Christos Bouras / Vasileios Kokkinos / Evangelos Michos

An online tool on sustainable water management

Abstract

Water demand strains supply capacity in the Mediterranean coastal areas, affecting negatively the maintenance of natural and cultural heritage. Tackling this subject, the "Coastal areas sustainable tourism water management in the Mediterranean - CASTWATER" project aims to support sustainable tourism water management in Mediterranean (MED) coastal areas, by improving the monitoring and assessment of the water sustainability performance of tourism. To this end, the elaboration of an online tool to monitor and assess sustainable tourism water management was envisaged and developed, primarily addressed to tourism sector small and medium-sized enterprises (SMEs). The CASTWATER online tool was designed to so as to provide two different functionalities. On the one hand, SMEs can self-evaluate their performance in sustainable water management and efficiently acknowledge possible actions that promote water efficiency in their tourism establishments. On the other hand, the tool measures, at both regional and local level, the levels of good governance and the effectiveness of water-tourism policies in order to improve sustainable water management. The approach presented in this work is heavily based on the initial technical specifications and end-user feedback, aiding SMEs in understanding, comparing, assessing and rating their performance regarding water efficiency and sustainable water management.

Key words: CASTWATER; water sustainability; Interreg MED; sustainable tourism; online tool

1. Introduction

Recent advances in technology are causing disrupts in the water tourism industry, since they empower tourism actors to form new markets, shape new services, and manage their businesses more effectively (Sigala, 2018a). They are fostering the transformation of tourism management and marketing in such a way that managers not only use technology as a tool but they both shape and are shaped by technology (Sigala, 2018b). The increasing pressure towards providing even more sophisticated and tailored products and increasing the efficiency and effectiveness of business leads hospitality business towards becoming more reliant on Information Communications Technologies (ICT) in various aspects of their business (Garbin Praničević & Mandić, 2020). At the same time, reliance on technologies throughout interoperability and interconnectivity has enabled hospitality organizations to increase competitiveness based on a better customer understanding of the market conditions (Buhalis & Leung, 2018).

In the last 50 years, the aggregate water demand in the Mediterranean (MED) has doubled, due to the tourism's water consumption, which per capita is double than this of a local resident's. Seasonal tourist demand places enormous pressures on local water supplies in MED coastal destinations, where water resources are more likely to be scarce. The adoption of water efficiency measures by the tourism industry is still very low in the MED coastal areas, where losses, leakages and wastage account for 40% of the total demand. As a result, those aforementioned issues undoubtedly create a direct demand addressed to tourism sector small and medium-sized enterprises (SMEs) for better understanding of

Christos Bouras, Computer Engineering & Informatics Dept., University of Patras, University Campus, Greece; e-mail: bouras@cti.gr
Vasileios Kokkinos, Computer Engineering & Informatics Dept., University of Patras, University Campus, Greece; e-mail: kokkinos@cti.gr
Evangelos Michos, Computer Engineering & Informatics Dept., University of Patras, University Campus, Greece; e-mail: emichos@ceid.upatras.gr

365-504 Tourism 2020 04ENG.indd 450 12/21/2020 8:29:00 AM

the performances on water efficiency and water management, alongside with the ability to compare performances with other SMEs.

In this contribution, the authors present a water management online tool, developed for the "Coastal areas sustainable tourism water management in the MED - CASTWATER" project (CASTWATER Project, 2020a). The aim of the project is explained in Section 3. The scope of the online tool allows tourism SMEs to understand, compare, rate their water efficiency and sustainable water management performances. The online tool integrates a system with two different types of indicators, one for tourism SMEs based on their replies in the 'self-assessment' section and one for PAs based on the SMEs' replies in the 'monitoring' section, measuring in overall the degree of both tourism SMEs and Public Authorities (PAs) compliance towards water sustainability. SMEs are invited to provide business-related information regarding their investments, measures and actions to promote water efficiency in their establishments, as well as their perceptions on the effectiveness and adequacy of the existing policy framework for water resources in their region. The input gathered is further utilized from the PAs to monitor tourism sector's overall performance in their region and measure the effectiveness of territorial policies on water management.

This work initially presents the current literature regarding the recent state in sustainable water tourism, water management and relevant water sustainability tools. Then, it describes the CASTWATER project, which tackles sustainable tourism water management in MED territories and then, the development and usage methodology of the online tool is explained. Following, the authors present the evaluation procedure and the main findings. Finally, the authors conclude the overall presentation this work.

2. Background

Nowadays, societies comprised of humans and ecosystems in nature heavily depend on the availability of water resources, since water not only is necessary for basic human needs, but also for developing a sustainably economy (Willet, Wester, Vreeburd, & Huub, 2019). According to this work, it is estimated that 30 years from now, the demand for global water will rise from 3500 it was in 2000 to almost 5500 in 2050 and this call for a global effort to tackle this issue. In some countries, the response to this alarming increase in water demands is to also increase non-renewable water extraction, which unfortunately leads to negative effects like aquifers overdraft, surface reservoirs depletion, and shortage in water supply. At the same time, the study reports that for the industrial sector, water demand is projected to increase by 400% by 2050, which will lead to severe negative consequences in the global ecosystem. The work concludes that using suitable assessment methods is the way to go to ensure that water demands in will remain within the carrying capacity of the ecosystems and suggest using the Sustainable System Indicators (SSI) to assess the environmental water sustainability.

Water challenges create a call for appropriate frameworks for accurate representation of the linkage between economic systems and water resources (López-Morales & Rodríguez-Tapia, 2018). This work included an innovative input-output economic framework, comprised of natural resources and production resources, alongside with generating, reusing and discharging wastewater, featuring resource endowments as constraints of the production stage. This framework model was applied to test the wastewater reuse treatment in the Mexico Valley Basin, an area where exploiting natural resources is considered unsustainable and the wastewater treatment is almost zero. The findings revealed that in order to avoid aquifer overexploitation, treatment is needed to produce up to 1.4 of high quality water for reuse. Additionally, the proposed model reduces water intake by 13%, amounting to reduced effort for treatment to around 0.9 . The authors conclude that the population of additional case studies

365-504 Tourism 2020 04ENG.indd 451 12/21/2020 8:29:00 AM

that incorporate the economic background of water sectors and the research on reuse treatment plants is crucial towards effective water sustainability in such cases. One thing also to keep in mind is the development of e-tourism in the last years. Since aspects like e-business, e-commerce and e-marketing have already emerged, the aspect of e-tourism also comes into play (Kazandzhieva & Santana, 2019). The creation of such systems come logically after the digitalization of all value chain processes in the tourism industry. This work analyzed the aspects and conditions of emerging development in e-tourism and created a conceptual framework for an e-tourism system. Thorough qualitative reseach on e-tourism was conducted to gather insights, based on theoretical approaches.

