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Recommendations for coastal planning and beach management in Caribbean insular states during and after the COVID-19 pandemic

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\textbf{ABSTRACT}

The COVID-19 pandemic has implications for coastal planning and management. Rules for isolation and physical distancing, among other measures for human life protection, have led to the closure of most beaches around the world. The present critical situation has raised the following question: How can some recommendations be designed in sun, sea, and sand tourism-dependent-insular countries to face “the COVID-19 new normality?” We used the content analysis technique to analyze representative publications on a global level to ascertain information on best management practices. A survey of 58 experts provided additional information. We used inferential statistics for sample selection and produced a list of 43 practices and beach planning and management actions to face the COVID-19 pandemic. This led to 27 new recommendations designed for beach planning and management within insular contexts, some of which were tested in the Republic of Cuba. Recommendations aim to guarantee a culture of safety and improvement within the field of beach or coastal planning and management. These recommendations should prove useful for other insular countries, during the COVID-19 period, in the new normality that follows, and in other post-pandemic scenarios.

1. Introduction

The global pandemic caused by COVID-19, a disease associated with the most recent SARS-cov-2 coronavirus (Galib B, 2020), threatens the sustainable development of coastal territories (Pirouz, Bet al, 2020). Its effects impacted society and the environment on a global scale (Chakraborty et al., 2020), as well as the world economy in a manifold way (Liu et al., 2020). Extensive coastlines and beaches help define insular island nations and thus render them vulnerable to the risks associated with the pandemic.

Native islanders and tourist keep beaches crowded during normal times (Botero et al., 2018). This historical form of use means close socialization and heightened risk for transmitting and contracting COVID-19. To reduce rates of disease transmission, most countries applied new regulations to beaches (Fig. 1). Unfortunately, many beach-gowers ignored the emergency regulations. Consequently, places known for attractive beaches suffered outbreaks of the disease. This includes places such as Cancun and Playa del Carmen, in Mexico; Miami, in the United States; Buyé Beach in Cabo Rojo, the insular state of Puerto Rico, and Playa del Pero, Brazil (Daza 2020).

Articles in the popular press and scientific journals question whether the beaches should be open or not during the pandemic (Daza, 2020; Gobierno Vasco 2020; Departamento de Salud, 2020). This includes analysis of post-COVID-19 scenarios (Botero et al., 2020a) and, identifying gaps in knowledge about the perception of risk for COVID-19, as well as protection strategies used by bathers (Zielinski and Botero, 2020). Other articles evaluate Covid-19’s impact on the tourism industry (Shih-Shuo, 2020), with special attention on the airline and hotel business (Lee-Peng et al., 2020). A few pieces evaluate the impact of the Coronavirus pandemic on the psyche of tourists, (Rock et al., 2020); (Haang et al., 2020). The practices and actions of governments regarding zoning, planning, and management of the beaches during the pandemic receive less attention (Milanes et al., 2020; Bianchi et al., 2020).

The relationship between beach planning and coastal management in the face of COVID-19 is only now emerging in the scientific literature.

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Most of the available reports come from the popular press and the internet (Reportur, 2020; Daza, 2020; Niusdiario.es., 2020; www.elpais.com.co; www.elheraldo.co; El Heraldo 2020a,b), showing the design of some standards (IMPLAN, 2020; Departamento de Salud, 2020), manuals (APA, 2020) guidelines (Gobierno de México, 2020a,b; Ministerio de Salud, 2020), protocols (Gobierno de México 2020c.), sanitary criteria (Gobierno Vasco, 2020) and resolutions (Resolución 1538 del 2020). These mostly use the main measures of isolation and physical distancing proposed by the World Health Organization (www.who.int/es) or, by the Pan American Health Organization (www.paho.org/es).

On the internet, it is also possible to find data on the behavior of beach users (Daza, 2020). There are reports of crowded beaches during the COVID-19 lockdown (Reportur, 2020; Niusdiario.es., 2020). We found European cases of inadequate infrastructures on beaches for avoiding contagion (El Correo, 2020). Presently missing is information on measures taken by island nations in response to the pandemic and specifications for beach planning.

Beaches constitute an important natural resource, not only for the continental States of the Greater Caribbean but also for the Small Island Developing States (Juanes et al., 2003 and Cepal, 2020). In these islands, the lack of resources such as fuel and minerals, and the scarce availability of freshwater resources, make tourist exploitation of the coasts a fundamental economic activity (Pérez and Milanés 2020). It is precisely due to this archipelago and islet setting that beaches are directly influenced by all the social and economic activity of different nations, which constitutes an additional environmental risk factor that requires special attention where “the planning and management of coastal resources essentially is synonymous with the planning and management of national resources” (Juanes et al., 2003 p.3). These beach host tourists from around world as well as the pollution from remote places that washes ashore.

There is an almost generalized opinion that closing beaches, as one of the immediate pandemic measures to control COVID-19, has had positive results for beaches, because natural vegetation has been restored, and birds, fishes, as well as other species, have returned to their environment (Soto et al., 2021; Bates et al., 2020). However, it is also true that COVID-19 lockdowns mean a near absence of tourist activity, creating negative economic impacts around the world (Ehrenberg et al., 2021). This is particularly serious for small island states since most of them depend on “sun, sea and sand tourism” (Eyawo et al., 2021).

Cuba is an island nation that suffers from the impact of COVID-19. The strategic plan for Cuba, from the first cases of COVID 19 in the island, established three phases: Phase 1: Pre-epidemic, Phase 2: limited native transmission and, Phase 3 epidemic stage. Among the measures of this plan is beach closure to guarantee isolation and physical distancing and avoid contagion in the population. However, little has been discussed in the scientific and management field in Cuba regarding how to organize the beaches after Covid-19. To wit, a group of Cuban experts belonging to IANP (Ibero American Network Proplayas, www.proplayas.org), discussed and evaluated the challenges of COVID 19 for the archipelago, posing the research question: How can some recommendations be designed in sun, sea, and sand tourism-dependent insular countries to face “the COVID 19 new normality?” In this paper, we develop a 4-stage response to the charge issued by IANP. The purpose of the study is to execute a formal analysis of appropriate information that will allow us to articulate a comprehensive list of recommendations for effective beach management in the post-COVID era for Cuba and other island nations.

