The Effects of COVID-19 Pandemic on Spanish Protected Areas: the Case of Picos de Europa National Park

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Abstract: Protected areas are complex social-ecological systems; thus, they were unavoidably impacted by COVID-19. Spain is one of the most diverse countries in terms of biodiversity in the European Union and the second most visited country in 2019 and third touristic destination worldwide. Understanding the effects of the pandemic in Spanish protected areas is very important to discuss new possibilities on how to drive sustainable development on these conserved spaces and how to manage them in the event of external shocks and uncertain scenarios. Therefore, the aim of this study is to have a better understanding of the effects and opportunities of the pandemic on Spanish protected areas.
To address this concern, a qualitative analysis is conducted based on an assessment of secondary literature and relevant interviews. Picos de Europa national park was chosen as case study because of its unique features. This study shows the drawbacks of the pandemic in Picos de Europa in terms of management operations, drastic fluctuation of visitors, loss of tourism revenues, vulnerability of neighboring communities, missed opportunities in conservation and education and pressure on nature. On the other hand, it poses opportunities in terms of technology, innovation, fundings, lessons learned, rise in educational and conservation activities and more awareness on the environment and rural surroundings. This study suggests that is difficult to find a win-win solution that includes the targets of nature conservation, viability of local economies and tourism activities in Picos de Europa. Ideas for management options that focus on dealing with the negative outcomes of the pandemic are suggested.

Keywords: COVID-19 Pandemic. Protected Areas Management. Biodiversity Conservation. Overcrowding. Social Impacts. Visitors. Picos de Europa National Park. Spain.

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Los efectos de la pandemia de COVID-19 en las áreas protegidas españolas: el caso del parque nacional Picos de Europa

Resumen: Las áreas protegidas son sistemas socioecológicos complejos y se vieron inevitablemente afectadas por la pandemia de COVID-19. España es uno de los países más diversos en biodiversidad de Europa y el tercer destino turístico mundial. Comprender los efectos de la pandemia en las áreas protegidas españolas es muy importante para discutir nuevas posibilidades sobre cómo impulsar el desarrollo sostenible en estos espacios conservados y cómo gestionarlos bajo impactos externos y escenarios inciertos. Por tanto, el objetivo de este estudio es conocer mejor los efectos y oportunidades de la pandemia en los espacios protegidos españoles. Para abordar esta preocupación, se lleva a cabo un análisis cualitativo basado en una evaluación de literatura secundaria y entrevistas oportunistas. El parque nacional de los Picos de Europa es el caso de estudio analizado debido a sus características únicas. Este estudio muestra los inconvenientes de la pandemia en Picos de Europa en términos de operación de gestión, fluctuación drástica de visitantes, pérdida de ingresos por turismo, vulnerabilidad de las comunidades vecinas, pérdida de oportunidades en conservación y educación y presión sobre la naturaleza. Por otro lado, presenta las oportunidades en términos de tecnología, innovación, ampliación de fondos, lecciones aprendidas, aumento de actividades educativas y de conservación y mayor conciencia sobre el medio ambiente y el entorno rural. Este estudio sugiere que es difícil encontrar una solución beneficiosa para todos que incluya los objetivos de conservación de la naturaleza, viabilidad de las economías locales y actividades turísticas en Picos de Europa. Se sugieren ideas para las opciones de gestión sobre cómo abordar los resultados negativos de la pandemia.

Palabras clave: Pandemia de COVID-19. Gestión de áreas protegidas. Conservación de la biodiversidad. Hacinamiento. Impactos sociales. Visitantes. Parque Nacional Picos de Europa. España

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1. Introduction

Protected areas are critical tools to maintain ecosystem services, and habitat integrity, to prevent species extinction, maintain forest coverage and reduce human pressure on natural capital (Ma, Zhang, Hou & Wen, 2020; UNEP-WCMC & IUCN, 2016). In addition, they safeguard cultural resources, create recreational possibilities and improve livelihoods (IUCN, 2021). Because protected areas are complex socioecological systems, these conserved spaces were unavoidably impacted by the COVID-19 pandemic, both on positive and negative terms and in their ecological and socioeconomic dimensions (Corlett *et al.,* 2020; Rutz *et al.,* 2020).

