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Water Management in Tourism

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01.

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An important aspect of our project involved an intermediate workshop in Málaga, where stakeholders from the tourism sector, local authorities, water utility organizations and other representatives were present. We are very happy with the active participation and engagement during this workshop, which provided various new insights for this report.

Furthermore, two online workshops were organized for tourism observatories worldwide. A special thanks to Prof. Dr. Nurlisa Ginting from the Sustainable Tourism Observatory of Lake Toba (Indonesia) and Ellen Walker-Matthews from the Sustainable Tourism Observatory / Thompson Okanagan Tourism Association (Canada) for sharing their regional findings in the form of a presentation.

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02.

About this report

Growing water scarcity and water stress put pressure on freshwater resources worldwide. Water is a vital source to the tourism sector. The tourism sector is multifaceted and complex because of its interconnectedness and overlap with other industries. It operates at different scales, from single facilities to entire countries. Key water users in the tourism sector include hotels, restaurants and recreational activities. Besides that, water is also indirectly used in the supply chain of goods and services for tourists (e.g., the water used for the production of food). Water measurements and implementation of water-saving measures in the tourism sector are important aspects for effective water management.

This report is designed to provide preliminary guidance to engage in improving efficiency in water management in the tourism sector with a focus on water consumption aspects. The introduction presents the issues of water scarcity and gives an overview of **existing water management frameworks**. Then, the **various users** of water in tourism, both direct and indirect, are discussed. Additionally, various **measurement methods** are presented. Finally, some considerations regarding **water-saving measures** are discussed and complemented with good practices.

In addressing water management in the tourism sector, it is important to distinguish between different scales of management. In this report, a distinction is made between two scales:

- **Facility-scale:** This refers to water management practices within individual tourism facilities, such as hotels, restaurants, resorts and facilities for recreational activities.

- **Destination-scale:** This involves broader management that impact an entire tourism destination such as a city, municipality or region.

As part of the preparation of this report, a workshop was organized in the city of Málaga, Spain. Stakeholders from the tourism sector, local authorities, water utility organizations and other representatives were invited to apply the findings of this report from a global point of view to their specific context. The sessions were designed to foster dialogue, clarify uncertainties and integrate feedback from the participants. Photos from this workshop can be found in Appendix 1.

Additionally, two online workshops were held. This provided a platform for knowledge exchange and additional reflection for this report. In this report, each chapter ends with a summary of the main findings from the three workshops.

This report seeks to clarify the understanding of the tourism sector's role in the global, broader water management discussion. It facilitates understanding and action by tourism managers and local authorities.

03.

Introduction

Fresh water is one of the most vital sources for humans

It is essential for food production, energy generation, industrial manufacturing and ecosystem sustainability. However, increasing competition between different sectors, changed weather conditions and decreasing water quality has put pressure on freshwater resources (IPCC, 2021). In some geographic areas this can lead to growing water scarcity and subsequent water stress, which, among others, impacts economic and social development.

The importance of water in facilitating development is universally recognized. It is not surprising that water holds a prominent position on global and national development agendas. In 2010, The UN General Assembly established the right to safe and clean drinking water and sanitation as a human right (UN-Water, 2010). This triggered increasing attention and action towards addressing global water and sanitation challenges.

'Ensuring availability and sustainable management of water and sanitation for all' is number 6 of the 17 Sustainable Development Goals that all the UN member states agreed on in 2015 for the agenda of 2030 (UN General Assembly, 2015). Sustainable Development Goal 6 (SDG 6) sets six specific targets, which are listed in Table 1. For every target, one or two indicators are used to track progression towards reaching SDG 6 (also in Table 1).

Table 1. Targets, indicators and agencies-databases for SDG 6 (Ortigara et al., 2018).

Target	Indicator (Custodian Agencies)	Custodian Agencies Databases
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all.	**6.1.1** Proportion of population using safely managed drinking water services (World Health Organization (WHO)/ United Nations Children's Fund (UNICEF))	WHO/UNICEF, JMP global database*
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.	**6.2.1.a** Proportion of population using safely managed sanitation services (WHO/UNICEF)	WHO/UNICEF, JMP global database*
	6.2.1.b Proportion of population using a handwashing facility with soap and water available (WHO/UNICEF)	
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.	**6.3.1** Proportion of wastewater safely treated (WHO/United Nations Humans Settlements Program (UN-Habitat)/ United Nations Statistics Division (UNSD))	WHO/UNICEF, JMP global database, UN-Habitat
	6.3.2 Proportion of bodies of water with good ambient water quality (United Nations Environment Program (UNEP), UNSD)	United Nations Enviroment Program, GEMStat water-quality database****
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.	**6.4.1** Change in water-use efficiency over time (Food and Agriculture Organization of the United Nations (FAO))	FAO, AQUASTAT***, World Bank
	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (FAO)	FAO, AQUASTAT***
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.	**6.5.1** Degree of integrated water resources management implementation (0-100) (United Nations Environment Program)	United Nations Environment Program, IWRM data portal**
	6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation (United Nations Educational, Scientific, and Cultural Organization (UNESCO)/United Nations Economic Commission for Europe (UNECE)	UNECE, UNESCO
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes.	**6.6.1** Change in the extent of water-related ecosystems over time (United Nations Environment Program / Ramsar Convention)	United Nations Environment Program, Ramsar Convention

Global water risk

Different regions face water scarcity in distinct ways, shaped by factors like geography, climate, and socio-economic conditions. To address the complexities of water scarcity, various standards and tools exist to evaluate and contextualize water availability and usage. One of those standards is provided by the World Resource Institute, illustrated in Figure 1. This figure shows the worldwide overall water risk caused by insufficient water quantity, poor water quality, and regulatory and reputational issues (e.g., lack of drinking water and/or sanitation). Water stress is one of the (sub) indicators to determine the overall risk. It is furthermore one of the two indicators for SDG 6.4 (Table 1). Water stress is defined as 'freshwater withdrawal as a proportion of available freshwater resources' (FAO, n.d.). Many countries in the world face problems with growing water stress. Aggregating water stress data on country level, Kuzma et al. (2023) concluded that 25 countries face "extremely high" water stress on an annual basis and this number is expected to increase in the near future. This level of extremely high water stress indicates that at least 80% of renewable water supplies are consumed each year. In Appendix 3, an overview of other water related standards and tools are given.

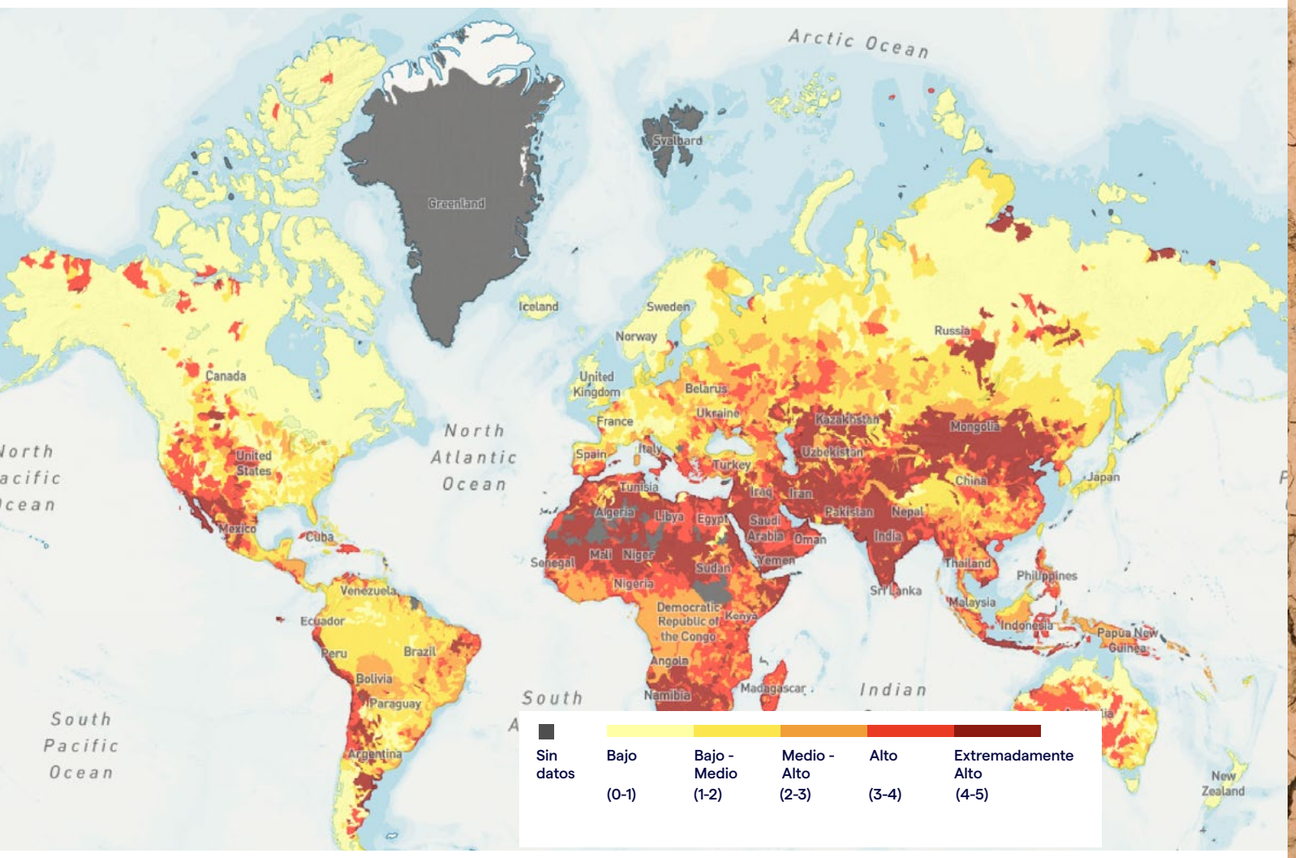


Figure 1. Overall water risk with default weighting; Water risk caused due to water quantity (69 %), water quality (12 %), and regulatory and reputational (18 %) issues (adapted from World Resource Institute, n.d.).

25 countries

Extremely high water stress level

80%
Of renewable water reserves

As for many sectors, water is also a vital source for the tourism sector.

