

# DEVELOPMENT OF A SUSTAINABLE ACCESSIBILITY MODEL FOR THE MARINE PROTECTED AREA GAIOLA UNDERWATER PARK, IN NAPLES, ITALY

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**Abstract** – The Marine Protected Area (MPA) Gaiola Underwater Park was instituted in 2002 for the preservation of the urban coastal area of extreme importance both for natural and archaeological aspects. Due to the urban context where the MPA is located, the anthropic pressure on the site has always been high and it has always undermined the preservation of the cultural and environmental heritage of the site itself. Particularly, the public beach in the General Reserve Zone B has always been impacted by great problems of overcrowding that have always undermined a safe and sustainable use of the area. During the recent Covid-19 crisis, the problems related to the overcrowding of the Park became even more urgent. In May 2020, the safety problems highlighted by the pandemic, drove the Manager Authority attention to change the paradigm of management of the MPA and to study a new model of accessibility that allowed to keep a safe environment, a more respectful preservation of the environmental and cultural heritage of the Park and, at the same time, a safer and more enjoyable experience for bathers and visitors. On the occasion of the July 2020 reopening, after the lockdown, a protocol that guaranteed the place's security and sustainable fruition, based on the regulation of users' access and zero waste strategy, was developed. Since the first year of its application, this new fruition model of the area has been able to reduce up to eliminate all the atavistic criticality connected to the exasperated overcrowding of the area, finding at the same time a high approval rating among the users due to the recovered decency and livability of the area. This work aims to show and discuss the results of the application of the new fruition model, obtained from the analysis of the data collected through field monitoring, questionnaires, user interviews and online reviews.

## Introduction

The Gaiola Underwater Park, with a marine surface of 41 hectares, extends for almost 2 km along the coast of Posillipo in the City of Naples between the Trentaremi Bay and the Borgo of Marechiaro. Established by the Interministerial Decree 07/08/2002, it is at the same time a Marine Protected Area and a Cultural Site referred to in the art. 101 of the Legislative Decree 22/01/2004, n. 42 “Code of Cultural Heritage and Landscapes”. In fact, the Park preserves under its water not only a precious biodiversity [4], but also part of the I century B.C. Roman Villa called Pausilypon [1], whose maritime structures are partially or totally submerged due to the volcano-tectonic phenomenon of bradyseism [2, 3].

Considering that the metropolitan area of Naples is one of the most densely populated in Europe, with almost 3 million inhabitants, the Gaiola Underwater Park is subjected to a constant anthropic pressure that reaches its peak during the bathing season

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(from May to September). In fact, in the General Reserve Zone B, the Park hosts a public bathing area, immediately adjacent to the Integral Reserve Zone A, where the exasperated overcrowding during summer had always represented one of the most critical aspect both for bathers' safety and for the cultural and natural heritage's preservation.

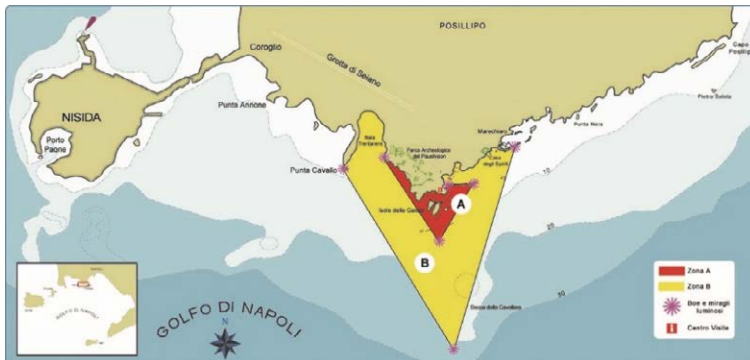


Figure 1 – Map of the MPA Gaiola Underwater Park.

During the years, the lack in regulation in this area had encouraged the development of problems related to lawlessness, public order and environmental impact, with negative effects on the livability of the place for bathers and on the Park's touristic and cultural development. In fact, besides the limited space available (almost 500 m<sup>2</sup>), until 2019 the area had always been subjected to an average turnout that varied from 800 to 1200 people per day, with peaks of more than 2000 people.

The sudden super-saturation of the space often forced bathers to reach and stay in dangerous and unusable places, exponentially increasing the risk of accidents.