The main objective of the Spanish National Parks Autonomous Agency (OAPN) is to preserve the integrity of their natural values and landscape to ensure the conservation of a representative sample of the main Spanish natural systems for future generations. In addition, this primary mandate must be pursued supporting the sustainable development of their socioeconomic areas of influence, promoting their recreational use and raising environmental awareness, as well as fostering scientific research and the maintenance and promotion of cultural values and intangible heritage (OAPN, 2019).

The health crisis posed challenges and opportunities for Spanish protected areas on how to achieve their missions on conservation of ecological and cultural values. This study aims to have a better understanding of the pandemic effects on Spanish protected areas. It identifies impacts and opportunities of the health crisis on Picos de Europa, discusses them in the light of study cases from the literature review and proposes ideas and suggestions on how to manage Spanish protected areas to tackle the negative outcomes of the pandemic and improve their sustainable development.

According to the Secretary-General of the United Nations, the effects of the health crisis hold crucial lessons concerning our response to the biodiversity crisis and a distinctive opportunity to start the transformative changes needed to achieve a sustainable development (United Nations, 2021). Therefore,

understanding the impacts and opportunities of COVID-19 on Spanish protected areas is important to show how to drive sustainable development on these conserved spaces.

2. Literature review

This study analyzed research papers that examined the diverse impacts of COVID-19 on protected areas. Regarding management of conserved areas, the impacts of the pandemic on decisions and strategies had cascading implications on economic, social, and ecological aspects (Jacobs *et al.,* 2021). On operation levels, protected areas had to modify their daily routines and postpone activities that did not comply with lock-down restrictions. However, the sanitary crisis enabled the integration of technological tools that led to more inclusive methods of public engagement and enhancement of parks' visibility. Furthermore, opportunities to test new management approaches and strategies to manage overcrowding also arose and COVID-19 served as a catalyst for more effective collaboration and creative thinking in management and marketing divisions (Jacobs *et al.,* 2020; Jones *et al.,* 2021a, 2021b; Miller-Rushing *et al.,* 2021; Smith *et al.,* 2021; López Ibáñez & Rodriguez, 2020; Templeton, Goonan & Fyall, 2021; Miller, Freimund, Dalenberg & Vega, 2021; Alba *et al.,* 2022).

Visitor flow patterns had multiple effects on visitors' experience, on local economies, on the tourism industry, on park's funding and human interaction with flora and fauna (Cheablam, Dachyosdee & Purintarapiban, 2021; Jacobs *et al.,* 2021; Jones *et al.,* 2020; Mandić, 2021; Cahyadi & Newsome., 2021; McGinlay *et al.,* 2020). The effectiveness of visitor management was disrupted as problems on overcrowding and carrying capacity appeared. Manpower challenges and constrained capacity of protected areas' facilities were widespread problems (Miller-Rushing *et al.,* 2021; Miller *et al.,* 2021).

In addition, visitors' profile changed as new tourist and nearby residents started visiting protected areas. Visitors' motivations to go to parks changed, as well as their behavior (Kupfer, Li, Ning & Huang, 2021; Ramli, Rahman & Ling, 2020; Souza *et al.,* 2021; Jacobs *et al.,* 2021). Negative outcomes were related to irresponsible use of the park and its facilities (such as parking issues, traffic jams, littering, walking out of marked paths, etc.) (Holtvoeth & Jones, 2020; McGinlay *et al.,* 2020), but opportunities arose in terms of new audiences, as well as business and marketing possibilities (Cheablam, Dachyosdee & Purintarapiban, 2021; Jones *et al.* 2021b; Templeton, Goonan & Fyall,2021).

COVID-19 showed the financial vulnerability of protected areas across the world (Molteni, 2021). In most protected areas, governmental and tourism-related sources of revenue became unpredictable. In developing countries, reduced budgets resulted in difficult trade-off decisions and put into risk the primary mandate of nature conservation. The altered funding also led to the disruption of fundamental park operations, monitoring and research projects and public engagement activities. Thus, the pandemic highlighted the fragile balance between tourism-driven development and nature conservation targets (Miller-Rushing *et al.* 2021; Templeton, Goonan & Fyall, 2021; Cheablam, Dachyosdee & Purintarapiban, 2021; López Ibáñez & Rodriguez, 2020; Mandić, 2021). On positive grounds, the pandemic created opportunities to diversified sources of funding and to enhance collaboration and partnership between public and private stakeholders (Miller-Rushing *et al.,* 2021; Templeton, Goonan & Fyall, 2021; Cheablam, Dachyosdee & Purintarapiban, 2021; Kupfer *et al.,* 2021).