Saving water while operating sectoral businesses is also a very important factor for sustaining manageable water demands (Kemper & Partzsch, 2019). More specifically, a German company named Armedangels is proud that they managed to keep their T-shirt production line requiring only 1/10th of the water demands needed generally in the sector. To achieve this, they developed a collective framework, consisting of 6 criteria and 9 indicators, allowing for assessing the certification standards, based on the social and environmental dimensions of water sustainability. The findings revealed that even though both organic and fair trade companies should be considered as water policy entrepreneurs, unfortunately, most of the water sustainability aspects directly correlated to these companies do remain hidden on purpose. The authors propose that more certification projects are needed to replace environmentally harmful practices and promote water sustainability and at the same time, voluntary certification and labeling initiatives should be more considered, since their increasing utilization can be seen as a viable mechanism for regulating water sustainability at the industrial sector (and more specifically, for cotton production).

Overtourism has become recently popular, due to the rapid tourist deriving from low cost airlines and services like Airbnb (Cheer, Milano, & Novelli, 2019; García-Hernández, Calle-Vaquero, & Yubero, 2017) and relates to how tourism can eventually cause protests and tensions between local residents and tourists (Muler-Gonzalez, Coromina, & Galí, 2018). The residents' perception of the tourism impacts and future tourism development shows that statistically, tourism residents strongly support future tourism development, whereas students, retired residents and unemployed people are less supportive (Soldić Frleta & Smolčić Jurdana, 2020). This study offered great insights on the different people groups' attitude as far as tourism impact and future development are concerned and gathered valuable information for already existing studies on such issues in specific countries like Tanzania and Malaysia (Jani, 2018; Nejati, Mohamed, & Omar, 2014).

Collectively, we all must take into consideration the constant changes in tourism demand and supply, especially when there exist many destinations that face challenges that related to the negative effects of tourism, like overtourism and tourismphobia (Cheer, Milano, & Novelli, 2019). The authors acknowledged the unprecedented global tourism growth and attempt to give an answer to the question of "*What are the limits to tourism growth?*", since tourism intensifications creates concerns towards breaching the acceptable tourism capacities. Their study on the case of Australia's Shipwreck Coast focused on the vulnerability of the coastal areas due to overtourism and the emerging concerns, like the fact that no trade-off is attained by leaving the local context in deficit and that tourism governance fails to provide efficient approaches towards tourism expansion through political processes. These refer to issues in contemporary tourism, like for example residents' quality of life and tourists' experience (Veríssimo et al., 2020). This work analyzed 154 documents and concluded that even through tourism conflicts are already being studied for a long time, both overtourism and *tourismphobia* have only emerged in the last years and as a result, further study is needed for these topics and their implication on tourism.

365-504 Tourism 2020 04ENG.indd 452 12/21/2020 8:29:00 AM

All the aforementioned topics are mostly apparent in some of the most famous European tourism destinations, such as Barcelona, Dubrovnik and Venice (note that the CASTWATER project was represented by partners from Spain, Italy and Croatia). More specifically, in Barcelona, work-field data was used in order to analyze those specific elements behind tourism aversion, determining the negative economic effects from the increase in accommodations and the increased water demand in these installments (Martín, Martínez, & Fernández, 2018). The results revealed that the people who manifest strong rejections against traditional tourism-dependent environments and those with low incomes that acknowledge the increased prices negatively comprise the most vulnerable and "dangerous" population groups against measures for water sustainability. In Dubrovnik, the anti-tourist attitude is also vastly apparent and has created a challenge towards re-constructing the pillars of tourism development in Croatia (Panayiotopoulos & Pisano, 2019). The research concerns ex-Yugoslavian resorts and their tourism planning and proposes innovative interventions that take greater advantage of Dubrovnik's existing tourism planning related to water sustainability, through a strategic focus on groups like students and seasonal workers. Moving on to the Venice case, attempts are being made towards a water sustainable city without occasional hostility from local groups demands an efficient management approach instead of existent anti-tourism movements (Seraphin, Sheeran, & Pilato, 2018). Unfortunately, Venice has to face tourism challenges like vandalism, crime, pollution and destruction of historical site and as a result, the World Tourism Organization (UNTWO) has declared the anti-tourist sentiments as a dangerous situation to be address, towards the ease implementation of water sustainability measures.

Now, regarding practical tools towards water sustainability, the CASTWATER online tool is not the first tool there exists that tackles tourism sustainability issues. The European Commission (EC) has already developed the European Tourism Indicators System (ETIS), a system of indicators suitable for all tourist destinations, aiding them in conducting performance measurements on tourism sustainability (European Commission, 2016). ETIS development includes a) a management tool that supports tourism destinations that aim to become sustainable, b) a system for monitoring tourism destinations and gathering overall information and c) an information tool for PAs, SMEs, as well as other stakeholders. Using the ETIS system, one may monitor, manage, measure and enhance sustainability performances of tourist destinations. As for the indicators, the ETIS toolkit consists of general guidelines and information over the included primary and secondary indicators. It is highly suggested that the toolkit is followed in association with the supporting documents that are provided from the project, so that readers deeply and fully understand the meaning and purpose of the indicators that are included in the toolkit.