Tourists use water during their stay at their accommodation and during recreational activities. Besides this direct water consumption, tourists also indirectly consume water. Examples of indirect water consumption by tourists include the water used during transportation and the water embedded in the supply chain of food for their diets.

The World Travel & Tourism Organization estimates that tourism accounts for between 3.5% and 5.8% of global water consumption (WTTC, 2023). Notably, around 80% of this water consumption is indirect, meaning that direct water use by the tourism sector contributes to approximately 1% of global water consumption. This number is relatively low compared to other sectors, such as agriculture, which accounts for 69% of global water consumption (FAO, n.d.).

Challenges arise from unequal distribution of water resources on a geographical and seasonal scale. Across regions characterized by higher water stress, tourism usually accounts for a larger percentage of water use (WTTC, 2023). 69% of water that was consumed in the tourism sector in 2019 was extracted from regions facing medium till extremely high water stress (WTTC, 2023) (Figure 3). Also, the number of tourist's arrivals is often highest during dry periods with minor precipitation. Figure 2 illustrates the seasonality of tourist arrivals and precipitation in Zanzibar, Tanzania. In this example, tourist arrivals peak during April and May, coinciding with periods of low precipitation.

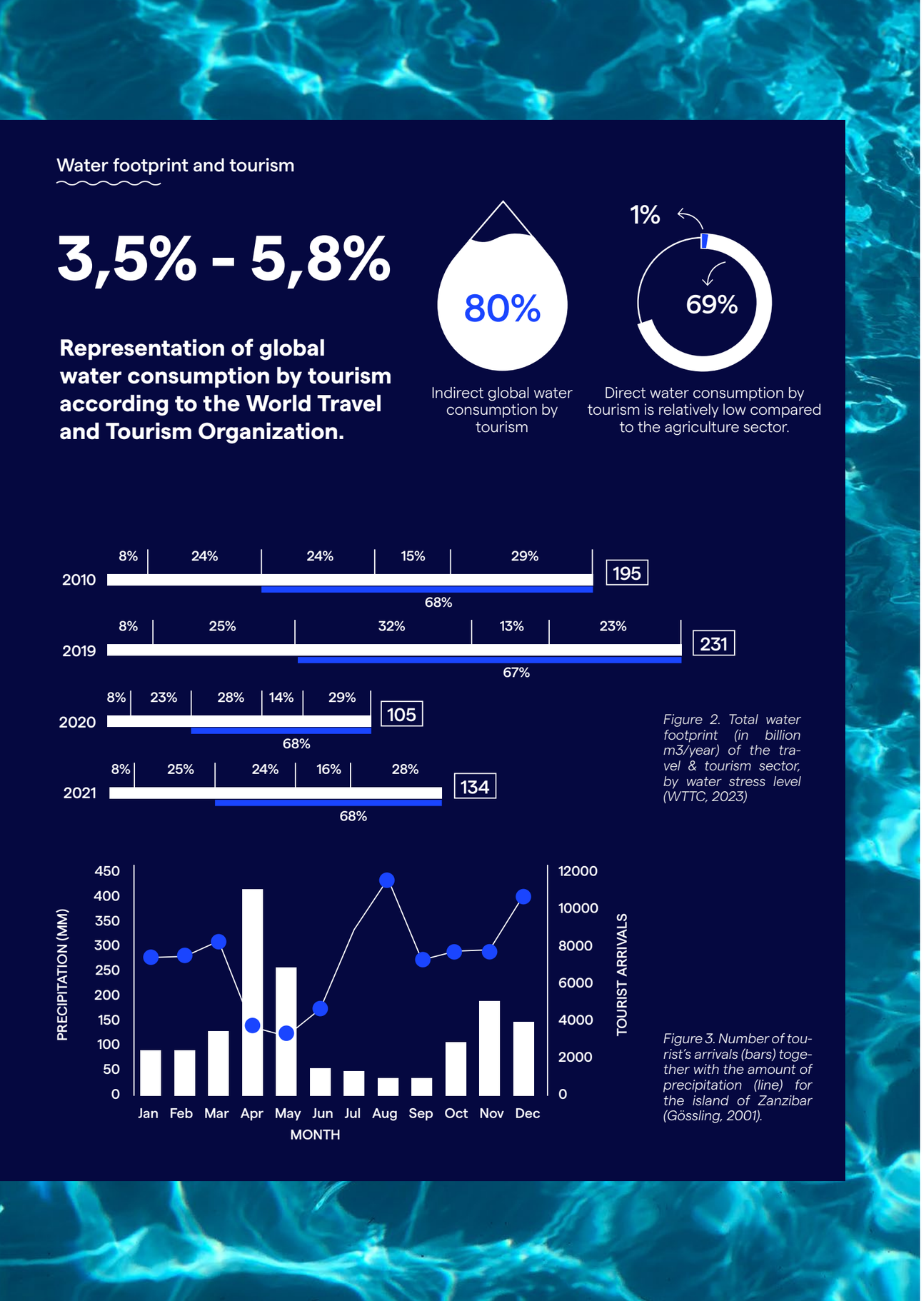


Figure 2. Total water footprint (in billion m3/year) of the travel & tourism sector, by water stress level (WTTC, 2023)

Figure 3. Number of tourist's arrivals (bars) together with the amount of precipitation (line) for the island of Zanzibar (Gössling, 2001).

To effectively address the challenges of growing water scarcity and ensure sustainable water management within the tourism sector, it becomes imperative to measure, monitor and report water consumption accurately. Various methodologies, along with knowledge, guidelines and tools can be employed to assess water scarcity and inform sustainable water use strategies. Three relevant frameworks are:

→ The System of Environmental-Economic Accounts for Water (SEEA-Water) (United Nations, 2012).

SEEA-Water is a framework adopted by the UN in 2012 to integrate water statistics across various sectors, combining hydrological and economic data. It provides internationally accepted standards for environmental-economic accounting.

For example, the Australian Bureau of Statistics (ABS) has produced an environmental-economic account called Water Account, Australia (WAA), which is in accordance with SEEA-Water (ABS, 2023). It provides details on the physical quantities and financial aspects of water supply and usage within the Australian economy. It includes indicators related to water, for example water prices, water intensity and water use for different industries.

→ The Statistical Framework for Measuring the Sustainability of Tourism (SF-MST) (UN Tourism, 2024).

SF-MST makes use of the principles of SEEA-Water. It is an internationally agreed statistical framework for measuring and producing reliable data of the tourism sector on three dimensions: economic, environmental and social. It can be applied at national- and sub-national level. The main goal of SF-MST is to help organizations on various scales to align with the sustainable

For example, a pilot study in Indonesia used the principles of SF-MST to, among others, estimate the amount of wastewater produced by marine tourism. A key finding was that 2.03% of wastewater from marine tourism is discharged untreated into the ocean, while the remaining 97.97% is processed in septic tanks (UN Tourism, 2020).

→ Indicators of Sustainable Development for Tourism Destinations (UN Tourism, 2004).

This is a guidebook designed by UN Tourism (named World Tourism Organization in 2004) to help tourism managers, companies and destinations by making tourism-related decisions. It emphasizes the use of indicators as a key tool for enhancing planning and management. A number of indicators is discussed systematically, including the reason for use of the indicator, the source(s) of data, the means to use the indicator and benchmarking.

Indicators in the aspects of “Water availability and conservation”, “sewage treatment” and “drinking water quality” are discussed in this framework. For example, the following three indicators are explained related to water conservation:

1. Water saving (% reduced, recapture or recycled),
2. % wastewater or grey water recycled, and
3. Number of establishments participating in water conservation programs, applying water conservation policies and techniques, recycling treated wastewater.

These indicators can measure water savings and associated cost reductions, serving as a performance metric for the tourism sector or water utility in their conservation efforts, while also supporting a “green” market image. Using these indicators allows the tourism sector to lead by demonstrating easing pressure on water resources by water savings. Data for these indicators can be retrieved from water utility data and records of involved businesses.

The above-mentioned frameworks provide comprehensive methodologies and elements for measuring water and can be effective when implemented successfully. However, even though there is an extensive body of knowledge on water management, it can be challenging to know where to start. This report is designed to support the necessary direction for starting the effective management of water in tourism facilities and destinations. A streamlined approach is presented to enhance the understanding of water in tourism facilities and destinations, aiming to assist tourism managers in better water resource management. First, the various users of water in the tourism sector are discussed. Subsequently, it will propose distinct measurement methods applicable at both facility- and destination-scale. The final section will focus on strategies to effectively reduce water consumption, again targeting facilities and destinations alike.
alike.

04.

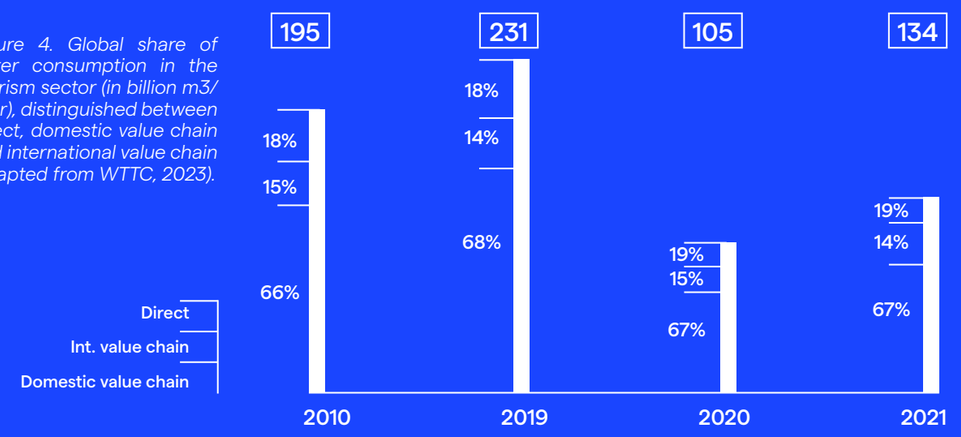
Water users in tourism destinations

Determining water consumption in tourism destinations is a **complicated and multifaceted** issue, primarily because of the challenge in delineating the boundaries of what belongs to the tourism sector and what to other sectors. For example:

Does the water used to produce the food consumed by tourists belong to the tourism sector or the agriculture sector?

