CHANGES IN NATURE-BASED TOURISM AND OUTDOOR RECREATION IN THE CANARY ISLANDS:

OBSERVATIONS, INFORMATION NEEDS AND WAYS FORWARD

Report of the MOBICON project workshop held in
Las Palmas de Gran Canaria 19th March 2024



Matti Hästbacka, Aina Brias Guinart, Johanna Eklund, Matías Manuel González Hernández, Tatu Leppämäki, Saray del Carmen Morales González, María Pulido Hernández, Antonio Samuel Ramírez Cabrera, Andrea Santana Suárez & Tuuli Toivonen

Digital Geography Lab, University of Helsinki

TIDES, University of Las Palmas de Gran Canaria

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Author contributions:

MH and TT contributed equally to this publication. ABG, MH and TT planned for the study design. ABG and MH prepared the survey and compiled the results. MMG together with CMG, MPH, ASRC and ASS took care of the practical organisation of the workshop.TL, CMG, MPH, ASRC and ASS took notes and participated in running the workshop. MH and TT compiled the document together with contributions from MMG, JE, AB, and TL. All authors provided critical feedback on the manuscript. TT supervised the work.

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EXECUTIVE SUMMARY

This report summarizes the outcomes of the workshop titled Changes in Nature Visitation and the Potential of Mobile Big Data for Visitor Monitoring, held in Las Palmas de Gran Canaria on March 19th, 2024. Altogether 20 experts from different organisations and islands took part in the workshop and an online survey before the workshop. The report is based on the survey results and the discussions. A scientific article on the findings is under preparation.

The aim of the workshop was to discuss and collect expert opinions related to 1) the expected changes in nature-based tourism, 2) the role of technology in nature visits, 3) the information needs related to visitor management and 4) the potential challenges in combining tourism and nature conservation in Canary Islands. During the discussion, the participants supplied several suggestions on how to advance sustainable recreational use of nature in the islands.

The discussions revealed a widespread worry about the fragile nature of the Canary Islands being degrading as the number of tourists and resident population climbs up. These worries related to the general lack of environmental awareness leading to careless behaviours, as well as challenges in administration and management.

Social, political and *technological* factors were the most important drivers of change in nature-based tourism on the islands and intertwined with *economic* and *environmental* factors. For example, the aging population in Europe as well as the increase in remote work possibilities generate new types of long-term visitors on the island, changing the tourism practices overall. General increase of individualism combined with new platform economies allows tourists to find accommodations outside traditional touristic zones and occupy more remote areas. Technology plays an important role also otherwise. The extensive use of natural areas for various activities is supported by the availability of detailed maps and social media content, which may lead to unwanted activities being repeated by many. Political unrest and climate change add uncertainties to foreseeing how both tourism flows and destination image change in the future.

The discussants noted that there is little systematic information available on how nature destinations are visited or used, outside the four national parks. However, other issues than the lack of visitor information were considered a bigger challenge at this point.

Overall, it was seen that the current tourism model centered around the sun and beach tourism, energetic nightlife, and cheap prices at the centre of the destination image is detrimental for advancing sustainable tourism and taking the nature of the islands in better consideration. In addition, the discussants raised concerns about 1) the poorly functioning administrative structures and the communication challenges between actors to ensure a sustainable future for the island, 2) the lack of proper regulations and sanctions and the administrative capacity to react to harmful behaviours and 3) the overall lack of awareness of the fragility of nature among visitors and locals.

The discussants brought up 13 suggestions to fight these challenges and protect the fragile nature of the islands for future generations. These included major changes in tourism practices in the islands overall (from reducing the targets in the number of tourists to charging for visits through an ecotax and entrance fees), the increase of cross-sectoral collaboration in the administration and a set of more targeted or local actions (increasing social media presence, improved signage, building path infrastructures).

The workshop was organized as part of the five-year MOBICON research project (*Mobile Big Data for Understanding People in Nature - Detecting short- and long-term changes and their implications for biodiversity conservation)* funded by Kone Foundation. For more information on the project and the next steps, please follow the project's website or contact the researchers via email: mobicon-project@helsinki.fi. Website: https://www.helsinki.fi/en/researchgroups/digital-geography-lab/projects/mobicon.

BACKGROUND

1. OBJECTIVE AND STRUCTURE OF THE WORKSHOP

The Changes in nature visitation and the potential of mobile big data for visitor monitoring-workshop was held at the University of Las Palmas on 19.3.2024 between 9 am and 2 pm. Altogether 19 experts from different administration, planning and research organisations were present at the event. The detailed programme of the workshop is presented in the Appendix 1.

The aim of the workshop was to discuss and collect expert opinions related to 1) the expected changes in nature-based tourism, 2) the role of technology in nature visits, 3) the information needs related to visitor management and 4) the potential challenges in combining tourism and nature conservation in Canary Islands. Furthermore, the groups discussed how to meet the needs of tourism and nature conservation simultaneously. The workshop was the second in a series of three workshops organized in different countries. The first workshop was organized in Helsinki, Finland, 28.8.2023 (Toivonen et al. 2023), and the third will take place in sub-Saharan Africa (location still open) in 2025.

The results of the workshops are reported both in workshop-specific reports (like this one for the Canary Islands) and later in scientific articles. The outcomes and findings are also used to further guide our research and to develop and help to operationalise the use of various data sources for visitor monitoring in protected areas.

The workshops are part of the five-year MOBICON research project (*Mobile Big Data for Understanding People in Nature - Detecting short- and long term changes and their implications for biodiversity conservation)* funded by Kone Foundation. The project team has previously published dozens of scientific articles on how data produced by mobile applications can be utilized when analysing the recreational use of nature (e.g., Tenkanen et al. 2017, Toivonen et al. 2019, Heikinheimo et al. 2020), producing novel information on the recreational use of nature both in Finland (Heikinheimo et al. 2017, Väisänen et al. 2021) and elsewhere in the world (Hausmann et al. 2018, 2020). Now the aim is to broaden the scope and inspect the changes occurring in nature tourism and outdoor recreation and to consider the usability of mobile big data to support the knowledge production for managers of protected areas or green infrastructure.

The workshop programme consisted of a general introduction, group discussions and plenary discussions with the entire group. Each topical discussion started by Aina Brias presenting the central findings from a pre-distributed online survey. A discussion followed in groups of 4-5 participants led by a facilitator (Aina, Matías, Matti & Tuuli). All discussions were recorded and documented in notes taken by the notetakers (Andrea, Saray, Samuel, Maria). This report summarizes the outcomes of all these activities, the survey, the group discussions and the plenary discussions.

2. TOURISM IN THE CANARY ISLANDS

Over the last six decades, the Canary Islands have developed a tourism industry whose current dimensions make it a reference hotspot for global tourism. With more than 16 million tourists, more than 0.5 million accommodation places and 20,334 million euros of gross tourist income in 2023, tourism has far surpassed the reference figures prior to the COVID-19 pandemic. With an area of just over 7,500 km^2 and 2.23 million inhabitants, the islands received 2133 tourists per km^2, 7.5 visitors per resident; around 125 million overnight stays, 95.7 million in hotels and apartments alone, over 30 million more estimated in holiday homes; and a floating tourist population of almost 350,000, which represents more than 15% of the resident population in 2023 (*Instituto Canario de Estadística*). The tourism sector's development has been largely driven by the construction and real estate sectors.

At the same time, the population of the Canary Islands has multiplied by a factor of 4.5, from half a million in 1960 to 2.23 million today. Particularly since the beginning of this century, the main driver of population growth has been European, South American, North African and sub-Saharan immigration, in the order of importance. In 2023 alone, the population of the archipelago increased by more than 25,000. At the same time, there has been an intense internal flow, first from the outlying islands to the two capital islands, Tenerife and Gran Canaria, from rural areas to the cities and from the interiors of the islands to the southern slopes and the capital centres. Undoubtedly, the development of infrastructures and tourist activity has been the main driving force behind population growth. A significant part of the immigrant population has been attracted by the opportunities generated by the provision of direct services to tourists, another by the development of activities indirectly benefited by tourism and by the activity induced by the expenditure of tourist income. Finally, the purchase of property by European citizens with permanent or temporary residence in the islands has been influenced by the growing importance of the archipelago as an international tourist destination.

