

BIBLIOGRAPHIC INFORMATION SYSTEM

Journal Full Title: [Journal of Biomedical Research & Environmental Sciences](#)

Journal NLM Abbreviation: J Biomed Res Environ Sci

Journal Website Link: <https://www.jelsciences.com>

Journal ISSN: 2766-2276

Category: Multidisciplinary

Subject Areas: Medicine Group, Biology Group, General, Environmental Sciences

Topics Summation: 130

Issue Regularity: [Monthly](#)

Review Process: [Double Blind](#)

Time to Publication: 21 Days

Indexing catalog: [Visit here](#)

Publication fee catalog: [Visit here](#)

DOI: 10.37871 ([CrossRef](#))

Plagiarism detection software: [iThenticate](#)

Managing entity: USA

Language: English

Research work collecting capability: Worldwide

Organized by: [SciRes Literature LLC](#)

License: Open Access by Journal of Biomedical Research & Environmental Sciences is licensed under a Creative Commons Attribution 4.0 International License. Based on a work at SciRes Literature LLC.

Manuscript should be submitted in Word Document (.doc or .docx) through

Online Submission

form or can be mailed to support@jelsciences.com

**IndexCopernicus
ICV 2020:
53.77**

 **Vision:** Journal of Biomedical Research & Environmental Sciences main aim is to enhance the importance of science and technology to the scientific community and also to provide an equal opportunity to seek and share ideas to all our researchers and scientists without any barriers to develop their career and helping in their development of discovering the world.

OPINION

Environmental Sustainability Indicators Applied to Tourism Sector in Sicily

Agata Matarazzo*, Zerbo Antonio, Arfo Sergio

Department of Economics and Business, University of Catania, C.so Italia 55 – Catania, Italy

ABSTRACT

Tourism represents one of the leading sectors worldwide and for this reason; its importance extends to a variety of studies and researches aimed to a better and more sustainable development. Tourism is an important added value to the economy of a city, of a region and therefore of a whole country. As a result, the development of this sector can be instrumental in improving the existing conditions in one place. But, it is not just an economic factor, but much more. It is not by chance that it is studied under different points of view such as economic, social, geographical and psychological. Tourism is an important source of revenue for the economy of a country because it brings money to the State which use it as a source to improve services, buildings, facilities and tourism destinations. In Italy, the tourism sector has a primary importance on the economy of the Country with an incidence on the Gross Domestic Product of 7% offering two million job positions. Every year facilities host more than 80 million people with about 350 million overnight stays. The aim of this study is to analyze environmental impact caused by tourism, thanks to the use of indicators, which varies regarding the tourism destination they are linked with. In particular, some environmental indicators on the city of Catania, in east of Sicily, are analyzed and their interaction could give a wide panorama of Sustainability in Catania and to identify all the advantages on sustainable tourism tools in Sicily.

INTRODUCTION

Tourist destinations have been facing, in the past few years, more and more social, cultural, economic, and environmental challenges. To help them measure their performance in relation to sustainability, which is essential, the European Commission has developed a 'European Tourism Indicators System' (ETIS, a system of indicators suitable for all tourist destinations, encouraging them to adopt a more intelligent approach to tourism planning [1,2]. It is a management tool, supporting destinations who want to take a sustainable approach to destination management; a monitoring system, easy to use for collecting data and detailed information and to let destinations monitor their performance from one year to another; an information tool (not a certification scheme), useful for policy makers, tourism enterprises and other stakeholders.

The evolution of environmental legislation, at a European, national and regional level, towards a regulation of local environmental impacts, together with the growing attention to the issues of Sustainable Development, aims at optimizing the use of resources and reducing the effects on the environment [3,4]. The term "indicator" identifies an instrument able to simplify information related to more complex phenomena, thus favoring comprehension, communication and comparison, making visible a trend or a phenomenon that is not immediately perceptible [5].