It is common to distinguish direct water consumption and indirect water consumption (WTTC, 2023) (Figure 4). Both categories are discussed in the section below.

Figure 4. Global share of water consumption in the tourism sector (in billion m3/ year), distinguished between direct, domestic value chain and international value chain (adapted from WTTC, 2023).



04.1.

Direct Water Consumption

Direct water consumption involves water directly consumed by tourists and tourism facilities. Figure 4 shows that globally approximately only 19% of water consumption by tourists is direct (2021 data). In most studies, the direct water consumption consists of water consumed at the accommodation and water used for recreational activities (Gössling et al., 2012). These two aspects are relatively easy to quantify, as they are directly attributable to the tourism sector.

Accommodation

Most research on water consumption in the tourism sector has been focused on accommodations, in particular hotels (e.g., Gössling, 2015; Charara et al., 2011; Tortella & Tirado, 2011). It is important to recognize that water consumption varies across different types of accommodations. For instance, hotels and resorts typically offer a wide range of water-intensive facilities, such as swimming pools and spas. In contrast, camping sites may have more limited facilities and private rental properties may align more closely with local water usage patterns. An additional facet of this discussion involves water use by ships and especially cruise ships in harbors, which represents a unique category in the tourism sector.

The most straightforward way tourists consume water at accommodations are the **facilities in the hotel rooms** itself. Water usage within hotel rooms encompasses essential activities, such as tap water for drinking and washing hands, toilet flushing, showering and bathing.

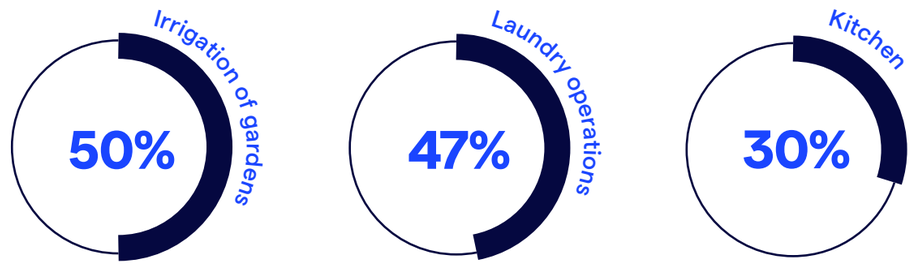
A key facility of notable importance is the irrigation of gardens at accommodations. The actual water consumption of gardens varies substantially based on factors such as garden size and prevailing climatic conditions. In warm, dry climates, plants not adapted to these conditions require more frequent irrigation.

Swimming pools are also significant contributors to water consumption within tourism accommodations, exhibiting various mechanisms of water loss. The main ways water is lost include filling the pool initially, evaporation, and backwashing the filter. The pool's size and the local climate significantly affects these processes. Larger surface areas of water are associated with increased evapotranspiration rates, a phenomenon exacerbated in warm, dry climates. Finally, shower facilities at swimming pools also contribute to total water consumption.

Laundry operations could constitute a significant portion of water consumption within hotels, as highlighted by Barberán et al. (2013), who report that laundry activities can represent up to 47% of the total water usage in a hotel. Particularly concerning are large quantities of laundry processed using outdated machines, which can substantially escalate overall water usage.

The kitchen represents another significant area of water consumption within hospitality establishments, with water usage for cooking purposes contributing notably to the overall consumption. Antakyali et al. (2008) conducted a study indicating that approximately 30% of total water consumption in certain settings is allocated to laundry and kitchen activities combined.

Water consumption on accommodations:



Recreational activities

Recreational activities are diverse and generally more difficult to quantify than water consumed at the accommodation. One reason for that is that in most cases local communities also utilize recreational facilities and the distinction between tourism and local demand difficult to quantify is. Two examples are discussed in the section below.

Golf is a well-discussed activity in water consumption studies in the tourism sector (Gössling, 2015; Gössling et al., 2012; Tortella & Tirado, 2011). Tortella & Tirado (2011) concluded that the most water-intensive tourism activity in many destinations is golf. **Golf courses** are large and require frequent irrigation and watering to maintain the green fairways. As for garden irrigation depends the total water consumption of golf courses also on climatic conditions.

On the other side of the spectrum, in winter tourism, **production of artificial snow for skiing** can put significant pressure on local resources. Rising temperatures due to global warming can in the future additionally threaten the resources in those areas.

04.2.

Indirect Water Consumption

Indirect water consumption refers to the consumption of water that is not directly linked to the immediate activities of tourists, but rather to the broader supply chain and support activities of tourists (Lee et al., 2021). As visible in Figure 4, indirect water consumption might be way more relevant than direct water consumption. This section is complemented by Box 1, which gives an idea of the total water footprint of certain products that are relevant for the tourism sector.

Food

Food production is one of the most water-intensive activities in the world. The water footprint of food includes the water used in growing crops, raising livestock, and processing food products. For tourists, the water embedded in the meals they consume during their travels can constitute a substantial portion of their overall water footprint (WTTC, 2023). Different types of food require varying amounts of water to produce.

According to Li (2018), diets high in calories require nearly five times more water compared to vegetable-based diets. Hadjikakou et al. (2013) found out that 75% of the food water footprint consists of **meat and dairy products.**

Transportation

Transportation also adds up to the water footprint of the tourism sector. Airplanes, cruise ships and cars need substantial amount of water for their operations. The use of **fossil fuels** is a well-discussed factor that contributes to the water footprint of tourists (Gössling et al., 2015). **Energy** is needed for fuel production and water is needed for energy production. Furthermore, **aircraft and engine cleaning processes** can, under some circumstances, also add up to the water footprint. Air France-KLM Group identified that aircraft-washing was their largest water consumer before they integrated a more sustainable way of aircraft-washing (Air France KLM Cargo, 2024).

Infraestructure

The water footprint of infrastructure falls under construction-related water use. **Concrete** is a resource that is often used for the construction of roads, highways and buildings. Van Oss & Padovani (2003) pointed out at that especially cement hydration is a water intensive process.

Box 1

Water Footprint of Various Products in the Tourism Sector

- For the production of **1 kg of beef**, **15,400 liters of water** is needed. This is more than for other types of meat (sheep: 10,400 l/kg, pig: 6,000 l/kg, goat: 5,500 l/kg & chicken: 4,300 l/kg) (Mekonnen & Hoekstra, 2010).
- Around **140 liters of water** is needed for a standard **cup of coffee** in the Netherlands (Chapagain & Hoekstra, 2003).
- The water footprint of **transport** per train is between **8 and 19 liters per passenger per km.** This is more water efficient than travelling by airplane (between 65 and 136 liters per passenger per km) (Gerbens-Leenes & Hoekstra, 2011).
- The blue water footprint of cement is between **1.7 and 2.6 l/kg** (Gerbens-Leenes et al., 2018).

04.3.

Main Findings from the Workhops

The main findings from the Malaga and online workshops reflect the findings from the introduction of this report.

Different destinations face diverse water management challenges because of their distinct environmental, economic and social conditions, e.g.,

- The city of Málaga, Spain, is experiencing prolonged periods of drought leading to reduced rainfall, higher temperatures and thus increased evaporation rates. Moreover, the region faces water extraction for tourism alongside water-intensive agricultural practices, like cultivation of avocados and mangoes.

- In Thompson Okanagan, Canada, a combination of low snowpack, seasonal runoff and warm weather forecasts is increasing drought risks during summer. This region also has a rich Indigenous heritage with its own traditional lands, rules, and cultural practices. It is essential to respect rights of indigenous people and to take into account their water knowledge.

- On the other hand, Lake Toba in Indonesia does not face problems related to water availability, but struggles with declining water quality. Challenges here include pollution from fish farming, water transport activities, agricultural and residential waste, and specifically the impact of hotels and resorts on water quality.

It is furthermore important, that local residents are also included in the discussion of water management in the tourism sector. Their insights and experiences can provide valuable perspectives on balancing the needs of tourism, agriculture, and community water use, ensuring that solutions are both sustainable and equitable. Engaging residents in the decision-making process helps align water management strategies with local needs and fosters community support for conservation measures

05.

Measuring water comsumption

Measuring water consumption in the tourism sector is crucial for understanding its environmental impact and for targeted implementations of water saving measures. However, measuring can be challenging, because the tourism sector operates at different scales and consists of a broad, multifaceted and dynamic range of activities. In this chapter, water consumption measurement at both the facility- and the destination-scale will be discussed.

05.1.

Facility-Scale

Measuring water consumption at the facility-scale is relatively straightforward, since the water consumption can most of the time directly be linked to tourism and can also directly be measured.

Water meters

Quantitative data on water consumption can be obtained by installing (smart) water meters. A water meter is a device used to measure the volume of water flowing through a pipe in a specific time. The data a water meter provides is usually collected by the **water utility company** to calculate the water bill for the customer. Historically, this data was collected periodically. Nowadays, with the deployment of **smart water meters**, it is possible to collect hourly or even sub-hourly data. Tracking water consumption at an hourly or sub-hourly scale makes it possible to quickly detect leaks or other anomalies. Any noticeable deviation in usage trends can be investigated directly. It can furthermore provide peak usage times. Sønderlund et al. (2014) reported that the installation of smart water meters at households can lead to an average water consumption reduction of up to almost 20%.

Sub-metering is the individual measurement of water consumption of different departments or units within a building. The installment of sub-meters can help to get a more detailed overview of water consumption at a facility. Sub-meters help to identify compartments with high water consumption and can therefore help to increase efficiency efforts. It can furthermore help to quickly **identify leaks** within the premises. It is recommended to install those sub-meters in major water consumption facilities, such as garden irrigation systems, kitchen, swimming pool and at every guest floor. Additionally, sub-metering can also be applied to different supply lines of water (e.g., municipal supply, greywater reuse water or rainwater harvesting). An example of a hotel using sub-meters is given in Box 2.

Box 2

Spotlight: Hotel Samba

→ **Source:** Buttiglieri et al. (n.d.)

