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URBAN-WASTE – 690452 – D2.3

URBAN-WASTE

Urban strategies for Waste Management in Tourist Cities

D2.3 – Report on indicator sets and touristic processes

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Abstract

This Deliverable reports on operationalising the concept of Urban Metabolism and therefore summarises the developed pragmatic approach to evaluate the environmental and socio-economic characteristics of pilot cases. The finally selected indicator sets, cross-checked with the 11 URBANWASTE Pilot Cases regarding suitability, practicability and data availability, that will be used for assessing the status quo in the URBANWASTE pilot cases within Task 2.6 are presented. Information regarding which indicator sets are aligned to those touristic processes that are considered as the relevant hotspots in touristic processes in terms of waste generation (“accommodation” and “food and beverage provision for tourists”) is provided. The connection between the final selected methodology (D2.2) and the chosen indicators is given. This deliverable summarises the URBANWASTE conceptual framework as well as chosen methodology to

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describe and assess the tourism related waste flows and their environmental impacts in urban areas. Based on the basic metabolism concept the dependencies of waste flows on specific determinants like lifestyle, infrastructure and capacities are included. Urban Patterns, Drivers and Lifestyle therefore were included in the waste related final set of multi layered indicators.

This Deliverable is an important input for the development of the database template within WP 2 Task 2.4 as it produces as an output a list of data (indicator sets) that have to be collected from the pilot cities/partner municipalities (within Task 2.5). These indicator sets represent the underlying data needed to calculate the impacts for the status quo assessment performed within Task 2.6.

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A detailed overview on the allocation of Work Package 2 partners to Pilot Cases for supporting them with completing the "Survey on data availability" is given in Table 1 in Chapter 3.



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Summary

Within WP 2 of the URBANWASTE project waste related, tourism related and socio-economic data will be collected in the 11 URBANWASTE pilot cases in order to allow the assessment of the status quo situation within Task 2.6 as well as – in a later step of this project – of the impacts of future scenarios for the pilot cases in order to identify waste prevention strategies and implementation activities that are environmentally sound, economically feasible and socially acceptable (WP 7, Task 7.1). This report refers to URBANWASTE Task 2.3 of Work Package 2. The **main goal of Task 2.3** is the **final selection of multi-layered indicators sets** for mass balances as well as environmental and socio-economic characteristics of the URBANWASTE pilot cases. In addition, those indicator sets shall be aligned to the relevant touristic processes in term of waste generation.

In this **Deliverable “D2.3 - Report on indicator sets and touristic processes”**, the **results of Task 2.1** regarding indicators commonly used in literature and in practice to connect waste generation with tourism as well as hotspots in touristic processes in terms of waste generation were combined with the **results of Task 2.2** regarding a suitable methodology for the assessments that will be carried out within URBANWASTE and **cross-checked with the pilot cases** that gave inputs on suitability, practicability and data availability **in order to select suitable and practicable indicator sets for displaying the mass balances as well as environmental and socio-economic characteristics of the URBANWASTE pilot cases.**

Besides **general indicators describing waste generation and tourism** in the pilot cases (e.g. waste generation (or disposal) rate or indicators related to the performance of the waste management system) general indicators (such as GDP/cap.) describing **social and economic aspects** of the current situation will be calculated. Further, as LCA was chosen to be the method used for assessing the **environmental aspects**, **LCA-specific indicators** such as “Global Warming Potential (GWP)”, “Acidification Potential (AP)” or “Resource Depletion” (Chapter 4.2) will be calculated. The final selection of indicators as well as the decision on the units for reporting on those selected indicators can only be made in Task 2.6 in the course of evaluating the collected data with statistical methodologies to identify which indicators / units are meaningful.

In addition to the selection of indicators, a **list of data (sets) which have to be collected from the pilot cases** (within Task 2.5) in order to calculate those indicators in the subsequent assessments was compiled. This list contains **waste related data sets, socio-economic data sets as well as tourism related data sets**. Waste related data (sets) cover aspects of waste generation (quantities), waste prevention and waste management. Data (sets) on socio-economic factors that influence waste generation cover aspects describing the pilot cases in general (e.g. area, local resident population) as well as relevant aspects regarding economy and society of the pilot cases. Tourism related data (sets) cover aspects of tourism economy as well as of variables of (accommodation) capacity and occupancy.

Asking for data on waste flows, on the waste management system and on tourism related aspects allows to display and assess the main touristic processes in terms of waste generation (namely „accommodation“; „food and beverage provision for tourists“) in the URBANWASTE pilot cases. Data requirements resulting from the modelling approaches (reported in D 2.1) are met by collecting time series data for selected indicator (sets) as well as basic socio-economic data. The final decision on the modelling approach used for the assessment can only be made in Task 2.6.



At this stage of the project, **only general indicators** suitable to be calculated in the **status quo assessment** (Task 2.6) can be selected. Further, more specific indicators for the assessment of the environmental, economic and social impacts of selected waste prevention strategies (developed within Task 4.1) within Task 7.1 can only be selected at a later stage of the project after the waste prevention strategies or measure that shall be implemented in the pilot cases are defined.

Based on the list of data (sets) that have to be collected from the pilot cases, which is the main output of this Task 2.3, a database template will be developed within Task 2.4 for the subsequent collection of the input data (Task 2.5).



1. Introduction

The impacts of tourism are manifold. On the one hand, tourism is one of the most important industries worldwide and a driver for socio-economic development in many regions. Around 10% of the world's GDP are directly and indirectly generated by and one out of eleven jobs is related to tourism. On the other hand, at the same time, the total number of 1.1 billion tourists every year also brings a range of negative externalities, including emissions from transport and touristic activities, high levels of unsustainable resource consumption (renewable and non-renewable, incl. water resources) and waste production.

Solid waste generation is considered being one of the most relevant environmental aspects related to tourism activities. In comparison with other cities, tourist cities have to face additional challenges related to waste prevention and management due to their geographical and climatic conditions, the seasonality of tourism flows and the specificity of tourism industry and of tourists as waste producers. One major objective of the URBANWASTE project is to support policy makers in answering these challenges and in developing strategies that aim at reducing the amount of municipal waste production and at further support the re-use, recycle, collection and disposal of waste in tourist cities.

The main aim of **Work Package WP 2** is to provide background data and to assess waste related impacts of tourism using a Life Cycle approach. To meet this objective, Work Package WP 2 is composed of **three procedural steps**. The first procedural step is the **development of a proper methodology (Task 2.2) and the adjustment and definition of data requirements**. Metabolism indicator sets suitable and practicable to display and analyse the urban metabolism of the URBANWASTE pilot cases and a database for the selected touristic URBANWASTE pilot cases shall be developed (Task 2.4). The database shall provide the information necessary for linking touristic processes to resource consumption and waste generation, prevention, recycling, treatment and disposal activities in order to analyse how tourism is responsible for positive and negative impacts considering the three pillars of sustainability (environment, society and economy). In a second step, a baseline assessment will be carried out (Task 2.6), **applying MFA and LCA to assess the current situation in selected URBANWASTE pilot cases**. The third procedural step within WP 2 to meet the project's objectives will be the **identification of best waste management practices and options for optimisation** of waste management strategies in the selected pilot cases (Task 2.8).

This report refers to URBANWASTE Work Package 2, Task 2.3. The main goal of Task 2.3 is **the final selection of multi-layered indicators sets for mass balances as well as environmental and socio-economic characteristics of the URBANWASTE pilot cases**. In addition, those indicator sets shall be aligned to the relevant touristic processes in term of waste generation. This **Deliverable "D2.3 - Report on indicator sets and touristic processes"** shall report on the finally selected indicator sets (that have been cross-checked with the pilot cases regarding suitability, practicability and data availability). In addition this report contains information on selected touristic processes that are aligned with the indicator sets. This deliverable is important input for the development of the database template (Task 2.4).

In order to finally select suitable and practicable indicator sets the **results of Task 2.1** regarding **indicators commonly used in literature and in practice** to connect waste generation with tourism as well as **hotspots in touristic processes in terms of waste generation** were **combined with the results of Task 2.2** regarding a **suitable methodology for the assessments** that will be carried out within Task 2.6 ("baseline") and Task 7.1 (assessing the environmental, social and economic impacts of selected waste prevention strategies) and **cross-**



checked with the pilot cases that gave inputs on **suitability, practicability and data availability**. A more detailed description of the approach applied in this Task 2.3 is given in Chapter 2.

Based on the results of Task 2.3, a database template will be developed within Task 2.4 for the subsequent collection of the input data (Task 2.5) that is necessary to calculate the indicator sets identified and selected as being suitable and practicable within this Task.



2. Approach

The aim of this deliverable is to provide **finally selected suitable and practicable multi-layered indicators** (indicators sets) that will be calculated for the “status quo assessment” in the pilot cases (performed within WP 2 Task 2.6) together with the corresponding information which underlying data has to be collected from the pilot cases (Task 2.5) for calculating those selected indicators. In addition, this report contains information on selected touristic processes that are aligned with the indicators sets.

In order to meet this objective the following information were combined:

- Results from the literature review (WP 2, Task 2.1):
 - Indicators commonly used in literature to connect waste generation with tourism;
 - Catalogue of data (sets) that are commonly used in practice to display waste generation and tourism;
 - Hotspots in touristic processes in terms of waste generation.
- Results from the methodology review (WP 2, task 2.2):
 - Suitable methodology for assessing the status quo in the URBANWASTE pilot cases as well as the subsequent accompanying sustainability assessments of waste prevention and management activities within the URBANWASTE project.
- Results from the “Survey on data availability” that has been carried out in the URBANWASTE Pilot Cases within Task2.3.

Based on the outcomes of the literature review and following the approach of Minx et al. (2011) on their pragmatic approach to assess Urban Metabolism in Europe, the URBANWASTE approach shall provide knowledge beyond pure metabolic waste related in- and outflows of an urban area. It shall also allow the explanation of differences between cities as well as to detect changes after the implementation of waste prevention and management measures.

Therefore urban patterns, urban drivers and lifestyle were included in the selection of indicator sets in addition to waste related figures (Figure 1).

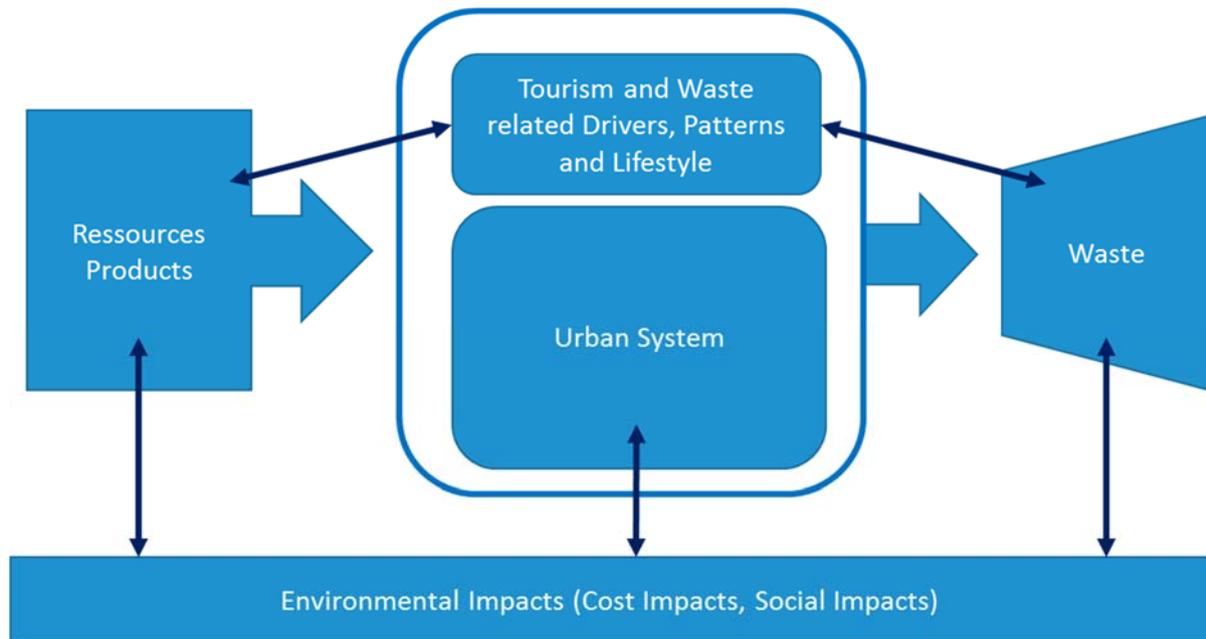


Figure 1: Waste related Inflows and Outflows including Urban Drivers, Urban Patterns and Lifestyle as Influencing factors

In order to find out if the indicators commonly used in literature as well as the data (sets) commonly used in practice (both identified in Deliverable D 2.1) are suitable and practicable to answer specific URBANWASTE questions these data (sets) as well as the underlying data requirements aligned to the commonly used indicators were cross-checked with the 11 URBANWASTE pilot cases. This cross-checking was done by asking the URBANWASTE pilot cases to provide information on which of the data listed in the catalogue of data requirements they were presented with (Annex 6.2) are available in the respective pilot case area at which spatial and temporal scale. Typical indicators on Urban Waste Flows included are waste quantities, waste composition or recycling rate. Tourism and waste related Urban drivers that directly influence the flows included in the catalogue are population, key economic indicators for tourism industries or typical tourism indicators like number of tourist arrivals. The infrastructural determinants (Urban Patterns) were depicted with indicators like city size, waste treatment facilities, or number of waste bins. Lifestyle was mainly included on a GDP and GNI basis. Further information on the design of the survey as well as on its results is provided in Chapter 3.

This Deliverable is an important input for the development of the database template within WP 2 task 2.4 as it produces as an output a list of indicators that will be calculated for the status quo assessment in the pilot cases (performed within task 2.6) together with the information which underlying data has to be collected from the pilot cases (task 2.5) for calculating those selected indicators. This list of indicators and corresponding data requirements will be fed into task 2.4.

The results of this Task 2.3 are also being fed back into WP 3 (Task 3.2), where different stakeholders are surveyed in a behavioural and situation analysis of tourist activities related to consumption, waste behaviour and patterns.



3. Survey on data availability

In order to find out if the indicators commonly used in literature as well as the data (sets) commonly used in practice (both identified in Deliverable D 2.1) are suitable and practicable to answer specific URBANWASTE questions these data (sets) as well as the underlying data requirements aligned to the commonly used indicators were cross-checked with the 11 URBANWASTE pilot cases. This cross-checking was done by the means of performing a “Survey on data availability” within Task 2.3. The following sub-chapters will give detailed information on the design as well as on the results of this survey.

The 11 URBANWASTE pilot cases are listed in Table 1.

