When these contaminated plastics are ingested they can have negative consequences on the function of thyroid hormones and alter the endocrine function relating to the reproductive system⁴⁴, as they accumulate within the fat tissues⁴⁵ of species, including turtles⁴⁶. Whilst the EU and the United States⁴⁷ have banned phthalates in products such as toys and child care products to prevent harm to human life, the presence of these chemicals in other products⁴⁸ still potentially poses threats to Loggerhead turtles and other marine wildlife that ingest plastic particles.

Furthermore, other chemicals can be added to plastics in order to reduce flammability and degradation, and increase pliability and resistance⁴⁹, for example, brominated flame retardants and lead compounds⁵⁰. When these plastics fragment over time within the ocean, these chemicals leach into the surrounding environment⁵¹, increasing the level of water contamination and also permitting an increase of adsorption of these chemicals onto other surfaces, due to the increase in surface area to volume ratio⁵², further increasing the risks of ingestion.

All species within the Mediterranean Sea are potentially at risk of the chemical consequences of plastic anthropogenic litter, as opposed to solely the physical harm it can cause. It is unclear how marine organisms will be able to cope with the chemical changes generated by plastic pollution⁵³, even in relation to hunting, as the continual

³⁷Nicolau, L., et. al., Ingestion of marine litter by loggerhead sea turtles, *Caretta caretta*, in Portuguese continental waters. *Marine Pollution Bulletin*. 103(1-2). (2016). 179-185. <<https://www.sciencedirect.com/science/article/pii/S0025326X15302228>> p.179

³⁸Nelms, S., et. al. Plastic and marine turtles: a review and call for research. (2018). *ICES Journal of Marine Science*. 73(2). (2016). 165-181. <<https://academic.oup.com/icesjms/article/73/2/165/2614204>>

³⁹Beeharry, Y., et. al., 2017, p. 87

⁴⁰Codina-García, M., et. al., 2013, p. 220

⁴¹Campani, T., et. al., Presence of plastic debris in loggerhead turtle stranded along the Tuscany coasts of Pelagos Sanctuary of Mediterranean Marine Mammals (Italy). *Marine Pollution Bulletin*. 74(1). (2012). 225-230.

<<https://www.sciencedirect.com/science/article/pii/S0025326X13003597>> p.227

⁴²Campani, T., et. al., 2012, p. 227

⁴³United States Environmental Protection Agency, 2016, p. 17

⁴⁴Blastic Project, 2018

⁴⁵Blastic Project. *Toxicity of plastics*. (2018). <<https://www.blastic.eu/knowledge-bank/impacts/toxicity-plastics/>>

⁴⁶Nelms, S., et. al., 2016

⁴⁷United States Environmental Protection Agency, 2016, p. 15

⁴⁸European Commission. *Specific products, standards and risks*.

<http://ec.europa.eu/consumers/consumers_safety/product_safety_legislation/standards/index_en.htm>

⁴⁹United States Environmental Protection Agency, 2016, p.14

⁵⁰Blastic Project, 2018

⁵¹Ibid.

⁵²United States Environmental Protection Agency, 2016, p.31

⁵³Deudero, S., Alomar, C., 2015, p.59

presence of plastic presents challenges for the most basic survival techniques such as feeding.

Recommendations

Effective waste management at both macro (governmental) and micro (individual) level is an agreed method to tackling marine litter⁵⁴, by identifying those who are most responsible for producing the pollution⁵⁵. However, it can be argued that consumer rather than producer behaviour is more influential on waste management. As previously stated, plastic found within the enclosed Mediterranean basin is likely due to the immersed shipping industry, neighbouring states' waste systems and tourism, suggesting that Mediterranean states can be held accountable for a large proportion of plastics within the basin. Nevertheless, it is essentially the consumer that produces waste, whether that is within industry, recreationally or residentially, implying that tackling waste management on an individual level will reduce the problem on a wider scale.

That said, efforts are being made at macro level, but unfortunately these are not flawless strategies. The EU has set up initiatives to promote effective waste management through the Waste Framework Directive 2008 (WFD) and Extended Producer Responsibility (EPR) schemes.