Regarding the effectiveness of parks to drive sustainable development, the health crisis hindered protected areas' ability to support local community development by means of encouraging tourism and by providing ecosystem services to locals (Mandić, 2021; Smith *et al.,* 2021). Thus, it made evident how many people depend on protected areas for their livelihoods while impacts were unevenly distributed among local actors (McGinlay *et al.,* 2020). Some negative effects were an economic downturn and restricted access to extract natural resources by locals (on a legal basis) (Smith *et al.,* 2021; Anand & Kim, 2021; Cahyadi & Newsome, 2021; Cheablam, Dachyosdee & Purintarapiban, 2021; López Ibáñez & Rodriguez, 2020). Furthermore, absence of in-person engagement meant deprivation of recreational and educational activities (Jones *et al.,* 2021a; Miller-Rushing *et al.,* 2021; Quesada-Rodríguez, Orientale, Diaz-Orozco, & Sellés-Ríos, 2021). In addition, COVID-19 triggered uneven representation of previously underrepresented communities (Alba *et al.,* 2022).

The health crisis altered the connection between people and parks. In European countries, local communities benefited from fewer non-local visitors in areas of natural beauty and some social tensions arose between villagers and tourists because of unresponsible behavior. On other cases, restrictions gave place to new ways of connecting people to national parks through the work of rangers and the perception of locals on parks' authorities improved amid pandemics (Holtvoeth & Jones, 2020; Jones *et al.,* 2021a; Jones & Mcginlay, 2020; Smith *et al.,* 2021).

Research and monitoring activities were affected differently across protected areas worldwide, since different protocols could either support or impede field work. In some cases, health crisis' restrictions caused a decrease, interruption and/or delay of research and monitoring activities. On other cases, the pandemic enabled faster data collection, innovation on methods and update of databases. The health crisis also encouraged cross disciplinary collaboration and promoted partnerships and data sharing (Jacobs *et al.,* 2020, 2021; Mandić, 2021; Miller-Rushing *et al.,* 2021).

The pandemic led to fewer volunteering activities and environmental education programs, which resulted in less opportunities to rise environmental awareness and networking possibilities. However, it also provided new opportunities to parks' authorities to digitize their educational and informative content which, in turn, enabled more learning opportunities and increased formalization of learning instances (Miller-Rushing *et al.,* 2021; Templeton, Goonan & Fyall, 2021; China, Zvuloni, Roll & Belmaker, 2021; Quesada-Rodríguez *et al.,* 2021).

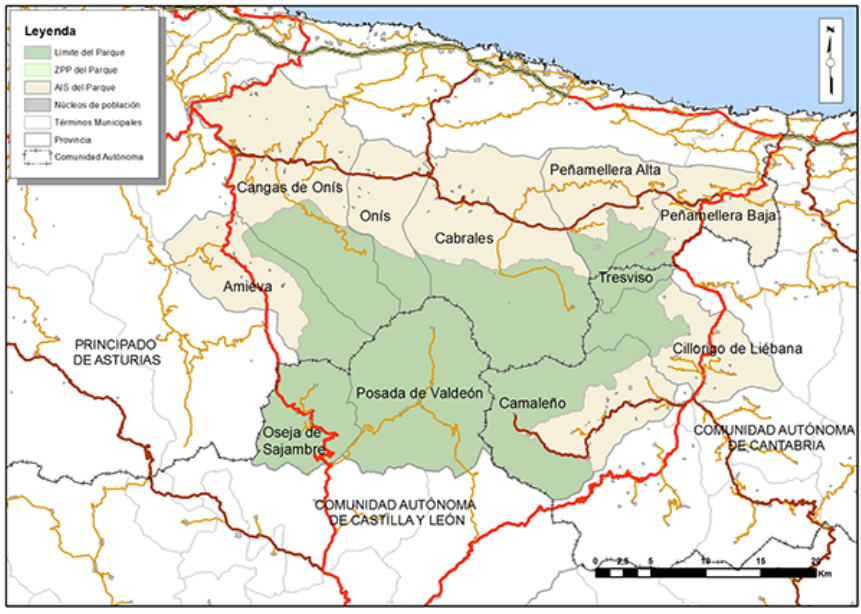
The health crisis showed two sides of a coin regarding pressure on biodiversity and ecosystems of conserved areas. On one hand, the cases analyzed show that human-made stressors decreased significantly during confinement (Jacobs *et al.,* 2021) and this led to enhance environmental parameters (reduction in noise, air, and water pollution) (Cheablam, Dachyosdee & Purintarapiban, 2021; Patterson Edward *et al.,* 2021). In marine protected areas, coral reefs recovered and rejuvenated, species' populations increased as well as its richness, in terms of evenness, diversity and density (China *et al.,* 2021; Patterson Edward *et al.,* 2021; Cheablam, Dachyosdee & Purintarapiban, 2021).