The Canary Islands are also a hotspot of endemic biodiversity in Europe and the world. More than 13,000 endemic species are registered in the Canary Islands Biodiversity Data Bank. Together with Madeira, the Canary Islands have the highest number of endemic plant species per unit area in Europe. In addition, the Canary Islands are home to the best representation of laurel forests, a relic of the Tertiary forests in the Mediterranean bioregion. The EU has recognised the importance of the Canary Islands' biodiversity and its conservation by incorporating 36.3% of the archipelago's land area into its Natura 2000 network. There is also a great natural heritage on marine areas, which are amomg of the most species rich and diverse regions in the north-east Atlantic. The biodiversity of the Canary Islands is extraordinary, but the relatively small area of the islands makes the species and habitats particularly vulnerable to human pressures, both global and local.

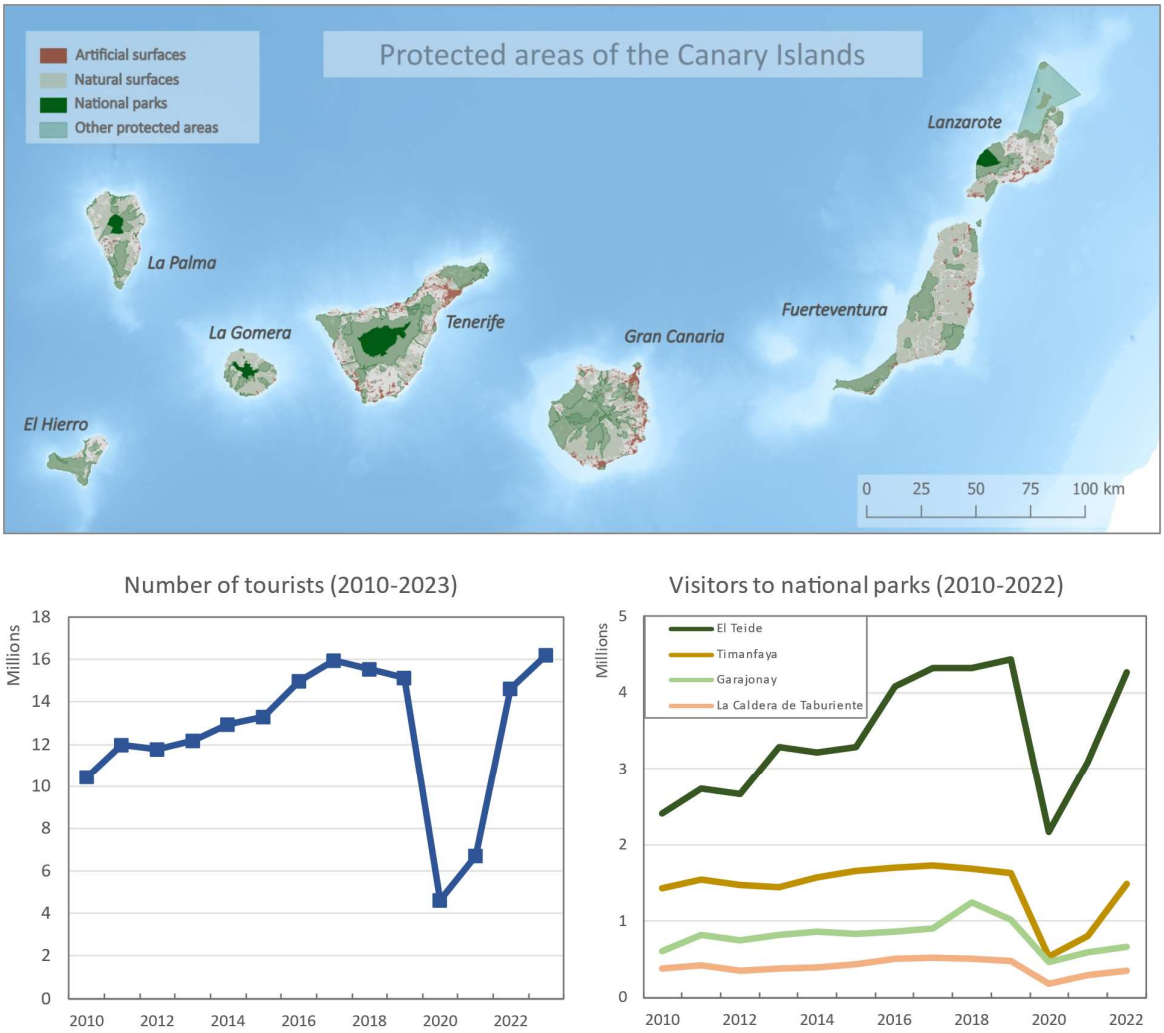

Figure 1. Protected areas of the archipelago (map above) and changes in the overall number of tourists[1] (graphs of the left) and visitors to national parks[2] (graph on the right) since 2010.

The Canary Islands have a relatively extensive network of protected areas with 146 natural areas, of which four are national parks. The protected area network covers some 300,000 hectares and stands for 44% of the islands' surface area. The aforementioned Natura 2000 areas mostly overlap with the protected area network, although some are not incorporated in the protected area network.

Many of the protected areas are also important tourist attractions: in 2019, the four national parks were visited by over 7.5 million people. The most popular one, El Teide, had almost 4.5 million visitors in 2019, making it one of the most visited national parks in Europe. The other three parks are visited by a high number of people annually as well: while Timanfaya had 1.6 million visitors in 2019,

[1] https://www3.gobiernodecanarias.org/istac/statistical-visualizer/visualizer/data.html?resourceType=indicator&resourceId=TURISTAS#visualization
[2] https://www3.gobiernodecanarias.org/istac/statistical-visualizer/visualizer/data.html?resourceType=dataset&agencyId=ISTAC&resourceId=C00005A_000003&version=1.0#visualization/table

Garajonay (1 million) and Caldera de Taburiente (0.5 million) followed with lower but still considerable visitation rates. Based on research using mobile big data, it has been shown that most of visitors to the islands visit a protected area during their stay (Hästbacka et al., in prep.).

Over the last few years, a substantial part of Canarian society has become increasingly unhappy with the state of conservation of its natural terrestrial and marine habitats, the most vivid expression of which has been the citizens' demonstrations of 20 April 2024, under the slogan "The Canary Islands have a limit"[3]. This public sentiment, together with the signals from markets and multilateral tourism organisations on a global scale, has led to a progressive shift in the vision and priority areas of intervention of the administrations in favour of sustainable tourism[4]. The recent announcement of the introduction of entry fees to certain protected areas in Tenerife and the intention of the municipality of Mogán to establish a fee for overnight stays for environmental recovery are concrete expressions of a change in direction towards sustainability, with implications for the management of protected areas.

FINDINGS OF THE WORKSHOP

3. CHANGES IN NATURE BASED TOURISM AND DRIVERS BEHIND THE CHANGES

In the first part of the workshop, we discussed about the changes in nature-based tourism and the drivers behind the changes. It was evident that the number of visitors was continuously increasing (FiguresFigure 5 Figure 6) and the geographical patterns of where and when they visit nature were changing. Also, the groups of visitors were diversifying in terms of visiting motivations and profiles (i.e., who the visitors are and what kinds of activities they realize in nature).

We also asked the participants to consider the drivers of change in nature-based tourism from the perspective of social, political, environmental, economic and technological factors (modified from Buckley et al. 2015). The respondents of the survey rated three of these as the most important: social factors, technological factors and environmental factors (Figure 2).

