



WWF

REPORT

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A top-down photograph of a woman with dark hair wearing a black diving mask. She is surrounded by a vast sea of discarded, clear plastic bottles, some of which are crushed. The background is a deep green color, suggesting water. The overall image conveys the message of plastic pollution in the ocean.

# STOP THE FLOOD OF PLASTIC

How Mediterranean countries can save their sea



**Front cover**

Free-diving Champion and WWF supporter Şahika Ercümen.

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# WWF CALL TO ACTION: MEDITERRANEAN COUNTRIES TO STEP UP REGIONAL AND NATIONAL POLICY AMBITION TOWARDS **NO PLASTIC IN NATURE BY 2030**

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*Plastic has become a ubiquitous material in the Mediterranean. It is part of people's everyday life and it is a usual presence on its beaches and at sea. Every year, 0.57 million tonnes of plastic enters Mediterranean waters. This is equivalent to dumping 33,800 plastic bottles into the sea every minute. Without action, this number will keep growing as plastic waste generation in the region is expected to quadruple by 2050.*

*Plastic has negative, and often lethal, effects on marine life. It also disrupts the wealthy Blue Economy of the Mediterranean, and litters its coastlines. Regional economic losses attributed to plastic pollution are estimated at €641 million per year, with tourism being the most affected sector.*

*Our analysis shows that in all Mediterranean countries plastic pollution is the result of failures across the entire plastic life cycle, including production, consumption, waste management, and secondary markets for recycled material. Therefore action must be taken at all levels to ensure zero leakage of plastic into nature.*

*The Mediterranean region is the world's fourth largest producer of plastic goods, and its residents and visitors generate 24 million tonnes of plastic waste each year. Tourism increases waste by up to one-third during the summertime in some countries, resulting in local waste management facilities being often overwhelmed.*

*More than half of plastic becomes waste less than a year after it was produced, and most is sent to landfills or incinerators, rather than recycled or reused. Few countries have achieved significant rates of separate collection for plastic, which would ensure the steady supply of plastic material for recycling.*

*Almost one third of the Mediterranean's plastic waste is mismanaged. This plastic, which either remains uncollected or ends up in illegal landfills and open dumps, is most likely to make its way into rivers, and eventually the sea. Every country in the region mismanages a proportion of its plastic waste and contributes to the problem of plastic pollution. This is why, only by acting together, with ambitious and coherent policy actions, can Mediterranean countries achieve zero plastic leakage into the sea by 2030.*

*While cutting plastic consumption remains a prerequisite for reducing the region's unbearable amount of waste, the zero waste model for the Mediterranean also includes minimizing plastic use in products and ensuring a fully efficient recycling and reuse system. These systemic shifts will require strong public fiscal and private financial investments. Some solutions and best practices are already available across the region and should be shared and scaled-up to maximize impact.*

*Based on the findings from this study, WWF urges governments, industry, and citizens to take responsibility and jointly build an efficient circular economy model in which unnecessary plastic is avoided and no plastic becomes waste.*

**TOGETHER,  
THROUGH COLLECTIVE  
COMMITMENT  
AND NATIONAL ACTION,  
GOVERNMENTS, INDUSTRY  
AND MEMBERS OF THE PUBLIC  
CAN ACHIEVE ZERO PLASTIC  
LEAKAGE INTO NATURE  
AND THE MEDITERRANEAN SEA  
BY 2030.**

**ALL ACTORS HAVE A ROLE TO PLAY.**





## WWF calls on **Mediterranean governments** to:

- Enter into a legally binding treaty to eliminate plastic leakage into nature by 2030, and support each other in achieving this goal.
- Ban unnecessary and problematic single-use plastic goods, and use extended producer responsibility schemes to hold industry accountable for the downstream impacts of their products.
- Invest in effective waste management systems to ensure that all material is collected, reused and recycled.
- Support the innovation of plastic alternatives and the development of a market for recycled material.
- Promote responsible consumption and proper waste management amongst residents and tourists.



## WWF calls on **industry** to:

- Take responsibility for the full life cycle of plastic products instead of passing the cost of waste on to society and nature.
- Design products that eliminate any unnecessary plastic, and that can be easily recycled and reused.
- Produce goods made of recycled materials, without use of any unnecessary virgin (or new) plastic.



## WWF calls on **members of the public** to:

- Avoid consuming single-use plastic goods, and adopt more environmentally sound alternatives.
- Sort waste following the requirements of local municipalities.
- Use your power to call on government and industry to take all needed actions.

# 1. THE THREAT OF PLASTIC POLLUTION TO THE MEDITERRANEAN

**22 COUNTRIES AND TERRITORIES<sup>[1]</sup> COMPRISING THE MEDITERRANEAN REGION PRODUCE 10 PER CENT OF ALL PLASTIC GOODS, MAKING IT THE WORLD'S 4<sup>th</sup> LARGEST PLASTIC PRODUCER**

Growing at four per cent per year, Mediterranean plastic goods production reached almost 38 million tonnes in 2016. This is equivalent to producing 76 kilograms of plastic goods for each person living in the region, which is 23 kilograms more than the global average.

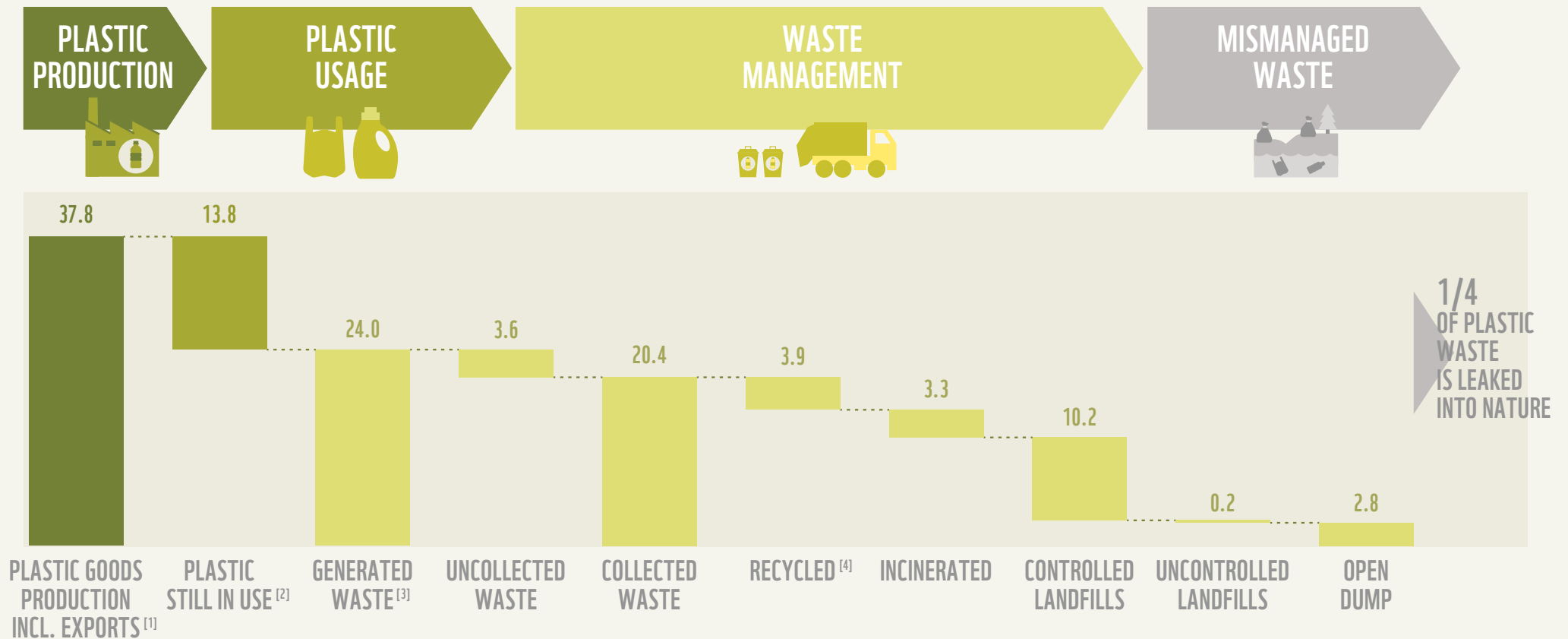
<sup>[2]</sup> Plastic production across all Mediterranean countries emits approximately 194million tonnes of carbon dioxide every year, similar to six times the annual carbon emissions of London (See Annex 3).



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Figure 1: OVERVIEW OF THE PLASTIC LIFECYCLE IN THE MEDITERRANEAN (million tonnes)



[1] Two main actors are needed to produce plastic goods for consumption: i. Virgin plastic producers; and ii. Manufacturers/converters of virgin plastic into a plastic good. This total production figure includes all plastic products manufactured using local and imported virgin plastic material. It includes all plastic goods reported by national plastics associations which cover packaging, construction, transport, textiles, electronics, industrial equipment, and others (See Annex III for further details).

[2] These are plastic goods produced with a mean product lifetime greater than 1 year, and/or exported for consumption in another country.

[3] A proportion of plastic generated in previous years becomes waste over time. This is already accounted in the waste generated figure. This figure includes waste with a mean product lifetime from 1 year (or less) to 35 years.

[4] In Europe less than 60% of the plastic collected for recycling is actually recycled; 40% is lost in the process. Recycling losses result from mixed plastic entering in the same recycling process, plastic additives making material unsafe to recycle, and plastic contamination from substances they held.

Source: Plastic Europe 2018, UN COMTRADE database on import/exports, Jambeck & al (2014), World Bank (2018), Dalberg analysis.

**ONLY 72%  
OF PLASTIC WASTE  
ENDS IN A CONTROLLED SYSTEM**

*Mediterranean countries generate 24 million tonnes of plastic waste every year, managing only 72 per cent through controlled waste treatment with some countries performing better than others.*

Of the waste generated, 20.4 million tonnes (85 per cent) are collected, leaving 3.6 million tonnes (15 per cent) uncollected and potentially leaked into nature. Of the waste collected, 17.3 million tonnes (72 per cent) is managed through controlled waste treatment: 10.2 million tonnes (42 per cent) end up in controlled landfills; 3.3 million tonnes (14 per cent) are incinerated; and 3.9 million tonnes (16 per cent) are recycled. The remaining waste is managed inadequately with 0.2 million tonnes (1 per cent) ending up in landfills that do not respect the minimum sanitary requirements (uncontrolled landfills), and 2.8 million tonnes (12 per cent) dumped illegally. The 6.6 million tonnes of plastic waste uncollected, openly dumped, or disposed in uncontrolled landfills, referred to collectively as mismanaged waste, is the main source of plastic leakage into the Mediterranean Sea (See Annex IV). On average, Southern Mediterranean countries recycle less than 10 per cent of their plastic waste, which is a lower recycling rate than the region as a whole.<sup>[4]</sup>



*Three Mediterranean countries account for two-thirds of plastic leaked into nature.<sup>[5]</sup>*

Every Mediterranean country is mismanaging a portion of its waste, as seen in Figure 2, but given their plastic production and consumption patterns, size of economy, and current waste management systems, the biggest contributors to mismanaged waste in the region are Egypt (42.5 per cent), Turkey (18.9 per cent), and Italy (7.5 per cent).<sup>[6]</sup>

