



*Women for  
Biodiversity*

**AMPHIBIAN OBSERVATION ECOTOURISM BASED ON AUGMENTED  
REALITY, IN THE COLOMBIAN ANDES FOREST.**

**WOMEN FOR BIODIVERSITY CORPORATION**

## **AMPHIBIAN OBSERVATION ECOTOURISM BASED ON AUGMENTED REALITY, IN THE COLOMBIAN ANDES FOREST.**

### **RESUMEN**

This program is an innovative ecotourism proposal based on the observation of endangered amphibians, through augmented reality with the aim of financing conservation actions in 144Km<sup>2</sup> of Andean forests, in Colombia. We will develop a portfolio of on-site and virtual ecotourism services, including a mobile application that uses augmented reality to show amphibians in their natural habitat to attract tourists and educate them about these animals. We propose the following stages:

1. Selection of species: Amphibian species classified globally as threatened (according to the IUCN) will be selected, which can be observed 'in situ' or will be shown in the application, taking into account their geographical distribution, their conservation status and their interest for the visitors.
2. Educational content: The herpetological trail will include detailed information about each species, such as its appearance, habitat, behavior, reproduction and relationship with the ecosystem. Likewise, it can be observed in its wild state in strategically located forest huts.
3. Interactivity: The application will be interactive, allowing the user to interact with the amphibians in augmented reality, take photos, listen to their sounds and learn about them through games and questions.
4. Integration with the environment: The little tours will be able to integrate with the real environment, through mobile cameras and the app, using geolocation technology to show the amphibians in their natural habitat.
5. Accessibility: It will be important to ensure the inclusion of the program so that the application and the herpetological trail are accessible to all visitors, including people with visual or hearing disabilities.
6. Constant updates: It is important to update the application and the herpetological trail it contains with new content and bug fixes to keep the interest of users and ensure the accuracy of the information.

**KEY WORDS:** Tourism, Ecotourism, Augmented Reality, Mobile Devices, amphibians



## INTRODUCTION

Augmented reality-based amphibian viewing ecotourism is an exciting way to explore and learn about these fascinating animals. Augmented reality allows tourists to have an immersive experience in the life of amphibians, allowing them to see them in their natural habitat and learn about their behavior and ecology.

Amphibians are unique animals and essential for the ecosystem balance. However, many amphibian species are endangered due to habitat loss, climate change, and pollution. Amphibian observation ecotourism can help raise awareness about the importance of these animals and contribute to the conservation of their habitats.

Amphibian observation ecotourism based on augmented reality will become a source of income for the Emberá indigenous community, who are adopting alternative livelihoods based on conservation; be an excellent opportunity for tourists of all ages to learn about nature and science in a fun and exciting way. Specialized ecotourism guides can provide detailed information about the amphibian species found in the area and how they relate to their environment.

In short, augmented reality based amphibian viewing ecotourism is an exciting and educational way to explore and learn about these essential animals. In addition, it helps to raise awareness about the importance of conserving amphibians and their natural habitat.



In addition, augmented reality-based amphibian-watching ecotourism can also be an excellent opportunity for tourists of all ages to learn about nature and science in a fun and exciting way. Specialized

ecotourism guides can provide detailed information about the amphibian species found in the area and how they relate to their environment.

Augmented reality technology allows tourists to see amphibians in their natural habitat in a way never before possible. Tourists can see the amphibians in their natural environment and learn about their behavior and ecology. Augmented reality also allows tourists to see amphibians in their natural environment, even in places where amphibians are rare or difficult to see.

Augmented reality technology also allows tourists to see amphibians from a unique perspective. For example, tourists can view amphibians from an



underwater perspective or view them in their nocturnal habitat. This allows tourists to learn about amphibians in a way never before possible.

Augmented reality-based amphibian-watching ecotourism can also be an excellent opportunity for tourists of all ages to learn about nature and science in a fun and exciting way. Specialized ecotourism guides can provide detailed information about the amphibian species found in the area and how they relate to their environment.

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can provide detailed information about the amphibian species found in the area and how they relate to their environment.

Augmented reality technology also allows tourists to see amphibians from a unique perspective. For example, tourists can view amphibians from an underwater perspective or view them in their nocturnal habitat. In this program, we will develop a strategy of activities that will allow the adoption of this type of tourism in the Emberá indigenous community in the period 2022-2025.