2. Material and methods

To obtain the best scientific information for structuring recommendations for effective coastal and beach management we undertook a two-prong approach. This combined a quantitative structured survey of the literature with qualitative data from photographs, social networks, and the views of experts in the field. The study took place between March and October of 2020. The methodological framework of the research was developed in stages and structured by different variables and categories of analysis, (See Fig. 2). These are: Stage 1. Systematization of the information published on the coastal planning and management of beaches in the Covid-19 lockdown (scientific articles, news on social networks, and digital and written press). Stage 2: Identification of good and bad practices and actions of beach management and coastal planning associated with protection measures against COVID in different countries. Stage 3: Determination, according to the criteria of experts, of the actions and recommendations for beach management and planning based on lessons learned from other contexts with better possibilities for success in island countries. Stage 4: Validation of the recommendations for the regulating and management of beaches in the post-Covid-19 stage in an island nation (Cuba). The specific details of each stage are described in the following sections.

2.1. Review of periodical publications

News published in newspapers and social networks such as
Facebook, Twitter, Instagram, Youtube, LinkedIn, platforms such as @Bandera.Azul ADEAC, @EnDefensaDeLasPlayasPublicas; @PlayaLimpiaPeru; as well as non-governmental organization (NGO), @RProplayas, among others, were reviewed in the development of the research.

We searched information pertaining to three variables: 1) actions related to beach management within the measures of COVID-19 lockdown in insular states dependent on tourism; 2) behaviors of populations affected by management measures; 3) examples of good practices such as hygiene and physical distancing measures for beach management.

We investigated practices and actions at the international level to identify important variables in beach planning in relation to COVID-19. Identifying articles and publications that addressed these aspects informed the design of the methodological framework of the inquiry. Six variables warranted analysis: 1) Equipment and facilities, 2) Biosafety and hygiene measures, 3) Reorganization of spaces, 4) Beach access, 5) Level of occupancy and beach monitoring, 6) Signage (see Fig. 2). These variables are directly related to protection measures against COVID-19, regardless of the location and conditions of the management practice.

The variables expressed in management behaviours vary according to the socioeconomic, environmental, cultural characteristics of the local area in which they are implemented.

The content analysis technique was applied to the official reports and press publications consulted, notably (Hsieh and Shannon, 2005): The Herald (www.elheraldo.co/atlantico), and Time Magazine (www.elespanol.com/organismos/revista_time), El País (www.elpais.com.co/), Colombia, Telemundo (https://www.telemundo51.com/) Mexico, Granma, (www.granma.cu), and Cubadebate, (www.cubadebate.cu), Cuba, El Economista (www.eleconomista.es/), Spain, The Sidney morning Herald (www.smh.com.au/), Australia, La Capital (www.lacapitalmdp.com/), Argentina, among others. At the same time, metric information was obtained from the Cuban observatory for the coronavirus and from official publications of the Cuban Ministry of Health (https://salud.msp.gob.cu/) as well as scientific observatories https://temas.sld.cu/coronavirus/covid-19/observatorio-cientifico/ to obtain statistics and behavior for COVID-19 in Cuba. We also used data and metrics obtained in the Coronavirus metric observatory of the University of Pinar del Río.

2.2. Scientific databases review

To obtain reliable information and to verify the few scientific publications on this subject, the literature published in Scopus and the Science databases were analyzed: The following three search equations were generated on the subject: 1) “land-use planning” OR “territorial ordering” OR “beach management” AND Covid*; 2) “beach management” OR “territorial planning” OR “marine spatial planning” AND Covid” and, 3) “land-use planning” OR “beach management” OR “territorial planning” OR “territorial ordering” AND Covid” OR pandemic.

The first search equation only generated two articles published in Scopus (Zielinski and Botero, 2020; Lal et al., 2020) with only the first one pertinent to our study. The second equation produced the same findings. Search of the Science website, yielded about 55,000 results. However, many of these articles were not relevant since they associated COVID-19 with health issues, tracking and tracing tourists and not focusing on the planning and management of beaches. In this case, some articles published in the International Journal of E-Planning Research (Graziano, 2021; Doyle et al., 2021) stood out for analyzing post-COVID city planning scenarios, with a special emphasis on Italy and without specifically considering beaches.

In the case of Cuba, no scientific articles were found about planning and managing beaches during the pandemic by COVID-19. Additionally,
found coastal management protocols didn't include sanitary hygiene or biosecurity issues for the prevention of contagion of diseases in the mentioned spaces. Therefore, the analysis done in this article is the first on these themes.

2.3. Selection of experts and survey application

To generate informed opinion on the impact of COVID-19 we surveyed experts in the fields of coastal planning and beach management during the third week of August until October 17, 2020. We used the structured questionnaire technique. The questionnaire was divided into four blocks with 17 questions. The electronic tool QuestionPro® www.questionpro.com was used in the design of the survey. The survey was applied in Spanish. The link was distributed in a personalized way via email and WhatsApp ©.

We applied inferential statistics to determine the sample size and the minimum number of experts, (Ostle, 2012). This constitutes an effective technique for calculating a sample of experts in a previously established universe. Following the qualitative methodology of (Sampieri 2014), a trial sampling was applied. Experts were selected following the authors’ criteria based on knowledge of the target population. We considered the qualitative variables related to a) the level of knowledge and expertise that individuals have on issues related to beach planning, zoning, and management; b) the years of work on the subject and 3) the quality and quantity of scientific publications of the experts on the subject. This yielded 60 national and international experts. Valid sample size criteria required a minimum of 48 experts responding of the 60 considered as a universe.

The selected experts are part of three major international knowledge networks. The first one known by its acronym PROPLAYAS is made up of a solid group of representatives from academia, civil society, scientists, activists, officials, and businessmen, who work only on beach issues (www.proplayas.org). The second network is called IBERMAR. It has been active since 2008. Its members are experts in Integrated Coastal Zone Management (ICZM) from a complex and integrated perspective (www.gestioncostera.es/ibermar). We also included the Stephen Olsen (ICZM International Chair). The network constitutes an initiative between Ibero-American Universities interested in the theoretical-methodological development of coastal governance and the four orders (Enabling framework, Changes in behavior, Practice results, and benefits, Sustainable Development) of the ICZM (UNEP/MAP/PAP 2015). The experts from this network work on the systematization of learning from cases and experiences of coastal and beach management at the local level and their interrelation with other levels. Despite the unprecedented pandemic, these experts carry out their activities under the ICZM perspective. This approach guides coastal management according to the precautionary principle. Therefore, new scientific findings to be included can be applied for coastal management in this case, using variables, such as biosecurity and sanitary hygiene, physical distancing, beach zoning, facilities, and monitoring, among others. The experts do not create the policy for confronting COVID-19, but they are responsible for implementing the measures that each country’s policy dictates.