In addition, these problems related to public security were exasperated both by the inborn difficulties for means of rescue to reach the area, that is located at the end of a long pedestrian stair, and by the lack of appropriate hard shoulders and evacuation routes.



Figure 2 – Overcrowding in the public bathing area in the B Zone in past years.



Figure 3 – Overcrowding in the public bathing area in the B Zone in 2019 and safety problems.

This situation was aggravated also by the wild stop of vehicles that regularly prevented the approach of means of rescue, besides the no-parking zone and limited traffic zone.

Along with the problems related to public safety and security, due to such a mass of people, there was the increasingly alarming environmental impact on the Park's delicate coastal and marine ecosystem and historical and archaeological heritage, considering also that the area lacks a public service of collection and disposal of waste produced by bathers. During the summer season, bathers in the public bathing area only produced on average almost 100 kg of waste per day, many of which were dispersed in the environment and at sea.

Regarding the archaeological preservation of the site, it is important to mention that the public bathing area is located where there is the submerged Ancient Roman harbor of the Imperial Villa, that is an area rich in archaeological finds that, with such overcrowding, were vulnerable and at risk of theft.



Figure 4 – Waste dispersal on land and at sea (before 2020).

During the years, the continuation of such chaotic condition and decay had submitted the MPA to a permanent state of emergency for environmental, archaeological and safety issues, encouraging the development of problems related to widespread illegality, public order and wrong usage of the territory.

In 2020, the sanitary emergency brought out the previously discussed atavistic problems and in order to open the Park again to the public – since, as a cultural site, it had been closed following the national dispositions - the regulations issued by the Government for

COVID-19's contention led to the adoption of a security protocol to ensure compliance with the guidelines established for Natural Parks, Cultural Sites and public beaches. At the invitation of MITE (Italian Ecological Transition Ministry) and MIC (Italian Culture Ministry) and in agreement with the Manager Authority, the Municipality of Naples and the Port Authority, a protocol that guaranteed the place's security and sustainable fruition regulating the access and the modalities of fruition of the public bathing area inside the Park was developed. The adoption of this regulation immediately led to exceptional results in terms of livability, safety and security, decency and environmental sustainability, eliminating all the atavistic problems related to the exasperated overcrowding, including widespread illegality and problems of public order.

Thanks to the results obtained in 2020 confirmed also by the widespread support from the same users of the area, on request of MITE and MIC, the protocol of access' regulation was maintained also in 2021 in order to guarantee the basic condition of public safety and a better archaeological and environmental preservation of the area, in line with the statutory aims of the Park.

## **Materials and Methods**

The Protocol for a safe and sustainable fruition of the public bathing area in the B Zone of the Park was developed considering 4 main objectives:

- to guarantee the safe fruition of the area for bathers and visitors;
- to eliminate the production and dispersion of waste in the environment;
- to improve livability and enjoyment in the area for the users;
- to improve people knowledge and awareness toward the environmental and cultural value of the Park.

In order to reach these objectives, the access to the public bathing area has been regulated through an online booking system with a clear and intuitive two-language interface on the institutional web site of the Marine Protected Area: <https://www.areamarinaprotettagaiola.it/prenotazione>. On the same webpage, it is shown the Regulation for the fruition of the area, that includes the norms of access, environmental preservation and, during the pandemic emergency, the anti-COVID19 measures. The entire Regulation is also printed on the ticket of access of each booked bather.

On the basis of the available surface of the area (500 m<sup>2</sup>) and of the sanitary emergency's trends, the number of accesses to the area has been enhanced from 75 people in 2020, to 100 in 2021 and 200 in 2022 (after the Covid-19 emergency).

In order to enhance and diversify the possibility of fruition of the protected area, two turns of access have been established: one in the morning (9:00 a.m. - 1:00 p.m.) and one in the afternoon (2:00 p.m. - 6:00 p.m.), with a total of 400 people per day in 2022.

In the Regulation for the sustainable fruition, among the norms for the environmental preservation of the area, it is included the Zero Waste Strategy that establishes the ban on the introduction of non-returnable bottles and single-use materials in order to reduce to nil the production and dispersal of waste in the environment. At the same time, the area has been cleaned up by the accumulation of waste and various objects that illegally occupied the state area, limiting the available space for bathing. Finally, hard shoulders for rescue and for the inflow and outflow of users have been realized.