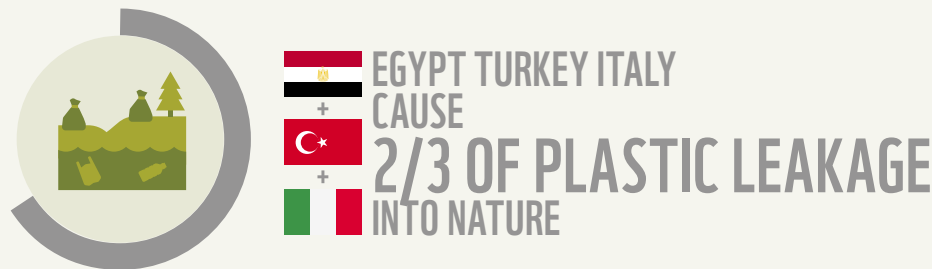
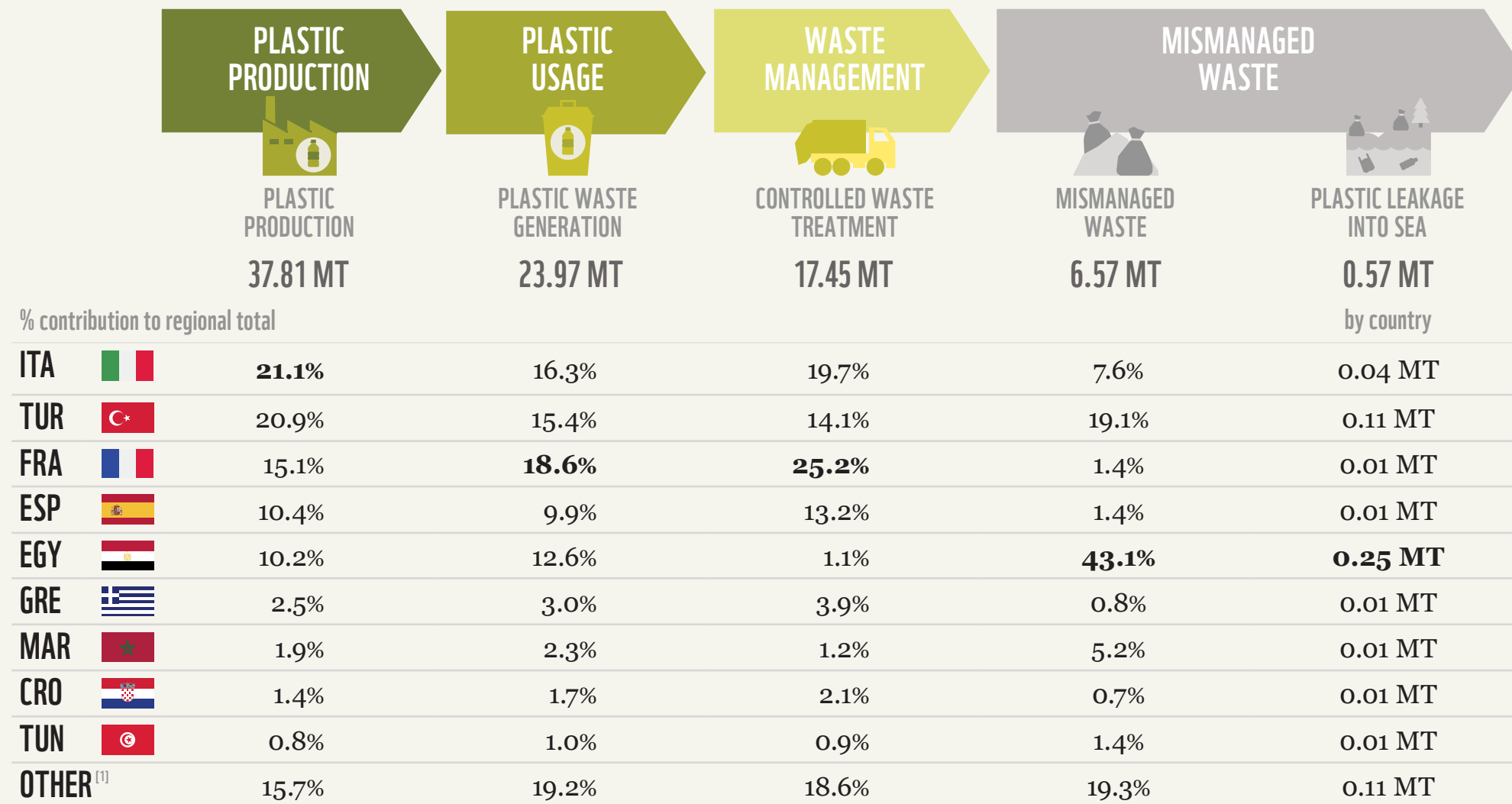


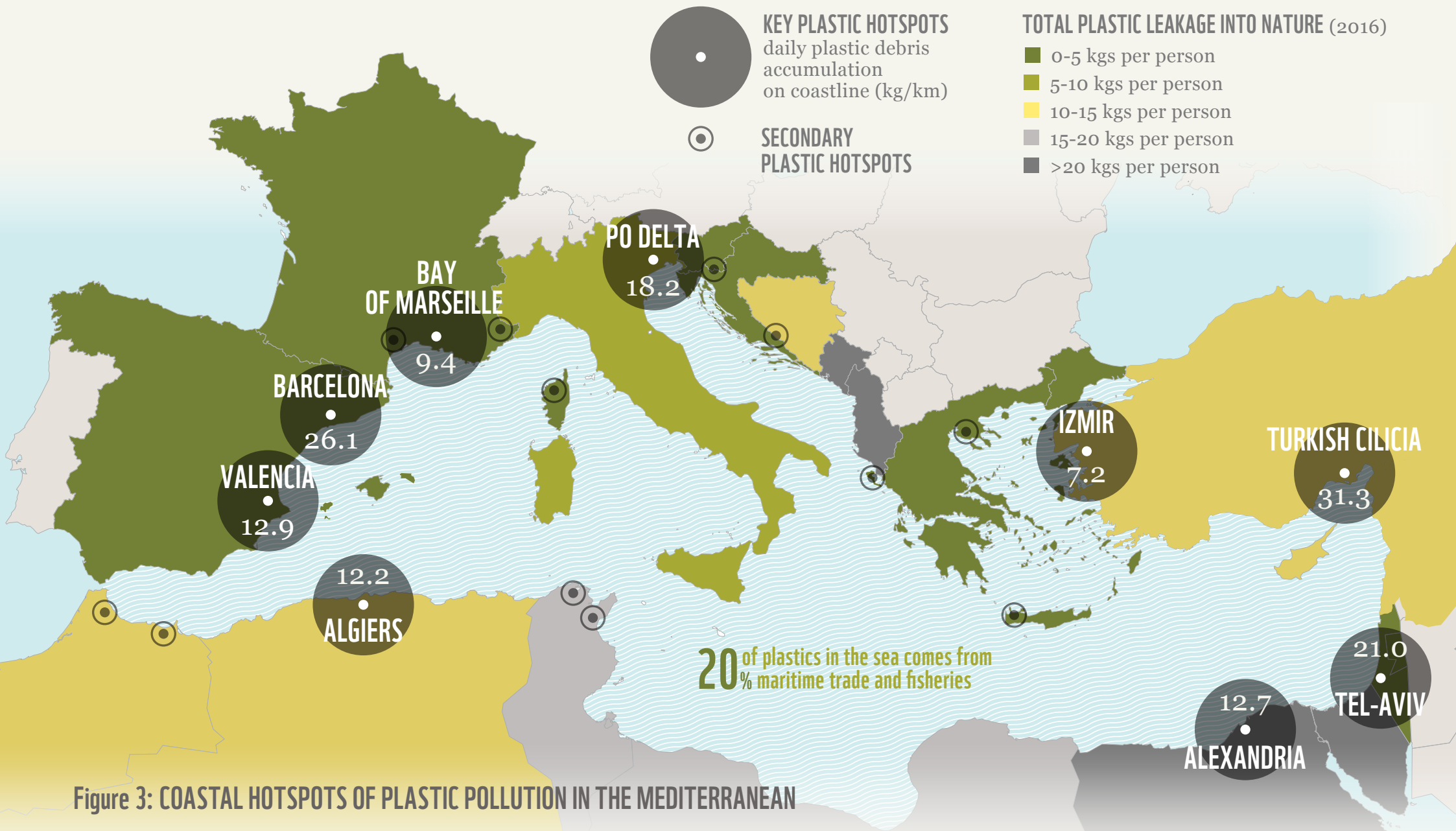


Figure 2: SUMMARY OF THE PLASTIC SYSTEM DRIVING MARINE POLLUTION IN THE MEDITERRANEAN



[1] Include total percentage contribution of across each value chain segment of remaining 13 mediterranean countries

Source: Dalberg analysis, Jambeck et al. (2017), Liubartseva et al. (2018)



**Figure 3: COASTAL HOTSPOTS OF PLASTIC POLLUTION IN THE MEDITERRANEAN**

Source: Dalberg analysis, Jambeck & al (2017), Liubartseva et al (2018)



**0.57 million tonnes of plastic leaked into nature makes its way into the Mediterranean Sea each year, equivalent to dumping 33,800 plastic bottles into the water every minute.**<sup>[2]</sup>

While most plastic waste remains on land or in freshwater systems,<sup>[7]</sup> current evidence suggests that about 10 per cent of land-based pollution eventually becomes marine pollution.<sup>[8]</sup> Coastal activities contribute to half of plastic entering the Mediterranean Sea, and 30 per cent arrives from land via rivers.

<sup>[9]</sup> The rest comes from on-sea sources of plastic pollution.<sup>[10]</sup>

On a per capita basis, Eastern Mediterranean countries mismanage more waste than Western Mediterranean countries causing higher leakage into the sea (Figure 3). Turkey's Cilicia region has the highest coastline pollution in the Mediterranean, followed by the coastal areas surrounding Barcelona and Tel Aviv. Other city hotspots include Valencia, Alexandria, the Venice coast close to the Po River Delta,<sup>[11]</sup> and the Bay of Marseille. Turkey's neighboring Ceyhan and Seyhan Rivers, the Po River Delta, and the Nile are the most contaminated rivers feeding plastic into the sea.<sup>[12]</sup>

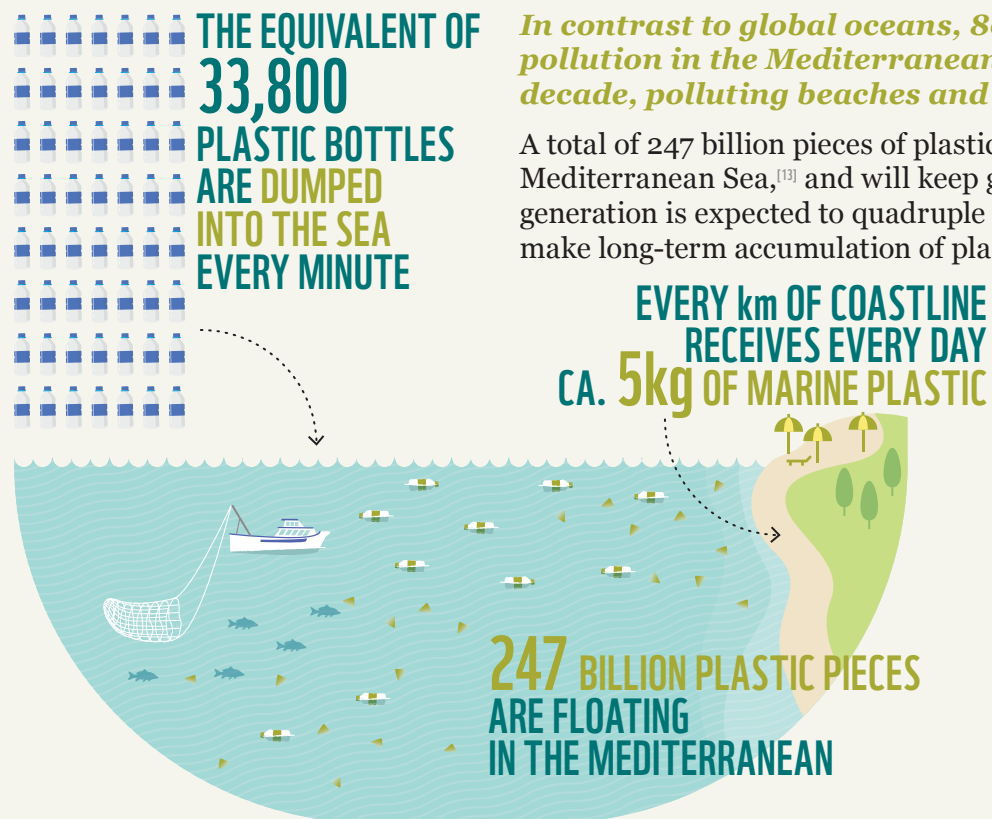
**On-sea sources of plastic waste contribute an additional 0.1 million tonnes of plastic in the Mediterranean.**

On-sea sources of pollution include loss of cargo or illegal dumping plastic debris while at sea, and loss or discard of fishing gear. The international maritime trade and fisheries industries account for 20 per cent of the plastic entering the Mediterranean Sea each year.

**In contrast to global oceans, 80 per cent of marine plastic pollution in the Mediterranean returns to land within a decade, polluting beaches and coastlines.**

A total of 247 billion pieces of plastic are estimated to be floating in the Mediterranean Sea,<sup>[13]</sup> and will keep growing as current plastic waste generation is expected to quadruple by 2050.<sup>[14]</sup> Sea currents and drifts make long-term accumulation of plastics on the water surface unlikely in

the Mediterranean.<sup>[15]</sup> Every day, on average 5.1 kilograms of marine plastic accumulates along each kilometre of coastline.<sup>[16]</sup> Given their length of coastlines and the high plastic concentrations in their coastal waters, Italy (12.6 kT/year) and Turkey (12.1kT/year) accumulate the most coastline plastic debris each year.<sup>[17]</sup> Plastic waste accumulating on the sea bed is estimated to be nine times smaller than coastline plastic accumulation, but is almost impossible to clean up.<sup>[18]</sup>