Given the interest in delving into the measures adopted for the management and regulating of beaches in the island states, with special emphasis on the case of Cuba, a subset of 36 Cuban specialists were selected from the universe of experts. These include 19 professionals linked to two of the three scientific nodes of the Proplayas de Cuba Network. The Cuban nodes consulted were: 1) Node 14 and 2) Node 44. After identifying the most significant variables using the international literature, we developed a questionnaire for the selected experts. We chose the recommendations based upon the scores given in their responses.

To test the recommendations made by experts, it was also considered pertinent to include Cuban decision-makers who, at the time of the pandemic, held responsibilities associated with regulating the beaches. Therefore, the survey was also applied to a large group of experts representing the Institute of Physical Planning, the Ministry of Science, Technology, and the Environment (www.citma.gob.cu) and their provincial agencies. The survey had response effectiveness of 97%. The average time for completing the questionnaire was 16 min. Of all participants in the survey, 68% were women and 32% men. The total of respondents, 93% were university graduates. The sample taken was multidisciplinary, having representation of the social, natural, technical, and environmental sciences. Most (88%) of the participants have a working or research relationship with issues concerning beach and/or coastal zone planning and management. Survey was based on the opinions of 62% Cuban experts and 38% International experts.

Of the experts, 36% have the category of professor and 31% researchers. In the case of the Cuban experts, there was also representation of authorities from three universities (Oriente, Matanzas and Las Villas) as well as from the research centers (Center for Environmental Studies Sp. CEA and Eastern Center of Ecosystems and Biodiversity Sp. BIOECO). In the case of international experts, universities from Colombia, Puerto Rico, Mexico, Uruguay, Italy, and Argentina were represented. The Network with the highest representation in the research was Proplayas with 60% of experts.

2.4. Case study of nation of islands

Given the particularities described above regarding Caribbean insular states and especially Cuba, it was considered appropriate to be the case study analyzed. The final purpose of this selection is to visualize and project into the immediate future, the recommendations for beach planning and coastal management proposed during the pandemic period, the new normality, and in post-pandemic scenarios. Finally, Cuba more than most island nations features a highly developed infrastructure that links science, policy, social need, concern for the environment, education, and economic development.

Cuba is a nation of islands. The Cuban Archipelago is contained in the Caribbean basin and is made up of more than 1600 islands, islets, and cays, of which the island of Cuba is the largest. The plan to deal with Covid-19 in Cuba has among its priorities the strengthening of national epidemiological surveillance for early identification of cases and their timely treatment (OPS, 2020). Beach closure in the confinement period and the reinforcement of sanitary organizational and hygienic measures in the plan’s later stages were effective in avoiding the spread of the disease (Prensa Latina, 2020a,b; Granma, 2020). However, despite these social advances, there is no visualization of a beach management model in the country that guarantees such measures over time, or once the crisis is over. The implementation of functional zoning and beach management measures in Cuba will prove to be very complex.

Flexibility in the beach opening measures allowed Cubans to return to them after their confinement. However, the influx of people on these beaches has not been comparable to other countries in Latin America and the Caribbean, due to the concern of the health authorities that infections could increase (Rodríguez, 2020). This could occur through the social behavior of Cubans in these spaces, characterized by group games, drinking from the same glass or bottle, and not using protective measures, among others. This sociocultural behavior is widespread in many Latin American countries.

In Cuba, the existence of well-managed beaches by tourist companies such as in Varadero and those of the keys in the north of the Island, among others (Fig. 3-A-B), puts them in better position to implement an effective plan in the post-COVID-19 opening stage. These beaches have strong infrastructure, materials, and financial resources, generated by their own tourist activity. Therefore, they can adopt higher standards in the quality of their services. The second and most common scenario of the urban and remote Cuban beaches of the Southeast is very different (Fig. 3-C-D). These beaches, which are heavily populated and hugely enjoyed by the local population, lack equipment, infrastructure, and furniture, meaning they will require different actions regarding
management and regulatory schemes. The marine-coastal zone of the Cuban archipelago constitutes a unique class resource. Its coastal planning and ICZM have a strategic nature, constituting a magnificent opportunity and a great challenge for its sustainable development. In this context, tourism activity in Cuba has been growing and has its greatest expression in tourism associated with beaches. Before COVID-19, Cuba received more than 4 million foreign tourists annually (Diario, 6124, 2021). The main motivations for the arrival of tourists to Cuba are its beaches, its cultural heritage, wealth, history, people, and security (Mintur, 2021). We used these scenarios in conjunction with the results of literature and expert surveys to model recommendations. SketchUp, Lumion, Photoshop and, CorelDRAW Graphics Suite 2020 software helped illustrate the model.

3. Results and discussion

This section is presented in three-steps. We combine the presentation of results with their interpretation and discussion of attendant implications. In this research, we use two important terms “beach management” and “beach planning”. Beach management can be considered as a subset of coastal zone management (Foreword p. Xix, wrote by Finkl, 2009 in Williams and Micallef, 2009). Some authors use the term “beach management” when referring to aspects related to the evaluation of the beach at a landscape scale, recreational use, ecosystem conservation, studies of environmental degradation, identification of conflicts, recreational opportunities, tourism and/or exploitation, scenario analysis to design beach management strategies, and more (Villares et al., 2006; Cervantes et al., 2008; Amyot and Grant, 2014).

In this research, “beach planning” refers to measures typical of the planning, zoning, and land and sea uses of the beach. These measures and actions were compared between countries to design recommendations that contribute to decision-making processes for better information and adaptive management services that the new model of beaches must assume in the face of the COVID-19 pandemic.

3.1. The practices and actions published in the literature

Experiences of more developed countries (APA 2020; Garófano, 2020; Muñoz, 2020; Info Praia, 2020a,b Medio Ambiente 2020 a,b; IMPLAN. 2020) differ in content and scope from those of less developed countries (El Cacho, 2020; Granma, 2020; MondoBalneare.com; Resolución 1538 del 2020). Those with the greatest economic development show greater use of technologies based on management (camera systems, digital monitoring signals, early warning systems, digital signage, traffic lights among others), as well as in the use of materials to implement equipment for physical distancing on the beaches. Practices and actions of less developed countries with fewer economic resources make use of indigenous materials and low-cost local solutions (Milanes et al., 2020; Pereira et al., 2019).

