Plastics hotspot assessment at sectoral level in Cyprus

Supported by:

Federal Ministry
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based on a decision of the German Bundestag

TRANSFORMING TOURISM

UNIVERSITY OF SURREY

DISCLAIMER AND ACKNOWLEDGEMENTS

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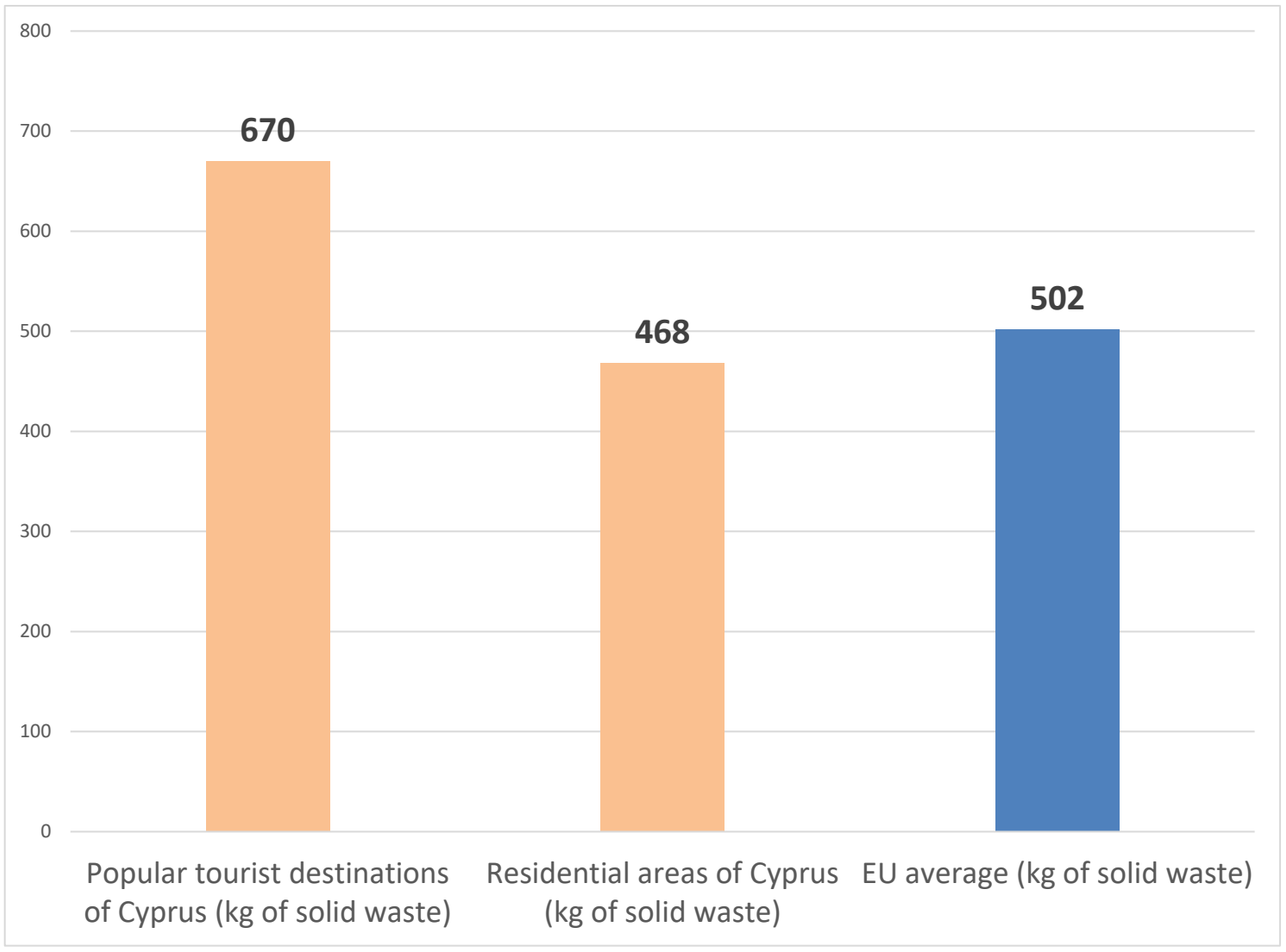
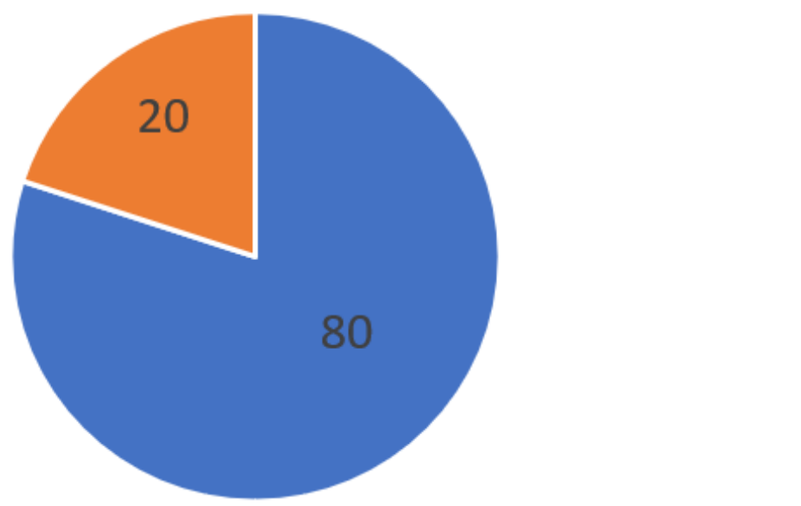
KEY FACTS

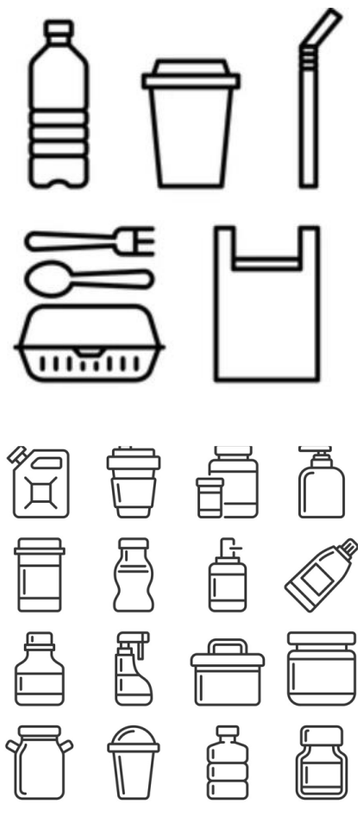
(1) SOLID WASTE GENERATION, INCLUDING PLASTICS, PER CAPITA IN:



(2) PROPORTION OF MUNICIPAL SOLID WASTE, INCLUDING PLASTICS, WHICH IS:



(3) PLASTIC WASTE IN THE SECTOR OF TOURISM IN CYPRUS IS GENERATED DIRECTLY AND INDIRECTLY



DIRECT e.g., single-use cutlery in hotels

INDIRECT e.g., fishing nets and food packaging

(4) PACKAGING IS THE MAIN CATEGORY OF PLASTIC WASTE IN THE SECTOR OF TOURISM WHICH HOLDS THE LARGEST POTENTIAL OF LEAKING INTO THE NATURAL ENVIRONMENT

(5) PLASTIC WASTE GENERATED BY AN AVERAGE TOURIST IN CYPRUS IS:

KEY TAKEAWAY MESSAGES

- 13 actionable hotspots are identified within the lifecycle of plastics in Cyprus

- Recommendations to address the hotspots are concerned with:

  (1) development of clear labels for imported plastics to facilitate separation and recycling;
  (2) optimization of local municipal solid waste collection services to reduce illegal dumping and littering;
  (3) construction of a recycling plan t to divert plastic waste from landfill;
  (4) facilitation of pro-environmental behavioural changes among managers of tourism enterprises, employees and tourists;
  (5) design of (more) creative approaches to increase public awareness of plastic waste and the need for its prevention.

CONTEXT

The sector of tourism, alongside the related sectors of hospitality, sports, and events, generates considerable amounts of plastic waste [1]. This plastic waste adds significantly to the challenge of solid waste management and local pollution in popular destinations, especially in remote locations, such as islands. COVID-19 contributed to plastic waste generation in tourism due to increased sanitary requirements [2]. For example, to minimize the spread of infection during the pandemic, hospitality operators preferred, or were even required by regulations and industry standards, to provide single-use items to their customers, such as cutlery and tableware.

Following the easing of COVID-19 travel restrictions, the recovery of European tourism from the pandemic is stronger than expected, as evidenced by the rapidly growing number of leisure and business trips [3]. This strong recovery implies increased consumption of products and services in popular destinations, thus generating larger amounts of plastic waste. Therefore, it has become ever more critical to assess the challenge of plastic waste generation in tourism. This assessment can facilitate the design of (more) effective management of plastic waste and policy interventions to enable progress of the tourism sector towards the goal of environmental sustainability.

GOAL, SCOPE, AND METHOD

This report, commissioned by the United Nations Environment Programme (UNEP), undertakes a plastics hotspot assessment in the tourism sector of an island destination, using the Republic of Cyprus as a case study. The choice of Cyprus is deliberate because, prior to the COVID-19 pandemic, it was the most popular island destination in Europe after the islands of Spain i.e., Canaries and Baleares [4]. Although the key points of this report are primarily valid for the tourism sector of Cyprus, with appropriate adjustments accounting for the local context, the findings can also be used to understand the challenge of plastic waste generation and management in other island destinations in Europe and beyond.

The report considers Cyprus as an island destination. However, it is only concerned with tourism in one part of the island i.e., the Republic of Cyprus. Tourism in the Turkish Republic of Northern Cyprus is beyond the scope of this report due to data availability constraints.

