Virtual tourism grew rapidly during the COVID-19 lockdown restrictions as an alternative to in-person travel and has been on the rise ever since as an innovative marketing and engagement strategy in the tourism sector. Following this trend, many protected and conserved areas (PCAs) have developed a variety of virtual solutions to promote their destinations and educate about conservation needs. It is foreseen that virtual tourism will continue to increase after the pandemic as a niche tourism segment. For PCAs this can be an opportunity to inspire conservation action and support, generate and diversify revenue, potentially reduce travel-associated carbon footprint and disturbance to species and habitats, inspire future in-person travel to the area, reach larger audiences and enable visitor experiences for segments of population unable to travel to the sites. At the same time, it is important to consider that this type of tourism comes with some challenges such as medium to high costs and limited access to Internet, and if not planned properly, it can lead to negative impacts both for the PCA and the local communities. More testing and research is needed to establish what best practice looks like, but based on available knowledge, building the local capacities and carefully considering the technical feasibility and any potential impacts on conservation are emerging as key factors for creating effective virtual tourism products in PCAs.

Acknowledgements

This document was written by Biljana Aljinović (IUCN consultant), with contributions from Ulrika Åberg (IUCN), Carla Danelutti (IUCN) and Anna Spenceley (IUCN WCPA Tourism and Protected Areas Specialist Group (TAPAS)).

This document was developed in the framework of the Sustainable Tourism and Protected Areas in a Post-COVID World project implemented by IUCN in partnership with Planeterra Foundation with support of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).
Virtual tourism, also known as digital or online tourism, is the use of technology to allow people to experience a place or an event remotely. It combines the notion of virtual reality and travel by offering an immersive experience of an activity, location or destination through the use of technology. In recent years, the tourism sector has adopted this approach for the advertising of products and services with the aim of increasing its competitiveness in the market.

The offer and the use of such experiences peaked during the COVID-19 lockdown restrictions in 2020 as an alternative to in person travel and has been on the rise ever since, stimulated by technological innovation and the re-conceptualization of leisure-seeking behaviour. Nature-based virtual tours represent an important segment of this trend, as they seek to provide a way for people to experience natural attractions such as PCAs from their homes, increasing their knowledge of the destination while inspiring future travel plans. As a result, we have witnessed many PCAs across the globe engaging in developing virtual solutions both during the pandemic lockdown and afterwards.

Virtual tourism uses technology such as augmented and virtual reality (VR) and other mixed systems based on digital technologies and human interaction. Virtual experiences can include the use of simple 360-degree images or more complex and elaborated content, such as live broadcasted tours of the destination organized by local actors onsite and immersive sensory experiences through gamification. Numerous applications and online platforms are available to experience virtual travel, ranging from simple solutions such as Zoom and Google Earth to more complex applications that use VR viewers, such as Oculus. The tours can be provided either for free or for a fee. Payment options can include subscription services, one-off payments for virtual classes or live experiences, payment for exclusive use of a video or photograph, and donations.

Steps to design a virtual tour in a PCA consist in selecting the appropriate technology to use (VR, augmented reality, mixed methods, other innovative methods), defining the content to be promoted, designing and developing the digital tool, and finally promoting the tool online. In this process it is important to ensure that the content and the approach are aligned with the conservation objectives of the PCA, much like with any other PCA tourism product. Virtual tour participants expect to experience the local culture and way of life, nature and wildlife, a feeling of actually being in the destination (sense of connection), social interaction, and active participation. Factors influencing these experiences include information, quality, technology acceptance, and affective involvement – all these have significant effects on people’s attitudes and behavioural intentions. This is very relevant for the PCA context, where environmental education, influencing behaviour and inspiring conservation action often represent important elements of storytelling.

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*The process of adding games or game-like elements to something so as to encourage participation (Merriam-Webster).*
Boosted by the conditions created during the pandemic, virtual tourism has flourished and is here to stay. Some studies show there is still much interest and potential in developing and implementing virtual tours even after the pandemic is over\textsuperscript{11, 12, 13}. However, the market is expected to be smaller than it was during the pandemic\textsuperscript{11}, especially for nature-based tourism, as on-site experience is still a much more preferred option\textsuperscript{13}. A recent analysis suggests that, in general, virtual travel will never be a substitute for conventional tourism but should rather be considered a future tourism niche\textsuperscript{14}.