Additionally, the 'Sustainable Tourism Entrepreneurship (SusTEn)' mechanism exists to approach territorial sustainability developing tourism and culture-based entrepreneurship through a tool for PAs to plan and manage the use of resources in the Mediterranean area by developing regional policy transferability plans (Sustainable Tourism Entrepreneurship Mechanism Project, 2020). By designing and installing an integrated system that may efficiently support enterprises involved in sustainable tourism activities, cost-efficient development could come up in MED areas. The SusTEn project has developed the Standards of Sustainable Tourism Enterprises and the corresponding Certification System, as well as an Integrated Management System. SusTEn deals with its challenges by a) focusing the attention at sustainable tourism and the improvement of rivalry across different products and territories, b) developing a sustainability framework that promotes territorial level initiatives on sustainable tourism with the aid of tourism enterprises and local actors and c) taking advantage of knowledge and lessons learnt throughout the project's course and transforming knowledge into added value in both local and international levels.

365-504 Tourism 2020 04ENG.indd 453 12/21/2020 8:29:00 AM

Under the Global Environmental Management Initiative (GEMI), the Water Sustainability Work Group developed a water sustainability tool that yields better understanding of this matter and assists companies and other organizations in identifying emerging water issues and thus, aiding them in developing a constructed business water strategy (Global Environment Management Initiative Project, n.d.). By using the tool, enterprises are encouraged to evaluate their relationship regarding water, assess possible opportunities and emerging risk and develop a water-related strategy that deals with the discovered threats and takes advantage of the available opportunities towards an efficient future framework on sustainable water management. Combined with the strategy outcomes for businesses that follow the GEMI tool's recommendations, one may deal with unearthed challenges and issues by visiting the tool's website and consulting the provided tips that support water sustainability, thus avoiding misinterpretations, misperceptions and public policy disincentives.

Free and Open Source Software Tools for Water Resource Management (FREEWAT) is a European Union (EU) funded HORIZON 2020 project, which uses an integrated water management and planning module in order to simulate the overall quality and quantity of surface water and groundwater (Free and Open Source Software Tools for Water Resource Management Project, n.d.). FREEWAT aims at bringing together different EU and national research to design a single water management module that incorporates all existing software tools and mechanisms, and to support the developed application by collecting technical staff and stakeholders to design applicable scenarios. To this end, FREEWAT can be described as unified collection of different water management tools, including both independent tools and tools that require complementary support from other tools as well. The supported tools inside the developed module provide capabilities, such as thorough analysis (time series analysis included), comprehensive interpretation and visualizations of hydrogeological and hydrochemical data. Additionally, model calibration, sensitivity analysis, input data preparations, post-processing information and uncertainty quantifications are some additional features as served from the module.

As far as water risk identification and future opportunities are concerned, there exists the Global Water Tool (GWT) as a free publicly available resource that deals with the issues and possibilities mentioned above (Global Water Tool, n.d.). The tool's development and distribution includes: a) a workbook, featuring data input, key indicators and metrics calculations), b) a mechanism that associates plot sites with the equivalent datasets and c) a Google Earth interface. The GWT tool supports site comparison across a country's territory, on metrics correlated to water availability, sanitation, population and biodiversity. Enterprises benefit from an efficient water management path and later on, develop water management strategies that mitigate risks in the long run and create long-term resilience. Tool's benefits include a clear understanding of water needs that are related to local externalities and thus, the ability to approach decision making with increased knowledge and a first level screening by using diagrams related to key water performances and water consumption risk indicators.

3. The CASTWATER project

CASTWATER is the first MED project to support sustainable tourism policies and practices on water efficiency in coastal areas. CASTWATER brings together 11 partners from 7 countries in order to reduce the impact of tourism activities on environmental heritage and improve management of water resources. The overall objective is to support sustainable tourism water management in MED coastal areas by improving the monitoring and assessment of the water sustainability performance of the tourism sector. CASTWATER follows a studying, testing and transferring approach of transnational cooperation, involving PAs, tourism enterprises and relevant agencies and stakeholders. Tackling the main water sustainability issues currently apparent in MED areas, inter-regional cooperation and

365-504 Tourism 2020 04ENG.indd 454 12/21/2020 8:29:00 AM

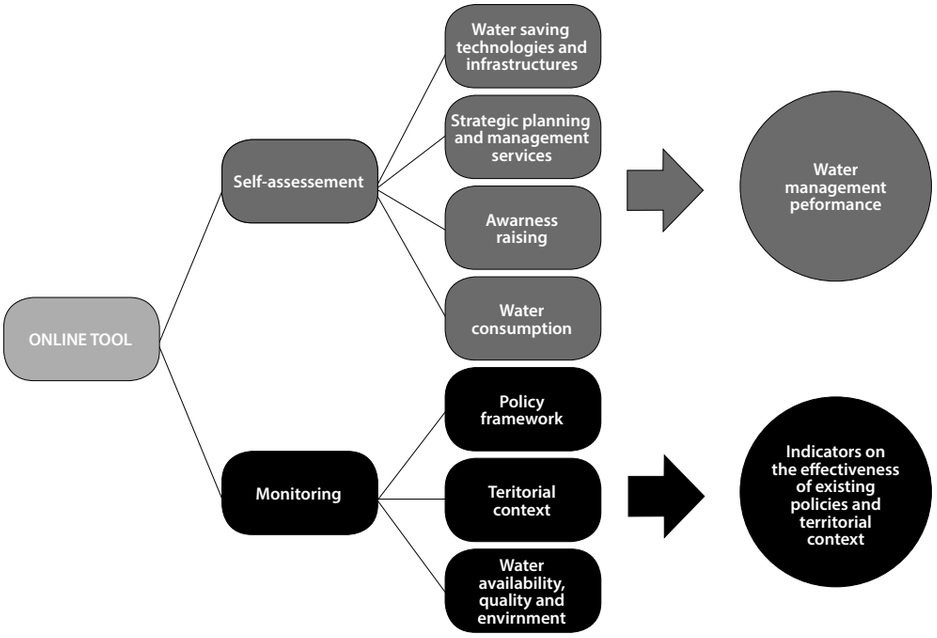
transnational implementation of the project's activities support the participating coastal localities via sharing and exchanging knowledge, monitoring and benchmarking methods, tools and experience in order to overcome the fragmentation, which characterizes this line of study in the MED basin.