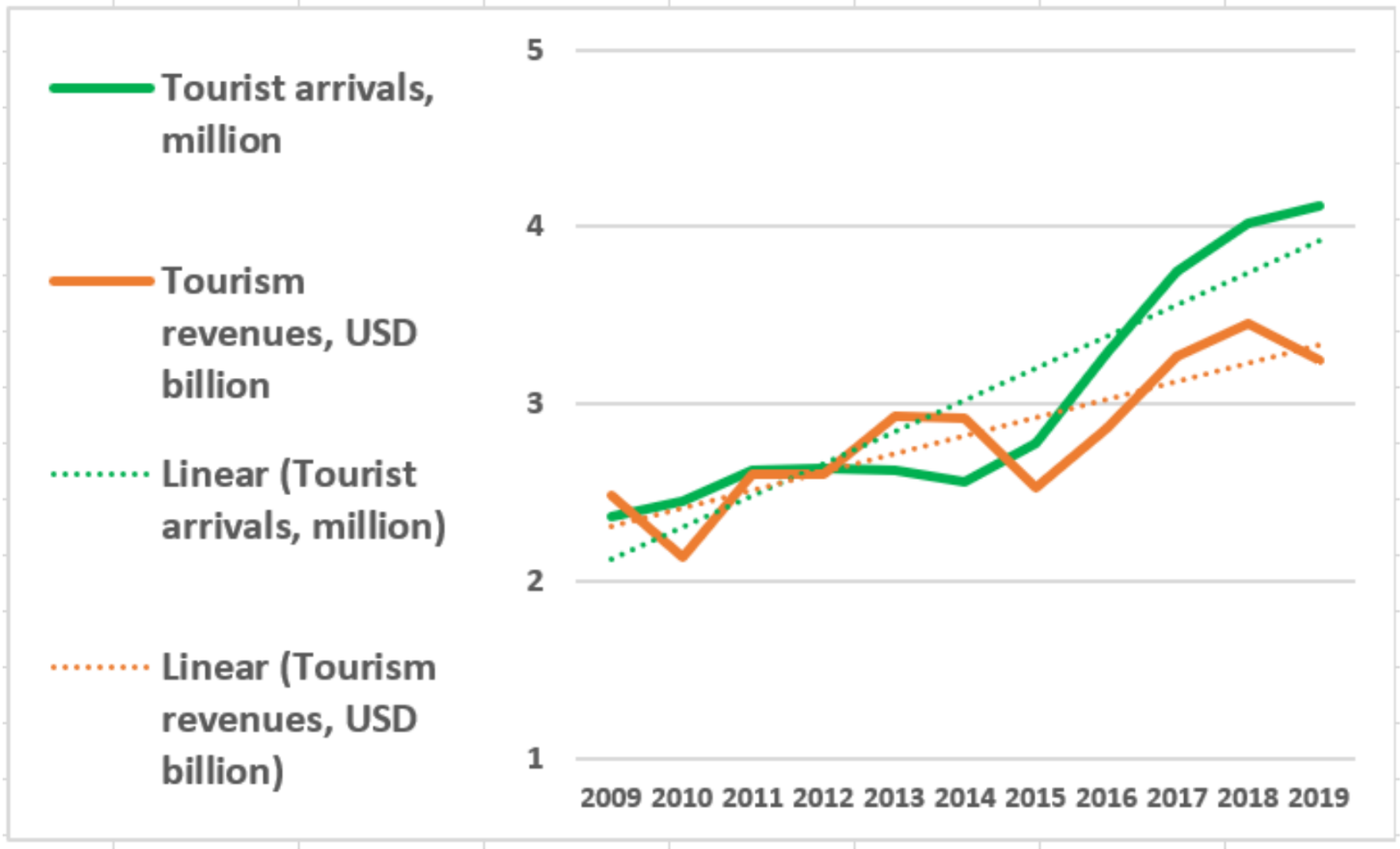
The report draws upon the plastics hotspot assessment methodology developed by UNEP and the International Union for the Conservation of Nature (IUCN). The analytical framework of UNEP/IUCN is supplemented with an analysis of secondary data on plastic waste generation and management extracted from academic and 'grey' literature. The assessment is also supported with primary data collected within the destination in the form of field/in-situ observations and interviews with local stakeholders. These local stakeholders were represented by owners/managers of hotels, restaurants, and tour operators in Famagusta, Limassol, Larnaca and Paphos. The local stakeholders also included the representatives of not-for-profit organizations, such as the Cyprus Sustainable Tourism Initiative. Lastly, the local stakeholders were represented by municipal authorities and destination managers (in Paphos and Famagusta), but also academics from the Cyprus University of Technology and the University of Cyprus.

Primary data are valid for the period of fieldwork i.e., April-August 2022.

ISLAND DESTINATION IN FOCUS: A BRIEF OVERVIEW OF CYPRUS

In 2019, the Republic of Cyprus recorded circa 4 million tourist arrivals [4]. This positioned the island as the 10th most popular destination in Southern/Mediterranean Europe. Since 2009, the number of tourist arrivals has grown by 74 % while tourism revenues have increased by 31 % (see Figure 1). **Tourism is key to the national economy of Cyprus, generating almost 13 % of gross national product** [5].

Figure 1. Temporal dynamics of tourism development in Cyprus [5]

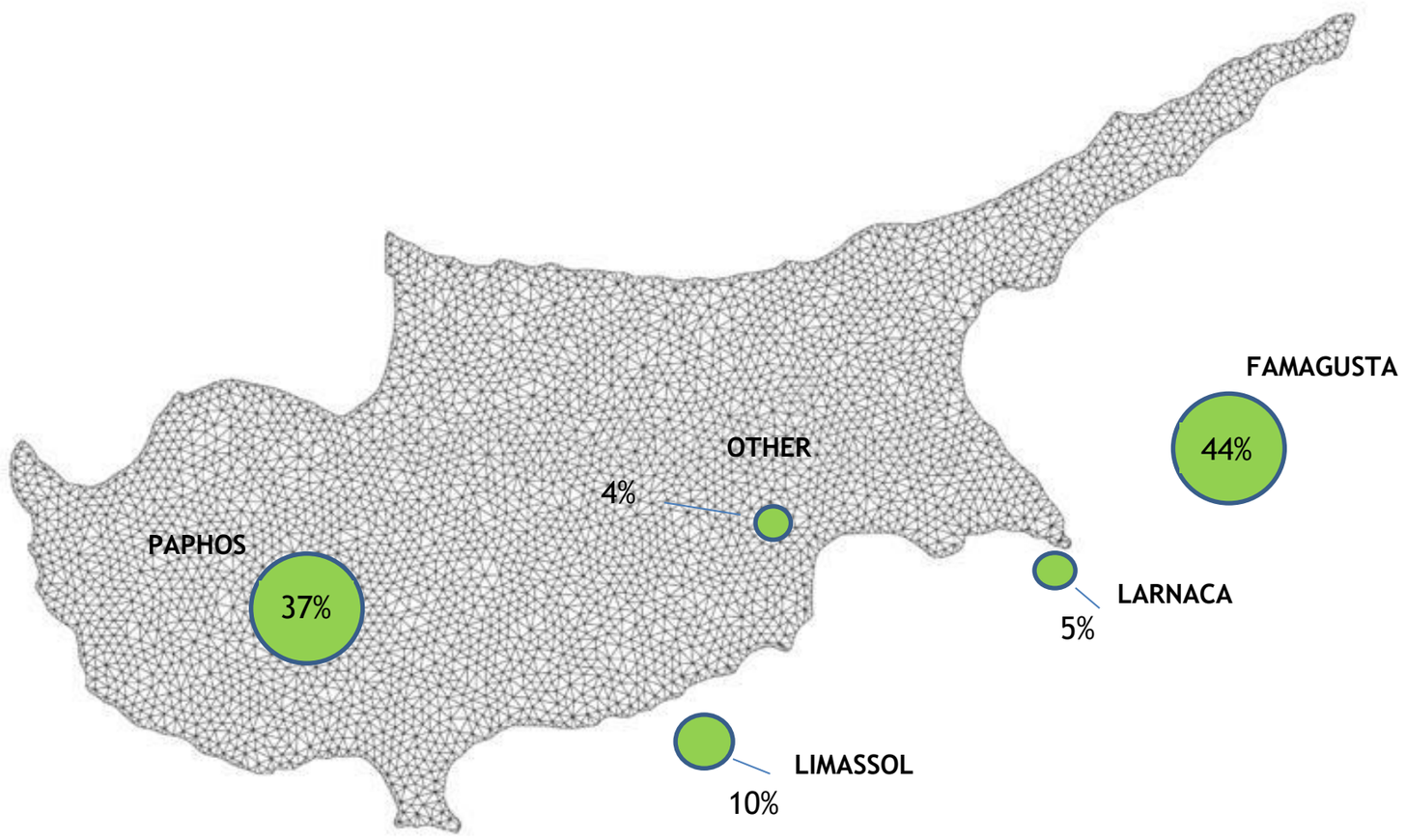


The tourist population of Cyprus is larger than its resident population: **in 2019, Cyprus hosted 3.4 tourists per resident** which ranked the island 18th in the world by this parameter [5]. Although tourist arrivals to Cyprus decreased to 0.6 million in 2020 due to the COVID-19 related travel restrictions [4], the national tourism sector is forecast to recover promptly driven by the rebound effect in tourist consumption and delayed demand [6].

Cyprus is an example of a sun and sea destination which attracts visitors staying in or near beaches. As a result, **tourism on the island concentrates in coastal areas, such as Famagusta (commonly known to tourists as Ayia Napa), Paphos and Limassol.** In total, these three cities accommodate 91 % of tourists in Cyprus [6], see Figure 2. Attempts have recently been made to promote other types of tourism on the island, such as cultural and religious, with a focus on experiences to extend the length of stay and reduce the effect of seasonality. In 2019, **80 % of tourists stayed in Cyprus during the 'summer' season (from April to October)** prompting most tourism organizations to remain closed during the tourism 'winter' (from November to March) [6]. The average duration of stay in Cyprus in 2019 was 8.8 nights with a downward trend since 2014 [6]. A large share of tourists come to Cyprus via organized tours facilitated by such tour operator as TUI Group and its national subsidiaries across Europe. A large share of these organized tours is provided on an all-inclusive basis [6].

Tourism organizations in Cyprus are represented by local tour operators, transportation providers, tourist accommodation establishments, catering operators, event organizers, and vendors of crafts and souvenirs. Reliable statistics exist only for tourist accommodation: **in 2019, there were over 700 licensed tourist accommodation establishments** in Cyprus with a further 120 unlicensed businesses, such as villas and furnished apartments provided by home rental platforms, with an overall bed capacity of almost 90,000 [6]. Most licensed tourist establishments in Cyprus were registered (in descending order) in Famagusta, Paphos and Larnaca; these three cities accounted for 71 % of the total market by number of business units [6].