Table 1: URBANWASTE Pilot Cases

URBANWASTE PILOT CASES	SUPPORTING WORK PACKAGE 2 PARTNER
Copenhagen (DK)	AARHUS UNIVERSITY (AU)
Florence (IT)	CONSULTA EUROPA PROJECTS AND INNOVATION SL (CE)
Kavala (GR)	UNIVERSITAET FUER BODENKULTUR WIEN (BOKU)
Lisbon (PT)	DELFT UNIVERSITY OF TECHNOLOGY (TUD)
Nice (FR)	UNIVERSITAET FUER BODENKULTUR WIEN (BOKU)
Nicosia (CY)	SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCE (SLU)
Ponta Delgada (PT)	UNIVERSITY OF COPENHAGEN (UCPH)
Santander (ES)	BIOAZUL
Syracuse (IT)	AMBIENTE ITALIA SRL (AI)
Tenerife (ES) (Municipalities of Adeje, Arona and Puerto de la Cruz)	BIOAZUL
Dubrovnik (HR)	UNIVERSITAET FUER BODENKULTUR WIEN (BOKU)



3.1 Design of the “Survey on data availability”

Based on the results from Deliverable D 2.1¹ (WP 2 task 2.1) the project partners compiled a catalogue of data (sets) that are commonly used in literature as well as in practice to display waste generation and tourism. In order to find out if those indicators commonly used in literature as well as the data (sets) commonly used in practice are suitable and practicable to answer specific URBANWASTE questions, the 11 URBANWASTE pilot cases were asked to provide information on **which of the data (sets) listed in the catalogue are available in the respective pilot case area**. The pilot cases were asked to provide information on data availability for different **spatial** and **temporal scales**. Furthermore, they were asked if **time series** of data are available and since when those time series are available.

The consideration of different spatial scales was to sharpen the results as the differentiation on touristic areas compared to areas without tourists could provide more reliable data on tourist related waste amounts. The basic requirement to use such data for the calculation of reliable indicator results is to have all input data for a specific indicator on the same scale, meaning that for calculating, for example, “waste generation per overnight stay” it is not useful to have data on waste generation on national level and data on the number of overnight stays on city scale.

The following **spatial scales** were considered:

- **“Whole City / Metropolitan Area”**: Basically, this category **refers to the whole pilot case area**. The URBANWASTE pilot case areas will be quite different covering cities, municipalities and metropolitan areas². For most pilot cases, this category will refer to the city- or municipality-level.
- **District-level**: “Districts” in this context means different **parts/regions/boroughs within the municipality or city of the URBANWASTE pilot case**. For the upcoming status quo assessment in the pilot cases it is interesting to know if partners have data only for the whole city/municipality area or also on a smaller scale.
- **City centre**: are often the **oldest parts of cities** (e.g. historical town centres) with lots of touristic sights.
- **Tourist Areas**: This category refers to tourist areas **within the pilot case area**.

The same reason is the basis of the consideration of different temporal scales. The amount of waste as well as the composition of waste, in general, is depending at least on different seasons (e.g. paper waste is incinerated in single stoves only during winter time, whereas for green and garden waste in winter time the amounts are very low). Especially in regions with touristic seasonality the tourist related amounts of waste can be detected via monthly time series.

The following **temporal scales** were considered:

- Monthly
- Seasonal
- Annual

¹ Results from D 2.1: Indicators commonly used in literature to connect waste generation with tourism; Catalogue of data (sets) that are commonly used in practice to display waste generation and tourism; Waste relevant hotspots in touristic processes in terms of waste generation

² Metropolitan area in this context means the municipality together with its surroundings



The information on the spatial and temporal scales of data availability was also important for the final decision on practicable indicators for the subsequent assessments to be carried out within Task 2.6 (status quo assessment) and Task 7.1 (assessment of changes after implementing selected waste prevention strategies). Those assessments have to be carried out on the scale of the pilot cases (i.e. mainly on city or municipal scale). Therefore, in order to check if indicators that seem suitable to link waste generation to touristic activities are practicable specifically for URBANWASTE as well, it was necessary to cross-check which data the URBANWASTE pilot cases can provide on the scale of the pilot case area or on smaller scales (which would also more in-depth analyses).

The document named “Survey on data availability” that was sent out to the URBANWASTE pilot cases is attached to this report in Annex 6.2. Besides the catalogue of data (sets) (Chapter 3) the “Survey on data availability” also contained questions regarding, amongst others, a general description of: the waste management system, current waste prevention activities, tourism related information, etc. (Chapter 2). The information resulting from this Chapter 2 will subsequently be fed into Task 2.8 providing the basis for the description of current waste prevention and management practices in the URBANWASTE pilot cases which will be reported in the aligned Deliverable D 2.7.

The **catalogue of data (sets)** was structured into three tables covering the following **three thematic areas**:

1. Waste related data requirements
2. Data requirements on factors influencing waste generation
3. Tourism related data requirements

In total, the tables contained a list of 47 data sets. For each data (sets) the pilot cases were asked to indicate its availability on the different spatial and temporal scales by putting a cross (“X”) in the respective column. Table 2 gives an example of how pilot cases filled out the survey tables. The detailed results of the survey as well as the implications of these results regarding the list of data requirements that will be fed into Task 2.4 (development of database template) are presented and analysed in Chapter 3.2.



Table 2: Example of filled out survey tables

Data Requirements			Data Availability							
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...
Waste Quantities										
[1] = Sum of [2] to [8]	Municipal solid waste (MSW)	[t]	x						x	2011-2015
[2] = Sum of [2a] to [2e]	Separately collected recyclables (Total amount)	[t]	x						x	2011-2015
[2a]	• Paper and cardboard	[t]	x						x	2011-2015
[2b]	• Glass	[t]	x						x	2011-2015
[2c]	• Metals	[t]	x						x	2011-2015
[2d]	• Plastics and compounds (e.g. multilayer packaging)	[t]	x						x	2011-2015
[2e]	• Other recyclables (e.g. textiles, wood)	[t]	x						x	2011-2015
[3] = [3a] + [3b]	Organic waste	[t]								
[3a]	• Separately collected organic waste	[t]								
[3b]	• Green waste	[t]	x						x	2011-2015

3.2 Analysis of survey results

In the following three tables the results of the survey on data availability are presented. Table 3 shows the results for the waste related data requirements, Table 4 the results for data on factors influencing waste generation and Table 5 the results for tourism related data requirements. These results **represent all 11 URBANWASTE pilot cases, but** it has to be remarked that **for 2 pilot cases (Santander and Tenerife) only partially completed surveys were available in time for the analysis**. For the other 9 pilot cases fully completed survey could be fed into the analysis of data availability.

For better **visualisation of the data availability** in the URBANWASTE pilot cases the results were **colour coded**.

- Cells with a **light grey** background colour indicate that less than one third of the URBANWASTE pilot cases can provide this specific data (set). Thus, this colour coding shows data that is available in 0 to 3 pilot cases.
- Cells with an **orange** background colour indicate that more than one third but less than two thirds of the URBANWASTE pilot cases can provide this data (set). Thus, this colour coding shows data that is available in 4 to 7 pilot cases.
- Cells with a **green** background colour indicate that more than two thirds of the URBANWASTE pilot cases can provide the data (set) that was asked for. Thus, this colour coding shows data that is available in 8 to 11 pilot cases.



Analysis of waste related data requirements

Table 3 shows the results for the waste related data requirements.

Table 3: Waste related data requirements

Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
Waste Generation (Waste Quantities)											
[1] = Sum of [2] to [8]	Municipal solid waste (MSW)	[t]	11	0	2	1	5	2	9	8	0
[2]= Sum of [2a] to [2e]	Separately collected recyclables (Total amount)	[t]	6	0	1	2	3	1	5	4	1
[2a]	• Paper and cardboard	[t]	9	1	1	2	6	2	7	8	0
[2b]	• Glass	[t]	9	1	1	2	5	3	7	7	1
[2c]	• Metals	[t]	8	1	1	2	5	2	7	7	1
[2d]	• Plastics and compounds (e.g. multilayer packaging)	[t]	8	0	1	2	5	1	6	7	0
[2e]	• Other recyclables (e.g. textiles, wood)	[t]	6	0	1	1	2	1	4	5	2
[3]= [3a]+[3b]	Organic waste	[t]	3	0	1	0	1	0	4	3	1
[3a]	• Separately collected organic waste	[t]	4	0	0	0	1	0	2	3	2
[3b]	• Green waste	[t]	9	0	0	0	3	1	7	7	1
[4]	WEEE	[t]	10	0	1	1	5	1	8	8	0
[5]	Residual waste	[t]	7	1	0	0	1	1	5	5	1
[6]	Bulky waste	[t]	10	0	2	1	5	1	8	7	0
[7]	Hazardous waste	[t]	6	0	1	0	1	0	5	4	2
Waste Prevention											
[8]	Number of home composting bins provided to households	[Number]	4	0	1	0	0	0	3	3	3
[9]	Number of reuse centres	[Number]	3	0	1	0	0	0	3	2	3
[10]	Total amount of goods reused or waste prepared for reuse	[t]	2	0	0	0	0	0	1	2	6
Waste Management											
[11]	Number of provided bags or bins per separately collected fraction (e.g. paper & cardboard, ...) for households	[Number]	8	1	1	0	0	0	5	6	3
[12]	Number of bins / containers for separately collected recyclables in public areas	[Number]	8	2	4	0	0	0	4	6	2
[13]	Number of bins / containers for residual waste in public areas	[Number]	9	1	2	1	0	0	5	7	3
[14]	Collection (service) coverage rate for residual waste and recyclables	[%]	11	0	1	0	0	0	5	4	3
[15]	Waste management tax / fee for private individuals / private households per assessment basis • potential assessment basis e.g. person, household, type of waste bag / bin / container, frequency of collection, m2... [will be specified later]	[€]	9	0	1	0	3	1	5	5	4
[16]	Waste management tax / fee for similar establishments per assessment basis • potential assessment basis = e.g. number of employees, commercial space, turnover, m2 ... [will be specified later]	[€]	7	0	1	0	3	1	4	4	5
[17]= [17a]+ [17b]	Total number of employees in waste management • e.g. split into administrative personnel (municipal and waste industry respectively), waste collectors and staff at local recycling stations, treatment sites etc., employees in re-	[Number]	6	1	0	0	1	2	5	4	3



Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
	/up-cycling industry [will be specified later]										
[17a]	Number of employees in waste management performed by the municipality (public employees) • e.g. split into administrative personnel (municipal and waste industry respectively), waste collectors and staff at local recycling stations, treatment sites etc., employees in re-/up-cycling industry [will be specified later]	[Number]	9	2	0	0	1	2	6	6	2
[17b]	Number of employees in waste management performed by private enterprises • e.g. split into administrative personnel (municipal and waste industry respectively), waste collectors and staff at local recycling stations, treatment sites etc., employees in re-/up-cycling industry [will be specified later]	[Number]	6	0	0	0	2	2	4	4	1
[18]	Municipal expenditures for cleaning of public spaces (total)	[€]	8	0	0	0	3	1	8	5	3
[18a]	• Municipal expenditures on street cleaning	[€]	7	1	0	0	1	1	8	4	4
[18b]	• Municipal expenditures on beach cleaning	[€]	3	0	0	0	1	0	3	1	3
[19]	Total amount of street sweeping waste	[t]	5	0	0	0	1	0	4	1	3
[19a]	Amount of litter (in % of street sweeping waste)	[%]	4	0	0	0	1	0	4	1	3
[20]	Total solid waste from bins at beaches	[t]	3	1	0	0	0	0	4	1	4
[21]	Total waste generated by touristic ships	[t]	3	0	0	0	0	0	2	0	4

Availability of data on waste generation / waste quantities (Data (set) IDs [1]-[7])

- With the exemption of data on organic waste (ID [3]), the results of the survey show that **most of the data requirements related to waste generation and waste quantities** that was asked for are **available in around two thirds or more of the URBANWASTE Pilot Cases** at the scale of the pilot cases (meaning city, municipality or metropolitan area). **Data on the quantities of Total Municipal Solid Waste, Paper & Cardboard, Glass, Green Waste, WEEE and Bulky Waste** are available in (nearly) all pilot cases according to this survey.
- However, the results of Chapter 2 of the survey regarding the description of the waste management systems in the pilot cases show that **some pilot cases separately collect waste fractions that were not displayed in the survey** (e.g. a co-mingled fraction of plastics and metals). Therefore, **the final list of data requirements** that will be fed into task 2.4 (development of database template) **will contain more data sets covering all possibilities for separately collected fractions across all pilot cases.**
- To state that only **three pilot cases** (Florence, Kavala, Lisbon) have data on quantities of organic waste (ID [3]) would be misleading as data set ID [3] only indicates those pilot cases which **can provide data on separately collected organic waste (ID [3a]) as well as on separately collected green waste (ID [3b])**. But, as the results further reveal, **4 out of the 11 pilot cases have data on separately collected organic waste (ID [3a]) and 9 out of 11 pilot cases have data on green waste (ID [3b])**. Only one pilot case (Santander) indicated that they **cannot provide any data on organic waste amounts** although it is known that separate collection of green waste does exist.



- As the data sets [3], [3a] and [3b] are connected to each other and as **food waste**, which was identified as one of the **main waste streams relevant to touristic processes**, is included in data set [3a] the authors decided to **keep all of these data sets** included in the list of data requirements that will be fed into task 2.4 (development of database template). Furthermore, some pilot cases might not differ between different categories of organic waste, thus, making it necessary also to keep data (set) ID [3] although this could possibly lead to mistakes during filling in the data collection forms (Task 2.5). Cross-checking the completed data collection sheets, thus, has to be done in case the collected figures indicate that such misunderstandings occurred during filling out data collection form.

Availability of data on waste prevention (Data (set) IDs [8]-[10])

- The results of the survey show that from the data requirements related to waste prevention **only data on the number of composting bins provided to households (ID [8]) is available in at least one third of all pilot cases**. Information on the number of reuse centres (ID [9]) or on the total amounts of goods reused or waste prepared for reuse (ID [10]) is available only in 3 and 2 pilot cases respectively.
- As data on reuse centres and reused goods might be relevant at a later stage of the project during assessing the changes due to implemented waste prevention measures and strategies (Task 7.1) the authors decided to keep data sets (ID [9]) and (ID [10]) and collect this information at least in those pilot cases that can provide this information.

Availability of data on waste management (Data (set) IDs [11]-[21])

- The results of the survey show that **most of the data requirements related to waste management are available in at least one third of the URBANWASTE Pilot Cases** at the scale of the pilot cases (meaning city, municipality or metropolitan area). Data on the **number of provided bins or bags per separately collected fraction for households (ID [11]), the number of bins / containers for separately collected recyclables in public areas (ID [12]), the number of bins / containers for residual waste in public areas (ID [13]), the collection service coverage rate (ID [14]), the waste management tax / fee for private individuals / households (ID [15]), the number of employees in waste management performed by the municipality (ID [17a]) and the municipal expenditures for cleaning of public spaces (total) (ID [18])** are available in **more than two thirds of the pilot cases**.
- As the number of provided bins or bags per separately collected fraction for households (**ID [11]**) is not considered relevant for identifying the impact of tourism on waste generation this data set will **not be kept included for the list of data requirements** that will be fed into task 2.4 (development of database template).
- The authors decided to **split data set ID [16]** into waste management tax / fee for hotels [16a] and [16b] waste management tax / fee for restaurant / bars in order to be able to identify differences related to waste management costs for those different establishments related to tourism.
- Data requirements regarding** municipal expenditure on beach cleaning (ID [18b]), total solid waste from bins at **beaches** (ID [20]) **and** total waste generated by **touristic ships** (ID [21]) are available in less than one third of the URBANWASTE pilot cases. Regarding these data sets it has to be noted that not all of the URBANWASTE pilot cases are located at the sea and, thus, issues regarding beaches and touristic ships are **not relevant to all pilot cases**. For this reason and because especially touristic ships can have a big influence of the tourism related waste generation in a particular pilot case these data requirements will be kept included in the list of data requirements that will be fed into task 2.4



(development of database template) although the availability on data related to waste from beaches and touristic ships seems to be low at first sight.