4. Methodology

4.1. Developing the tool

The CASTWATER online tool serves two key functions. Firstly, it enables tourism SMEs to self-evaluate their performance in sustainable water management and learn what they can further do to promote water efficiency in their establishment. Secondly, the tool measures the degree of good governance and the effectiveness of water-tourism policies to improve sustainable water management, especially at regional and local level. The online tool integrates a system with two different types of indicators. The indicators intended for tourism SMEs are automatically displayed in the online tool, enabling the grading of SMEs' performance in promoting water efficiency, whereas the indicators intended for PAs are available upon request during the analysis stage as aggregate statistics, to help them draw useful conclusions about the sector's overall performance and the surrounding environment measures. The structure of the online tool is displayed below in Figure 1.

Figure 1
Structure of the CASTWATER online tool



The self-assessment section provides evidence to facilitate the evaluation of tourism SMEs' performances in fostering sustainable water management. SMEs can rate their current level of achievement in implementing water sustainability measures, yielding indicators that help measuring the SMEs' capacity to deal with water scarcity issues and growing water demand during touristic peak seasons. To do so, an aggregate score from users' replies is calculated based on four assessment areas (see Figure 1). Based on the results, the tool employs a rating system to present the results of the self-assessment process and also integrates a mechanism to rank SMEs' performances compared to other users' results

365-504 Tourism 2020 04ENG.indd 455 12/21/2020 8:29:00 AM

and provides recommendations on how to improve their water management performance by indicating the areas in which more actions are required.

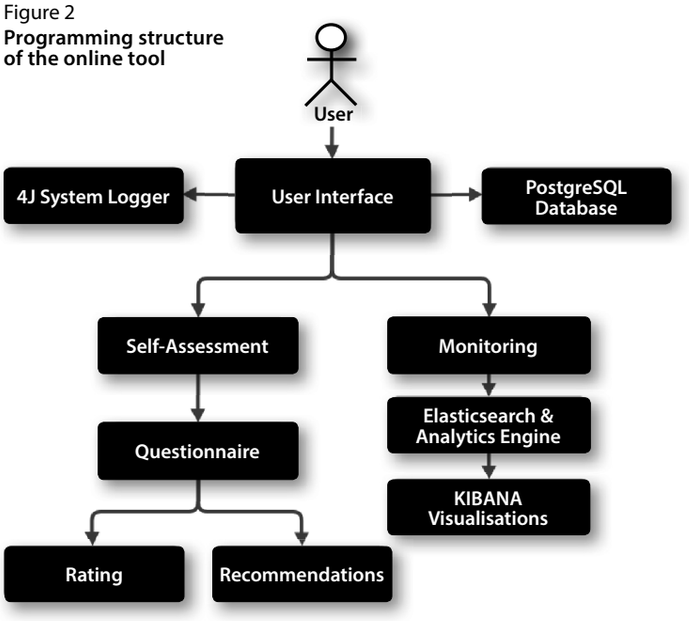
The monitoring section provides evidence that allows the evaluation of whether the governance systems for water resources are functioning properly. The indicators are used by PAs to extract conclusions on the strengths and weaknesses of their water management systems and evaluate the surrounding environment and achieve greater transparency in the functioning of water governance by improving data availability, risk assessment and policy implementation. Three areas are investigated in the monitoring section (see Figure 1). The online tool also provides access to key metrics and visualisations, drawn from SMEs' replies in the tool's survey. PAs are also able to filter data sorted by type of establishment, country of origin, as well as per region and per province.

SMEs obtain a score in a 0-100 scale, which indicates their overall performance in water management. The evaluation is further analyzed into the different assessment areas, each of them holding a different weight. The score in each area is calculated as the sum of the points received in the course of question included in this category, where each question is divided into sub-questions that contribute different points to the total obtained score per category.

SMEs that have completed the survey can follow the provided recommendations, which include a large variety of implementable measures across all self-assessment areas. For example, a low score in 'water saving technologies' offers recommendations like investing a bigger percentage of the annual budget in water saving technologies or start using water saving devices and fixtures like sensors or timers to control faucets. A low grade in 'strategic planning and management' section may yield recommendations like the necessity to compare water consumption with tourism industry benchmarks or establishing water reduction targets. A low score in 'awareness raising' provides recommendations, such as the need to implement staff training programmes that include communicating on water reduction targets, training staff on how to make prudent water use and establishing reward systems for employees with environmental awareness.

The online tool's programming structure is presented in Figure 2.

Figure 2
Programming structure of the online tool



365-504 Tourism 2020 04ENG.indd 456 12/21/2020 8:29:00 AM

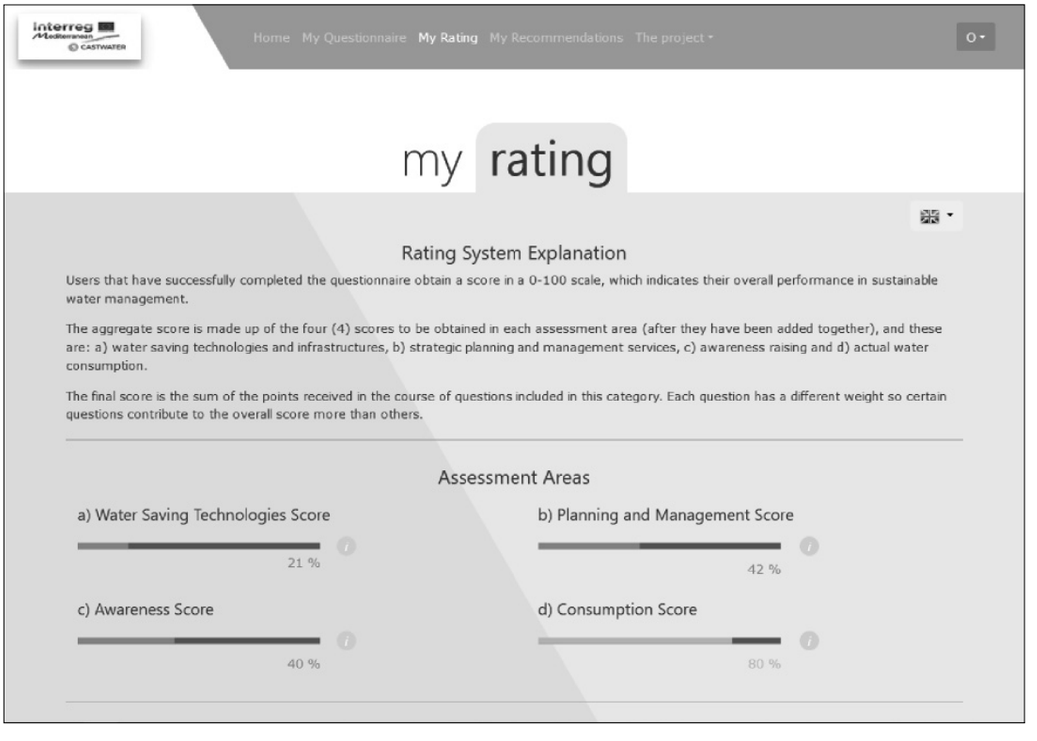
The back-end of the tool was developed using Spring Boot, creating a standalone production web application (Spring Boot, n.d.). After SMEs complete the questionnaire, the data is saved directly to the PostgreSQL database (PostgreSQL Database, 2020). Each time a user completes the questionnaire, the record is also forwarded to the Elasticsearch Search and Analytics engine, which sorts the received raw data (Elasticsearch, n.d.). Through the analysis of the raw data collected, the visualisations are created using a tool that offers aggregated measurements and monitoring dashboards like Kibana (Kibana, n.d.). Stored data is anonymous, fully complies with the General Data Protection Regulation (GDPR) and is solely used for statistical purposes. The online tool is available in all partnership languages (English, Greek, Croatian, French, Italian and Spanish).