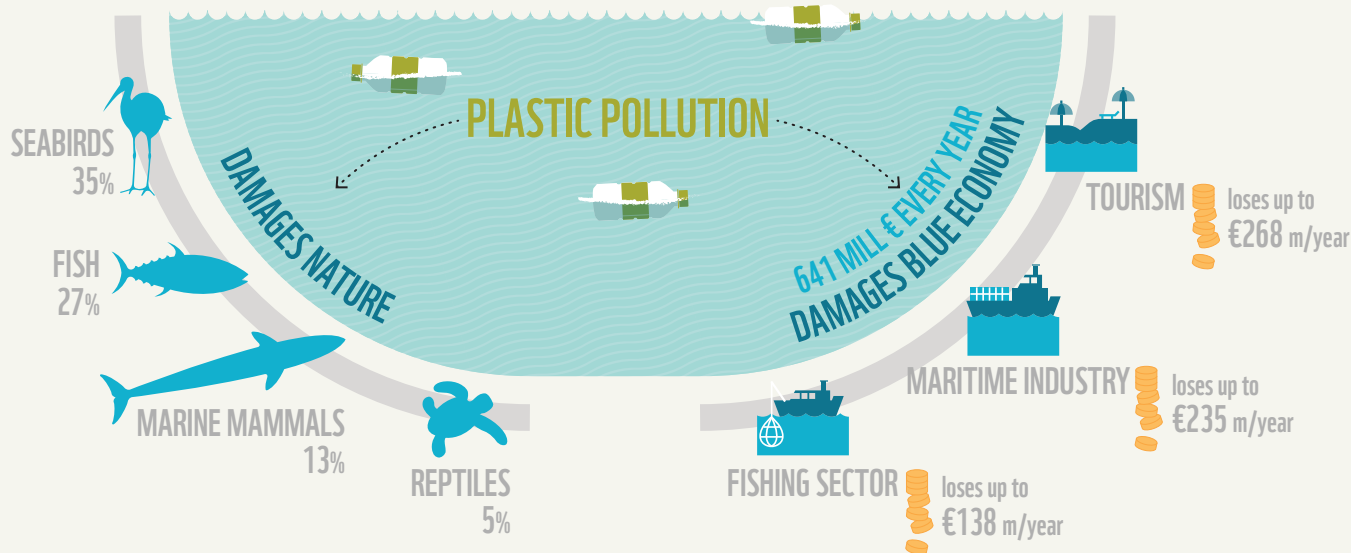
## PLASTICS ARE CREATING A SERIOUS CHALLENGE FOR NATURE, SOCIETY, AND THE ECONOMY

### *Plastic waste is damaging the Mediterranean ecosystem.*

Plastic pollution kills aquatic wildlife, damages natural systems, and contaminates marine food chains.<sup>[19]</sup> Each year, people living in the Mediterranean region are ingesting more and more plastic from food and drinking water, with the full effects still unknown.<sup>[20]</sup> Globally today, over 700<sup>[21]</sup> marine species, including sea mammals and birds, are impacted by plastic through ingestion, entanglement, or habitat degradation.<sup>[22]</sup> The international maritime and fisheries industries abandon, lose or discard gear (nets, lines, traps, pots, etc.) and other equipment at sea. This damages marine habitats and kills wildlife, including through a phenomenon known as “ghost fishing.” In the Mediterranean, plastic pollution and ghost fishing cause the injury or death of seabirds (35 per cent), fish (27 per cent), invertebrates (20 per cent), marine mammals (13 per cent) and reptiles (5 per cent).<sup>[23]</sup>

*The Mediterranean’s prosperous Blue Economy represents 6% of the region’s GDP,<sup>[24]</sup> but loses an estimated €641 million to marine plastic pollution each year.*

Tourism, maritime trade, and fisheries are directly and adversely impacted by plastic pollution.<sup>[25]</sup> Tourism accounts for over three-quarters of the current Mediterranean Sea economy, with maritime trade and fisheries producing the remainder.<sup>[26]</sup>







## TOURISM

**loses up to €268 million each year from plastic pollution.**<sup>[27]</sup>

Tourism increases monthly waste generation by one-third during the summertime, costing an average of €1,300 per tonne.<sup>[28]</sup> Local municipalities can be overwhelmed by the additional waste influx, leading to uncollected waste or unsafe management practices. As a result, the tourism industry often bears the cost of the clean up to ensure locations remain attractive for tourists.



## MARITIME INDUSTRY

**loses an estimated €235 million a year from marine plastic debris.**<sup>[29]</sup>

Maritime transport is particularly vulnerable to collisions with plastic objects, entanglement of floating objects with propeller blades, and clogging of water intakes for engine cooling systems.<sup>[30]</sup> Costs are incurred by vessel downtime, delays and additional maintenance costs. Port facilities are also at risk of damage from plastic pollution, including clogging of waterways, which creates delays and incurs cleanup costs.<sup>[31]</sup>



## FISHING SECTOR

**loses close to €138 million per year from plastic pollution.**<sup>[32]</sup>

Marine plastic debris can clog boat engines and fishing nets leading to disruption of fishing operations. The largest cost to the sector is related to vehicle damage and maintenance caused by collision with plastic debris, and delays caused by fishing nets filling up with plastic rather than fish are also incurred.<sup>[33]</sup>

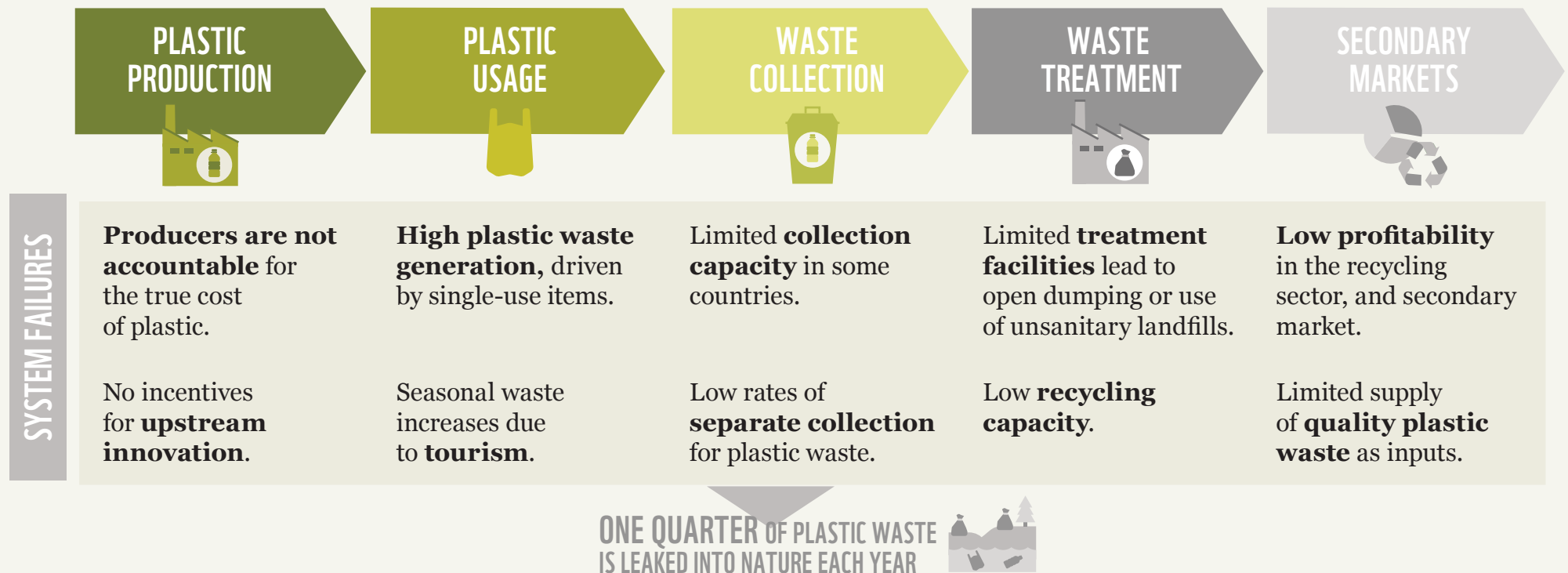


## 2. THE ROOT CAUSES OF PLASTIC LEAKAGE INTO THE MEDITERRANEAN

*Plastic pollution is the result of failures across the entire plastic life cycle, including production, consumption, waste management, and secondary markets for recycled material.*

The current plastic system does not hold actors accountable for the negative consequences of their actions or incentivize them to address the negative impacts (See Annex I). Each step within the value chain is driven by the priorities of different stakeholders, such as producers, plastic converters, end users, governments, and waste management actors.

Figure 4: OVERVIEW OF THE MAIN SYSTEM FAILURES IN THE PLASTIC VALUE CHAIN





## 1. PLASTIC PRODUCERS ARE NOT INCENTIVIZED OR OBLIGED TO ADDRESS THE TRUE COST OF PLASTIC.

*Accelerated production of plastic goods in Mediterranean countries results from falling production costs that do not represent the full lifecycle cost to nature and society.*

Due in part to these low costs, the 22 Mediterranean countries and territories produced 37.8 million tonnes of plastic goods in 2016. The cost of virgin plastic production is increasingly low, as the cost of raw materials, such as oil and natural gas, have declined by almost half over the last decade.<sup>[34]</sup> Most producers of plastic materials and goods are not required to carry waste management costs, or the environmental and social costs of pollution.<sup>[35]</sup> Regulatory incentives currently in place to curtail virgin plastic production, or to develop sustainable alternatives, are very limited. For example, petrochemical companies in Europe do not pay for the carbon dioxide emissions caused by virgin plastic production,<sup>[36]</sup> and petrochemical production is exempt from carbon emission caps.

*There are very limited incentives or regulation for producers to innovate product design to reduce the environmental impacts of plastic.*

Eco-design can substantially reduce the amount of plastic used in products and packaging, and increase the extent to which a product is safely and cost-effectively reused and the plastic material is recycled. Small awards or grants are led by industry associations for product innovations, such as the Packaging Europe Sustainability Awards and the Italian EPR System CONAI's eco-design awards.<sup>[37]</sup> These provide good visibility for the winners, but overall do not provide the necessary incentives to scale-up these innovations across the industry.

**MORE INCENTIVES  
FOR ECO-DESIGN**



**DESIGN WITH LESS PLASTIC  
CAN REDUCE UNNECESSARY  
PLASTIC IN PRODUCTS**





2.

## THE MEDITERRANEAN POPULATION AND ITS TOURISTS PRODUCE HIGH QUANTITIES OF PLASTIC WASTE, THE MAJORITY OF WHICH IS DRIVEN BY CONSUMPTION OF SINGLE-USE PLASTIC PRODUCTS.

*65 per cent of plastic consumed in Mediterranean countries becomes waste within a year, with single-use packaging items the biggest source of waste.*

The production of plastic per person is very high in Mediterranean countries, 23 kilograms higher than the global average.<sup>[38]</sup> In Italy and Turkey, packaging represents at least 80 per cent of the total waste generated. In 2016, Greece was using approximately 300 plastic bags per person yearly.<sup>[39]</sup> Further, Italy is the largest consumer of bottled water globally, with about 178 litres of water sold in plastic bottles per person, per year.<sup>[40]</sup>



**65%**  
**OF PLASTIC CONSUMED IN THE MED**  
**ENDS IN THE BIN**  
**WITHIN A YEAR**

*Tourism significantly increases waste generation on Mediterranean coasts, which are visited by over 200 million tourists each year.<sup>[41]</sup>*

During summer months, tourists increase the total population by over one-third across the Mediterranean's coasts. During this period, waste generated increases substantially: Greece sees a waste increase of 23-26 per cent, while in Italy the increase is up to 30 per cent in coastal areas. Local waste management facilities are often overwhelmed by this additional waste, which can lead to larger amounts of mismanaged waste and higher pollution risk. As a result, marine litter increases by up to 40 per cent on Mediterranean coasts during peak tourist season.<sup>[42]</sup>

# SUMMER TOURISTS GENERATE

→ **30% WASTE INCREASE**  
IN SOME COASTAL MUNICIPALITIES



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3.

### EFFECTIVE WASTE COLLECTION SYSTEMS REMAIN A CHALLENGE IN SEVERAL MEDITERRANEAN COUNTRIES.



HIGHER SEPARATE WASTE COLLECTION = MORE PLASTIC FOR RECYCLING

*Waste collection remains a problem in several Mediterranean countries, leaving 3.6 million tonnes of plastic waste uncollected each year.*

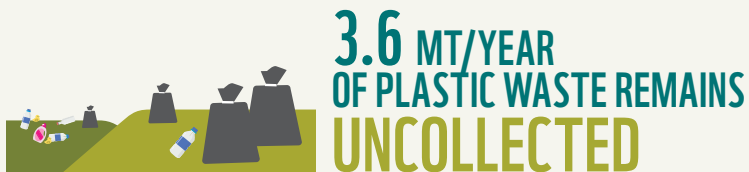
In most Mediterranean countries, municipalities are legally responsible for the collection of household waste. Municipalities can conduct collection operations directly or outsource the service to private sector companies. These are highly costly operations, especially in areas with lower population density and greater distances. In Tunisia, for example, waste collection and transport currently constitute 75-100 per cent of municipalities' solid waste management budget.<sup>[43]</sup> In countries where waste collection systems are ineffective, informal waste picking sectors are likely to emerge, posing serious risks to these workforces.

*Few countries in the region have achieved significant rates of separate collection for plastic, which would ensure the steady supply of plastic waste for recycling.*

Italy is one of the very few Mediterranean countries to have implemented a separate collection stream for plastic, which collects 38 per cent of the country's plastic waste. Collection rates vary at sub-national levels in Italy as northern regions collect 57 per cent of plastic waste separately, while southern regions only collect 27 per cent.<sup>[44]</sup> France achieves high rates through door-to-door collection, while Greece, Turkey and Tunisia have low levels of separate collection. The low number of collection points in some provinces places a high travel burden on consumers, and results in low collection rates.