On the other hand, upon reopening of protected areas to visitors, the risk and extent of disturbances to wildlife increased. This was especially problematic in remote sensitive areas of protected areas that were not so popular before the pandemic (Holtvoeth & Jones., 2020; McGinlay *et al.,* 2020; Templeton, Goonan & Fyall, 2021). In addition, conserved areas in developing countries were more prone to experiencing an increase in poaching, logging, illegal fishing and extraction of plants and seeds as a source of food and income (Cahyadi & Newsome, 2021; Cheablam, Dachyosdee & Purintarapiban, 2021; Koju *et al.,* 2021; Quesada-Rodríguez *et al.,* 2021; Smith *et al.,* 2021).

3. The case study

Picos de Europa national park represents a key case that serves as an example to gain knowledge on the effects of COVID-19 on Spanish protected areas. Situated at the north of Spain, in the central region of Cantabrian mountains, Picos de Europa has an exceptional geological morphology and a high biophysical value. It is the third most visited park in the country and has distinctive socioecological characteristics. Namely, it is one of the only two conserved spaces in Spain with communities living inside their borders. It also counts with an extensive area of socioeconomic influence that covered 14.217 people by 2019 (OAPN, 2019). It also faces complex governance issues since it is co-managed by three autonomous provinces (Asturias, Cantabria, and León) (RSCG, 2017).

Figure 1. Map of Picos de Europa National Park



Source: OAPN (2019).

The key mandates of Picos de Europa for nature conservation oppose to and conflicts with the locals' rights and interests and also with tourism activities as a source of revenues (RSCG 2017). Reports show that locals do not value the national park as something that needs protection, and they consider that the conservation regime hinders socioeconomic development (López & Pardo, 2018; OAPN, 2019; Sáenz de Buruaga & Llaneza, 2017).

Another problem is the drastic depopulation of villages inside the park's boundaries (MITECO, 2015). Moreover, tourism represents an important source of revenue for the villages (Hidalgo *et al.* 2011) but poses challenges to traditional economic activities and nature conservation (López & Pardo, 2018). In addition, traditional activities that shaped the socioecological landscape, such as cattle breeding and cheese production, are disappearing as villagers are turning to the more profitable tourist sector (RSCG, 2017). One ecological problem associated to this is that abandonment of traditional agricultural activities produces the scrub and homogenization of the territory (OAPN, 2019).

Therefore, in Picos de Europa we find a complex and problematic situation between biodiversity conservation targets, socioeconomic viability, rights of local communities and pressure on natural resources. The «unstable balance» brings an opportunity to explore the effects of the pandemic on Spanish protected areas through the lenses of the three pillars that drive sustainable development: financial feasibility, social relevance and nature conservation (Guadilla Sáez, 2019; López & Pardo, 2018).

