Action! For the Chiquitano Dry Forest -

# Senckenberg in motion

an interdisciplinary project

symbio(s)cene

SENCKENBERG world of biodiversity



hochschule macromedia university of applied sciences

## Acknowledgement

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### Abstract

This report was assembled by Macromedia University Design Management Master's students to document an Interdisciplinary Project for Senckenberg Research Institute, in which they consider new ways to address the environmental crisis of the Chiquitano region in Bolivia that is currently exacerbated by deforestation and human-wildlife conflict from land-use change for the cattle industry. The project development revolved around design-thinking and a human-centred approach. It included iterative divergent and convergent processes over three Interim phases with culminating points for decision-making instances, in order to drive the work forward within the given timeframe. Details are provided on methodology, understanding the problem space, possible action areas, specific approaches, potential tools, ideation, concept formulation, and prioritisation. Over the course of the project, four initial concept were formed and repeatedly improved upon to create a final solution called "Action! for the Chiquitano Dry Forest - Senckenberg in Motion", consisting of 3 sub-programs and an overarching theme based on visual media, as well as possible funding opportunities. The project was well-received by Senckenberg and enthusiasm for implementation was expressed.

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#### **1. INTRODUCTION (VV)**

As part of the Interdisciplinary Project under the supervision of Professor Oliver Szazs, the authors of this paper were entrusted with accompanying external and interdisciplinary projects for the semester and supporting them with their knowledge of design management.

This project consisted of a close collaboration between the authors and the Senckenberg Research Institute and Natural History Museum. At the beginning of the project, a staff member of the institute and an expert in Terrestrial Zoology, Dr. Martin Jansen, informed about the current status and framework of the project Symbioceno Chiquitos - A transdisciplinary vision for a sustainable future region.

The project is an initiative of the institute, which deals with threats and problems concerning the ecosystem in Chiquitano, Bolivia. Staff members of the institute have been operating a research facility in the region since 2009, studying the local ecosystem of the Dry Forest, especially concerning biodiversity and climate change. For example, numerous frog species have already been researched and dated in the region. With the help of camera traps, it was possible to document that the species-rich region has a healthy ecosystem. One indicator of this ecosystem's condition is the presence of jaguars, around 14 of which have been recorded locally in recent years (Jansen, project brief, March 25, 2021).

However, in addition to the research of biodiversity, the institute must also deal with severe threats to the study area. In particular, the region has to deal with three elementary core problems. First, the number of jaguars goes hand in hand with human and agrarian conflicts, so-called cowflicts. When the local population and the jaguar get in each other's way, the jaguar usually loses out for economic reasons. Second, the region is plagued annually by severe fire seasons. In 2019 alone, the Dry Forest lost approximately twelve per cent of its area to flames. The cause of said fires can increasingly be attributed to humans. The third core problem is deforestation in the region. This, along with increased land-use change, contributes to a tremendous loss of biodiversity (Jansen, project brief, March 25, 2021).

All three threats have become firmly entrenched in the region and are increasingly out of control. For this reason, the institute created Symbioceno Chiquitos. The goal is to create a more sustainable future for the region that benefits both the local population and the ecosystem. The interplay of the three aspects, Society, Science and Sustainability, is intended to provide a foundation on which people can reconnect with nature and learn to recognise its value (Jansen, project brief, March 25, 2021).

To this end, a thoughtful narrative is imperative. This is where Macromedia's design managers come in. Dr. Jansen and the institute tasked them to learn about the current situation and work on innovative concepts that can address this wicked problem.



# METHODOLOGY

#### 2. METHODOLOGY (AD)

The entire research process involves a number of methodologies through an iterative process of design thinking. It was found, by the authors, as a useful way to come up with new and unexpected solutions to a problem.

"Design thinking is a human-centered approach to innovation - anchored in understanding user's needs, rapid prototyping, and generating creative ideas. The iterative process brings together what is desirable from a human point of view with what is technologically feasible and economically viable

(IDEO U, 2021)."

Hence, to begin, the authors agreed on a double diamond approach, compiled a broad spectrum of secondary research and conducted primary research to understand the topic thoroughly. Based on this research, the authors use design thinking methods like What If Questions, Empathy Mapping, How Might We Questions, Brainstorming, a How Now Wow Matrix, and a Prioritisation Matrix to better comprehend the situation and bring together solutions from a human-centred perspective.



Figure 1: Initial Draft of Process Based on Design Thinking

Analysing the process, Fig. 1 provides an overview of the framework that guided the authors well into interdisciplinary working. In this framework, divergent and convergent phases of work led up to three interim presentations at which Senckenberg provided helpful feedback to propel the project forward.

#### 2.1 ITERATIVE DOUBLE DIAMOND (AD)

The basic structure of the research process and design approach into the project follows an Iterative Double Diamond model, as developed by the Design Council. The authors underwent all four phases of this well-established method, which covers the following steps: *Discover, Define, Develop, Deliver* (Design Council, 2019):



#### Figure 2: The Iterative Double Diamond Method for the Project

The image in Figure 2 demonstrates how the divergent and convergent steps of the Double Diamond model were repeated throughout the three phases of the project. Divergent steps, such as *Discover* and *Develop*, opened up the possibilities of exploration and creativity. The convergent steps of *Define* and *Deliver* helped to narrow the focus down and determine where the direction of the project should lead. The separate steps within the three project phases are described below.

First Interim – To *Discover*, the authors focused on understanding the problem space through primary and secondary research investigating the roles of various stakeholders and critical factors in the areas. For the *Define* step, the key categories were narrowed down into Politics, Economics, Conservation, Culture and Tourism, helping define the problem. How Might We Questions were used to turn the challenges into opportunities for design (Design Kit, 2021). Next to *Develop*, central areas of focus were identified. These included: Stakeholders, Possible Action Areas, Approach, and Tools. Lastly, to *Deliver*, the findings were presented to Senckenberg and feedback was provided.

Second Interim – To *Discover*, a brainstorming session was conducted to ideate possible solution ideas. In order to *Define*, the authors implemented a How Now Wow Matrix to narrow down four specific solution ideas. For the *Develop* step, each of the four solutions was elaborated upon with relevant details. Then to *Deliver*, the solutions were presented to Senckenberg and once again, the authors received helpful feedback.

Third Interim – The authors continued the *Discover* step by exploring in-depth and following up on the most recent feedback. Then, to *Define*, they utilised a Priority Matrix that helped illustrate where the focus of the project should be, based on logistics and feasibility as well as impact. Next, to *Develop* the solution, the authors expanded upon the concept by formulating details, planning out user journeys, and creating mock-ups. Finally, the thoughtfully planned solution was then presented to Senckenberg at the final presentation.

#### 2.2 PRIMARY RESEARCH (AD)

As mentioned in the introduction, the project is based on the current status and framework of the project Symbioceno Chiquitos, which aims to address challenges such as how to prevent further degradation of forest, resolve human-wildlife conflict, and develop a new vision for the ecosystem in the Chiquitano region of Bolivia. Ideally, when using design thinking methods, these challenges would be thoroughly explored via extensive interaction with those living in the area. However, there were many limitations regarding the collection of primary data, owing to geographical distance, language barriers, differing time zones, and movement restrictions. These arose from the international nature of the project as well as the current COVID-19 pandemic.

Therefore, the authors express their gratitude to Dr. Jansen for providing essential information himself and sharing contacts of his colleagues and other fellow researchers from the Senckenberg Research Institute. They helped the authors gain more insights into the current situation through interviews held online. This was invaluable for obtaining a first-hand look into the region in question.

In addition, interviews were conducted with international experts of various backgrounds, i.e., conservationists, zoologists, biologists, and specialists in health, hygiene, and gender. These conversations revealed expert opinions on their fields of study.

A list of all the interviewees, their fields, and organisations can be seen in Table A1 of the Appendix. Although other methods such as surveys and workshops were not possible, these interviews provided a solid foundation and exciting information to pursue.

#### 2.3 SECONDARY RESEARCH (AD)

A comprehensive analysis of academic literature research has been conducted throughout the course of the project. The retrieved literature ranges from academic search engines like ResearchGate and Academia.edu, working reports and surveys from respected sources such as the United Nations and its subsidiaries, to various NGOs particularly working in environment and wildlife conservation. Additional non-scholarly research from different media platforms like YouTube, Instagram, and various TV shows were also referenced to understand the situation of Bolivia through diverse contexts and act as a source of inspiration.