→ **Location:** Lloret de Mar, Spain

→ **Hotel type:** Large three-star hotel with 441 rooms, restaurant, garden, pool, bar and conference rooms.

→ **Monitoring and measurement:**
- Sub-meter installation: Utilizes 21 sub-meters strategically placed across the property.
- Purpose: Allows precise measurement of water consumption in various hotel areas.

→ **Environmental recognition:** Awarded by four environmental labels for successful implementation of water-saving practices.

Conclusion: Hotel Samba sets a benchmark in the hospitality sector by integrating advanced sub-metering technology for precise measurement of water consumption, reinforcing their commitment to environmental stewardship and sustainable practices.

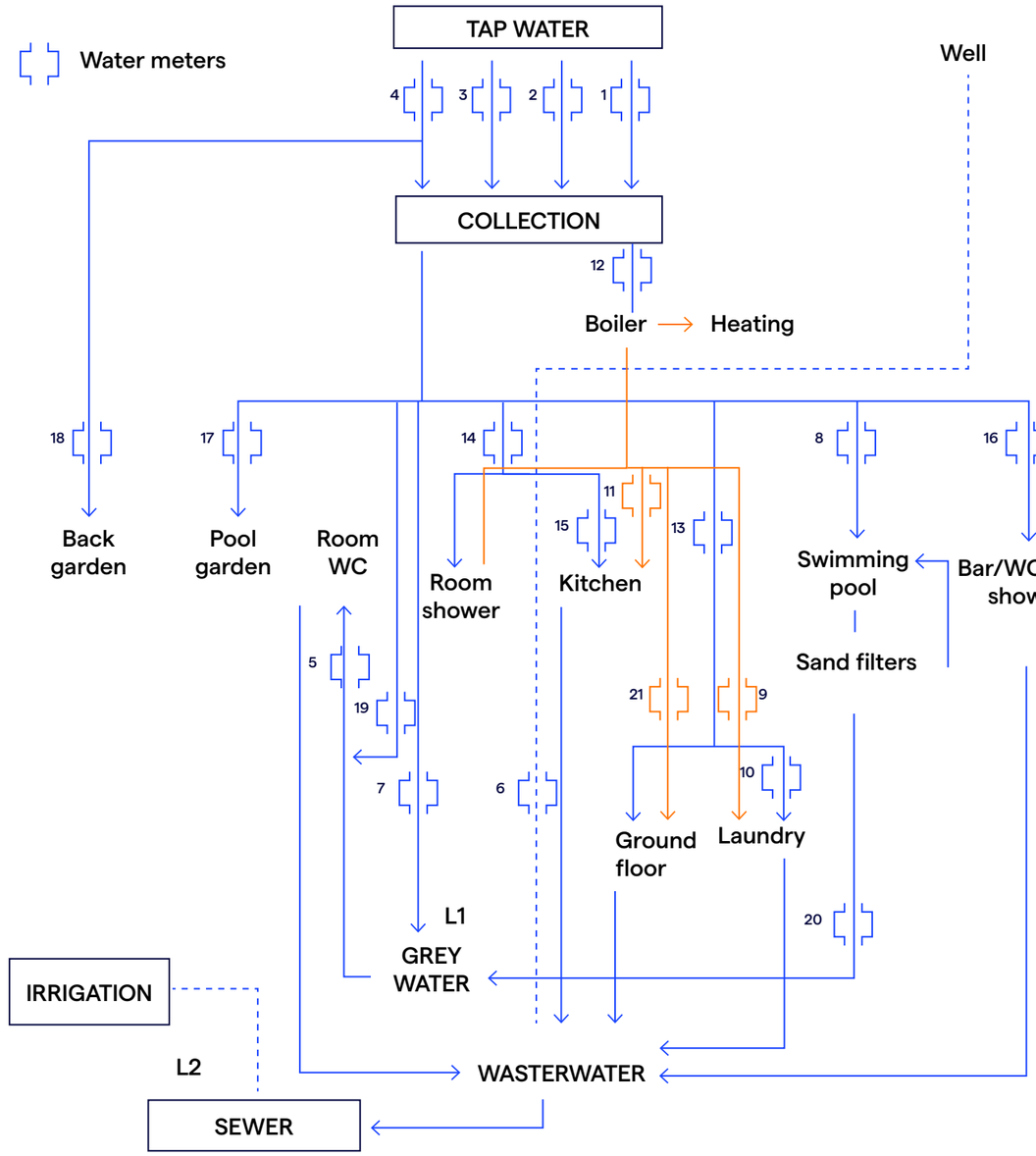


Figure 5. Measuring scheme of Hotel Sambas various water facilities (adapted from Buttiglieri et al., n.d.).

Indicators

Benchmarking between facilities often relies on conventional units for comparative analysis. **Liters per guest night** and liters per day are units that are often used in the literature and in frameworks. Liters per guest night can be calculated by dividing the water consumption of a certain time by the numbers of guest nights during that period. In the accommodation industry, a number of tools are available to report and benchmark performance (see also Box 3). Also, several benchmark schemes have been developed internationally (e.g., Table 1).

Water user rating (L/G-N)

Property size	Good	Fair	Poor	Very poor
< 50 rooms	< 439	439- 507	507-583	< 583
50-150 rooms	< 583	583-674	674-806	> 806
> 150 rooms	> 666	666-855	855-980	> 980

Table 2. Benchmark scheme for three hotel categories (adapted from Meade & Gonzalez-Morel, 1999).

While benchmarks like liter per guest night or liter per tourist per day provide insights into overall water consumption, they aggregate data across multiple guests and nights. This might hide the different ways (individual) guests use water, potentially masking chances for specific water efficiency improvements.

Box 3

Hotel Water Management Initiative

→ The World Sustainable Hospitality Alliance, together with KPMG and representatives from various hotel groups, have developed the **Hotel Water Management Initiative (World Sustainable Hospitality Alliance, 2016)**. With this tool, it is possible to calculate the amount of water used per occupied room per day and per area of meeting space per hour. This tool facilitates companies and individual properties to consistently measure and report water withdrawal. It will help accommodations to understand water consumption, benchmark their performance and set targets.

05.2.

Destination-Scale

Measuring water consumption in the tourism sector at the destination-scale can be a challenging task because of the complex interplay between tourists and local demand. This complexity sometimes necessitates the use of reliable proxies to accurately assess water consumption at the destination-scale.

Direct water consumption

Measuring quantitively water consumption at the destination level could be done by the installment of **water meters at key points in the village or town's water supply system** (e.g., at hotels, resorts, tourist attractions, restaurants and public facilities). The utility company usually handles the installation and maintenance of these meters. In addition, **utility billing data** plays a crucial role in quantitatively measuring water consumption at the destination level. **Utility companies** collect data from water meters, which include readings of water usage from various units such as hotels, resorts, tourist attractions, restaurants, and public facilities. In most destinations, utility records provide enough detail to separate tourist consumption from other uses, like agricultural, domestic and industrial (Un Tourism, 2004).

In destinations where this detailed information is unavailable, water meter data from selected accommodations or tourist facilities can be collected (UN Tourism, 2004). When the data does not differentiate between different types of uses, indirect estimates of tourist-related water consumption can be made by comparing total water usage across different seasons or months (UN Tourism, 2004). The differences can be attributed to tourist activities. However, this indirect way of estimating water consumption carries uncertainties, as fluctuations in water usage between months and seasons can also be influenced by other factors.

Accurately estimating water consumption for **private rental properties** presents a unique challenge. Since the increase in online platforms (such as Airbnb), the swapping of homes between people has increased, yet there is a lack of comprehensive data on this form of lodging (Gonzalez-Perez et al., 2023) (see Box 4). Additionally, tourists who stay at their second home are most of the time also not accounted for in official data (Gonzalez-Perez et al., 2023). Unlike hotels that often report water usage data to local authorities or have systems in place to monitor water consumption, Airbnb properties are independently managed. Many hosts may not have the same reporting requirements as commercial accommodations, making it challenging to include them in broader assessments. **Data from similar types of accommodations** (e.g., small hotels or residential buildings) can serve as a proxy to estimate water consumption patterns for Airbnb properties.

Box 4

Case Study: Analyzing the Real Size of the Tourism Industry on the Basis of an Assessment of Water Consumption Patterns

→ **Source:** Gonzalez-Perez et al. (2023)

→ **Location:** Balearic Archipelago, Spain

→ **Study focus:** Using water consumption data to estimate the size of the full tourism industry, including non-registered overnight stays, private rental properties and people staying at second homes. This will be compared to official statistics.

→ **Key insight:** The number of non-registered overnight stays is up to 23% higher than official statistics suggest

Water footprint

Indirect water consumption is also crucial to consider for a comprehensive understanding of the tourism sector's overall water footprint. The city of Valencia measured the water footprint of tourism activities in their city. The results are shown in Box 5.

Measuring indirect water consumption is more challenging than measuring direct water consumption, due to complex supply chains and varying levels of data availability. Generally, two approaches exist for the calculation of the tourism water footprint: bottom-up and top-down (Wang et al., 2017).

Box 5

Water Footprint of Tourism in València (Visit Valencia, 2023)

- A tourist in València has an average water footprint of 315 liter / day,
- Only 16% of the total water footprint results from direct water consumption and 84% from indirect water footprint (this includes meals consumed, goods purchased and maintenance of attractions and entertainment venues),
- Transportation only accounts for 0.1% of total water footprint,
- Public water facilities are responsible for only 0.53% of total water footprint.

• Bottom-up

The bottom-up approach utilizes life cycle assessment (LCA) to measure tourism's water use step-by-step (de Alvarenga et al., 2012). For example, Yang et al. (2011) estimated the water footprint of tourism in a small mountain destination in China. Data collection involved:

Direct Measurement: Utilizing flow meters installed in the toilets, kitchens, bathrooms, wash basins and toilets.

Interviews: Engaging with staff and property owners to ascertain additional direct water consumption practices (e.g., washing cars, gardening and cleaning rooms).

Tourist Surveys: Conducting surveys among tourist groups to gather information on meal consumption patterns.

Kitchen Data: Obtaining data on food types and quantities from kitchen staff to assess water usage in food preparation.