The initiator of management practices varies in accordance with economic considerations. In coastal zones with consolidated tourism, tourism companies, and private businesses are those directly engaged in economic activity related to beaches and therefore play a more active role in structuring policy and management (Garófano, 2020; APA 2020; Gorrey, 2020; Medio ambiente 2020 a,b; IMPLAN, 2020). The local population, volunteers and local governments dominate management in areas with less tourism activity (Zuniga 2020; Resolución 1538 del 2020; La Capital, 2020; El Cacho, 2020).

Initially, the most relevant examples observed in the international literature regarding beach planning and coastal management during the pandemic were described in Appendix 1. These practices and actions were the support for designing of the recommendations and have been classified into 6 variables. A treatment of the 6 variables follows.

3.1.1. Practices and actions regarding equipment and facilities

Beachgoers complain about the absence of beach huts is (Milanes et al., 2020; www.elpais.com). Many visitors consider such structures a necessity, particularly in the COVID-19 era. The beach huts are in high demand in countries like Spain, Italy, and Cuba. However, in the insular country, beach huts are restricted to the service area above the beach proper Decree Law 212 (GORC, 2000; Milanes et al., 2019; Batista, 2018a,b).
In Spain, beachgoers ignored the wooden structures installed to maintain social distance between groups of different families (Xavi, 2020). Visitors instead crowd the shore without making use of these demarcated spaces (see Fig. 4a and b). But the action, which could be classified as “a good practice,” has been characterized as “negative” by some authors (Milanes et al., 2020; Botero et al., 2017; Botero et al., 2020a). The main negative problem is the affectation of these structures on the landscape of the beach. Other similar practices include the design of spaces with social distancing rules. The Fig. 4c-d shows the minimum distances of 1.5 m between people and 3 m between awnings applied in Portugal in the CoVID-19 era.

3.1.2. Practices and actions regarding biosafety and hygiene measures

The proliferation of personal protective equipment deployed during the Covid-19 epidemic means the accumulation of discarded masks and gloves on beaches. They wash ashore from the sea, are left behind by visitors, and are carried in by the wind and nest-building animals (Milanes et al., 2020). Gloves, face masks, among other solid waste are present and poorly managed in island states such as Hong Kong and elsewhere (El Cacho 2020; Reuters, 2020). In Mexico, the Federal Maritime Terrestrial Zone (Sp. Zofemat) applied the sanitary protocol “Everyone against Covid 19”, which includes social distancing and groups of no more than five people. To enter the beaches, it is necessary to use a mask and antibacterial gel. Also prohibited are alcoholic beverages and contact sports (www.excelsior.com.mx). Similar measures were also tested in Pozos Colorados, Santa Marta (see Fig. 5).

3.1.3. Reports on practices and actions regarding beach acces and reopenings

Attempts to reopen beaches in an organized way that includes protective measures are sometimes successful, as for the cities of San Antero and Bajo Sinu in Córdoba, Colombia (www.elheraldo.co). Nevertheless, in other regions such as Buenaventura and Puerto Colombia, return to the beaches meant unruly crowds that violated biosafety standards (www.lafm.com.co).

Columbia restricted beachgoing to between the hours of 9 a.m. and 5 pm to take advantage of the sterilizing effect of intense solar radiation (www.ideal.gov.co; Resolution 1538 of 2020). They also issued ID numbers for beach access. However, the numbering scheme failed to account for families. Members of the same family often received numbers incompatible with simultaneous attendance. (www.eltiempo.com; Resolution 1538 of 2020. Mexico took a more lenient approach,
restricting beach access in Acapulco to the hours between 7 a.m. and 7 p.m. (Government of Mexico 2020a,b).

3.1.4. Practices and actions regarding level of occupancy and beach monitoring

Beach Apps such as Info Praia (2020a,b) and “Nik Hondartzak” (Medio Ambiente 2020 a, b.), are highly valued to analyze occupancy level and monitoring of beaches. Both Apps allow users to check occupancy levels prior to arrival. The Nik Hondartzak App uses the traffic light system and sends information to beach managers using images. This is a free App that is updated every 15 min, and for regulating the beach, it establishes physical distancing under the geographical criteria of each beach. However, both applications are limited to Gipuzkoa and Portuguese beaches at this time. Similar systems could be developed for Cuba and other insular nations.

3.1.5. Practices and actions regarding reorganization of spaces, and signage

Practices for reorganizing beaches during Covid19 times include posted norms on websites and platforms (APA 2020; Mar à Vista, 2020), and traffic lightmaps (IMPLAN, 2020). However, some of these tools still need improvements to show reliable data and other information options, such as their application on a greater number of beaches. Some actions, such as those used in APA (2020); Info Praia (2020a,b); Medio Ambiente (2020a,b) and, Garófano, 2020, cannot be used in underdeveloped and blocked countries, like Cuba, due to limited access to 4G telephony. The high costs for use of mobile phones are another limitation in Cuba. However, despite financial constraints, these actions lead to a change in the Cuban beach management model, contributing also to the design of smart beaches and cities with the potential given by technology (Ravelo and Milanes, 2018; Graziano, 2021).

An excellent action initiated by the academy is Mar à Vista (Mar à Vista, 2020), designed as a university extension project between the Department of Geography and the Marine Geography Laboratory of the Federal University of Rio de Janeiro. The initiative is powered by a network of users from various social categories, such as bathers, surfers, and vendors. They monitor currents, wave heights, load capacity, pollution, and beach morphology. Its application has been strengthened during the pandemic, using a data collection form called Vicon SAGA mobile, which is very similar to KoBoCollect. Collaborators include the Blue Flag of Praia do Peró (a citizen advocacy organization for the ocean) and the Prainha Municipal Park. Despite its local impact, it is evident that this type of good practice needs to be disseminated more to the scientific community and the Brazilian population in general to replicate its use. This would also promote the emerging movement of citizen scientists (Bonney et al., 2014).