Some of the most insightful secondary research was recommended by primary research contacts as well. Sources mentioned in the interviews guided the authors towards specific examples, strategies, or information that helped lay the cornerstones of the project.

Various key themes repeatedly surfaced, steering the research into specific subject matters such as successful case studies of recovered species, pros and cons of existing conservational efforts, and ecotourism around the globe. Research into decision-making strategies and the ideas behind successful initiatives was beneficial for the authors and helped to determine an approach for the project.

Certain subjects like Bolivian politics, customs, and culture were challenging to obtain due to the limitations regarding communication with the target audience. Politics in the region is particularly complex and important, as demonstrated in the recent turmoil. Therefore, these difficulties were addressed to the extent possible under the given circumstances and other creative sources were employed.



# UNDERSTANDING THE PROBLEM SPACE

#### **3. UNDERSTANDING THE PROBLEM SPACE (AD)**

After establishing a design thinking framework and carrying out extensive research, the first step into understanding the problem space was to identify the various stakeholders involved and the key drivers that influence their activities. This, in turn, contributed to framing the picture of current problems, where the authors then attempted to define the problem by constructing What If Questions.

#### **3.1 STAKEHOLDERS AND KEY DRIVERS (VV)**

Based on the in-depth secondary and primary research, it quickly became apparent that various parties with different interests are deeply involved in the situation. Five main stakeholders can be identified in the Chiquitano region (See Fig. 3). First, there is the Bolivian government and local authorities, which are responsible for the legal framework of the area. Second, there is the private sector, for example, businesses such as timber companies or cattle ranchers, as the driving force in the local labour market. Various NGOs and CSOs, on the other hand, support the region in terms of climate protection and social matters. Of course, academic researchers are also active in the region, among others the Senckenberg institute, which deals with the local flora and fauna. The local population was placed amid the four other stakeholders. They are directly or indirectly involved with each of the groups mentioned so far.



#### Figure 3: Five Main Stakeholders Identified in the Chiquitano Region

In addition to an overview of the five stakeholders, it is also essential to be aware of the potential conflicts of interest between the individual parties. For this purpose, the so-called individual key drivers were examined in more detail. These represent elementary reasons for their respective groupings to act. The local population, for example, pursues its work for a completely different reason than the academic scientists in the region. It is essential for the effective progress of the project to deal critically with these issues. Only in this way can a deeper understanding of the regional interplay be ensured and dealt with adequately.

#### 3.1.1 GOVERNMENT (OF)

Evo Morales has substantially shaped the past decades of Bolivia's political landscape. The former coca grower used the Coca Growers Federations of Cochabamba as a platform and grew famous as a leader. Morales was able to appeal to a wide range of social movements and Leftists in Bolivia and around the world. In terms of economics and non-material aspects, social well-being was pledged to be a major priority by him and his party, the Movimiento al Socialismo (MAS). The goal was not to repeat the pursuit of paths towards economic wealth through harmful measures to the environment but rather obtaining well-being by sticking to holistic processes. The fundamentals of "Buen Vivir", a social philosophy defined by its goal to achieve harmony between humans and harmony between humans and nature, were often cited as the basis for this notion. A story of freeing Bolivia of capitalism and imperialism through sustainable measures was spread (Hollender, 2016; Balch, 2013).

In 2005, Evo Morales was elected as the president of Bolivia. The movement that supported Morales' MAS party welcomed the election. Morales and his party passed a new constitution, including provisions that preserve the so-called "Rights of the Mother Earth" and put Buen Vivir over other economic indicators. This effort was celebrated even in international media, such as in articles by NPR or The Guardian (Glennie, 2010; Murphy, 2010). It was a factor that considerably contributed to Morales's election to lead the country for another term in 2010. Morales also renegotiated international oil and gas contracts and nationalised the sector so that the government and all Bolivians profit from the country's natural wealth. At the time, MAS was backed by the Unity Pact, a national alliance of Bolivian grassroots organisations which includes the six umbrella movements for indigenous people and impoverished communities. In line with Morales' government, The Unity Pact endorses eco-friendly alternatives and opposes neoliberalism, capitalism, and imperialism. It argues for the disadvantageous effects these have for Bolivians and their environment and economy (Hollender, 2016). Müller et al. (2014) summarise the legal framework, resulting from Morales's changes, for land and forest governance in Bolivia (see Table A2).

However, despite the promising claims and policy changes, Morales and his party were criticised by many for not following through on what was promised and introducing policies that put economics above sustainability and the population's well-being. One major criticism revolved around Morales opening up protected areas for fossil fuel extraction and transport through pipelines, thus prioritising the economic interest of companies and landowners over sustainable development. Despite the approval of local communities being a legal requirement for such undertakings, Morales also opened up new mining sites and highways without the necessary permission (Hollender, 2016).

The evidence shows that MAS seemed to have discarded the pledges initially made and supported the harmful extraction of natural resources. Another area where this can be observed is in agriculture, as Morales's administration foresaw an expansion of the sector at one million hectares per year until 2025 (Bustillos, 2015). The dissatisfaction with Morales's policies showed in the 2014 elections, in which he lost support from indigenous populations in La Paz, El Alto, and Cochabamba (Fidler, 2015). Overall, MAS still won the 2014 presidential elections with 61% and was able to keep the lion's share of legislative seats, mayors, and governors in subnational polls in 2015 (Hollender, 2016). MAS also won a majority in Santa Cruz, an area known to be the stronghold of the agroindustry lobby and the elite of landowners. Achtenberg (2015) states that:

*"Fundación Tierra* has investigated changes in government agricultural policy that favour agribusiness interests, limit opportunities for land redistribution, and contribute to the marginalisation of peasant farmers". This is a sign for the convergence of the party towards the land-owning elite, which profit from the expansion of the agricultural sector the most (Zibichi, 2014).

This expansion is driven by a policy to improve access to land and the allocation of rights. The *Función Económica Social* (FES) eases access to land, legalising illegal occupations and creating unsustainable incentives, as the easiest way to gain property rights over land claim ownership is to clear the forest. Converting forest to agriculture (livestock production in particular) is considered the most economical way to demonstrate the socio-economic function of the land and gain adherence to the FES. The FES, together with other policies, have accelerated land-use change and deforestation (Müller et al., 2014).

#### **3.1.2 PRIVATE SECTOR (OF)**

The leading causes of deforestation in Bolivia, much like in other regions of the world, are timber extraction, growth of industrial agriculture, expansion of small-scale agriculture, and the increase in cattle ranching. The latter factor is responsible for 60% of deforestation between 2005 and 2010. Chiquitania (the lowland region, which is of primary concern to this paper) has the highest rate of deforestation that can be attributed to cattle ranching (Müller et al., 2012). While farm sizes vary, it was estimated that half of the cattle in Pando belong to only 20 families (Müller et al., 2013).

Industrial agriculture is spreading in Bolivia, especially in the fertile lands of Santa Cruz. Soybean is the number one crop produced in the area and most of the output is exported (IBCE 2012). Next in line is sugarcane, the production of which is mainly focused on a small area in northern Santa Cruz. Farms larger than 50 hectares, primarily run by agro-industrial corporations, produce around three quarters of the total soybean output. Control of the corporations is partly in the hands of a small group of businessmen located in Santa Cruz. Additionally, international companies, predominantly from Brazil in particular, also exert influence in the region through foreign capital (Müller et al., 2014).

Small-scale farmers produce several crops, including but not limited to coca leaf, cocoa, banana, rice, corn, cassava, or coffee.

These farms mainly produce for their own needs and local markets through manual processes. The main group of small-scale farmers (about 400,000 people) consists of national settlers, originally from the Andean region. Müller et al. (2014) collected the characteristics of the leading direct drivers of deforestation as follows:

	Mechanised agriculture	Small-scale agriculture	Cattle ranching on cultivated pasture
Cattle ranching on cultivated pasture	North and east of the city of Santa Cruz	Northern Andean foothills, northern Santa Cruz	Mainly Chiquitania and northern Amazon, but practically everywhere
Main agents	Foreign and national companies, including Brazilian, Mennonite and Japanese	Mainly settlers originating from western Bolivia	Livestock farmers with big or medium- sized farms, also involvement of Brazilian capital
Main products	Soybean, sugarcane, sunflower, rice, corn	Rice, corn, banana, small amounts of meat and milk	Beef, some milk
Production systems	Large units, highly mechanised with high technical and financial inputs	Traditional systems of manual agriculture, mainly with crop rotation (burning or chaqueo)	Different size systems mainly for fattening, usually with low productivity
Markets	Mainly preferential markets in Andean countries (Colombia and Venezuela), also national markets	Subsistence, local and national markets, very limited exports	Local and national markets, very limited exports

Table 1: Characteristics of the main direct drivers of deforestation

Given how profitable these drivers are and how much they contribute to the Bolivian economy, reducing their expansion is difficult. One initiative aimed at eliminating diesel subsidies for this sector was lifted shortly after its publication in 2010 as it resulted in protests and actions against the government (Müller et al., 2014).