Figure 2. The main tourist destinations within Cyprus [6].
The figures showcase the share of the main destinations in the total number of tourist arrivals to Cyprus.



WASTE MANAGEMENT IN CYPRUS: A BRIEF OVERVIEW

Waste management in Cyprus is the prerogative of the Department of Environment established in 2010 under the Ministry of Agriculture, Rural Development and Environment, http://www.moa.gov.cy/moa/environment. The Department is responsible for the implementation of the national Waste Management Strategy underpinned by the Waste Law of 2011 (L. 185(I)/2011) and the Packaging and Packaging Waste Law of 2002 (L. 32(I)/2002) alongside subsequent amendments to these laws and associated regulations and decrees [7]. **The legislation on waste management in Cyprus is harmonised with the EU policies and regulations.** In particular, the EU waste management hierarchy with its prioritisation of activities i.e., prevention over reuse over recycling over recovery over final disposal, is strictly adhered to.

Waste management activities in Cyprus between 2015 and 2021 have been implemented as part of the national Waste Prevention Programme (2015-2021) designed under the EU guidance [8]. Among other waste types, **this programme prioritises prevention of plastic waste which is considered within the waste categories of *Packaging* and *Others***. The waste category *Others* is broad and includes synthetic textiles, clothing, plastic toys, and bulky (mostly manufacturing) waste It is understood that single-use plastics products are part of the category *Others,* although this is not explicitly stated in the literature reviewed.

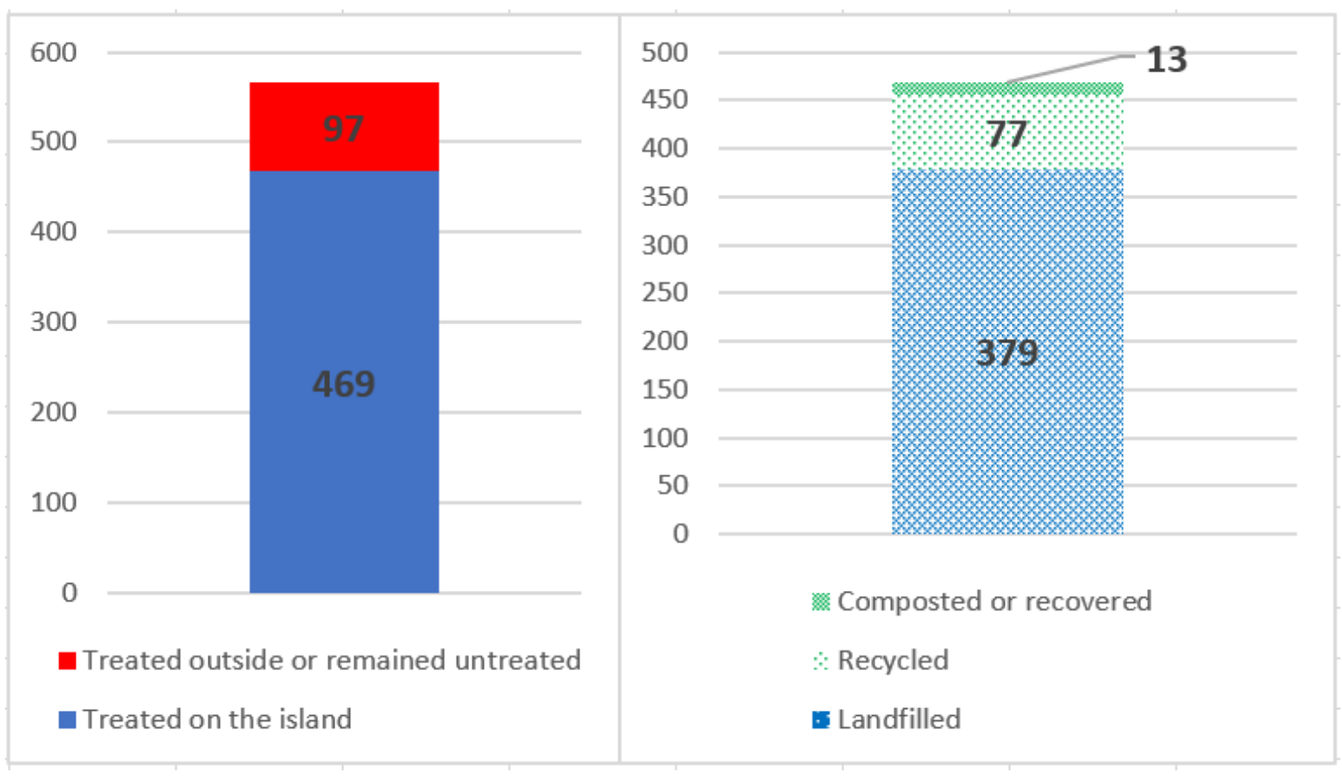
During the period of implementation of the national Waste Prevention Programme (2015-2021), municipal waste generation in Cyprus has not decreased, but increased i.e., from circa 620 kg per capita in 2015 to circa 640 kg in 2019. **Cyprus is the fourth largest per capita waste generator in the EU** [9]. The increase in municipal solid waste generation is partially attributed to growing consumption, including in the sector of tourism.

However, it is important to note that **tourism is not explicitly mentioned as a priority sector** in the national Waste Prevention Programme (2015-2021) of Cyprus. It is understood that tourism is incorporated in the sector entitled *Private service activities, hospitality*. Although the sector of tourism is not recognized fully in the national Waste Prevention Programme (2015-2021) of Cyprus, the hospitality sub-sector representing hotels, restaurants, bars, and cafes is considered a major contributor.

Total waste generated in Cyprus in 2019 (i.e., waste from all economic activities, including households) amounted to 2.3 million tonnes [8], whereby **municipal solid waste accounted for circa 0.6 million tonnes** [10]. Municipal solid waste is represented by waste generated in households and by service industries, such as tourism. The rest of the waste occurs due to manufacturing and mining activities. Municipal solid waste is of prime interest to this report because most tourism enterprises are located within major urban settlements, meaning that all wasted plastics go to municipal waste streams. The subsequent analysis will therefore be concerned with municipal solid waste generation and management.

Most municipal solid waste in Cyprus is treated on the island; however, circa 21 % is either treated outside or remains untreated, see Figure 3. Municipal solid waste is treated on the island by the method of landfilling, with **only 20 % of municipal solid waste being either recycled or recovered**, see Figure 3 [10]. This is considerably lower than the EU average recycling figure of 44 % with the EU target of 55 % set for 2025. Although the same target applies to Cyprus, its fulfillment is highly unrealistic [11].

Figure 3. Key figures on municipal solid waste generation and management in Cyprus [10]. On the left – the share of treated on the island versus outside the island/untreated municipal solid waste, thousand tonnes. On the right – the share of different treatment methods on the island, thousand tonnes.
Solid waste total is in thousand tonnes per year, data from 2019.



Disposal of municipal solid waste in Cyprus takes place on the island, but also outside the island (Figure 3). On the island **municipal solid waste is treated in three privately operated landfills**: Koshi, covering Limassol and Nicosia; Pentakomo, covering Larnaca and Famagusta; and Paphos [11]. The capacity of these landfills, although currently sufficient, is likely to be exceeded soon. Two other landfills have recently been shut in Cyprus in response to the EU requirement to reduce the amount of landfilled waste in its member states to 10 % by 2035 [12]. **The lack of treatment sites has led to the increase of illegal landfills and dumpsites**, especially in rural areas, where up to 25 % of solid waste is estimated to be dumped in unauthorised locations. Illegal dumpsites have also been reported in popular touristic areas, such as Ayia Napa [13]. Further, residents increasingly oppose landfill operations on the island in fear of heath and fire hazards associated with landfilling [14]. This puts pressure on the government of Cyprus to reconsider the feasibility of landfill operations in addition to the financial penalties to be imposed by the EU for the delay in closing the island's remaining landfills [12, 13].

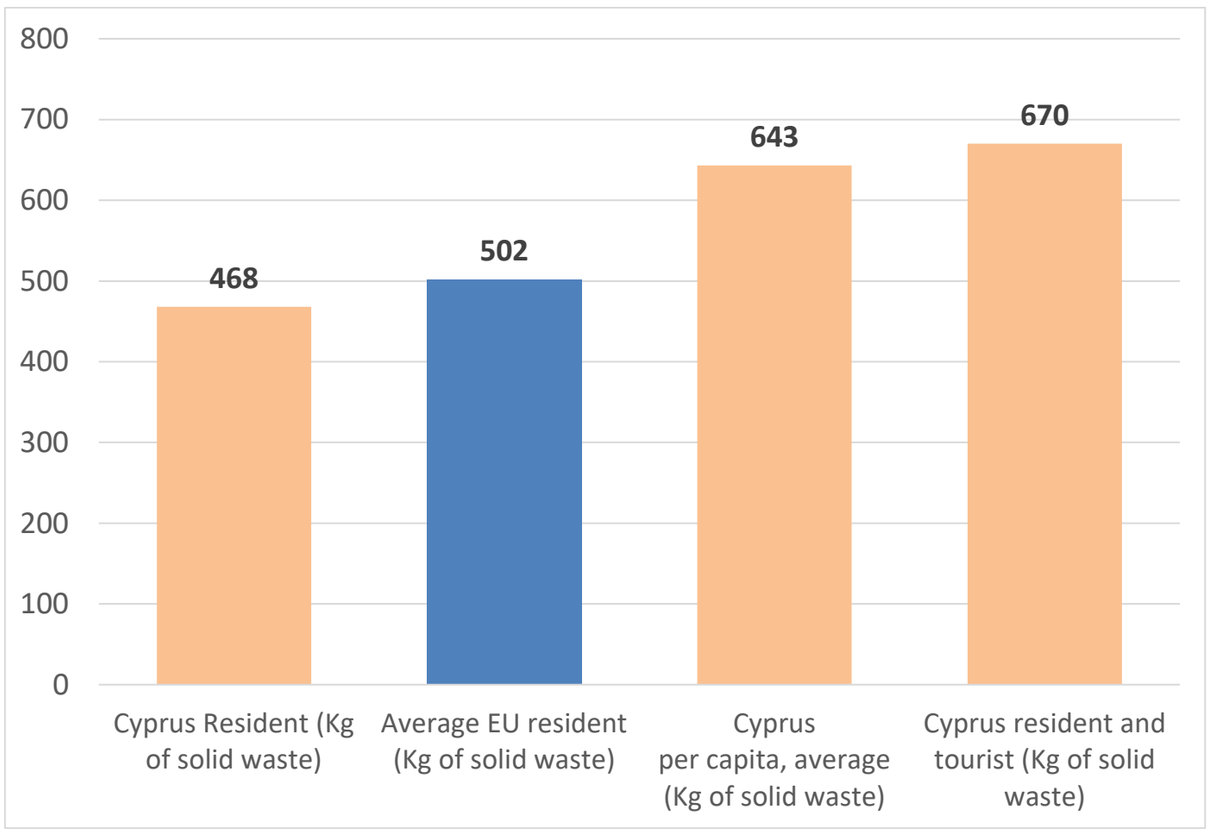
Municipal solid waste which is not landfilled on the island, including plastics, is sorted locally and then transported outside Cyprus to such countries as Greece, Lebanon, China, Thailand, and India. Cyprus pays for disposal of its waste in these countries; however, the destiny of waste outside the island is unclear. There are concerns that it is not recycled or recovered but landfilled, thus transferring the challenge of solid waste management from Cyprus to other countries [14].