Below, we report the discussions in order of importance of the change factors, according to the participants.

[3] *Canarias tiene un límite;* https://www.ecologistasenaccion.org/evento/manifestacion-canarias-tiene-un-limite-20-abril-2024/

[4] See, for example, https://turismodeislascanarias.com/es/canarias-destino/#razones-para-la-transformacion

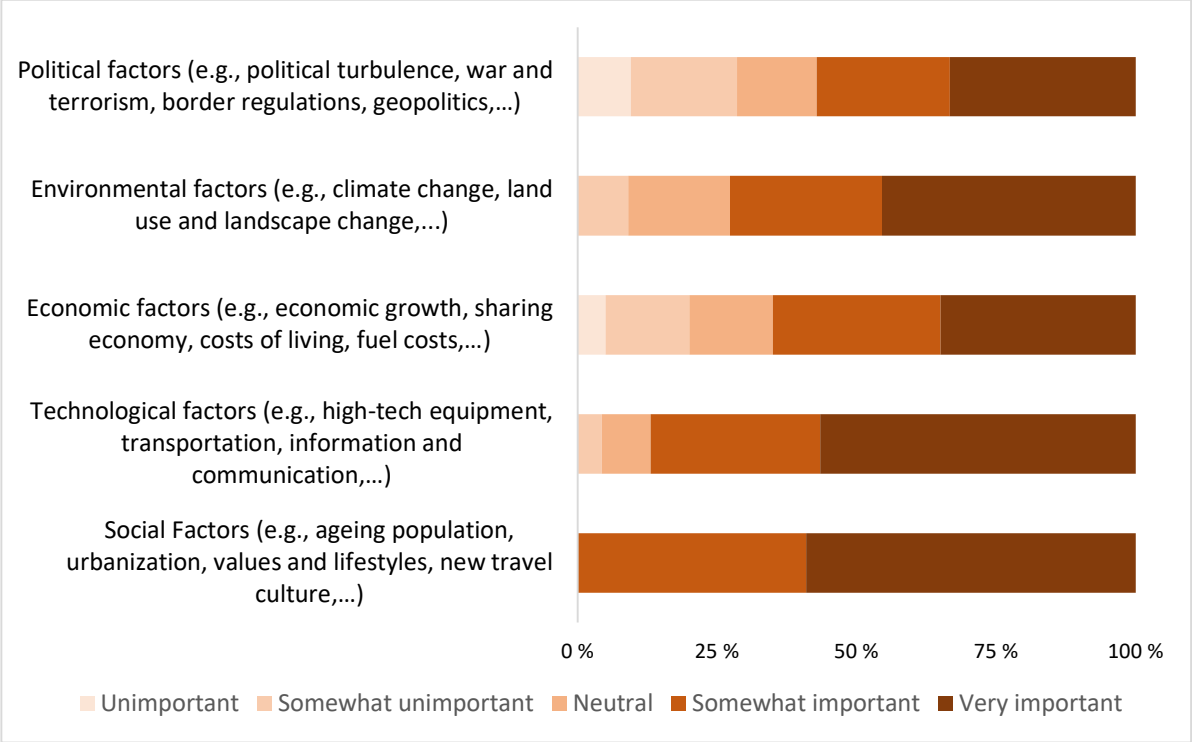

Figure 2. What are the main factors that will drive these changes in your area?

3.1 Social factors

Social factors were seen as the most important drivers of change in nature tourism and thus for the management of natural areas. Among the significant societal trends, the participants discussed changes in the visitor groups and number of visitors. The workshop participants also mentioned that they sense a general increase in people's (both tourists and locals) interest in nature and nature-based recreation.

Changes in types of tourists: In addition to increasing tourism numbers, the discussants identified new visitor groups who are staying on the islands for longer periods of time and also visit nature in new ways. For example, the aging population in Europe was seen to increase the number of so called "silver tourists", who are spending the winter on the islands and potentially living an active life with a high readiness to pay for the services they consume. A second group found were the so called "digital nomads", typically younger people who work remotely for foreign companies and are free to move around globally. A third group found were the so called "hippies", people living with low budgets in rural houses with a wish to live close to nature, including subsistence farming etc. This overall diversification of tourist groups and particularly the increase of long-term stays will increase the pressures to nature and impact the local economies for example through affecting rents in previously non-touristic areas.

Broad sociocultural changes affecting tourism and traveling globally (i.e., the so called "new travel culture") are also visible in the Canary Islands: new generations of tourists are increasingly individualistic and interested in unique and authentic experiences. This can lead to an increased interest towards "pristine" nature and activities in increasingly remote locations. The participants connected these emerging trends with sociocultural changes: today's society is more individualistic than before and people's increasingly urban and sedentary lifestyles may increase the demand for nature-based recreation, as people seek new ways of disconnecting from their everyday lives. The

social dimensions of the Covid-19 pandemic and countermeasures were also discussed as a potential factor: after lockdowns, people felt a need to move around and often sought escape in nature. Importantly, the participants saw that many of the changes were also present in the local residents and in their ways of being in nature and did not apply only to tourists coming from abroad.

3.2 Technological factors

Technological factors were considered the second most important driver of change for nature-based tourism on the islands. Some discussion groups rated technological drivers as the most important driver of change in tourism in the region. Technology was seen to change tourism in several ways, but the most important changes related to, in no particular order, 1) the expanding use of social media, 2) map applications, 3) platform economies and 4) new technological gadgets.

Social media. People are increasingly seeking information from social media. On the positive side, they may be guided by posts from their peers, providing important information that matches their interests and needs. On the negative side, the information posted by peers may be erroneous, generating unwanted or illegal behavior, or filtered, creating false expectations and disappointments, or too influential, leading to unexpected crowdedness. For official information communication purposes, it is difficult to compete with entertaining and engaging social media content. It was also noted that visits to nature are increasingly motivated by the possibility to share content on social media, rather than the nature visit itself.

Social media activity can cause quickly emerging trends that are impossible to predict and difficult to react to (e.g., TikTok & Youtube challenges etc.). Viral content may make places popular overnight, or social media influencers may even stimulate destructive behaviour. The latter happened, e.g., in the dunes of Maspalomas in February 2024 when a social media influencer hid a box with 1000 euros to the dunes and generated a crowd of fortune seeking diggers in the protected area[5]. Social media posts have also encouraged people to visit isolated locations. For example, in Fuerteventura, Playa del Bajo de la Burra also known as “Popcorn Beach” has suffered from people collecting the unique algae fossils with a distinctive popcorn like shape.

Map applications and GPS have made it possible for people to be more explorative on their own. Detailed satellite images and community mapping efforts like Open Street Map allow people to plan visits to more and more remote areas, spreading the visitor pressure. Hiking apps like Wikiloc allow people to share their hiking tracks for others to follow in detail. While this improves the safety of the hikes overall, not all the tracks on the platforms are official paths. Some may even pass through private properties or areas of high erosion risk or endemism.

Platform economies and remote work technologies have changed the way how holiday lodging distributes on the islands. Increasing numbers of remotely working knowledge workers, so called “digital nomads”, have found the Canary Islands, many of them finding their accommodation in rural houses through platforms like AirBnB instead of beach side hotels. This changes the way visitors are distributed spatially (rural houses close to nature instead of sun and beach hotels) and temporally (full winters on the island instead of shorter vacations). Many of these people also visit nature on their free time to counterweight the work on the laptop, even if having their accommodation in the urban areas.

[5] https://spanishnewstoday.com/dozens_of_youngsters_destroy_protected_spanish_sand_dunes_in_search_of_buried_treasure_1000006378-a.html

New gadgets such as drones and electronic bikes have changed the ways people enjoy nature. Electronic bikes allow longer routes and make them more accessible for a larger number of people. Drones allow beautiful footage to be shot from places that are inaccessible by people and may therefore create false expectations for visitors. When shared on social media, the content may lure people to dangerous or prohibited locations also by foot. The use of drones themselves may distract birds and other animals and introduce a fire hazard in high-risk areas.