#### 3.1.3 NGOS & CSOS (KS)

NGOs or CSOs, are non-governmental organisations that are independent and do not pursue profit-making objectives. These private organisations are committed to social, sociopolitical, or environmentally relevant causes. The subject areas include, for example, development cooperation, human rights, social justice, humanitarian aid, or environmental protection (Frantz & Martens, 2006).

Organisations relevant to the project mainly deal with the maintenance of nature conservation areas, educational campaigns, and environmental and species protection to support implemented projects.

One example of this would be the NGO CLAWS Conservancy. Though not located in South America, they are an excellent example of an organisation that carries out innovative techniques for protecting large predatory cats. They develop and deploy new strategies with partners and communities to reduce conflicts between people and predators. Therefore, they develop economic, social, and ecological approaches for human-wildlife coexistence and coordinate efforts between various stakeholder groups, including government agencies, community groups, non-profit organisations, academic institutions, tour operators, and researchers for effective implementation (CLAWS Conservancy, 2021).

Another organisation is El Llamado Del Bosque. The Bolivian organisation represents a civil society coalition of cultural, academic, and indigenous groups. Over 600 people have signed the so-called "Forest Pact", funded by the organisation, to protect the forest resources, biodiversity, and the people who inhabit it in the face of the severe crisis caused by deforestation.

Since Bolivia is one of the countries with the highest deforestation rates in the world, the organisation seeks to counter the practices of large international soya and meat corporations that have led to increased deforestation.

Studies show that deforestation in Bolivia is responsible for 77 million tonnes of carbon dioxide emissions into the atmosphere each year, reducing biodiversity and degrading the habitat of an incredible number of species: 14,000 plant species, 325 mammal species, 186 amphibian species, 260 reptile species, 550 fish species, and 1,379 bird species. To address this large-scale crisis, the "Forest Pact" citizen initiative was launched in November 2017 in Yvaga Guazú Park in Santa Cruz, one of the epicentres of deforestation in Bolivia. The Pact has been endorsed by the Departmental Government of Santa Cruz, municipal authorities, city councillors, mayors, members of the Plurinational Legislative Assembly and the Departmental Legislative Assembly, and more than 300 leaders from different organisations. The "Forest Pact" also calls on international companies whose supply chains and financial relationships have encouraged deforestation in Bolivia to join the effort. One of the reasons the Pact has been able to bring together different representatives of Bolivian civil society is the recognition that the expansion of the agricultural frontier can be done in a sustainable way, while protecting the forest. More than 4.6 million hectares of previously deforested land can be used for agriculture without sacrificing the forests that are the country's most significant treasure (El Llamado del Bosque, 2017).

Unfortunately, Bolivia is excluded from international private sector conservation efforts. This is partially due to the lack of concrete measures. An excellent example of such a measure is the soy and cattle moratoria implemented in Brazil. It has achieved a significant reduction in deforestation while promoting a more than twofold increase in productivity (El Llamado del Bosque, 2017).

In this project, the NGOs and CSOs were seen as possible supporting partners. In addition, they serve as inspiration for innovative approaches and potential supporting partners to transfer already existing solutions to the Chiquitano region.

#### **3.1.4 ACADEMIC RESEARCHERS (DJ)**

Senckenberg itself exhibits insight into the role of academic researchers in the region. The actions of Senckenberg researchers in the region provide an understanding of this particular stakeholder and what compels them to partake in specific activities.

An example of a scientific project being carried out in the Chiquitano region aims to determine how climate change affects frog species in the area. For this endeavour, Senckenberg

scientists stay at their research station in order to track the different frog's numbers and behaviour patterns. A second example is that of the WildLIVE! program, where citizen scientists based in Germany review footage from camera traps to help researchers extract helpful information such as which jaguar individuals are present (Jansen, project brief, March 25, 2021). These both demonstrate how academic researchers are motivated by the pursuit of knowledge as well as conservation interests.

Further information regarding the status of the scientific community in the region was provided by Alfredo Romero-Muñoz (2021), a Bolivian doctoral researcher residing in Germany. He explained that science "barely exists in the country" and attributes this as a reason for his decision to live abroad. This information suggests that the majority of this stakeholder group present in Bolivia would be made up of non-locals, such as the Senckenberg researchers. Additionally, it emphasises the potential opportunity for Bolivia's own scientific community to grow.

Additional information on academic researchers remains somewhat limited due to the limited access to people physically working in Bolivia. However, interviews with a number of Senckenberg scientists provided extensive information on the area's status and how it relates to their interests. For example, Dr. Matthias Baumann (2021) shared that, in his opinion, it will be nearly impossible to recreate the ecosystem that has already been destroyed as it takes a long time to grow such areas in the first place. This would have substantial implications for researchers whose work depends on these biodiverse regions.

Though academic researchers are primarily interested in science, it is clear that this science relies on the status of the environment. Therefore, it can be deduced that these values influence the decision-making processes of this stakeholder group. Understanding who the academic researchers are, and their possible motivations, helps to determine how they influence the current situation in Bolivia and how this influence might be amplified in the development of a solution for the Chiquitano Dry Forest region.

#### **3.1.5 LOCAL COMMUNITIES (VV)**

All four stakeholders are based around and influence the lives of the fifth stakeholder, the local communities. These communities in the Chiquitano region are primarily composed of indigenous Chiquitano and informally-called Highlanders who immigrated from the higher parts of Bolivia (Romero-Muñoz, 2021).

In Bolivia, the Chiquitano are estimated to be the most numerous indigenous people in eastern Bolivia and the frontier part of Brazil. Their number is estimated between 40,000 and 60,000 individuals (Fernandes Silva, 2018).

The name Chiquitos dates back to the time of the Spanish conquistadors and means "small" in Spanish. Said conquistadors assumed that the population was of small stature based on the low entrances of local dwellings. However, this is a cultural misunderstanding, as the low entrances only increase safety from local fauna and are not related to one's height (Fernandes Silva, 2018).

The most widely spoken language among the Chiquitano is Chiquito, also known as Chiquitano (Sorosoro, 2009). Both the language and the Chiquitano people originated in the missions of the Jesuits in the 17th and 18th centuries. The Jesuits aimed to influence the culture of the indigenous people with European culture and the Christian faith. For this purpose, several Jesuit missions were established in the region, six of which are still preserved today (UNESCO, n.d.).

Several small groups of native peoples were brought together in said missions, including the Kuruminaka, the Tapiis, and the Paunaka. From these isolated small communities, over time, the Chiquitano people emerged. The missionisation of the Chiquitano resulted in a mixture of traditional religion, shamanism and Christianity. The work of the missions can also be observed in terms of craftsmanship and agriculture (Fernandes Silva, 2018).

Because of their craft and agricultural expertise, the Chiquitano have always been highly regarded by various historical landowners. However, over the centuries, this has also resulted in increased levels of slave labour and exploitation to the detriment of the Chiquitano (Fernandes Silva, 2018).

Due to the region's lack of resources, the Chiquitano rely heavily on agriculture, while the people initially ensured their survival primarily through hunting. Today, crops grown in the region include corn and cacao, while the land is also used for cattle ranching.

The communities of the Chiquitano are largely self-governing. They are guided by the elected chief and a council. Often these leaders are distinguished by their youthful appearance and their knowledge of Spanish. Thus, they predominantly take over the communication to the outside. Society is divided into so-called clans, and the individual clans are led by the elders (Fernandes Silva, 2018).

Due to the Chiquitanos' history with outside influences and the harsh conditions on the ground, great emphasis is placed on collective work. Thus, many Chiquitano join together to form worker associations and host events for the community (Fernandes Silva, 2018).

Over time, the Chiquitano developed a stronger sense of cultural identity. While they were often looked down upon from the outside, in the 20th century, more communities began advocating politically for their people. There was a desire for independence and identity (Green, 2016). While years of political expertise eventually won a member of the Chiquitano, Eva Morales, the presidency of Bolivia, it did not solve all of their problems.