4.2. Using the tool

Considering that our user is an SME user, he/she has to follow the following steps:

1. Visit the online tool (CASTWATER Project, 2020b).
2. Sign up as an SME representative by clicking on the 'Sign up' button on the top right corner of the page.
3. Upon registration, SMEs must then login to their account by clicking at the 'Login' button at the top-right corner of the page.
4. After the SME user is logged in, he may begin the tool's questionnaire and answer the questions for multiple sections, answers which will later help on evaluating his current status on water management and comparing alongside other businesses.
5. Complete all the survey sections.

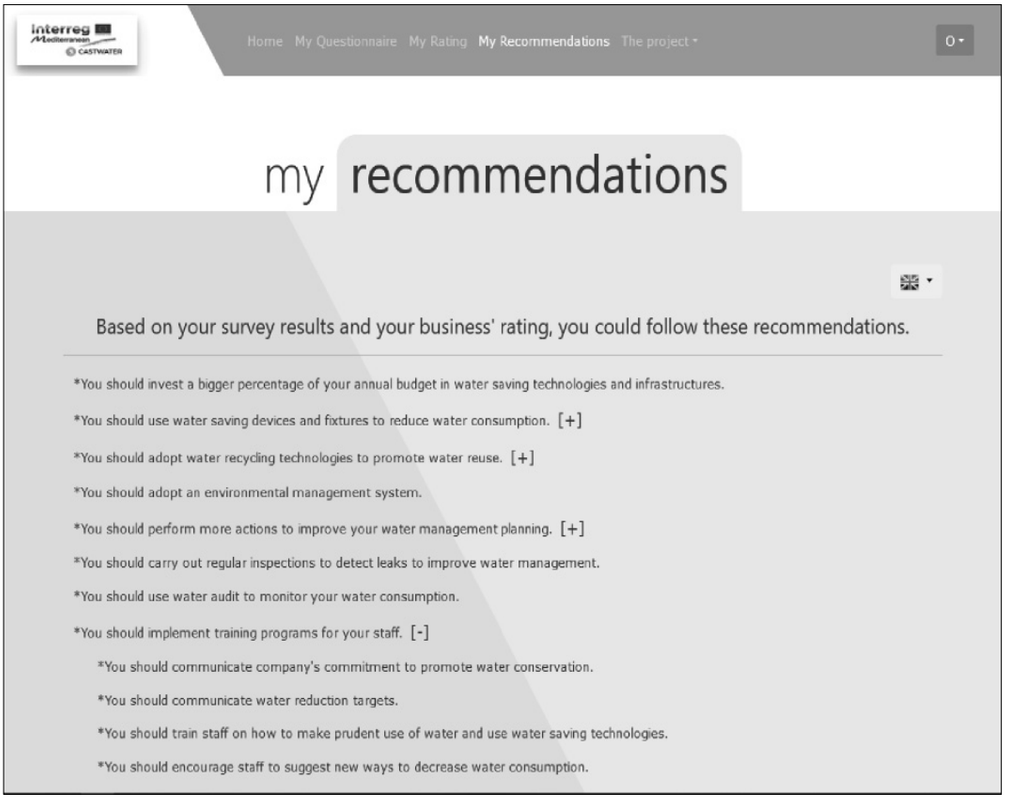
Figure 3
CASTWATER tool rating results



365-504 Tourism 2020 04ENG.indd 457 12/21/2020 8:29:00 AM

To aid the smooth completion of the questionnaire, all required information is also available for a direct download by clicking the '*Download as .pdf*' button. This better prepares SMEs for the upcoming questions and helps them collect all necessary data. After completing the survey, SMEs may a) change their responses, b) see their overall survey grade (see Figure 3), followed by comparison data with other SME establishments and c) check on the provided recommendations (see Figure 4).

Figure 4
CASTWATER tool recommendations



Considering that our user is a PA, he/she has to follow the following steps:

1. Visit the online tool (CASTWATER Project, 2020b).
2. Sign up as a PA clicking on the 'Sign up' button on the top right corner of the page.
3. Upon registration, PAs must then login to their account by clicking at the 'Login' button at the top-right corner of the page.
4. After the PA user is logged in, he/she is provided with two different options in reviewing statistics.
5. PAs may gain insight for the sector's views on the current policy framework, or simply, obtain a picture of the level of trust in the current policy framework by the SMEs. Aggregated data can be filtered based on country, region, province and establishment (see *Figure 5)*.
6. PAs can also monitor their water sustainability levels through aggregated statistics on water management solutions and categorize them per country, region, province and establishment.