*Additionally, low collection rates can be the result of low citizen engagement.*

In countries where education around the environmental impact of waste is lower, citizens are less likely to dispose of waste adequately. In Greece, Turkey and Tunisia, an estimated 50 per cent of waste collected for recycling through so-called "blue bin" systems is contaminated by non-recyclables. Most countries do not enforce a penalty fee on consumers for improper waste sorting, and therefore rely on citizens' good will.<sup>[45]</sup>







**FISHING GEAR**  
LOST OR ABANDONED AT SEA  
**THREATENS MARINE WILDLIFE**



**ONLY 1.5%** OF GEAR  
IS PROPERLY  
**RECYCLED**



4.

## WASTE MISMANAGEMENT IS THE RESULT OF INSUFFICIENT WASTE MANAGEMENT CAPACITY AND UNCONTROLLED OR ILLEGAL LANDFILL SITES, PRIMARILY IN THE SOUTHERN MEDITERRANEAN AND BALKANS.

*A total of 6.6 million tonnes of plastic waste is mismanaged yearly around the Mediterranean, but mismanagement rates vary vastly across countries.*

This refers to waste that remains uncollected or is illegally landfilled or openly dumped. Almost half of the region's total amount of mismanaged waste is accounted for by Egypt, followed by Turkey, Italy, Algeria and Morocco. Countries also vary on the proportion of their national waste stream that they mismanage (Figure 5). Those that mismanage the highest proportions of their waste streams are Montenegro (95 per cent), Egypt (93 per cent), Albania (73 per cent), and Libya (64 per cent).<sup>[46]</sup>



ALMOST 50% OF MISMANAGED WASTE COMES FROM EGYPT



MONTENEGRO MISMANAGES 95% OF ITS WASTE



EGYPT AND TURKEY ARE THE LARGEST SOURCES OF OPEN DUMPING

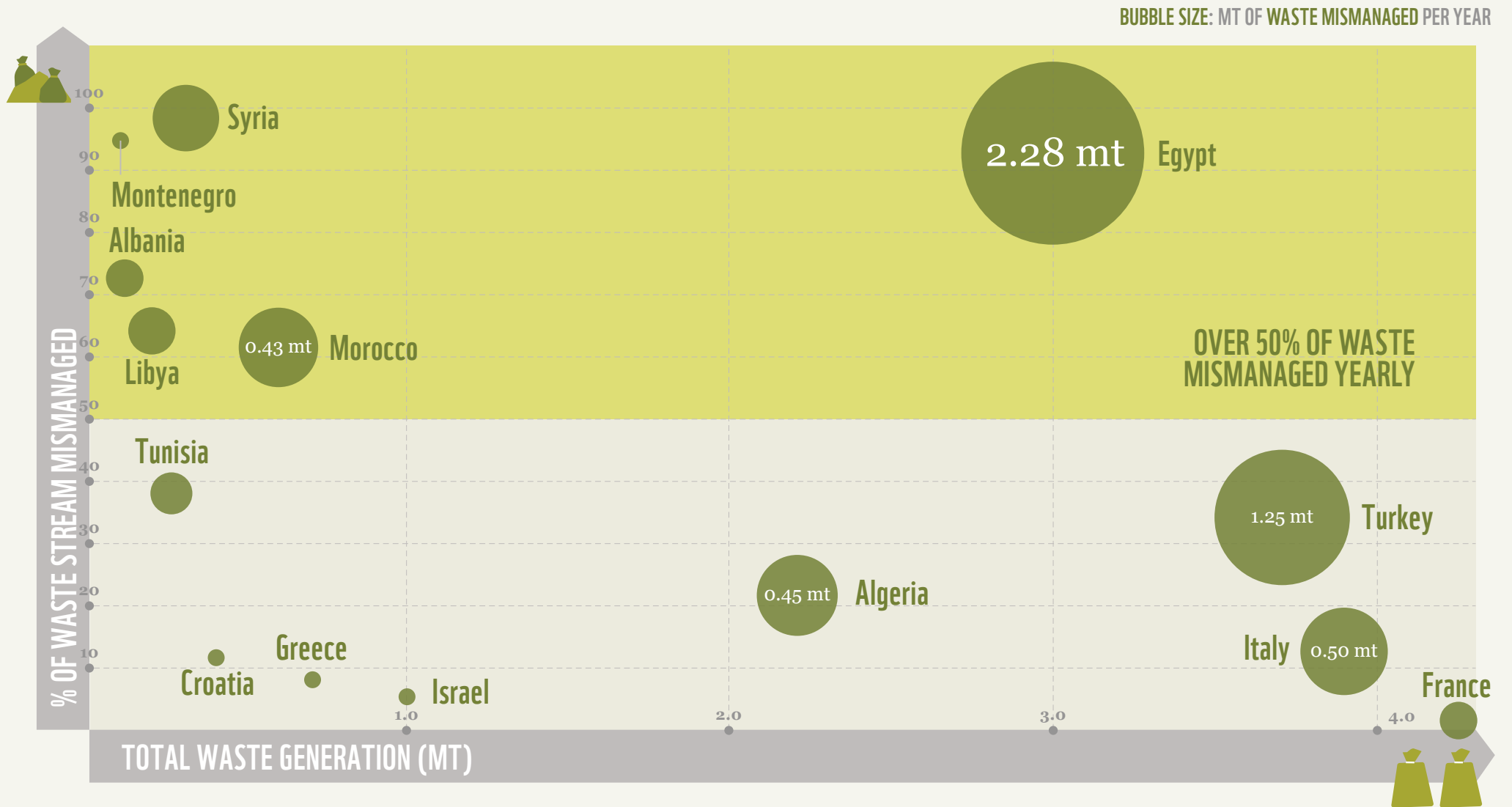
*Open dumping and illegal waste disposal sites persist in several countries, particularly in North Africa, due to insufficient waste management facilities.*

An estimated 2.8 million tonnes of waste is openly dumped in uncontrolled sites around the Mediterranean each year. Egypt and Turkey are the two largest sources of open dumping by total volume, dumping 1.3 million tonnes and 0.8 million tonnes of untreated plastic waste into open sites each year.<sup>[47]</sup> Morocco and Libya also rank high when looking at the total waste openly dumped per capita.<sup>[48]</sup>

*A large proportion of fishing gear is dumped or lost at sea, due to the high costs of disposal, and to limited port collection facilities.*

Each year, 20 per cent of Mediterranean marine litter comes from sea-based sources, including abandoned or lost fishing gear.<sup>[49]</sup> Despite its high quality of plastic materials, only 1.5 per cent of gear is recycled effectively; the vast majority is simply abandoned at sea. There is currently no extended producer responsibility (EPR) system to oblige producers to cover the costs of waste management. Until recently, fishers were charged high rates for the disposal of fishing gear and deterred from bringing so-called ghost fishing gear to shore. Many ports in the Mediterranean, not covered by the EU Port Reception Facilities Directive, have limited disposal facilities for fishing gear.

Figure 5: PERCENTAGE AND TOTAL SIZE OF MISMANAGED WASTE, BY COUNTRY (million tonnes, 2016)





## IN SEVERAL COUNTRIES LANDFILLS DO NOT MEET SANITARY STANDARDS



***Landfilling remains the top method of waste disposal in most countries, and not all landfills meet required sanitary standards.***

Despite calls to reduce the proportion of waste being landfilled, this remains the primary method of waste management in all Mediterranean countries except France, the Principality of Monaco, and Slovenia, where incineration surpasses landfilling.<sup>[50]</sup> In several countries, landfills fail to meet sanitary requirements. The EU Landfill Directive 1994/31/EC mandates that landfills be fully sealed and covered, and bans several waste categories. The EU Circular Economy Strategy establishes that sites constructed before 2001 are considered uncontrolled, due to the lower minimum standards applied at the time. In Tunisia, however, the European Environmental Agency found that in ten operating landfill sites, “appropriate sanitation measures...are lacking, even at controlled landfill sites.”<sup>[51]</sup> Similarly, 170 landfill sites in Morocco that have been identified for closing remain in operation.<sup>[52]</sup> There is serious risk of waste leakage from these uncontrolled sites into nature.

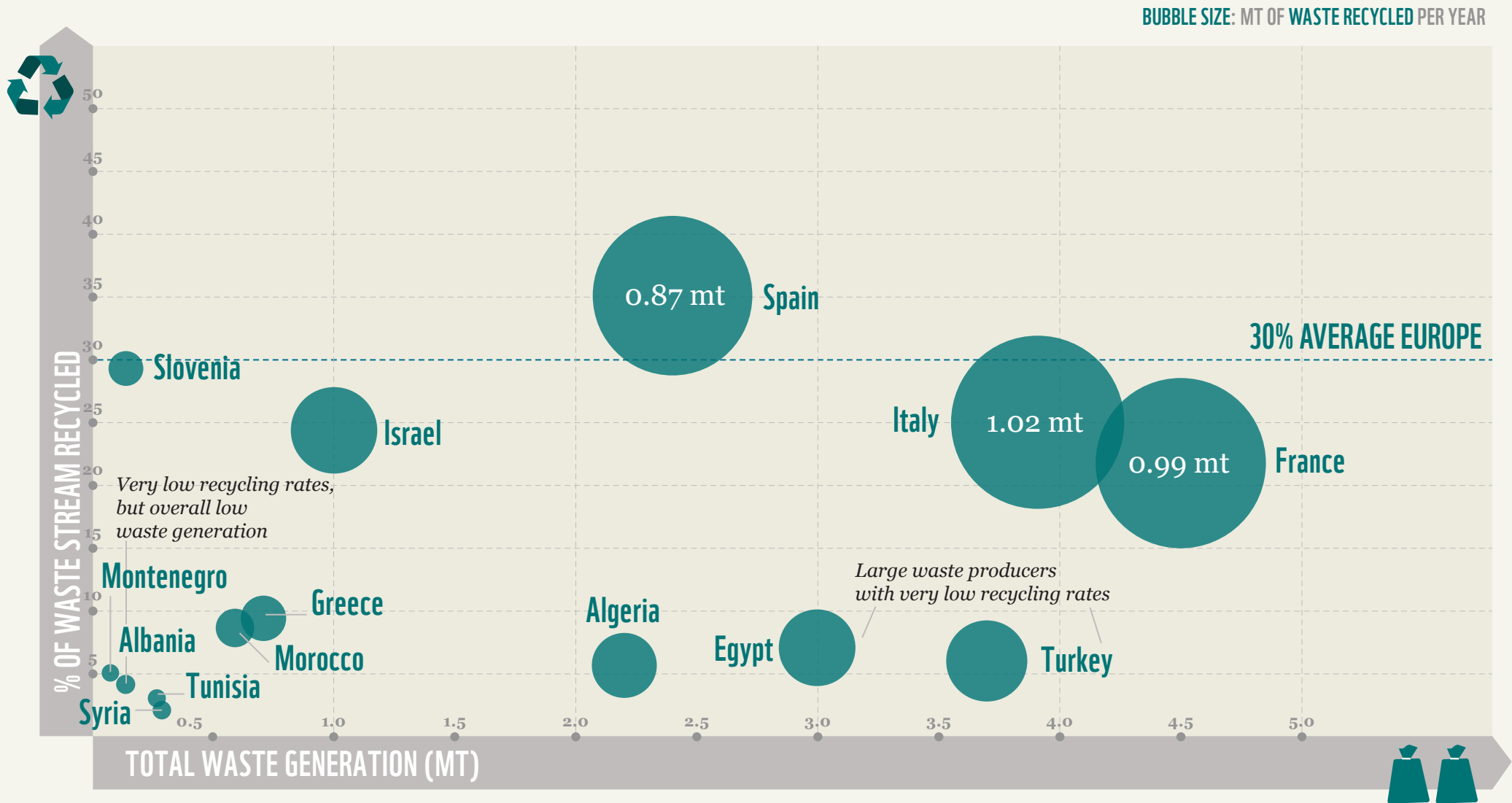
***Mediterranean countries recycled 3.9 million tonnes of waste in 2016, but recycling rates vary across the region.***

Italy has the leading recycling industry in the region by size. France is a close second, followed by Spain (Figure 6).<sup>[53]</sup> A number of countries in the Balkans, as well as Syria and Tunisia, recycle less than five per cent of their waste streams. Across all Mediterranean countries, only 17 per cent of waste gets recycled. This remains behind the European average of 31 per cent, with large economies like France (22 per cent) and smaller nations like Slovenia lagging behind this benchmark.<sup>[54]</sup>

***Recycling is hindered by a limited supply of high-quality plastic waste, and insufficient recycling infrastructure.***

Plastic recyclers often face unreliable supplies of good quality separated waste. In many cases, the inclusion of different materials or harmful substances means that the plastic waste cannot be recycled for health, safety, or quality control reasons,<sup>[55]</sup> and thus must be discarded. Collecting and sorting waste for recycling is a time-consuming and labor-intensive process, due to high levels of mixed and contaminated plastic waste in unsorted waste streams. Collecting and sorting constitute on average 40 per cent of total recycling costs.<sup>[56]</sup>

Figure 6: PERCENTAGE AND TOTAL SIZE OF RECYCLED WASTE, BY COUNTRY (million tonnes, 2016)







**TURKEY  
HAS BECOME  
ONE OF THE TOP 10  
GLOBAL WASTE IMPORTERS**

***The Chinese reform of quality regulations for imported plastic waste, started in 2018, has significantly shifted the global balance of trade in plastic waste.***

Since then, a significant volume of global waste trade has shifted toward countries with lesser restrictions than China. As of 2018, imported waste to Turkey grew to approximately 3.5 per cent of the total global waste trade, making it one of the top ten global waste importers.<sup>[57]</sup> Imported plastic is higher quality than domestically generated plastic waste, due to more effective sorting and treatment processes, and is hence of higher value to recyclers. A large portion of Turkish recycling capacity is occupied by imported waste coming from the United Kingdom, Belgium and Germany. Therefore, only 6 per cent of domestic plastic waste is recycled through these facilities.<sup>[58]</sup>

***In addition, many of the countries accepting larger volumes of imported waste, like Turkey and Morocco, have challenges with effective waste management.***

As a result, they were ill equipped to handle the sudden influx of imports. This means that plastics collected and exported for recycling to these nations may have ended up in landfills, incinerators or open dumps.<sup>[59]</sup>





5.