Reservation of plots through web platforms for choosing specific times and locations on beaches (www.bendidormbeachsafety.es), as well as the sale of a kit to build “anti-coronavirus plots” (www.antena3.com), are other good measures. Some of the proposed actions, as well as the strategies developed in different countries to deal with Covid-19, tend to be short-term local solutions and are not evidence-based policies (Kreiner and Ram, 2020).

| Table 1 | Recommendations for the planning and management of beaches. |
|---------|-------------------------------------------------------------|
| **Category**| **Recommendations** |
| Instruments of coastal planning | 1. Formulate new planning instruments and methodologies for coastal marine regulating of beaches. |
| | 2. Improve the regulatory framework or coastal policies and legislation or design management and planning strategies for the sustainability of tourist destinations on beaches in a post-pandemic scenario. |
| | 3. Design measures to control the unlimited load capacity affecting most of today’s beaches. |
| | 4. Regulate the activities of informal traders. |
| | 5. Create local beach committees under the coordination of local governments and communities. |
| Use of space | 6. Zone off areas on the beach for sunbathing and relaxation according to the level of tides. Establish active, resting and service areas. |
| | 7. Regulate the beach by family groups. Keep these shorter, (maximum of 4 h), to reduce crowding and give opportunities for a greater number of people to share and enjoy the space. |
| | 8. Maintain a distance in the sunbathing, recreation, and bathing areas of at least 2 m between non-family members. |
| | 9. Do not allow umbrellas, chairs and belongings, or groups of people to be placed in the transit area of the beach. |
| | 10. Establish shaded points with an area of at least 12 m² and a distance between individual perimeters of no less than 3 m from each other (modified according to Bianchi et al. 2020). |
| | 11. At each shaded point, a maximum of 4 people must be authorized (modified according to Bianchi et al. 2020). |
| | 12. Prohibit group sport activities (such as volleyball, soccer, basketball) and regulate water sports and leisure activities. Prioritize those that can be developed with no more than two people (water bikes, kayaks). |
| | 13. Maintain distances between hammock or deck chair areas, while cleaning and disinfecting these after each use. |
| | 14. Open kiosks and bars with customer reservation restrictions. Establish prior reservation schedules and the organization of space with tables located more than 2 m away. |
| Beach access | 15. Regulate the entrances and exits of each beach via the competent authorities. |
| Beach occupancy | 16. Implement a visitor control system and occupancy level in the bathing and recreation areas using traffic lights or other technological means. |
| Hours of beach use by the visitors | 17. Update beach occupancy levels throughout the day. |
| | 18. Set time slots that allow rotation for the use and enjoyment of each beach recreation area, according to types of activities and, when possible, by age groups. Prioritize age groups, such as older adults, to avoid beach use in the afternoon when the sun is more intense. |
| Hygiene and biosafety on the beach | 19. The bathroom and toilet areas must have hygienic products and biosecurity standards for the use of one person at a time. Maintain good ventilation and fit them out with soap and hydroalcoholic gels, disposable towels, and pedal bins. |
| | 20. Restrict the use of showers. Only for people with disabilities or special needs. |
| | 21. Increase the frequency of cleaning and disinfection in public areas of the beach - at least four times a day. Increase on the busiest days. |
| | 22. Place baskets for garbage collection separated into types of waste. E.g. masks and gloves according to their types (nylon, rubber, textiles). |
| | 23. Frequently carry out beach sand disinfection activities. |
| | 24. In children’s play areas, cleaning and disinfection will be carried out prior to opening the beach. |
| | 25. Record environmental changes and implement monitoring actions for morphodynamic, physicochemical, ecological/biological variables and environmental quality. |
| Signage on beaches | 26. Put signs at aid stations reminding people to keep a minimum 2-m distance. |
| | 27. Elaborate a system of signs that are homogeneous in their meaning worldwide where green represents: favorable conditions for bathing according to the number of people present in the bathing area; Yellow: dangerous conditions (bathing is only allowed within the flags that demarcate the bathing points); Red: forbidden to swim in the sea (the prohibition to swim will be established by the lifeguard, (modified according to Bianchi et al. 2020). |
3.2. Recommendations for coastal planning and beach management during the pandemic and in a post-pandemic scenario

The crisis caused by the pandemic highlights the interconnection between nature and the vulnerabilities of society. COVID-19 provides an ideal opportunity to demonstrate how changes in beach planning and management are possible. The rapid changes produced by this pandemic sparked the debate on how to build more resilient societies and the role of planning to promote a fair and sustainable recovery (Doyle et al., 2021). The analysis and assessment of international practices in the management of beaches during the pandemic, as well as the interpretation of two chapters (Milanes et al., 2020; Bianchi et al., 2020) published by (Botero et al., 2020a), allows the authors to propose 27 recommendations (Table 1).

Before proceeding to endorse the recommendations, information was obtained on the effectiveness of the government measures to protect the population associated with beach closures and their impact on these ecosystems. At the same time, data on the transformations observed in these ecosystems, as well as other aspects related to the actions and innovations designed in the period of closure, were supported by the experts.

The experts agree with the closure of beaches, within the plan of measures to combat Covid-19. In this period, experts observed significant changes in these ecosystems. The most significant changes noted by the experts and percent who indicated such are as follows: Decrease in solid waste pollution (18%), decrease in population and tourists who attend the beaches for fear of contagion (14%), restoration of the beach’s natural vegetation (13%), return of birds to the beach environment (12%), the appearance of fish in the bathing area (11%). The data obtained coincide with other authors who record positive modifications in coastal ecosystems and beaches, due to the absence or reduction of humans in these places (Mukherjee et al., 2020; Zambrano-Monserrate et al., 2020; Zielinski and Botero, 2020).

Before the appearance of Covid-19, experts assessed the management and coastal planning of beach ecosystems as being between fair 47% and good 37%. They recommended that in the post-pandemic period the following aspects should be reviewed: a) Normative, zoning, and coastal planning frameworks regarding beach use (15%), b) Coastal policy related to human and ecosystem health (14%), c) Coastal marine planning of beaches (14%), d) Communication and promotional policies for these spaces (12%).

According to the experts, the new post-pandemic scenario requires new measures related to coastal planning in beach management. The experts considered the following actions: a) Signposting beaches with the allowed carrying capacity to avoid contagion (13%), b) Developing a public welfare campaign for the education of people post-COVID-19 (13%), c) Zoning the bathing area, recreational and sunbathing zones (11%), d) Setting disinfection points on the beaches (11%), d) Traffic lights that give information to bathers on the load level on the beach (10%), Increase testing in the beach area (10%) (Fig. 6).

Isolation and physical distancing measures to avoid contagion demand, according to the experts, new actions to organize and manage beaches previously not considered for these spaces. Some of the proposals refer to (with % of experts recommending such): the use of traffic lights to indicate beach occupancy rates (27%), the use of surveillance videos using cameras with 4G mobile phone connectivity (20%), regulating, and marking beaches via traffic light colors regarding strong currents (19%), restricting beach spaces using ropes for family groups (17%).