The WFD encourages member states to implement the 'Waste Hierarchy' (see Appendix, Figure 2), achieve a target of 50% preparing for re-use and recycling of municipal waste materials by 2020, and adhere to the "polluter pays" principle⁵⁶. Whilst the Mediterranean consists of six EU members (Cyprus, France, Greece, Italy, Malta and Spain), the region itself has the highest level of municipal solid waste produced annually per capita, amounting to between 208 and 760kg each year⁵⁷. Despite this implementation, as of 2014 the recycling rates for Mediterranean states had increased but remained fairly low (See Appendix, Figure 3), with the exception of Italy and France who had reached their 2020 target. However, the level of production was still high (See Appendix, Figure 4). The ten-year gap presented by Figures 3&4 suggest that seeing positive results at macro level is a slow process. It also implies that the production of the material can be addressed as well as the disposal; within the EU, the EPR schemes aim to tackle this issue, but loopholes are evident in the scheme.

EPR schemes give manufacturers financial responsibility for the disposal of their products, urging them to improve their product design, increase the lifetime of products, and to recover their packaging after consumption⁵⁸. As of 2015⁵⁹ only 45% of product packaging within the EU was covered by an EPR scheme, despite first being outlined in 1990⁶⁰. Again, this suggests that macro policies take time to become beneficial, leaving the threats of plastic pollution still present within the environment.

Additionally, companies are not urged to find plastic-free alternatives, they are encouraged

⁵⁴Ocean Conservancy, 2018

⁵⁵ García-Rivera, S., et. al., 2017, p.250

⁵⁶European Union. *Directive 2008/98/EC on waste (Waste Framework Directive)*. (2016). <<http://ec.europa.eu/environment/waste/framework/>>

⁵⁷ García-Rivera, S., et. al., 2017, p.249

⁵⁸ Rodrigo, A. *Europe must design economic incentives fit for a circular economy*. (2017). <<https://zerowasteurope.eu/2017/11/europe-must-design-economic-incentives-fit-circular-economy/>>

⁵⁹Perella, M. *Extended producer responsibility: the answer to cutting waste in the UK?* (2017). <<https://www.theguardian.com/suez-circular-economy-zone/2017/may/10/extended-producer-responsibility-the-answer-to-cutting-waste-in-the-uk>>

⁶⁰ Tibbetts, J., 2015

to produce materials that can be recycled⁶¹ rather than aim for higher levels of the Waste Hierarchy (“prevention” or “reuse”) as the WFD suggests. Within the United Kingdom *Iceland* supermarkets recently declared that they will have achieved “prevention” by eliminating all plastic on their own-brand products by 2023⁶². However, this sense of responsibility is not shared among other large corporations, leaving consumers with very little choice when buying, and repeatedly, permit the existence of plastic within the environment.

On the other hand, consumers essentially determine the market and highly influence producer behaviour: consumers avoiding convenience products such as disposable plastic bottles or plastic-wrapped groceries forces manufacturers to find alternatives to meet consumer demands. Younger generations have been raised in a society of convenience, with a vast number of single-use, disposable items stretching beyond the typical plastic bottle. From a producer perspective, it is obliged to respond to the lifestyles/behaviours of the consumers, therefore continuing to produce such materials. One strategy to changing consumer behaviour is through education, simply by installing the message that convenience is not always the answer⁶³. For example, refusing plastic bags and straws and carrying a refillable water container⁶⁴. By installing these habits at a younger age, and broadcasting the reasons why this is important, the success of societal, behavioural changes become possible⁶⁵. Consumers are ultimately the ones that produce waste; avoiding materials such as plastic can contribute to the success of initiatives such as the EPR scheme among others and improve prevention rates set by the WFD.

Furthermore, in an area such as the Mediterranean where tourism and the local population are major contributors to marine litter⁶⁶, behavioural campaigns targeting tourists as well as the local population help to improve waste management⁶⁷. These campaigns aim to raise awareness of the economic losses coastal populations may face if their main tourist attractions are under threat from marine litter, due to a lack of visitors and unsafe bathing water. Grass-route movements such as Zero Waste Europe (ZWE) are one of the drivers for said campaigns. Unlike the EPR schemes, ZWE aim for a waste-free environment, focusing on communities as well as policy makers⁶⁸. In 2017, they launched the *Break Free From Plastic* movement within the Mediterranean region in order to encourage residents to undertake more responsible consumption, raise public awareness about the issues caused by marine litter and organise beach cleans within the region⁶⁹.

Despite some initiatives proving to be successful from a policy perspective (increase in recycling targets), it can be a slow process with a number of insufficient outcomes, such as enhanced products instead of plastic elimination. In this instance targeting consumers can

⁶¹ Ibid.

⁶² Slawson, N. *Iceland supermarket vows to eliminate plastic on all own-branded products*. (2018).