## A CIRCULAR ECONOMY FOR PLASTIC HAS YET TO DEVELOP ACROSS THE REGION, AS SECONDARY MARKETS FOR RECYCLED MATERIALS REMAIN UNPROFITABLE.

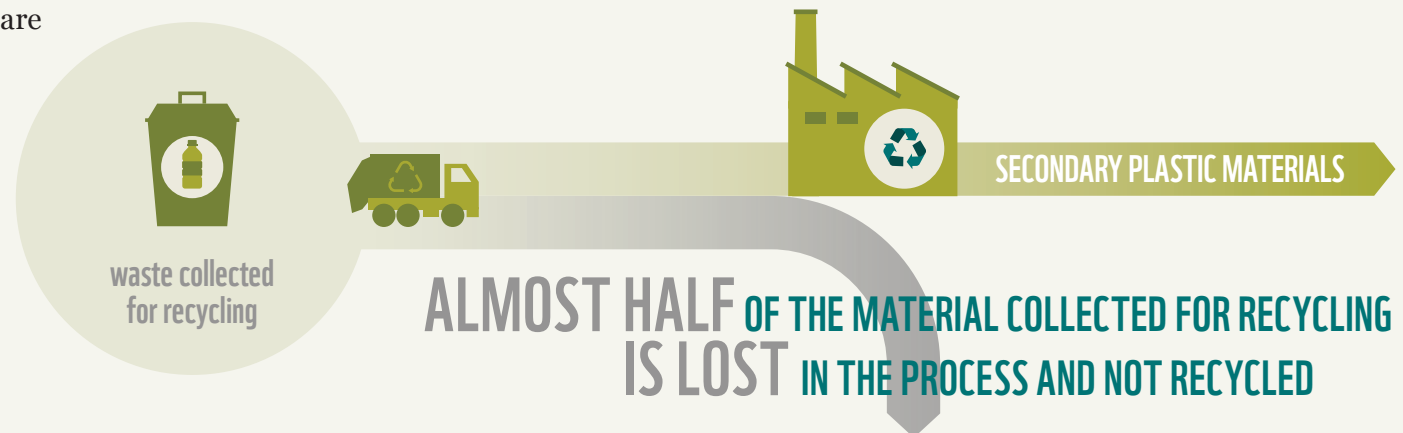
*Secondary markets for plastic remain broadly unprofitable and unable to scale, hindering the development of a proper circular economy system.*

Losses result from mixed plastics entering the same recycling process, plastic additives making material unsafe to recycle, and contamination from substances previously contained.<sup>[60]</sup> For example in Europe, almost half the material currently collected for recycling is lost during the recycling process.<sup>[61]</sup>

This data is not publicly available for all Mediterranean countries and territories, but similar results could be expected given many European countries are using best available recycling technologies.<sup>[62]</sup>

Most materials created from secondary plastic are of inferior quality to virgin plastic, and therefore trade for a lower price. Operating costs for recycling ventures remain prohibitively high due to waste collection and separation costs, expensive technology, and a limited supply of recyclable plastic. Finally, while some regulations are

emerging on the mandatory use of secondary materials, the market for secondary plastic remains small. The EU Single-Use Plastics Directive set a target of 25% of PET bottles to be made from recycled materials, but the industry is still far away from achieving this goal given the average recycled content in a PET bottle was 11% in 2017.<sup>[63]</sup> In Europe, operating costs are estimated to be €924 per tonne to recycle plastic, which is significantly more than the average selling price of secondary plastic material, €540 per tonne.<sup>[64]</sup> Thus, recycling remains vastly unprofitable.

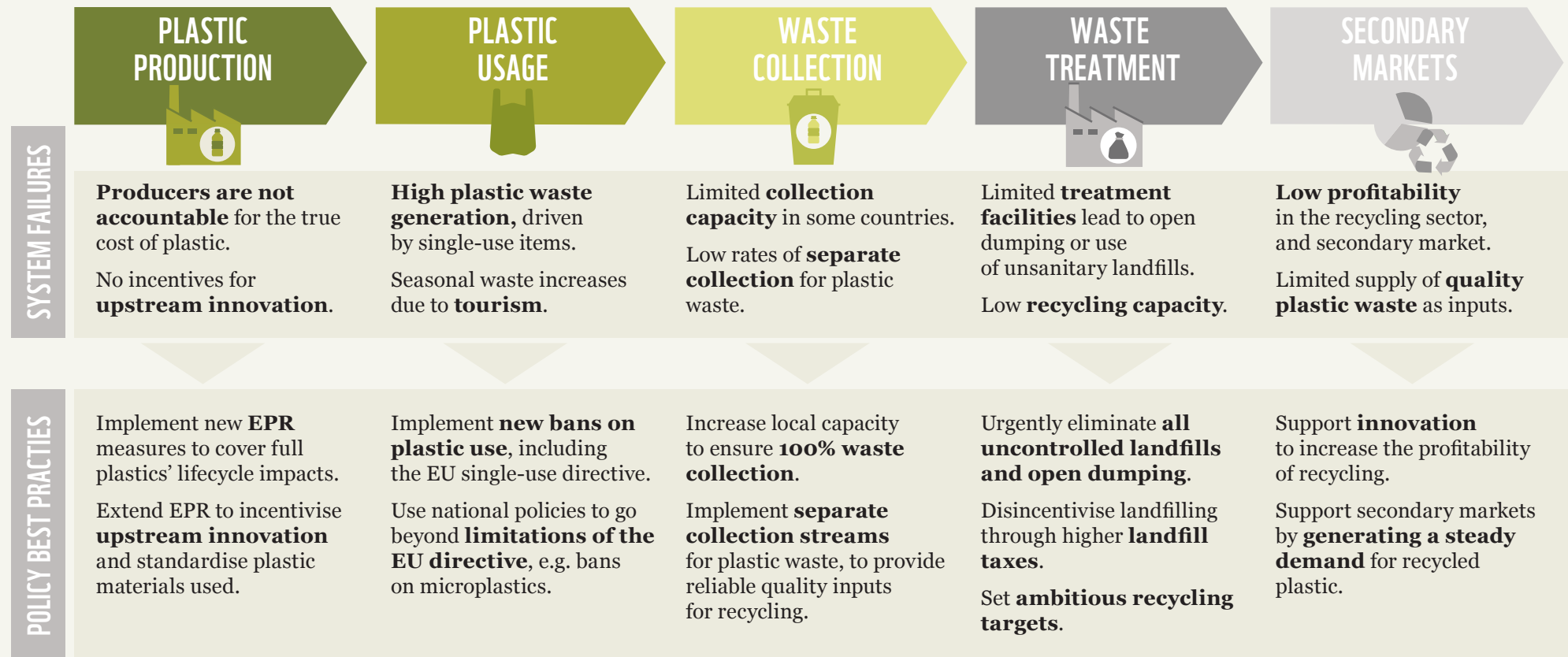


# 3. NATIONAL POLICY RESPONSES TO PLASTICS: GOOD PRACTICES AND KEY GAPS

*Current plastic pollution levels are caused by several system failures across the plastic value chain.*

National governments possess the mechanisms to create systemic solutions to end plastic pollution.

Figure 7: OVERVIEW OF POLICY INTERVENTIONS NEEDED ACROSS THE VALUE CHAIN





1.

## EXTENDED PRODUCER RESPONSIBILITY (EPR) CAN MAKE PRODUCERS RESPONSIBLE FOR PLASTIC'S WHOLE LIFECYCLE IMPACT.

*Standardizing EPR schemes across the region can ensure that manufacturers bear the full cost of waste management.*

EPR schemes raise funds by charging producers set environmental contributions for the materials produced. However, across the region, these schemes vary substantially on the categories of plastic waste covered, their environmental contribution levels, and their monitoring systems. For example, contributions levels vary from as little as €66 per tonne in Greece, to over €222 per tonne in France.<sup>[65]</sup> Creating regional minimum standards can help improve the performance of EPR schemes across the region, and monitor against free riders.

**REGIONAL STANDARDS  
FOR EPR SCHEMES  
WOULD IMPROVE PERFORMANCE**

*EPR contribution fees can be used to incentivize upstream innovation.*

The French and Italian schemes (CITEO and CONAI) have introduced new eco-modulated fee structures to focus on recyclability and eco-design.<sup>[66]</sup> These fee structures reward more recyclable products, based on features such as: clear labelling, easily separable materials, available recycling technology, and markets for secondary materials. Penalties are applied on features such as complex packaging design or disruptive additives, such as dark colorants or opacifiers, which hinder recycling. These schemes are promising examples of how to encourage industry behavior change. However, more should be done through EPR schemes to incentivize industries to reduce their plastic consumption overall.

**EPR SHOULD INCENTIVIZE  
PLASTIC REDUCTION**



2.



## THE EU SINGLE-USE PLASTICS DIRECTIVE CAN BE A COMMON MINIMUM STANDARD FOR REDUCED CONSUMPTION.

*Mediterranean countries are taking some positive steps in banning single-use plastics, as recently dictated by the EU Single-Use Plastics Directive.*

France and Croatia are among the countries that have already implemented steps toward the directive by banning disposable cutlery, glasses, plates and plastic cotton swabs. Italy is following suit, having already banned plastic cotton swabs.<sup>[67]</sup> While the directive could be more ambitious, it will provide a strong incentive for countries within and beyond the EU to take concrete steps to reduce single-use plastics.










**MORE  
SINGLE-USE PLASTIC  
AND ALL MICROPLASTIC  
SHOULD BE BANNED**

*National policies can be effective in filling the gaps of the EU Single-Use Plastics Directive.*

Some polices have addressed single-use plastic bottles and cups and microplastic added to cosmetics and detergents. The directive bans using polystyrene and oxo-degradable materials for making food containers, cups and bottles. These plastics disintegrate quickly into tiny fragments, and cause harm to the environment. Italy and France, for instance, have been pioneering in banning microplastics in exfoliant cosmetics. These bans could be expanded even further to cover all cosmetics, personal care products, soaps and washing detergents. Overall, individual countries should conduct analyses of the key local threats, which are left out of the directive, and develop legislation to overcome these gaps.

Figure 8: OVERVIEW OF PLASTIC BANS ACROSS SELECT MEDITERRANEAN COUNTRIES

EXAMPLES OF SINGLE-USE PLASTIC BANS IN THE MEDITERRANEAN						
		BAGS	CUTLERY	COTTON BUD STICKS	CUPS	MICRO BEADS
<b>FRA</b>		<p><b>2016:</b> Ban on the distribution bags, except compostable or bio-sourced bags</p> <p><b>2016:</b> Minimum bio-sourced content in bags by 2025</p>	<p><b>2020:</b> Bans on cotton swabs, cups, glasses and plates (with the exception of compostable cups/ glasses/compostable plates in domestic compost and partly bio-sourced materials), straws, cutlery, steak sticks, disposable drinks lids, meal trays, ice pots, salad bowls, boxes and beverage stirrers</p>			<p><b>2018:</b> Ban on the introduction of new exfoliating cosmetics containing microplastics</p>
<b>ITA</b>		<p><b>2011:</b> Ban on manufacturing, distribution and import of non-biodegradable bags</p> <p><b>2018:</b> Ban on ultra-light plastic bags for fresh produce</p>		<p><b>2019:</b> Ban on the manufacture and sale of cotton swabs with a plastic stick</p>		<p><b>2020:</b> Ban on the sale of all exfoliating or detergent cosmetics containing microplastics</p>
<b>CRO</b>		<p><b>2019:</b> Small customary levy and fee for distributors plastic bags of \$1,500/T of bags</p>	<p><b>2019:</b> The Parliament voted to ban single-use plastic cutlery, cotton buds, straws, stirrers, and polystyrene cups from oxo-degradable plastics as per the EU Single-Use Plastics Directive</p>			
<b>GRE</b>		<p><b>2018:</b> Customer levy of €0.04 on plastic bags, increased to €0.09 in 2019</p>				
<b>TUR</b>		<p><b>2019:</b> 0.25 TL fee on plastic bags to reduce per capita use from 440 to 90 bags by 2025</p>				
<b>TUN</b>		<p><b>2017:</b> Ban on the sale of plastic bags</p>				
<b>MAR</b>		<p><b>2015:</b> Ban on the production, sale and use of non-biodegradable plastic bags</p>				



### 3. REACHING 100 PER CENT COLLECTION AND IMPLEMENTING SEPARATE WASTE STREAMS REQUIRES ADDITIONAL LOCAL CAPACITY AND CITIZEN EDUCATION.