Corruption and personal interests quickly weakened the movement's political agenda.

In the eyes of the Chiquitano, unfair land distribution to the informally-called Highlanders and discrimination continue to fuel conflicts. Incoming landowners from the higher parts of Bolivia are destroying the ecosystem, according to the Chiquitano, due to a lack of knowledge about the lowland region. In this case, the Chiquitano serve only as cheap labour and get little chance to use their expertise sustainably (Green, 2019). Furthermore, this situation between the two groups brings with it increased discriminatory and sometimes racist tendencies. This deep conflict is complex beyond measure and difficult to assess from the outside (Jansen, feedback session, June 1, 2021).

In summary, local communities are traditionally knowledgeable about their region. Yet, they also have to face the problems of modernity, politics and also ensure their survival. Often, this requires compromises that tend to disadvantage the Chiquitano. Past revolutions have shown that the Chiquitano are quite willing to actively participate in positive change but often become victims of the larger and external circumstances (Green, 2019). With the help of suitable means of communication, this could certainly be supported and thus have a lasting positive influence on the project.

#### 3.1.6 SUMMARY OF KEY DRIVERS (VV)

After extensive research of the various stakeholders in the Chiquitano region, it can be observed that numerous different key drivers are gathered around one table. Although the stakeholders are connected and cooperate in various ways, they often pursue fundamentally different goals.



#### Figure 4: Stakeholders and their key drivers

Academic researchers seek a deeper understanding of the local ecosystem through their research on the region. This in turn can be applied to conservation, to protect these ecosystems.

Similar key drivers are shared by the various NGOs and CSOs in the region. They, too, are committed to the preservation of the environment. However, they are also increasingly providing social support. Since NGOs are usually strongly dependent on the values of their donors, it is naturally worthwhile for them to act in accordance with these values (MacArthur Wellstein, 2021).

The government has its past in the region. Previous missteps show that, at least in part, power and profit determine its actions. Of course, the country's economic situation must not be ignored. The government therefore has good reason to be interested in growth.

The private sector is also interested in financial growth. In order to achieve this goal as efficiently as possible, the sector is increasingly relying on inexpensive labour, such as the local population.

The local population is in contact with all other stakeholders, and the primary key driver of the population is survival. The survival of the respective communities must be ensured with the help of labour. Often, this goal is not necessarily compatible with the traditions and culture that the population holds dear. For this reason, resentment is spreading. Interests that have been competing for a long time lead to an increased desire for respect and freedom.

By researching the respective key drivers, valuable insights into motives and perspectives could be gathered, which can then be used profitably.

#### **3.2 FRAMING OUR PROBLEM (OF)**

What If Questions helped the authors to think about possible ways to address the underlying issues. The method has its roots in thought experimentation and helps remain open to new and more radical ideas, thus promoting creativity (Markov, 2020).

In the context of this project, the authors came up with three What If Questions that helped guide the action area development described in the next section.

- 1. What if there were better ways to make money than cattle ranching?
- 2. What if locals making a difference environmentally had a louder voice?
- 3. What if Senckenberg and citizen scientists were able to play a significant role?

# **POSSIBLE ACTION AREAS**

#### **4. POSSIBLE ACTION AREAS (KS)**

After extensive research, three possible action areas were defined. These aim to address many of the focal issues considered in the project, which are the consequence of specific circumstances like poverty, the exploitation of the natural habitat, and the conflict between farmers and predators. In this phase, the following solutions were considered: the establishment of ecotourism, a system to provide economic value to the environment in the region, and the protection of the jaguars. Based on these approaches, different possibilities were explored, which will be examined in more detail below.

#### **4.1 ECONOMIC VALUE (OF)**

Healthy ecosystems provide services to society. Water treatment, carbon sequestration, waste recycling, and pest and disease control are among the essential services nature provides us with and are crucial to society's maintenance. David C. Holzman's article titled "Accounting for Nature's Benefits: The Dollar Value of Ecosystem Services" from 2012 classifies these services into four different categories:

- Provisioning services like factories, provisioning services maintain the supply of natural products: food, timber, fuel, fibers for textiles, water, soil, medicinal plants, and more.
- 2. Regulatory services keep different elements of the natural world running smoothly. They filter pollutants to maintain air and water quality, moderate the climate, sequester and store carbon, recycle waste and dead organic matter, and serve as natural controls for agricultural pests and disease vectors.
- 3. Supporting services can be thought of as the services that maintain the provisioning and regulatory services. These services include soil formation, photosynthesis, and provision of habitat. Healthy habitats preserve both species diversity and genetic diversity, which are critical underpinnings of all provisioning and regulatory services.

4. Finally, cultural services are defined as the intangible benefits obtained from contact with nature—the aesthetic, spiritual, and psychological benefits that accrue from culturally important or recreational activities such as hiking, bird watching, fishing, hunting, rafting, gardening, and even scenic road trips. Increasingly, these services are being tied to tangible health benefits, especially those related to stress reduction.

The article also explains three ways of evaluating such services. The so-called "stated preference" involves surveying people on what they would be willing to spend on a particular service. "Revealed preference" can be determined from related actual purchases, for example, the expenditure people incur to travel to untouched places. "Replacement cost" is also a powerful way of determining value in that it looks at the cost of the least expensive technical fix as a replacement for ecosystem service (Holzman, 2012).

# 4.1.1 ECONOMIC VALUE: PROMISING & CHALLENGING ASPECTS (OF)

Generally speaking, the value of the services healthy natural ecosystems provide remains unaccounted for. Both policymakers and corporations often do not consider the fundamental value of their natural surroundings when making decisions. Natural resources such as oxygen and water are taken for granted. The President's Council of Advisors on Science and Technology (PCAST) in the United States explained there is a "widespread under-appreciation of the importance of environmental capital for human well-being and [...] the absence of the value of its services from the economic balance sheets of producers and consumers" (2011). PCAST argues for the inclusion of values of environmental health in decision-making. Additionally, John P. Holdren explained that "[...] technological substitutions for ecosystem services are often costly, sometimes to the point of impracticality, and that sometimes an incomplete understanding of how they function makes such substitutions impossible" (Holzman, 2012). Due to the immense complexity of the natural world, replacing a functioning ecosystem through technology is risky.

Interdependencies often only show once it is too late and (sometimes irreparable) damage to the environment has already been done (Holzman, 2012).

A range of institutions also argue for the use of such valuation efforts in conservation and offer tools, frameworks, or even software to do so. The World Bank's Wealth Accounting and the Valuation of Ecosystem Services (WAVES) "aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts." The wealth accounting approach that the initiative promotes aims to estimate using the total wealth of a nation, including Natural and Human Capital factors. WAVES also argues against the usage of GDP as a sole indicator. A country can exploit its natural resources to drive up GDP, but the depletion of wealth that is happening simultaneously is not being captured by the GDP. Thus, the indicator promotes unsustainable behaviour instead of looking at long-term prosperity (WAVES Partnership, 2021).

Stanford's Natural Capital Project (NatCap) came up with InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs). InVEST publishes open-source software models that can value the goods and services that nature provides. The software creates a spatial model of the region on several dimensions, such as Crop Pollination, Habitat Quality, Fisheries, Urban Cooling, Water Purification, Urban Flood Mitigation, Carbon, and many more (InVEST, 2021).

The Economy for the Common Good also provides an economic model which makes a good life for everyone a primary goal in decision-making. This model can be applied to the public as well as the private sector. First, a Common Good balance sheet is created, and a score is given. Next, the Common Good indicator tracks the quality of life and allows for a regular review. The Economy for the Common Good also promotes companies' achievements and pioneers through awards. Ultimately, the score could be used to favour companies with a good balance regarding purchasing or awarding contracts (Lindner et al, 2021).

Several governments have already recognised the inherent value of ecosystem services. Costa Rica paid landowners 42 USD per hectare annually to protect the forest in 1996, a point in time during which the country, relatively speaking, cut down more trees than any other country in the world. Costa Rica moved from having one of the highest rates in the world to one of the lowest (Holzman, 2012).

Despite these promising initiatives making the method more accessible and easier to implement, some difficulties are still involved in valuing ecosystems. One factor that needs to be considered is that there is still a lot to understand about ecology. The natural world is one of the most complex systems there is, and modelling benefits, effects, or replacement needs to deeply involve experts in the field to be robust (Holzman, 2012).