365-504 Tourism 2020 04ENG.indd 458 12/21/2020 8:29:00 AM

Figure 5
CASTWATER tool statistics

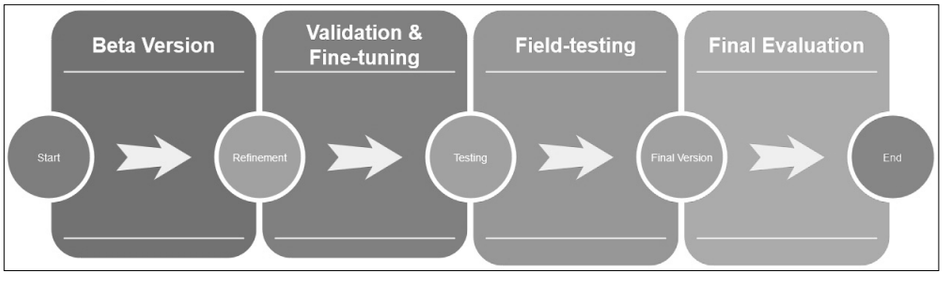
All diagrams are accompanied by self-explanatory messages, so that users clearly understand the scope each visualization refers to and receive translated metrics in their language. Visualisations range from vertical bars to pies and geographical region maps. Statistics reveal information such as average survey grades, a pie chart related to the survey grade ratings, a pie chart related to the different types of establishments from the SMEs, a geographical country map that shows submission distribution per country, presented per county and many more.

5. Evaluation methodology

5.1. Validation and fine-tuning

The testing phase of the tool involved the implementation of a small scale field-testing with end-users to pilot test the online tool, determine their water management performance and evaluate its technical performance, usability, and relevance of criteria and indicators on which the tool is based. The beta version of the tool was disseminated to industry and policy stakeholders to receive feedback and fine-tune it towards the final version.

Figure 6
The testing phase of the tool



365-504 Tourism 2020 04ENG.indd 459
12/21/2020 8:29:01 AM

5.2. Field testing

Field testing was selected, as it is a testing and evaluation method that involves trying an offering (e.g. product, service, system, application) in a real-life usage context, so as to identify shortcomings and flaws that could be experienced by end-users. Participants try the offering and to report their experience as they follow their own work processes in everyday situations. All project partners invited tourism stakeholders to pilot test the online tool and assess its usability and functionality. This enabled the partnership to monitor users' self-assessment, collect territorial data to present aggregate statistics and most importantly, evaluate the online tool's effectiveness in addressing SMEs' needs. The testing objectives were the following:

- Understand users' actual needs and discover opportunities to address them.
- Explore if end-users are able to complete all sections successfully without any malfunctions.
- Identify problems, dependencies and interactions in a real application context.
- Collect qualitative data about the target audience that is impossible through lab/computer testing.
- Evaluate users' understanding as regards the presentation of results and feedback provided.

The partnership employed a remote process to evaluate the usability and technical performance of the online tool, so that the researcher and the user were in different locations while the test was being conducted, since remote testing helps achieving multiple sessions that increase the validity of the evaluation results. The partnership conducted an un-moderated test where the test participants were provided with full instructions on how to progress through the testing session and assess the tool using an evaluation form (e.g. questionnaire), so that all sessions can be completed concurrently by the participants. This allowed us to invite many users to test the online tool and provide their feedback and comments. In addition, participants were able to complete the testing session and fill in the evaluation questionnaire when it was more convenient for them, as it is easier to engage participants if they do not have to be present in a specific location a given time and date.

An evaluation form was the main method for investigating the interaction of participants with the final version of the online tool and measuring users' engagement and experience. The evaluation focused on how easy it was for participants to use the tool and complete all sections in order to achieve their needs in terms of estimating their performance in sustainable water management. A questionnaire was used to establish a structured and well documented way to collect participants' personal views on the usability of the online tool. The questionnaire comprised of a textual form of questions after they have completed the testing process and was distributed to participants with an invitation email they received, asking them to participate in the testing process alongside with all the necessary directions to carry out the testing and complete the evaluation form.

6. Main findings

The target participants for the field-testing questionnaire were logically approached to complete the questionnaire for the evaluation of the online tool. These were the people who had been involved in the process of implementing or in the decision-making upon the adoption/integration of water management practices, within their organisation. Thus, the participants possessed significant experience in the implementation of water efficiency and saving measures and knowledge about company's water consumption and environmental performance.

365-504 Tourism 2020 04ENG.indd 460 12/21/2020 8:29:01 AM

Table 1
Participation in the evaluation process per type of establishment

Tourism facility	Number	Percentage (%)
Hotel	16	46
Restaurant	5	14
Bar/pub	3	9
Campsite	2	6
Café/tea shop	1	3
Golf/tennis court	1	3
Hostel	1	3
Tourism agency	1	3
Other	5	14
Total	35	100

Data source: CASTWATER Validation Report A4.4.

Table 1 shows the number of industry stakeholders from the different tourism sub-sectors. The largest number came from the accommodation sector with 19 participants (58%), followed by food and beverage businesses (23%), as well as tourism service providers and recreational centres (6%). The remaining (14%) represent other types of facilities that are undefined and belong to the category "other".

Evaluating the usability of the online tool, SMEs were asked about their opinions regarding the tool's functionality, since they should know from the very beginning what the tool is meant to do, what functions it serves, and what type of (diverse) needs are addressed. The responses received are summarized in Table 2 below.

Table 2
SMEs' opinions on the usability of the online tool

Question	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Mean (μ)	Std. deviation (σ)
The intended functions of the online tool are clear	2	1	4	29	18	4.11	0.89
The indicators are relevant to the concept of water sustainability	1	1	7	27	18	4.11	0.83
The questions included in the tool are easy to understand	3	2	7	28	14	3.88	1.01
The scoring system is easy to understand	2	3	6	20	23	4.09	1.04
The tool integrates a ranking system that enables comparisons	2	2	9	24	17	3.09	0.98

Data source: CASTWATER Validation Report, Deliverable A4.4.