In 2021, thanks also to users' suggestions, the online booking system was improved, introducing the limit of 2 reservations per week for each bather and the possibility to delete autonomously the reservation. This led to a greater turnover of users in the public area. In addition, it was introduced a penalty that consisted on the impossibility to reserve for the following 2 weeks for those that reserved but did not use their reservation without deleting it. This unfair practice (ghost booking) was very common in 2020, going to reduce up to 20 % the number of daily available places for users. Already in the first two weeks since the opening of the Park in 2021, the number of deleted bookings amounted to 756, in comparison with the scarce 11 in 2020. Both in 2020 and 2021, it was developed a monitoring plan for the innovative model of fruition based on sample interviews, questionnaires and the analysis of the spontaneous reviews left by the users on the online platform of the Park and independent online platforms, such as Tripadvisor.

The main objective of this study is the analysis of the strengths and weaknesses of this sustainable fruition model of the area that - for the second year, in 2021 - tried to combine public fruition, safety and security, environmental sustainability and preservation of the cultural heritage.

## Results

The data in the following work have been collected not only through field monitoring, questionnaires and interviews supplied to users, but also through the online booking system. The data that better explains the difference in fruition from the past is density, defined as the number of people/m<sup>2</sup>.

As Figure 5 shows, the difference between the data collected in 2020-2021 and in the previous years (2018-2019) is really evident. In the previous years the maximum density amounted to 1,13 - 1,49 p/m<sup>2</sup>. By contrast in 2020, the maximum density was between 0,16 e 0,13 p/m<sup>2</sup> and in 2021, between 0,19 e 0,24 p/m<sup>2</sup>.

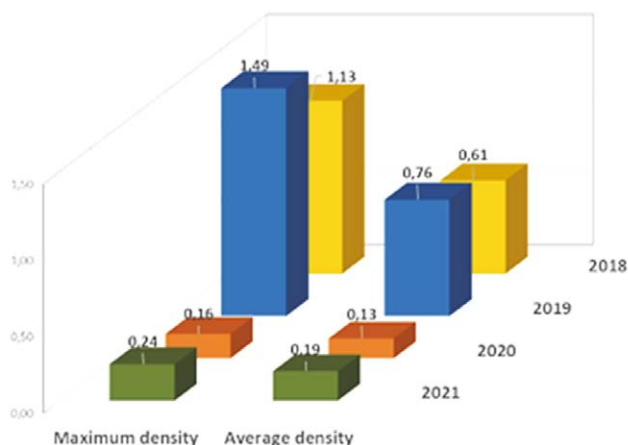


Figure 5 – Comparison: average and maximum density from 2018 to 2021.

The available space, that in the previous years varied from 0,67m<sup>2</sup> to 0,88m<sup>2</sup> per person, reached 4,20 m<sup>2</sup> in 2021, as shown in Figure 6 (A), going to considerably reduce the overcrowding of the previous years, ensuring the proper interpersonal distance in 2020 with direct improvements in livability and security of the public place.

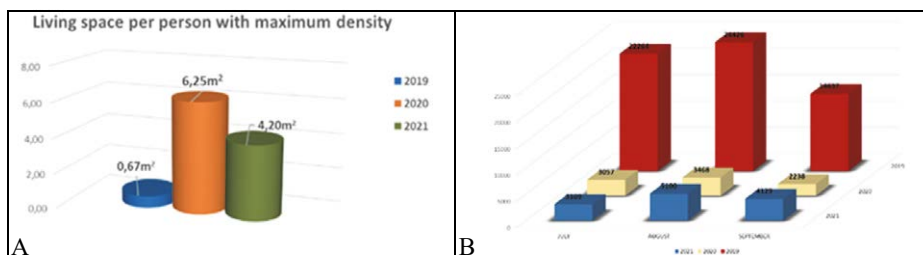


Figure 6 – Comparison 2019-2020-2021 between living space per person (A) and turnout per months (B).