Next, there are significant error bars involved in such models. Even when involving experts, assumptions will have to be made, and the ranges calculated in such studies can vary widely. In the case of the article on Canadian Sea Otters ("Cascading social-ecological costs and benefits triggered by a recovering keystone predator"), the estimate for the predicted increase in catch of lingcod ranges from 2 to over 30 million CA\$ per year (Gregr et al., 2020). The authors address this concern by acknowledging that e total economic value will be a net positive even at the low end of their estimations. When making the assumptions for the model, the person applying the valuation technique must be careful to avoid any bias. As such models are typically used to argue for conservation, there could be a danger of overstating specific values for the final result to come across even more dramatically. Any model should be expected to be criticised and evaluated by third parties and therefore must be set up as objective as possible to be robust (Holzman, 2012).

Lastly, the valuation of ecosystem services is a cumbersome and lengthy process. For example, one study assessing the worth of pollination, conducted at the University of Vermont, involved hand-pollinating flowers tin simulating maximum pollination and covering some flowers to affect no pollination as pollination is only one of many drivers of an ecosystem's value and research methods differ widely, depending on which driver is being assessed, creating a holistic picture requires intense investment (Holzman, 2012).

#### **4.1.2 ECONOMIC VALUE: EXAMPLE ACTIONS (OF)**

Referring back to the Chiquitano Dry Forest, and based on the information above, it is hypothesised that calculating values for services provided by the ecosystem could be beneficial in several ways:

- Uncover services that the ecosystem offers that might not have been explored yet.
- Educate on how a healthy ecosystem benefits the region and society economically and how the destruction of any ecosystem destroys said value.
- Exhaustively identify areas that economic value could additionally be derived from (e.g., ecotourism) to alleviate poverty.
- Quantify the value of services provided to assess potential and support decision-making.
- Advance the understanding of the connection between the services nature provides for humankind and how humankind impacts the provisioning of said services.

#### 4.2 ECOTOURISM (KS)

Poverty, a lack of alternatives, and ignorance of ecological interrelationships drive many people in emerging and developing countries to intensively use the natural resources of their environment to the point of irreversible overexploitation. In addition, corporations endanger and destroy natural areas primarily due to economic interests, like exports and mass tourism. Mass tourism has been extensively criticised for the negative environmental and social impacts of its development. Most research has shown that tourism development, although generating revenue for the destination, is associated with habitat destruction, increased water and energy consumption, increased littering, disruption of local social values, social imbalances and child labour and/or prostitution, among other negative impacts (Blumstein et al., 2017).

Many local people do not benefit from mass tourism due to low economic gains and high environmental and socio-cultural costs, raising concerns about the meaningfulness of the visit. Furthermore, most tourism businesses are developed as small islands where local people are excluded or work as low-paid employees. Tourism development also poses a threat by way of its impact on protected areas and biodiversity conservation, primarily through the destruction of roads and habituation of wildlife (Blumstein et al., 2017).

In contrast to this is the increasingly popular approach of ecotourism. When introduced in the context of pro-poor tourism, ecotourism can be understood as a strategy that focuses on increased economic benefits, non-economic impacts, and political processes that should, to some extent, benefit local communities. The economic benefits of ecotourism include the expansion of business as well as employment opportunities. Non-economic benefits include capacity building, empowerment of poor people, and mitigation of tourism's environmental and socio-cultural impacts on local communities. Furthermore, policy processes include building supportive and planned frameworks that enhance the local community to participate in decision-making processes (Blumstein et al., 2017).

#### **4.2.1 ECOTOURISM: PROMISING & CHALLENGING ASPECTS (KS)**

The impact of tourism on the environment and culture cannot be denied. The development of tourism has increased the amount of environmental damage and the negative impact on the culture and society of the host countries, which is partly due to the sheer mass of travellers and their lack of environmental and social awareness. Therefore, alternative approaches and new concepts for tourism began to be developed in the mid-seventies, evolving into ecotourism (Viegas, 1998).

To ensure that there is less cultural and environmental damage, indigenous people and communities should at best be included in the tourism industry and especially in ecotourism. It is essential to preserve indigenous knowledge in ecotourism because it encompasses people's skills, experiences, and insights to maintain or improve their livelihoods. This brings economic and social progress and success within the communities themselves. Indigenous people have a deep understanding of their environment that is passed on to new generations.
Therefore, indigenous knowledge cannot be ignored concerning sustainable tourism, as they have more knowledge and deeper insights to share about the area or territory (Hoyme, 2016).

Examples of sustainable tourism include eco-tours, eco-lodges, hunting and fishing tours, cultural villages and other nature-based tourism facilities or services. Indigenous ecotourism can thus be understood as nature-based attractions or tours incorporating indigenous interpretation of the natural and cultural environment, including wildlife (Hoyme, 2016).

In many ways, sustainable tourism exemplifies the relationship between ecotourism and sustainable development and focuses on three focal areas:

- Quality The valuable experience for visitors and increased life quality for host communities due to cultural identity, poverty reduction, and environmental quality;
- Continuity Exploitation happens at the appropriate level that allows the preservation and regeneration of the local and natural resources;
- Balance Should be between the needs of the tourism industry, environmental protection, and local communities by an equitable distribution of benefits among stakeholders (Kiper, 2013).

In the following, the opportunities and challenges of ecotourism are further discussed. First of all, ecotourism creates jobs for local communities when they are involved in sustainable tourism projects. By choosing local companies as suppliers or partners, regional value creation can be strengthened, which contributes to a reduction of environmental exploitation and thus to the protection of the surrounding natural areas and the species living there. Furthermore, the locals develop an awareness of the value of natural resources and how they can be marketed in the best and most sustainable way.

Another advantage is the implementation of energy-saving measures and sustainable transport concepts. Ecotourism should consider the social, cultural, and regional conditions to

develop tourism concepts together with the local population that promote the common good, the quality of life, and local prosperity. At best, this can promote socio-cultural participation as well as the self-reliance of the communities. With the creation of new jobs, the establishment of fair working conditions must not be ignored. This includes fair pay and the introduction of protective measures for workers (Ecotourism, 2021).

To make tourism as sustainable as possible, the focus must be on an intact natural landscape, the reduction of pollution of air, water, and soil, the reduction of greenhouse gases, minimal interventions in natural areas, animal welfare measures, efficient and minimal use of resources, as well as implementing short- and long-term climate protection concepts, e.g. through the use of renewable energies. Ecotourism strengthens and promotes a sense of responsibility towards nature and the environment and understanding and respect for other cultures among tourists and hosts. Thus, ecotourism is also a platform for intercultural exchange (Ecotourism, 2021).

On the other hand, there are also challenges and limitations. If ecotourism becomes a mass travel trend, the positive effects can turn into negative ones. The growing demand for travelling to undeveloped, near-natural areas feeds this trend. Inevitably, encroachment on previously untouched ecosystems increases. This threatens biodiversity, regional ecosystems and local communities (Ecotourism, 2021). Another crucial factor is the journey to the holiday destination. The high CO2 emissions of a long-distance flight contradict the basic idea of ecotourism (Ecotourism, 2021). Although ecotourism is not a universal remedy and requires constant monitoring, it is a viable option for overcoming poverty and protecting biodiversity.

## **4.2.2 ECOTOURISM: EXAMPLE ACTIONS (KS)**

To give an insight into the successfully applied ecotourism concept, the example of Nepal's country will be described in the following. Some developing countries like Nepal are beautiful for tourism due to their unique natural environment and culture. Nepal is a successful example applied to the ecotourism concept. Here, ecotourism creates sustainable jobs for the unskilled labour force in rural areas through community-led tourism activities to conserve natural ecosystems. Nepal is a small country covering 147,181 square kilometres with a wide variety of topographical and eco-climatic features and is rich in natural and cultural heritage. It is known for its physiographic and eco-climatic features such as the Himalayan mountain ranges, protected areas, rich biodiversity, spectacular scenery, exceptional cultural heritage, and ethnic diversity (IntechOpen, 2016).

It is necessary to appropriately manage these tourism resources to attract enough tourists and not overburden the given resources. Nepal receives the most significant number of international tourists and is experiencing rapid tourism growth. The Nepalese government has also identified ecotourism as a vital sector that contributes significantly to environmental protection, employment generation, and socio-economic development (IntechOpen, 2016).

In rural areas, community-based tourism has been established in protected areas, which supports the livelihood of local communities by providing opportunities for national and international visitors to participate in community activities. For example, the Nepalese government has developed national parks, wildlife sanctuaries, buffer zones, protected areas, and heritage sites to conserve wildlife and promote ecotourism. In the villages of Kaski, Tanahu, Syangja, Lamjung and Gorkha districts in western Nepal, sustainable tourism already provides an alternative, reliable and sustainable source of income (IntechOpen, 2016).