3.3 Political factors

It was seen that global political unrest affects the flow of visitors as political conflicts may restrict the travelling of some groups. Unrest in competing destinations (e.g., Morocco and Jordan) has previously redirected tourism flows, causing an increase in tourism demand in the Canary Islands. On the other hand, previously important groups of Russian tourists have been decreasing as a consequence of Russia's war in Ukraine.

Local political setting impacts both nature conservation and tourism. Solutions that would be important for nature conservation can often conflict with actions aimed at increasing the revenue from tourism. The political actions that are taken e.g., to increase tourism on the island, may have direct impacts on nature as well. There was a widespread sentiment that the public administration was unable to react to changes due to weak cross-sectoral communication in the administration. For example, the tourism authorities may make politically guided decisions that are contradictory to the conservation goals. Overall, in the local political context, tourism development and economic interests were seen to override environmental protection, with the latter already suffering from insufficient resources and legislation.

3.4. Economic factors

The participants related the growth in tourism numbers to a **general increase in wealth across Europe**, which has left people with more available resources to use for leisure and traveling. Also the comparatively low level of consumption taxation in the region and the availability of low-cost flights shaping the islands into a low-cost destination. This has allowed the overall tourism numbers to grow and fueled the growth of visitor numbers also in the protected areas of the islands.

The economic incentives for stimulating economic growth in the Canary Islands were also discussed. Audiovisual productions, for example, are publicly subsidized through tax incentives, and much of the filming takes place in natural areas, sometimes resulting in environmental damage. Mass sporting events or festivities are regularly organized in protected areas and the impact such events have are often in conflict with nature protection. The participants noted that the event production companies have little interest in minimizing their environmental impact.

They also highlighted the **absence of a regulation** obliging companies that use the natural environment for their activities to undertake restoration actions aimed at the regeneration of the degraded environments. Furthermore, there was a **call for use of reliable indicators** to evaluate both the damage and the effectiveness, if any, of the restoration measures. Moreover, it was seen that as protected areas are freely accessible and poorly signed, their value might not be properly appreciated by the visitors. Instead, **protected areas are used as a leisure ground** for various organized and unorganized activities that cause damage to the environment.

The majority view among participants was that short-term profit continues to dominate the scene of economic activity on the islands, and that economic growth, largely driven by the tourism sector, has profoundly changed land use dynamics on the islands.

3.5. Environmental factors

Climate change and the loss of biodiversity and geodiversity were seen as the biggest environmental changes impacting nature-based tourism in the future, for example in the ways listed below.

Habitat degradation. It is clear that climate change is significantly altering habitats, challenging long-established environmental patterns such as the Canarian ecosystem's altitudinal zonation, and increasing the risk of large human-induced wildfires in increasingly dry conditions. It was noted that extreme weather events may be leading to the loss of beach and mountain zones through wildfires or floods.

Changing tourism flows to the islands. Warming climate may reduce the number of winter tourists in the archipelago as high temperatures are to be found also in mainland Europe. For those preferring to avoid flying, the Canaries becomes a difficult destination. On the other hand, tourists usually visiting more distant winter destinations, such as Thailand, might be increasingly drawn to the Canaries.

Distribution of tourism on the islands. Climate change is also expected to change the distribution of tourism within islands. For example, higher altitudes may be preferred for their lower temperatures, in comparison to the current touristic zones along the coasts. Heat waves and anomalies may, however, be more severe on higher altitudes, leading to more complext tourism relocations patterns.

4. USE OF TECHNOLOGY IN NATURE

As noted also in section 3.2, technology plays an increasing role in nature visits in the Canary Islands. People use technology before, during and after their nature visits in various ways. The survey highlighted the importance of official information sources among the visitors (Figure 8), but in the discussions the role of user-generated content and information exchange with peers mediated by digital technologies and platforms was emphasized.

Before their visits, social media platforms such as Instagram, TikTok, YouTube, blogs and websites were mentioned as important sources of information. There is a wide variety of webpages, from official marketing material to unofficial blogs that offer bucket list type listings of destinations on the islands, which were considered popular and influential by the participants. Visitors may also use sports applications such as Wikiloc to explore the islands' activity supply virtually before a visit. In addition, official websites and apps (e.g., TenerifeON) were mentioned, but their popularity among visitors was not known. Platforms such as TripAdvisor are used often by visitors to explore different destinations during their stays and also to decide which services (e.g., restaurants) to use.

The use of technology during nature visits is very popular and plays an increasingly important role. Tourists increasingly rely on mobile maps, such as Google maps or Wikiloc for navigation. However, digital maps have not entirely replaced printed maps. Importantly, people use digital technologies to document their trips, and **many** also share their activities on social media almost in real time. In addition to mobile devices, drones were discussed, and their popularity in photographing and filming nature activities was considered to have increased. The use of apps related to specific activities, such as sports (e.g., Strava) or learning about nature (e.g., iNaturalist) is limited to specific visitor groups (e.g., cyclists, birdwatchers).

After their visits, visitors mainly share their experiences on different platforms, such as social media or route-sharing platforms. The contents published after the visits may be more edited and polished than real-time publications, but this is not necessarily the case, as the same services may be used

both during and after visitations. Visitors also comment and review their visits using online platforms, such as Google reviews or TripAdvisor.

5. Information needs for visitor monitoring

Currently, information about nature-based tourism is being collected with counters, interviews, and personal observations and managed locally (Figure 9). The four national parks monitor the number of visitors, and maintain action plans on the management of visits. The existing monitoring systems of the use of protected areas are not centralized or systematized, which hinders coordinated information production about the recreational use of nature.

In some areas, mobile big data -based monitoring has been explored, and some areas are continuously making use of data from sports applications in monitoring and management of visitor flows. The participants also mentioned that in some areas, social media and other online sources are actively used in a qualitative manner to understand visitors' interests, activities, and satisfaction.

The participants agreed that there exists a need to understand the visitor flows (where and when people are visiting the areas) better. In addition, there is a need to better understand the motivations, activities, and the level of visitor satisfaction in the areas they manage. There was also an interest in predictive models about future trends of visitation to better prepare proactively for future changes.

It was also noted that the knowledge base on nature is sporadic. Although there is accumulated scientific knowledge about the nature of the Canary Islands (e.g., taxonomic studies about species), this knowledge is difficult to synthesize and to use to support spatial decision-making and planning.

CHALLENGES AND IDEAS FOR THE FUTURE

6. Challenges in meeting the needs of tourism and nature protection

The complex relationship between nature-based tourism and nature conservation was discussed. The participants brought up several major challenges.

6.1 The current model of mass tourism

The current model of tourism where the quantity of visitors is maximized, and people are attracted by beaches, parties and thematic park activities was seen as unsustainable by many of the workshop participants. Since many tourists visit iconic natural sites (e.g., Teide or Timanfaya National Parks, Roque Nublo or Dunas de Maspalomas in Gran Canaria or Corralejo and Jandía in Fuerteventura), the increasing numbers of tourists leads to an increase in visitor numbers also in the protected areas. As visitor numbers increase, the current technical and human resources become increasingly insufficient to manage the pressures the visitors put on the natural environment. In the future, problems related to unsustainable tourism will be worsened, as hotter climate is likely to direct tourism from coastal areas to higher elevations, where most protected areas are located. The current tourism model and its emphasis on infrastructure development is in stark conflict with nature conservation, as there are pressures to expand touristic infrastructure to new areas. In addition, the overuse of natural resources may indirectly damage fragile ecosystems (e.g., high demand of water affecting the laurisilva), negatively affecting their touristic carrying capacities and attractiveness at the same time.