*Waste separation at the source is an effective method to increase the quality of plastic waste, but not all Mediterranean countries have adopted this process.*

Italy and Croatia are among the few Mediterranean countries collecting waste through several different material streams, typically being: paper, plastic, glass and metal. Separate waste collection is one of the most effective methods to reduce the cost of sorting and to improve the steady flow of secondary plastic. When the “raccolta differenziata” system was introduced in Italy, the percentage of packaging waste recycled increased more than four per cent per year between 2005 and 2015, to over 44 per cent in 2016.<sup>[68]</sup>

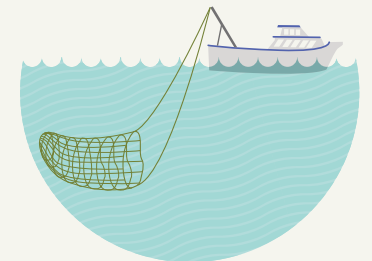


**SEPARATE  
WASTE COLLECTION  
CAN INCREASE QUALITY  
OF RECYCLED WASTE**

*The European Commission (EC) is considering new standards to improve the safe waste management of fishing gear.*

The EC proposed a new directive which removes all disposal fees for fishing gear to incentivize bringing retrieved nets ashore. Italy has been the first to propose a law which enables fishers to bypass waste disposal fees, called the “Salva Mare” law. The newly proposed EC directive requires governments to invest in specialized waste management facilities and dedicated waste streams for fishing gear waste in ports, and to lead open-sea retrieval operations. The directive also calls for the creation of an EPR system for the fishing gear industry, to take on the responsibility for managing fishing gear plastic once it is landed, reducing port costs for fishers, particularly in small fishing ports.

**PRODUCERS  
MUST COVER THE COST  
OF FISHING GEAR WASTE**







## 4. IMPROVING WASTE MANAGEMENT CAPACITY WILL DECREASE LEAKAGE.

*Building up waste management capacity is the top priority of most southern Mediterranean countries.*

This is primarily driven by the development of new landfills, rather than recycling plants. In Tunisia, there are currently only ten operating landfills; in Morocco there are currently only 14.<sup>[69]</sup> The national solid waste management plans of both countries, supported by the World Bank, focus on the development of new controlled landfilling facilities, particularly targeting coastal cities. While these new landfills will represent an important step against waste mismanagement, they should not divert attention from the need for the development of new recycling facilities.

*Fiscal penalties have been an effective method to ensure countries identify, close, and rehabilitate open dumpsites.*

The European Commission has previously sanctioned countries that have failed to close dumpsites declared illegal. In 2013, Italy was fined €40 million for the failure to close 40 dumpsites in its southern regions, and in 2016, Greece was fined €40 million for failing to improve the sanitary conditions of its landfills.<sup>[70]</sup> To tackle the issue of illegal dump sites, investments were made on new facilities, and satellite imagery and drone technology is being used to identify dumping sites for hazardous waste.

*In the northern Mediterranean, countries have started taking significant measures to disincentivize landfilling.*








The EU Circular Economy Package revised the previous restrictions on landfilling from the EU Landfill Directive, calling on countries to reduce landfilling to below ten per cent of waste management. Greece recently set its own target, seeking to divert 74 per cent of waste from landfilling by 2020.<sup>[71]</sup> This waste should be diverted to recycling. Landfill taxes are an effective method to financially disincentivize landfills as a waste management option, in order to achieve these targets. However, several countries have yet to implement these laws. In 2014, Greece and Croatia announced the introduction of a landfill tax, which has not been applied to date.<sup>[72]</sup> Given the lack of alternative waste management facilities in these countries, there has been significant pushback on these laws from municipalities and citizens that would have to bear the cost. These taxes hence need to be accompanied by growing investment in alternative waste management facilities.

**MORE CONTROLS  
AND SANCTIONS  
TO END ILLEGAL  
DUMP SITES**



**LANDFILL TAX  
IS AN EFFECTIVE WAY  
TO REDUCE  
LANDFILLING**

Figure 8: OVERVIEW OF PLASTIC BANS ACROSS SELECT MEDITERRANEAN COUNTRIES

	LANDFILL TAX	CURRENT LANDFILLING (% of waste)	TARGET LANDFILLING (% of waste by 2030)
FRA 	32€/t in authorized sites	<b>36%</b>	<b>&lt;10%</b>
ITA 	5.2€/t - 25.82€/t depending on the region	<b>28%</b>	<b>&lt;10%</b>
CRO 	<b>No tax.</b> A fee is encouraged by the waste management plan for 2017-2022, but not applied yet	<b>73%</b>	<b>&lt;10%</b>
GRE 	<b>No tax.</b> In 2014, a fee of 35€/t, increasing by 5€/t yearly to 60€, was announced but not enforced. The circular economy law announced a new 10€/t tax in 2019, to be implemented	<b>76%</b>	<b>26%</b> (by 2020)
TUR 	<b>No tax</b>	<b>60%</b> + <b>22%</b> open dumping	n/a
TUN 	<b>No tax</b>	<b>60%</b> + <b>18%</b> open dumping	n/a
MAR 	<b>No tax</b>	<b>31%</b> + <b>44%</b> open dumping	n/a



5. **TO BECOME PROFITABLE, RECYCLING NEEDS TO BE PROMOTED ACROSS THE VALUE CHAIN, FROM CREATING RECYCLABLE PRODUCTS, TO ENSURING SEPARATE COLLECTION, AND INCENTIVISING MARKET DEMAND.**

*The economic value of recycling is driven by innovation across the value chain, not only within waste management.*

Secondary markets do show promise, but they require financing for innovation at each stage of the plastic lifecycle. Plastic products need to be designed to maximize recyclability from the outset. Waste collection systems need to generate a steady supply of high-quality plastic inputs, by effectively separating waste at the household level. New cost-effective recycling processes are required to reduce the amount of value currently lost during the recycling process, so that secondary products can replace primary materials one-to-one. Governments and multilateral institutions can support this process of innovation by developing grant schemes or investment facilities for research and development in these areas, as has already been done in a number of environmental sectors such as carbon reduction.

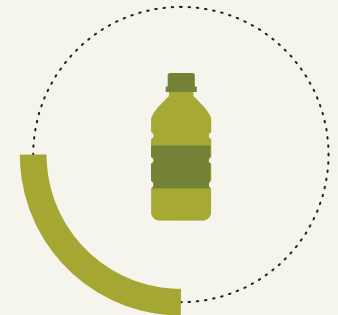


**INNOVATION FUNDS**  
CAN GENERATE INVESTMENT IN INNOVATION

*Generating a stable demand for secondary/ recycled plastic materials is crucial to create a circular economy system.*

A number of requirements are emerging around the inclusion of secondary materials in certain types of products. The EU Single-Use Plastics Directive, for instance, calls for the integration of 25 per cent recycled material in all PET plastic bottles by 2025, and 30 per cent by 2030. Given the high recyclability of PET, and the good quality of recycled PET, this target could be far higher. Governments can also enforce a minimum volume of secondary material in public procurement, as part of green procurement schemes. Additionally, governments have started offering incentive structures to encourage higher volumes of secondary material usage, creating a financial incentive to use secondary plastic in products.

**MIN 25% OF RECYCLED PET**  
TARGET SHOULD BE MUCH HIGHER





***Across the region, recycling targets can be made more ambitious.***

The EU Circular Economy Package calls for at least 55 per cent of plastic packaging waste to be recycled by 2030. Recycling front-runners of the region, Italy, France and Spain, can set higher targets, to parallel the top European packaging recyclers such as Germany (currently at 50 per cent) and the United Kingdom (currently at 46 per cent).<sup>[73]</sup> Italy, for example should aim to increase packaging recycling to 65 per cent by 2025, and 80 per cent by 2030. Further, while packaging represents 70-80 per cent of all plastic waste generated, it only accounts for around 40 per cent of total plastic produced.<sup>[74]</sup> Focusing recycling efforts on packaging means that about 60 per cent of plastic goods produced will never be recycled. Innovation in mechanical and chemical recycling will be necessary to ensure that plastic waste from durable sectors, like building and construction, transportation, electronics and more, can be recycled and generate additional value. Increasing recycling rates also requires eliminating the use of disruptive elements, such as plastic additives and certain resins.

 **BY 2030 ITALY SHOULD RECYCLE 80%  
OF ITS PLASTIC PACKAGING** 



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## 4. RECOMMENDATIONS FOR POLICY MAKERS

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### ALL MED COUNTRIES MUST SUPPORT A LEGALLY BINDING TREATY TO NO LEAKAGE INTO NATURE BY 2030

*Across the value chain, regional coordinated effort is needed in order to create a path to no plastic in nature.*

Stopping plastic pollution requires a system that prioritizes reducing plastic consumption, improving reuse of plastic products, and increasing recycling of plastic waste. To achieve these priorities, a regional accountability mechanism should be created through a legally binding agreement. This agreement should commit to protect the Mediterranean from plastic pollution.

*Regional interventions by all Mediterranean governments can create collective responsibility for improving the plastic lifecycle, such as:*

- **CREATING A BINDING COMMITMENT TO STOP ALL PLASTIC LEAKAGE INTO THE SEA BY 2030**

The impact of plastic leakage into nature does not respect national borders, and therefore plastic pollution is a collective responsibility for all countries around the Mediterranean Sea. While each country faces different challenges, shared targets would create greater mutual accountability, whereby countries can support each other in reaching zero leakage. The Barcelona Convention represents the regional platform for this commitment amongst the contracting nations.

- **DEVELOPING COMMON POLICY MEASURES TO IMPROVE THE PLASTIC INDUSTRY'S RESPONSIBILITY ACROSS THE WHOLE PLASTIC SYSTEM**

While some form of extended producer responsibility (EPR) scheme exists in most Mediterranean countries, different EPR requirements in each country creates complexity for plastic companies, and uneven results across the Mediterranean. Common, robust laws and commercial schemes could be developed to ensure that the plastic industry takes responsibility for all parts of the plastic system. Measures must ensure that the cost of plastic waste management and recycling is fully internalized into the plastic sector.

- **ENCOURAGING COLLABORATION AMONG MEDITERRANEAN COUNTRIES BY SHARING PLASTIC LIFECYCLE BEST PRACTICES AND INNOVATION**

Some Mediterranean countries are taking more ambitious steps to solve the issue of plastic pollution, and piloting innovations in policy and technology. Countries are testing the best ways to reduce waste generation and future growth, such as micro-plastic bans in Italy and France, pay-as-you-throw schemes in Greece, and the deposit-refund program in Turkey. Collectively, Mediterranean countries can strive for more ambitious targets by learning from each other's best practices in order to bring about a circular Mediterranean economy.

# RECOMMENDATIONS FOR EACH MEDITERRANEAN COUNTRY

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## EACH MED COUNTRY SHOULD SET TARGETS TO 100% PLASTIC REUSE & RECYCLING = ZERO WASTE

All Mediterranean governments possess key policy instruments to incentivize reduction of plastics production, increased reuse and recycling, and more efficient and effective waste management practices. While each nation's immediate policy priorities may differ, each government should take measures against plastic leaking into the sea.

*National governments play a key role to ensure that all actors in the plastic system are held accountable to end plastic pollution. These should include:*

- **ELIMINATING WASTE MISMANAGEMENT IN EVERY MEDITERRANEAN COUNTRY BY REACHING 100 PERCENT WASTE COLLECTION RATES AND ERADICATING PLASTIC WASTE DUMPING, LITTERING AND UNCONTROLLED LANDFILLING**

Collaboration between the Mediterranean countries could help improve waste management. Technical and financial support from northern and western Mediterranean countries can help to expedite the development of waste management capacity, governance and regulation, as well as to lower the physical barriers for end-users to effectively dispose of waste.

- **BANNING PROBLEMATIC SINGLE-USE PLASTICS TO REDUCE CONSUMPTION AND TO ENCOURAGE ACTORS TO DESIGN PRODUCTS FOR REUSE**

All countries need to focus on transitioning away from plastic products with the shortest lifespan, as these plastics are the main drivers of consumption and waste generation. The phase-out of single-use plastic can include bans of single-use products, as seen in many countries. These bans must have supporting legal frameworks to create the conditions for a plastic free Mediterranean community, including incentivizing reuse business models, recycling and sustainable alternatives.



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- **CHANGING CONSUMER BEHAVIOUR BY PROVIDING ENVIRONMENTALLY SOUND ALTERNATIVES TO PLASTIC, AND SUPPORTING REDUCED USE OF UNNECESSARY PLASTICS**

Consumers should be encouraged to phase-out use of unnecessary plastics, and to seek proven environmentally sound alternatives as substitutes for remaining plastics. Legislation and financial incentives should support these initiatives and maximize opportunities to scale-up commercially viable alternatives. Additionally, policy, regulation and education programs should be put in place to help consumers create cleaner, and separated plastic waste to facilitate increase of recycling capacity.

- **SCALING-UP CAPACITY TO RECYCLE 100 PER CENT OF PLASTIC WASTE IN ALL MEDITERRANEAN COUNTRIES**

Governments could incentivize the economics of recycling in several ways, including driving innovation on quality through technical and financial support, and driving demand for recycled materials through commercial and fiscal incentives.