In literature there is the distinction between "indicator", a parameter or a

*Corresponding author

Agata Matarazzo, Department of Economics and Business, University of Catania, C.so Italia 55 – Catania, Italy

E-mail: amatar@unict.it

DOI: 10.37871/jbres1466

Submitted: 27 April 2022

Accepted: 30 April 2022

Published: 30 April 2022

Copyright: © 2022 Matarazzo A, et al. Distributed under Creative Commons CC-BY 4.0

OPEN ACCESS

Keywords

- Sustainability
- Environmental impacts
- Tourism sector
- Environmental indicators
- Development instruments

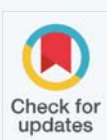
ENVIRONMENTAL SCIENCES

ENVIRONMENTAL IMPACTS

ENVIRONMENTAL CONTAMINATION

NATURAL RESOURCE MANAGEMENT

VOLUME: 3 ISSUE: 4 - APRIL, 2022



value derived from parameters that describes the state of a phenomenon and “index”, set of parameters or indicators aggregated and weighed [6,7].

Sustainable tourism

Tourism impacts on the environment is a delicate and important topic. Nowadays awareness towards respect of what surrounds us, the places in which we live and the environment in general, brought up the need for sustainability; concept that led to the research for sustainable tourism [8].

The term “sustainable tourism” has come to represent and encompass a set of principles, policy prescription, and management methods which charts a path for tourism development such that a destination area’s environmental resource base. Tourism, as environmentally responsible, leads to a direct benefit of the natural area and to the economic welfare of local populations [9]. A community-based approach to ecotourism combines the quality of life of people and the conservation of resources. It is common that economic benefits related to the development of tourism for a local community, may result in damages to social and cultural systems [10,11]. At the same time, the respect towards tourism refers to both citizens and tourists because ecotourism is based on the respect for values by tourists themselves, without which tourism, has no reason to exist; but it is also a rational behavior of the same local populations that sustainably manage their natural and cultural heritage, which ensures long-term economic activity in the long run. Sustainable tourism can be defined as: “Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities [12,13]”. According to the World Tourism Organization (WTO) “The development of sustainable tourism responds to the needs of tourists and regions that welcome them, protecting and improving opportunities for the future. It must translate into an integrated management of all the resources that can satisfy economic, aesthetic and social needs, while at the same time preserving cultural integrity, ecosystems, biodiversity and the basic conditions for life”.

In 2004 the definition is clarified through the identification of three indispensable prerogatives of sustainable tourism: the optimal use of natural resources, which must be preserved; respect for the socio-cultural identity of the host communities and the contribution to inter-cultural understanding and tolerance; the equitable distribution of socioeconomic benefits both in terms of employment and social services [14,15]. Furthermore, sustainable tourism must be a participated and constantly monitored process and finally must guarantee an elevated level of satisfaction for tourists. Thus, sustainable tourism should: 1) Make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to

conserve natural heritage and biodiversity. 2) Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to intercultural understanding and tolerance. 3) Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation. Sustainable tourism development requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building [16]. Achieving sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary. Sustainable tourism should also maintain an elevated level of tourist satisfaction and ensure a meaningful experience to the tourists, raising their awareness about sustainability issues and promoting sustainable tourism practices amongst them [17,18].

The sustainability of tourism in each area depends on the balance of multiple factors, ranging from the ecosystem to infrastructures, from socio-demographic aspects to economic ones. Achieving sustainable tourism planning should be the result of a process agreed between the various stakeholders and will be specific to the location considered. Eco tourism management has raised a variety of concerns related to the education of the tourist. It is highly expensive to educate tourists on a topic that is still developing and that has not a unique definition. For this reason, cannot be found a single method of tourist’s education but the only way of reducing tourism negative impacts is to be aware of the consequences; for example, tourists have the possibility to choose public transport over private transport, understanding which action should be done from an ethical point of view and behave in a responsible way [19]. On the other hand, local population must assume an active role on maintaining safe their environment [20]. Factors, such as ecosystem, infrastructures, socio-demographic aspects and economic elements are an essential part of the management of sustainable tourism. Achieving sustainable tourism planning should be the result of a process agreed between the various stakeholders and will be specific to the location considered [21]. To respond to the need to build a model of development adaptable to all environmental realities, UNEP in 1997 developed, through the Program of Priority Actions, a Tourism Carrying Capacity Assessment (TCCA). The tourist load capacity is defined by the WTO as “the maximum number of people who visit, in the same period, a tourist resort without compromising the physical, economic and socio-cultural environment, and without reducing tourists’ satisfaction [22]”. This evaluation process takes into consideration three main groups of parameters: physical and environmental, socio-demographic and political economic, closely linked to a specific territory