6.2 Administrative structures and communication challenges

Overall, there seemed to be a disconnection between conservation actors and the tourism industry, and this can lead to unsustainable practices which could possibly be prevented if the communication and coordination between these were improved. The administrative structures of the management are isolated and different actors may be working in opposite directions. Public administration issuing permits to development projects do not fully consider the impacts on fragile ecosystems, and tourism companies may even be unaware of natural values when organizing activities in protected areas. Hotels and other accommodation providers may provide information about what to enjoy in the surrounding areas, but restrictions and natural values are seldom included in these instructions. As an example, the discussants presented a case where the tourism administration had wanted to increase nature-based tourism by promoting bird watching activities on fragile areas, without consulting the protected area managers about this activity.

6.3 Weak regulation and missing sanctions

There was a clear consensus among the participants that the regulations related to the use of protected areas were insufficient, or existed only on paper without proper implementation, or lack proper means of sanctioning.

The local administration lacks the ability to enforce nature protection laws, for example in relation to problematic or forbidden behaviour in natural areas. The existing bureaucratic processes related to budgetary planning and reporting of problematic behaviour in protected areas were also deemed heavy and laborious, which hinders reacting to emerging challenges. It was also mentioned that the current protected area network has been the same since its establishment, without any additions despite the increased pressures.

Some protected areas have not been able to develop specific regulations governing their management and conservation, and some participants were concerned that there are no sufficient technical, human, and/or financial resources to carry out the management entrusted to them. The problem is emphasized by the unpredictable behaviour of visitors, for example due to big events that spread on social media. Massive events such as internationally known running competitions or film shoots, may stretch the boundaries of what is acceptable in terms of use of nature. The existing sanctioning regime has had little success in deterring misbehaviour, due to the size of the sanctions and the fact that they are difficult to impose, especially on non-residents who visit the islands only for a short time.

6.4 Visitors' understanding of the fragility of nature

Overall, there was a consensus that the biodiversity and geodiversity of the Canary islands are undervalued both by tourists and locals compared to many other island destinations with high endemism and geological specialities, where this diversity is a main attraction. Visitors arriving to the Canary Islands are mostly motivated and attracted by the sunny climate, beach and night life, and cheap flights from Europe. While many of them visit a protected area on their visit, they may not be interested in or even aware of the high natural diversity and the fragility of the islands' nature. Visitors might also not be aware of the fact that some of their actions or activities are illegal or forbidden, for example when repeating activities or behaviours that have become popular on social media. Nature may be seen as a theme park-like scene for holiday activities or photos, instead of something fragile to protect. The lack of awareness and appreciation has led to degradation of the natural areas, as activities may cause littering, fire hazards, erosion (mountain biking and active beachlife), disturbance (dogs, drones or boats), or loss of diversity (e.g., through collection of rare rocks and plants).

6.5 Valuing of biodiversity and geodiversity among private sector actors

The lack of appreciation is seen in how little tourism enterprises are bound to consider the fragility of nature. While many companies are highly considerate of the environment, there are no well-defined protocols, based on effective and measurable indicators, which would oblige companies that carry out activities in the natural environmentto prevent the degradation of the environment and to restore it following guidelines established by experts in this field. Furthermore, accommodation providers are not obligated to guide their visitors or inform them about restrictions and responsible use of protected areas. Moreover, special events, such as sports competitions, festivities and film shootings frequently take place in protected areas, often with little regard to their fragility.

6.6 Conflicting interests around natural areas

Some protected areas, the rural parks in particular, have resident populations, and the managers have to balance between conservation and recreation management and service provision for the inhabitants. In the most visited parks however, visitor management leaves little resources for other responsibilities. At the same time, there is pressure to cater to the needs of the largely elderly populations of the rural areas. In addition, imposing strict protection rules and conservation measures is seldom welcomed by the residents, as it may be seen as an infringement of their rights, which also reduces willingness to comply. High visitor numbers also create concrete problems in these remote parts of the islands, as traffic jams may hinder accessing services that are not found within the parks.

7. Ideas presented for future development

During the discussions, the participants named several solutions for ensuring a more sustainable future for tourism and nature on the Canary Islands.

- **Changing the tourism model of the islands.** The participants shared the opinion that the growing tourism numbers and the current tourism model of the islands was broadly conflicting with sustainable development of the islands at large, compromising the sustainable recreational use of protected areas. The model should be reconsidered to ensure the sustainability of tourism in the long run.
- **Improved communication and coordination within and across the public sector actors**. Improved cross-sectoral communication was seen as vital to ensure coordinated planning, management and external communication.
- **Improved impact assessment of development projects**. The value of natural capital should be recognized in all planning. Environmental impact analysis procedures should be made more seriously prior to authorizing development projects, using environmental impacts as criteria along with economic measures. The impact assessments should be broad, and take into account the full environmental impacts of new infrastructure developments.
- **From paper parks to real protection.** Currently over 40 % of the Canary Islands is protected under some protection scheme, but many areas have not set out conservation actions. More management and prioritization of the actions is called for.
- **Improved knowledge production**. Further information would be needed to understand people's behaviour in the natural areas. Also understanding of the channels that people use to seek knowledge would be needed for improving communication to the visitors. Data infrastructures bringing together relevant knowledge on visitors and the nature itself would help integrated planning of conservation areas.
- **Fiscal measures to support sustainable tourism**. Several measures were proposed to control tourism flows and support (conservation) management in the islands. These include ecotax

(ecotasa) to be included for example in the accommodation prices or introducing entrance fees to protected areas.

- **Clearly communicated rules and rights**. The participants agreed that protected natural areas should be clearly marked in the terrain, and the rules about allowed and forbidden activities should be communicated clearly, including information about the possibility of sanctions over misconduct.
- **Effective law enforcement in protected areas.** Enhance the enforcement of rules of conduct in protected areas through sanctions to combat forbidden behaviours. Fines and entry bans for tourists and companies not meeting the regulations should be implemented.
- **Stronger public-private partnerships**. Taking companies (hotels, tour operators etc.) onboard and exploring the possibility of setting up a licensing system for tour operators taking tourists into protected areas.
- **Increasing environmental education and communication to raise awareness** about the value of the natural capital of the islands among tourists and locals is needed. This should be done through multiple channels, via tour operators, hotels but also local schools and cultural institutes. The discussants recognized the value of cultural activist groups (such as Abubukaka).
- **Providing alternatives for recreational use**. Protected areas with close to urban centres and with good accessibility are pressured by those looking for recreational areas for their leisure time. For those not particularly interested in the local biodiversity, recreational areas could be built close to urban areas and madeaccessible, so as to prevent the use of fragile sites for leisure activities. This could allow rewilding of previously degraded areas.
- **Providing local infrastructures to direct the flows of people**. In many popular places paths are eroding and people's hiking routes degrade the landscape. More effort should be put to build well-designed pathways, duckboards and fences to popular sites.
- **Stronger presence on social media**. It was agreed that more online presence on major social media channels is needed. Offering administrative and educative content in an appealing manner is challenging. Therefore, the administration might benefit from using social media influencers of various types to pass on awareness of the value and fragility of the nature in the Canary Islands to the visitors.

8. Closing words

We warmly thank all the experts who took part in the workshop and the institute TIDES at ULPGC for taking the lead on organizing all the practicalities. We are thankful also for the Kone Foundation for funding the MOBICON project and the Nordenskiöld foundation for supporting this trip. We hope that through this workshop report, we have been able to contribute to the important discussion around the future of nature-based tourism in the Canary Islands and to the general monitoring of nature-based tourism and outdoor recreation. We will inform our participants and stakeholders about the progress of the work directly by email and on our website https://www.helsinki.fi/en/researchgroups/digital-geography-lab/projects/mobicon.


Resumen de la jornada




Tarea 4. El papel de la tecnología en las visitas de la naturaleza
¿Qué importancia tienen las siguientes fuentes de información para los visitantes?