## **BACKGROUND OF THE PROGRAM**

As previously mentioned, the Emberá indigenous community is a pre-Colombian aboriginal people, dedicated to cattle ranching, illegal mining and agricultural activities; but it wants the commitment and social and environmental responsibility regarding the development of its activities in the country. One of its main objectives and interests is to eradicate the illegal trade of vulnerable species, which is why the Emberá indigenous community wants to stand out in the country as a pioneer company in the sustainable conservation of amphibian species, in addition to protecting and regenerating natural habitats for its conservation; Finally, it is intended to establish a space where education and environmental conservation are promoted.

Within its fundamental pillars as a community, are allocating its economic income to the care and protection of the environment, financing research projects and forest conservation, likewise, supporting the education of children and young people in amphibian-diverse places. The Emberá indigenous community has projects and is committed to the community of Junín, in the province of Manabí, and Chinambí, in the province of Chocó. In addition to this,

the Emberá indigenous community wants to have a virtual education platform, which will allow obtaining relevant information on new scientific research publications about amphibians and other products generated by the company, which are linked to its website.

This community, together with the Jambatu center, works with 40 species of amphibians, of which 18 are found in the territories of the Emberá indigenous community; These species are not intended for conservation, research and environmental interpretation. It is important to mention that amphibians are characteristic organisms that have moist skin and lack scales, they have a double life, that is, in the first stage of their lives they live in the water as tadpoles and the following stages of life are out of the water. Amphibians perform various ecological functions, among which are controlling insects (trophic chain) within ecosystems; they are sensitive to the chemical agents found in the water, which is why they are also considered bioindicators of environmental health in aquatic ecosystems (Céspedes et al., 2008).

With this background, according to Phillips et al. (2014), an interpretive trail is a very important instrument to generate environmental education and interpretation; These interpretive trails are not only located in natural areas, but can also be established in urban spaces. This is why the trail that is located within the facilities of the Emberá indigenous community can be used for this purpose, since it has great potential for the development of activities aimed at alternative tourism, however, it is not in good condition. optimal for use.

Through the redesign and reactivation of the trail, it will be possible to share information through a guide by the technical staff who work in the Emberá indigenous community in order to optimize learning for visitors, focused on issues about the importance of species, related to the spaces of the trail and the correct relationship that should exist between amphibians and society.

## **METHODOLOGY**

To promote amphibian observation ecotourism based on augmented reality, we will follow the following work plan:

### **1. Investigate and select the most important and accessible amphibian observation sites in the area.**

Researching and selecting the most important and accessible amphibian viewing sites in the area is a key step in developing an augmented reality-based amphibian viewing ecotourism plan. Choosing the best amphibian viewing sites is essential to ensure tourists have an enriching learning and entertainment experience.

To investigate amphibian viewing sites, it is necessary to identify the ecosystems and habitats where the amphibian species of interest are found. This may involve consulting with experts in herpetology, reviewing scientific studies and specialized literature, and conducting field research. It is important to choose sites that are rich in biodiversity and support a variety of amphibian species, as this will increase the likelihood that tourists will see a variety of amphibians and learn about different species and habitats.

Once the sites of interest have been identified, it is necessary to assess the accessibility of these sites for tourists. It is important to choose sites that are easily accessible to tourists, either through paved roads or well-marked trails. At the same time, it is important to ensure that the selected sites are far enough away from urban and tourist areas to offer an authentic nature viewing experience. It is also important to consider the existing infrastructure at the sites, such as toilets, parking, and first aid services.

In addition to accessibility, it is important to ensure that the selected sites are protected and are not in danger of degradation or destruction due to human activity. It is important to consider the presence of human activities in the vicinity of the sites, such as agriculture, mining, dam construction, and tourism. It is important to work with local authorities and communities to ensure the protection of sites and to promote sustainable ecotourism.

In summary, researching and selecting the most important and accessible amphibian viewing sites in the area is a crucial step in developing an augmented reality based amphibian viewing ecotourism plan.

### **2. Develop educational and entertainment content about amphibians and their habitat using augmented reality technology.**

Developing educational and entertaining content about amphibians and their habitat is essential to provide tourists with an enriching learning experience and make amphibian-watching ecotourism attractive. Augmented reality technology can be a valuable tool in making content more engaging and easier to understand for tourists.



To develop educational content, different augmented reality techniques and tools can be used, such as 3D animations, videos, and interactive games. For example, 3D animations can be used to show how amphibians reproduce or how they adapt to their habitat. Details about their biology, ecology, and behavior can be included, as well as information about the threats facing the amphibian species and the measures being taken to protect them.