and to local political management; moreover, it is based on a careful study of the state of the environment and of all possible development scenarios. Quality objectives of the services offered, and promotion of the local economy must be pursued, also based on the introduction of new eco-compatible technologies. Social equity and economic growth must be guaranteed, accompanied by the total well-being of the local population, through the involvement of all subjects in decision-making processes. In the planning and tourism management of the locality the component of durability of development over time must always be considered. An excess of tourist presence can cause environmental damage in ecologically sensitive areas, high consumption of natural resources, increased pollution, deterioration of the artistic heritage, compared to the historical-cultural aspects of the communities involved, can contribute to the cultural flattening, to the loss of local traditions and serious socio-economic imbalances [23]. The consequences of these events negatively affect the tourist attractiveness of a locality. Most of the time “Sustainable” is synonymous with responsible tourism, two concepts that for some they coincide, but for others they show appreciable differences. The meaning of “Responsible” refers to a meeting tourism, in that devotes more attention to the social and cultural aspects of tourism, while “Sustainable” can be referred to a tourism aimed at the conservation of ecosystems [24]. The contribution of Sustainable Tourism can be essential for the development of the social cooperation, not only for the protection of the environment. The fundamental characteristic of this form of tourism is the local management of services and the active participation of indigenous communities, with consequent beneficial effects on the related socio-economic aspects.

Environmental impact of the tourism sector

The impact of tourism on the environment can be defined in terms of “environmental and social pressure”: greater turnout of vehicles, greater presence of people, increase in waste production and increase in the construction of new accommodation facilities. Surely it is not easy to understand, study and evaluate the effects, so much so that although several studies have been done there is not a real “method” to be followed as there are no models of Environmental Impact Assessment (EIA) generally accepted. The EIA is a process by which we try to verify that a given project can develop by limiting and controlling its negative effects. It is an evaluation aimed at highlighting the consequences of a given intervention so that, in this case, the project can be modified before it is put in place without having to go to the point of trying to correct the errors after the project has been started [2]. It is therefore important to apply this procedure also to developments in tourism projects [11]. Some environmental effects, both positive and negative, can be generated by tourism. Speaking of positive effects, the main consequences can be:

- Protection of natural areas, beaches and coastal
- Creation of national parks

- Restoration and preservation of historical structures, sites and monuments
- Conservations of forests
- Environmental awareness of both citizens and tourists; on the other hand, negative impacts can be increased hunting and fishing with effects on fauna and flora
- Destruction destroyed or damaged
- Excessive production of waste and unpolished forms of disposal and therefore soil, water, atmospheric and acoustic pollution
- Disfigurement, erosion, damage to ancient monuments by tourists
- Disfigurement of the landscape

MATERIALS AND METHODS

Local authorities have become aware, first through the “Seventh European Union Environmental Action Program”, and subsequently with the “Aalborg Charter”, to base their decision-making and control activities on several types of indicators. The Seventh Environmental Action Program The program entered into force in January 2014; it is now up to the EU institutions and the Member States to ensure it is implemented, and that priority objectives set out are met by 2020. The 7th Environment Action Program (EAP) will be guiding European environment policy until 2020. In order to give more long-term direction, it sets out a vision beyond that, of where it wants the Union to be by 2050 (<http://ec.europa.eu/environment/action-programme/>) [10]. With the signing of the Charter, the European cities and regions are committed to implementing Agenda 21 at local level and to develop long action plans term for a sustainable development. It is therefore necessary to choose the most suitable indicators to be correlated with the environmental aspects and repercussions of the various sectoral policies.

The European environmental agency has recognized various main groups of indicators: descriptive indicators (they quantify the environmental state) such as motorization rate, per capita emission of CO₂; performance indicators (which refers to a target and measure its distance) such as % of separate waste collection on total waste produced, number of beds in hospital facilities; efficiency indicators such as all the expensive cause by the production; global welfare indicators (which aggregate the social, economic and ecological dimension) such as Per capita GDP; punctual indicators (which represents the minimum aggregation sets of data in large lists) [15].

Local authorities have become aware, first through the “Seventh European Union Environmental Action Program”, and subsequently with the “Aalborg Charter”, to base their decision-making and control activities on several types of indicators. The Seventh Environmental Action Program The program entered into force in January 2014; it is now up to the EU institutions and the Member States to ensure it is

implemented, and that priority objectives set out are met by 2020. The 7th Environment Action Program (EAP) will be guiding European environment policy until 2020. In order to give more long-term direction, it sets out a vision beyond that, of where it wants the Union to be by 2050. It identifies three key objectives:

- To protect, conserve and enhance the Union’s natural capital
- To turn the Union into a resource-efficient, green, and competitive low carbon economy
- To safeguard the Union’s citizens from environment-related pressures and risks to health and wellbeing.