Spatial scale: Most of the data is only available at the level of the pilot case (meaning for the whole city, municipality or metropolitan area). The availability of data on smaller spatial scale (e.g. district level, city centre or tourist areas) is low. Data on smaller spatial scale is only available for a few pilot cases and a very limited set of data.

Temporal scale: With the exemption of data related to waste generation most of the waste related data requirements are only available at annual intervals. Data on a monthly scale can be provided by only a few pilot cases and only for a very narrow set of data. Data on seasonal scale can be provided by hardly any pilot case.

Time series: Times series are available for most of the waste related data requirements. Nevertheless, the starting point of the available time series differs considerably between the pilot cases, starting between 1999 and 2015.

Analysis of data requirements on factors influencing waste generation

Table 4 shows the results for the waste related data requirements.

Table 4: Data requirements on factors influencing waste generation

Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
Description of the Pilot Case											
[22]	Total local resident population	[Number]	10	1	3	2	1	2	7	4	1
[22a]	• Number of commuters (if included in "total population")	[Number]	2	0	0	1	0	0	1	0	3
[22b]	• Number of tourists (if included in "total population")	[Number]	7	0	1	2	1	1	5	2	1
[22c]	Total number of migrants	[Number]	4	0	0	1	0	1	1	1	1
[23]	Total Area	[km ²]	10	1	1	1	0	1	3	3	1
[24]	Total Beach Area	[km ²]	6	0	1	1	0	0	3	2	1
[25]	Total number of households	[Number]	9	0	1	1	0	1	3	3	1
[25a]	Average household size	[Number]	8	1	1	1	0	1	3	3	1
[26]	Number of second homes (vacation homes)	[Number]	3	0	0	1	0	0	2	1	2
Economy											
[27]	GDP per capita (at special scale of study area i.e. city or region)	[€]	8	0	0	0	0	0	6	2	1
[28]	GNI per capita (at special scale of study area i.e. city or region)	[€]	6	0	0	0	0	0	4	2	1
[29]	Household disposable income (at special scale of study area i.e. city or region)	[€]	5	0	0	0	0	0	4	1	2
[30]	Economically active persons by sectors		5	0	0	0	0	0	2	1	2
[30a]	• Sector Agriculture (NACE Rev. 1 A, B)	[%]	7	0	0	0	0	0	4	2	1
[30b]	• Sector Industry (NACE Rev. 1 C-F)	[%]	7	0	0	0	0	0	4	2	1
[30c]	• Sector Services (NACE Rev. 1 G-P)	[%]	7	0	0	0	0	0	4	2	1
[31]	Employment rate	[%]	8	0	0	0	0	0	5	2	1



Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
[32]	Unemployment rate	[%]	8	0	0	0	0	0	5	2	1
Society											
[33]	Population by broad age groups and gender (total=100%)		6	0	0	0	0	1	4	2	1
[33i]	Total female population	[%]	11	0	0	0	0	1	7	5	1
[33ii]	Total male population	[%]	11	0	0	0	0	1	7	5	1
[33a]	• Age 0-14	[%]	10	0	0	0	0	1	7	5	1
[33ai]	Female population age 0-14	[%]	9	0	0	0	0	1	6	4	2
[33aii]	Male population age 0-14	[%]	9	0	0	0	0	1	6	4	2
[33b]	• Age 15-59	[%]	10	0	0	0	0	1	7	5	2
[33bi]	Female population age 15-59	[%]	9	0	0	0	0	1	6	4	2
[33bii]	Male population age 15-59	[%]	9	0	0	0	0	1	6	4	2
[33c]	• Age 60 and more	[%]	10	0	0	0	0	1	7	5	2
[33ci]	Female population age 60 and more	[%]	9	0	0	0	0	1	6	4	2
[33cii]	Male population age 60 and more	[%]	9	0	0	0	0	1	6	4	2
Building Statistics											
[34]	Predominant heating type of buildings • e.g. split into: District heating / Block heating; central heating (whole building); gas heating system; electric heating system; central heating (apartment level); single stove heating; no heating [will be specified later]	[Number/ heating type] or [% of total]	4	0	0	0	0	0	3	1	5

Availability of data on describing the pilot case (city, municipality, metropolitan area ...) (Data (set) IDs [22]-[26])

- **Data on the local resident population** on the scale of the pilot case (city, municipality etc.) (Data (set) ID [22]) is available in **nearly all pilot cases**. The answers to the connected **data sets [22a] and [22b] would have to be cross-checked** if the data set was correctly understood by the pilot cases partners as especially the answers to [22b] seem unrealistic. The authors decided to **delete both data set [22a] and [22b]** from the list of data requirements that will be fed into task 2.4 (development of database template) because these data sets obviously caused confusions among the pilot case partner. **Data set [22c] will be kept** as Europe currently receives many migrants and, thus, this aspect might be relevant during data analysis in Task 2.6.
- The **availability on data describing the pilot case area (Data (set) IDs [23] and [24]) is high**. For data set ID [24] is has to be considered that beaches are not existing in all URBANWASTE pilot cases.
- The results show that **data on the total number of households and average household sizes** (data (set) ID [25] and [25a]) **are available in more than two thirds of the pilot cases** on the scale of the pilot cases.
- In contrast, **only three pilot cases** indicated to be able to provide **data on the number of second (vacation) homes** (data (set) ID [26]). Nevertheless, as this is information is **an essential component to get information on the “unofficial part” of tourism** (meaning overnight stays outside the “paid” sector in e.g. private vacation homes or in places of friends or families) this data set **will be kept** in the



list of data requirements that will be fed into task 2.4 (development of database template). This provides URBANWASTE with the opportunity to not only draw conclusions on the “commercial” (official) part of tourism but also on the “unofficial part” at least for the few pilot cases that can provide such information.

Availability of socio-economic data (Data (set) IDs [27]-[33])

- The results show that all **economic data** (data (set) IDs [27]-[29]) as well as all **data on employment** (data (set) IDs [30]-[32]) that was asked for in the survey **are available in at least one third of the analysed pilot cases** on the scale of the pilot cases. In some pilot cases this information is only available on national level as the comments made by pilot cases partners show. Information on GDP per capita (data ID [27]), employment rate (data ID [31]) and unemployment rate (data ID [32]) on pilot case scale can be provided by 8 out of 11 pilot cases.
- **Data on total male and female population** (data IDs [33i]-[33ii]) is available in **all pilot cases**. Data on **population structure** (data set [33a]-[33c]) on the scale of the pilot case area is **available in all but one or two pilot cases depending on the level of detail**. The Kavala pilot case partners remarked that this data is only available at different age groups and only at regional level.

Availability of other data on factors influencing waste generation (Data (set) ID [34])

- **Building statistics:** The results show that less than one third of the analysed pilot cases are able to provide data on the predominant heating type of buildings in the pilot case area. The **type of heating** used has an influence on the collected waste quantities as, for example, a single stove heating can be used by the owners to burn waste paper or certain components of residual waste that, thus, do not appear in the official municipal solid waste figures. With electric heating systems or central heating systems powered by the city this would not be possible. Thus, as the type of heating can have a relevant influence on the collected waste quantities (at least for some fraction) especially in pilot cases with cold climate in winter, the authors decided to **keep this data set (ID [34]) included** in the list of data requirements that will be fed into task 2.4 (development of database template) and to **split it up into [34a] “District heating”, [34b] “Single stove heating” and [34c] “No heating”**.

Spatial scale: As the results show hardly any data sets regarding socio-economic factors influencing waste generation are available on a smaller scale than the whole pilot case area (city, municipality, metropolitan area). As the comments made by pilot case partners show some of the information that was asked for in this section of the survey on data availability only exist on regional or even national level.

Temporal scale: The results of the survey show that hardly any data on factors influencing waste generation can be provided on monthly or seasonal scale. It is mainly available on annual scale.

Time series: Not for all pilot cases time series for data on socio-economic factors influencing waste generation are available. The starting point of the available time series differs considerably between the pilot cases, starting between 1992 and 2011.



Analysis of tourism related data requirements

Table 5 shows the results for the waste related data requirements.

Table 5: Tourism related data requirements

Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
Tourism Economy											
[35]	Number of persons employed in different categories of tourist attractions • e.g. split into: cultural/natural heritage, entertainment, sports, events etc. [will be specified later]	[Number/category]	3	0	0	1	0	0	3	2	6
[36]	Number of persons employed in different types of tourism enterprises • split into hotels, restaurants, ... [will be specified later]	[Number/type]	6	0	0	1	0	0	5	3	4
[37]	Number of commuters working in the tourism industry	[Number]	3	0	0	1	0	0	2	1	3
[38]	Number of seasonal workers in the tourism industry	[Number]	2	0	0	1	0	0	1	0	4
[39]	Turnover of the tourism industry	[million EUR]	7	0	0	1	1	0	5	4	2
Variables for (Accommodation) Capacity											
[40]	Number of tourist accommodation establishments by accommodation type • split into different types of tourist accommodation such as: hotels and similar accommodation; holiday and other short-stay accommodation; camping grounds, recreational vehicle parks and trailer parks	[Number/type]	9	2	2	3	1	0	4	5	2
[40a]	Share of tourist accommodation establishments that are open all year	%	4	1	1	2	0	0	1	2	3
[40b]	Number of tourism accommodation establishments that are labelled with national or internationally recognised labelling schemes • split into different types of tourist accommodation such as: hotels and similar accommodation; holiday and other short-stay accommodation; camping grounds, recreational vehicle parks and trailer parks	[Number/type]	4	0	0	1	0	0	2	3	4
[41]	Number of bed places by accommodation type • split into different types of tourist accommodation such as: hotels and similar accommodation; holiday and other short-stay accommodation; camping grounds, recreational vehicle parks and trailer parks	[Number/type]	10	1	2	2	2	1	5	5	2
Variables for Occupancy											
[42]	Total number of tourist arrivals at the URBANWASTE pilot case area	[Number]	9	0	1	1	2	1	5	5	3
[42a]	• by residents	[Number]	9	0	1	1	2	1	4	5	4
[42b]	• by non-residents	[Number]	9	0	1	1	2	1	4	5	4
[42c]	• Tourist arrivals split into places they arrive at (e.g. airports, ports, etc.)	[Number/type]	6	0	0	1	1	0	2	2	4
[43]	Total number of tourist arrivals at a tourist accommodation establishment	[Number]	8	0	1	1	3	1	4	4	2
[43a]	• by residents	[Number]	10	0	1	1	3	1	5	4	2
[43b]	• by non-residents	[Number]	10	0	1	1	3	1	5	4	2
[43c]	• Tourist arrivals split into types of tourist accommodation	[Number/type]	6	0	0	1	2	0	2	3	3
[44]	Number of nights spent (overnight stays) in total	[Number]	8	0	1	1	3	1	4	4	2



Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
[44a]	• Nights spent by residents	[Number]	11	0	1	1	3	1	6	5	2
[44b]	• Nights spent by non-residents	[Number]	11	0	1	1	3	1	6	5	2
[44c]	Number of nights spent in different types of accommodation	[Number/type]	6	0	0	1	2	0	2	3	3
[45]	Average length of stay	[Days]	9	0	0	1	2	0	4	5	2
Data on Other Tourism Related Information											
[46]	Country of origin of tourists / Home destination of tourists	[Number/country]	11	0	1	1	3	1	6	4	2
[47]	Number of beach users	[Number]	1	0	0	1	0	0	0	0	6

Availability of data on tourism economy (Data (set) IDs [35]-[39])

- From the **data requirements related to tourism economy** (Data (set) IDs [35]-[39]) **only the number of persons employed in different types of tourism enterprises (data ID [36]) and the turnover of the tourism industry (data ID [39])** can be provided by **more than one third of the pilot cases** on the scale of the pilot case area. Therefore, the authors decided to **only keep data ID [39]** (turnover of the tourism industry) included in the list of data requirements that will be fed into task 2.4 (development of database template). The other data sets (IDs [35]-[38]) will not be included in this list because of poor data conditions.

Availability of data on variables for (accommodation) capacity (Data (set) IDs [40]-[41])

- From the **data requirements related to variables for (accommodation) capacity** (Data (set) IDs [40]-[41]) the **number of tourist accommodation establishments by accommodation type (data ID [40])** as well as the **number of bed places by accommodation type (data ID [41])** can be provided by **nearly all pilot cases** on the scale of the pilot case area.
- More detailed information on this issue such as share of tourist accommodation establishments that are open all year (data ID [40a]) and **number of tourism accommodation establishments that are labelled with national or internationally recognised labelling schemes (data ID [40b])** can only be provided by four pilot cases. As data ID [40b] might be relevant at a later stage of this project when it comes to implementing waste prevention measures on hotel level and assessing the changes due to these measure (Task 2.7) the authors decided to **keep** this data set in the list of data requirements that will be fed into task 2.4 (development of database template). **Data set IDs [40a]** will **not** be included in this list because of poor data conditions and low relevance.

Availability of data on variables for occupancy (Data (set) IDs [42]-[45])

- From the **data requirements related to variables of occupancy** the **total number of tourist arrivals** at the URBANWASTE pilot case area including its split into arrivals by residents and non-residents (data ID [42], [42a] and [42b]) can be **provided by more than two thirds of the pilot cases** on the scale of the pilot case area. The same applies to the **total number of tourist arrivals at a tourist accommodation establishment split into arrivals by residents and non-residents** (data set IDs [43],



[43a] and [43b]) as well as for the total **number of nights spent (overnight stays) by residents** (data ID [44a]) **and non-residents** ([44b]). For data sets [43] and [44] it has to be cross-checked at a later stage (at least during data analysis in task 2.6) the total numbers on these data are available in less pilot cases than the total numbers split into residents and non-residents. The authors assume that these inconsistencies were overlooked by mistake by the pilot case partners during filling out the tables.

- Information on the **average length of stay of tourists** (data ID [45]) can be **provided** on the scale of the pilot case area **by more than two thirds of pilot cases**.
- **Data on tourist arrivals and the number of nights spent split into different types of accommodation (data set IDs [43c] and [44c])** are also only available in about half of the pilot cases. As these information might be relevant for strategy development (WP 4) or for the assessment of changes due to the implementation of the developed waste prevention and management measures and strategies (depending on the type and target groups) this information **will for the moment be kept included in the list of data requirements that will be fed into task 2.4** (development of database template). At this stage of the project is not possible to finally judge on the importance of this data set.
- **Data on the place of tourists' arrivals (e.g. airport, port etc.) (data ID [42c])** can be provided by only 6 pilot cases. As data availability is comparably low and the authors assume that it will be hard to get reliable data on this aspect, **the authors decided not to include** this data set in the list of data requirements that will be fed into task 2.4.

Availability of data on other tourism related information (Data (set) IDs [46]-[47])

- Information on the **country of origin of tourists** (data ID [46]) can be **provided** on the scale of the pilot case area **by all pilot cases**.
- Data on the **number of beach users** (data ID [47]) are only available in **one of the pilot cases**. Therefore, this data set will not be in the list of data requirements that will be fed into task 2.

Spatial scale: As the results of this survey on data availability in the pilot cases show hardly any data sets regarding tourism related information are available on a smaller scale than the whole pilot case area (city, municipality, metropolitan area).