Most of the experts accepted all (61%) while (91%) accept some of the 27 recommendations for the management and coastal planning of beaches in the post-COVID-19 stage (Fig. 7).

The proposed recommendations provide an opportunity to reconsider the necessary transformation of the global beach tourism system improving planning and management capacity better aligned with sustainable development goals as mentioned Lancet Public Health (2020). The recommendations could also be incorporated into national tourism strategies during the Covid-19 pandemic (Kreiner and Ram 2020). This will mean better planning and management of the visitors and tourism in the beach context (Gössling2020).

The experts also evaluated the applicability of these recommendations in their area of work or scientific research, considering the 27 recommendations appropriate and useful for post-pandemic beach management in their coastal environments. This allows a more detailed case study analysis for insular states, and in particular the case of Cuba.

Fig. 6. Beach planning and management measures to be applied in the post-COVID-19 era. The bars refer to management measures tested and reported by experts. Caption: Organize commercial activities on beaches diversifying the point of sale (7.29%); Create groups of volunteers to organize recreational activities on beaches that comply with social distancing (6.93%); Create traffic lights in beaches that give information to bathers about load levels in real-time (10.38%), Develop campaigns of public wellbeing to educate people post COVID (13.30%), Signal beaches with the admitted load capacity to avoid contagions (13.48%).
3.3. Applicability of the recommendations at insular states: Cuba as study case

Despite progress in some Caribbean island states, the paradox is evident that, with beaches being the fundamental axis of tourist activity and a deep-rooted cultural-recreational tradition for the local population, these venues experienced a general physical-natural and environmental deterioration in recent years, reducing their commercialization potential (Cabrer et al., 2019a, b; Juanes et al., 2003).

In the Caribbean islands, lack of economic resources, such as fuel and minerals, and scarce availability of freshwater resources, cause several health problems for communities at risk (Perez and Milanes 2020; Milanes et al., 2020; Juanes et al., 2003; Batista, 2018a, b). Sun, sea, and sand tourism become a fundamental economic activity (Botero et al., 2020).

Caribbean insular states have a set of local characteristics in which the recommendations proposed are especially suitable for them, among which it is worth highlighting: a) High dependence on tourist activity on beaches and coastal zones b) Frequent excesses in the density of users, c) Failure to comply with proper functional zoning, which indicates serious deficiencies in beach planning and management due to tourist uses, d) Several erosion processes and environmental degradation with high occupancy by different types of facilities, buildings, and infrastructures, e) Lack of an integrated vision of beach and coastal zone management, for addressing in a holistic way a set of problems and key issues that currently affect these sites, as well as the human activities developed in them, f) Several limitations for funding and technical resource-materials to implement response measures to the aforementioned problems.

Especially under the new conditions imposed by the Covid 19 pandemic.

Management and coastal planning for Cuban urban beaches focused on erosion, pollution, and loss of resources rather than infrastructure, facilities, and coastal landscape value (Fig. 8). The economic-financial approach in most of the urban and tourist beaches in the southeastern region of Cuba predominates over environmental sustainability (Cabrera et al., 2009a,b).

In the current context, where the unexpected and abrupt outbreak of the pandemic associated with COVID-19 occurs, the profound economic repercussions for coastal and insular states of the Caribbean are evident, not only from the epidemiological perspective but also from the economic, social, and environmental dimensions. The pandemic reveals the absence of measures in coastal management and beach planning of insular states focused on the risks and threats associated with climate change. There is no complex and preventive vision for these issues associated with risks of a biological origin, which, in spatial and temporal terms, have their own characteristics and requires their own responses.

More control over anthropogenic and epidemiological alterations of coasts and beaches is required. Before, and during Covid-19 Cuban beaches suffered from constructions on the coastline, hard and damaging infrastructure, pollution of water and sand. These reduce biodiversity and the sustainable bearing capacity. This entails, as 90% of the experts surveyed responded, moving towards new policies and regulatory frameworks for planning and management in the post-pandemic phase.

Of the experts surveyed, 76% point out the need to create and put into operation committees or other forms of collective bodies for the
management and regulation of beaches. This speaks to the importance of entities such as the Local Committees for the Organization of Beaches (CLOP in Spanish) in force in Colombia (Decreto, 1766 of 2013), known in Mexico as Clean Beaches Committees (SEMARNAP, 2020), and in Cuba as MIZC-GIP Coordination Boards, (Juanes et al., 2003; Cabrera et al., 2009). This similar organization, under name of Beach Management Bodies (Organismos de Gestión de playas -OGP in Spanish), has also been proposed in Spain since the 90s by Yepes et al. (1999).

The practice of CLOP has been tried with few effective results in island states such as Haiti (Juanes et al., 2003); the Dominican Republic (Cabrera et al., 2009), and Puerto Rico. For the last island, a project of law and a norm were formulated (Personal communication Barreto, 2020). Both are still without approval.

Encouragingly, in Cuba these bodies exist for the beaches of Varadero, Habana del Este, and some areas under the island’s integrated coastal management regime (Cabrera et al., 2019; Lozoya et al., 2016). However, despite some successes, most of the Cuba’s beaches do not have these structures in place. The greatest absence of these committees can be seen for the beaches located in the eastern and central regions of the country. Thus, recommendations must quickly be extended as an effective mechanism of coordination and dialogue for beach planning and organizing actions during the pandemic.

Also widely supported by the experts surveyed, with 81% for the post-pandemic phase, was the need to apply rigorous zoning for beaches, establishing active areas, rest areas, and services for bathers, requiring a control in the density of users to avoid crowding and risks of contagion. The need to incorporate traffic light access in relation to the load capacity of the beach and implement biosafety standards at its access points was raised. The emphasis by 81% of those surveyed stands out regarding the need for signage measures as both informative and regulatory, and above all, for education regarding the behavior of visitors and waste collection derived from the pandemic. Fig. 9a–j illustrate those recommendations that garnered 70 or more percent of favorable consideration from the experts. It was modeled using the software 3D, Sketchup.

Considering the analysis from the responses, in a general sense, the experts suggest that visual changes or phenosystemic signals should not be trusted absolutely. This is due to there being “invisible” structural and functional aspects. Of those surveyed, 83% insist on the need to record changes and monitor each physical, chemical, and biological variable closely to understand deeply the ecological and environmental panorama left behind by the pandemic. This should be the starting baseline to learn and improve beach planning and management in the post-pandemic phase.