As for entertainment, interactive games and quizzes can be included to test the knowledge of tourists about amphibians and their conservation. This will help engage tourists in learning and make the experience more fun and engaging. In addition, images and videos of amphibians in their natural habitat can be included, so that tourists can see how they behave and live in the wild.

Another possibility is to include interactive content in which the user can interact with the amphibians virtually, through augmented reality the amphibians can be shown in their natural size, allowing the user to get closer and see them from different angles and distances, this will help increase empathy and awareness for these animals.

In addition, it is important to ensure that the content is up to date and based on recent scientific research to ensure that tourists receive accurate and relevant information. It is also important to consider the culture and language of the tourists to ensure that the content is accessible and easy for them to understand.



In summary, the development of educational and entertainment content on amphibians and their habitat is essential to provide an enriching learning experience for tourists.

**3. Create a mobile app that allows tourists to explore amphibian viewing sites using augmented reality and access educational content.**

Once the educational and entertainment content about amphibians and their habitat has been developed, it is important to create a mobile application that allows tourists to access it easily and conveniently. The application must be designed to be intuitive and easy to use, with a clear and attractive user interface.

An important aspect of the application is an interactive map showing selected amphibian viewing sites and providing detailed information about each one. The map should show the exact location of each site, as well as information on accessibility, infrastructure and available services. Photos and videos of the sites should also be included so tourists can see what to expect.

Another important feature of the app is the ability to use augmented reality to explore amphibian viewing sites. The app should include augmented reality features, such as the ability to view 3D animations of amphibians and learn about their habitat in real time. For example, animations of amphibians in their natural habitat can be

shown, allowing tourists to see how they behave and live in the wild.

In addition, the application must include a section of educational and entertaining content about amphibians and their habitat, as described in the previous item. This should include detailed information on the amphibian species that can be found at the selected viewing sites, as well as information on their biology, ecology, and behavior.

To facilitate navigation, search and filter functions can be included, so tourists can search for specific information on amphibian species or viewing sites. Likewise, a notification section could be included to inform tourists about events and activities related to amphibian observation ecotourism.

In summary, creating a mobile application that allows tourists to explore amphibian viewing sites using augmented reality and access educational content is essential to provide an enriching learning and entertainment experience.

**4. Promote amphibian observation ecotourism through social networks, the media, and collaborations with environmental and tourism organizations.**

Promoting amphibian watching ecotourism is essential to attract tourists and make the ecotourism plan a success. The promotion can be carried out through different channels, such as social networks, the media and collaborations with environmental and tourism organizations.

One of the most effective ways to promote amphibian watching ecotourism is through social media. Popular social media platforms, such as Facebook, Instagram, and Twitter, can be used to share information about amphibian viewing sites, amphibian species that can be found, and ecotourism-related activities and events. It is important to create engaging and informative content, such as photos and videos of amphibians and their habitat, to attract the attention of potential tourists.

In addition to social media, traditional media can be used to promote amphibian-watching ecotourism. This may include placing ads in newspapers and magazines, or creating a television or radio ad campaign. It is important to ensure that the campaign is attractive and informative, in order to attract the attention of potential

tourists and provide them with valuable information on amphibian-watching ecotourism.

Another way to promote amphibian-watching ecotourism is through collaborations with environmental and tourism organizations. This may include working with local amphibian conservation organizations to disseminate information about amphibian-watching ecotourism, or collaborating with tourism agencies to include amphibian-watching ecotourism in tour packages.



Another way to promote amphibian-watching ecotourism is through tourism events and fairs. These events can provide a great opportunity to introduce amphibian-watching ecotourism to a wide audience and generate interest among potential tourists. Talks and presentations about amphibians and their habitat can be organized, and educational and entertaining content can be displayed using augmented reality technology to attract tourists.

In summary, promoting amphibian watching ecotourism is essential to attract tourists and make the ecotourism plan a success. The promotion can be carried out through different channels, such as social networks, the media, collaborations with environmental and tourism organizations and tourism events and fairs. It is important to create engaging and informative content and work with organizations and agencies to ensure greater visibility and access to potential tourists, and to promote sustainable and environmentally friendly ecotourism.

**5. Offer tourist packages that include guided tours and the use of the augmented reality application.**

Offering tourist packages that include guided tours and the use of the augmented reality application is an effective way of providing tourists with a complete and enriching experience of amphibian-watching ecotourism. Tour packages should be designed to provide tourists with a detailed overview of amphibian viewing sites and the amphibian species that can be found there, as well as provide educational and entertaining information about amphibians and their habitat.