Temporal scale: The results of the survey show that hardly any data regarding tourism related information can be provided on monthly or seasonal scale. It is mainly available on annual scale.

Time series: Times series data are available for at least half of the pilot cases. The earliest starting point for time series data is 1990, the latest 2014.



4. Final Selection of multi-layered indicator sets

In order to finally select suitable and practicable indicator sets, in the following chapters the **results of Task 2.1** regarding indicators commonly used in literature and in practice to connect waste generation with tourism as well as hotspots in touristic processes in terms of waste generation (**Chapter 4.1**) are **combined** with the **results of Task 2.2** regarding a suitable methodology for the assessments that will be performed within this project (**Chapter 4.2**) and **the results from cross-checking data availability** with the pilot cases (**Chapter 4.3**) and their **implications for the database template** that will be developed within Task 2.4 are discussed.

The **output** of this synthesis is a **list of data requirements that is necessary to calculate those indicator sets identified and selected as being suitable and practicable** within this Task. This list, which will subsequently be fed into Task 2.4, is presented in Chapter 4.4. The whole list can be found in Annex 6.1.

4.1 Indicators suitable to connect waste generation with tourism and modelling approach

As reported in report “D 2.1 - Literature Review on Urban Metabolism Studies and Projects”, “tourism” can be split into the following “**touristic processes**”:

- Travel and transport
- **Accommodation**
- **Food and beverage provision for tourists**
- Leisure activities
 - Shopping
 - Cultural activities (museum, theater, heritage sites, city tours etc.)
 - Sports and outdoor activities (e.g. water park)
 - Sun and beach

As the results of the literature review on studies linking waste management to the tourism sector, which are presented in D 2.1, reveal, in terms of waste generation, “**accommodation**” and “**food and beverage provision for tourists**” can be considered as the **waste relevant hotspots in touristic processes**.



Commonly used indicator sets to link waste generation to touristic processes with relevance for waste generation

An overview on indicator sets commonly used in literature to link waste generation to those two waste relevant hotspots in touristic processes (“accommodation” and “food and beverage provision for tourists”) (as reported in D 2.1) is presented in Table 6.

Table 6: Commonly used indicators in literature to link waste generation to tourism (based on the results of report “D 2.1 - Literature Review on Urban Metabolism Studies and Projects”)

Indicators for waste generation	
Accommodation	Food and beverage provision for tourists
<p>Total waste generation rate = total waste per guest (or tourist) per unit of time</p> <ul style="list-style-type: none"> • Sub-divided into sorted and unsorted waste or different waste types (e.g. paper, plastics, food waste, residual waste etc.) • Very commonly used units: kg/guest/day; kg/tourist/night; kg/guest/overnight stay etc. • Other units: kg/day/hotel; kg/day/hotel room <p>Waste disposal rate = (total waste - recyclables) per guest (or tourist) per unit of time</p>	<p>Total waste generation rate = total waste per type of food provision (or source of waste) per guest served (or per employee per unit of time)</p> <ul style="list-style-type: none"> • Sub-divided into different types of food provision (e.g. breakfast buffet, Lunch "a la carte", Lunch buffet, Dinner "a la carte", dinner buffet etc.) and different source of waste (e.g. preparation waste, customer plate leftover waste, buffet leftover waste, total food waste etc.) • Used units: Kg/customer; kg/person; kg/cover; kg/seat; kg/employee; kg/guest room; kg/day/hotel kitchen; kg/employee/year; kg/square meter <p>Food wastage = Average loss of energy occurring during meal preparation and consumption (expressed as a percentage of the energy value of the meal)</p>
Indicators for waste management	
<p>Frequency of collection of municipal solid waste</p> <p>Impact of the implementation of waste reduction systems (e.g. indicators on waste reduction, indicators on adequacy of waste collection services, indicators related to handling and disposal of hazardous substances etc.)</p>	

The literature review presented in report “D 2.2 - Methodology framework document as guidance for accompanying assessment” that the commonly used indicators about **waste generation** and waste management are not very diversified. The review further showed that the multitude of the waste related indicator sets used are mainly volume-based (e.g. in m³ or litres) or weight-based indicators and to a certain



extent also waste composition data. Very commonly used weight-based indicators are “kg/guest/day” and “kg/tourist/night”.

Most studies reviewed are case studies in a particular area, town or (group of) hotel(s). In case studies about a particular area or town the total amount of (solid) waste generated is often used (e.g. by reporting / calculating the monthly per capita generation of solid waste), sometimes also in combination with the recovery rate of recyclable waste. In some cases, the amount of generated waste was related to the ratio between the number of inhabitants and the number of tourist in the respective area. **In general, the commonly used indicators are broadly defined and not very detailed.** The waste generated by hotels (but also for campsites) is often measured by the total amount of waste (in kilograms) per guest-night.

The studies which focus on **waste management** (or environmental management systems) **hardly use quantitative indicators** such as the amount of waste, for example. In some cases the **frequency of collection** of municipal solid waste is used as an indicator. Many studies about waste management are based on highly aggregated data or data collected on basis of interviews and surveys. The former type of data are usually used in model simulation studies, while the latter type of data are used to gather information about the **implementation of waste management in the hospitality industry**. These interviews and surveys do not deal with the amount of recycled or saved waste, but only give insight in the implementation processes of waste reduction systems. Studies that give insight in amounts of reduced or recycled waste are case studies on the firm level in the hospitality sector; but it is unknown how representative these are for the whole sector.

Some of the indicators used in the reviewed studies have a limited level of significance due to different reasons: Indicators based on the unit “kg/day/hotel room” or “kg/day/hotel kitchen” for example are less meaningful for comparison as long as they do not contain additional information on size or capacity. The unit “kg/employee/year” does consider the size of the establishment to some extent, yet the number of employees depends also on the layout and structure of the establishment and therefore might distort results. Some studies use as reference value the unit “square meter”, of course it again depends on the layout and structure of the establishment, whether square meter is a useful unit and whether total square meter are used or built-up area or of the rooms etc.

For URBANWASTE both indicators on waste generation as well as on waste management seem useful to be calculated. The indicators about waste generation commonly used in literature (waste generation rate, waste disposal rate etc.) in general will be adopted for URBANWASTE. The indicators about waste management that mainly report on the implementation processes of waste reduction systems can be used in URBANWASTE as indicators for urban patterns as infrastructural determinants.

The scope of the assessment in Task 2.6 is the municipality level. The scope for the assessment of the environmental, economic and social impacts of selected waste prevention strategies (which will be developed within Task 4.1) within Task 7.1 can only be defined after the waste prevention strategies or measure that shall be implemented are clear. The consideration of waste management indicators depends on the final selection of waste prevention and management measures.

Because of the limitations regarding significance of some indicator units reported above such units will not be used in the URBANWASTE project. To display waste generation resulting from tourism URBANWASTE is going to use more meaningful indicator units which also allow for comparison such as “waste per tourist per unit of time”.



The final decision on the units for reporting on the selected indicators will be made in Task 2.6 in the course of evaluating the collected data. Then, different indicators (with different units) will be calculated and compared with statistical methodologies to identify which indicators / unit are meaningful (e.g. if kg plastic per tourist, kg MSW per tourist or kg MSW per overnight stay delivers more suitable results).

Approaches for modelling the influence of tourism on waste generation

Most of the reviewed studies (report "D 2.1 - Literature Review on Urban Metabolism Studies and Projects") deal with data on waste and tourism that were generated at the level of waste generators related to **accommodation** (and also to food and beverage provision), thus, applying a bottom-up approach. **Bottom-up approaches** are based on waste quantity and composition data (e.g. from waste sorting analysis) as well as on characteristics collected at source, i.e. they are closely related to the waste generator (e.g. tourism companies such as hotels, restaurants etc.) or to the waste collection infrastructure in touristic regions.

Another modelling approach, which is less often applied according to the results of the literature review, is top-down modelling. **Top-down approaches** are mainly based on **waste collection statistics** (aggregated data based on shipment data of waste collection companies or on statistics on input for waste treatment operators) of municipalities and regions at monthly or annual basis and try to relate variation in time with tourism-related activities (e.g. overnight stays or tourist arrivals) as reported by statistical offices. Possible ways of **statistical estimation of tourism impacts on MSW generation and composition** are

- cross-sectional analyses, i.e. comparisons between regions (without time perspective),
- time-series analyses for one region or
- analyses of panel data, i.e. time series of different regions in time.

Depending on the approach for performing data analysis (top-down approach) data need are different: For cross-sectoral analysis socio-demographic and tourism-related indicators have to be available for each municipality in order to explain the variation of MSW between the municipalities. Applications of time-series analyses for in single regions may be based on annual data, or on monthly data. The analysis of panel data can produce most suitable information for estimations of the impact of tourism on MSW generation and composition can be applied on the basis of data for a high number of municipalities, long annual time-series and at monthly basis.

The final decision on the modelling approach used for identifying the influence of tourism on waste generation can only be done in the course of data analysis within Task 2.6 ("baseline" assessment). Therefore, within Task 2.5, time series data on monthly and on annual scale shall be collected from the pilot cases for selected data (sets) that are suitable to **identify the influence of tourism on waste generation by using seasonal variation (monthly time series) or time series on annual scale**. Details on for which data (sets) which type of time series data will be collected from the URBANWASTE pilot cases are provided in the list of data requirements for data collection that will be fed into Task 2.4 (development of database template), attached in Annex 6.1 of this report. Furthermore, underlying data needed to calculate **socio-demographic and tourism-related indicators** shall be collected to allow for **cross-sectoral** analyses.



Comparing an URBANWASTE pilot cases with a neighbouring non-touristic baseline city / municipality (analysis of panel data) in order to identify the influence of tourism on waste generation might additionally be done in case other modelling approaches do not deliver satisfactory results. Such an analysis approach requests a high amount of additional data to be provided by city partners. One has to be aware that this possibly cannot be covered within the scope of URBANWASTE.

4.2 Methodology for sustainability assessment used for URBANWASTE

As reported in report “D 2.2 - Methodology framework document as guidance for accompanying assessment”, it seems to be reasonable to **choose a modular design** - applying several methodologies suitable to answer specific questions in combination - **for the assessments** to be performed within URBANWASTE. Table 7 gives an overview on the methodologies that will be used for assessing the status-quo situation in the pilot cases (Task 2.6) as well as the environmental, social and economic impacts of implementing selected waste prevention and management measures or strategies in the pilot cases (Task 7.1).

Table 7: Overview of selected methods and additionally considered methods / concepts that will be considered in the modular design for the assessments that will be performed within URBANWASTE

Assessment part	Selected method	Additional considered method
Structuring data and visualisation of waste and material flows	Material Flow Analysis (MFA)	----
Environmental assessment	Life Cycle Assessment (LCA)	----
Economic assessment	Ecological Efficiency (EE)	Cost Benefit Analysis (CBA) and Life Cycle costing (LCC)
Social assessment	Individual indicators	Social Life Cycle Assessment (SLCA)
Structuring / ranking of results of sustainability assessment	Analytical Hierarchy Process (AHP)	Driving forces – Pressures – States – Impacts – Responses Framework (DPSIR)
Scenario building	Urban and Industrial Symbiosis (UIS) approaches	----

Based on an **MFA**, which will provide an **inventory of material / waste flows** and, thus, will lay the **basis for the subsequent impact assessment**, an **LCA** will be carried out as especially **for assessing environmental impacts** the use of a life cycle based approach is important. For assessing **economic impacts**, the method of **Ecological Efficiency (EE)** will be applied together with other cost-related methods such as **CBA** and **LCC**. For the assessment of **social impacts only individual parameters** will be selected and analysed within URBANWASTE, but under consideration of general aspects of one methodology (SLCA).

Table 8 gives an overview on the impact categories and indicators used by the selected assessment methodologies.



Table 8: Overview indicators used by the selected assessment methodologies

Assessment part	Indicators used by the selected assessment methodologies
Environmental assessment	<p>Global Warming Potential (GWP) (Indirect measurable indicators: Use of Electricity, Use of Fuel)</p> <p>Acidification Potential (AP)</p> <p>Eutrophication Potential (EP)</p> <p>Resource Depletion: Abiotic depletion potential (ADP)</p> <p>Cumulative Energy Demand (CED)</p>
Economic assessment	<p>Material Costs</p> <p>Operating Costs</p> <p>Maintenance Costs</p> <p>Transport Costs</p> <p>Disposal Costs / Resale value</p> <p>End of Life costs for postconsumer waste (separate collection costs, born by commune; disassembly costs, born by the recycler; costs of reprocessing of secondary materials; revenues from secondary materials)</p> <p>Other Costs:</p> <ul style="list-style-type: none"> - Taxes: costs for all taxes occurring within URBANWASTE project's framework - Tooling cost: costs including the depreciation of the App (WP5), the maintenance and the cost for any consumables (water, paper) used while the tool is in operation - Other non-obligatory costs such as assurance costs, infrastructure costs, building costs, settlement costs, control costs, financing costs, appliance costs, scrap costs and service costs.
Social assessment	<p>Labour practices and decent work conditions can be evaluated by various indicators, e.g.</p> <ul style="list-style-type: none"> - Wages, including equal remuneration on diverse groups, regular payment, length and seasonality of work and minimum wages - Benefits, including family support for basic commodities and workforce facilities - Physical working conditions, including rates of injury and fatalities, nuisances, basal facilities and distance to workplace - Psychological and organisational working conditions, such as maximum work hours, harassments, vertical, two-way communication channels, health and safety committee, job satisfaction, and worker contracts - Training and education of employees <p>The "Society" the following criteria can be mentioned:</p> <ul style="list-style-type: none"> - Development support and positive actions towards society, including job creation, support of local suppliers, investments in research and development, infrastructure, and local community education programmes - Local community acceptance, such as complaints from society, and presence of communication channels - Ensuring of commitment to sustainability issues from and towards business partners

Many of the indicators listed in Table 8 aim at describing very specific aspects (especially economic and social aspects) and are, thus, not suitable to be applied for the status quo assessment that will be performed within Task 2.6 of this project. The **status-quo assessment** (Task 2.6) will mainly focus on urban waste flows



specifically generated by tourism activities in the URBANWASTE pilot cases, but will as well consider the environmental, social and economic aspects of waste generation in the pilot cases. Therefore, especially for describing social and economic aspect, only very general indicators will be selected for this first “baseline” assessment. Those indicators, further, have to allow displaying impacts on municipality level. Other, more specific social and economic indicators will be selected at a later stage of the project for the assessment in Task 7.1. This selection will be tailored specifically to the waste prevention measures and strategies that shall be implemented in the pilot cases in order to address the main social and economic impacts of those strategies. This selection can only be done after Task 4.1 (development of strategies) is completed.

As an LCA shall be performed within Task 2.6 (status quo assessment), the indicators listed in Table 8 for displaying the environmental impacts will be already considered in this first assessment. Underlying data requirements for the LCA are:

- a) Waste flows
- b) Energy flows for products and processes Emissions
- c) Emissions

The Inventory Analysis as first step of an LCA will be performed according to Figure 2. Focus on the data generation will be laid on Material- and related Waste Flows. Necessary Energy flows and resulting Emissions will be taken from generic Literature data and LCA Software Databases.