Virtual tourism in PCAs (and in general) is still a relatively new concept and more systematic research is needed to investigate this experience from the perspective of different tourism actors (managers, planners, local providers and tourists)\textsuperscript{15}. With this in mind, this publication relies on currently available knowledge and offers a brief insight on some of the long-term opportunities associated to this type of tourism, along with some of the challenges that have been identified so far. It also highlights several good practice examples that have been designed to provide benefits for PCAs and the surrounding communities.
Opportunities Associated with Virtual Tourism in PCAs

People who participated in virtual tours during the COVID-19 pandemic highlighted the positive impact it had on them in terms of mental health, as an opportunity to stay entertained and socialise\(^\text{11}\). In the long run, virtual tourism (in general and/or in PCAs specifically) can present other benefits and associated opportunities:

**Inspiring conservation action and support**

Research has shown that virtual tourism has a significant potential to inspire visitors to pursue conservation actions. A recent study applied to the Great Barrier Reef World Heritage Site reveals that a nature-based tourism experience delivered via 360-degree VR technology can potentially be as effective as a real-life experience in influencing conservation behaviours\(^\text{16}\). It means that individuals do not need to be exposed to (and potentially impact upon) natural environments to adopt actions known to protect such environments. Participants also claimed they felt a connection to the site that was ‘realistic and pervasive’ during their virtual snorkel experience\(^\text{16}\). Another study, based on the use of simulated VR, obtained similar results, showcasing that digitally rendered spaces in virtual environments can effectively strengthen the feeling of connection with nature, and consequent intentions to support its protection\(^\text{17}\).

**Generating and diversifying revenue for the PCA and the surrounding communities**

A virtual experience can also potentially generate revenue for destinations and reduce the impacts of seasonality\(^\text{1}\). For many PCAs that rely heavily on international tourism in terms of revenue and financial stability, virtual tourism during the COVID-19 pandemic represented an opportunity to partially compensate for losses and ensure support for conservation actions and livelihoods\(^\text{4}\), but these benefits can go beyond this exceptional situation. Virtual experiences could be a valuable alternative revenue source also in the long run, either directly through pay-to-view access or indirectly through stimulating philanthropic donations\(^\text{18}\). Although most virtual tours in PCAs seem to be accessible free of charge, more elaborated experiences that involve active participation of local guides, tour operators and/or more advanced technology can be offered at a fee. Data on income (and distribution of income) generated by these activities are scarce for the moment, but some examples show benefits that do touch upon conservation needs and livelihoods. In Africa, virtual safaris were found to contribute to conservation resilience by helping to alleviate the impacts of funding deficits, and assisted with business recovery in the short term\(^\text{18}\). The andBeyond travel company reported a 150,000 USD income from virtual tours during the 2020-2021 season, which were used to provide support for research activities in the private reserve where activities took place, as well as income for guides and an NGO that supports rural communities surrounding PCAs where the company operates\(^\text{4}\).
Potentially reducing carbon footprint and disturbance to species and habitats

Some studies suggest that virtual tourism can be considered as an element of sustainable tourism in terms of reducing unnecessary greenhouse gas emissions from transportation and minimising disturbance to species and habitats by omitting physical tourism infrastructure and limiting negative impacts from visitors. However, this is only valid for users that choose to visit a site virtually instead of travelling there in person, as it happened during the pandemic lockdown. In normal conditions, virtual tourists can represent additional ‘visitors’ on top of the actual visitors on site, which could even result in an increase of the overall greenhouse gas emissions associated to PCA visitation. More research is needed to confirm the correlations and impacts of virtual tourism in terms of climate change and conservation objectives of in-situ environmental protection.

Inspiring future in-person travel

Virtual tours allow potential customers to get acquainted remotely with a destination and preview some of the attractions in the area, which can be useful to inspire future travel and serve as a tool for trip planning. Virtual tourism has been observed to have a strong influence on people's on-site destination choices and can be used as an effective marketing tool to promote destinations. When considering this strategy to promote a PCA, it is important to evaluate beforehand whether increasing the number of visitors is appropriate, sustainable and in-line with the site’s conservation objectives. Areas that are subject to mass tourism and overcrowding might need to design the narrative around their virtual products carefully and send a clear message about the impacts of human presence in the area.

Reaching larger audiences and enabling visitor experiences for segments of population unable to travel to PCAs

Virtual tourism manages to break the spatial, temporal, monetary and other barriers related to the conditions of a destination and enables the experience of travelling to those who cannot do it in person, thus reaching larger audiences. In the case of PCAs, experiences like virtual tours can bring those who have limited access to nature, closer to nature. They can provide ‘virtual accessibility’ especially for the elderly and disabled with limited mobility, and to children who cannot travel independently.

Virtual travel can also represent an opportunity to visit a particularly remote or inaccessible PCA or easily experience activities that would require specific physical condition or certification to do so in person. For example, virtual marine experiences, such as the ones offered in the Hawaiian Islands Humpback Whale National Marine Sanctuary, provide a unique opportunity to expose a wider audience to what lies beneath the ocean’s surface and the need to protect it.