LITERATURE

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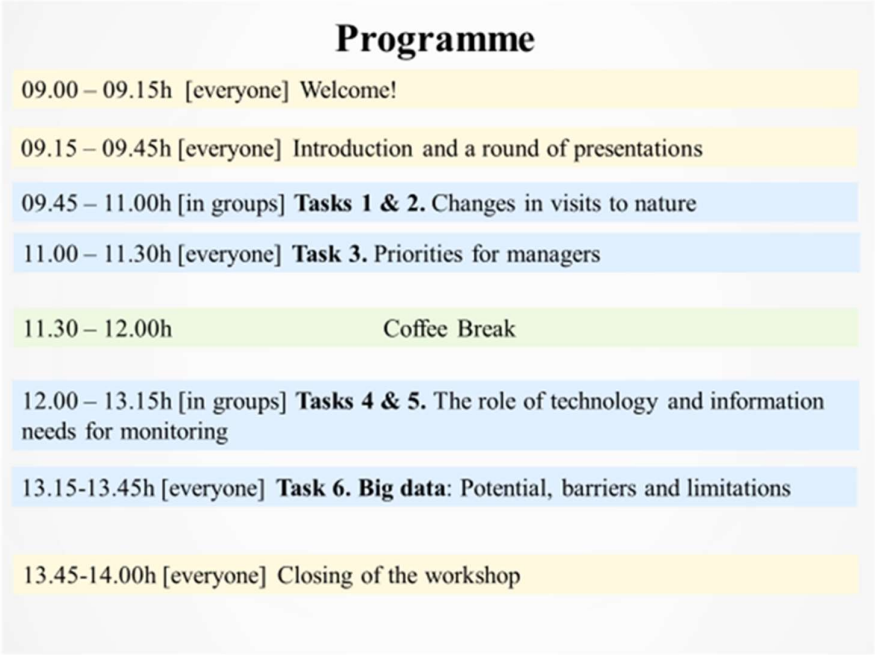
APPENDIX 1: THE WORKSHOP PROGRAMME

During the morning hours, the discussion focused on the changes in nature visits that have occurred in the past and are expected to take place in the future, drivers of these changes, as well as the impacts of these changes to the management of natural areas and nature conservation. The changes were discussed against a broad classification of major global megatrends (modified from Buckley et al. 2015): Social, environmental, political, economic and technological drivers. The participant perspectives were elicited using post-it notes that were then explained and discussed with other participants. This was followed by broader discussions in plenary.

After a common coffee break, the participants were divided into new groups and given the task of considering the use of technology in nature visitations, their own information needs, and the potential big data can have for monitoring the use of natural areas.



Programme

09.00 – 09.15h [everyone] Welcome!

09.15 – 09.45h [everyone] Introduction and a round of presentations

09.45 – 11.00h [in groups] **Tasks 1 & 2.** Changes in visits to nature

11.00 – 11.30h [everyone] **Task 3.** Priorities for managers

11.30 – 12.00h Coffee Break

12.00 – 13.15h [in groups] **Tasks 4 & 5.** The role of technology and information needs for monitoring

13.15-13.45h [everyone] **Task 6. Big data**: Potential, barriers and limitations

13.45-14.00h [everyone] Closing of the workshop

Figure 3. The programme of the workshop.

APPENDIX 2: SUMMARY OF THE RESULTS OF THE PRELIMINARY SURVEY

Before the workshop, workshop participants responded to an online survey. There were 26 complete responses. Below are some excerpts from the responses we used to introduce the topics of discussion during the workshop.