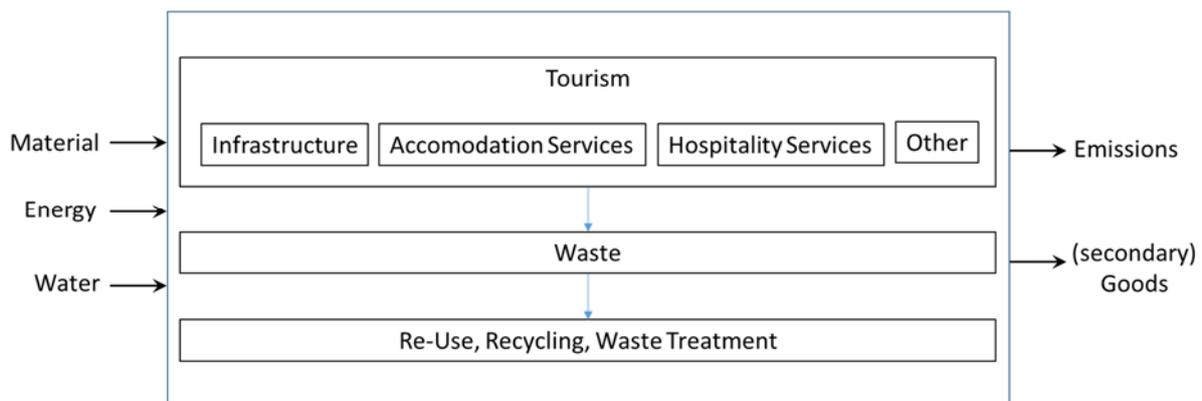


Figure 2: Elements of Inventory Analysis for Tourism and waste related LCA

Data on the use of energy can be taken from literature or statistical data (e.g. on energy mix in a region etc.) can be used. Depending on the availability of respective data it might be necessary to get back to the pilot cases for specific data at a later step in the project. Data on emissions is already embedded in the tools used for calculating LCA results (GaBi 6.0). The status quo assessment will be performed on the basis of generic data taking into account the different energy mixes of the different regions. Data on waste flows have to be collected from the URBANWASTE pilot cases within Task 2.5. Based on the Inventory results environmental impacts like Global Warming Potential are calculated according to characterisation factors recommended in ISO 14040 standard and the ILCD Handbook.

Therefore, **data on waste flows** as well as **basic socio-economic data** and **general tourism data** have to be collected from the pilot cases within Task 2.5 for the “baseline” assessment (Task 2.6). What kind of more specific data will be needed for the second assessment (Task 2.7) can only be decided at a later stage of the project.



4.3 Implications from cross-checking practicability of suitable indicators

The aim of cross-checking underlying the availability of underlying data requirements of indicators that seemed suitable to link waste generation with touristic processes (as identified in report “D 2.1 - Literature Review on Urban Metabolism Studies and Projects”) with the URBANWASTE pilot cases was to be able to finally select indicators that are not only suitable but also practicable specifically for the URBANWASTE context.

The analysis of the responses to the “Survey on data availability” revealed that for several data sets data availability was (very) low in the 11 pilot cases. Those data sets cannot be considered as being practicable for the URBANWASTE context and, thus, will not be included in the list of data requirements that shall be collected from the pilot cases that will be fed into Task2.4 (Annex 6.1). Some further data sets were excluded from this list by the authors as they were not considered relevant for assessing the current situation in the pilot cases within Task 2.6 (status quo assessment).

Cross-checking data availability with the pilot cases further provided information on the **spatial and temporal scales of data availability** which is another aspect that has to be considered when it comes to practicability of indicators for URBANWASTE.

Spatial Scale:

As the results of this survey on data availability in the pilot cases show hardly any of the data that were asked for are available on a smaller scale than the whole pilot case area (meaning for the whole city, municipality or metropolitan area). Data on smaller spatial scale (e.g. district level, city centre or tourist areas) is only available for a few pilot cases and for a very limited set of data requirements. As the comments made by pilot case partners show, some of the information regarding socio-economic factors influencing waste generation that was asked for only exist on regional or even national level.

Therefore, **all the data (sets) collected will be collected at the scale of the pilot case, meaning at city, municipality or metropolitan area level.** As pilot cases indicated that some of the information might be available only on regional or national level **the database template**, that will be developed within Task 2.4, **shall contain a separate column where the pilot cases have to specify the spatial scale for each data set.** Only with this information the data provided by the pilot cases can be interpreted correctly within Task 2.6.

Temporal Scale:

With the exemption of data related to waste generation most of the waste related data requirements are only available at annual intervals. Data on a monthly scale can be provided by only a few pilot cases and only for a very narrow set of data. Data on seasonal scale can be provided by hardly any pilot case. The results of the survey show that hardly any data on factors influencing waste generation as well as data regarding tourism related information can be provided on monthly or seasonal scale. It is mainly available on annual scale.

Therefore, **most of data** will only be collected at **annual scale** as it is not necessary for later analysis to have it in shorter intervals. Only **selected data sets** will be collected at **monthly scale**. These data (sets) are related to waste quantities and tourists (arrivals, overnight stays).



Time series:

With the exemption of data related to waste generation time series for the other data requirements that were asked for in this survey on data availability are available in about half of the pilot cases. For data related to waste generation a higher share of pilot cases can provide time series data. Nevertheless, the starting point of the available time series differs considerably between the pilot cases and different data sets: for waste related data requirements the starting points for time series differ between 1999 and 2015, for data on socio-economic factors influencing waste generation between 1992 and 2011 and for tourism related data time series start between 1990 and 2004.

As **time series are a commonly used option to model the influence of tourism on waste generation** the authors decided that collection time series data shall be done for selected data sets that will be included in the list of data requirements that will be fed into Task 2.4 (development of database template). A more detailed description of possible options to model the influence of tourism on waste generation is given in URBANWASTE D 2.1. **For selected data sets, time series data at annual scale** will be collected for the period **2000 – 2015**. For **some selected data sets, additionally**, also time series on **monthly** scale will be collected for the period **2013 – 2015**.

For many **data sets only the current status quo is important**. For those data sets, only data from 2015 and **no time series** data will be collected.

4.4 Final selection of multi-layered indicator sets

Based on the results from Task 2.1, Task 2.2 and the cross-checking of data availability with the pilot cases, the final selection of multi-layered indicator sets (together with defining the underlying data requirements) for mass-balances, environmental and socio-economic characteristics of pilot cases was carried out within this Task 2.3.

At this stage of the project, **only general indicators** suitable to be calculated in the **status quo assessment** (Task 2.6) that will be performed within URBANWASTE can be selected. Further, more specific indicators for the assessment of the environmental, economic and social impacts of selected waste prevention strategies (which will be developed within Task 4.1) within Task 7.1 can only be selected at a later stage of the project. As this selection will be tailored specifically to the waste prevention measures and strategies that shall be implemented in the pilot cases in order to address the main social and economic impacts of those strategies, it can only be done after the waste prevention strategies or measure that shall be implemented in the pilot cases are defined.

Therefore, for the **status quo assessment (Task 2.6)** commonly used **indicators describing the waste generation** of the pilot cases and **general tourism indicators**, which have been identified by the literature review performed in Task 2.1, are selected (e.g. waste generation (or disposal) rate or indicators related to the performance of the waste management system). As LCA was chosen to be the method used for assessing the **environmental aspects** (Chapter 4.2) **LCA-specific indicators** such as “Global Warming Potential (GWP)”, “Acidification Potential (AP)” or “Resource Depletion” will be calculated. For describing **social and economic aspects** of the current situation, also only very **general indicators** (such as GDP/cap.) will be calculated for this first “baseline” assessment. Those indicators, further, have to allow displaying impacts on municipality level. As



explained in Chapter 4.1, the final selection of indicators as well as the decision on the units for reporting on those selected indicators can only be made in Task 2.6 in the course of evaluating the collected data with statistical methodologies to identify which indicators / units are meaningful.

In **Annex 6.1** of this report, the whole **list of underlying data (sets) which have to be collected from the pilot cases** (within Task 2.5) **in order to calculate those indicators** in the subsequent assessments is presented. This list is the **main output of this Task 2.3** and will be the input for the development of the database template (Task 2.4).

The list of data (sets) that will be collected from the URBANWASTE pilot cases (within Task 2.5), which is presented in Annex 6.1, contains waste related data sets, socio-economic data sets as well as tourism related data sets. **Waste related data (sets)** cover aspects of waste generation (quantities), waste prevention and waste management. The listed data (sets) do not cover all waste types but only those types of waste that likely are influenced by touristic activities such as total municipal solid waste, separately collected waste fractions (e.g. paper, glass, plastics, organic waste ...), bulky waste (e.g. furniture, mattresses etc. from hotels) or waste from electrical and electronic equipment (WEEE) (e.g. TV-sets, refrigerators, cooling devices from hotels). **Data (sets) on socio-economic factors** that influence waste generation cover aspects describing the pilot cases in general (e.g. area, local resident population) as well as relevant aspects regarding economy and society of the pilot cases. **Tourism related data (sets)** cover aspects of tourism economy as well as of variables of (accommodation) capacity and occupancy.

The list further gives an **overview on the spatial and temporal scale** (including time series) of data collection that was decided for all listed data (sets). Regarding the **spatial scale of data collection** the authors decided – based on the results from cross-checking data availability with pilot cases – that all data shall be collected **at the spatial scale of the respective pilot case** (meaning at city or municipality level). Regarding the temporal scale, **most data** will only be collected at **annual scale**. Only **selected data sets** (such as data on waste quantities and tourist arrivals or overnight stays) will be collected at **monthly scale**. **Time series data (on monthly or annual scale)** will only be collected **for selected data sets** in order to allow the application of different modelling approaches in the assessments performed later in this project. Such data sets include data on waste quantities, local resident population, basic economic indicators and tourist arrivals or overnight stays. Time series data at annual scale will be collected for the period 2000 – 2015, time series on monthly scale will be collected only for the period 2013 – 2015. For the remaining data sets only the current status quo is important and no time series data will be collected.

This list of data (sets) that will be collected from the pilot cases for the status quo assessment (Task 2.6), as presented in Annex 6.1, thus, meets the following requirements:

- The listed data (sets) allow to **display and assess the main touristic processes in terms of waste generation („accommodation“; „food and beverage provision for tourists“)** in the **URBANWASTE pilot cases**: By asking for data on waste flows, on the waste management system and on tourism related aspects regarding accommodation, the influence of the touristic processes “accommodation” on waste generation can be displayed. In order to display the process “food and beverage provision for tourists” on municipality level mainly data on organic waste flows in combination with tourism data are relevant.



- **Data requirements resulting from the modelling approaches** are met by collecting **time series data** for selected indicator (sets) as well as **basic socio-economic data**, thus, allowing the application of different approaches for statistical data analysis and modelling in the subsequent assessments. As explained in Chapter 4.2, the **final decision on which modelling approach** will be used for the assessments can only be made in **Task 2.6**.
- The **requirements resulting from the modular design** that was chosen **for the status quo assessment** (Task 2.6) are mainly met by collecting data on waste flows. For the assessment of the environmental, economic and social impacts of the implementation of selected waste prevention measures and strategies that will be performed in a later stage of the project (Task 7.2) further, more specific indicators can only be selected after the waste prevention strategies or measure that shall be implemented in the pilot cases are defined.

4.5 Concluding remarks

At this stage of the project only the main indicators for the assessments that will be performed within URBANWASTE can be selected. Indicators identified by the literature review performed in Task 2.1 as being commonly used to link waste generation to touristic processes (Chapter 4.1) as well as indicators resulting from the modular approach that was chosen for the assessments (Chapter 4.2) as well as their underlying data requirements have already be defined in this deliverable D 2.3. Other, more specific indicators for the assessment of the environmental, economic and social impacts of waste prevention strategies (which will be developed within Task 4.1) within Task 7.1 can only be chosen at a later stage of the project after the waste prevention strategies or measure that shall be implemented in the pilot cases are defined.

To allow a comparison of environmental impact categories and to recognise their relevance normalisation of the results will be performed. Normalisation gives the possibility to show the impact indicator results relative to a reference amount. For the normalisation, reference quantities for a reference region or country (e.g. Europe or specific country) during a time period (e.g. 1 year) for each impact category are used. This allows a direct comparison of different impact results.

At this stage for operationalising the Urban Metabolism concept no weighting of Impact categories is foreseen. The first evaluation steps to follow an as transparent approach as possible will be performed for each impact category and for each sustainability pillar separately. At the end of the assessment process to assist decision makers by reducing complexity and providing them with a simple understandable statement weighting may be taken into account if necessary.

The weighing of Impact categories can be done at different levels:

- At the level of sustainability aspects: E.g.: Are economic indicators more important than environmental or social indicators?
- Within a sustainability aspect: E.g.: Is Global Warming Potential more important than Acidification Potential or Eutrophication Potential?



Report “D 2.2 - Methodology framework document as guidance for accompanying assessment” identified some methods such as MCDM or AHP that are dealing with ranking indicators for weighing purposes and thus could be helpful for this weighing process.

Based on the list of underlying data (sets) which have to be collected from the pilot cases, which is the main output of this Task 2.3, a database template will be developed within Task 2.4 for the subsequent collection of the input data (Task 2.5) that is necessary to calculate the indicator sets identified and selected as being suitable and practicable within this Task.

Besides of the catalogue of data (sets), the “Survey on data availability” also contained questions regarding, amongst others, a general description of: the waste management system, current waste prevention activities, tourism related information, etc. (Chapter 2 of the survey). The information resulting from this will subsequently be fed into Task 2.8 providing the basis for the description of current waste prevention and management practices in the URBANWASTE pilot cases which will be reported in the aligned Deliverable D 2.7.



5. References

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6. Annex

6.1 List of data requirements - input for database development (Task 2.4)

This list contains all underlying data (sets) which have to be collected from the pilot cases (within Task 2.5) in order to calculate those indicators in the subsequent assessments. This list is the main output of this Task 2.3 and will be the input for the development of the database template (Task 2.4).

Table 9: List of data requirements - input for database development (Task 2.4)

Data Requirements			Need of Time Series		Comments for database template development
Orig. Data (Set) ID	Data (Sets)	Unit	Annual Scale	Monthly Scale	
WASTE RELATED DATA					
Waste Generation (Waste Quantities)					
[1] = Sum of [2] to [8]	Municipal solid waste (MSW)	[t]	2000 - 2015	2013 - 2015	
[2]= Sum of [2a] to [2e]	Separately collected recyclables (Total amount)	[t]	2000 - 2015	2013 - 2015	
[2a]	• Paper and cardboard	[t]	2000 - 2015	2013 - 2015	
	Paper only	[t]	2000 - 2015	2013 - 2015	
	Cardboard only	[t]	2000 - 2015	2013 - 2015	
[2b]	• Glass	[t]	2000 - 2015	2013 - 2015	
[2c]	• Metals	[t]	2000 - 2015	2013 - 2015	
[2d]	• Plastics and compounds (e.g. multilayer packaging)	[t]	2000 - 2015	2013 - 2015	
	Plastics (Co-mingled fraction of rigid and soft plastics)	[t]	2000 - 2015	2013 - 2015	
	Rigid plastics only	[t]	2000 - 2015	2013 - 2015	
	Co-mingled fraction of metals and plastics	[t]	2000 - 2015	2013 - 2015	
	Co-mingled fraction of paper, cardboard, metals and plastics	[t]	2000 - 2015	2013 - 2015	
	Co-mingled fraction of plastics, aluminium (cans), board packaging	[t]	2000 - 2015	2013 - 2015	
	Packaging waste	[t]	2000 - 2015	2013 - 2015	
	Clothing, shoes, and textiles	[t]	2000 - 2015	2013 - 2015	
	Clothing only	[t]	2000 - 2015	2013 - 2015	
	Textiles only	[t]	2000 - 2015	2013 - 2015	
[2e]	• Other recyclables (please specify)	[t]	2000 - 2015	2013 - 2015	For this category there must be a column for the pilot case to specify which fractions "other recyclables" covers!