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[b]i.e., greenhouse gas emissions from online activity associated with virtual tourism.
[c] https://sanctuaries.noaa.gov/vr/hawaii-humpback-whale/hawaiian-adventure/
Challenges Associated with Virtual Tourism in PCAs

Setting up and running a virtual tourism product is a complex process that relies heavily on technology and specific expertise. In the case of PCAs, it also requires an efficient coordination among tourism, conservation and IT sectors, as well as good cooperation with local communities, where applicable. Although more effort is necessary to clearly identify the challenges associated to virtual tourism (and their potential solutions) in PCAs, this preliminary overview highlights some of them:

**Limited connectivity/internet access**

Limited internet access and problems with connectivity are the most common constraint for remote PCA destinations and operators to develop virtual tourism activities. One way around it is to develop offline content (e.g., a pre-recorded guided tour of the PCA) that can then be shared on the main website or video sharing platforms such as Vimeo or YouTube. While this can provide a glimpse of the area’s natural values, it offers limited possibilities for interaction and engaging the users in a more compelling way. Surveys among virtual tourism providers have confirmed that, while virtual tours offering interactivity were the most beneficial in terms of engagement, they were also the most difficult to execute (e.g., getting a live broadcast on a moving vehicle from the middle of an African remote PCA).

**Potential negative impacts on livelihoods**

It is clear that, while virtual tourism helped to partially alleviate the lack of funding associated with COVID-19, it does not benefit all stakeholders in the same way conventional tourism can and it cannot provide the same support for local livelihoods that rely on income from in-person tourists. Additionally, there are concerns that local livelihoods may be even negatively impacted in the process of creating virtual tourism offers in PCAs. For instance, due to limited internet access and/or lack of technological literacy, it may be challenging for local guides and PCA staff to participate in and benefit from virtual tours, with the risk that such experiences could make their jobs redundant by sourcing external experts. Appropriate training programmes and investments in innovation and technology at local level are needed to address this issue.
Creating and maintaining virtual tours can be expensive and time-consuming, as they require the use of often advanced digital technologies and highly specialised human resources. Although precise information on cost estimates is limited and depends much on the type of virtual experience to be developed, the budget that is required is estimated as ‘medium to high’. A study on the development of ecotourism in Russian protected areas estimated that setting up a virtual ecological tour using 5D technology would require 4 people (2 videographers, 1 photographer and 1 programmer) and an initial cost equivalent to around 11-12,000 EUR.

Other challenges have been identified in reference to virtual tourism in general, such as limited social interaction, lack of familiarity and technical knowledge required for the use of more advanced forms of virtual tourism products, potential overconsumption and/or addiction, complexities in creating realistic and immersive experiences that stand out, and providing enough information and context for the user. From a policy perspective, there are concerns about the ethical use of consumer data and curating safe tourist e-community interactions.

Due to these challenges, there is still a lot of untapped potential in virtual tourism in PCAs, especially in terms of technology used. While many PCAs offer pre-recorded or 3D Google Earth-based virtual tours with some interactive elements, or live-streamed webcams (e.g., US National Parks, Andalusia Region protected areas, Colombia’s National Park), very few are currently engaging in advanced immersive content or live broadcasted tours with a guide and Q&A sessions. These are almost exclusively available through different virtual tourism platforms (e.g., HeyGo, Beeyonder, Wowzitude) and advertised by individual tour guides or operators, rather than the PCAs themselves.
Good Practice Examples

At the moment, there is very little insight into the impacts of virtual tours in PCAs in terms of level of engagement, benefits for local communities and compliance with conservation objectives. More studies and surveys are therefore needed to be able to identify practices that have demonstrated to bring good results (i.e., positive impact) for PCAs and their local communities. The following good practice examples were chosen based on the approach in the planning and design of the virtual product, that suggest an enhanced engagement of communities and/or the PCA entities themselves.

**Wadi Degla Virtual Museum**

is a community-owned project supported by the Nature Conservation Egypt NGO and focused on promoting and protecting the Wadi Degla Protectorate PA since 2018. It is an interactive ‘museum’ that uses virtual reality technology (360-degree videos, use of 3D goggles) to travel across the country. The viewing sessions and communication with the public are led and implemented by community volunteers, which include community members of all ages and social statuses. While the primary purpose of this initiative is awareness raising and knowledge dissemination, it also strives to offer an alternative solution for those who are unable to visit Wadi Degla, as well as to inspire future travel. A survey carried out among the participants revealed that 83% of viewers plan to visit the PA in the future. The Virtual Museum runs its activities for free, or charges a fee with compensation based on a sliding scale depending on the recipient’s ability to pay. A small amount of the fee is used for equipment maintenance, while the majority goes towards sponsoring free events at institutions that cannot pay.