External Studies: Incorporating findings from existing studies regarding the water required to cultivate and produce food items.

Wastewater Estimation: Employing water-to-waste conversion factors to estimate wastewater production.

The multifaceted approach they employed in data collection not only underscores the complexity of estimating water footprints for destinations but also emphasizes the numerous uncertainties inherent in the process. The study concluded that the most water-consuming activities were food production and waste dilution.

The bottom up-approach provides detailed information of individual components of tourism activities, making it suitable for measuring water footprints of small regions (Wang et al., 2017). However, researcher's subjectivity in defining boundaries and selecting data for LCA can lead to unstable results (Wang et al., 2017; Zhou et al., 2015). Additionally, this approach faces limitations due to unavailability of data for some parts of the supply chain.

Top-down

The top-down method calculates a water footprint making use of environmental extended input-output (EEIO) frameworks. EEIO frameworks link economic accounts with data on resources, such as water (Hadjikakou et al., 2013). The top-down method requires statistical and tourism satellite account data, which are usually publicly available official data. (Lee et al., 2021). Such input-output approaches enable for upstream and downstream linkages of activities or products. For example, a coastal resort has backward linkages with the water that was embedded in food that was produced for the restaurant. A forward linkage example is that the coastal resort boosts water demand in other services, such as transport and recreational activities. In this way a complete picture of the whole supply chain can be captured (footprint). An example of a study which used EEIO analysis is shown in Box 6.

The top-down approach gives a broad overview of the total water footprint at a larger scale (national or regional) with data that is easily accessible. However, there is a lack of detail due to aggregation and averaging of data.

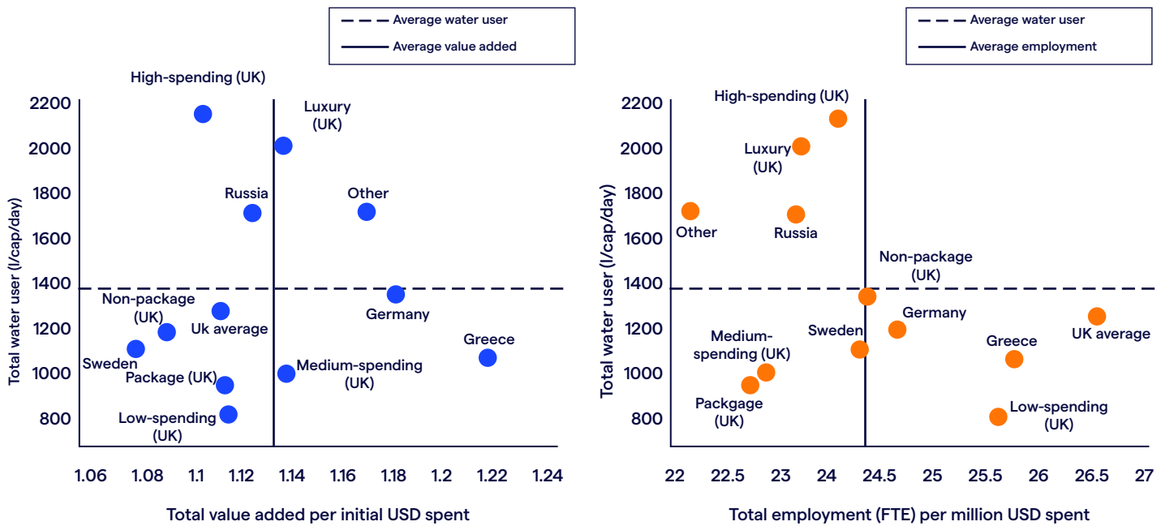


Figure 6. Total value added per initial USD spent in relation to total water use (left) and total employment per million USD spent in relation to total water use (right) (Hadjikakou et al., 2015)).

Box 6

Case study: A Comprehensive Framework for Comparing Water Use Intensity across Different Tourist Types

→ **Source:** Hadjikakou et al. (2015)

→ **Overview:** A framework was developed for water-scarce regions to quantify water intensity (water use compared to economic output) for different tourism segments. This framework uses extended input-output tables based on expenditure data and tourism satellite accounts to asses the economic and environmental impact of various tourism segments. The study presents data from water use of tourists in Cyprus.

→ **Tourism segments:** Tourists from Russia, Germany, Sweden, Greece and United Kingdom (further subdivided into low-spending, medium-spending, high-spending, luxury tourists, average non-package and budget mass tourists).

→ **Key findings:**

- The left graph in Figure 6 shows that tourists from Germany and Greece, as well as medium-spending tourists are the best performers, generating high economic output per dollar spent with relatively low water use, due to high spending on accommodation and transport. In contrast, high-spending tourists and those from Russia use more water while generating lower value added.

- The right graph highlights that those tourists from Germany, Greece, UK (average), and low-spending segments are good performers in terms of job creation per million USD spent, with significant spending in accommodation, food, drinks, and tobacco.

Strategic Recommendations: To optimize economic and environmental outcomes, the study suggests boosting tourism segments like Germany and Greece that generate high value added and job creation with low water use. For segments like Sweden, increasing expenditure strategically can enhance value added without significantly raising water use. For high water use segments (e.g., high-spending tourists and those from Russia), improving water efficiency in accommodation and promoting behavioral changes are recommended.

Indicators

Various indicators exist regarding water availability and conservation. A key indicator to assess water consumption efficiency is value created per liter of water used. This indicator helps destinations evaluate how effectively they are utilizing water resources by linking water usage directly to economic performance. In Box 6, this was done between different tourism segments. However, this can also be done between sectors. Comparison of this indicator between various sectors helps tourism managers to allocate water resources in an efficient way (United Nations, 2012).

05.3.

Main Findings from the Workshop

Measurement of water consumption is crucial for successful integration of water-saving measures. Although there is a strong willingness by destinations to measure water consumption, it frequently gets overshadowed by competing priorities. By making it a priority, stakeholders can better understand and manage the water resources needed to support sustainable tourism.

A common-mentioned obstacle for measuring water consumption was the availability of data. While it's true that data can sometimes be fragmented, difficult, or costly to obtain, it is often the case that the data needed for measurement is already being collected. For example, most tourism facilities monitor their water consumption using water meters, or this information is maintained by the water utility company. During the workshop in Málaga, which brought together (among others) stakeholders from government, private companies, and water utilities, it became clear that data is frequently available. However, the challenge lies in identifying the right individuals who can provide access to this information. These workshops and events, which facilitate discussions between people from various sectors, prove to be invaluable in overcoming this challenge. Finally, ensuring that water consumption data is readily accessible can additionally help to address this challenge.

For some destinations, there is confusion surrounding methodologies, definitions, and the criteria for applicability, which complicates the comparison of measurements across different locations. There is not a full picture or solution available for this. However, certain elements, described in frameworks, like SEEA-Water, MST and Indicators of Sustainable Development for Tourism Destinations, can guide tourism managers in this.

06.

Water conservation measures

Water conservation plays a crucial role in tackling problems of growing water scarcity.

The level of success depends on collaboration and cooperation of tourism stakeholders, governmental and non-governmental organizations, and tourists themselves. Water conservation measures can be implemented at various scales and by various organizations and businesses. In this section, some important considerations regarding water conservation measures will be discussed at facility- and destination-scale. Additionally, some examples of good practices will be highlighted. .

06.1.

Facility-Scale

Facilities, from hotels to restaurants, play a significant role in managing water resources effectively. Implementing water-saving techniques and strategies not only reduces operational costs but also contributes to environmental stewardship.

Step-by-step plan

To make sure water-saving techniques are implemented successfully, it is recommended to follow a step-by-step plan (adapted from: Biosphere Tourism, 2016):

1. Measure water consumption of various facilities and areas. In order to understand where water-saving techniques could be functional, it is important to know and benchmark water consumption of different facilities and areas (e.g., swimming pool, kitchen, garden and floors). Sub-metering is a recommended technique to do so.

2. Create a strategy plan. After analyzing the water consumption of different facilities, a strategic plan can be developed with specific targets set. It would make sense to target the areas of greatest use first, but this depends on a range of factors and capacities. For example, an accommodation containing a large area with vegetation could investigate vegetation characteristics and needs in order to avoid over-irrigation.

3. Implementation of water-saving techniques. A large variety of water-saving techniques exists, ranging from relatively simple to more advanced. Besides water-saving techniques, also a number of possibilities exists for the reuse of water.

4. Control and maintain the system. After implementation of the water-saving techniques, the effects can be measured by sub-meters. To quickly detect leaks, sub-meters should be read out regularly.

5. Train staff and create awareness. Training staff in water management techniques can greatly reduce consumption. Guests can also contribute to water savings through simple behavioral changes.

Simple water-saving techniques

Often, the implementation of water-saving techniques is associated with high costs and effort. However, this does not always have to be the case. Embracing simple water-saving techniques could lead to reduced environmental impact and cost saving. In the tourism sector, a large range of techniques exist to simply reduce water consumption (e.g., avoid watering of gardens in the heat of day, cover the pool when not in use, the installment of dual-flush or even water-less toilets and checking of leaks in the water supply system). Box 7 shows an example of a hotel in Zaragoza (Spain) that implemented various simple water-saving techniques and successfully reduced water consumption.

Box 7

Case Study: Evaluation of Water Saving Measures in Hotels: A Spanish Case Study

→ **Source:** Barberán et al. (2013)

→ **Location:** Zaragoza, Spain

→ **Hotel Type:** Four-star, 117 rooms, restaurant, cafeteria, gym, parking garage and outdoor terrace

→ **Interventions:**
- Replace old taps with ecological cartridges and dual flow system
- Installation of aerators and discs in the wash basins and showers
- Upgrade pre-wash showerheads in the kitchen

→ **Results:**
- Total water consumption reduction: 21.5%
- Cold water: 17.6 % • Warm water: 33.2%

→ **Cost and economic analysis:**
- Investment cost (general case): €10.987
- Expected lifetime: 12 years
- Average Net Present Value (NPV)*: 140.000€

**the average NPV represents the overall profitability of the investment, taking into account the present value of expected future savings over the 12-year lifespan.*

Conclusion: Implementation of relatively easy water-saving measures demonstrated significant reduction in water consumption without hindering the pleasure of the tourist, highlighting the economic viability and sustainable benefits of such initiatives.