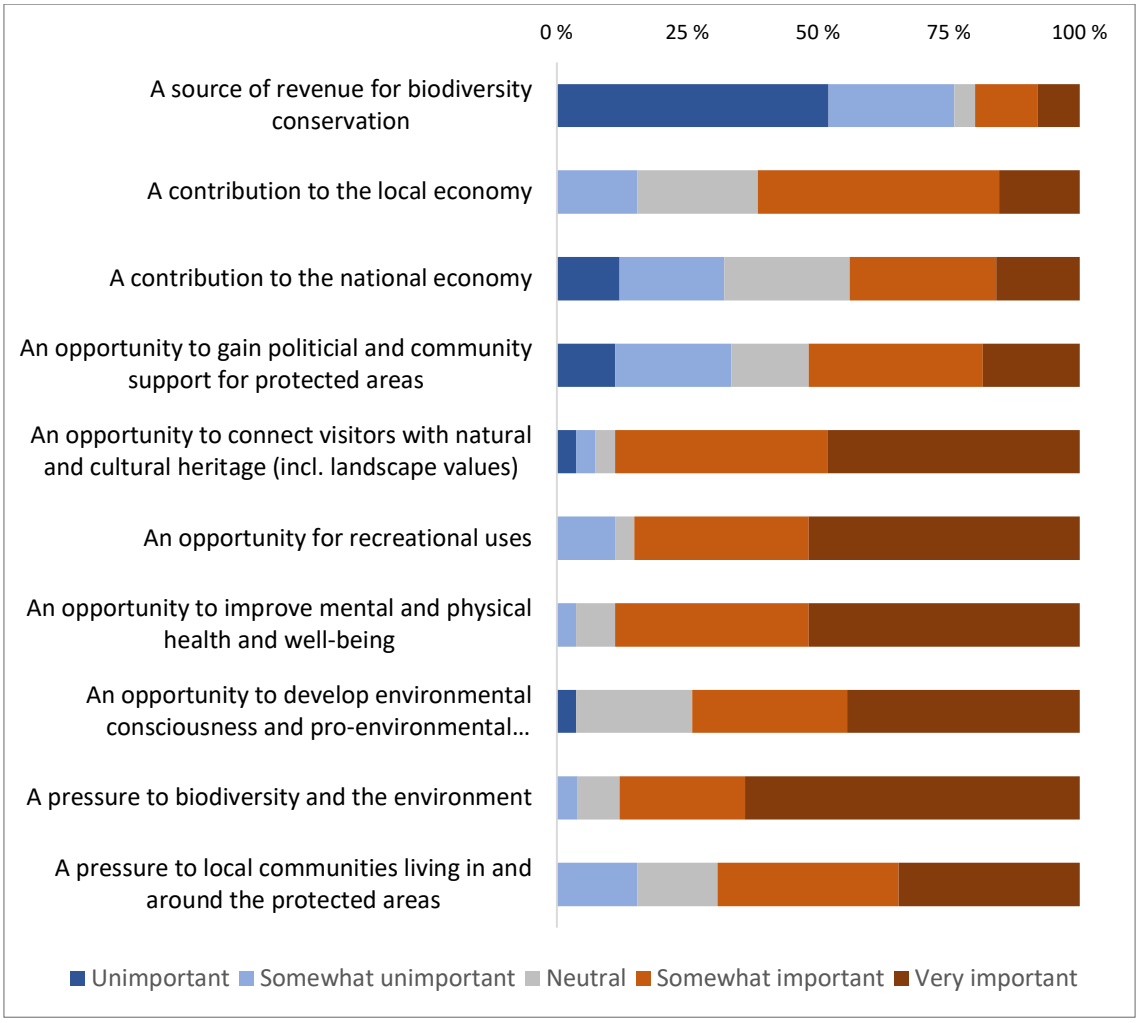


Figure 4. Survey question: Nature-based tourism in my area is…

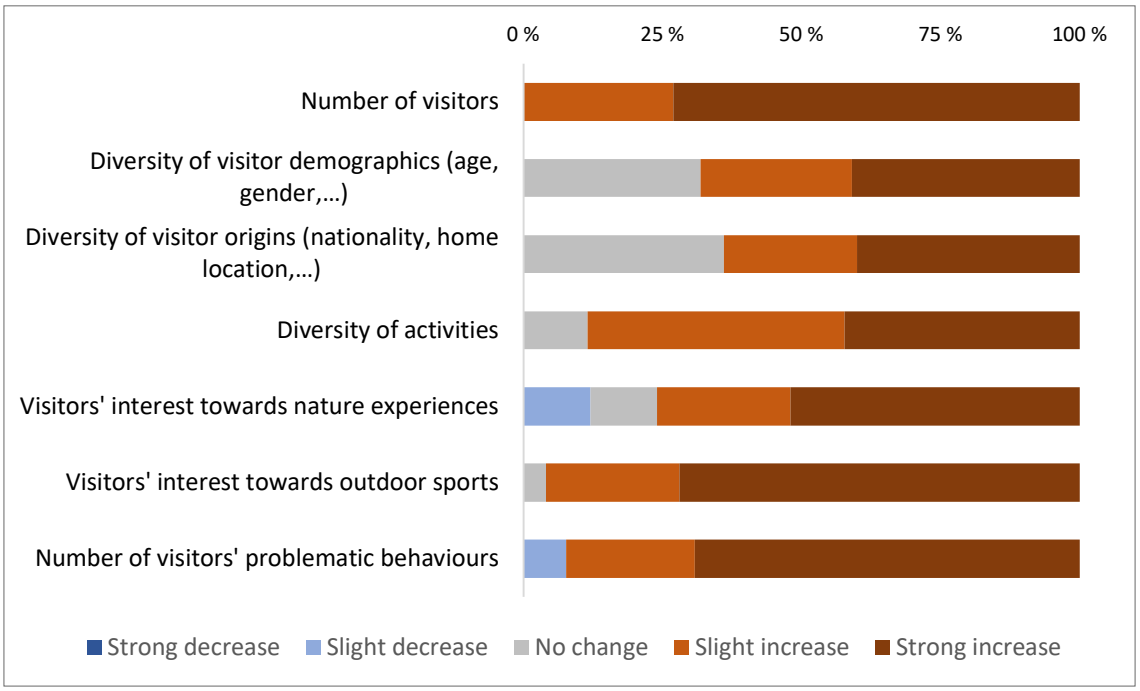


Figure 5. Survey question: How has nature-based tourism changed in your area in the last 10 years (since 2013)?

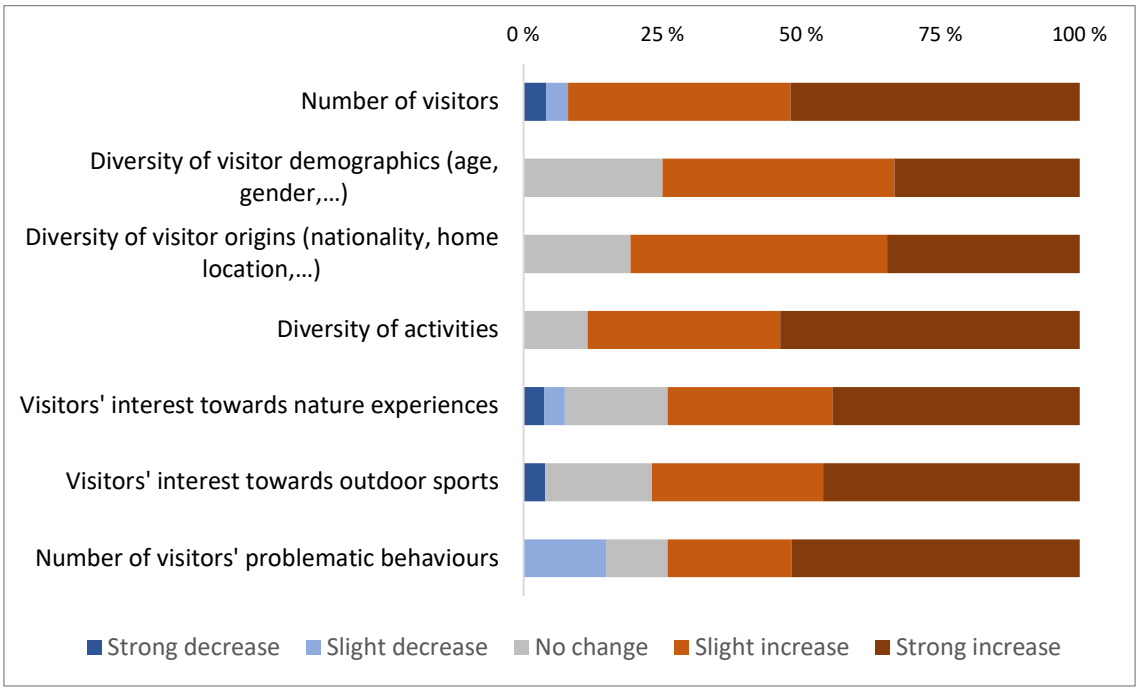


Figure 6. Survey question: In the coming 10 years, What changes do you anticipate in terms of...

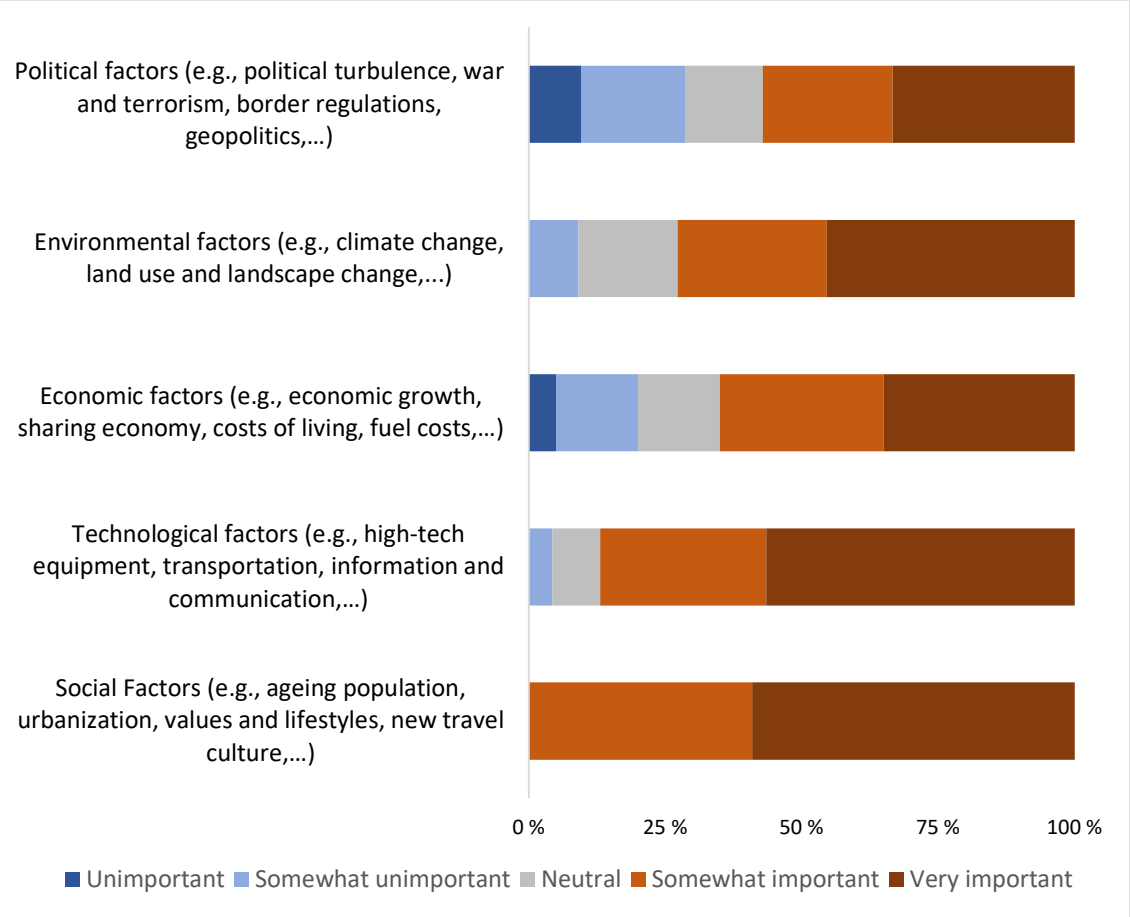


Figure 7. Survey question: What are the main factors that will drive these changes in your area?