700 MARINE SPECIES  
THREATENED  
BY PLASTIC  
IN THE WORLD

# REFERENCES

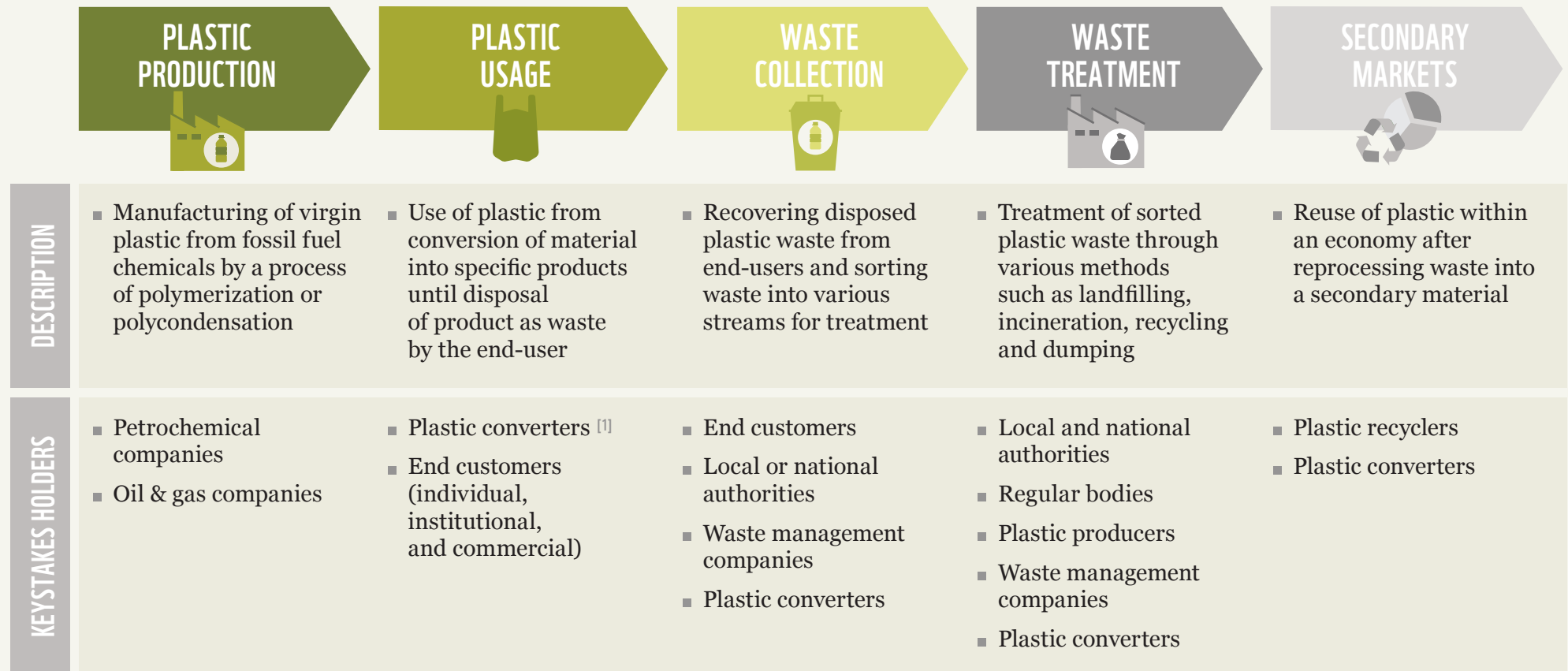
- [1] PlasticsEurope, Conversion Market & Strategy GmbH, and myCEPPI, "Plastics – the Facts 2017: An Analysis of European Plastics Production, Demand and Waste Data" (Brussels: PlasticsEurope's Market Research and Statistics Group, 2018).
- [2] 76 kgs of plastic goods per person determined using total production for region divided by total 2016 population of the Mediterranean region published by the World Bank. The 2016 plastic production data was sourced from the National Plastic Industry/Association in a specific country, or from PlasticsEurope. Global Benchmark sourced from WWF, "Solving plastic pollution through accountability, 2019. ([link](#))
- [3] Jenna R. Jambeck et al., "Plastic Waste Inputs from Land into the Ocean," *Science* 347, no. 6223. 2015. ([link](#))
- [4] Ibid.
- [5] Geyer, R., J.R. Jambeck, and K. Lavender, *Law, Production, Use, and Fate of All Plastics Ever Made*. 2017.
- [6] Kaza et al., "What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050."
- [7] De Souza Machado et al. "Microplastics as an Emerging Threat to Terrestrial Ecosystems. 2018 ([link](#))
- [8] J.R. Jambeck et al., "Plastic Waste Inputs from Land into the Ocean," *Science* 347, no. 6223. 2015. ([link](#))
- [9] S. Liubartsevaa et al, 2018. "Tracking plastics in the Mediterranean: 2D Lagrangian model".
- [10] Ibid.
- [11] Kaza et al., 2018. "What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050". 2018.
- [12] S. Liubartsevaa et al., 2018. "Tracking plastics in the Mediterranean: 2D Lagrangian model".
- [13] Cózar et al., 2015. "Plastic Accumulation in the Mediterranean Sea." ([link](#))
- [14] J.R. Jambeck et al., 2015. "Plastic waste inputs from land into the ocean."
- [15] Ibid.
- [16] S. Liubartsevaa et al., 2018. "Tracking plastics in the Mediterranean: 2D Lagrangian model".
- [17] Ibid.
- [18] Ibid.
- [19] WWF, "Solving plastic pollution through accountability", 2019. ([link](#))
- [20] J.D. Meeker, S. Satyanarayana, and S.H. Swan, "Phthalates and Other Additives in Plastics: Human Exposure and Associated Health Outcomes," *Philosophical Transactions of the Royal Society B: Biological Sciences* 364, no. 1526 (July 27, 2009): 2097–2113, <https://doi.org/10.1098/rstb.2008.0268>.
- [21] Gall S.C. and Thompson R.C., 2015. "The impact of debris on marine life". *Mar. Pollution Bulletin*, 92(1-2), p. 170-179.
- [22] Dias, B. F. de S., 2016, "Marine Debris: Understanding, Preventing and Mitigating the Significant Adverse Impacts on Marine and Coastal Biodiversity."
- [23] UNEP, 2016. "Marine Plastic Debris and Microplastics."
- [24] WWF, 2017. "Reviving the economy of the Mediterranean Sea" ([link](#))
- [25] Thevenon, F., C. Caroll, and J. Sousa, "Plastic Debris in the Oceans: The Characterization of Marine Plastics and Their Environmental Impacts" (Switzerland: International Union for Conservation of Nature, 2014), <https://portals.iucn.org/library/sites/library/files/documents/2014-067.pdf>.
- [26] European Commission 2018: "Blue Economy Report."
- [27] McIlgorm et al., 2011. "The economic cost and control of marine debris damage in the Asia-Pacific region". ([link](#))
- [28] Kaza et al., 2018. "What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050."
- [29] Ibid.
- [30] Ibid.
- [31] Patrick ten Brink et al., 2016, "Plastics Marine Litter and the Circular Economy," Briefing IEEP for MAVA Foundation.
- [32] Takehama S. (1990) Estimation of damages to fishing vessels caused by marine debris, based on insurance statistics. In: Shomura R.S., Godfrey M.L (eds) *Proceedings of the Second International Conference on Marine Debris*. Honolulu, Hawaii, April 2-7, 1989. US Dept of Commerce, NOAAATM-NMFS-SWFSC-154, Washington, DC, p. 792-809.
- [33] Ibid.
- [34] CIEL, "Fuelling Plastics: Fossils, Plastics & Petrochemical Feedstocks", (Washington, DC: Centre for International Environmental Law, September 21, 2017).
- [35] CIEL, "Fueling Plastics: Fossils, Plastics & Petrochemical Feedstocks", (Washington, DC: Center for International Environmental Law, September 21, 2017).
- [36] Griffin, P.W., Hammond, G.P. & Norman, J.B., 2018. "Industrial energy use and carbon emissions reduction in the chemicals sector: A UK perspective," *Applied Energy*, Elsevier, vol. 227(C), p. 587-602.
- [37] Institute for European Environmental Policy, "EPR in the EU Plastics Strategy and the Circular Economy", 2017.
- [38] WWF, 2019, "Solving plastic pollution through accountability". ([link](#))
- [39] Bans on the distribution of free single use plastic bans have now been implemented across both countries to reduce consumption. Source: Turkish Ministry for the Environment.



- [40] Censis, 2015, "Un mare di plastica."
- [41] Coll M. et al., 2010, "The Biodiversity of the Mediterranean Sea." PLOS One, 5(8) e11842.
- [42] Galgani F. et al., 2014. In: CIESM 2014. Marine litter in the Mediterranean and Black Seas. CIESM Workshop Monograph n° 46 [F. Briand, ed.], 180 p., CIESM Publisher, Monaco.
- [43] Sweepnet, 2014, "Report on the Solid Waste Management in Tunisia."
- [44] ISPRA, 2018, "Rapporto Rifiuti Urbani."
- [45] Kaza et al., "What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050."
- [46] Kaza et al., "What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050."
- [47] Kaza et al., "What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050."
- [48] Kaza et al., "What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050."
- [49] S. Liubartsevaa et al, 2018: "Tracking plastics in the Mediterranean: 2D Lagrangian model."
- [50] PlasticsEurope, "Plastics: The Facts 2018: An analysis of European plastics production, demand and waste data."
- [51] European Environmental Agency, 2014, "Horizon 2020: Mediterranean Report Annex 6: Tunisia."
- [52] Sweepnet, 2014, "Report on the Solid Waste Management in Morocco."
- [53] PlasticsEurope, "Plastics: The Facts 2018: An analysis of European plastics production, demand and waste data."
- [54] PlasticsEurope, "Plastics: The Facts 2018: An analysis of European plastics production, demand and waste data."
- [55] MESAB, "The Circular Economy - a Powerful Force for Climate Mitigation."
- [56] MESAB, "The Circular Economy - a Powerful Force for Climate Mitigation."
- [57] UN COMTRADE Database, 2018.
- [58] OECD, 2019: "Environmental Performance Reviews: Turkey 2019."
- [59] Blood et al., "Why the World's Recycling System Stopped Working."
- [60] MESAB, "The Circular Economy - a Powerful Force for Climate Mitigation."
- [61] Ibid.
- [62] Ibid.
- [63] European PET Bottle Platform, 2017, "How to keep a sustainable PET recycling industry in Europe"
- [64] MESAB, "The Circular Economy - a Powerful Force for Climate Mitigation."
- [65] Packaging Recovery Organisation Europe, "Producer Responsibility in Action."
- [66] Institute for European Environmental Policy, 2017, "EPR in the EU Plastics Strategy and the Circular Economy," .
- [67] UN Environment Programme, "Legal Limits on Single-Use Plastics and Microplastics: A Global Review of National Laws and Regulations."
- [68] COREPLA, 2018, "Il futuro del riciclo della plastica nella circular economy."
- [69] Sweepnet, 2014, "Report on the Solid Waste Management in Morocco and Tunisia."
- [70] European court of Justice database.
- [71] Liogkas, (2017), "Plan for addressing waste management of the Hellenic Republic". derived from 2020 National Waste Management plan of Greece
- [72] ECWEP, 2017, "Landfill taxes and bans."
- [73] PlasticsEurope, "Plastics: The Facts 2018: An analysis of European plastics production, demand and waste data."
- [74] PlasticsEurope, "Plastics: The Facts 2018: An analysis of European plastics production, demand and waste data."

**FOR ADDITIONAL INFORMATION ON PLASTIC POLLUTION IN THE MEDITERRANEAN, SEE ALSO WWF MMI REPORT: ALESSI , ET AL. 2018 "OUT OF THE PLASTIC TRAP: SAVING THE MEDITERRANEAN FROM PLASTIC POLLUTION" ([link](#))**

# ANNEX I - THE PLASTICS VALUE CHAIN AND STAKEHOLDERS



[1] Manufacturers of plastic products in all plastic markets (e.g. packaging, building and construction, transport) that convert virgin plastic into a specific products for use within the economy. These plastic products can be combined with other non-plastic materials during the conversion process

## ANNEX II - GLOSSARY

TERMS	
■ Controlled landfill	A landfilling process which is subject to a permit system and to technical control procedures in compliance with the national legislation in force.
■ Uncontrolled landfill	A landfilling process which fails to meet certain standards and technical control procedures, and therefore is at risk of leakage or contamination.
■ Open dump	Illegal land disposal sites at which solid wastes are disposed of in a manner that does not protect the environment, and are therefore susceptible to leakage, open burning, and are exposed to the elements, vectors, and scavengers.
■ Controlled waste treatment	All legally compliant waste treatment operations, including controlled landfilling, waste-to-energy (incineration) and recycling.
■ Secondary material production	The total amount of secondary plastic product extracted from the plastic recycling process, averaging at 55% of the material inputted for recycling.
■ Recycling	All plastic collected for recycling from the waste stream. This figure is not adjusted for actual material losses during reprocessing into a secondary material. These material losses result from collected plastic considered as not recyclable due to additives preventing recycling or food contamination, etc.
■ Mismanaged waste	All plastic left uncollected, openly dumped into nature, littered, or managed through uncontrolled landfills.
■ Recovered mismanaged waste	Mismanaged waste that re-enters the controlled waste management process through waste-pickers, clean up operations, or any other method.
■ Bio-degradable	A product that can be broken down by microorganisms (bacteria or fungi) into water, naturally occurring gases like carbon dioxide (CO <sub>2</sub> ) and methane (CH <sub>4</sub> ) and biomass.
■ Blue Economy	Represents all economic activities related to oceans, seas or coastal areas. It covers established sectors such as fisheries, shipbuilding and tourism as well as emerging industries, including ocean energy and biotechnology.