#### **4.3 JAGUAR PROTECTION (DJ)**

Protecting the endangered jaguars as an umbrella species for the Chiquitano Dry Forest ecosystem could be a potential direction for developing a solution. There are some existing actions already taking place in Bolivia, which provide helpful context for the problem.

In recent years, there have been notable efforts to strengthen protection for jaguars in South American countries. A roadmap formulated through collaboration between 14 countries and integral organisations addressing conservation issues was in 2018. It outlined a plan to bolster jaguar protection significantly by the year 2030. Some specific steps mentioned include coordination of efforts, strategy formation, sustainable development that allows for jaguar corridors, and increased financing for such actions. Additionally, a yearly International Jaguar Day launch was revealed to raise awareness of the problem (UNDP, 2018).

Shortly after, another multi-state cooperation echoed this approach in 2020. Costa Rica proposed that the jaguar be included in appendices of the Bonn Convention and was supported by Bolivia, Paraguay, Uruguay, Peru, and Argentina. This measure should enable countries to work on international agreements to benefit the jaguars (UNEP, 2020).

In addition to the threat of habitat loss, jaguars are also susceptible to illegal wildlife poaching. There is an increased demand from China for jaguar meat, skin, bones, and teeth, in correlation to the depletion of Asia tiger populations. These animal parts are smuggled out of South America by established networks of people. This illegal export system poses a significant threat to the dwindling numbers of jaguars in South America (van den Heuvel, 2020a). However, in 2019 signed on to the Lima Declaration, which addresses the illegal trade of wildlife and recognises jaguars as a flagship species for the region (UNEP, 2020). Furthermore, in 2020, a coalition of ten organisations in Bolivia have teamed up on an initiative to oppose the illegal poaching of wild predators. SAVIA, the Wildlife Conservation, and Panthera are responsible for arranging this plan of action. The organisations plan to collaborate on sharing knowledge and creating real change on this issue (van den Heuvel, 2020b).

The recent collaborations formed on jaguar protection are starting to tackle the issue, though there is a long way to go before natural conservation is achieved. Some inspiring examples from predator protection efforts around the globe provide insights into what challenges and opportunities might arise when implementing conservation strategies and share some specific tactics to consider.

# 4.3.1 JAGUAR PROTECTION: PROMISING & CHALLENGING ASPECTS (DJ)

Research Associate Sanjiv Fernando (2021) at RESOLVE, an NGO for sustainable solutions, notes some promising tactics for addressing human-wildlife conflict. He mentions that predator protection initiatives are more likely to succeed in working together with strong partners on the ground, such as well-established NGOs. It is likewise beneficial to ensure that local communities are empowered to take ownership of projects that are in rural areas and manage them independently (MacArthur Wellstein, 2021). Chitwan National Park in Nepal is a successful example of a park that protects species as well as benefits local communities, where indigenous populations are allowed to use the forest for their traditions and purposes, and a portion of the tickets also go towards the region's people (Fernando, 2021). Furthermore, donors have plenty of funding opportunities, though such agreements often come with constraints (MacArthur Wellstein, 2021). Based on these strategies and examples, there are ample opportunities to mitigate the Chiquitano region's conflict to successfully mitigate the Chiquitano region's conflict.

However, challenges are likely to arise when implementing protection measures for animals such as the jaguar species. One issue that can occur when implementing a project is to unintentionally shift the problem, for example, from one side of a national park to the other. A project that protects livestock in a given area may reduce the amount of human-wildlife conflict and force predators to look elsewhere for food. If no suitable option is available, they could resort to hunting cattle in a different village without protective measures and instigate the same conflict once again. Additionally, much of this work relies on land-use planning, a historically complex and slow process. Further complicating matters is the frequent requirement to collaborate with governments, for instance, in national parks. Lastly, environmental efforts sometimes occur at the expense of local people and create negative social consequences (Fernando, 2021).

#### **4.3.2 JAGUAR PROTECTION: EXAMPLE ACTIONS (DJ)**

Several specific actions are being implemented to diffuse tension between humans and predator species worldwide. Some traditional techniques include predator-proof enclosures for livestock and dogs or shepherds to watch over herds (Linnell & Cretois, 2018). An example from

CLAWS Conservancy shows the advantages of creating communal flocks in Botswana, with 80% of a village's livestock (CLAWS Conservancy, 2021). These herds have certified herders that are responsible for the health and protection of the cattle. The organisation Panthera describes another method of mixing in enormous wild buffalo with a herd to deter attacks on the smaller animals (Panthera, 2021). Implementing emergency response efforts also provides an alternative to a dependency on aggressive action towards wild predators (African People & Wildlife, 2021). These methods are straightforward and perhaps simple to put into action.

Education is also a form of traditional conservation efforts. Krishna Tiwari (2021), a wildlife conservationist at Sanjay Gandhi National Park in India, cites awareness campaigns as a significant device for leopard protection. He explains that locals are less likely to engage in conflict if they have a foundational understanding of how to behave around leopards, such as a "do's and don'ts" list. Fernando (2021) also points out the benefit of farmer-to-farmer training, in which local community members share helpful information for avoiding human-wildlife conflict with each other. Providing education or supporting communities to spread it themselves could be an essential part of a predator protection plan.

The previously discussed concepts of ecotourism and increasing the economic value of nature are also applicable in conjunction with jaguar protection. When done effectively and appropriately, Fernando (2021) explains that ecotourism can be a plausible way to promote the presence of predators as a valuable flagship species. Furthermore, CLAWS Conservancy promotes selling wildlife-friendly beef at tourist lodges to profit from the protection of predator species (CLAWS Conservancy 2021). Another form of economic incentive is exemplified in the program "Cameras for Conservation: Direct Compensation as Motivation for Living with Wildlife" from The Center for Growth and Opportunity (CGO) at Utah State University. This program offers payments to landowners each time a relevant predator species image is captured, acting as an incentive to allow the wild species on their land and even protect the ecosystem these animals require (Huggins et al., 2021). Each of these techniques influences people to support predator protection by offering tangible benefits to a community.

Evolving technologies are opening up new possibilities for the conservation of predators. Fernando (2021) describes LionShield, where collared lions trigger an alarm when approaching a particular radio transmitter placed strategically by livestock. This startles the predators away from the animals they had been hunting for prey. Because the alarm is set off by the lion's movements, there are low chances of habituating and learning to manipulate the system. CLAWS Conservancy uses a similar method, where alerts are sent to villagers when a collared lion nears the area successfully to give them a proper warning. This has helped the locals minimise instances of conflict by 50% and demonstrates the effectiveness of these emerging conservation options (CLAWS Conservancy, 2021).

RESOLVE also employs a second useful technology called TrailGuard AI. This tool relies on camera footage and AI to assess who enters an area and determine an appropriate response. For example, the system might recognise a farmer or a cattle rancher going to collect a lost animal, which would not necessitate a response. It might identify multiple people with weapons and vehicles that are likely to be poachers. The appropriate authorities would be sent to handle any potential problems. This type of technology can also note the predators' movements and warn villages of their presence (Fernando, 2021). This particular example shows how progressive technology can be harnessed for the advancement of conservation.

These actions hold promise for opportunities to protect the jaguars in Bolivia, and subsequently, the Chiquitano Dry Forest ecosystem that makes up part of their habitat. The various concepts, details, and logic introduced through these examples provide ideas to consider when developing a potential solution for the region.



# POSSIBLE APPROACHES

#### 5. POSSIBLE APPROACHES (DJ)

Many approaches emerged from secondary and primary research, mainly through interviews with professionals of various backgrounds who work with communities in rural settings worldwide. These approaches are techniques for working with local people in a positive, effective, and respectful manner.

#### **5.1 LOCAL CHAMPIONS (DJ)**

Local champions are members of a community who take on the role of furthering a particular proposed initiative. They have better chances to influence their peers as a result of coming from the same background. When these local champions share what has worked for them, there is a response of trust and willingness (Fernando, 2021).

This could be exhibited in the form of farmer-to-farmer training on a simple scale. For example, some farmers who have learned a particular strategy using chilli as a deterrent to elephants in the case of human-wildlife conflict in Sri Lanka might choose to share their experience and knowledge with other farmers. When the implemented strategy supports specific behaviour, such as taking non-aggressive action to protect crops and cattle from wildlife, these farmers become local champions by demonstrating the desired behaviour with the issue at hand (Fernando, 2021).