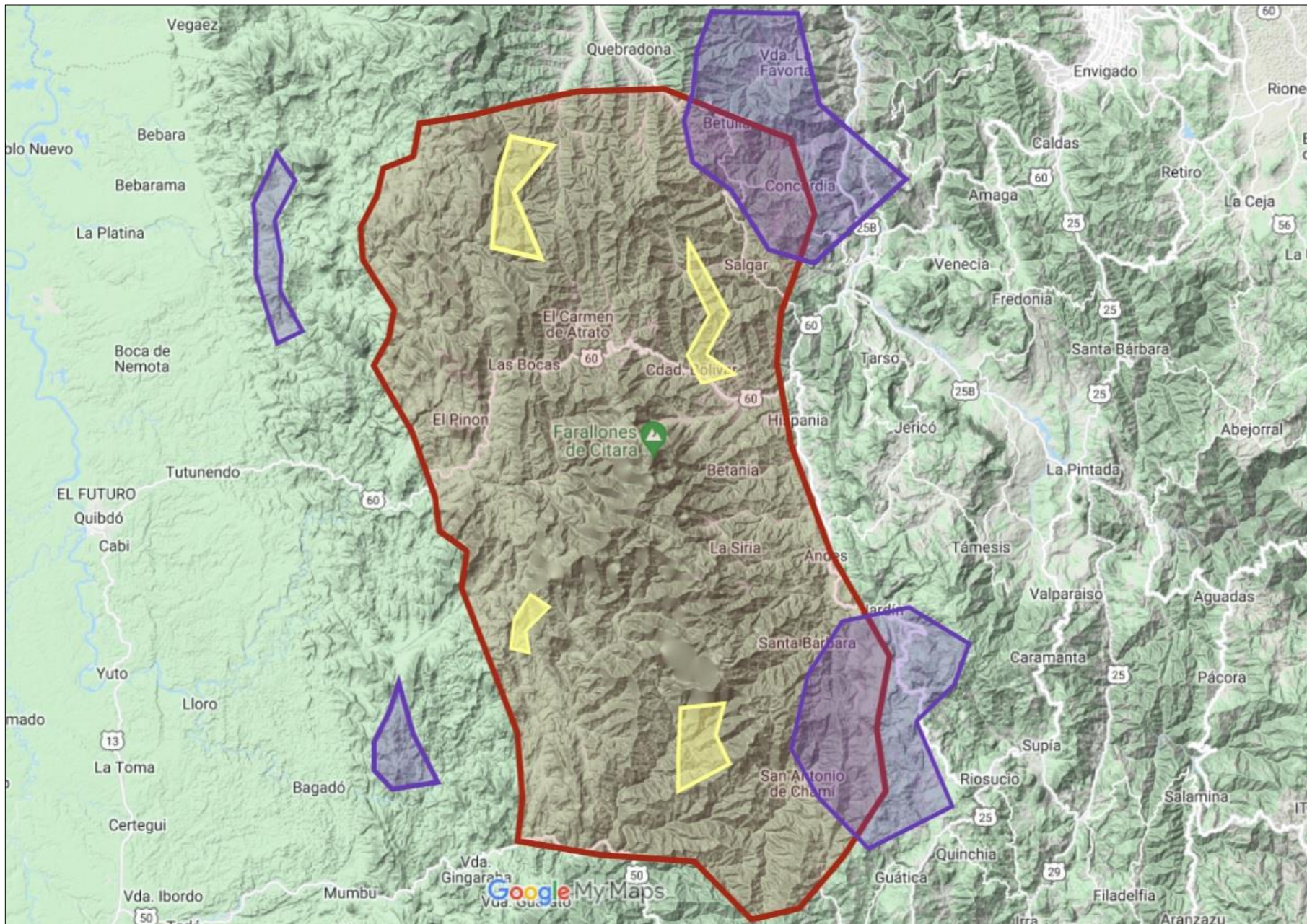
Tour packages must include guided visits to selected amphibian viewing sites. These visits must be led by guides specialized in herpetology, with extensive knowledge about amphibians and their habitat. Guides should provide detailed information on the amphibian species that can be found at each site and help tourists to identify them and understand their behavior and ecology. Additionally, guides should provide information on how amphibian species are being protected and the measures being taken to conserve them.