Four so called “enablers” will help Europe deliver on these goals:

- Better implementation of legislation
- Better information by improving the knowledge base
- More and wiser investment for environment and climate policy
- Full integration of environmental requirements and considerations into other policies.

Two additional horizontal priority objectives complete the program:

- To make the Union’s cities more sustainable
- To help the Union address international environmental and climate challenges more effectively

In order to fulfil the practical aim of this study, we could set two main objectives. First, develop an indicator system that is easy to implement, measure, and interpret for application towards improving the sustainability of tourism activities in established destinations [25]. Furthermore, the proposed system allows users to assess the sustainability of activities belonging to the cultural tourism segment. To facilitate information use and interpretation by managers and the general public, it is possible to construct composite indicators of sustainability by using the methodology of the composite indicator of goal programming. Specifically, it is shown how to use this methodology to evaluate the sustainability aim in tourism destinations.

A second objective is to show how local agents can use indicator systems and composite indicators in current tourism policy making. Cultural tourism may contribute to seasonally adjusted tourism and to generating benefits for the local community. Surely it is not easy to understand study and evaluate the effects, so much so that although several studies have been done there is not a real “method” to be followed as there are no models of Environmental Impact Assessment (EIA) generally accepted (http://ec.europa.eu/growth/sectors/tourism/offer/sustainable/indicators_en).

The EIA is a process by which we try to verify that a given project can develop by limiting and controlling its negative

effects. Sustainable Tourism Indicators for Mediterranean established destinations. Some environmental effects, both positive and negative, can be generated by tourism. In conclusion, despite the performance indicators allow a faster and better circulation of environmental information within the company and favor, the strengthening of environmental policy. The development of the management system, the improvement of relationships with suppliers, the reduction of emissions and related costs of abatement and prevention, however, until now, they have been used as a communication tool only leaving their application for managerial purposes out of a firm’s policy [15].

CASE STUDY: THE CITY OF CATANIA

The case study is the city of Catania, a city located in the middle of the Ionian coast in the Eastern Sicily; it extends between the Mediterranean Sea and Mount Etna, the highest Volcano in Europe (3.3.50m), dominating the alluvial land bounded by Simeto and Dittaino. In the city center of Catania, is possible to notice Greek and Roman ashes due to their invasion several years ago. Catania was founded in 729 f.c. by Greek colonies coming from Calcide in Eubea: after the foundation on Naxos in 734 f.c., they, thanks to their strengths, drive away Sicilian and built the city of Leontini and Catania. During the first Punic war, Catania was conquered by the Roman Empire in 263 f.c. which enabled the city to acquire prestige and importance on that time. After the fall of the Roman empire, Catania was dominated by Ostrogoths, Byzantines, Saracens and Normans thanks to which had an era of splendor and health; this period was followed by the domination of Swabians who, on the other hand, destroyed and plundered it in 1197 and 1232. Under the Aragonese dynasty it was the capital of the Kingdom of Sicily, and from 1434, at the behest of King Alfonso V, it was the seat of the oldest University of the island, the Sciliorum Gymnasium. In the course of its history it has been repeatedly affected by volcanic eruptions (the most impressive, in historical times, is that of 1669) and by earthquakes (the most catastrophic ones remembered were those of 1169 and 1693). The city was able to overcome these natural disasters thanks to the Spanish domination followed after the Aragonese dynasty. Catania has been a native or adoptive homeland of some of the most famous Italian artists and writers, including the composers Vincenzo Bellini and Giovanni Pacini and the writers Giovanni Verga, Luigi Capuana, Federico De Roberto, Nino Martoglio, Vitaliano Brancati. The baroque of its historic center has been declared a UNESCO World Heritage Site.

Environmental indicators are essential tools for tracking environmental progress, supporting policy evaluation and informing the public. In this part, the environmental indicators described in the second chapter are used to evaluate the tourism sector of the city of Catania (Department of Tourism, (2017), Sport and Entertainment-Tourist Observatory, *Il Turismo in Sicilia*).