4. Methodology

A qualitative study was conducted. For data collection, secondary literature was used and some interviews were carried out. First, this study gathered information from public documents such as newspapers, reports from OAPN, EUROPARC, official bulletins from the Spanish government and a variety of public NPS communications (e.g., guidelines, press releases and newsletters). In addition, we carried out relevant interviews by phone and e-mail. Collected data was analyzed using the thematic method. Firstly, all the textual material was read, which provided an opportunity to have an overview of available information (Creswell & Plano Clark, 2014; Hycner, 1985). Later, data reduction by coding was conducted. Next step involved organizing the coded data within themes and form new subcategories (Braun & Clarke, 2006).

5. Results

5.1 Management

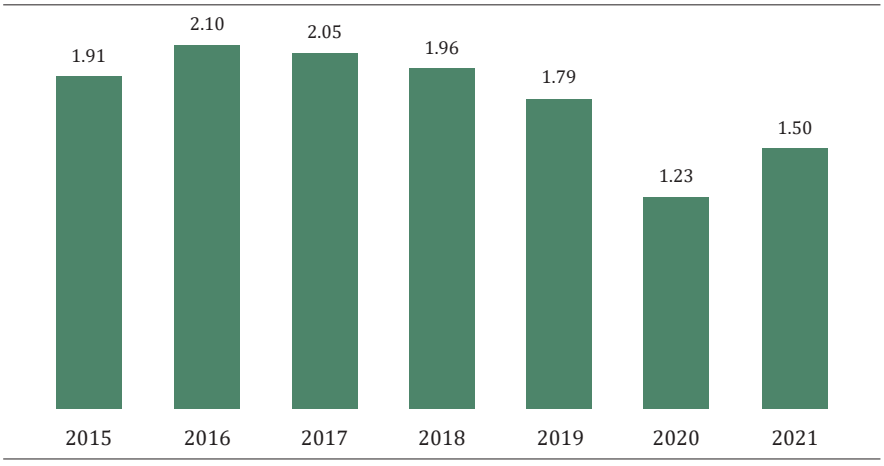
During the lockdown period, management operations were altered in Picos de Europa. The management body had to re-schedule and adjust meetings, daily tasks and their processes. The Park closed its doors to users and many services provided to them were canceled. Most of the personnel had to telecommute full-time and some activities and staff training were rescheduled. Visibility and promotional actions undertaken in 2020 fell by half as compared to the previous year, thus impacting on engagement levels.

Upon reopening, overcrowding problems occurred at some entrances of the national park and in certain days during high season. Also, recreational activities that could not be done safely were cancelled and events that previously gathered thousands of people in Picos de Europa and the surrounding municipalities (e.g., sports competitions and mountain races) were postponed, resulting in missed opportunities for users and affecting tourism and engagement levels of the park.

Within the Spanish network of national parks, the pandemic added more difficulties to the regular visitor management, since it was necessary to implement a series of new and strict sanitary regulations and make them compatible with the nature conservation aim. As a result, its reopening in the summer of 2020 was not smooth in Picos de Europa. At that time, the three provinces that comprise it were on different stages of the transition to a new normality. Therefore, there was a mismatch between the different standards and measures regulating the surroundings of Picos de Europa. This miss-coordination also affected local communities. For example, the twenty inhabitants of Tresviso could not visit their Cantabrian neighbors by road because Asturias' routes were closed, so they could only walk through Picos de Europa.

However, many of the management operations adapted successfully to virtual procedures and the drop of attendants in relation to guides in tours resulted in the improvement of tour quality. In addition, new channels of communication, such as social media, were opened or improved and this enhanced communication between the protected area and its users and helped giving visibility to the OAPN webpage.

Figure 2. Annual visits to Picos de Europa (number of visitors in millions)



Source: Prepared by the author. Data from OAPN (2020) and Álvarez (2022).

5.2 Tourism

Tourism in Picos de Europa was altered by the pandemic because the number of visitors fluctuated among the stricter and flexible phases of it. The protected area registered a decrease of 50% of visitors during the first year of the pandemic (2020), compared to 2019 (a striking drop of - 58.82% between the months of January and June and an 8% increase in the summer season. On the other hand, in 2021 the protected area registered an increase in visitors in relation with the year 2020 (approximately 22% until October 2021).