In addition to the guided tours, the tourist packages must include the use of the augmented reality application. The app should be a key tool in providing an enriching educational and entertainment experience. Tourists should be able to use the app to explore amphibian viewing sites using augmented reality, view 3D animations of amphibians, and learn about their habitat in real time. In addition, the application must provide educational and entertaining information about amphibians and their habitat, as described in the previous items.

Another important advantage of tourist packages is the possibility of offering personalized packages, adapting the content and duration of the experience according to the needs and interests of each group of tourists.




In addition, it is important to ensure that package tours are accessible and affordable for a variety of tourists, and offer fair prices to ensure that amphibian-watching ecotourism is sustainable and environmentally friendly.

In summary, offering tourist packages that include guided tours and the use of the augmented reality application is an effective way to provide tourists with a complete and enriching experience of amphibian observation ecotourism. Packages should be designed to provide a detailed overview of amphibian viewing







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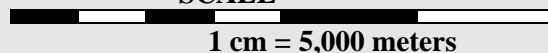
**CONVENTIONS**

	<b>Project area</b>
	<b>Emberá indigenous cities</b>
	<b>Target amphibian populations</b>

**Elevations**

	<b>0m – 1,000m</b>
	<b>1,000m – 2,000m</b>
	<b>2,000m – 3,000m</b>
	<b>3,000m – 4,000m</b>

**SCALE**



**Country:** Columbia

**Province:** Chocó

144Km<sup>2</sup> in the Emberá indigenous territory

**Geographic coordinates:** 5°46'13.9"N /

76°03'57.5"W

CITARÁ moorlands

**Sources:**

- WOMEN FOR BIODIVERSITY corporation
- IMAP, wildlife information database
- Google maps





sites and the amphibian species that can be found there, as well as provide entertaining and educational information about amphibians and their habitat, priced fairly and adapting the content according to the needs and interests of the tourist.

#### **6. Evaluate and measure the impact of the work plan and make necessary adjustments to improve the tourist experience and the positive environmental impact.**

Evaluating and measuring the impact of the work plan is essential to ensure that amphibian-watching ecotourism is sustainable and environmentally friendly, and to enhance the tourist experience. The evaluation should be an ongoing process that is carried out regularly to detect any problems or areas for improvement in the work plan.

One way to assess the impact of the work plan is through tourist surveys. These surveys should include questions about tourist satisfaction with amphibian viewing ecotourism, the quality of educational and entertainment information provided, the quality of guided tours, and the usefulness of the augmented reality application. This information provided by tourists is valuable to identify areas for improvement and to make decisions to improve the tourist experience.

In addition to tourist surveys, environmental impact studies should be carried out. This may include monitoring the amphibian population at observation sites, studying the impacts of tourists on amphibian habitat, and evaluating the measures implemented to minimize these impacts. This information is essential to ensure that amphibian-watching ecotourism is sustainable and respectful of the environment.

Once this information is collected, it is important to make the necessary adjustments to improve the tourist experience and the positive environmental impact. Adjustments may include changes to selected amphibian viewing sites, educational and entertainment content, augmented reality application, and environmental conservation measures. It is important to work with specialized guides, environmental organizations and other interested parties to implement these changes and ensure that they are effective.

In summary, evaluating and measuring the impact of the work plan is essential to ensure that amphibian-watching ecotourism is sustainable and respectful of the environment, and to enhance the tourist experience. The evaluation should include surveys of tourists and studies on environmental impact, and based on that information, necessary adjustments should be made to improve the tourist experience and positive environmental impact. It is important to work with specialized guides, environmental organizations and other interested parties to implement these changes and ensure that they are effective.



In addition, it is important to consider feedback from guides and staff involved in amphibian-watching ecotourism, as they also play an important role in the tourist experience and environmental conservation. Feedback from guides can provide valuable insight into how tourists are being managed in the field and how environmental conservation measures are being met.

Finally, it is important to consider measuring the economic impact of amphibian-watching ecotourism on the local community. This can include the number of jobs created, the increase in income for the community, and the impact on the local economy. This information is important to ensure that amphibian-watching ecotourism is beneficial to both the environment and people in the local community.

In summary, the evaluation and measurement of the impact of the work plan is essential to ensure that amphibian-watching ecotourism is sustainable and respectful of the environment, and to improve the tourist experience. Surveys of tourists and studies on environmental impact should be carried out, and based on that information, necessary adjustments should be made to improve the tourist experience and positive environmental impact. It is important to work with specialized guides, environmental organizations and

other interested parties to implement these changes, take into account the feedback of the personnel involved and measure the economic impact in the local community.