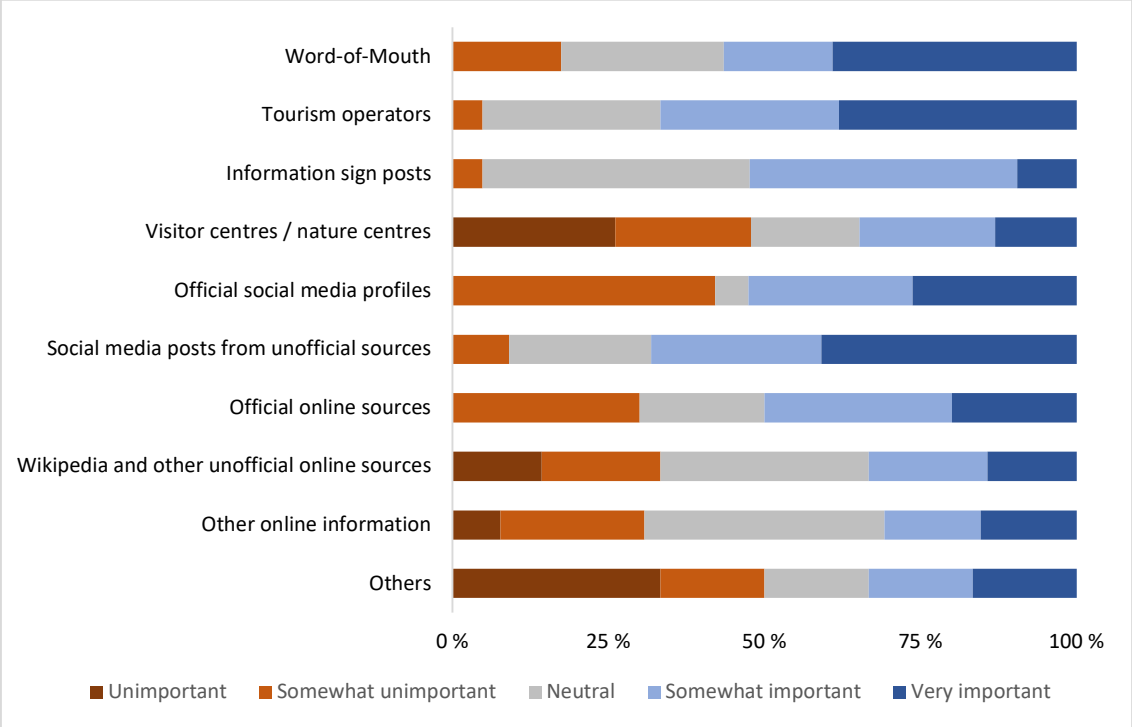


Figure 8. Survey question: How important are the following information sources for visitors in your area?

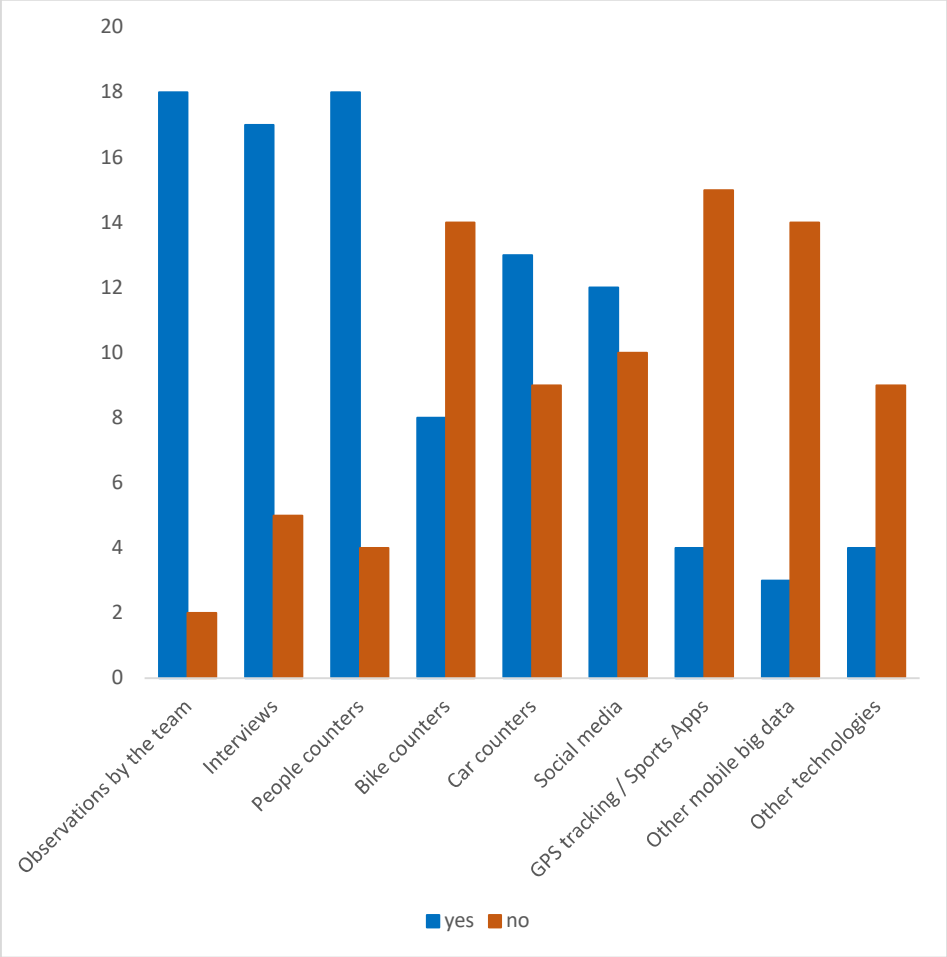


Figure 9. Survey question: How do you collect information about visitors in your area?

APPENDIX 3: LIST OF PARTICIPANTS

Island	Name	Organization
Gran Canaria	Francisco José González Artiles	Unidad de Espacios Naturales Protegidos
Gran Canaria	Marta Martínez Pérez	Reserva Natural Especial de Maspalomas
Gran Canaria	José Gil González	Instalaciones uso público Cabildo de Gran Canaria
Gran Canaria	Rosa Delia Castillo Armas	Reserva de la Biosfera de Gran Canaria
Gran Canaria	Pilar Pérez	Reserva de la Biosfera de Gran Canaria
Gran Canaria	Tanausú Zumaquero-Nuez	Asociación de Turismo Activo de Canarias
Gran Canaria	Pablo J. Carretero Díaz	Parque Rural del Nublo, la Reserva Natural Integral de Inagua y el Monumento Natural del Roque Nublo
Gran Canaria	Juli Cajaupé	Jardín Botánico Viera y Clavijo
Gran Canaria	Haideé Aranda	Cabildo de Gran Canaria
Tenerife	José Alberto Delgado Bello	Biodiversidad. Cabildo Tenerife
Tenerife	Judith Fernández Rodríguez	Parque Rural de Teno
Tenerife	Rosa Amelia Expósito López	Espacios Naturales del Norte
Tenerife	Fátima Reboso Ávila	Uso Público. Cabildo de Tenerife.
Tenerife	Javier León	Servicio Técnico de Gestión Forestal
Tenerife	María Antonia García Granda	Parque Rural de Anaga
Fuerteventura y Lanzarote	Rainero Brandon	Gestión Áreas Protegidas. Cabildo Lanzarote
Fuerteventura y Lanzarote	Pascual Gil	Parque Nacional de Timanfaya
Fuerteventura y Lanzarote	Javier Sordo	Parque Natural de Isla de Lobos - Fuerteventura
La Gomera	Ruymán Armas Fuertes	Parque Nacional del Garajonay, La Gomera