Some of the recommendations are already being tested in Cuba by a group of competent institutions and entities, headed by the Directories of Physical Planning (Sp. IPF) and. Science, Technology, and Environment (Sp. CITMA) in coordination with local government authorities and social organizations. Recommendations put forward can be extrapolated to other insular contexts depending on policies and capacities of the response of the corresponding governments, as well as of the human and financial resources.

Regardless of the validity of these recommendations, there is the full conviction that the management of beaches and coasts continues to be a conceptual-methodological model under construction and development, which must be based on an ecosystem approach. Feedback on implementation experiences is needed. Systems of monitoring and periodic assessments of beaches increasingly play a decisive role.

The results obtained might lead to future research, using additional techniques to examine other aspects of beach management and planning. The main limitation of the present research work is the fact that the COVID-19 pandemic is still a recent threat. Therefore, relevant published research about that topic is limited, (Severyn & Botero, 2020). This suggests the timeliness of this research.

3.4. Operational details and relevant factors to consider for beach planning and management

For environmental sustainability managers of the beaches should give importance to a set of factors and operational variables that allow for solutions to remedy erosion, pollution, and habitat loss. This must be done with a holistic approach in the context of tourism and sustainable economic development.

Recommendations include: 1) Prohibiting the construction of buildings on the coastline, as well as the use of hard works that cause erosion, 2) To control the discharge of different types of waste, which translate into high levels of pollution of water, sand and air, to avoid affecting native vegetation and biodiversity, 3) To apply rigorous zoning on the beaches, clearly establishing the active, rest, and service areas, 4) To establish measures to control the density of users, in order to avoid crowds and dangers of contagion, ensuring respect for the carrying capacity of the beach and implementing biosecurity standards at its entrances, 5) To prioritize specific signalling actions, both informative and regulatory, and above all educational activities regarding visitor behaviours, 6) To work together to establish a permanent monitoring system, periodically evaluating the results, and, finally, 7) To review critically new policies and regulatory frameworks for ordering and managing beaches and coasts in the post-pandemic phase to advance in its improvement.

This research proposes operational aspects for beach managers, associated with rethinking seven categories into which the 27 recommendations provided were divided. These recommendations respond to the economic and cultural conditions of each island region, and of each beach in a more specific way. The results and recommendations of this work have a high theoretical-methodological implication for beach and/or coastal planning and management. Working with experts who are directly involved in these issues, ensures the objectivity and possible implementation of the 27 proposed recommendations.

4. Conclusions

COVID-19 showed the need to integrate physical distancing, biosecurity and sanitary hygiene measures into beach planning and management programs. Diversity of management practices, analyzed by the authors in different contexts around the world revealed that the relationship of COVID-19 with beach management is clearly expressed in six variables: equipment and facilities, biosafety and hygiene measures, reorganization of spaces, beach access, level of occupancy and beach monitoring, and signage. Practices observed in developed countries include responses with greater use of technologies, while those in less
developed countries offer lower-cost solutions.

The 27 recommendations provided in this study are valid and very operational for beach managers. The recommendations proposed were grouped into seven categories 1) Instruments of coastal planning, 2) Use of space, 3) Beach access, 4) Beach occupancy, 5) Hours of beach use by the visitors, 6) Hygiene and biosafety on the beach, and 7) Signage on beaches. These must be adjusted to the political, economic, environmental, and cultural conditions of each management scope, according to the strategies and conditions of each island state to face the pandemic.

Some existing Apps for beaches can be relevant for coastal planning and beach management. New Apps need to be developed for insular nations. Forty-three practices and/or actions for planning and management of beaches during COVID-19 have been identified. While twelve were taken for biosecurity and hygiene measures, nine have been considered for occupancy levels, beach monitoring, and space reorganization. Finally, six of them were directed to the categories of

Fig. 9. (a) Varadero Beach, Cuba, without zoning and facilities located on the beach before and during COVID-19 lockdown (Source: Cabrera, 2020). (b) The same beach with proposed zoning in a post-pandemic era. (c) Baconao Beach in Santiago de Cuba without coastal planning in COVID-19 lockdown (Source: Milanes 2020). (d) The same beach with organizational, biosecurity, and sanitary measures to avoid contagion of COVID-19. (e–j). Modelling carried out for Siboney beach in Santiago de Cuba, showing how access to this beach should be with biosecurity measures as well as for the management and classification of waste derived from the pandemic.
equipment and furniture, five for beach access, and two for signage.

It has been difficult to define a universal confinement period, a post-pandemic scenario, and restrictions to beach access. In most island countries, as in the case of Puerto Rico, and Cozumel in Mexico, the beaches have opened and closed on several occasions due to new outbreaks. The situation of Cuba has been different. At the most famous tourist beaches in Cuba, some recommendations are being implemented. As the largest island of the Caribbean, Cuba has particular characteristics and represents more than 900 Caribbean region islands. The 27 recommendations provide answers to operational aspects of coastal management and are valid for the islands of the Caribbean. The proposed recommendations include measures for the protection and confrontation of the pandemic universally accepted by the WHO, with the particularities of the activities and uses that take place in coastal zones.

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Author contributions

CBM conceived the article; CBM, OP, and JAC designed, applicated and analyzed the results of the survey; CBM, OP, JAC, and BC analyzed the data and discussed the results; CBM, OP, JAC, BC, wrote the manuscript; CBM designed all the figures and the questionnaire using the online platform.

Impact statement

This research contributes to beach planning and coastal management in insular countries. The 27 recommendations proposed being suitable to be used during the pandemic period, the new normality, and in other post-pandemic scenarios. All the recommendations are designed to seek safe and sustainable tourism on urban and touristic beaches. Governments and decision-makers can help to test this proposal during and after the pandemic. The recommendations were validated by international experts from an Ibero-American network and by Cuban experts that research and work in beaches. The article seeks to open a discussion about beach planning and coastal management. The designed recommendations are expected to be carried out in other insular states.