Environmental indicators and tourism are strictly connected. For this reason, is useful to analyze some indicators:

Tourist function indices: Accommodation capacity; hotel beds; extra-Hotels beds

Flow indicators: arrivals, departure, average stay, attendance, hotels etc.

The data available for Catania (Figure 1) is of the year 2016, a year of quantifiable expansion for the tourism sector in the province of Catania, with a growth of 13.6% in the number of business activities and 4.6% in the availability of beds. The contribution of the non-hotel sector was decisive, with 114 new structures compared to 2015 (+ 14.9%) reaching the availability of 10.399 beds (32.2% of which available at B & B) equal to + 6% compared to 2015. The hotel sector in the province of Catania has grown; + 6.1% in the number of structures and a + 3.4% in terms of beds. Catania, for its economic activity, represents the biggest and most important center of Sicily; it has acquired this position thanks to its commercial center, which is the richest of the

island, and its commerce, that goes beyond the provincial boundaries (Department of Tourism, (2017), Sport and Entertainment-Tourist Observatory, *Il Turismo in Sicilia*). Flow Indicators related to the Province of Catania, represent another tool to observe the sustainability in Tourism. Based on the provisional data available at the Regional Tourist Observatory in 2016, the inter-regional tourist flows showed a decline with rates that stood at - 2.7% for arrivals and -5.6% for presences. The 5.6% contraction recorded in the presences is mostly due to the tourism of our compatriots (-9.6% the Italian presence compared to 2016), while the reduction in the presence of foreigners was much lower (-5.6%), mostly from France and Germany. Moreover, it is possible to measure the portion of overnight stays in the 9 Provinces of Sicily compared to the entire Region, looking closely to the case of Catania (Figure 1). Among foreigners, the greatest visitors of Sicily are the French who, both in 2015 and 2016, occupy the first place in the ranking of arrivals from foreign countries to our region. It follows Germany, the United Kingdom and so on (Figure 2). The analysis of environmental indicators in Catania can be focused on the natural protected areas in the Province. There are several

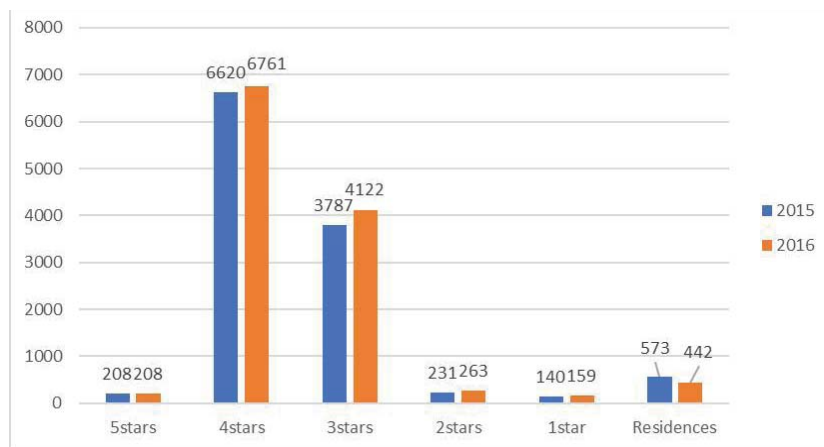


Figure 1 Hotel Beds in the Province of Catania, 2015-2016.

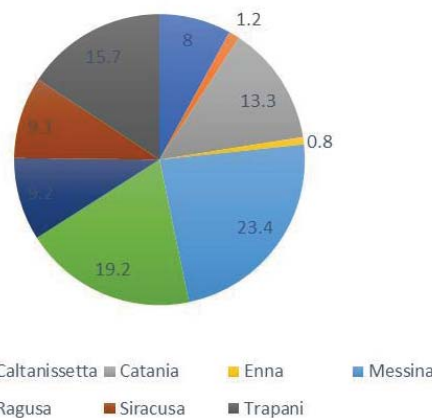


Figure 2 Share of overnight stays by province compared to the entire region, 2018.

protected areas, specifically twelve. This indicator expresses how much of the city's surface is undergoing biodiversity protection measures:

$$LAE = Sc / Spa * 100$$

Sc: Stands for the surface of the Province of Catania

SpS: Stands for the surface of the protected areas.

Considering the surface of the Province of Catania which is 357400ha and the total surface for the protected areas of 157235 ha the indicator will be: $LAE = 357400 / 157235 * 100 = 22730$ ha

In the table 1 is shown the surface for each area considered in the calculation.