Cyprus has set targets on municipal waste management, some of which relate to plastics and the sector of tourism. More specifically: **by 2020, 50 % of recyclable solid waste, including plastics, should have been prepared for re-use** and, by 2027, 50 % of solid waste, including plastics, generated by households and businesses, including services, should be separated at source [9,10]. The 2020 target has however been missed and it is unclear if the 2027 target will be met given slow progress of Cyprus in adopting more proactive approaches to municipal waste management [13].

The reason why only a small fraction of waste is recycled in Cyprus is the lack of recycling facilities in the island [12]. **To be profitable, a large-scale recycling plant needs large amounts of waste**, preferably generated nearby to minimise transportation costs. Given the topography and distances of Cyprus and considering the lack of large urban settlements (for example, the population of Nicosia, the largest city in Cyprus, is only circa 200,000), large-scale recycling operations are viewed as inefficient. Further, a recycling plant relies on solid waste being generated continuously; however, the seasonality of tourist demand in Cyprus hinders financial viability of large-scale recycling on the island.

Lastly, it is important to note the unequal distribution of waste in touristic and non-touristic (residential) areas of Cyprus. While circa 470 kg of waste is produced per capita in the residential areas, **the main touristic areas**, such as Famagusta, Paphos and Limassol, **generate 670 kg of waste per capita** [12]. The overall volume of waste generated in Cyprus per capita is well above the EU average where circa 500 kg per capita was reported in 2019 [10], see Figure 4. As the Waste Prevention Programme (2015-2021) has now ended, a new national waste management programme for Cyprus is currently being revised by the EU Network for the Implementation and Enforcement of Environmental Law (IMPEL) with technical assistance from the Structural Reform Support Service (SRSS) [9].

Figure 4. Per capita municipal solid waste generation in Cyprus [12].



HOTSPOT ASSESSMENT METHODOLOGY

The plastics hotspot assessment methodology developed by UNEP and IUCN [15] is based on two streams of activities: technical and strategic (Figure 5). Both streams are designed to identify and support engagement of relevant stakeholders in plastic waste prevention at a destination level. In particular, the technical stream aims to provide stakeholders with reliable datapoints for the development and implementation of policy and management interventions.

The technical stream is underpinned by six activities which quantify and characterise plastic waste (activities T1 and T2), but also model plastic waste flows within a destination if direct quantification is unfeasible. Modelling aims to fill potential data gaps in plastic waste generation and management at different levels of decision-making (activities T3, T4 and T5) and evaluate the severity of the related impacts to prioritise policy and management interventions (activity T6).

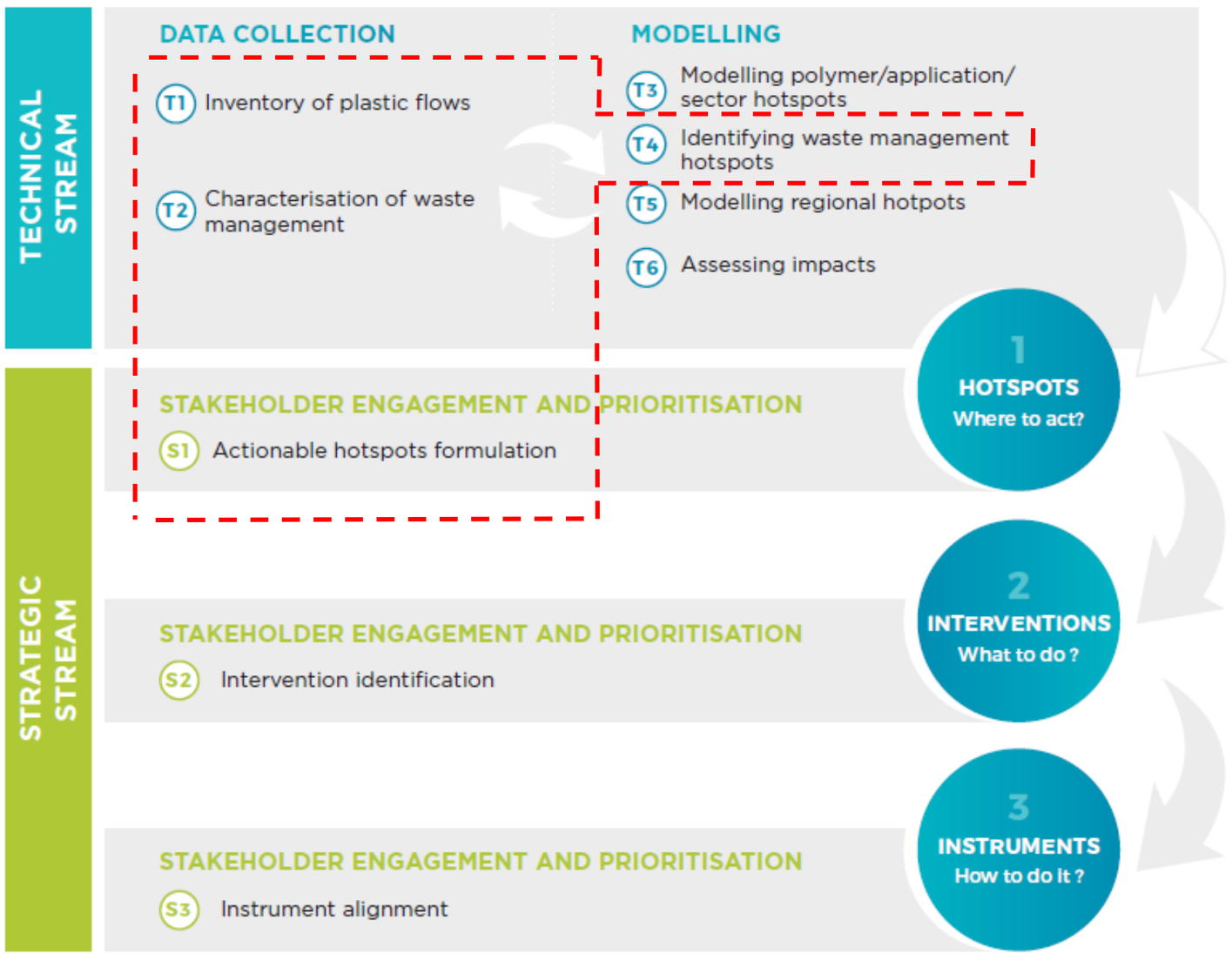
The strategic stream is underpinned by three activities aiming to explain where interventions are necessary to prevent plastic waste generation in a specific destination (activity S1), outline exact actions required for prevention (activity S2), and pinpoint tools, resources, and specific stakeholders to be engaged in preventative interventions (activity S3). This report is concerned with activities S1, T1, T2 and T4. Activities S2, S3, T3, T5 and T6 are beyond the scope of this report.

In this report, the plastics hotspot assessment methodology developed by UNEP and IUCN [15] was supplemented with analysis of secondary data on the topic in question available in open access. Primary data have also been collected to support the analysis. More specifically, primary data were used to assess various activities within the technical and strategic stream. Herewith, primary data were required to fill the data gaps, but also to formulate actionable hotspots based on first-hand experience and perspectives of the local stakeholders.

As part of primary data collection, interviews with local stakeholders were conducted. Owners/managers of hotels, restaurants, and tour operators in Famagusta, Limassol, Larnaca and Paphos were interviewed (15 interviews in total). Interviews with the representatives of not-for-profit organizations, such as the Cyprus Sustainable Tourism Initiative, municipal authorities and destination managers in Paphos and Famagusta, and academics from the Cyprus University of Technology and the University of Cyprus were also conducted (12 interviews in total).

Besides, as part of primary data collection, in-situ, field observations were also made, including practices of plastic waste management in a sample of hotels and restaurants in Famagusta, Larnaca and Paphos. The interview data and the data from in-situ, field, observations were compared with and contrasted against the secondary data to obtain a more nuanced and balanced assessment.

Figure 5. The plastics hotspot assessment methodology by UNEP/IUCN and the analytical boundary of this report (**dashed red line**).