The pandemic had a double effect on tourism: during lockdown there was a great reduction of activities (even up to 0%) while, upon reopening, there was an initial inertia of activities due to the differential attributes of the product and the destination. In addition, mobility restrictions hindered the touristic activity as many services, and adventure or recreational activities, were normally intended for visitors from other provinces and from abroad. Also, amid the pandemics, last-minute cancellations were widespread across the hospitality sector, which reduced business revenues and resulted in missed opportunities for other potential guests. As a result, the tourism sector experienced high levels of uncertainty during the pandemic.

Regarding the visitors' profile, changes in origin and behavior were noticed amid the pandemics. In 2020, 26% of Spanish tourists who traveled changed

their destinations, from beach or cultural options to rural and ecotourism ones. A rise of touristic activities carried out by nearby residents was also noted. For instance, in summer 2020 (July-September), the visitor center of *Fundación Osos de Asturias* received 148% more visitors from the region within the park and the number of visitors from other Spanish regions grew 107%. In the case of mountain refuges, the visitor profile changed during the pandemics because of the virtual disappearance of foreigners, who represented usually 30% of mountaineers. Changes in behavior were noticed since tourist presence at visitor and interpretation centers dropped and visits to external infrastructure, such as walk trails, viewpoints and recreational areas grew. Moreover, irresponsible behavior (like littering) was reported.

In mountain refuges inside the national park, implementation of safety protocols caused less social interaction between rangers and hikers, resulting in a reduced perception of the quality of the visiting experience. The late opening of mountain refuges also affected users, since these are important to provide information and advice to hikers and to support rescue operations.

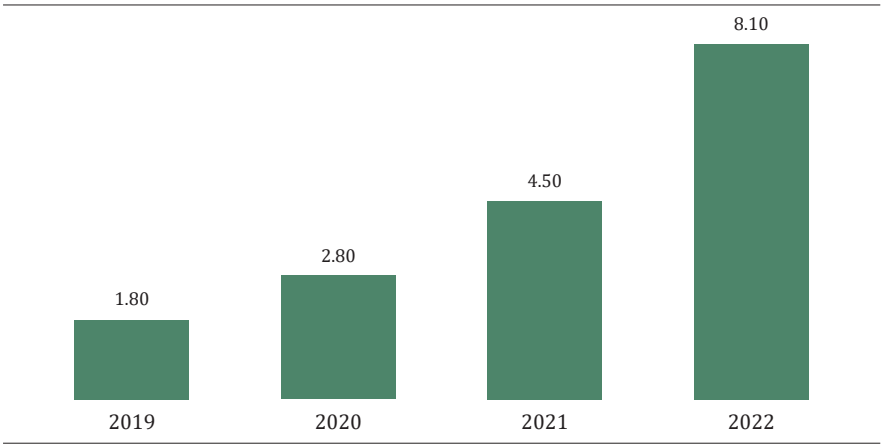
Though interviewees acknowledged that the closure of destinations, like Picos de Europa, in a tourist town could never have a positive impact, they also recognized that it is during critical situations where the greatest opportunities appear in terms of progress and change. Thus, the pandemic encouraged touristic businesses to apply new digital tools to the services they offer and to test new services or products, such as recipes, outdoor activities and sustainable tourist experiences.

5.3 Funding

Covid-19 had an impact on revenues derived from the provision of services of Picos de Europa. For instance, in the mountain refuges, economic losses amounted to up to 65% of annual turnover in 2020. However, the protected area counts with other sources of funding that are independent from tourism-related revenues. These external funding continued supporting its main operations during the pandemic. For example, some long-term programs, e.g. the «Plan to Promote Adaptation to Climate Change», which was financed by the auctioning of emission allowances. It did not stop its support during 2020 and 2021.

In terms of opportunities, external funding increased during the pandemic. For example, Asturias, Cantabria and León governments significantly raised their co-funding contributions through Picos de Europa National Park Consortium

Figure 3. Budget from the Consortium 2019-2022 (in million €)



Source: prepared by the author. Data from Muñiz & Pomarada (2021)

over the pandemic years. Similarly, the EU Recovery and Resilience Funds that support the recovery of economies after COVID-19 added more external funding (2.5 million euros) in 2022.

In the private tourist sector, the pandemic impacted business' turnover and financial security. For many small businesses, their activity was their only source of income and because of the pandemic they didn't have money to respond to any potential inconveniences. Although many touristic enterprises applied for government financial grants, it was reported that such aid was not enough or did not suit their needs.