Another fundamental aspect that competes to establish a more efficient tourism level in the city of Catania is the urban viability; reason why the municipality has been trying to set new goals for a continuous improvement. Catania and its Administration, in the last decade, have been carrying out new measures to reorganize the Limited Traffic Zone (LTZ) in the city center and increase the pedestrian traffic only (Table 2). However, the public transportation service has been reduced (-50%) because of the cuts in the national TPL service in 2010 and because of the financial crisis of AMT Catania: for these reasons, users decrease of the 17% between 2012 and 2016. Statistics say that, in the city of Catania, 68% of people use their own car for movements. To reduce this amount, is necessary to leverage on collecting transportation; thankfully, the underground service has been developed in 2016 in the city of Catania and the Administration is still working to improve it and reach a wider area. The central pedestrian area has been extended and, during summer, every other Sunday the seafront is closed to the traffic to increase the cycling and pedestrian traffic. Moreover, in 2016 has been installed the car sharing service to reduce the use of private transport. Again, another step closer to sustainability has been taken to improve the

Table 1: Protected areas and their surfaces in the province of Catania.

| Protected area | Year Institution | (ha) |
|-----------------------------|------------------|-------|
| Ciclope Island | 2004 | 623 |
| Simeto Lava holes | 2000 | 1217 |
| Ponte Arca Oasis | 2009 | 70 |
| Nebrodi Park | 1993 | 86000 |
| Etna Park | 1987 | 58000 |
| River Park Alcantara | 2001 | 1927 |
| Fiumefreddo River | 1987 | 10 |
| Immacolatelle e Micio Conti | 1998 | 70 |
| Simeto Oasis | 1984 | 1859 |
| Bosco S.Pietro | 1999 | 6559 |
| La Timpa | 1999 | 225 |
| Simeto River | 2000 | 675 |

Table 2: Limited traffic areas of Catania, 2016.

| 2.396 | 426 |
|------------------------------|----------------------------|
| Vehicles licensed to LTZ | LTZ entrances |
| 0% growth rate 2006/2016 | -28% growth rate 2012/2016 |
| 18 | 32 |
| Interchange parking | Paid parking on the road |
| + 173% growth rate 2012/2016 | 0% growth rate 2011/2016 |

railway service. In 2017 the first Ognina- Catania center sector of 2.6 km which will be connected to the underground and the local railway "Circumetnea" to link every part of the city, has been opened (Figure 3).

Advantages of the Application of Sustainable Tools in Tourism

The sensibility of public opinion towards a sustainable lifestyle increases with the spread of environmental pollution [21]. The use of mandatory and volunteer tools to respect the environment is the correct action to develop. It is noticeable how tourists appreciate the interventions, for the protection of the environment, promoted by accommodation facilities such as Hotel, B&B and Residences; how they increase their appreciation towards a better environmental quality and how the certification systems of environmental quality are valued [23]. The main advantages related to the use of the tools previously described can be:

- Economic development of the hotel structure
- Environmental conservation and the artistic heritage of the destination
- Waste reduction
- Optimization of waste management
- Economic saving
- Decrease in pollution and environmental impact
- Use of organic products and consequent contribution to a healthy diet benefits for revenue management

In tourists' facilities such as Hotels, Hostel, B&B and residences, the manager should, through an adequate communication plan, inform the potential guests that the structure adopts environmental sustainability measures and, at the same time, instruct the staff on what are the services offered and the ways in which the hotel is committed to saving resources. There are several approaches usable to develop a sustainable management such as adopt measures to save energy and water, recover rainwater for irrigation of green areas and use the magnetic card instead of traditional keys. Today many hotels are equipped with a switch placed next to the door of the room where you can insert this type of magnetic key, inserting it activates the electricity; in this way, if the guest is not present, there will be no energy waste;

- Separate waste collection
- Use electric cars
- Take advantage of the short supply chain by

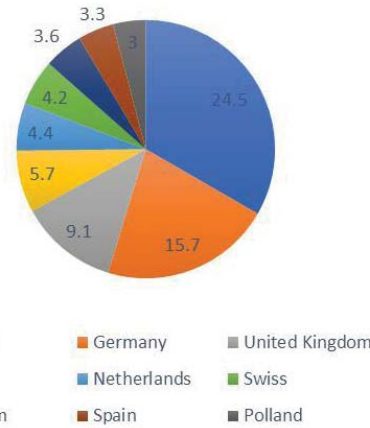


Figure 3 Incidence of overnight stays of the main foreign visitors in Sicily, 2018.

establishing partnerships with local companies

- Install solar panels
- Use recyclable or recycled materials
- Use rechargeable packs and ecological products for the courtesy kit
- Offer organic and local foods. There are many more approaches that can be developed to implement an efficient sustainable tourism system.