As seen above, around 87% of participants declared that the core functions of the online monitoring tool are clearly described in the tool's homepage and across the different sections, so it was easy for them to understand what the tool is about and what functions it serves. Participants across all countries and type of users are in agreement that the indicators are relevant to the concept of water sustainability, as the number of positive replies reaches 83%. The vast majority felt that questions are easy to understand and straightforward, however, users' responses and comments show that the tool is not without challenges, as participants experienced difficulties in understanding the wording of a number of questions included in the "monitoring" section. Furthermore, there was a relative significant share (9%) which

365-504 Tourism 2020 04ENG.indd 461 12/21/2020 8:29:01 AM

found that the tool contains tough questions to answer. Users did not experience any substantial difficulty in comprehending how the system works and how the final outcome is calculated. The total level of agreement reaches 80%, which is more than half of them strongly agreed with this statement. Lastly, results show that the big majority of respondents had a positive reaction on the statement referring to the tool's capability to enable comparisons and benchmarking, as the total level of agreement reaches 80% for this statement, out of which 43% appear extremely enthusiastic with the ranking functionality provided by the tool.

Evaluating the design of the online tool, SMEs were asked about their opinions in terms of the tool's aesthetics, since design is a key component in creating an attractive and successful application and a system with a well-designed user interface can stimulate positive emotions and increase engagement. The responses received are summarized in Table 3 below.

Table 3
SMEs' opinions on the design of the online tool

Question	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Mean (μ)	Std. deviation (σ)
The interface is attractive	3	2	12	29	8	3.68	0.90
The interface is practical	2	4	1	31	16	4.01	0.97
The tool includes controls and notifications that make it easy to use and navigate	1	3	10	28	12	3.87	0.88
Registration to the online tool is quick and easy	1	0	0	27	26	4.42	0.68
The tool is loading and refreshing fast	0	1	1	29	23	4.37	0.61

Data source: CASTWATER Validation Report, Deliverable A4.4

The SMEs' overall experience with the tool in terms of interface design is considered positive. When asked to assess the tool's visual appearance, the vast majority (69%) had a positive reaction, claiming that the tool a nice user interface design and incorporates appealing visual elements. Some commented that the color selection contributed to making them feel welcomed. Almost 9 out of 10 stakeholders found the interface easy to use and quite practical. Users felt confident and comfortable to navigate within the tool. This is mostly because the interface's layout follows a typical pattern that most of users are familiar with, helping to save time and understanding the sequence of tasks and how to proceed. Around 75% of participants agreed that the tool includes notifications that make it easy to use and navigate, while only 4 stakeholders declared their disagreement with this statement. At the same time, almost all participants (98%) found the registration process quite easy and fast. The attitudes of industry and policy stakeholders regarding the tool's processing capacity is as clear as the following figure illustrates. Around 96% of the participants did not experience any technical problem, bug or malfunction when using the tool, stating explicitly that the online monitoring tool was loading and refresh increasingly fast.

Evaluating the relevance of the online tool, SMEs were asked to answer questions related to how relevant were the questions to their establishments. The responses received are summarized in Table 4 below.

365-504 Tourism 2020 04ENG.indd 462 12/21/2020 8:29:01 AM

Table 4
SMEs' opinions on the relevance of the online tool

Question	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Mean (μ)	Std. deviation (σ)
The tool can be used by tourism SMEs for assessing their water management performance	1	2	9	16	7	4.64	1.19
The tool provides useful recommendations on how to improve businesses' water performance	0	1	9	19	6	3.85	0.72
The tool allows regional authorities to estimate and monitor the tourism industry's (overall) performance in sustainable water management	3	0	3	8	4	3.55	1.30
The tool provides guidance to regional authorities on how to improve water related policies and adapt plans towards water sustainability	3	2	0	9	5	3.57	1.38

Data source: CASTWATER Validation Report, Deliverable A4.4

Participants felt that the issues that the online tool addresses were coherent with the needs on the ground. Tourism SMEs gained a clear view of the extent to which they are engaged in sustainable water management. Data shows that 7 in 10 industry stakeholders had a positive attitude towards the effectiveness of the online monitoring tool to provide reliable measurements on tourism SMEs' water management performance. These results confirm that the tool has been successful in fulfilling its primary function, to provide a practical solution to a real challenge. Results show that the tool successfully serves this functionality, as almost all industry stakeholders stated that the tool provides useful recommendations to improve water sustainability. Additionally, the majority believes that the monitoring tool constitutes a practical solution for PAs to get reliable and useful metrics for water consumption and sustainable practices in their territory. The total level of agreement regarding the guidance on improving water related policies and plans towards water sustainability exceeds 70%, while 3 in 10 participants appeared fascinated about the possibilities offered by the online tool. Policy stakeholders regard the online tool as an innovative practical solution and a reference point to gain insights and reliable statistics on tourism water sustainability.

The transferability potential of the online tool was evaluated by the following question:

- *Do you think that the CASTWATER online tool can be used by other types of tourism facilities for measuring their water management performance?*
  Yes (Please specify the type of tourist facility e.g. restaurants, hotels etc.)
  No (Please specify the reason)

Regarding the transferability potential of the online tool, the opinion expressed by the respondents is that the usage of the online tool could be increased with new target groups of tourism facilities that could benefit of it (73% of the SMEs). Some of the SMEs submitted additional information on the different types of tourism facilities that could practically use the online tool, like theme parks, car wash facilities and resorts.

Finally, the following overall conclusions could be drawn by the evaluation on the online tool:

- The tool is positively assessed by almost all testing participants, working as intended and reaches the targeted results for all of its sections - usability, relevance, design and transferability.
- The aspect of the online tool that does not seem to adequately address users' expectations and therefore was negatively evaluated, is its capacity to allow users to compare their performance with those of their competitors.

365-504 Tourism 2020 04ENG.indd 463 12/21/2020 8:29:01 AM

• The positively evaluated features of the online tool that however received recommendations for improvements should be further explored in detail and adjusted in order to fully satisfy the emerging tourism needs.

7. Conclusion

In this contribution, an online tool on water sustainability was presented, tackling sustainable tourism water management in MED coastal areas by improving the monitoring and assessment of the water sustainability performance of tourism. The tool offers two main functions: a) it allows tourism SMEs performance evaluation in sustainable water management and lesson learning on what SMEs can further do in order to promote water efficiency in their establishment and b) it measures the degree of good governance and effectiveness of water-tourism policies to improve sustainable water management at regional and local level. The tool's evaluation stage revealed that the tool was positively assessed by almost all testing participants, working as intended and reaches the targeted results for all of its sections, namely relevance, usability, design and functionality and transferability by the SMEs.