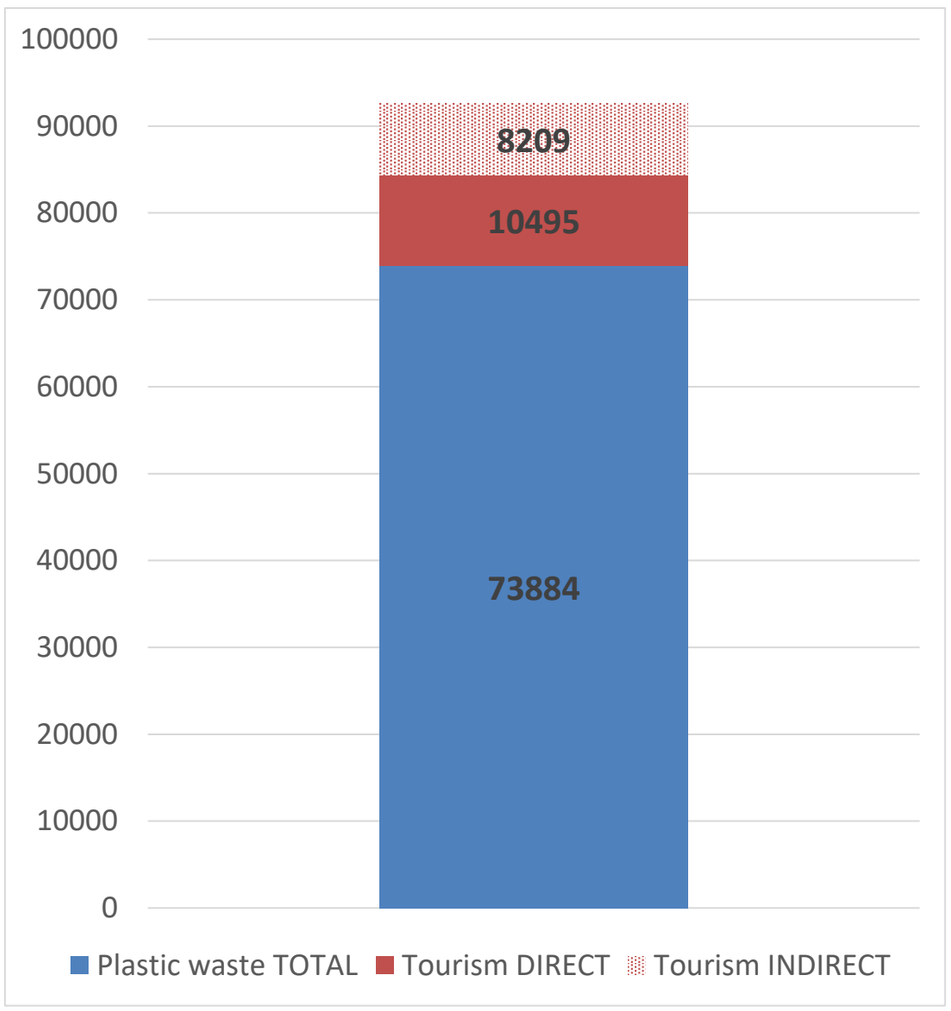


THE LIFECYCLE OF PLASTICS IN THE SECTOR OF TOURISM IN CYPRUS

INVENTORY OF PLASTIC FLOWS (T1)

Accurate figures on plastics in the sector of tourism in Cyprus do not exist. There is no primary plastics production in Cyprus [16] which implies that **all plastic waste generated in the island arrives from outside in the form of consumables**, such as toys and cutlery, textiles, and packaging, or raw material for local manufacturing and processing industries. IUCN suggests that circa 93 thousand tonnes of total plastic waste is produced in Cyprus (irrespective of an economic sector) with **circa 10500 tonnes attributed specifically to tourism** (see Figure 6) [17].

Figure 6. Plastic waste flows in Cyprus and the contribution of the sector of tourism, in tonnes, data from 2019 [17].

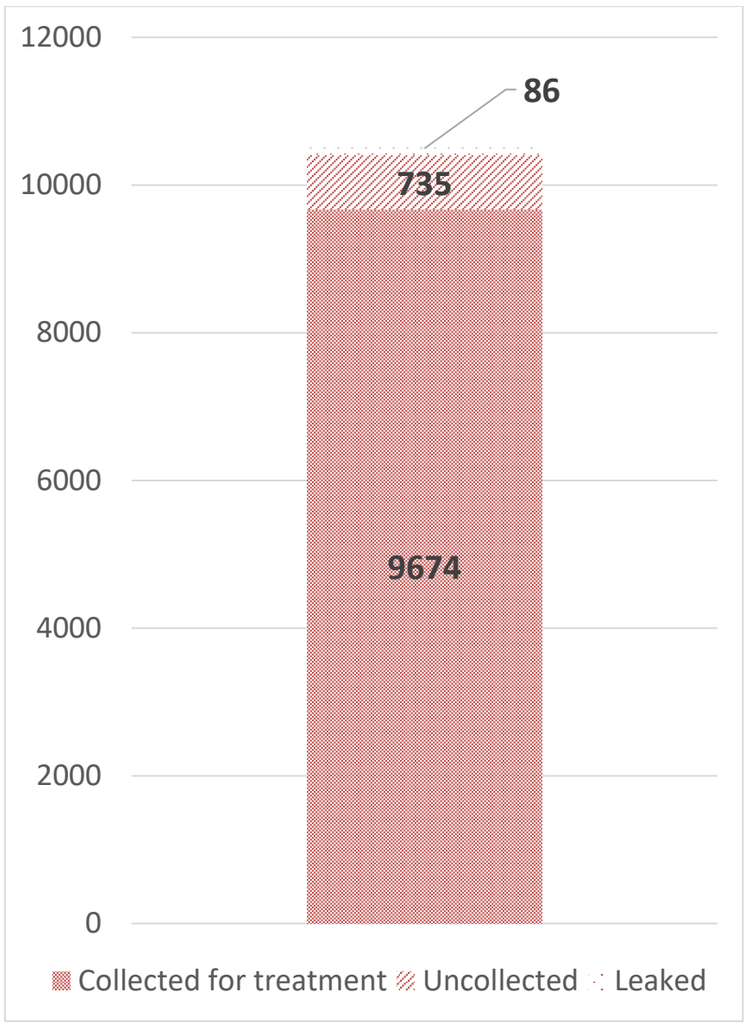


Given that circa 4 million tourists visited Cyprus in 2019 [4], it is estimated that each tourist must have generated 2.6-3.25 kg of plastic waste. This represents 'direct' plastic waste in the national sector of tourism. However, tourism is supported by other industries, such as food production, fishing, and retail. It is estimated that **at least 10 % of plastics used by these supporting industries ends up in tourism** [17]. This represents 'indirect' plastic waste in the national sector of tourism. If this indirect plastic waste is accounted for, the contribution of the sector of tourism to total plastic waste generation in Cyprus becomes higher than estimated by IUCN.

Without the 'indirect' contribution, **an 'average tourist' may generate at least 4 kg of plastic waste per stay**. With the average duration of stay of 8.8 nights in 2019 [6], **an 'average tourist' generates over 455 g of plastic waste per night of stay**. For comparison, an 'average' EU resident generates 58 kg of plastic waste per EU resident per year or 160 g of plastic waste per day [18]. Therefore, tourists in Cyprus, daily, generate almost 3 times more plastic waste than EU residents.

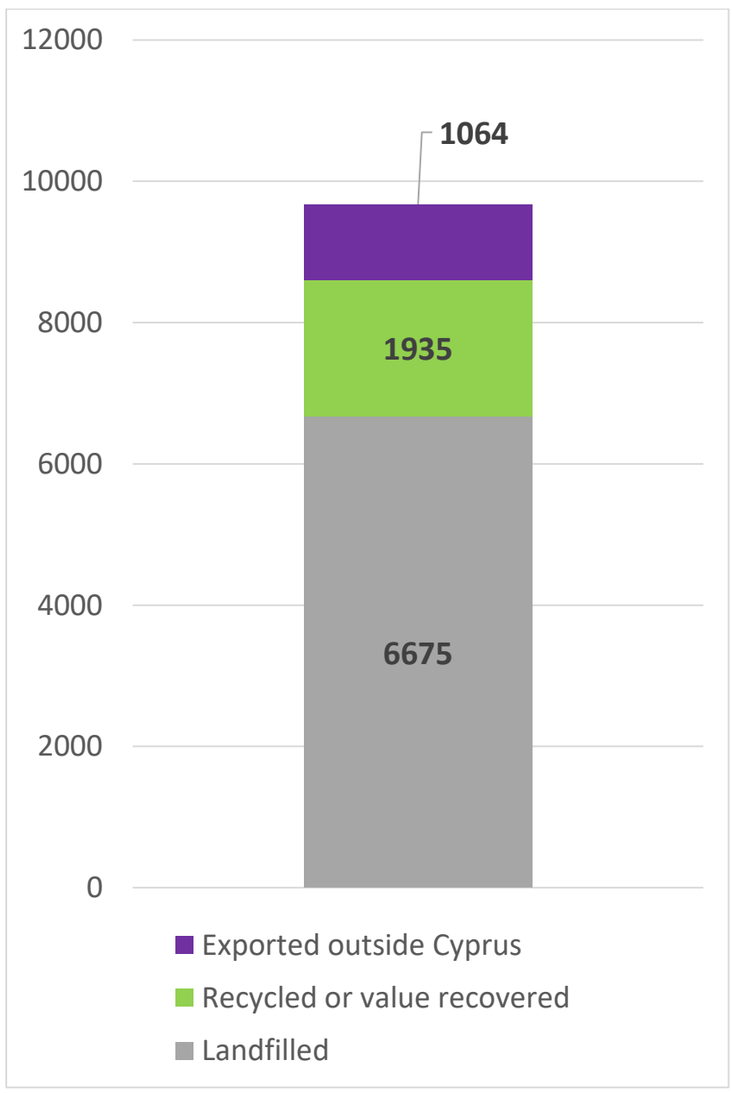
93 % of wasted plastics in Cyprus is collected by municipal services [17], see Figure 7. The remaining 7 % is subject to 'mismanagement' which includes illegal dumping, littering and uncollected waste. It is estimated that out of this 'mismanaged' plastic waste, circa 800 tonnes leak into waterways, with tourism contributing circa 90 tonnes [17]. **The sector of tourism in Cyprus has one of the highest plastic leakage rates due to littering by tourists.**

Figure 7. Proportion of collected, uncollected and leaked plastic waste from the sector of tourism in Cyprus, in tonnes, data from 2019 [17].



Out of the 93 % of plastic waste collected by municipal services in Cyprus, in the absence of recycling facilities on the island, it is estimated that circa 11 % is exported for treatment outside the island [16], see Figure 8. **Similar quantities of plastic waste are destined for small-scale, local recycling and energy recovery while the rest is landfilled.** It is important to note that these figures are derived by means of modelling rather than by direct measurements, so they should be taken with caution.