CONCLUSION

The sensibility of public opinion towards a sustainable lifestyle increases with the spread of environmental pollution. The use of mandatory and volunteer tools to respect the environment is the correct action to develop. It is noticeable how tourists appreciate the interventions, for the protection of the environment, promoted by accommodation facilities such as Hotel, B&B and Residences; how they increase their appreciation towards a better environmental quality and how the certification systems of environmental quality are valued [10].

There are several approaches usable to develop a sustainable management such as: Adopt measures to save energy and water: recover rainwater for irrigation of green areas and use the magnetic card instead of traditional keys. Today many hotels are equipped with a switch placed next to the door of the room where you can insert this type of magnetic key, inserting it activates the electricity; in this way, if the guest is not present, there will be no energy waste; Separate waste collection; Use electric cars; Take advantage of the short supply chain by establishing partnerships with local companies; Install solar panels; Use recyclable or recycled materials; Use rechargeable packs and ecological products for the courtesy kit; Offer organic and local foods. These and many more approaches can be developed to implement an efficient sustainable tourism system. In tourists' facilities such as Hotels, Hostel, B&B and residences, the manager

should, through an adequate communication plan, inform the potential guests that the structure adopts environmental sustainability measures and, at the same time, instruct the staff on what are the services offered and the ways in which the hotel is committed to saving resources.

The main advantages related to the use of the tools previously described can be:

- Economic development of the hotel structure
- Environmental conservation and the artistic heritage of the destination
- Waste reduction
- Optimization of waste management
- Economic saving
- Decrease in pollution and environmental impact
- Use of organic products and consequent contribution to a healthy diet benefits for revenue management

ACKNOWLEDGMENT

Authors wish to acknowledge the support of the Italian Ministero dell'Istruzione, dell'Università e della Ricerca (MIUR) through the project "Optimization of Wind Turbine Performance and their Particular Uses - Technical-Economic and Environmental Feasibility Analysis" of the Department of Civil Engineering and Architecture and Department of Economics and Business of the University of Catania- Piano di incentivi per la Ricerca 2020/2022 (PIA.CE.RI).

REFERENCES

1. Matarazzo A, Clasadonte MT, Lo Giudice A. Improvement of touristic services through an innovation model based on environmental sustainability indicators. Tourism sector, Socio-cultural resources. 2012. <https://tinyurl.com/4pzzbrdf>
2. Merli R. Technology and innovation for a sustainable future: A commodity science perspective. Conal. 2012;1-11:24-28. <https://tinyurl.com/bde65t9f>
3. Miller G. The development of indicators for sustainable tourism: Results of a Delphi survey of tourism researchers. Tourism Management. 2001;22:351-362. <https://tinyurl.com/mvhwky2m>
4. Ventura MR, Pecorino F, Saia N, Matarazzo A, Bertino A. Environmental performance