Another example of local champions which is more complex and structured would be the Warriors for Wildlife program in Tanzania. The Warriors are a team of local community members dedicated to protecting lions, in conjunction with the organisation African People & Wildlife. Using ArcGIS technology, they can respond immediately to any lion-related conflicts that arise, such as threats to cattle or uncomfortably high numbers of predators. They also take responsibility for spreading the Living Walls program, a design solution to create an enclosure for livestock out of trees. The Warriors are victorious at these jobs because they understand the local culture and know-how to handle clashes of opinion and high-pressure situations (African People & Wildlife, 2021). The acceptance of solutions from within the community rather than outside of it was a concept that arose multiple times during the research process.

Based on this information, it would be highly beneficial to consider incorporating the participation of local individuals in a solution. Community members who authentically embrace the proposed initiative would increase the likelihood of a lasting and effective solution.

#### **5.2 POSITIVE DEVIANCE (DJ)**

Along the same lines of pursuing change through individuals within a given community is the concept of positive deviance. Jess MacArthur Wellstein (2021), a Water, Sanitation and Hygiene (WASH) and Gender Specialist, described this approach as "finding those people that are [already] doing the behaviours or the actions that you want", and expands that these would be people who are acting in favour of the proposed initiative, perhaps even unintentionally.

MacArthur Wellstein (2021) recommends exploring why these people are exhibiting such behaviour, what is motivating them, and encouraging them to act as an example and influence others in the community. The strategy is based on looking for what helpful factors are present in the community rather than focusing on what is lacking. This is also known as a strengths-based approach.

On a larger scale, positive deviance can be identified in certain groups of people as well. Fernando points out that indigenous populations are frequently better stewards of the environment than other stakeholders. Romero-Muñoz (2021) further backs up this notion, illustrating that the Chiquitano indigenous communities have lived in harmony with nature for centuries.

Although focusing on indigenous behaviour alone is unlikely to solve a problem for reasons such as power imbalance, the positive deviance approach suggests that it would be worthwhile to explore what aspects of the local Chiquitano culture could be highlighted and amplified to further biodiversity and conservation goals.

#### **5.3 POSITIVE INCENTIVES (DJ)**

To further support a positive and inclusive approach is the concept of positive incentives. The program "Cameras for Conservation: Direct Compensation as Motivation for Living with Wildlife" from the CGO emphasises the benefits of this approach. This project, which pays landowners for any relevant photos captured through wildlife camera traps, shows that using rewards can help influence how locals in the area regard conservation. When there is a tangible and personal value attached to certain conservation efforts, people are more likely to support them. The CGO also recommends against any adverse consequences to be respectful of the local cultures and foster collaboration towards conservation achievements (Huggins et al., 2021).

The notion of providing rewards, particularly in the financial sense, could be beneficial based on some background information about the Chiquitano region shared by Romero-Muñoz (2021). He explains that many people in Bolivia are not equipped to become environmental activists, as they have more pressing social and political matters to attend to. MacArthur Wellstein (2021) also referenced a similar example from the media channel Vice, describing locals in Borneo living nearby to areas of mass deforestation for palm oil. In this case, the village chief explains that his people cannot take any action before improving their financial standing (Vice Asia, 2021). These scenarios underscore how significant a financial incentive might be in the Chiquitano area.

#### 5.4 COMMUNITY BUY-IN (DJ)

Due to the precarious financial status of many rural communities, the community buy-in approach may seem counterintuitive at first. Fernando (2021) describes how this strategy of requesting local community members to pay a fee for specific project equipment has been successful for RESOLVE's work worldwide. When people are given an item for free, they are less likely to feel a sense of attachment or responsibility to it. Therefore, equipment for an initiative that is simply handed out often gets used for a short while before being set aside and forgotten.

However, if the local community chooses to commit their shares to the project, the chances of the equipment being continuously used increases; this makes sense, as the community members would not choose to invest in an idea they did not believe would be beneficial. This technique could help gain participation and test whether a concept will be successful in a community such as in the Chiquitano region. It will become evident that a specific initiative is not worth pursuing if none of the locals in an area think that it is worth contributing to. Contrarily, suppose community members are excited about an initiative and believe it will bring them more success. In that case, this might become clear in their willingness to take responsibility for part of the costs.

#### 5.5 LOCAL PARTNERS (DJ)

An important strategy for achieving acceptance of a certain initiative is that of local partners. Fernando (2021) and MacArthur Wellstein (2021) both note that maintaining local contacts who are well respected in the area will open up opportunities that would otherwise not be available. These contacts can be in the form of existing organisations which have already attained a good name in the region and can provide social cover for the new initiative, or can be individuals who share the same culture and are more effective than outsiders (MacArthur Wellstein, 2021). These connections help to combat any suspicion that a community might feel towards outsiders, however sometimes even a local person who lives in a nearby city will still be doubted by a community compared to one of their own members (Fernando, 2021). MacArthur Wellstein (2021) emphasises that this process of establishing local partners takes time, but is important to do as outsiders may never be fully accepted into the community.

Natasha Kalam (2021), a Maternal, Child Health and Nutrition (MCHN) Coordinator with Helen Keller International in Bangladesh, suggests a direct way to handle this approach by hiring local community members to work on the project. She elaborates that their ability to communicate in the same dialect and their understanding of the culture are immensely important for ensuring initiatives that are well-designed and appropriate for the local community. Furthermore, Kalam recommends including the influential members of a community in the project as partners, as this increases local ownership and encourages others to participate.

For the Chiquitano region, this approach could include identifying established organisations in the area as possible partners as well as finding individuals from the rural communities to be a part of the project, either out of interest or for employment opportunities. Including local partners would not only increase trust of the project, but also provide insight into the views of the community members for developing increasingly better solutions.

#### 5.6 RESPECT FOR THE LOCAL CULTURE (DJ)

Although it is challenging to find acceptance as outsiders to a community, respecting the local culture is necessary for bridging this gap. As mentioned above, the CGO believes there are higher instances of success when acting respectfully towards local norms instead of trying to change or punish them (Huggins et al., 2021). MacArthur Wellstein (2021) exemplifies this approach by making an effort to follow local customs. She recommends wearing an appropriate cultural dress when interacting with a community and attempting to learn the local language. In a broader sense, she also discusses respecting the opinions of the community. Sometimes the viewpoint of donors and project managers do not align with that of the community member, and yet they may all have valid points. In this case, MacArthur Wellstein has an open discussion with the community, explaining the resources available and asking if they can explore areas where the interests of each party overlap.

Despite the lack of direct contact with Chiquitano community members in this project, it is essential to consider cultural differences and attempt not to make inappropriate assumptions. To pursue this aim, considering ways to support local people in taking ownership of the project and learning about them in-depth can create a foundation to build off of.

#### 5.7 AWARENESS AND EDUCATION (DJ)

In order to cultivate respect, thoroughly understand the situation, and communicate effectively, awareness and education play an essential role. This means learning about the local people and current situation and contemplating how to be understood.

Some effective techniques include carrying out personal research and making the essential local partners' connections previously mentioned (Fernando, 2021). Media such as Youtube and movies from the local culture can be included in this background research to provide an inside look at the region from afar (MacArthur Wellstein, 2021). Furthermore, the opportunity to speak to individuals is precious, as they might reveal important information relevant to the project.

For example, Fernando (2021) explains that sometimes certain customs inform a community's behaviour, such as relying on traditional mantras as a form of safety against predators or believing predator attacks result from their bad behaviour. These beliefs are essential to understand and respect during the process of addressing human-wildlife conflict.

It is also necessary to be aware of some potential downfalls concerning projects with good intentions. Fernando (2021) points out that Westerners aim to protect the environment but fail to understand, respect, and include the local communities. This results in what can be called colonial conservation, where foreigners impose their agenda favouring the environment at the cost of benefits for the local communities. Another problem that can arise would be unintentionally shifting a problem, as mentioned previously, regarding jaguar protection if project managers do not have a holistic understanding of the area. Lastly, parachute science, in which researchers from abroad have little interaction with local communities, creates a weakened ability to impact positively. These projects failed during Covid-19, while solid networking and partner programs continued to flourish. Being aware of these failures can help to avoid them in future initiative implementation.