Figure 8. Proportion of landfilled, recycled/value recovered and exported plastic waste from the sector of tourism in Cyprus, in tonnes, data from 2019 [16].



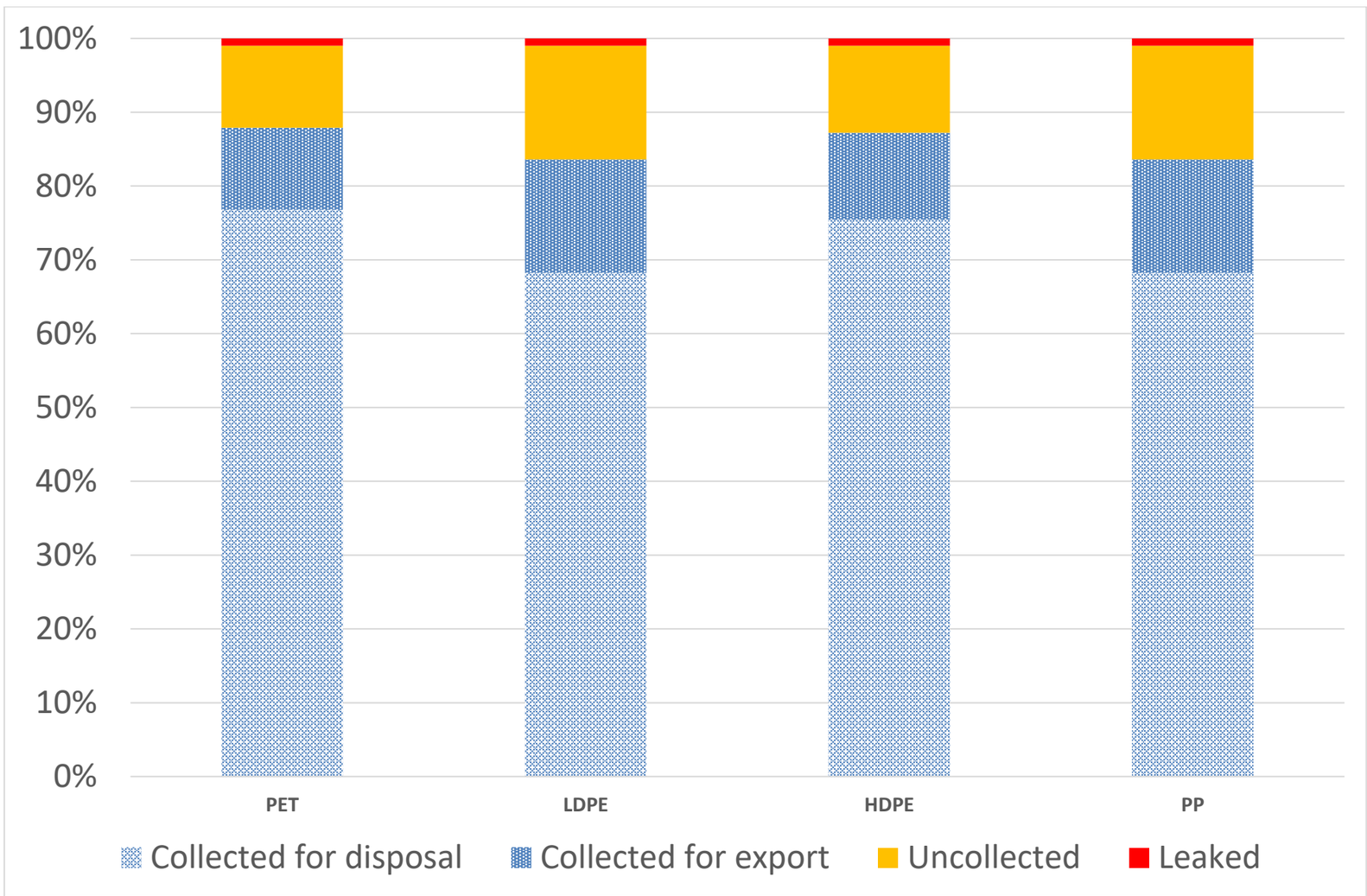
CHARACTERISATION OF PLASTIC WASTE MANAGEMENT (T2)

UNEP/IUCN define hotspots as the most relevant plastics and plastic polymers, their applications, industrial sectors, regions, or waste management stages causing leakage of plastics into the environment alongside associated impacts, throughout the life cycle of plastic products [17]. From the viewpoint of plastic polymers and their applications in the sector of tourism, packaging and plastic-based — or 'synthetic' — textiles are the main types of plastic waste in the island; this includes wasted packaging made of plastics and synthetic textiles from the sector of tourism [16]. The industries which support tourism in Cyprus, such as fishing and catering, also contribute significantly to plastic waste although precise magnitude of this contribution is unknown [17]. Most plastic waste in the tourism sector of Cyprus is represented by 'long-lived products', such as fishing nets and clothes. **This waste is largely recyclable, but no reliable figures exist to estimate how much of this waste gets recycled and how much is landfilled.** A third of plastic waste generated by the sector of tourism in Cyprus is constituted by 'short-lived products', such as single-use plastics [17]. This waste is difficult to recycle; hence, it can be assumed that it is either landfilled or exported outside the island.

Hospitality enterprises, especially catering, are the main producers of plastic waste in the sector of tourism in Cyprus. **Most plastic waste, including mismanaged plastic waste, is generated in the key touristic areas of the island i.e., Famagusta, Paphos, Limassol, Larnaca and Nicosia**. In hospitality enterprises, plastic waste is generated across all service areas, but catering stands out in terms of the volume of plastics wasted. In the kitchen, (food) **packaging represents the main source of plastic waste**. Plastic packaging is a necessity to preserve food, but also other products, from damage and spoilage. The non-plastic packaging alternatives in Cyprus are not widely available or are more expensive. Outside the kitchen, **single-use cutlery and tableware make a significant contribution to plastic waste** as they are widely utilised due to such factors as convenience, safety precautions and low cost. For example, ceramic tableware can be dangerous to serve in wet or slippery areas, is heavy and time-consuming to handle, it occupies a lot of space, and requires water and cleaning agents for treatment. Single-use plastics are safe to use, easy to dispose of, and lightweight, which explains their popularity with industry professionals.

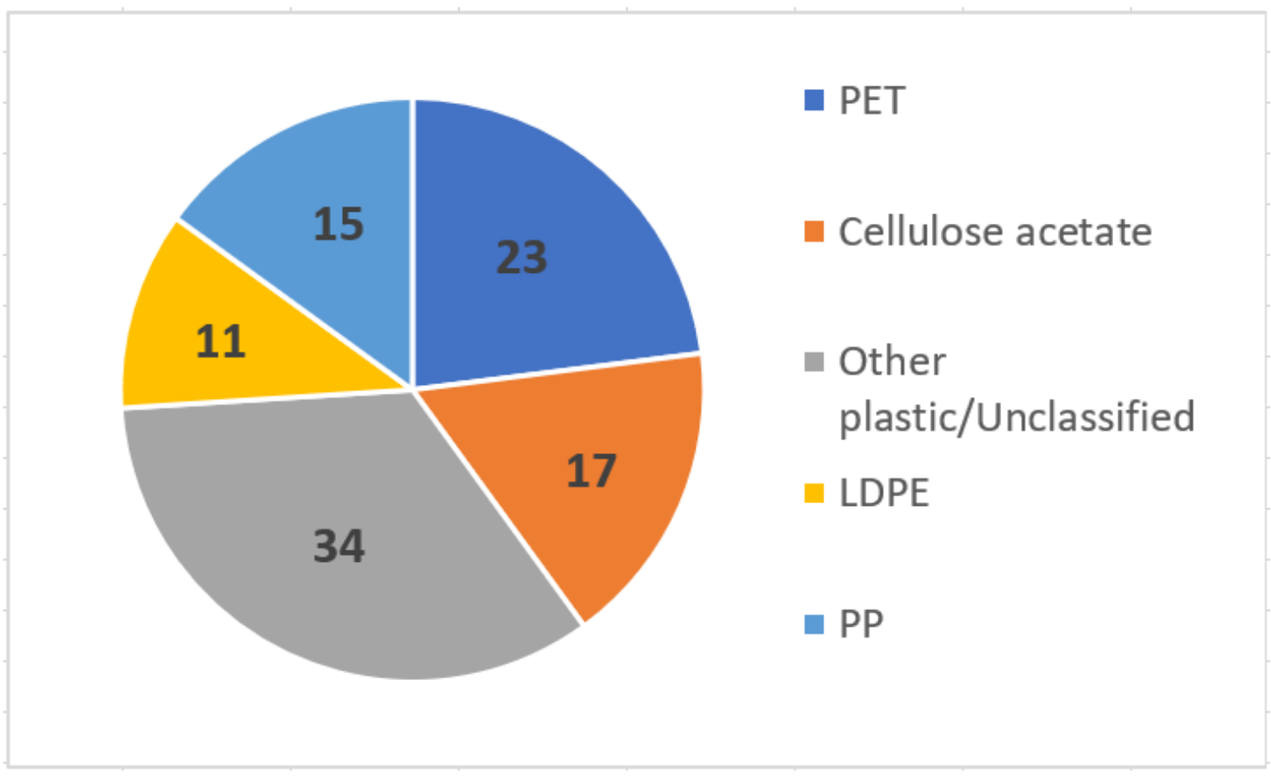
The character of plastic waste in the sector of tourism in Cyprus resembles the main categories of plastic waste across the whole national economy of the island except for synthetic rubber. Synthetic rubber is not widely used in tourism; hence, **plastic wastage within the sector is dominated by PET (Polyethylene Terephthalate), LDPE (Low-density Polyethylene), HDPP (High-density Polyethylene) and PP (Polypropylene).** These plastics are used in packaging, such as water and shampoo bottles, food liners and lids. The contribution of PS (Polystyrene) and PVC (Polyvinyl Chloride) that are popular packaging materials (for instance, food containers and detergent bottles) and are used in direct consumption (for example, single-use cups and toys) is less significant. The contribution of the category of plastics 'Other' is also substantial; however, it is unfeasible to divide these plastics into smaller sub-categories because of the variety of plastic fractions and sizes. It is further estimated that LDPE, PET, HDPE, and PP are the main categories of plastics contributing to leaking, including littering and illegal dumping, see Figure 9. Although the proportion of leaked plastics is only circa 1 %, the environmental implications of leakage are substantial [17]. The remaining plastics categories are routinely collected for disposal. However, only a portion of these collected waste plastics is subsequently recycled while the rest is landfilled.