Data Requirements			Need of Time Series		Comments for database template development
Orig. Data (Set) ID	Data (Sets)	Unit	Annual Scale	Monthly Scale	
[3]= [3a]+[3b]	Total organic waste	[t]	2000 - 2015	2013 - 2015	
[3a]	• Organic waste from households (separately collected)	[t]	2000 - 2015	2013 - 2015	
[3b]	• Green waste (from public and private gardens)	[t]	2000 - 2015	2013 - 2015	
	Biodegradable waste from the kitchens, canteens, restaurants, bars	[t]	2000 - 2015	2013 - 2015	
[4]	Total WEEE (small and big, separately collected and assignable amounts from other waste streams)	[t]	2000 - 2015	2013 - 2015	
	Small WEEE (separately collected)	[t]	2000 - 2015	2013 - 2015	
	Big WEEE (refrigerator, washing machines, furniture, etc) (separately collected)	[t]	2000 - 2015	2013 - 2015	
[5]	Residual waste	[t]	2000 - 2015	2013 - 2015	
[6]	Bulky waste (including big WEEE)	[t]	2000 - 2015	2013 - 2015	
	Bulky waste (without big WEEE)	[t]	2000 - 2015	2013 - 2015	
[7]	Hazardous waste	[t]	2000 - 2015	2013 - 2015	
[19]	Total amount of street sweeping waste	[t]	2000 - 2015	2013 - 2015	
[19a]	Amount of litter (in % of street sweeping waste)	[%]	2000 - 2015	2013 - 2015	
[20]	Total solid waste from bins at beaches	[t]	2000 - 2015	2013 - 2015	
[21]	Total waste generated by touristic ships	[t]	2000 - 2015	2013 - 2015	
Waste Prevention					
[8]	Number of home composting bins provided to households	[Number]	2015		
[9]	Number of reuse centres	[Number]	2015		
[10]	Total amount of goods reused or waste prepared for reuse	[t]	2015		
Waste Management					
[12]	Number of bins / containers for separately collected recyclables in public areas	[Number]	2015		
	• Paper and cardboard		2015		
	Paper only		2015		
	Cardboard only		2015		
	• Glass		2015		
	• Metals		2015		
	• Plastics and compounds (e.g. multilayer packaging)		2015		
	Plastics (Co-mingled fraction of rigid and soft plastics)		2015		
	Rigid plastics only		2015		
	Co-mingled fraction of metals and plastics		2015		
	Co-mingled fraction of paper, cardboard, metals and plastics		2015		



Data Requirements			Need of Time Series		Comments for database template development
Orig. Data (Set) ID	Data (Sets)	Unit	Annual Scale	Monthly Scale	
	Co-mingled fraction of plastics, aluminium (cans), board packaging		2015		
	Packaging waste		2015		
	Clothing, shoes, and textiles		2015		
	Clothing only		2015		
	Textiles only		2015		
	• Other recyclables (please specify)		2015		
	• Organic waste from households (separately collected)		2015		
	• Green waste (from public and private gardens)		2015		
	Public containers for other waste fractions (please specify)		2015		For this category there must be a column for the pilot case to specify for which fractions this type of bin is!
[13]	Number of bins / containers for residual waste in public areas	[Number]	2015		
[14]	Collection (service) coverage rate for residual waste and recyclables	[%]	2015		
[15]	Waste management tax / fee for private individuals / private households per assessment basis	[€ / assessment Basis]	2015		For this category there must be a column for the pilot case to state to which assessment basis this data is related to!
[16a]	Waste management tax / fee for hotels per assessment basis	[€ / assessment basis]	2015		For this category there must be a column for the pilot case to state to which assessment basis this data is related to!
[16b]	Waste management tax / fee for restaurants / bars per assessment basis	[€ / assessment basis]	2015		For this category there must be a column for the pilot case to state to which assessment basis this data is related to!
[17]= [17a]+ [17b]	Total number of employees in waste management	[Number]	2015		
[17a]	Number of employees in waste management performed by the municipality (public employees)	[Number]	2015		
[17b]	Number of employees in waste management performed by private enterprises	[Number]	2015		
[18]	Municipal expenditures for cleaning of public spaces (total)	[€]	2015		
[18a]	• Municipal expenditures on street cleaning	[€]	2015		



Data Requirements			Need of Time Series		Comments for database template development
Orig. Data (Set) ID	Data (Sets)	Unit	Annual Scale	Monthly Scale	
[18b]	• Municipal expenditures on beach cleaning	[€]	2015		
SOCIO-ECONOMIC DATA					
Description of the Pilot Case					
[22]	Total local resident population	[Number]	2000 - 2015		
[22c]	Total number of migrants	[Number]	2000 - 2015		
[23]	Total Area	[km ²]	2015		
[24]	Total Beach Area	[km ²]	2015		
[25]	Total number of households	[Number]	2000 - 2015		
[25a]	Average household size	[Number]	2015		
[26]	Number of second homes (vacation homes)	[Number]	2000 - 2015		
Economy					
[27]	GDP per capita (at special scale of study area i.e. city or region)	[€]	2000 - 2015		
[28]	GNI per capita (at special scale of study area i.e. city or region)	[€]	2000 - 2015		
[29]	Household disposable income (at special scale of study area i.e. city or region)	[€]	2000 - 2015		
[30]	Economically active persons by sectors		2015		
[30a]	• Sector Agriculture (NACE Rev. 1 A, B)	[%]	2015		
[30b]	• Sector Industry (NACE Rev. 1 C-F)	[%]	2015		
[30c]	• Sector Services (NACE Rev. 1 G-P)	[%]	2015		
[31]	Employment rate	[%]	2015		
[32]	Unemployment rate	[%]	2015		
Society					
[33]	Population by broad age groups and gender (total=100%)		2015		
[33i]	Total female population	[%]	2015		
[33ii]	Total male population	[%]	2015		
[33a]	• Age 0-14	[%]	2015		
[33ai]	Female population age 0-14	[%]	2015		
[33aii]	Male population age 0-14	[%]	2015		
[33b]	• Age 15-59	[%]	2015		
[33bi]	Female population age 15-59	[%]	2015		
[33bii]	Male population age 15-59	[%]	2015		
[33c]	• Age 60 and more	[%]	2015		
[33ci]	Female population age 60 and more	[%]	2015		
[33cii]	Male population age 60 and more	[%]	2015		
Building Statistics					
[34]	Predominant heating type of buildings				
[34a]	District heating	[% of total]	2015		
[34b]	Single stove heating	[% of total]	2015		
[34c]	No heating	[% of total]	2015		



Data Requirements			Need of Time Series		Comments for database template development
Orig. Data (Set) ID	Data (Sets)	Unit	Annual Scale	Monthly Scale	
TOURISM RELATED DATA					
Tourism Economy					
[39]	Turnover of the tourism industry	[million EUR]	2000 - 2015		
Variables for (Accommodation) Capacity					
[40]	Number of tourist accommodation establishments per accommodation type				
	Number of hotels and similar accommodation	[Number]	2000 - 2015		
	Number of holiday and other short-stay accommodation	[Number]	2000 - 2015		
	Number of camping grounds, recreational vehicle parks and trailer parks	[Number]	2000 - 2015		
[40b]	Number of tourism accommodation establishments that are labelled with national or internationally recognized labelling schemes per accommodation type				
	Number of hotels and similar accommodation labelled with national or internationally recognized labelling schemes	[Number]	2000 - 2015		
	Number of holiday and other short-stay accommodation labelled with national or internationally recognized labelling schemes	[Number]	2000 - 2015		
	Number of camping grounds, recreational vehicle parks and trailer parks labelled with national or internationally recognized labelling schemes	[Number]	2000 - 2015		
[41]	Number of bed places by accommodation type				
	Number of bed places in hotels and similar accommodation	[Number]	2000 - 2015		
	Number of bed places in holiday and other short-stay accommodation	[Number]	2000 - 2015		
	Number of bed places in camping grounds, recreational vehicle parks and trailer parks	[Number]	2000 - 2015		
Variables for Occupancy					
[42]	Total number of tourist arrivals at the URBANWASTE pilot case area	[Number]	2000 - 2015	2013 - 2015	
[42a]	• by residents	[Number]	2000 - 2015	2013 - 2015	
[42b]	• by non-residents	[Number]	2000 - 2015	2013 - 2015	



Data Requirements			Need of Time Series		Comments for database template development
Orig. Data (Set) ID	Data (Sets)	Unit	Annual Scale	Monthly Scale	
[43]	Total number of tourist arrivals at a tourist accommodation establishment	[Number]	2000 - 2015	2013 - 2015	
[43a]	• by residents	[Number]	2000 - 2015	2013 - 2015	
[43b]	• by non-residents	[Number]	2000 - 2015	2013 - 2015	
[43c]	• Tourist arrivals split into types of tourist accommodation				
	Tourist arrivals in hotels and similar accommodation	[Number]	2000 - 2015	2013 - 2015	
	Tourist arrivals in holiday and other short-stay accommodation	[Number]	2000 - 2015	2013 - 2015	
	Tourist arrivals in camping grounds, recreational vehicle parks and trailer parks	[Number]	2000 - 2015	2013 - 2015	
[44]	Number of nights spent (overnight stays) in total	[Number]	2000 - 2015	2013 - 2015	
[44a]	• Nights spent by residents	[Number]	2000 - 2015	2013 - 2015	
[44b]	• Nights spent by non-residents	[Number]	2000 - 2015	2013 - 2015	
[44c]	Number of nights spent in different types of accommodation	[Number/ type]	2000 - 2015	2013 - 2015	
	Nights spent in hotels and similar accommodation	[Number]	2000 - 2015	2013 - 2015	
	Nights spent in holiday and other short-stay accommodation	[Number]	2000 - 2015	2013 - 2015	
	Nights spent in camping grounds, recreational vehicle parks and trailer parks	[Number]	2000 - 2015	2013 - 2015	
[45]	Average length of stay	[Days]	2000 - 2015		
[46]	Country of origin of tourists / Home destination of tourists	[Number/ country]	2000 - 2015		

Note: "Orig. ID" refers to the IDs used in the "Survey on Data Collection". Data (sets) without IDs are data sets that were added to this list of data (sets) that will be fed into Task 2.4 as a result of the analyses done within this Task 2.3.



6.2 SURVEY ON THE AVAILABILITY OF DATA

URBANWASTE – Task 2.3

SURVEY ON THE AVAILABILITY OF DATA REQUIRED TO LINK WASTE GENERATION WITH TOURISM

Feedback from URBANWASTE Pilot Cases on the catalogue of data requirements

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6.2 SURVEY ON THE AVAILABILITY OF DATA REQUIRED TO LINK WASTE GENERATION WITH TOURISM 43

Please return this questionnaire to **BOKU (iris.gruber@boku.ac.at)** by **29th of October**.

In case of questions please contact the URBANWASTE Partner responsible for the respective URBANWASTE pilot case (see Annex I).



1. Contact Information

URBANWASTE Pilot City	XXX	
Main Contact Person:	Name:	
	E-Mail:	
	Phone-Nr.:	
	Organization/ Authority:	
English speaking contact person from local waste management authority*:	Name:	
	E-Mail:	
	Phone-Nr.:	
	Position/ Function	
English speaking contact person from local tourism authority**:	Name:	
	E-Mail:	
	Phone-Nr.:	
	Position/ Function	

* in case the main contact person does not belong to the waste management authority

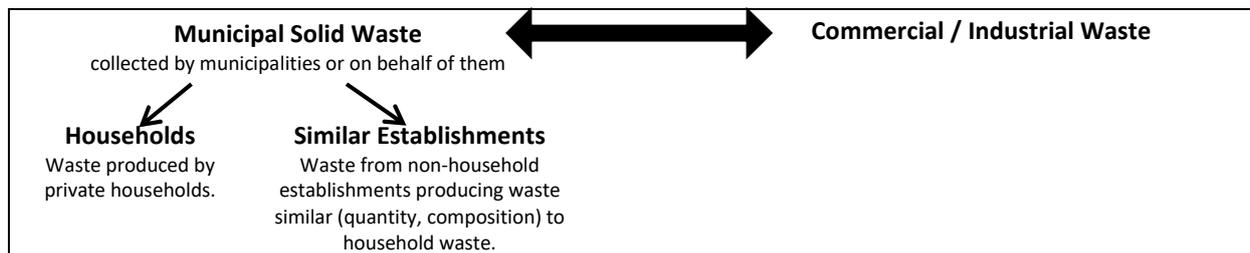
** in case the main contact person does not belong to the tourism authority



2. General questions on waste management in the URBANWASTE pilot cases

Please answer the following general questions (*terms in italics are defined in Annex II*):

WASTE MANAGEMENT



In our project the main focus is on municipal solid waste (MSW) which is defined as waste from households or similar establishments (e.g. commercial activities, office buildings, institutions such as schools and government buildings and small businesses) that produce waste similar (in quantity and quality) to household waste (*definition in Annex II, [1]*). Usually, MSW is collected by the municipality or on behalf of the municipality. Nevertheless, for our project it is also important to know if (and if yes: which) tourist establishments (e.g. hotels, restaurants, camping sites, marinas etc.) are not covered by municipal collection in the pilot case areas, but disposed via other waste collection and disposal systems.

1. Municipal solid waste:

- a. What do you understand by the term "*municipal solid waste (MSW)*"? Is your definition of MSW consistent with the definition of MSW provided in the "Definitions for catalogue of data requirements" (Annex II, [1])?
- b. Is *litter* (Annex II, [16a]) part of your definition of MSW?
- c. What do you understand by the term "*street sweeping waste*"?
 - i. Is your definition of street sweeping waste consistent with the definition provided in Annex II, [16]?
 - ii. What kinds of different waste streams are included in your local definition of "*street sweeping waste*"? Please state all the different waste streams composing "*street sweeping waste*".
For example, only waste that accumulates from street sweeping when cleaning large areas or also the contents of public waste bins and/or *litter*? Etc.
 - iii. Are there some **waste streams** included in **street sweeping waste** that show a **significant seasonal variation** in generated quantities? Please state these waste streams and indicate if you have monthly or seasonal



data on these waste streams showing seasonal variations.

(For example, in Austria in winter big amounts of grit, salt and de-icing products are part of street sweeping waste, in summer there is no grit in street sweeping waste.)

- iv. Are the management of street bins and street sweeping under the responsibility of the local authority managing municipal waste? If not: Who is responsible for managing street bins and street sweeping?

2. Survey of waste prevention actions:

- a. Are there some **waste prevention actions** active in the area of the URBANWASTE pilot case? (For example: home composting and others)
- b. Are there any **statements / voluntary agreements to reduce waste** by tourist facilities? (This means, for example, statements / voluntary agreements for the commitment to implement waste prevention best practices in hotels, restaurants and other tourist facilities. This might be associated with the assignment of labels from national or internationally recognized labelling schemes (e.g. EU Flower, ISO, Green Key, Nordic Swan etc. (but not just own labels within chain of hotels etc.) and/or discounts in the waste collection fees.)