<<https://www.theguardian.com/business/2018/jan/15/iceland-vows-to-eliminate-plastic-on-all-own-branded-products>>

⁶³ Rowsell, J. *Keeping plastic waste in our engines, not our oceans - read about Jeremy Rowsell's amazing project #CleanSeas*. (2017) [Online]. United Nations Environment Programme. Available from: <<https://www.unenvironment.org/news-and-stories/resource-efficiency/keeping-plastic-waste-our-engines-not-our-oceans-read-about>>

⁶⁴ Rowsell, J. *Keeping plastic waste in our engines, not our oceans - read about Jeremy Rowsell's amazing project #CleanSeas*. (2017) [Online]. United Nations Environment Programme. Available from: <<https://www.unenvironment.org/news-and-stories/resource-efficiency/keeping-plastic-waste-our-engines-not-our-oceans-read-about>>

⁶⁵ Ibid.

⁶⁶ Prevenios, M., et al., 2017, p.1

⁶⁷ Prevenios, M., et al., 2017, p.9

⁶⁸ Zero Waste Europe. *About Zero Waste Europe*. (2017). <<https://zerowasteurope.eu/about/>>

⁶⁹ Arbinolo, R. *Environmental NGOs join forces for a Mediterranean free from plastic pollution*. (2017). <<http://mio-ecsde.org/wp-content/uploads/2017/07/MANIFESTO-OF-THE-BREAK-FREE-FROM-PLASTIC-MOVEMENT-IN-THE-MEDITERRANEAN-.pdf/>> p.1

help to make instant changes to the market, as ultimately it is the individual that controls its own waste management.

Conclusions

The Mediterranean, despite being a relatively small sea in comparison to other areas, is heavily affected by anthropogenic waste, especially plastics. Despite the physical properties of plastics permitting the material to travel worldwide, it can be argued that the sources of pollution in the Mediterranean can be related to the surrounding states and immersed industries, through ineffective waste management. Its enclosed characteristics and limited outflow to the Atlantic Ocean create an accumulation of pollution within the basin that not only has negative effects on industries (tourism, shipping, fisheries), but has covert, severe consequences, such as chemical contamination of the environment and organism tissue. Tackling plastic pollution has become a recent focus of the media, but with efforts coming from international stages such as the EU that are slow and provide loopholes, grass-route movements intending to change public perception and consumer responsibility can offer immediate effects on markets and production changes.

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Appendix

Figure 1

Table of top 20 countries in terms of mismanaged plastic waste

Source: Tibbetts, J. Managing marine plastic pollution initiatives to address wayward waste. Environ Health Perspective. (2015). Available from: <https://ehp.niehs.nih.gov/123-A90/> [Accessed 2 January 2018].

Rank	Country	Percentage of waste that is mismanaged	Quantity of mismanaged plastic waste (MMT/year)	Percentage of global mismanaged plastic waste	Quantity of plastic marine debris (MMT/year)
1	China	76	8.82	27.7	1.32–3.53
2	Indonesia	83	3.22	10.1	0.48–1.29
3	Philippines	83	1.88	5.9	0.28–0.75
4	Vietnam	88	1.83	5.8	0.28–0.73
5	Sri Lanka	84	1.59	5.0	0.24–0.64
6	Thailand	75	1.03	3.2	0.15–0.41
7	Egypt	69	0.97	3.0	0.15–0.39
8	Malaysia	57	0.94	2.9	0.14–0.37
9	Nigeria	83	0.85	2.7	0.13–0.34
10	Bangladesh	89	0.79	2.5	0.12–0.31
11	South Africa	56	0.63	2.0	0.09–0.25
12	India	87	0.60	1.9	0.09–0.24
13	Algeria	60	0.52	1.6	0.08–0.21
14	Turkey	18	0.49	1.5	0.07–0.19
15	Pakistan	88	0.48	1.5	0.07–0.19
16	Brazil	11	0.47	1.5	0.07–0.19
17	Burma	89	0.46	1.4	0.07–0.18
18	Morocco	68	0.31	1.0	0.05–0.12
19	North Korea	90	0.30	1.0	0.05–0.12
20	United States	2	0.28	0.9	0.04–0.11

MMT = million metric tons

Figure 2

The Waste Hierarchy.

Source: European Union. *Directive 2008/98/EC on waste (Waste Framework Directive)*. (2016). [Online]. European Union. Available from:

<http://ec.europa.eu/environment/waste/framework/> [Accessed 14 January 2018].