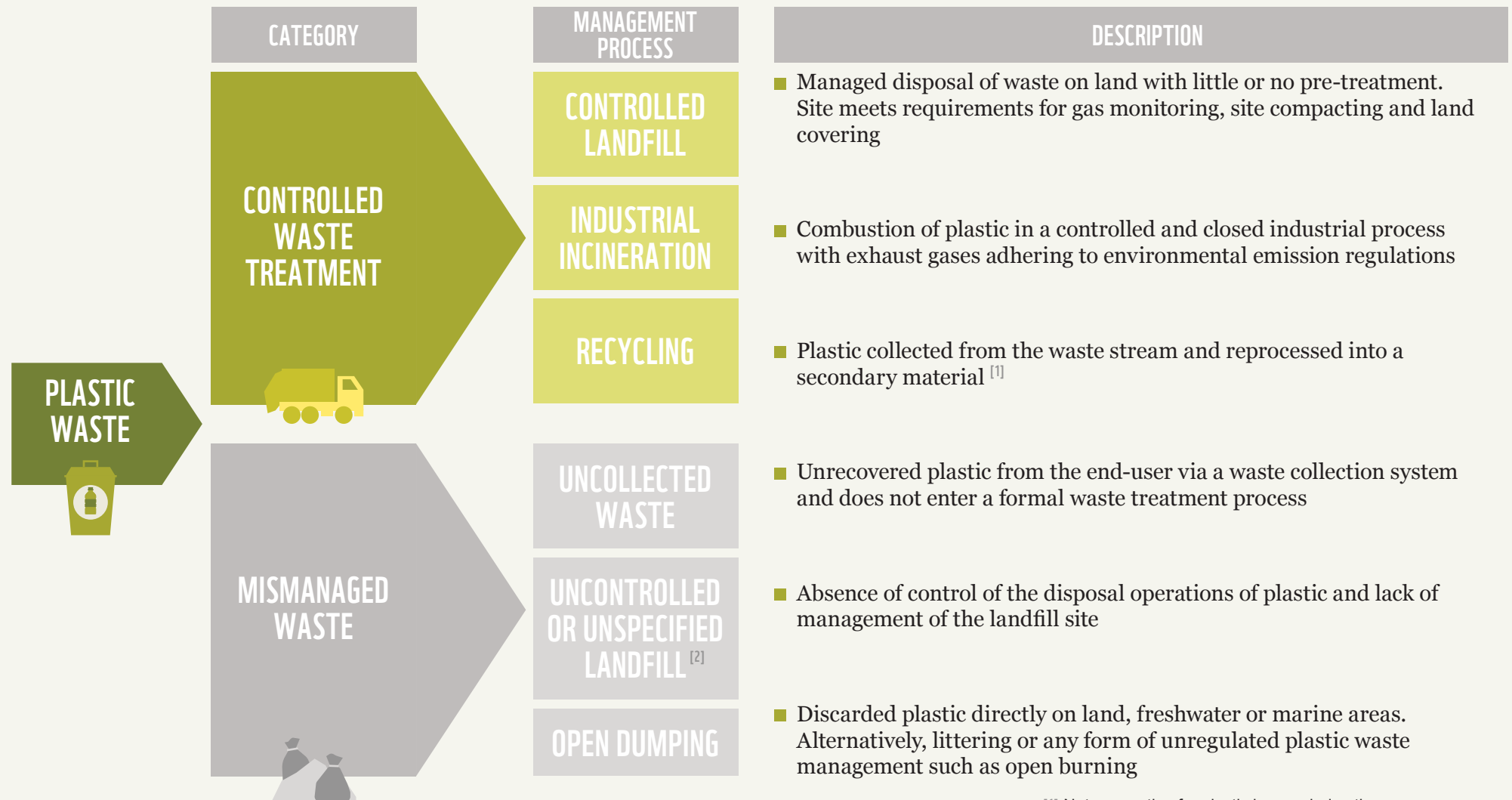


## ANNEX III - PLASTIC WASTE SYSTEM ACTIVITIES

SECTION	METRIC	METHODOLOGY
PLASTIC LIFECYCLE (MT)	<ul style="list-style-type: none"> <li>Plastic produced</li> </ul>	Collected national-level data on total production of PP, PET, HDPE, LDPE, PCV and PS. Plastics are used in many products that are imported and exported and limited public data exists separating these goods into their raw materials used. This plastic goods production data by country is not adjusted for international trade (import and export) of these products. If national plastic goods data unavailable, calculated based on the ratio of global plastic production to plastic waste for 2016 in the WWF global plastics report (78%).
	<ul style="list-style-type: none"> <li>Waste Generation and Management</li> </ul>	Collected national-level data on total plastic waste generation per annum, or total waste MSW waste generation and percent composition of plastic within MSW. Also collect national-level data on plastic management (percentages of plastic waste collected landfilled, incinerated, recycled or openly dumped). Data validated with relevant WWF national offices.
	<ul style="list-style-type: none"> <li>Mismanaged waste</li> </ul>	Calculated by adding the total waste which goes uncollected, openly dumped and sent to uncontrolled landfills. Data on uncollected waste is taken from the World Bank 'What a Waste 2.0' Database.
	<ul style="list-style-type: none"> <li>Waste recovered or leaked into nature</li> </ul>	Calculated using the proxy of 90% of mismanaged waste ending up in nature, based on the study completed by Jenna Jambeck Research Group, 2015. We assume the rest of the waste is recovered through clean-up operations, etc.
	<ul style="list-style-type: none"> <li>Waste leaked into the Mediterranean</li> </ul>	<ul style="list-style-type: none"> <li>- For countries whose coastline are only on the Mediterranean, this figure is calculated based on the proxy that 10% of plastic waste becomes marine litter, as found in the analysis completed by Jenna Jambeck Research Group, 2015.</li> <li>- For countries with multiple coastlines, this figure also takes into consideration the proportion of waste generated by regions with coastlines on the Mediterranean.</li> </ul>
	<ul style="list-style-type: none"> <li>Waste leaked by source (sea-based, rivers, coastal)</li> </ul>	Collected data on sea-based sources and major rivers from S. Liubartsevaa et al, 2018. Where data is missing for other major rivers, annual plastic flux is calculated as a ratio between the Po River's drainage basin, and its annual plastic flux. Coastal sources represent the remainder of annual leakage.

SECTION	METRIC	METHODOLOGY
PLASTIC IMPACT	<ul style="list-style-type: none"> <li>Energy consumed in oil equivalent (M, barrels)</li> </ul>	Calculated based on the weighted average of energy required to make a kilogram of global plastic (PP, PET, HDPE, PS, PCV), converted into barrel of oil equivalent.
	<ul style="list-style-type: none"> <li>Average age of plastic life (years)</li> </ul>	Calculated based on national data collected on the production of plastic per industry, and the average lifetime of plastic goods in each industry, as found in peer-reviewed research completed by Roland Geyer et al, <i>“Production, Use, and Fate of All Plastics Ever Made”</i> , 2017
	<ul style="list-style-type: none"> <li>CO<sub>2</sub> emissions (MT)</li> </ul>	Calculated based on the average CO <sub>2</sub> emissions caused by plastic production, incineration and recycling, as reported by SITRA, 2018: <i>“The Circular Economy a Powerful Force for Climate Mitigation”</i> .
	<ul style="list-style-type: none"> <li>Annual coastline plastic pollution (kT)</li> </ul>	Calculated based on the daily plastic debris flux (kg/km) multiplied by the total length of the coastline and 365 days. This differs from the total plastic leaked into nature as it doesn't include plastic on the sea -bed and sea-surface.
	<ul style="list-style-type: none"> <li>Daily plastic flux (kg/km)</li> </ul>	Collected data from S. Liubartsevaa et al, 2018: <i>“Tracking plastics in the Mediterranean: 2D Lagrangian model”</i> .
	<ul style="list-style-type: none"> <li>Economic cost of pollution (M, €)</li> </ul>	Calculated based on the methodology used in McIlgorm et al, 2011 to estimate the cost of plastic pollution to the APAC region, which takes the proxy of cost to the fishing and shipping industries from Takehama, 1990.
	<ul style="list-style-type: none"> <li>Cost of waste generated by tourists (M, €)</li> </ul>	Calculated based on the proportion of waste generation caused by tourists, which was calculated based on national statistics on tourist arrivals and departures. The cost uses the World Bank estimated cost of \$50-100/T of waste in an advanced system.

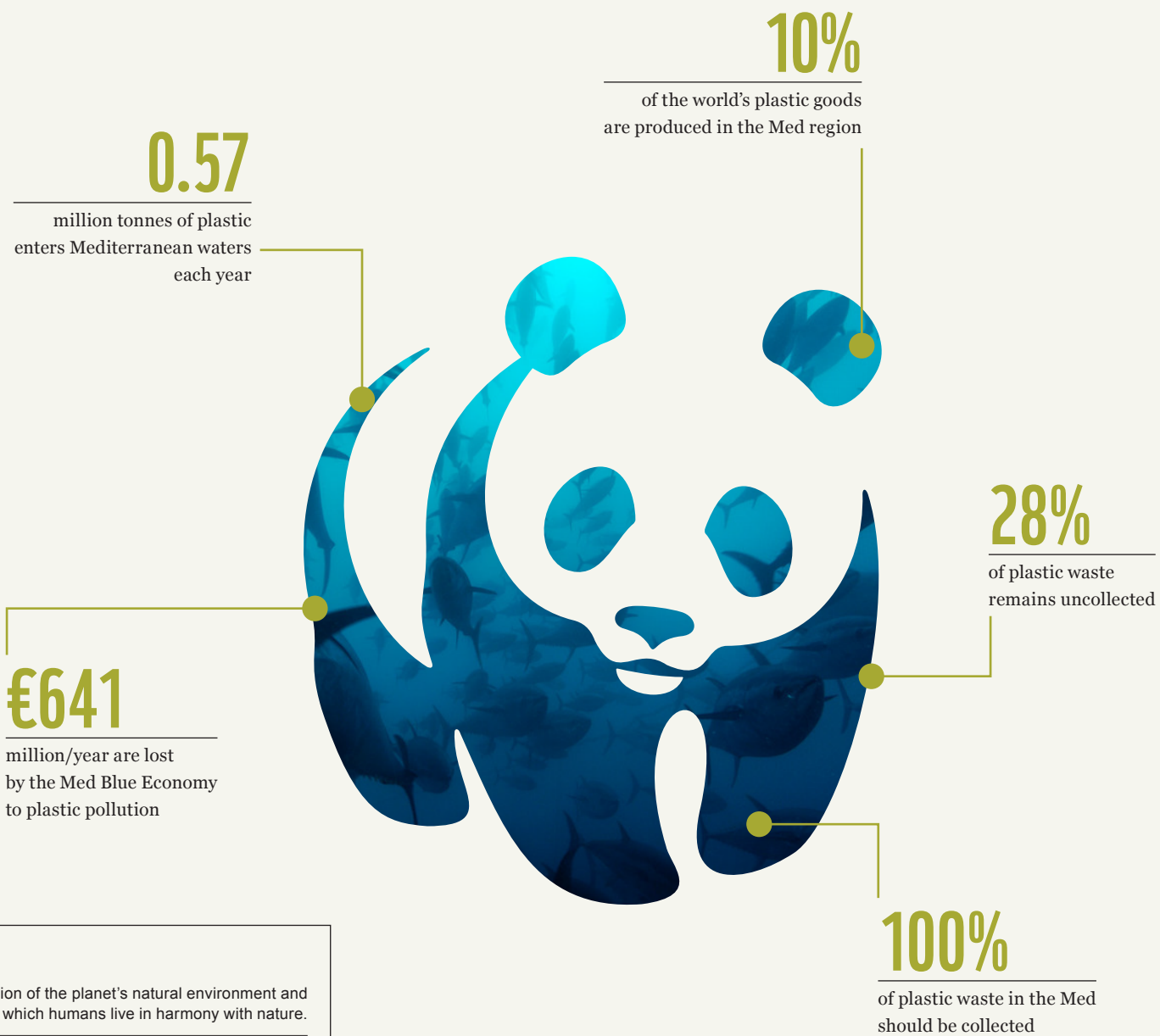
# ANNEX IV - PLASTIC WASTE SYSTEM ACTIVITIES CAUSING CONTROLLED AND MISMANAGED WASTE



[1] Not accounting for plastic losses during the recovery process

[2] Unless explicitly specified as “controlled” or “sanitary” landfills, we consider all other landfills as uncontrolled  
 Source: Dalberg analysis, Jambeck & al (2015), World Bank (2018), SITRA (2018), European Commission (2001)





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To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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