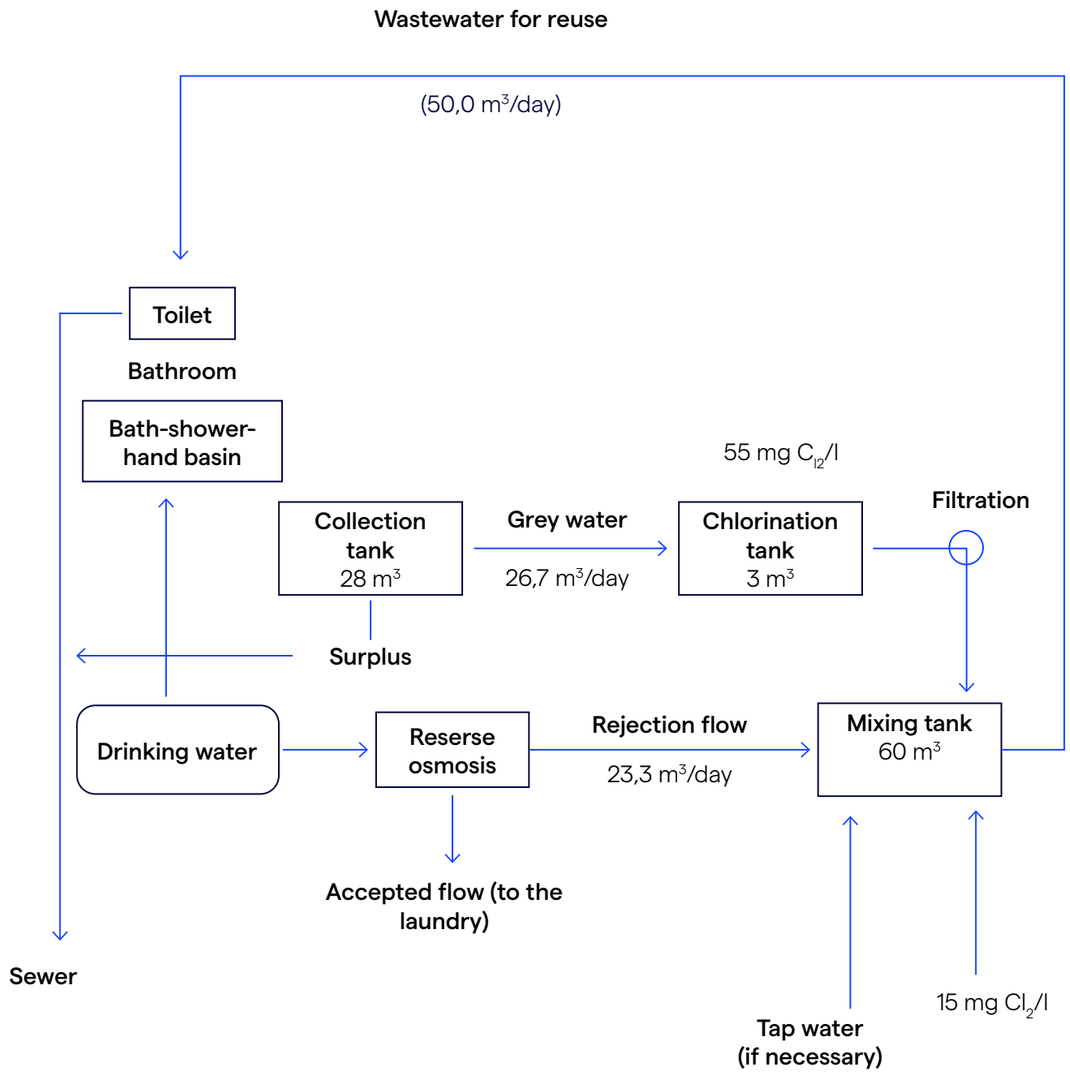


Figure 7. Pilot plant setup (Gual et al., 2008).

Reutilización del agua

Many water conservation strategies are focused on reducing water consumption. Water reuse is also a potential economic and sustainable solution. Various sources, like greywater or rainwater, can be effectively utilized—for example, for flushing toilets or irrigating green areas. Implementing water reuse systems can be costly due to necessary infrastructure installment such as pipes, pumps, tanks, and filtration units. However, these costs can be recovered on the long term. Box 8 shows an example of a case study of a hotel on Mallorca that has installed a water reuse system for flushing the toilets.

Box 8

Case Study: Monitoring of an Indoor Pilot Plant for Osmosis Rejection and Greywater Reuse to Flush Toilets

→ **Source**: Gual et al. (2008)

→ **Location:** Mallorca, Spain

→ **Hotel type**: Three-star, 227 rooms, 72 apartments, garden, four swimming-pools and laundry-facilities

→ **Water reuse strategy:** Using osmosis rejection flow mixed with treated greywater for toilet flushing

→ **Pilot plant setup:**
- Greywater source: bathing, showering and hand-basins.
- Greywater treatment: hypochlorite treatment, nylon and sand filter.
- Osmosis rejection water source: rejection flow with high ion-concentration that can not be used for laundry activities.

→ **Results:**
- Annual Water reuse: 13.500 m³
- 20% of total water consumption

→ **Cost and economic analysis:** Calculated cost for reused water: €1.14/m³
- Assumed lifetime: 15 years
- Installation costs: €116.204
- Annual operation costs: €6.307

Conclusion: The study demonstrates the viability of integrating greywater and osmosis rejection water for sustainable water management in hotels, achieving significant water savings at a competitive cost.

Awareness

Studies show that the pro-environmental behavior of people at households and tourists destinations show large differences (Dolnicar et al, 2019; Miao & Wei, 2013). People often ease their environmental efforts when staying at a hotel compared to their practices at home. The reuse of towels in hotels is an example of a water conservation technique that can be linked to guests environmentally responsible behaviors (Han & Hyun et al., 2018).

06.2.

Destination-Scale

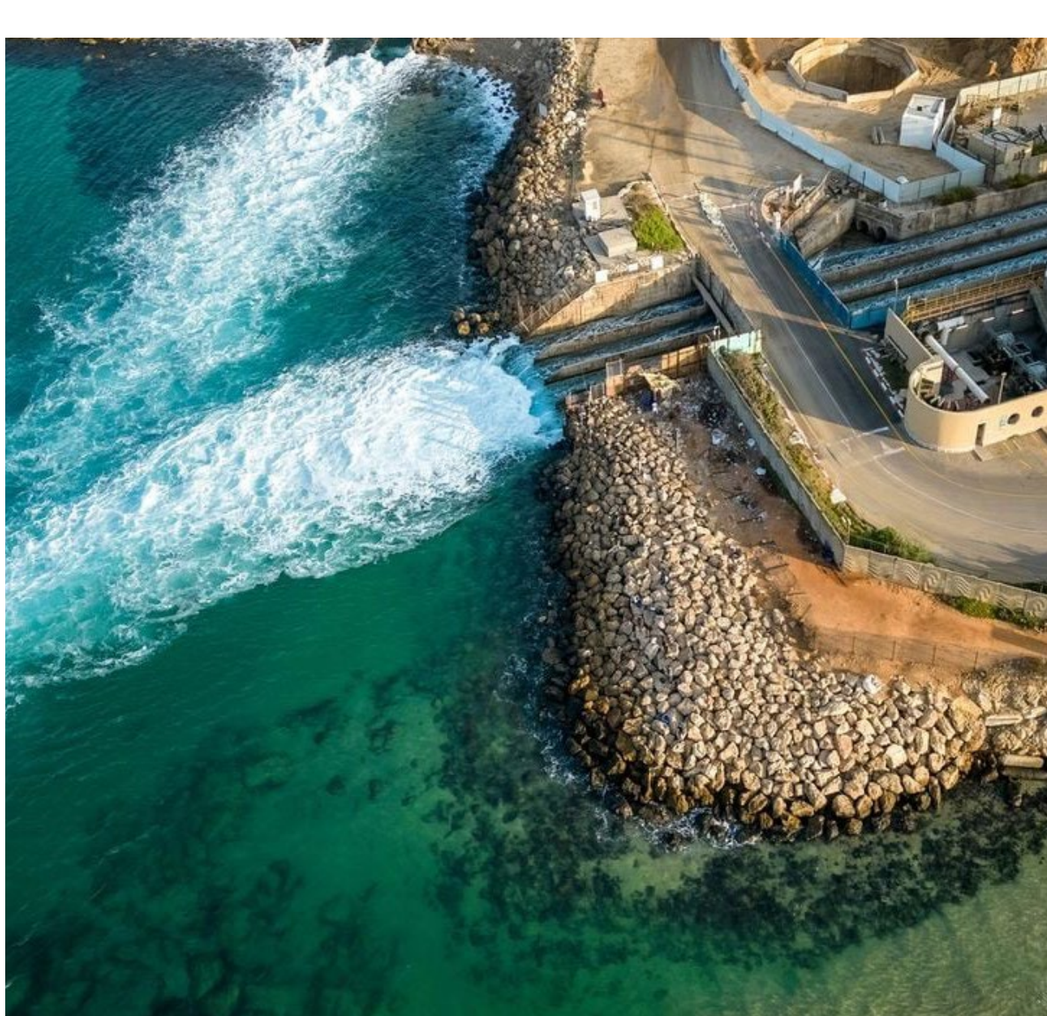
Beyond individual properties, efforts to reduce water consumption must extend to destination-wide strategies. Decision makers can contribute to water conservation measurements in a large variety of ways.

Integrated water resource management (IWRM)

Integrated Water Resource Management (IWRM) is defined by the Global Water Partnership (2000) as 'a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of ecosystems'. IWRM not only recognizes that water resources are interconnected but also acknowledges that different water users impact each other (UNEP, n.d.). IWRM can be implemented in several ways and adapted to local contexts.

One effective strategy in response to growing water scarcity is the promotion of wastewater reuse and water exchange, aligning with IWRM principles. However, this 'integrated' approach must tackle technical difficulties, promote social learning through cross-sectoral collaboration, establish agreements between different water users and ensure active stakeholder participation (Pires et al., 2017).