Figure 6 (B) shows the turnout of users in July, August and September in 2019, 2020 e 2021 (only these 3 months have been considered since, due to anti-COVID 19 measures, in 2020 the Park opened on the 3<sup>rd</sup> of July). It is really interesting the data showed in Figure 7, related to the comparison between the density of bathers in the different coastal bathing areas near to the Park, in 2016 and 2020. Paradoxically, it is possible to notice that, in 2016, the Park, that represents the most important area along the coast from a biological and archaeological perspective and that is the most difficult area to be reached from means of rescue, had the highest level of bathers' density with respect to the other bathing sites along the coast. In 2020, the data related to the Marine Protected Area was clearly lower than the other coastal sites (only few private beaches had a density lower than Gaiola).

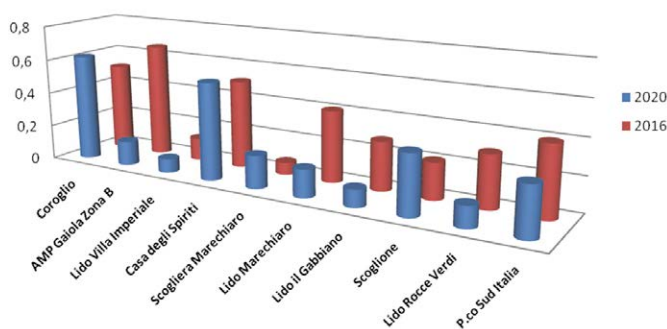


Figure 7 – Density comparison among the other coastal bathing sites in 2016 and 2020.

In relation with the statutory aims of the Marine Protected Area, the most interesting data, consequential to the adoption of the sustainable fruition model, is the one related to the elimination of waste production and dispersion in the environment. As Figure 8 shows, the data exceeds expectations, above all if compared with the previous years, when the kilos of waste produced and dispersed in the environment, both on land and at sea, were out of control with more than 3 tons of waste per month.

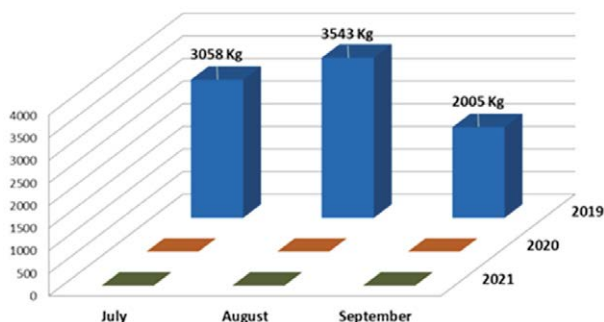


Figure 8 – Waste production per month in 2019, 2020 e 2021.

This situation was exacerbated by the permanent overcrowding in the area and by the lack of a public service for cleaning, completely in contrast with the Park’s statutory aims for the environmental preservation and the basic measures for public hygiene.

The introduction of the sustainable fruition model, with the ban to introduce non-returnable bottles and one-way packaging, has reduced to nil the production of waste in the area, following the “Zero Waste” strategy, in line with the statutory aims of the Park and the MITE’s campaign “Plastic Free”.

Through the anonymous questionnaires supplied to bathers, it has been possible to collect data related to the degree of satisfaction of the site after the introduction of the new model of fruition. In particular, the questions have been divided between habitual users (61 % of the survey participants), that have been able to compare the actual situation with the past, and new users (39 % of the survey participants), that visited the Park for their first time evaluating the actual condition, without being influenced by the comparison with the previous years.

Figure 9 (A) shows the answers of the habitual users in 2021 in comparison with previous years considering 4 parameters: general satisfaction, cleanliness and decency, livability and security. The results exceed expectations, since all the parameters analyzed reach almost 100 % of perceived amelioration. The same result has been detected also from the new users, since more than 90 % of the survey participants has rated “excellent” or “good” (Figure 9 – B).