- indicators regarding the water system in a leader sicilian steel industry. *Procedia Environmental Science, Engineering and Management*. 2019;6:269-274. <https://tinyurl.com/2p86xxbj>
5. Matarazzo A, Pappalardo N, Clasadonte MT. The rough set analysis for the identification of synthetic indicators of environmental performance in the air sector of urban centers. *First Meeting on Mathematical Models applied to environmental management*. 2007;26-27.
 6. Clasadonte MT, Matarazzo A, Zerbo A, Primerano P. Application of an industrial ecology model in environmental high risk area in Eastern Sicily. 2013;3:54-65. <https://tinyurl.com/2bv7ksfk>
 7. Matarazzo A, Maugeri E, Gullo E, Romano P, Spedalieri F, Licciardello A. Life cycle thinking approach applied to the sustainable tourism sector, life cycle thinking in decision making for sustainability: From public policies to private business. 2018;1:421-429. <https://tinyurl.com/yues24cx>
 8. Arfò S, Mulè M, Matarazzo A, Bongiorno V, Giarratana A. Management and reuse of industrial waste: inert asbestos as a raw material in the construction sector in a circular economy perspective. *Procedia environmental science, engineering and management*. 2019;6:17-24. <https://tinyurl.com/377chpt9>
 9. Matarazzo A, Vazzano TA, Squillaci C. Survey on purchasing methods of food products in tarragona and catania. *Advances In Global Services And Retail Management*. 2021;2:1-18. <https://tinyurl.com/2p8h8rf7>
 10. UNEP and UNWTO. Making tourism more sustainable. A Guide for Policy Makers. 2005;11-12. <https://tinyurl.com/yt4hnn7b>
 11. Arfò S, Matarazzo A, Saccone AP. Environmental sustainability indicators applied to tourism sector in sicily. *Procedia 17th International Conference on Environmental Science and Technology*. 2020.
 12. Hunter C. Sustainable tourism as an adaptive paradigm. *Annals of tourism research*. 1997;24(4):850-867. <https://tinyurl.com/5b3tvjfn>
 13. Sharpley R, Telfer DJ. Tourism and development: Concepts and issues. *Channel View Publications*. 2002;1:47. <https://tinyurl.com/2p98kct2>
 14. Zilia F, Bacenetti J, Sugni M, Matarazzo A, Orsi L. From waste to product: Circular economy applications from sea urchin. *Sustainability*. 2021;13:1-18. <https://tinyurl.com/yckn5pxw>
 15. Matarazzo A, Clasadonte MT. The Eco mapping as a useful tool to simplify the preliminary environmental analysis of a seaside resort. *International Conference on Commerce*. 2010;116:868-877.
 16. Matarazzo A, Spampinato EC, Arfò S, Sinigaglia U, Bajeli A, Benanti S. Block chain technology applied to the consortium etna doc to avoid counterfeiting. *Advances in Global Services and Retail Management*. 2021;2:1-11. <https://tinyurl.com/4yrmwsx8>
 17. Mc Cool SF, Moisey RN. Tourism, recreation, and sustainability: Linking culture and the environment. *CABI Publishing*. 2002. <https://tinyurl.com/2p9uraw4>
 18. Clasadonte MT, Matarazzo A, Sabbia A, Bruno BV. Guidelines for environmental accounting and territorial bodies. 2005;180-182.
 19. Matarazzo A, Sabbia A, Micali G. Environmental impact indicators for the determination of carrying capacity tourism, in *Proceedings of the XXIV National Congress of Commodity Sciences. Environment Internationalization - Systems - Goods - Energy*. 2009;1:329-336
 20. Lozano-Oyolaa M, Blancasa FJ, Caballero R. Ecological Indicators, Sustainable tourism indicators as planning tools in cultural destinations. 2012;18:659-675.
 21. De Camillis C, Mazzi A, Arzoumanidis I, Matarazzo A, Petti L, Toniolo S, Raggi A. Some lessons learned and highlights from the working group on tourist services to position the Italian LCA Network in the context of SDGs, life cycle thinking in decision making for sustainability: from public policies to private business. 2018;1:325-333.
 22. Donati A, Petracchini F, Gasparini C, Tomassetti L. Air quality and mobility policies in the 14 major Italian cities. 2016.
 23. Matarazzo A, Maugeri E, Gullo E, Romano P, Spedalieri F, Licciardello A. The Bioeconomy in Sicily: new green marketing strategies applied to the sustainable tourism sector. *Journal Of Global Business Insights Global Conference on Business, Hospitality, and Tourism Research*. 2019;2:5:27-34.
 24. Sabbia A, Clasadonte MT, Matarazzo A. The specialization index as a measure of the tourist-cultural vocation of a territory, *Proceedings of the XXIV National Congress of Commodity Sciences. Environment - Internationalization - Systems - Goods - Energy*. 2009;1:377-384.
 25. Campese C. Tourism, territorial marketing analysis, catania is not a tourist destination. 2014;5-10.

How to cite this article: Matarazzo A, Antonio Z, Sergio A. Environmental Sustainability Indicators Applied to Tourism Sector in Sicily. *J Biomed Res Environ Sci*. 2022 Apr 30; 3(4): 465-472. doi: 10.37871/jbres1466, Article ID: JBRES1466, Available at: <https://www.jelsciences.com/articles/jbres1466.pdf>