5.4 Local development

In terms of sustainable development of nearby and inside communities, results show that the moments when pandemic-related restrictions were harder triggered some unsustainable conditions in surrounding villages and towns. During the last two decades, the villages within the socioeconomic influence of Picos de Europa experienced growth in tourism-related services that led to a reduction of labor for the traditional -but less profitable- agricultural sector. Thus, the impact of the pandemic on tourism affected directly and indirectly large sectors of local communities, while traditional activities -like cheese production- suffered a major drawback that made agricultural business even more unsustainable. Cheese-makers from the surrounding areas of Picos

de Europa had to stop their production in March, April and May of 2020, as well as in the summer season. Their sales revenues were further affected by cancellation of cheese contests and local fairs. This situation continued throughout the first months of 2021, causing uncertainty on business viability. The health crisis also highlighted the shortcomings of the municipalities to address the needs and problems posed by the first wave of the pandemic.

In addition, COVID-19 posed a threat on the health of the aging population, postponed or delayed different infrastructure and service initiatives from local governments and led to economic instability. As a result, concerns on future sustainability of the villages arose during pandemics. However, upon reopening, locals were able to appreciate the privilege of living in a natural non-crowded space, and they could enjoy the national park and its surrounding areas without the presence of outsider visitors.

5.5 Research

Educational activities were affected by the health crisis and face-to-face programs and school visits were suspended in the spring of 2020. This situation was regarded as a missed opportunity for school students and other potential learners, and as drawback for the park's visibility. On the positive side, online education alternatives were implemented by governmental and non-governmental institutions, which enabled the possibility to continue offering citizens with environmental educational program (even in adverse circumstances), and to propose new online recreational and pedagogical opportunities that did not exist before the pandemic. For instance, Fundación Oso de Asturias offered new videos to educational institutions, so that students could learn different aspects of the life of the Cantabrian brown bear. Similarly, the foundation provided different pedagogical playful materials for children and training to teachers. During the summer of 2020, the foundation strengthened its visibility and benefited from increased environmental awareness of citizens and greater knowledge of conservation efforts to protect the grizzly bear in Picos de Europa.

Research and monitoring activities were also affected by COVID-19. A butterfly conservation NGO reported setbacks due to the cancellation of workshops and seminars on butterfly identification, which are fundamental tools that provide the most short-term benefits in terms of enhanced visibility of their project and raising awareness on butterfly conservation efforts among citizens. Though their growth prospects suffered a little setback, they were able to adapt fast, diversified their work and performed time-consuming tasks. For

instance, they caught up with data analysis, enhanced their database, updated materials and guidelines for volunteers and finished their mobile application. Another research team working on research and monitoring of butterflies in Picos de Europa, reported that the pandemic gave them opportunity to spend more time doing field work. For the following year of the pandemic, 2021, research activities were flexible enough to be subjected to the evolutions of the COVID-19 situation. For instance, online seminars were organized with some on-site sessions.

5.6 Ecosystem

In the first moments after confinement restrictions were lifted, high visitation levels, irresponsible visitor's behavior (like camping, littering, overcrowding on the park entrances) and the greater use of external infrastructure (such as paths, viewpoints and recreational areas) posed pressure on the ecosystem in terms of noise pollution, soil erosion and trampling, disturbances to habitats of species, and contamination with human waste. In addition, authorized hunting was also reported. During the pandemic, two grizzlies were killed by hunters. However, the hunters stated these killings were accidental, the loss of two grizzles meant a loss of biodiversity of the protected area, and a severe blow to efforts made by environmental foundations that look after the conservation of bears in Picos de Europa.

Opportunities arose in terms of lessons learned: the pandemic served to highlight the significance of nature for people's well-being and health and it added value to Picos de Europa, as an idyllic area far from crowds, where people can breathe fresh air and forget their worries.

6. Discussion

On the management level several protected areas, including Picos de Europa, had to rethink their daily routine and adjust their tasks to the Covid protocols. However, these limitations also paved the way for the integration of technological solutions. In the Spanish case, co-management between provinces suffered because they were not able to coordinate considering the different protocols that applied to each of them, a situation which calls for more efforts at the national level.