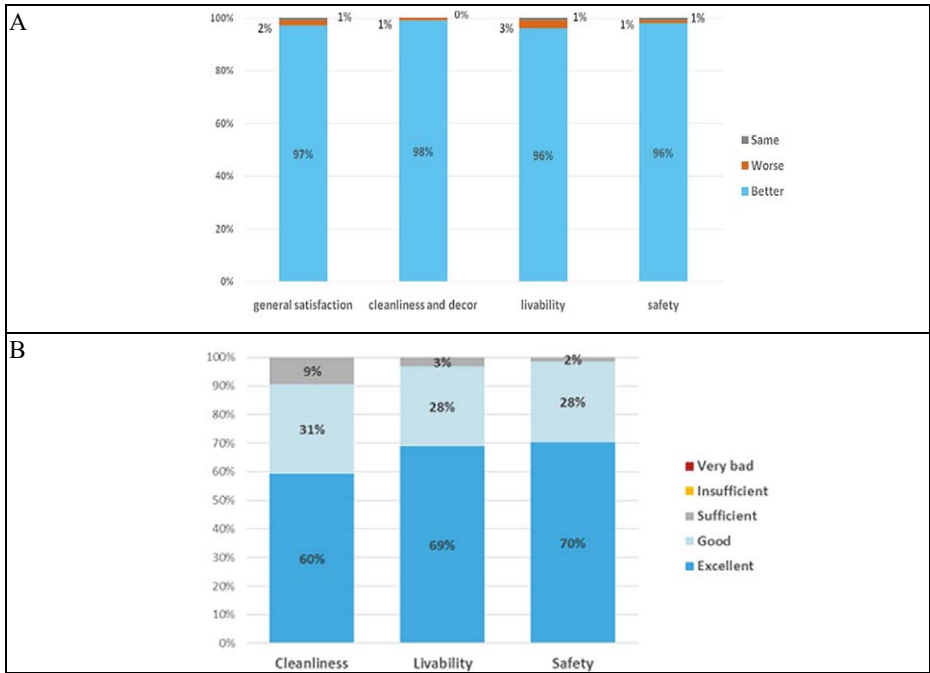


Figure 9 – Index of satisfaction of habitual users (A) and new users (B).

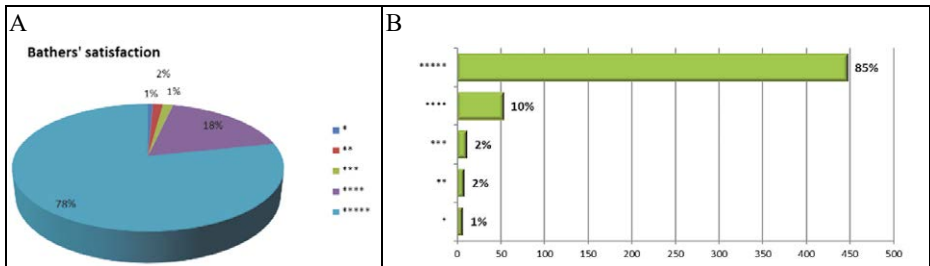


Figure 10 – Index of users' satisfaction from the online reviews left on the Park's website (A) and on Tripadvisor (B).

The bathers' absolute satisfaction of the new conditions of livability, enjoyment and decency of the area is proved also by the analysis of the online reviews left on the online platform of the Park (Figure 10 - A) and on Tripadvisor (Figure 10 – B), that are not influenced by the presence of the interviewer.

A very interesting data is the increasing awareness and perception in bathers of being in a Marine Protected Area with respect to the past, as represented in Figure 11. This is due to the fact that users, at the moment of the online reservation, visit the website of the Park, improving their knowledge on the environmental, archaeological and normative



issues that characterized the Park and their awareness of going to dive in a Marine Protected Area. The same improvement is visible also in the awareness of being in a very important archaeological site.

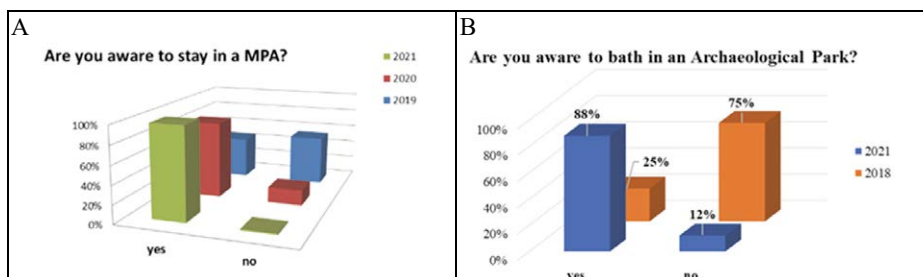


Figure 11 – Answers to the question on the awareness of being in a MPA (A) and in an Archaeological Site (B) in the years.