Another aspect of IWRM in some countries involves increasing the water supply through the installation of desalination plants. While this can be a viable solution under certain circumstances to address water scarcity, it requires careful consideration. Water authorities typically address the water needs of economic sectors like tourism by focusing on increasing supply (Masi et al., 2020). This approach encourages the misconception that water use can be limitless, hindering the adoption of integrated water cycle solutions in tourist facilities.



Nature-based solutions

Besides technical installations for the reuse of water, also a number of Nature-Based Solutions (NBS) exists. The European Commission (n.d.) defines NBS as 'solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience'. The majority of decision-makers is still not aware of NBS as a technique to reuse water (Masi et al., 2020). An advantage of introducing NBS to tackle water-related issues over conventional ones is their multi-functionality (Estelrich et al., 2021). They are often more energy-efficient, they increase biodiversity, they restore ecosystems and they facilitate resource recovery (e.g., Box 9). Two examples of NBS in the context of water management are:

1. Treatment wetlands.
Treatment wetlands are engineered systems that are established and designed to treat wastewater by using the natural processes occurring in plants, soils and microbes (Dotro et al., 2017). They replicate many of the natural processes occurring in natural wetlands.

2. Blue-green infrastructure. Blue-green infrastructure is described as 'A strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services, while also enhancing biodiversity' (European Commission, n.d.). This includes e.g., green roofs, vertical greening systems and rain gardens. These systems are designed to capture, filter, and infiltrate stormwater, reducing runoff and improving water quality. An example of a vertical greening system is shown in Figure 8.

Figure 8. Example of a vertical greening structure at the Mariposa Hotel in Málaga.

Box 9

Case Study: Feasibility of Vertical Ecosystem for Sustainable Water Treatment and Reuse in Touristic Resorts

→ **Source:** Estelrich et al. (2021) & Masi et al. (2020)

→ **Location:** Lloret de Mar, Spain

→ **Hotel type:** Three-star, 441 rooms

→ **Water reuse strategy:** Vertical ecosystem (vertECO) to treat greywater which can be used for flushing the toilet.

→ **Setup:**
- Four vertical levels with horizontal water flow
- Greywater pumped into highest stage, aerobic microorganisms stimulated with air compressor at each stage, UV-disinfection at final stage

→ **Results:**
- Satisfactory for organic standard parameters
- Meets Spanish regulations for various purposes of water use
- Payback time in Spain: 9 – 10 years
  In regions with higher water prices, payback time could reduce to 3.5 years.

Conclusión: The vertECO system demonstrates effective greywater treatment for toilet flushing using NBS, aligning with regulatory standards and offering a feasible payback period.

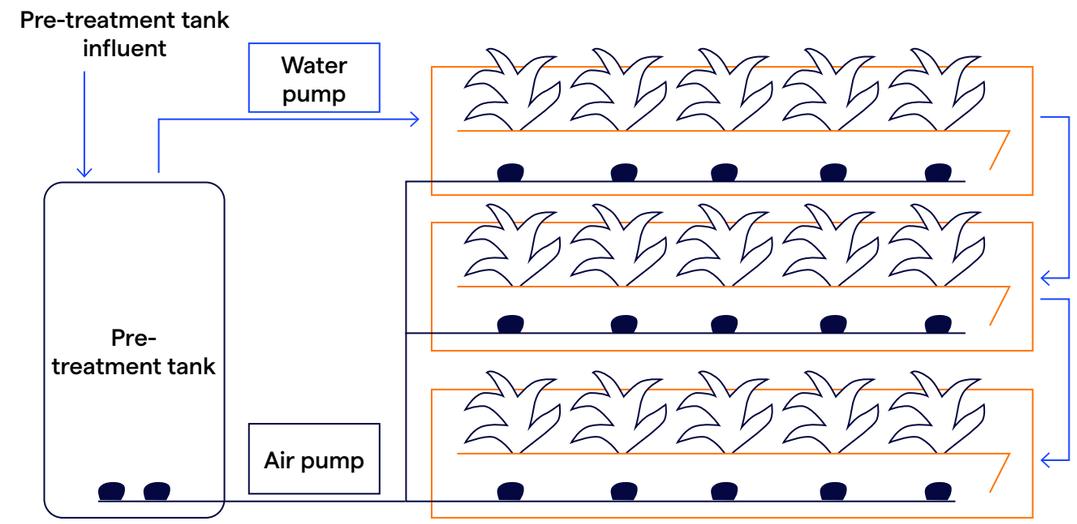


Figure 9. Top. vertECO system (Masi et al., 2020). Bottom. vertECO scheme of hotel Samba (adapted from Estelrich et al. 2021).

Infrastructure investment

In some countries, a lot of input water is lost in the supply system due to leaks in pipes, overflows, storage tank issues and unauthorized use. The global volume of non-revenue water is estimated to be 126 billion cubic meters per year. This corresponds to 30% of global total water input (Liemberger & Wyatt, 2019). Addressing non-revenue water through infrastructure improvement can lead to costs savings in the long term.

Increase awareness

Raising awareness among tourists and local residents about water conservation practices through educational campaigns could also be a strategy to reduce water consumption. Box 10 shows the example of Cape Town, South Africa, where promoting behavioral changes was part of an important water-conservation program.

Box 10

Day Zero

Between 2015 and 2018, Cape Town was suffering from an acute water crisis because of three consecutive dry winters (Pascale et al., 2020). Early 2018, this crisis reached a point where the government announced "Day Zero" – the day when the city's water supply is cut, causing the taps to run dry - to happen soon. Fortunately, this did not happen. The city successfully implemented water saving campaigns. One important focus of these campaigns was to promote behavioral changes and awareness. Key aspects were (adapted from: Martinus & Naur (2020) and Government of South African (2018)):

- The city officials chose to reveal the honest truth that the city might face a water shortage, despite the risk of being blamed for poor management.
- Every reduction in water consumption was followed with shared acknowledgement, which helped to maintain the momentum. This means that everyone was involved and felt rewarded for the social improvements.
- The city distributed clear, easy-to-understand posters to raise awareness about water conservation.
- Recognizing the power of social media, the city engaged "water ambassadors" to promote effective water-saving practices online.
- To encourage water conservation, the city organized competitions among schools, rewarding those that achieved the greatest reductions in water use (gamifying).
- The government introduced engaging initiatives like two-minute-shower songs to make conserving water more enjoyable.

The example of the city of Cape Town showed that clear and honest messaging and awareness can successfully reduce water consumption.

Subsidies and labels

Destinations can introduce subsidies or financial support for private establishments that participate in water-saving practices. Examples include subsidies for water-reuse installations or water-efficient appliances. Moreover, destinations can introduce tax incentives for private companies that maintain low water usage. Finally, water-efficiency certification programs can be introduced to certify that tourism facilities meet specific water conservation standards, thereby enhancing their reputation and marketability. Box 11 shows an example of such a certification.

Box 11

LEED certification

Leadership in Energy and Environmental Design (LEED) is a green building rating system. It acknowledges and rewards buildings that conform to high environmental and performance criteria. LEED also assigns credits for effective water management practices. For example (adapted from Benjamin, 2019):

- Installation of water meters in the building
- Reduce irrigation by 30% with native plants or efficient irrigation methods
- Use fixtures with certain efficiency standards for indoor water use.
- Recycle non-potable water for cooling and mechanical processes.
- Use rain gardens, vegetated roofs and cisterns to reuse 80% of rainwater
- Treat runoff from impervious surfaces to prevent local waterway pollution

LEED essentially supports building operators and owners in being environmentally responsible and efficient resource management. Having a LEED certification can enhance the appeal of tourist facilities by showcasing their commitment to sustainability and environmental stewardship.

Anhancing water management through partipatory processes

As mentioned in the foreword, a workshop on water management in the tourism sector was organized in Málaga. This workshop illustrated how engaging different stakeholders can lead to significant advancements in water management practices. Box 12 represents the findings from the moderatos Mira Bangel and Hugo Lopes during that day.

Box 12

Comments by the process facilitators Mira Bangel and Hugo Lopes

Participatory processes discussing the management of resources at the destination observatory level offer significant value and opportunities, as shown by the example of Málaga when discussing the management of water resources. The Málaga observatory brought together different stakeholders, including **local communities, government agencies, and businesses from the hospitality and water management sectors to discuss water management challenge**s. This gathering led to a valuable exchange of knowledge among stakeholders with diverse perspectives, reflected in this report.

By engaging all parties, we created a constructive dialogue, fostering co-ownership of the generated output and building trust among regional actors. This is essential for promoting regional innovation and resilience in addressing water challenges.

The workshop was organized **with three rounds of open questions**, allowing for comprehensive discussion and engagement. These questions, given in Appendix 2, can also be used for similar workshops in other destinations, providing a structured framework for discussion. Professional support in participatory processes can make these efforts more efficient, inclusive, and effective, leading to better water management outcomes. Facilitators like us can help refine questions, offer suitable dialogue formats, and guide conversations towards a balanced and fair collaborative decision-making environment.

06.3.

Main Findings from the Workshop

During the workshop in Málaga, water utility companies mentioned the importance of increasing water supply by for example the installation of desalination plants. Under some circumstances (i.e., available water resources as well as financial resources to unlock them), this strategy can contribute to solving the acute problem. However, addressing water scarcity also requires urgent adoption of water-saving practices. This was clearly recognized and supported by the tourism sector.

The focus should thereby not only lie on decreasing water consumption. Reused water can be used for various purposes for which potable water quality is not required, such as flushing the toilets or garden irrigation. Facilities should be designed to reuse water in a circular way.

Furthermore, awareness promotion should be intensified for both tourists and local residents. Individual water consumption at tourist destinations is not separately measured and charged. Once the bill has been paid, water is free of use. A topic of discussion was the “pay-as-you-use” principle, which involves incentivizing good practices with bonuses or imposing higher charges for greater water usage. The use of in-room water meters to charge tourists individually for their water usage is rare. Accurately measuring the total water consumption of tourists in hotels poses a challenge due to the numerous shared facilities, such as pools, spas, and public restrooms.

07.