Ethical statement

The present manuscript has never been published before, and it is not under consideration by any other publisher. Its publication has been approved by all authors and, if accepted, it will not be published by other editors, nor in other languages without written authorization by the holder of the author’s rights.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1. Practices and actions of beach planning and management during the COVID-19 lockdown

| Variables analyzed | Practices and actions proposed | Country/source |
|--------------------|--------------------------------|----------------|
| Equipment and facilities | 1 Use of wooden structures to enclose family groups. | Sigar, Galicia, Spain |
| | 2 Booths on beaches used to store belongings and change wet swimsuits. | Xavi (2020) |
| | 3 Design of plastic cubicles as isolation modes on beaches and in restaurants. | Spain (https://elpais.com) |
| | 4 Prohibition of use of umbrellas without pole. | Italy (www.elcorreo.com) |
| | 5 Location of umbrellas 15 feet apart. | Island “Padre Sur” and Island “Mujeres”, Mexico www.telemundo51.com |
| | 6 Arrangement of umbrellas using vertical signage dividing the beach into grids each 4 m. | Chipiona, Cadiz Spain (Garrofano, 2020) |
| | 7 Monitoring of water quality in bathing zones of the beaches | Portugal APA (2020) |
| | 8 Fines of up to 500,000 Mexican pesos for those who violate physical distancing between umbrellas. | Island “Padre Sur” and Island “Mujeres”, Mexico www.telemundo51.com |
| | 9 Swab tests for beach access. | Mar del Plata, Argentina La Capital (2020) |
| | 10 Obligatory use of masks on beaches and in resorts. | Chile, Cuba island; Colombia (www.cooperativa.cl; Granma (2020); (Resolución 1538 del 2020) Bournemouth, UK Noticias (2020) |
| | 11 Lack of protocols for restricting load capacity on beaches. | Soko Archipelago (El Cacho, 2020) |
| | 12 Inadequate waste management on uninhabited islands. | www.lavanguardia.com/ |

(continued on next page)
## Variables analyzed

| Practice or action proposed | Country/source |
|----------------------------|----------------|
| 13 Biosecurity measures and protocols for the defence of the territory and visitor safety. | Barú island, Colombia  [www.eltiempo.com](http://www.eltiempo.com)  
| 14 Participatory processes to fulfil the right of native communities to make use of organized and sustainable tourism. | Island “Grande”, Colombia  [www.eltiempo.com](http://www.eltiempo.com)  
| 15 Restrictive measures for access to the island and its beaches | Island Anguilla, in the Caribbean Region  [www.elpais.com](http://www.elpais.com)  
| 16 Reinforcement with a greater number of lifeguards. | Cuba island (Granma, 2020)  
| 17 Distance of at least six feet, both in and out of the water. |  
| 18 Reinforcement of organizational and hygienic-sanitary measures. |  
| 19 New spaces on the beach only for vulnerable populations (older adults). | Benidorm, Spain  [www.visitenbordem.es](http://www.visitenbordem.es)  
| 20 Sale of the kit to build anti-coronavirus plots on the beach. | Gandia town hall, Valencia, Spain  [https://www.antez3.com](http://www.antez3.com)  
| 21 Private beach clubs. | Bondi beach, Australia (The Sidney morning Herald, 2020)  [Correy, 2020]  
| 22 Reservation of plots through web platforms in physical points enabled for them. | Beaches “Levante” and “Poniente”, Spain  [www.bendidormbeachsafety.es](http://www.bendidormbeachsafety.es)  
| 23 Parking access to beach areas in Covid-19. | Portugal  [APA (2020)]  
| 24 Pedestrian movements, promenade, to keep distances in different areas of the beach. | Mujeres island, Mexico  [www.telemundo51.com](http://www.telemundo51.com)  
| 25 Vendors located in the front row of the beach. | Chipiona, Cádiz Spain  [García (2020)]  
| 26 Reorganization of umbrellas calculated according to average tide. |  
| 27 Location of plots calculated in a space suitable for a family of no more than four or five people. |  
| **Beach access** |  
| 28 Free Access to the beach by taking the footbridge that crosses the dunes. | Varadero, Cuba.  [MondoulBalnear.com](http://MondoulBalnear.com)  
| 29 Access to beaches considering ID numbers. | DIMAR, Colombia, (Zuniga 2020).  [https://www.eltiempo.com/columbia/barranquilla/](https://www.eltiempo.com/columbia/barranquilla/)  
| 30 Ways of restricting access to the beach based on schedules. | Resolución 1538 del 2020 Colombia  [www.telemundo51.com](http://www.telemundo51.com)  
| 31 Access to the beach is restricted with a cord or rope. | Resolución 1538 del 2020 Colombia  [www.telemundo51.com](http://www.telemundo51.com)  
| 32 New accesses to the beach enabled for the elderly on sand with a green colour. | Benidorm, Spain  [www.visitenbordem.es](http://www.visitenbordem.es)  
| **Level of occupancy and beach monitoring** |  
| 33 Automatic video vigilance to control beach capacity. | Town councils of Spain (Mutoz, 2020)  [El País](https://elpais.com)  
| 34 App Info Praia. Beach occupancy status in the current context of COVID-19. | Portugal and the Autonomous Regions (APA, 2020)  [Info Praia, 2020a.b.]  
| 35 Present six other different utilities. | Portugal, Island “Madeira” and “Azores”  [https://play.google.com/store/apps](https://play.google.com/store/apps)  
| 36 App SandiSpace. Includes a georeferencing system of 580 oceanic and river beaches. | Beaches of Gipuzkoa, Spain  [Medio ambiente 2020 a.b.]  
| 37 App “Nick Hondartzak” to control capacity. | Beaches of Chipiona  [https://m.facebook.com/playaschipiona/photos/](https://m.facebook.com/playaschipiona/photos/)  
| 38 Zoning the sunbathing and relaxation areas of the beach using a traffic light map and according to the height of the tides. | Chipiona, Cádiz Spain  [García (2020)]  
| 39 Delimitation is complemented by a notification service through QR codes that inform of occupancy levels for the different sectors of the beach. | Beaches of the municipalities of Rio de Janeiro, Brazil (Vicon SAGA mobile, 2020; Mar à Vista, 2020)  [www.eltiempo.com](http://www.eltiempo.com)  
| 40 Monitoring of ocean beaches through the Vicon SAGA application. | Department of the Environment Provincial Council of Gipuzkoa in collaboration with Azti (Medio ambiente 2020 a.b.)  [Rosarito municipality, Mexico](https://m.facebook.com/playaschipiona/photos/)  
| **Signage** |  
| 41 Participatory observation through the Vicon SAGA application. | Rosarito municipality, Mexico  [IMPLAN, 2020]  
| 42 Use of traffic lights. |  
| 43 Norms for the use of beaches covid-19/Orange traffic light. |  

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