### **7. Monitor and protect amphibian habitats and work with local communities to promote conservation and sustainable ecotourism.**

Monitoring and protecting amphibian habitats is essential to ensure the conservation of these species and their long-term sustainability. Monitoring includes the collection of data on the distribution, abundance, and conservation status of amphibian species in a given area. This information is valuable for identifying critical conservation areas for species and for making informed decisions about how to protect them.



An important approach to protecting amphibian habitats is to work with local communities. It is essential to involve local communities in the conservation process, as they have valuable knowledge about the environment and can be important allies in protecting amphibian habitats.

One way to involve local communities is through environmental education programs. These programs should provide information on the importance of amphibians and their habitat, as well as on the measures that can be taken to protect them. In addition, training programs should be established for local communities, in order to provide them with the necessary skills and tools to monitor and protect amphibian habitats effectively.

Another way to involve local communities is through natural resource management programs. These programs must provide economic benefits to local communities through sustainable activities, such as

amphibian-watching ecotourism. This may include creating jobs in the tourism sector and selling products and services related to amphibian-watching ecotourism.

In addition, it is important to work with local authorities and environmental organizations to establish protected areas and promote amphibian habitat conservation. This may include creating nature reserves, implementing environmental conservation measures, and promoting sustainable practices in local communities.

In summary, monitoring and protecting amphibian habitats is essential to guarantee the conservation of these species and their long-term sustainability. It is important to involve local communities in the conservation process, as they have valuable knowledge about the environment and can be important allies in protecting amphibian habitats. One way to involve local communities is through environmental education and training programs, and natural resource management programs that provide economic benefits through sustainable activities. It is important to work with local authorities and environmental organizations to establish protected areas and promote amphibian habitat conservation.

In addition, it is important to continuously monitor the status of amphibian habitats, to detect changes and take preventive measures to avoid problems. It is also important to work with local communities to develop sustainable management plans and establish protocols to minimize human interference with amphibian habitats. It is also important to work with local authorities and environmental organizations to establish protection measures for amphibian species, and establish surveillance and monitoring systems to detect and prevent any illegal activity or damage to amphibian habitats.

In addition, it is important to promote conservation and sustainable ecotourism through collaboration and cooperation between local communities, authorities and environmental organizations. This can include creating alliances for conservation, implementing programs to monitor and protect amphibian habitats, and promoting sustainable practices among local communities.

In summary, monitoring and protecting amphibian habitats and working with local communities to promote conservation and sustainable ecotourism are

essential to ensure the survival of these species and provide a sustainable and responsible tourism experience. It is important to involve local communities in the conservation process.



## CONCLUSION

In conclusion, amphibian observation ecotourism based on augmented reality is an excellent opportunity to promote the conservation of these species and provide a unique and sustainable tourist experience. A work plan to promote amphibian-watching ecotourism should include several key elements, such as research and selection of the most important and accessible amphibian-watching sites, development of educational and entertainment content about amphibians and their habitat using augmented reality technology, creating a mobile app to explore amphibian viewing sites, promoting amphibian viewing ecotourism through social media, media, and collaborations with environmental and tourism organizations, offering tour packages that include guided tours and the use of the augmented reality application, evaluate and measure the impact of the work plan and make necessary adjustments to improve the tourist experience and the positive environmental impact and monitor and protect amphibian habitats and work with communities to promote conservation and ecotourism.

It is also important to continuously monitor the state of amphibian habitats, to detect changes and take preventive measures to avoid problems. It is also important to work with local communities to develop sustainable management plans and establish protocols to minimize human interference with amphibian habitats. It is also important to work with local

authorities and environmental organizations to establish protection measures for amphibian species, and establish surveillance and monitoring systems to detect and prevent any illegal activity or damage to amphibian habitats.

In summary, amphibian observation ecotourism based on augmented reality is an excellent way to promote the conservation of these species and provide a unique and sustainable tourist experience. It is important to implement a work plan that includes the research and selection of amphibian observation sites, the development of educational and entertainment content using augmented reality technology, the creation of a mobile application, the promotion of ecotourism, the offer of tourist packages, evaluation and measurement of the impact of the work plan and the protection and monitoring of amphibian habitats and work with local communities. In addition, it is essential to involve local communities in the conservation process, and to work with local authorities and environmental organizations to establish protected areas and promote amphibian habitat conservation. With a sustainable and collaborative approach, augmented reality based amphibian observation ecotourism can be a valuable tool for the conservation of these species and an exciting and educational tourist experience.

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