Recommendations

Raise Awareness of Sector Complexity
The tourism sector has a complex and multifaceted nature. Stakeholders from various sectors are involved, including hospitality, agriculture, transportation and local residents. Understanding the interconnectedness of these players is key for efficient water management. Therefore, it is of utmost important that awareness is raised about the sector's multifaceted nature and its significant role in the broader water management discussion.

Considerations for Water Distribution
As water is used for many different economic and social activities, the value the resource is creating for the destination shall be considered when prioritizing its distribution. This process benefits, like many other discussions related to the desired development of a destination, from a participatory process.

Tailored Solutions for Diverse Destinations
Water management challenges vary greatly across different destinations due to distinct environmental, economic and social contexts. A one-size-fits-all solution is therefore likely to be ineffective. Instead, water management strategies should be adapted to the specific problems and needs of each destination, considering local water availability, tourism patterns and existing infrastructure.

Prioritize Water Management Actions
Destinations often recognize the importance of good water management in the tourism sector. However, the prioritization of water consumption measurements within the broader scope of tourism is often missing. Therefore, it is important that the critical role of measuring water consumption in the effective management of water resources is highlighted. By clearly communicating the benefits of measurements, stakeholders and destinations can better understand its value and elevate its priority.

Increase Water Measurements
The installation of smart meters is not difficult and should be included as a fundamental component of water-saving measures. Smart water meters provide precise, real-time data on water usage, enabling better monitoring and management. By incorporating water metering, destinations can implement more effective water-saving strategies, ensuring a sustainable approach to water resource management. Additionally, sub-metering of high water-consuming units (e.g., pools, irrigation, washing machines) can lead to optimization within a tourist facility.

Simplify the Start of Measurement Initiatives
One of the main barriers in effective water management is getting started with measurement and monitoring. While there is a wealth of knowledge and good will available, stakeholders often lack clear guiding on the first steps to take. Providing clear and straightforward information, guiding and training can help to overcome this problem.

Collaborate Data Collection and Sharing
Accurate and comprehensive data is important for effective water management. Often, the necessary data exists, but is fragmented across various stakeholders. Facilitating collaboration among tourist managers, local governments, water utilities, researchers and other representatives can ensure that relevant data is collected, shared and utilized effectively.

Raise Awareness among Tourists and Local Residents
Raising awareness about water conservation should not be limited to tourists but should also include local residents. It is important to avoid blaming tourists for water consumption issues. Both groups play a significant role in water consumption and management. Moreover, supporting dialogue between tourists, tourism managers and local residents will lead to more comprehensive solutions.

Promote Water Reuse and Innovative Solutions
Focusing on the reuse of water, such as treated greywater, can significantly contribute to water conservation. Implementing innovative solutions like nature-based solutions can be particularly effective. These systems not only save water but also enhance the overall sustainability of tourism operations by reducing reliance on freshwater resources.

Shift to Water Conservation
Traditionally, water utilities have focused on increasing supply to meet growing demand by for example installation of more desalination plants. Under some circumstances, this strategy can contribute to effective water management. However, to overcome problems of growing water scarcity and stress, there is also an urgent need of water-saving practices. The tourism sector is taking significant steps towards implementation of water-saving methods. These efforts should be supported and scaled up to further reduce water consumption.

Encourage Continuous Innovation and Research
Promoting an environment where curiosity and innovation is important for tourism destinations. By actively seeking out and embracing new techniques and technologies, such as advanced water treatment systems and alternative water sources, the tourism sector can enhance water reuse and conservation. Collaborating with research institutions can help to use the latest solutions and support the growth of sustainable practices. This proactive approach ensures that tourism destinations remain resilient and adaptable to evolving water resource demands.

08.

Conclusion

Increasing water scarcity and water stress require effective water management and water conservation strategies. Understanding the role of the tourism sector and his interconnectedness to other sectors in the discussion of water management is therefore crucial. While the sector's dependence on water resources highlights the need for effective measurement and management practices, many destinations still struggle to prioritize these efforts.

Measuring and monitoring are essential for implementing effective water-saving practices. Installing water meters is a straightforward way to gain quantitative insights into water use, detect leaks, and apply sub-metering for more detailed analysis. Despite the availability of such data, it is often fragmented across various stakeholders. To address this issue, a collaborative and participatory approach is needed. By bringing together diverse stakeholders to share knowledge and data, a more cohesive and effective water management strategy can be developed. This collaborative effort ensures that all relevant information is utilized, leading to better-informed decisions and more robust water conservation practices.

While the tourism sector demonstrates the willingness to engage in water conservation, there is always room for improvement. Besides reducing the water consumption of tourist facilities and destinations, water reuse is an essential part of sustainable water management that helps preserving scarce water resources. Good water management practices should be scaled up and recognized. Moreover, adopting innovative water strategies, such as nature-based solutions (NBS), plays a critical role in advancing water conservation. NBS, which harness natural processes and ecosystems to address water-related challenges, offer sustainable and often cost-effective alternatives to traditional methods.

09.

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10.1

Appendix 1

Photos from the Málaga Workshop


de Málaga
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INSTO
Workshop Málaga
Panel de Expertos "El papel de las administraciones en la gestión del agua"
09:30 - 10:05
D. Javier Alcántara Pérez.
Gerente Territorial ACUAMED. Gobierno Central
D. Álvaro López García. Coordinador Provincial de Aguas. Consejería de Agricultura, Pesca, Agua y Desarrollo Rural. Junta de Andalucía
D. Juan José Denis Corrales. Gerente de EMASA. Ayuntamiento de Málaga
Financiado por la Unión Europea
Ayuntamiento de Málaga


Palo
Barrios marineros
Malagueta
GRUPO 7

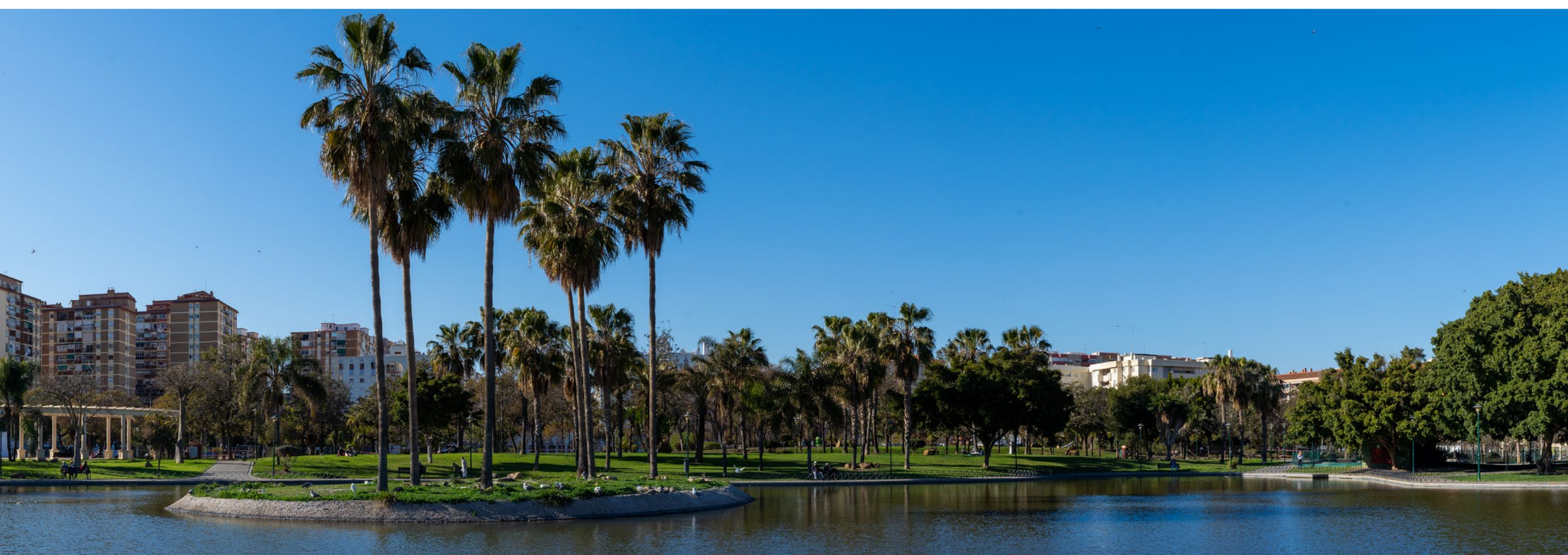
10.2

Appendix 2

Questions discussed at the Málaga Workshop

At the Málaga workshop, discussions were organized around the following 3 questions. These questions can be used for similar workshops in other destinations, providing a structured framework for discussion on water management in the tourism sector.

1. *What should we consider when discussing water consumption in our region (e.g. water restrictions, indirect water use (like food production) or water distribution across different sectors)*
2. *How and why are we measuring water and what could be improved (as well considering freshwater, greywater and rainwater)*
3. *What are effective ways to reduce and/or optimize water consumption?*



10.3

Appendix 3

Tools and Standards to address the context

Different regions face water scarcity in distinct ways, shaped by factors like geography, climate, and socio-economic conditions. To address the complexities of water scarcity, various standards and tools exists to evaluate and contextualize water availability and usage. Some important ones are:

- WRI Aqueduct (World Resource Institute, n.d.): the World Resource Institute launched this tool to assess and map water related risks on a global-scale. It categorizes risks into three main categories: physical quantity, physical quality and regulatory and reputational. It provides insights into various water related risks, for example water scarcity, water quality, flood risk and drought risk.
- WWF Water Risk Filter (WWF, n.d.): this tool is developed for companies to identify their geographical water risks at a facility level. The risks are categorized as physical, regulatory and reputational. It can be used to prioritize action and support decision making.
- FAO Aquastat (FAO, n.d.): this is a global information system by the Food and Agricultural Organization (FAO) of the United Nations. It provides data on various aspects of water resources, for example freshwater availability, how water is distributed between various sectors, irrigation efficiency and water management policies.
- HydorSHEDS (Hydrosheds, n.d.): this global database shows high-resolution spatial information on the distribution of water systems. It provides information on boundaries of watersheds, connectivity and flow direction. It is used for hydrological modelling, environmental monitoring and decision-making.

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