3. Municipal waste collection:

- a. Who is responsible for the collection of MSW? Only the local waste management authority (public utility service)? The local waste management authority together with partners from the private sector? Only private enterprises on behalf of the local waste management authority? Which waste streams are collected by public utility, which are collected by private enterprises (on behalf of the local waste management authority)?
- b. Does waste collection by the local waste management authority cover only households or also *similar establishments (Annex II [16])* producing waste similar to household waste (e.g. schools, offices, public institutions, hotels, tourist establishments ...)?
- c. Is the waste collection service reinforced or changed during the year according to the touristic flows?
- d. Are the bins / containers tagged e.g. with a chip or optical code and linked to a specific location / customer? Is the waste weighed on site when collected?
- e. **Details of waste collection:**
 - i. Which **types of waste** are separately collected? (e.g. paper and cardboard, glass, plastics, metals, food and garden waste, *green waste*, clothing/textiles, *hazardous waste*, co-mingled fractions of recyclables (e.g. metals and plastics are collected together) ...)



- ii. Which **collection system** is used for which type of waste? (i.e. For which types of waste there is a kerbside collection? For which types of waste fractions there is bring-it-yourself system?)
 - iii. Are there **other options** available for households to give away certain types of waste? (e.g. provide clothing to charities, return certain types of waste (e.g. batteries, worn shoes, worn clothes ...) to retailers, etc. ...)
- f. Composition of residual waste:** Please provide the latest available data on **residual waste** composition (waste composition analysis).
- g. Details of waste treatment:**
- i. Please define the treatment / recycling for each separately collected waste fraction (including residual waste).
In case of co-mingled fractions (e.g. for recyclables), please specify the different fractions that are separated and how they are treated.
 - ii. Are there certain types of waste that have to be exported from the area of the respective URBANWASTE pilot case for treatment / recycling / landfilling?
 - 1. If yes, please state if the exported waste fractions are exported abroad for treatment / recycling / landfilling or if they are exported to a different region of the same country.
 - 2. If yes, please state which waste fractions are exported and what happens with this fraction (type of recycling, incineration, landfilling...).
- 4. Collection of waste from tourist establishments** (Hotels and similar accommodation (e.g. hostels, Bed&Breakfast), restaurants, camping sites, marinas, public structures such as museums, other tourist establishments important in your area):
- a.** Is the collection of waste from tourist establishments covered by municipal waste collection?
 - b.** If the collection of waste from tourist establishments is not covered by municipal waste collection, please answer the following questions:
 - i. **Who is responsible** for the collection of waste (local waste management authority, private enterprises, combination ...)?
 - ii. Which **types of waste** are separately collected from the different types of establishments? (Don't forget special systems for kitchen waste!)
 - iii. What kind of **collection system** is used for the different fractions?
 - iv. How are the different fractions **treated**?



- v. Is the waste collection service reinforced or changed during the year according to the touristic flows?
- vi. Are the bins / containers tagged e.g. with a chip or optical code and linked to a specific location / customer? Is the waste weighed on site when collected?

5. Touristic ships

- a. Are the **amounts of waste from** touristic ships³ included in municipal waste figures?
- b. **Disposal** of waste from touristic ships:
 - i. **Waste fractions:** Do touristic ships dispose only one (residual, mixed) waste fraction or do they dispose different waste fractions (e.g. residual waste, paper, metals ...)? If yes, which different waste fractions do they dispose? How are these fractions **treated** (e.g. sorted prior to further treatment, incineration, landfill)?
 - ii. Is waste from touristic ships covered by the waste collection of the local waste management authority?
 - 1. If yes: Is waste from touristic ships collected separately or together with waste from households?
 - 2. If no: Who is responsible for the collection of waste from touristic ships if it is not the local waste management authority?
- c. **Composition of waste from touristic ships:** Please provide the latest data on the composition of waste from touristic ships (waste composition analysis), if available.

TOURISM

6. Touristic ships:

- a. Are tourists that stay more than one day in the respective URBANWASTE pilot case area but sleep on the ship included in the total number of overnight stays?
- b. Are tourists arriving by ships included in the official municipal tourist numbers?
- c. How many percent of total tourists arrive by ships?

³ The term "**Touristic ships**" embraces all types of ships of different size that come from somewhere else and bring tourists to the pilot case area (e.g. cruise ships). Small boats that only offer sightseeing cruises on local rivers, channels or along local coast lines (e.g. "boat sightseeing" such as Gondola rides in Venice) are not included.



7. Seasonal variation of tourism:

Does the respective region have a seasonal variation in tourism? Please state the months of high season.

8. Private part time accommodation:

Do the official numbers on tourists include tourists staying in private part time accommodations (e.g. B&B, Airbnb)? If not, are there estimations for the number of tourists that stay in such accommodations available for the respective URBANWASTE pilot case?



9. Total number of tourist arrivals at the URBANWASTE pilot case area:

- a. Is there a possibility to collect data on the total number of incoming tourists for your URBANWASTE pilot case area?
- b. Do you have data that allows splitting the total number of incoming tourists (arrivals) at airports, harbours, train stations, bus stations, etc. within or in connection to your pilot case area into (1) the number of tourists actually visiting the pilot case area and (2) the number of tourists going elsewhere?

Description of URBANWASTE pilot case area:

- 10.** Please state the spatial (sub)division of the respective URBANWASTE pilot case: Does the area of this URBANWASTE pilot case only consist of a core city / municipal area or does it include a metropolitan area⁴?

⁴ A metropolitan area covers the core city / municipal area as well as the surroundings.



3. Catalogue of data requirements

Based on a literature review on studies on waste generation from tourism activities the project partners compiled a catalogue of indicators and background data requirements that are commonly used in academia to connect waste generation with tourism.

To identify which of these indicators and data requirements are suitable and practicable in practice, the eleven URBANWASTE pilot cases are asked to provide information on which of the data listed in the catalogue are available in the respective city.

The catalogue of data requirements is structured in three tables covering three thematic areas:

1. Waste related data requirements
2. Data requirements on factors influencing waste generation
3. Tourism related data requirements

Instructions:

- Please indicate **which data is available** in this URBANWASTE pilot case area with putting an “X” in the respective cell of the following tables and state if and since when time series data is available. (Please note, at this stage **you do not have to provide actual figures!**)
- Please state by putting an “X” in the respective cell on which spatial and temporal scale the required data (sets) are available (e.g. total amount of Municipal Solid Waste MSW is available for the whole city area and on district levels and on monthly and annual temporal scale).
- If time series data are available, please provide information since when (**please enter the year in the respective cell of the table**). If no time series data are available, please put an “X” in the cell labelled “Not available”.
- Cells already filled with  do not have to be filled out.
- For definitions of specific terms please consult Annex II (“definitions for catalogue of data requirements”).

General note:

Data on waste generation and population: Data on waste generation and population should relate to the same region and to the same time frame (time series). Example: If you provide data on waste generation for the whole city area from 2005 to 2015, data on population of the whole city area also should be provided for 2005 to 2015.



3.1 Waste related data requirements

Data Requirements			Data Availability									
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series		
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available	
Waste Quantities												
[1] = Sum of [2] to [8]	Municipal solid waste (MSW)	[t]										
[2] = Sum of [2a] to [2e]	Separately collected recyclables (Total amount)	[t]										
[2a]	• Paper and cardboard	[t]										
[2b]	• Glass	[t]										
[2c]	• Metals	[t]										
[2d]	• Plastics and compounds (e.g. multilayer packaging)	[t]										
[2e]	• Other recyclables (e.g. textiles, wood)	[t]										
[3]= [3a]+[3b]	Organic waste	[t]										
[3a]	• Separately collected organic waste	[t]										
[3b]	• Green waste	[t]										
[4]	WEEE	[t]										
[5]	Residual waste	[t]										
[6]	Bulky waste	[t]										
[7]	Hazardous waste	[t]										
Waste Prevention												
[8]	Number of home composting bins provided to households	[Number]										
[9]	Number of reuse centres	[Number]										
[10]	Total amount of goods reused or waste prepared for reuse	[t]										
Waste Management												
[11]	Number of provided bags or bins per separately collected fraction (e.g. paper & cardboard, ...) for households	[Number]										



Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
[12]	Number of bins / containers for separately collected recyclables in public areas	[Number]									
[13]	Number of bins / containers for residual waste in public areas	[Number]									
[14]	Collection (service) coverage rate for residual waste and recyclables	[%]									
[15]	Waste management tax / fee for private individuals / private households per assessment basis <ul style="list-style-type: none"> potential assessment basis e.g. person, household, type of waste bag / bin / container, frequency of collection, m2... [will be specified later] 	[€]									
[16]	Waste management fee /tax for similar establishments per assessment basis <ul style="list-style-type: none"> potential assessment basis = e.g. number of employees, commercial space, turnover, m2 ... [will be specified later] 	[€]									
[17]= [17a]+ [17b]	Total number of employees in waste management <ul style="list-style-type: none"> e.g. split into administrative personnel (municipal and waste industry respectively), waste collectors and staff at local recycling stations, treatment sites etc., employees in re-/up-cycling industry [will be specified later] 	[Number]									
[17a]	Number of employees in waste management performed by the municipality (public employees) <ul style="list-style-type: none"> e.g. split into administrative personnel (municipal and waste industry respectively), waste collectors and staff at local recycling centres, treatment sites etc., employees in re-/up-cycling industry [will be specified later] 	[Number]									



Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
[17b]	Number of employees in waste management performed by private enterprises <ul style="list-style-type: none"> e.g. split into administrative personnel (municipal and waste industry respectively), waste collectors and staff at local recycling centres, treatment sites etc., employees in re-/up-cycling industry [will be specified later] 	[Number]									
[18]	Municipal expenditures for the cleaning of public spaces (total)	[€]									
[18a]	• Municipal expenditures on street cleaning	[€]									
[18b]	• Municipal expenditures on beach cleaning	[€]									
[19]	Total amount of street sweeping waste	[t]									
[19a]	Amount of litter (in % of street sweeping waste)	[%]									
[20]	Total solid waste from bins at beaches	[t]									
[21]	Total waste generated by touristic ships	[t]									



3.2 Data requirements on factors influencing waste generation

Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
Description of the city / region											
[22]	Total local resident population	[Number]									
[22a]	• Number of commuters (if included in "total population")	[Number]									
[22b]	• Number of tourists (if included in "total population")	[Number]									
[22c]	Total number of migrants	[Number]									
[23]	Total Area	[km ²]									
[24]	Total Beach Area	[km ²]									
[25]	Total number of households	[Number]									
[25a]	Average household size	[Number]									
[26]	Number of second homes (vacation homes)	[Number]									
Economy											
[27]	GDP per capita (at special scale of study area i.e. city or region)	[€]									
[28]	GNI per capita (at special scale of study area i.e. city or region)	[€]									
[29]	Household disposable income (at special scale of study area i.e. city or region)	[€]									
[30]	Economically active persons by sectors										
[30a]	• Sector Agriculture (NACE Rev.1 A, B)	[%]									
[30b]	• Sector Industry (NACE Rev.1 C-F)	[%]									
[30c]	• Sector Services (NACE Rev.1 G-P)	[%]									
[31]	Employment rate	[%]									
[32]	Unemployment rate	[%]									
Society											
[33]	Population by broad age groups and gender (total=100%)										
[33i]	Total female population	[%]									
[33ii]	Total male population	[%]									
[33a]	• Age 0-14	[%]									



Data Requirements			Data Availability								
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series	
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available
[33ai]	Female population age 0-14	[%]									
[33aii]	Male population age 0-14	[%]									
[33b]	• Age 15-59	[%]									
[33bi]	Female population age 15-59	[%]									
[33bii]	Male population age 15-59	[%]									
[33c]	• Age 60 and more	[%]									
[33ci]	Female population age 60 and more	[%]									
[33cii]	Male population age 60 and more	[%]									
Building statistics											
[34]	Predominant heating type of buildings • e.g. split into: District heating / Block heating; central heating (whole building); gas heating system; electric heating system; central heating (apartment level); single stove heating; no heating [will be specified later]	[Number/ heating type] or [% of total]									



3.3 Tourism related data requirements

Data Requirements			Data Availability									
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series		
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available	
Tourism economy												
[35]	Number of persons employed in different categories of tourist attractions • e.g. split into: cultural/natural heritage, entertainment, sports, events etc. [will be specified later]	[Number/category]										
[36]	Number of persons employed in different types of tourism enterprises • split into hotels, restaurants, ... [will be specified later]	[Number/type]										
[37]	Number of commuters working in the tourism industry	[Number]										
[38]	Number of seasonal workers in the tourism industry	[Number]										
[39]	Turnover of the tourism industry	[million EUR]										
Variables for (accommodation) capacity												
[40]	Number of tourist accommodation establishments by accommodation type • split into different types of tourist accommodation such as: hotels and similar accommodation; holiday and other short-stay accommodation; camping grounds, recreational vehicle parks and trailer parks	[Number/type]										
[40a]	Share of tourist accommodation establishments that are open all year	%										



Data Requirements			Data Availability									
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series		
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available	
[40b]	Number of tourism accommodation establishments that are labelled with national or internationally recognized labelling schemes <ul style="list-style-type: none"> split into different types of tourist accommodation such as: hotels and similar accommodation; holiday and other short-stay accommodation; camping grounds, recreational vehicle parks and trailer parks 	[Number/type]										
[41]	Number of bed places by accommodation type <ul style="list-style-type: none"> split into different types of tourist accommodation such as: hotels and similar accommodation; holiday and other short-stay accommodation; camping grounds, recreational vehicle parks and trailer parks 	[Number/type]										
Variables for occupancy												
[42]	Total number of tourist arrivals at the URBANSWASTE pilot case area	[Number]										
[42a]	• by domestic tourists	[Number]										
[42b]	• by international tourists	[Number]										
[42c]	• Tourist arrivals split into places they arrive at (e.g. airports, harbour, etc.)	[Number/type]										
[43]	Total number of tourist arrivals at a tourist accommodation establishment	[Number]										
[43a]	• by domestic tourists	[Number]										
[43b]	• by international tourists	[Number]										
[43c]	• Tourist arrivals split into types of tourist accommodation	[Number/type]										
[44]	Number of nights spent (overnight stays) in total	[Number]										
[44a]	• Nights spent by domestic tourists	[Number]										
[44b]	• Nights spent by international tourists	[Number]										
[44c]	• Number of nights spent in different types of accommodation	[Number/type]										



Data Requirements			Data Availability									
Data (Set) ID	Required Data (Sets)	Unit	Spatial Scale				Temporal Scale			Time series		
			Whole City / Metropolitan Area	District Level	City Centre	Tourist Areas	Monthly	Seasonal	Annual	Time series data available since ...	Not available	
[45]	Average length of stay	[Days]										
[46]	Country of origin of tourists / Home destination of tourists	[Number/country]										
[47]	Number of beach users	[Number]										



4. Annex I: In case of questions please contact ...

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Copenhagen (DK)	AU	Trine Bjørn Olsen trbjol@btech.au.dk
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5. Annex II: Definitions for the catalogue of data requirements