Figure 9. The pattern of management of the key types of plastics in the sector of tourism in Cyprus [15].
Estimates are based on the figures of plastics imports/trade, as there is no primary production of plastics in Cyprus



Recent academic studies have empirically confirmed the 'plastic intensity' of solid waste in the sector of tourism in Cyprus. Loizia et al. measured solid waste prepared for collection in the tourist areas of Famagusta and established different categories of plastics as the main contributors to waste before and during the COVID-19 pandemic [19]. In a more nuanced study, Orthodoxou et al. examined marine litter in various coastal locations across the island i.e., the plastic waste which has not been collected for disposal but leaked to the environment [20]. Orthodoxou et al. identified **plastics as the largest contributor to marine litter in Cyprus (86 % of total marine litter detected)** with the key plastic fractions represented by bottles and single-use cups (PET and PS, 23 %), smaller plastic fragments (various types of plastics, 22.1 %), cigarette butts (cellulose acetate, 17 %), bags (LDPE, 10.1 %), and food containers and wrappers (LDPE and PP, 5.4 %), see Figure 10. The density of marine litter has been established as being higher in the coastal areas directly adjacent to touristic spots and urban settlements, such as Famagusta, Larnaca, Limassol, and Paphos. Here, the density of marine litter has reached 0.23 items per square metre which is higher than in the islands of Spain (0.06-0.12) and is comparable to the islands of Greece (0.24) [20]. Importantly, **the density of marine litter in the popular touristic beaches of Cyprus has been found to be considerably higher than in its non-touristic beaches i.e., 0.24 items per square versus 0.12 items per square metre**, respectively [20]. This confirms the large contribution of tourism to the leakage of plastic waste to the marine environment. It is important to note that Orthodoxou et al. did not explored the leakage of plastics in the sector of tourism in Cyprus to the non-marine environment, such as via illegal dumping. It can however be assumed that the leakage will be comparable if not more significant given limited rainfall in the island which hampers transport of plastic debris to the sea.

Figure 10. Plastics leaked to the marine environment in Cyprus. Source: modified from Orthodoxou et al. [20]
Figures showcase the proportion of different plastic fractions in total plastic litter found in the sea



IDENTIFYING PLASTIC WASTE MANAGEMENT HOTSPOTS (T4)

Clear boundaries are essential to ensure that appropriate information is obtained and used within the hotspot analysis. To establish the hotspots, the point of plastics' arrival to a destination, such as via import trade flows and the point of plastics' departure from a destination, such as via final disposal and/or leaking, must be identified. **The plastics hotspot assessment should therefore be underpinned by a lifecycle perspective** i.e., it begins with assessing the source (origin) of plastics, then moving to transport (to the point of plastics consumption), then looking at the consumption (use) stage, then going through the stage of collection and transport to the point of disposal and finishing with the end-of-life stage.

Considering that there is no primary plastics production in Cyprus and some plastic recycling takes places abroad, the analysis of plastics imports and exports, alongside plastic flows within the island, has been undertaken. Figure 11 summarises the results of plastics hotspot assessment in the tourism sector of Cyprus using the methodology developed by UNEP/IUCN.

Origin

In 2020, Cyprus imported plastics to the value of US$ 218.9 Million [21]. This figure is consistent with the value of plastics' imports in 2019 and 2018, but it is over 10 % higher than plastics' imports in 2017. Most of these imports are destined for manufacturing industries, while the exact figure of imports represented by consumer goods destined for tourism is unknown. However, looking at the key markets for imports of consumer goods in Cyprus, it can be concluded that most plastics come to the island from

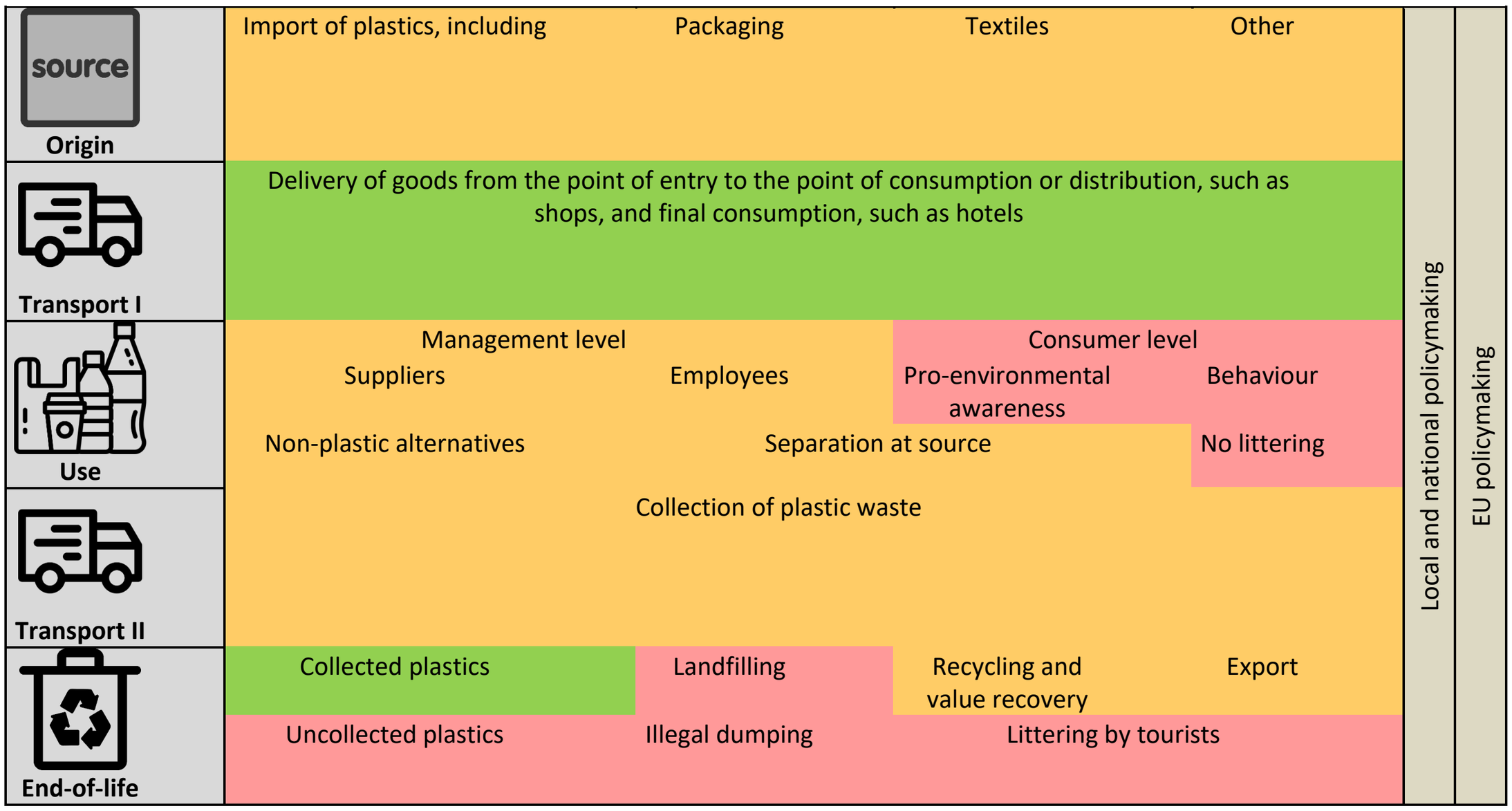
countries in East Asia and the Pacific, including China, but also from the UK, Germany, Spain, and France [22]. The main problem with the imports of plastics to Cyprus, especially with imported plastic packaging, is so-called **'unsuitable' plastics whereby the packaging does not specify which plastic category has been used to manufacture it, when the plastic labelling is not aligned with the EU/Cyprus standards, or when the label is incorrect.** This hinders separation of plastics at source and, consequently, hampers correct treatment, most notably recycling. This hotspot can be improved by policymakers in Cyprus/EU imposing more stringent requirements for labeling of imported plastics, especially when these come from East Asia and the Pacific, including China, where plastics labelling standards are not aligned with EU requirements. This holds true for products directly consumed in tourism, but also for products supplied by tourism-supporting industries, such as retail.

Transport I

There is no evidence of plastic waste/leakage occurring at the stage of plastics' delivery from the point of origin to the final consumer.

Figure 11. Plastics hotspot assessment.

Legend: Red colour indicates areas for critical improvement. Amber colour indicates areas where certain improvements are possible. Green colour indicates areas that do not currently require improvement. See the main text for detailed explanations.



Use

At the use stage, **the hotspot requiring urgent improvement is consumer behaviour**. Tourists, especially those coming from East-Central Europe and Russia, often lack awareness of plastics as a major environmental issue. This results in irresponsible behaviour which brings about leakage of plastics in the form of littering. Further, the problem of improper separation of plastic waste in-situ exists; while some tourists separate waste appropriately, for instance by using dedicated bins for recyclables and non-recyclables, some tourists do not separate at all, despite the bins provided. This leads to mixed waste which should be additionally separated by staff, thus adding extra tasks to employees in the sector of tourism. Hence, interventions are necessary, designed by academics and industry professionals, and supported by policymakers via, for instance, awareness raising campaigns, to change attitudes and behaviour of tourists towards prevention of plastic waste, most notably in-situ separation. At the management level, tourists can be nudged to encourage plastic waste prevention. These nudges can take the form of short communications and clearly visible labels [23], but also default plastic-free options, see Figure 12.

Figure 12. Example of managerial commitment to plastic waste reduction in a hotel in Paphos.