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**VIRTUAL TOURISM AND EDUCATION IN EGYPT'S PROTECTED AREAS: reaching out to local communities**

Wadi Degla Virtual Museum is a community-owned project supported by the Nature Conservation Egypt NGO and focused on promoting and protecting the Wadi Degla Protectorate PA since 2018. It is an interactive ‘museum’ that uses virtual reality technology (360-degree videos, use of 3D goggles) to travel across the country. The viewing sessions and communication with the public are led and implemented by community volunteers, which include community members of all ages and social statuses. While the primary purpose of this initiative is awareness raising and knowledge dissemination, it also strives to offer an alternative solution for those who are unable to visit Wadi Degla, as well as to inspire future travel. A survey carried out among the participants revealed that 83% of viewers plan to visit the PA in the future. The Virtual Museum runs its activities for free, or charges a fee with compensation based on a sliding scale depending on the recipient’s ability to pay. A small amount of the fee is used for equipment maintenance, while the majority goes towards sponsoring free events at institutions that cannot pay.

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https://natureegypt.org/wadi-degla-virtual-museum
Virtual Tourism in Protected and Conserved Areas

New South Wales National Parks and Wildlife Service developed a series of interactive, 360-degree video tours narrated by Aboriginal rangers in national parks across the region, with the aim of connecting the viewers to the rich Aboriginal culture and traditions and their role in the conservation of these areas. The tours were initially developed in 2017 with an educational purpose as part of the award-winning WilderQuest Learning program, and are now available online for the wider public as a promotional tool. An Aboriginal digital agency provided the rangers with specialist training in advanced 360-degree video and drone technology for virtual reality production.

Other protected areas in Egypt are starting to engage in virtual tours too. Led by the Ministry of Environment, a nationwide PA tourism campaign called Eco Egypt was launched in 2022. It includes a virtual reality component that aims to “take travellers on journeys of discovery through some of Egypt’s most remarkable and diverse protected areas”. Twelve VR tours that cover seven different areas, including Wadi El Gemal, Wadi El Rayan, St. Katherine, the Sannur Cave, Taba, the White Desert, and El Wahat El Bahariya, are available free of charge on a dedicated website. The campaign seeks to echo “the voices, experiences, and customs of local tribespeople, from Nubians to Bedouins, and thus support for local livelihoods by giving a platform for the promotion of unique practices, traditions, and crafts of local communities”.

ABORIGINAL STORYTELLING VIRTUAL TOURS IN AUSTRALIA’S NSW NATIONAL PARKS: engaging and building capacity of indigenous peoples

New South Wales National Parks and Wildlife Service developed a series of interactive, 360-degree video tours narrated by Aboriginal rangers in national parks across the region, with the aim of connecting the viewers to the rich Aboriginal culture and traditions and their role in the conservation of these areas. The tours were initially developed in 2017 with an educational purpose as part of the award-winning WilderQuest Learning program, and are now available online for the wider public as a promotional tool. An Aboriginal digital agency provided the rangers with specialist training in advanced 360-degree video and drone technology for virtual reality production.

* https://ecoegypt.org/

Experience the sounds of Yarrangobilly Caves
Recommendations

Based on the insightful albeit limited knowledge presented in the previous sections, as a concluding remark we highlight 5 key recommendations for PCA managers aimed to support their decisions when planning virtual tourism activities in PCAs:

1. **Ensure local engagement and benefit-sharing:** involving PCA staff and local communities in the design and roll-out of virtual tourism contributes to support livelihoods, stimulates their sense of ownership, and offers local insight for curious virtual travellers. For that, building local capacities through targeted trainings is key (particularly for people that are not IT-savvy), as is using local knowledge to provide virtual tourism content and experiences.

2. **Consider technical feasibility:** internet connectivity and other technical characteristics required for virtual tourism must be carefully analysed and planned. Factors such as remoteness can impact internet access options and influence the final format of the tour (e.g. live-broadcasted vs. pre-recorded).

3. **Incorporate educational elements to inspire conservation action:** much as any other tourism product in a PCA, virtual tours can be a valuable tool in promoting and encouraging conservation actions. For that, the storytelling should follow an educational narrative and call for action.

4. **Consider impacts on conservation values:** any potential disturbance on species, habitats and ecosystems during a virtual tour (e.g. recording in sensitive areas, potential increase of on-site visits as a result of the tour, etc.) should be taken into account and addressed as a limiting factor when designing virtual tours.

5. **Ensure smooth collaboration between tourism, conservation and IT:** PCA staff, relevant stakeholders and external experts from all three sectors should work together in planning and implementing virtual tours. This will ensure that your final virtual product complies with the above-mentioned points and is more likely to offer a unique experience that stands out from the rest.
References