Data-set ID		Definition
DEFINITIONS FOR WASTE RELATED DATA REQUIREMENTS		
[1]-[8]	Waste generation	The weight or volume of materials and products that enter the waste stream before recycling, composting, landfilling, or combustion takes place. Also can represent the amount of waste generated by a given source or category of sources. Source: EEA
[1]	Municipal solid waste	All types of solid waste that are collected by municipalities or by order of them . They include waste originating from households and similar establishments (e.g. commercial activities, office buildings, institutions such as schools and government buildings and small businesses) that produce waste similar (quantity and quality) to household waste and dispose of waste at the same facilities used for municipally collected waste. They also include similar waste from rural areas, even if they are disposed by the generator. The definition goes on to include: similar wastes generated by the same sources that are collected or purchased for recycling, even if the material does not enter the same waste stream (including separately collected fractions); white goods, bulky waste; street sweepings and the content of litter containers, if managed as solid waste. Source: EEA Report
[2]	Recyclables	Waste streams collected separately (one waste stream not mixed with other waste streams) with negligible contamination going to a sorting or recycling facility, Source: R4R-project
[2b]	Glass	Bottles and jars without deposit Source: LCA/IWM-project
[2c]	Metals	Total of packaging and non-packaging Source: LCA/IWM-project
[2d]	Plastics and compounds	Total of packaging and non-packaging Source: LCA/IWM-project
[2e]	Other recyclables	Textiles, wood etc.. Source: LCA/IWM-project
[3]	Organic waste	Food (kitchen) waste and garden waste (including pruning wood). Source: LCA/IWM-project and R4R-project
[3a]	Separately collected organic waste	Food and garden waste collected in bio-bins Source: LCA/IWM-project
[3b]	Green waste	Bulky organic waste from private and public gardens Source: LCA/IWM-project
[4]	WEEE	Waste from electrical and electronic equipment Source: LCA/IWM-project
[5]	Residual waste	Mixed waste collected from households and other sources. Source: EEA
[6]	Bulky waste	Large items of waste material that do not fit into the regular waste containers because of their size and nature (e.g. furniture, large car parts, trees, electrical appliances such as white goods, bicycles, rugs etc.) .
[7]	Hazardous waste	Waste that because of their chemical reactivity, toxic, explosive, corrosive, radioactive or other characteristics, cause danger, or likely to cause danger, to health or the environment. See also: EC Directive on hazardous waste, HWC (hazardous waste catalogue). Source: LCA-IWM-project
[8]	Home composting	Composting of organic waste by private households by having a compost pile in their backyards/gardens or by using special composting bins on their premises.
[9]	Reuse	Reuse means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived. Source: EU Waste Framework Directive 2008
[9]	Reuse centres	Reuse centres are service establishments that facilitate the transaction and redistribution of reusable goods. They take possession of the donated materials and make them available for redistribution or sale. Source: Wikipedia
[10]	Goods reused or waste prepared for reuse	Reusable goods are unwanted, yet perfectly usable products or components of products. Preparing for re-use' means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing. Source: EU Waste Framework Directive 2008



Data-set ID		Definition
[11]	Bags and bins provided	Type of bags and bins: e.g. bags, bins smaller 300 ltr, bins from 300 to 1.100 ltr, bins larger 1.100 ltr, large containers [will be specified later] Source: LCA-IWM-project
[14]	Collection (service) coverage rate	How many people are served as a % of the total population. Source: draft WATRA-Project
[16]	Similar establishments	Similar establishments are non-household waste producers producing waste similar (in quantity and quality) to household waste (e.g. commercial activities, office buildings, institutions such as schools and government buildings and small businesses).
[19]	Street Sweeping Waste	Street sweeping waste refers to waste that accumulates from street sweeping when cleaning large areas (sometimes including the contents of public waste bins). Street-sweepings consist mostly of materials such as grit, dust, salt, and de-icing products, abraded particles of the roadbed, interspersed with organic components of soil, roadside greenery, leaves, etc., as well as harmful substances related to motor vehicles, such as abraded particles from tyres and brake linings, heavy metals from exhaust fumes, and the residue from car leaks, as well as waste from collection containers along the roadside and in parks and public squares. Source: Austrian Federal Waste Management Plan 2006
[19a]	Litter	Litter means small pieces of rubbish (e.g. cans, paper, plastic bottles) that have been left lying on the ground in public places. Source: Cambridge Dictionary
DEFINITIONS FOR DATA REQUIREMENTS FOR FACTORS OF INFLUENCE ON WASTE GENERATION		
[22]	Total local resident population	For census purposes, the total population of the country consists of all persons falling within the scope of the census. In the broadest sense, the total may comprise either all usual residents of the country or all persons present in the country at the time of the census. The total of all usual residents is generally referred to as the de jure population and the total of all persons present as the de facto population. Source: OECD
[22a], [37]	Commuters	A commuter is someone who regularly travels from the region where they have their permanent residence to a different region in order to be at their place of work. Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_commuting_patterns_at_regional_level
[22b]	Tourist	For tourism statistics, a <u>traveller</u> is someone who moves between different geographic locations, for any purpose and any duration. A <u>visitor</u> is a traveller taking a trip to a main destination outside his/her usual environment, for less than a year, for any main purpose (business, leisure or other personal purpose) other than to be employed by a resident entity in the country or place visited. These trips taken by visitors qualify as tourism trips. A visitor is classified as tourist (or overnight visitor), if his/her trip includes an overnight stay, or same-day visitor (or excursionist), if his/her trip does not include an overnight stay. Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Tourist
[22c]	Migrants	The Special Rapporteur of the Commission on Human Rights has proposed that the following persons should be considered as migrants: (a) Persons who are outside the territory of the State of which they are nationals or citizens, are not subject to its legal protection and are in the territory of another State; (b) Persons who do not enjoy the general legal recognition of rights which is inherent in the granting by the host State of the status of refugee, naturalised person or of similar status; (c) Persons who do not enjoy either general legal protection of their fundamental rights by virtue of diplomatic agreements, visas or other agreements. This broad definition of migrants reflects the current difficulty in distinguishing between migrants who leave their countries because of political persecution, conflicts, economic problems, environmental degradation or a combination of these reasons and those who do so in search of conditions of survival or well-being that does not exist in their place of origin. It also attempts to define migrant population in a way that takes new situations into consideration. Source: http://www.unesco.org/new/en/social-and-human-sciences/themes/international-migration/glossary/migrant/
[23]	Total area	Total area of a city or region including green space, built-up area, roads/streets, bodies of water, ... Source: LCA/IWM-Project



Data-set ID		Definition
[25]	Total number of households	Total number of households existing within the region/city. Source: LCA/IWM-Project A household is a small group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food. Source: Eurostat
[25a]	Average household size	Average number of persons per household.
[26]	Second home /vacation home	A second home/ vacation home (sometimes also designated as a holiday home) is a secondary dwelling that is visited by the members of the household mostly for purposes of recreation, vacation or any other form of leisure. Trips should not be so frequent and the duration of the stay so large as to turn the secondary dwelling into the principal dwelling of the visitor. Source: UN_Dep.ESA_2010_International Recommendations for Tourism Statistics 2008
[27]	GDP	Gross domestic product is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units. Source: OECD
[28]	GNI	Gross national income (GNI) is GDP less net taxes on production and imports, less compensation of employees and property income payable to the rest of the world plus the corresponding items receivable from the rest of the world (in other words, GDP less primary incomes payable to non-resident units plus primary incomes receivable from non-resident units). Source: OECD
[29]	Household disposable income	Real household net disposable income is defined as the sum of household final consumption expenditure and savings, minus the change in net equity of households in pension funds. This indicator also corresponds to the sum of wages and salaries, mixed income, net property income, net current transfers and social benefits other than social transfers in kind, less taxes on income and wealth and social security contributions paid by employees, the self-employed and the unemployed. Household gross adjusted disposable income additionally reallocates "income" from government and non-profit institutions serving households (NPISHs) to households to reflect social transfers in kind. These transfers reflect expenditures made by government or NPISHs on individual goods and services, such as health and education, on behalf of an individual household. The indicator includes the disposable income of non-profit institutions serving households. Disposable income, as a concept, is closer to the idea of income as generally understood in economics, than is either national income or gross domestic product (GDP). This indicator is measured in terms of net in annual growth rates and in terms of gross adjusted in USD per capita at current prices and PPPs. Source: https://data.oecd.org/hha/household-disposable-income.htm



Data-set ID		Definition
[30]	Economically active population (Economically active persons) by economic sectors according to NACE Rev. 1 & ISIC Rev. 3	<p>Economically active population comprises all persons of either sex who furnish the supply of labour for the production of economic goods and services as defined by the United Nations System of National Accounts during a specified time-reference period (=Economically active persons). Source: OECD</p> <p>Classification NACE Rev. 1 (resp. ISIC Rev. 3):</p> <p>Sector Agriculture:</p> <ul style="list-style-type: none"> A Agriculture, hunting and forestry B Fishing <p>Sector Industry:</p> <ul style="list-style-type: none"> C Mining and quarrying D Manufacturing E Electricity, gas and water supply F Construction <p>Sector Services:</p> <ul style="list-style-type: none"> G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods H Hotels and restaurants I Transport, storage and communication J Financial intermediation K Real estate, renting and business activities L Public administration and defence; compulsory social security M Education N Health and social work O Other community, social and personal service activities P Private households with employed persons
[31]	Employment rate	Employment rate represent persons in employment as a percentage of the population of working age (15-64 years). Source: Eurostat
[32]	Unemployment rate	The unemployment rate gives the number of unemployed persons as a percentage of the civilian labour force (total labour force excluding armed labour force). Source: OECD
[33]	Population by broad age groups and gender	Fill the percentage of population divided into three age groups: Age 0 to 14 [%] - Age 15 to 59 [%] - Age 60 and more [%] Source: LCA/IWM-Project
Definitions for tourism related data requirements		
[39]	Turnover	<p>Turnover, in the context of structural business statistics, comprises the totals invoiced by the observation unit during the reference period, and this corresponds to the total value of market sales of goods and services to third parties.</p> <p>Turnover includes:</p> <ul style="list-style-type: none"> - all duties and taxes on the goods or services invoiced by the unit with the exception of the value-added tax (VAT) invoiced by the unit vis-à-vis its customer and other similar deductible taxes directly linked to turnover; - all other charges (transport, packaging, etc.) passed on to the customer, even if these charges are listed separately on the invoice. <p>Reductions in price, rebates and discounts as well as the value of returned packing must be deducted.</p> <p>Excluded are:</p> <ul style="list-style-type: none"> - income classified as other operating income, financial income and extraordinary income in company accounts; - operating subsidies received from public authorities or the institutions of the European Union (EU). <p>Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Turnover_-_SBS (08.07.2016)</p>



Data-set ID		Definition
[40]	Tourist accommodation establishment	<p>A tourist accommodation establishment is a local kind-of-activity unit (an enterprise or part of an enterprise). It includes all establishments providing, as a paid service, accommodation for tourists, regardless of whether or not the provision of tourist accommodation is the main or a secondary activity of the enterprise to which the establishment belongs. As such, all establishments providing accommodation are covered, even if a major part of their turnover comes from restaurant / catering services or other services.</p> <p>Tourism accommodation establishments are classified and described in groups according to Section I.55 of NACE Rev. 2 classification as follow:</p> <p>55.1 (hotels and similar accommodation), 55.2 (holiday and other short-stay accommodation) and 55.3 (camping grounds, recreational vehicle parks and trailer parks).</p> <p>Class 55.1 - Hotels and similar accommodation. This class includes the provision of accommodation, typically on a daily or weekly basis, principally for short stays by visitors. This includes the provision of furnished accommodation in guest rooms and suites. Services include daily cleaning and bed-making. A range of additional services may be provided such as food and beverage services, parking, laundry services, swimming pools and exercise rooms, recreational facilities as well as conference and convention facilities. This class includes accommodation provided by: hotels (and similar establishments, for instance operating under the name 'bed & breakfast'); resort hotels; suite/apartment hotels; motels. This class excludes provision of homes and furnished or unfurnished flats or apartments for more permanent use, typically on a monthly or annual basis, see division 68.</p> <p>Class 55.2 - Holiday and other short-stay accommodation. This class includes the provision of accommodation, typically on a daily or weekly basis, principally for short stays by visitors, in self-contained space consisting of complete furnished rooms or areas for living/dining and sleeping, with cooking facilities or fully equipped kitchens. This may take the form of apartments or flats in small free-standing multi-storey buildings or clusters of buildings, or single storey bungalows, chalets, cottages and cabins. Very minimal complementary services, if any, are provided. This class includes accommodation provided by: children and other holiday homes; visitor flats and bungalows; cottages and cabins without housekeeping services; youth hostels and mountain refuges.</p> <p>Class 55.3 - Camping grounds, recreational vehicle parks and trailer parks. This class includes: provision of accommodation in campgrounds, trailer parks, recreational camps and fishing and hunting camps for short stay visitors; provision of space and facilities for recreational vehicles. This class also includes accommodation provided by: protective shelters or plain bivouac facilities for placing tents and/or sleeping bags. This class excludes: mountain refuge, cabins and hostels, see 55.20.</p> <p>No regional statistics are available for nights spent in non-rented accommodation (= occupancy of dwellings by tourists, on a non-commercial basis, either as a service provided without charge by family or friends or on own account like secondary homes...) or for same-day visits. Source: Eurostat_2014: Methodological Manual for tourism statistics</p>
[40b]	National or internationally recognized labelling schemes	National or internationally recognized labelling schemes include e.g. EU Ecolabel, ISO, Green Key, Nordic Swan etc. (but not just own labels within chains of hotels and similar).
[41]	Bed places	<p>The number of bed places in a tourist accommodation establishment is determined by the number of persons who can stay overnight in the beds set up in the establishment, ignoring any extra beds that may be set up upon customer request. The term bed place applies to a single bed; a double bed is counted as two bed places.</p> <p>The unit serves to measure the capacity of any type of accommodation. A bed place is also a place on a pitch or on a mooring in a boat to accommodate one person. One pitch for camping / tent, caravan or similar shelter and one mooring for boat should be counted for 4 bed places if the actual number of bed places is not known.</p> <p>Source: Eurostat_2014: Methodological Manual for tourism statistics</p>
[42]	Total number of tourist arrivals at the URBANWASTE pilot case area	<p>The total number of tourist arrivals at the URBANWASTE pilot case area refers to the number of visitors (international and domestic) who arrive during a given year in the area of the URBANWASTE pilot case and who are staying at least one night.</p> <p>A tourist is any visitor who stays at least one night in collective or private accommodation.</p>



Data-set ID		Definition
[43]	Tourist arrival at a tourist accommodation establishment	Within the context of European Union (EU) tourism statistics, an arrival is defined as a tourist who arrives at a tourist accommodation establishment (rented accommodation) or at a non-rented accommodation; in the scope of the Tourism Regulation, however, no data for the latter are collected. Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Arrival_of_tourist_at_a_tourist_accommodation_establishment
[44]	Night spent or tourist night (overnight stay)	A night spent or tourist night (overnight stay) is each night a guest / tourist (resident or non-resident) actually spends (sleeps or stays) in a tourist accommodation establishment or non-rented accommodation. Source: Eurostat_2014: Methodological Manual for tourism statistics It covers the total number of nights spent at destination. Source: (LCA-IWM / Eurostat)
[45]	Average length of stay	The average length of stay for a number of tourism trips is calculated by dividing the total number of nights spent by the total number of tourism trips. Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Average_length_of_stay



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IN TOURIST CITIES