## Discussion

From the results previously exposed, it is evident that all the criticalities detected in the previous years related to the overcrowding in the bathing area have been reduced to nil thanks to the adoption of the new model of sustainable fruition of the area and the limitation of access to the public bathing area inside the Park. The necessity to limit people turnout, urgently required by the pandemic emergency, has made it even more evident the problems related to the lack of safety and security and preservation that characterized the area before 2019, triggering actions in order to solve them. The overcrowding in such a small area, lacking in evacuation routes, hard shoulders and characterized by serious difficulties of access for means of rescue, exacerbated also by the constant congestion in the narrow street due to uncontrolled parking, has always represented a persistent problem for bathers and visitors' security, independently from COVID-19. To this are added also serious problems of environmental decay, waste dispersal and risks for the natural and archaeological heritage that avoid to reach the statutory aims for the Park's preservation and safeguard of the cultural and environmental heritage. The situation was exacerbated by the lack of an ordinary cleaning service and garbage collection along with the illegal occupation of the state area with boats and various objects then abandoned in the area. During the years, all these issues have provoked a continuous and inexorable deterioration of the area, increasing problems of criminality and public order. The limitation of access and the online reservation system have reduced to nil not only the problem of overcrowding in the bathing area but also the traffic congestion in the narrow street at the entrance of the Park that in the past regularly prevented the transit of the means of rescue.

The regulation of access along with the ordinary service of management and surveillance through specially trained staff, since the access' gate of the Park, have restored, for the second year, decency and livability in the area, preventing the resurgence of illegal activities and illegal occupation of the area.

Data show that both new and habitual users strongly and equally perceive the amelioration in livability, decency, security and enjoyment of the area, expressing great satisfaction toward the new model of sustainable fruition of the Park. The majority of users (97 %) in 2021, confirming the 2020's data, sustain and support the efforts to improve the quality of public fruition of the area and ask for the maintenance of the access' regulation for the future, even after COVID-19 emergency (Figure 12).

All the indicators analyzed demonstrate the radical reduction, almost to nil, of all the main criticalities that in the past represented not only an obstacle to the obtainment of the statutory aims of the Park but also a serious problem for the security and livability of the area, as perceived by the same users.

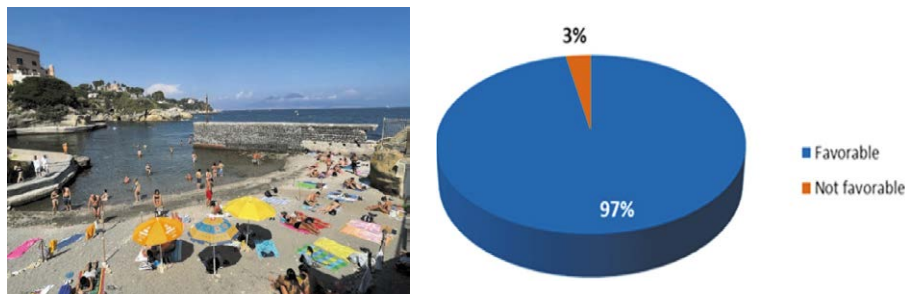


Figure 12 – Users favorable to the limitation of access even after Covid.

## Conclusion

In conclusion, it is possible to affirm that the modality of access to the Gaiola Underwater Park following the model of sustainable fruition adopted since 2020, has managed - after 18 years - to solve all the criticalities related to the fruition of the area, in terms of visitors and bathers' security, decency, livability, public order and preservation of the environmental and archaeological heritage of the Park. Such model of sustainable fruition may represent a best practice for all those places where, due to needs of public security and cultural and environmental preservation, it becomes necessary a limitation of public access, guaranteeing a public and free participation, respecting the principles of democracy and plurality that should characterized common goods.

## Acknowledgements

The surprising results obtained in these two years and the process of reborn and sustainable usage of the marine resource that is being practiced in the Gaiola Underwater Park is possible thanks to the fruitful synergy between several institutions. So, we would like to thank the competent Ministries (Ministry of Ecologic Transition and Ministry of

Culture), the municipal administration (both at a central level and at a municipality level), the Port Authority and the law enforcement for the surveillance both at sea and on land.

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