Notes: ceramic tableware is provided as a default option for beverages during meals (see the bottom of the picture). Single-use cups have been replaced with recyclable cups following liaison with suppliers (see the middle-to-top of the picture). These recyclable cups are explicitly designed for taking beverages away, such as to the pool. Hotel guests are verbally encouraged i.e., 'nudged', to use ceramic cups when dining in-situ.

There are management related hotspots at the use stage where certain improvements are necessitated. Managers of tourism enterprises, especially international chain-affiliated and branded businesses, have developed appropriate mindsets towards the need to prevent plastic waste in operations. This is in part driven by corporate agendas on sustainability and, in part, by personal pro-environmental values. However, **the mindset of many managers of small, independent tourism enterprises is not always aligned with this understanding of the importance of plastic waste management.** Having a sustainability agenda is not a priority among this category of managers as profitability represents the main goal, especially given significant financial losses incurred during the pandemic. The mindset of such managers needs to change to better incorporate the ideas of plastic waste prevention. Local policymakers should facilitate this change by incentivising plastic waste minimisation or penalising non-complying enterprises.

Further, managers of tourism enterprises should work with suppliers to reduce plastics in purchased products. **Suppliers, in turn, should action plastic waste reduction down their value chain.** For instance, non-plastic alternatives for cutlery or tableware can be proactively sought and offered to tourism enterprises. As an example, single-use cups can be replaced, subject to the availability and affordability, by recyclable cups (Figure 12). The only problem, albeit a major one, with this procurement of recyclable alternatives is the low recycling rates in Cyprus, as discussed below. Even if recyclable alternatives become widely available, in absence of effective recycling, effective management of plastic waste will be difficult to achieve.

Lastly, managers should influence the mindset of employees. **Employees are generally receptive of the plastic waste challenge; however, like customers, pro-environmental awareness remains problematic among some staff, especially represented by migrant labour coming from East-Central Europe.** The lack of awareness brings about limited commitment to plastic waste prevention targets and can hamper important activities, such as in-situ plastic waste separation for subsequent collection and recycling. Again, as in the case of customers, policymakers can play a role in raising pro-environmental awareness of employees. Together with managerial actions directed to incentivise pro-environmental behaviour of staff in the workplace, such dual interventions can exert a multiplying effect on employees of tourism enterprises in Cyprus.

Transport I

Improvements are required for plastic waste transportation from the point of generation (for example, a hotel) to the point of treatment (for instance, a recycling facility) in Cyprus. Collection of municipal solid waste has sufficient frequency in the summer and in the main metropolitan areas of the island. **However, remote and rural areas, particularly during winter, are served irregularly or less frequently.** This leads to illegal landfilling, dumping, and littering. Interventions should be designed by local policymakers to tackle this hotspot by, for example, increasing frequency of municipal waste collection or by optimizing collection itineraries, especially in the 'low' season. For instance, smaller, more maneuverable and quicker vehicles can be used for municipal solid waste collection in winter, serving longer distances and covering more localities.

End-of-life

This hotspot has the largest potential for improvement. Although the efficiency of collection of plastic waste in Cyprus is high at 93 %, most of this waste is landfilled, with recycling and recovery rates being currently low. This calls for urgent interventions facilitated by local policymakers and aligned with EU plastic waste reduction targets. **Given the lack of recycling facilities on the island, consideration should be given to constructing one.** The construction can be financially supported by EU or public private partnerships (PPPs) can be considered to co-finance and co-manage the project. There is evidence from another island destination in Europe i.e., Mallorca, that **PPPs can aid significantly in municipal solid waste management if designed and implemented appropriately** [24]. To overcome the problem of insufficient plastic waste generated to keep the plant busy all year round, smaller facilities can be built in major metropolitan areas to tailor recycling to the needs of the island. **Further, contracts can be signed with nearby countries to export wasted plastics to Cyprus for recycling**, such as Israel or Lebanon. This intervention will not only solve the problem of plastic waste's recyclability in-situ, but it will also aid Cyprus in meeting the EU target on reducing landfilling. Lastly, this intervention will also ensure that all plastics are recycled locally. Given that a significant share of plastic waste is exported outside the island with the destiny of this waste being currently unknown (11 % of the total collected plastic waste), the construction of a recycling facility in Cyprus can guarantee no transfer of the plastic waste challenge from the island to the overseas.

Lastly, interventions are necessitated to reduce leakage of plastic waste from tourism. The problem of uncollected plastics can be tackled by regular inspections, especially in remote areas, areas with waterflows and areas of high environmental sensitivity. Illegal dumping can be addressed by increasing the frequency of municipal waste collections, as discussed above. **A system of incentives should be designed to encourage appropriate disposal of plastic waste.** To prevent littering among tourists, creative approaches can be adopted to supplement (more) traditional methods of raising pro-environmental awareness and encouraging pro-environmental behaviour. For example, in addition to existing waste bins with clear labels and notes in different languages, installed in popular touristic hotspots to encourage collection and separation, art installations can be made (see Figure 13). Such art installations can draw attention of tourists, thus prompting them to engage in plastic waste prevention. Further, art installations can draw attention of children who, in turn, can lead or inspire their parents towards appropriate collection and separation of plastic waste. **The effectiveness of art installations in tackling the issue of plastic pollution in popular destinations has been proven in scholarly research** [25]. However, such unconventional, creative approaches to plastic waste collection and separation will only succeed if the collected plastic debris will subsequently be properly treated via recycling and value recovery rather than by landfilling, as discussed above.

Figure 13. Conventional (A) and creative (B) ways of preventing leakage of plastic waste in popular touristic hotspots of Famagusta and Paphos.

Note the shape of the cage as a fish. This is to trigger human emotions on the negative impact of plastic waste on marine life, but also to appeal to children who will then discourage parents from littering. Also note that some plastic waste has already been put to the cage. This is to show tourists that they are not alone in their intention to prevent plastic pollution.

A

B

ACTIONABLE HOTSPOTS FORMULATION (S1)

The analysis has enabled the formulation of actionable hotspots to enhance plastic waste management in Cyprus (see Figure 14). In total, 12 hotspots have been listed, categorized as generic or specialized, and assigned to the different stages of the plastic life cycle in the island. As recommended by UNEP/IUCN, generic hotspots stand for the actions required for the entire destination and all types of plastic waste. Specialized hotspots concern specific parts of the island, or particular actors and/or specific plastic waste types. Figure 14 also identifies the stakeholders whose involvement is necessitated to intervene in each hotspot.

Figure 14. The list of actionable hotspots.

N	Lifecycle stage	Actionable hotspot	Category	Stakeholders to be involved
1	 Source	Require/Reinforce correct/clear labelling of imported products with plastics, especially packaging	Specialized (non-EU products containing/made of plastics)	Local policymakers EU policymakers
2	 Use	Change mindset of managers to ensure an understanding of the importance of plastic waste prevention	Specialized (small, independent enterprises)	Local policymakers
3		Change mindset of suppliers to ensure they proactively seek non-plastic tourism product alternatives	Generic	Local policymakers Industry practitioners
4		Change mindset of employees to ensure an understanding of the importance of plastic waste prevention	Generic (but focusing on migrant labour from East-Central Europe and Russia)	Industry practitioners Staff
5		Change mindset of customers to ensure they understand the importance of plastic waste prevention	Generic (but focusing on tourists from East-Central Europe and Russia)	Local policymakers EU policymakers Industry practitioners Staff Academics Tourists
6	 Transport II	Optimize collection of plastic waste to avoid dumping and littering	Generic	Local policymakers
7	 End-of-life	Consider construction of a recycling plant for plastic waste	Generic	Local policymakers EU policymakers Local communities
8		Consider design of public private partnerships (PPPs) for plastic waste management	Generic	Local policymakers Industry practitioners
9		Increase efficiency of plastic waste collection for disposal by optimizing frequency and itineraries	Generic	Local policymakers
10		Reduce illegal landfilling and dumping by introducing a system of economic (dis)incentives	Generic	Local policymakers Industry practitioners Local communities
11		Discourage littering by installing bins in touristic areas and collecting waste from these bins regularly	Specialized (targeting different waste types, particularly cigarette butts, and key touristic areas, such Famagusta)	Local policymakers Tourists Local communities
12		Discourage littering and increase pro-environmental awareness by using creative approaches, such as arts	Specialized (targeting key touristic areas, such as Famagusta)	Local policymakers Not-for-profit organizations Local communities

CONCLUSION

This report has undertaken a plastics hotspot assessment in the tourism sector of an island destination, Cyprus, using the guidelines developed by UNEP/IUCN. The report has established tourism as an important contributor to plastic waste flows within the island and one of the main reasons for Cyprus not meeting the EU targets on solid waste recycling and recovery. More specifically, the report has outlined the following takeaway messages:

- Plastic waste in the sector of tourism in Cyprus is generated directly, such as via disposal of single-use cutlery in hotels, but also indirectly by the tourism supporting industries, such as fishing nets and food packaging

- An average tourist in Cyprus generates at least 4 kg of plastic waste per stay or 455 g of plastic waste per night. This is almost 3 times more than the plastic waste produced daily by an 'average' EU citizen

- Main tourist destinations of Cyprus, such as Famagusta, Paphos, and Limassol, generate 670 kg of solid waste per capita per year, including plastics, which is 200 kg more than residential areas of the island, and 170 kg more than the EU average figure
- Only 20 % of municipal solid waste, including plastics, is either recycled or recovered in Cyprus, with the rest being landfilled or sent for treatment abroad
- Packaging is the main category of plastic waste generated in the sector of tourism and it has the largest potential for non-disposal i.e., leaking to the environment

Twelve hotspots in plastics waste generation and management have been identified, outlining the potential areas for intervention which can aid the island in more effective prevention of plastic waste. The implementation of these hotspots is subject to engagement of the following stakeholders: local and EU policymakers, industry practitioners, not-for-profit organizations, academics, tourism sector employees, tourists, and local communities. The hotspots which should be considered by these stakeholders for actioning are as follows:

- Development of a clear labeling scheme for imported plastics;
- Optimization of municipal solid waste collection services;
- Construction of a recycling plant to divert plastic waste from landfill;
- Facilitation of pro-environmental behavioural changes among managers of tourism enterprises, but also their employees and tourists;
- Design of (more) creative approaches to increase public awareness of plastic waste and the need for its prevention.

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