Figure 3

Municipal waste recycling in 34 European countries (2004 and 2014).

Source: European Environment Agency. *Municipal waste management across European countries*. (2017). [Online].

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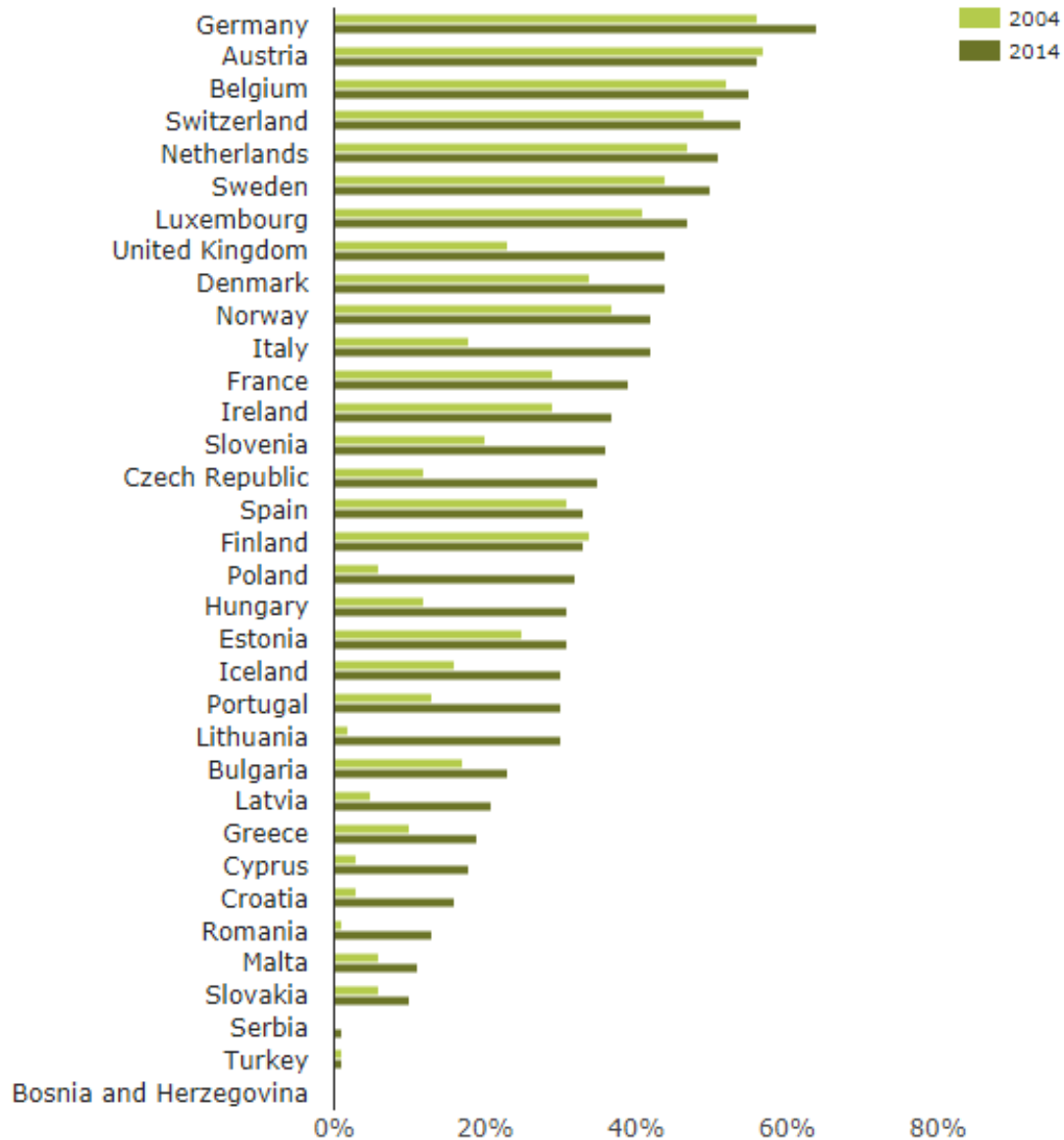


Figure 4

Municipal waste generated per person in 35 European countries (2004 and 2014).

Source: European Environment Agency. *Municipal waste management across European countries*. (2017). [Online].

European Environment Agency. Available from: <https://www.eea.europa.eu/themes/waste/municipal-waste/municipal-waste-management-across-european-countries> [Accessed 13 January 2018]