Acknowledgment

The authors acknowledge that the starting point and the drive of this paper has been generated and financed in the context of the transnational European Cooperation Programme for the Mediterranean area, the Interreg MED Programme 2014-2020 project "Coastal areas sustainable tourism water management in the Mediterranean - CASTWATER" (contract number 1MED15_3.1_M12_340). Therefore, the authors would like to thank all the project partners for their aid in the collection of the required data.

References

Buhalis, D., & Leung, R. (2018). Smart hospitality - Interconnectivity and interoperability towards an ecosystem. *International Journal of Hospitality Management*, *71*, 41–50.

CASTWATER Project. (2020a). *Project website*. Retrieved from https://castwater.interreg-med.eu/

CASTWATER Project. (2020b). *Online tool*. Retrieved from https://castwater-tool.ceid.upatras.gr/

Cheer, J. M., Milano, C., & Novelli, M. (2019). Tourism and community resilience in the anthropocene: Accentuating temporal overtourism. *Journal of Sustainable Tourism*, *27*(4), 554–572.

Elasticsearch. (n.d.). *Elasticsearch*. Retrieved from https://www.elastic.co/products/elasticsearch

European Commission. (2016). *European Tourism Indicator System (ETIS) for the sustainable management of destinations*. Retrieved from https://ec.europa.eu/growth/sectors/tourism/offer/sustainable/indicators/

Free and Open Source Software Tools for Water Resource Management Project. (n.d.). *FREEWATER Project*. Retrieved from http://www.freewat.eu/project

Garbin Praničević, D., & Mandić, A. (2020). ICTs in the hospitality industry: An importance-performance analysis among small family-owned hotel. *Tourism: An International Interdisciplinary Journal*, *68*(2), 221–234.

García-Hernández, M., de la Calle-Vaquero, M., & Yubero, C. (2017). Cultural heritage and urban tourism: Historic city centres under pressure. *Sustainability*, *9*(8), 1-19.

Global Environment Management Initiative Project. (n.d.). *Tool overview*. Retrieved from http://gemi.org/water/overview.htm

Global Water Tool. (n.d.). *Global water tool*. Retrieved from https://www.wbcsd.org/Programs/Food-Land-Water/Water/Resources/Global-Water-Tool

Jani, D. (2018). Residents' perception of tourism impacts in Kilimanjaro: An integration of the Social Exchange Theory. *Tourism: An International Interdisciplinary Journal*, *66*(2), 148–160.

365-504 Tourism 2020 04ENG.indd 464 12/21/2020 8:29:01 AM

Kazandzhieva, V., & Santana, H. (2019). E-tourism: Definition, development and conceptual framework. *Tourism: An International Interdisciplinary Journal*, *67*(4), 332–350.

Kemper, L., & Partzsch, L. (2019). Saving water while doing business: Corporate agenda-setting and water sustainability. *Water*, *11*(2), 297.

Kibana. (n.d.). *Kibana*. Retrieved from https://www.elastic.co/products/kibana

López-Morales, C., & Rodríguez-Tapia, L. (2018). On the economic analysis of wastewater treatment and reuse for designing strategies for water sustainability: Lessons from the Mexico Valley Basin. *Resources Conservation and Recycling*, *140*, 1–12.

Martín, J. M. M., Martínez, J. M. G., & Fernández, J. A. S. (2018). An analysis of the factors behind the citizen's attitude of rejection towards tourism in a context of overtourism and economic dependence on this activity. *Sustainability*, *10*(8), 2851.

Muler-Gonzalez, V., Coromina, L., & Galí, N. (2018). Overtourism: Residents' perceptions of tourism impact as an indicator of resident social carrying capacity – Case study of a Spanish heritage town. *Tourism Review*, *73*(3), 277–296.

Nejati, M., Mohamed, B., & Omar, S. I. (2014). Locals' perceptions towards the impacts of tourism and the importance of local engagement: A comparative study of two islands in Malaysia. *Tourism: An International Interdisciplinary Journal*, *62*(2), 135–146.

Panayiotopoulos, A., & Pisano, C. (2019). Overtourism dystopias and socialist utopias: Towards an urban armature for Dubrovnik. *Tourism Planning and Development*, *16*(4), 393–410.

PostgreSQL Database. (2020, February). *PostgreSQL: The World's Most Advanced Open Source Relational Database*. Retrieved from https://www.postgresql.org/

Seraphin, H., Sheeran, P., & Pilato, M. (2018). Over-tourism and the fall of Venice as a destination. *Journal of Destination Marketing and Management*, *9*, 374–376.

Sigala, M. (2018a). Market formation in the sharing economy: Findings and implications from the sub-economies of Airbnb. In S. Barile, M. Pellicano, & F. Polese (Eds.), *Social dynamics in a systems perspective 2018*. Cham: Springer.

Sigala, M. (2018b). New technologies in tourism: From multi-disciplinary to anti-disciplinary advances and trajectories. *Tourism Management Perspectives*, *25*, 151–155.

Soldić Frleta, D., & Smolčić Jurdana, D. (2020). Insights into differences in residents' attitudes: Tourism impacts and support for future development. *Tourism: An International Interdisciplinary Journal*, *68*(2), 170–180.

Spring Boot. (n.d.). *Spring Boot*. Retrieved from https://spring.io/projects/spring-boot

Sustainable Tourism Entrepreneurship Mechanism Project. (2020, January). *Approaching territorial sustainability through developing tourism and culture based entrepreneurship*. Retrieved from https://www.keep.eu/project/1658/susten-mechanism-sustainable-tourism-entrepreneurship-mechanism-approaching-territorial-sustainability-through-developing-tourism-and-culture-based-entrepreneurship

Veríssimo, M., Moraes, M., Breda, Z., Guizi, A., & Costa, C. (2020). Overtourism and tourismphobia: A systematic literature review. *Tourism: An International Interdisciplinary Journal*, *68*(2), 156–169.

Willet, J., Wester, K., Vreeburd, J., & Huub, H. M. R. (2019). Review of methods to assess sustainability of industrial water use. *Water Resources and Industry*, *21*, 100110.

Received: 29/06/2020
Accepted: 04/11/2020

365-504 Tourism 2020 04ENG.indd 465 12/21/2020 8:29:01 AM