Effectiveness of visitor management was disrupted in conserved areas worldwide. Possible implications could be moving from a high-visitation model to a lower-impact one, where tourists are distributed across space

and time (reduce the acute seasonality and provide more access points and more facilities and visitors' centres distributed across the park). This would imply maintaining the same level of visits to prevent affecting local economies and the park's self-generated revenues, while preventing overcrowding and excessive pressure on the park's carrying capacity (McGinlay *et al.,* 2020). In addition, encouraging a model that focuses on more meaningful and higher-quality tourism will result in more revenues for the sector but without scenarios of over-tourism (that exceeds the carrying capacity of the protected area) (Mandić, 2021). In addition, the growth of rural and ecotourism demands reinforces the need for guidelines to achieve sustainable use, that is consistent with the primary conservation objectives.

Regarding parks' effectiveness to drive sustainable development, COVID-19 made evident how many people depend on protected areas for their livelihoods. Possible management implications are diversifying local economies so that they do not depend that much on tourism revenues. Rural development policies could target this problem by strengthening other potential sources of economic production. For example, encouraging regional food brands and quality labels or organic farming.

Visitation patterns were unstable during the pandemic and changes in tourist behaviours were also reported. In Spain as well as in other protected areas, irresponsible use of the park and its facilities was also noticed. A recommendation to tackle irresponsible behaviour is to carry out sensibilization campaigns to raise environmental awareness on new parks' users.

Visitor flows also impacted on the revenues of national parks. A suggestion on this topic is to diversify the sources of funding to reduce risks. Some examples of non-related tourism revenues are: emission auctions, green taxes, bilateral investments based on global biodiversity conservation and climate change, payments for ecosystem services, more public-private partnerships, among others (Mulongoy *et al.,* 2008).

The cases analyzed show to what extent COVID-19 triggered a socioeconomic crisis that already existed in local communities. In Picos de Europa, the pandemic revealed unsustainable conditions in rural villages and towns. Many implications derived from this. Firstly, protected areas cannot drive sustainable development alone, they need cross-collaboration from other stakeholders involved. In addition, governmental institutions could encourage repopulation of small villages by offering tax benefits for business to allocate

operations there, and enhance basic infrastructure (e.g. internet access or transportation). Traditional economic activities could be supported with more targeted rural development policies.

While many conserved spaces in developing countries suffered from increased risk of poaching, the case of Picos de Europa was, to some extent different: the accidental killing of two grizzlies was perpetrated by hunters which were authorized to carry out their activity. This supposes a loss of biodiversity and the suggestion is to increase control on protected areas.

Regarding the ecosystems of protected areas during the pandemic, the recovery of ecosystems during the «anthropause» were, all in all, short-term consequences. Lessons learned that remain are: the degree of importance of biodiversity conservation for human health. It is suggested that protected areas capitalized these new lessons to promote their conservation goals and push for the designation of new conserved spaces.

7. Conclusions

It is hard to find a win-win solution that includes the targets of nature conservation, viability of local economies and tourism activities. However, the health crisis provided a moment to rethink and realize what are the needs of stakeholders involved and the varying values they attach to protected areas.

This pandemic highlighted the interdependencies between local communities and Spanish national parks as well as the existence of unsustainable conditions in surrounding rural villages. Since it is not possible for protected areas to drive sustainable development by itself, the viability of the local communities depends on acknowledging that interconnected actions are needed across numerous fronts, which are all necessary but not enough on its own.

Due to the scope of this study, certain issues remain unanswered revealing the need for additional research in the future. For instance, it is worth researching on the preferred management options to overcome the negative effects of the pandemic (Jones *et al.,* 2021a). Stakeholders involved had different interest and those differences could be represented on the different management options proposed by them.

Public support and acceptance of the need to protect conserved areas is crucial to achieve conservation targets in the long term (Bennett et al., 2019). Thus, it is important to capture the level of acceptance of protected areas among

stakeholders (Jones, McGinlay & Dimitrakopoulos, 2017). This issue was not raised in this study, however potential areas for future work could explore social perceptions of the National Park Picos de Europa and examine if they changed with the pandemic impacts.

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