Once a solid understanding of the local culture and situation is established, it is then produced to develop effective ways to be understood. MacArthur Wellstein (2021) considers their literacy level and what education forms will have the most significant impact to communicate information with community members. She finds the visual appeal of slideshow presentations and flashcards particularly helpful, in addition to having personal, informal conversations while drinking tea together. Regarding communicating with influential people in the community, a successful tactic is to accompany them on monitoring visits or cross-learning visits. In this circumstance, which often takes form in a walk to survey the area, the authority monitors the project's progress. In contrast, the project representative has specific talking points to cover. By the end, the influential person might understand the integral problems to address rather than outright insisting there are no issues.

The insight from this approach highlights the importance of understanding the Bolivian, and specifically Chiquitano culture by learning intentionally and holding space open for cultural differences and the possibility to adjust accordingly. It is also necessary to explore ways to communicate in the region that will be respectful and effective.

# **POSSIBLE TOOLS**

## 6. POSSIBLE TOOLS (DJ)

Through discussion with MacArthur Wellstein, several vital tools were identified based on the methods she implements in her current work in rural communities across South Asia. These included concentric circles, empathy mapping, participation ladders, and a 3x3 matrix for determining action to target different stakeholders across various scales. Some of these tools overlap with well-known design methods, particularly concentric circles and empathy mapping.

#### **6.1 CONCENTRIC CIRCLES (DJ)**

Concentric circles are based on the Theory of Change and focus on what specific actions can be taken to influence results to create a domino effect towards the desired outcome (MacArthur Wellstein, 2021). The Theory of Change suggests identifying the overall intention to clarify the gap between the current situation and the goal (IDEO.org, 2021). This is demonstrated in the concentric circles, where the outermost ring represents the impact that should be achieved. The innermost ring represents the direct actions available to those seeking a solution (MacArthur Wellstein, 2021). Therefore to use the circles, it is logical to start from the outer ring and work inwards.



Figure 5: Concentric Circles Filled From the Outside for Project Orientation

The concentric circles were helpful in the project to provide perspective on the desired outcome and potential ways to approach the issue. Based on the project brief, the outermost ring was identified as addressing threats of human-wildlife conflict specifically relating to jaguars, fire season, and deforestation based on land-use change primarily for the cattle industry. The identified possible action areas fit within the middle rings of the circle as relevant and conceivable target areas. Founded on the outer two rings was a different narrowed-down approach in the innermost ring, focused on possible action, which led to initial solution concepts.

#### 6.2 EMPATHY MAP (DJ)

An empathy map is a commonly used design tool, often to enhance user experience based on understanding what the user thinks, feels, says, and does (Gibbons, 2018). It can also be used to assess the pains and gains of the user, which MacArthur Wellstein (2021) does by asking, "what are the incentives and the barriers for each of [the] different actors to do a particular behaviour or to do something differently?". This provides deeper insight into what sticking points might need to be addressed for specific stakeholders and what kinds of motivation might be advantageous to pursue.

Empathy mapping for the various stakeholders of the Chiquitano ecosystem was insightful for determining where to focus. Some of the stakeholders were easier to understand, with clear intentions and actions, such as local communities and academic researchers. Others remained difficult to obtain information on or demonstrated contradictory behaviour, for example, the government. This helped narrow down which stakeholders were worth including in the solution development phase and explained more in detail.

#### 6.3 PARTICIPATION LADDER (DJ)

The participation ladder, formulated in 1996 by Sarah White, is a scale to illustrate the extent to which a local community plays a part in a given initiative (MacArthur Wellstein, 2021). MacArthur Wellstein (2021) points out that it is ideal to have the most outstanding amount of local participation, or the highest rung on the ladder, although this is impossible to achieve. This

is particularly the case in terms of funding, where donors have their specifications and requirements that might interfere with communities' ability to take complete ownership of a project.

Although this tool was not directly implemented during the project, it helped provide a context around local participation. The participation ladder supported a strengthened resolve to place Bolivian communities at the centre of the process and promote solutions that enable local individuals to take ownership of ecosystem protection.

## 6.4 3X3 MATRIX (DJ)

MacArthur Wellstein (2021) implements a 3x3 matrix examining various stakeholders and scales in terms of determining different types of action to take. On one side of the matrix are the main stakeholders: the government, private sector, and NGOs/CSOs. On the other side are levels of scale, for example, local, regional and national. The intersections of these axes provide various situations to consider. For example, what can be done on a national level in collaboration with NGOs versus what can be done on a local level with lower-level government officials. This opens up perspectives that may not have been considered before and fosters a holistic systems approach that considers the whole situation and its collective parts.

Though this approach was not directly applicable to the project due to limited scope, it was informative in examining the problem holistically and considering what actions could be done with various stakeholders, mainly at the local level.



DECISION-MAKING BASED ON CLIENT FEEDBACK

# 7. DECISION-MAKING BASED ON CLIENT FEEDBACK (AD)

Based on the feedback from Senckenberg in the First Interim presentation, a few constraints and possible directions were highlighted. The main observations were about the stakeholders, namely, highlanders from the local communities and the academic researchers. Although the authors conducted extensive research into the stakeholders, the experts who worked there guided them to understand the situation better. These two decisions led them in a constructive direction as they continued developing a concept.

#### 7.1 EXCLUDING HIGHLANDERS (AD)

It was deduced that out of the two local stakeholder communities, namely the Chiquitano and the Highlanders, the latter community would be challenging to include in the project due to complex social relations in the area. Hence, it was made clear that the highlanders were not a feasible stakeholder to pursue.

## 7.2 INCLUDING ACADEMIC RESEARCHERS (AD)

The academic researchers and the scientific community in Bolivia were also considered a stakeholder by the authors. It was discussed during the feedback round whether to include them as stakeholders or not. This brought into question Senckenberg's role in the region and their potential to make a difference. Therefore, considering their already established infrastructure and proximity to the locals around, it was concluded to retain academic researchers as stakeholders in further strengthening their participation and making them a key focus in the ideation process.





#### 8. IDEATION (KS)

IDEO (2020) describes the ideation phase as the mode of the design process, which concentrates on idea generation. It represents a mental process of "going wide" in terms of concepts and outcomes. It provides both the fuel and the source material for building prototypes and getting innovative solutions. During the ideation phase, the core of the design thinking process, several design methods were applied. Each of the creative processes contained multiple cycles of iteration to move closer to sophisticated solutions. To develop a wide array of ideas, the following methods were used: the Empathy Map, How Might We Questions, brainstorming, and the How Now Wow Matrix, which will be examined in more detail below.

#### 8.1 EMPATHY MAP (KS)

To find solutions to the problems and needs of the target group and better understand them, the Empathy Map method was chosen (See Fig. 8.1.1). The empathy map is a simple but very effective tool for gathering assessments of the perceptions and feelings of the target group. The map is divided into several fields:

- Seeing: What does the person see on a typical day? What does she see in the defined situation? What does she see when she looks at the market of providers of possible solutions?
- 2. Hearing: What acoustic impressions does the person hear in the situation (sounds, voices, street noise, etc.)? What does the person typically hear from people around her? What information is she exposed to?
- 3. Acting: What does the person do on a typical day? What does she do in the defined situation? What are regular statements for them?
- 4. Thinking & Feeling: What does the person think and feel on a typical day or in a specific situation?
- 5. In the classic Empathy Map, two more aspects are added: Pains and Gains.

- 6. Pains: What are the person's fears, worries, problems?
- Gains: What are the person's wishes, dreams, needs? (Empathy Maps, 2021)



Figure 6: An Empathy Map for the Local Communities Stakeholder

Knowing that, the method was applied to several sectors: the government, the academic researchers, the NGOs and CSOs, and the local communities (See Fig. 6).



#### Figure 7 : Empathy Maps for Each Stakeholder

By using the Empathy Map method, the understanding of local problems could be increased. New perspectives were considered, and thus new approaches to possible solutions could be identified. In particular, it became clear that there were some knowledge gaps in understanding the government and the private sector. Therefore, these stakeholders were identified as unsuitable for the main focus of the project. Instead, academic researchers, local communities, NGOs, and CSOs, who the authors all better understood, became integral stakeholders involved in the solution.

#### **8.2 HOW MIGHT WE QUESTIONS (KS)**

Another design method implemented was How Might We Questions, which are helpful to begin considering how to approach a problem. David and Tom Kelley (2015), authors of Creative Confidence, describe this method in detail below.

"A good "How Might We" question should not be so narrow that it suggests a solution (even if it's a good idea). Initially, you are just trying to capture the problem, not jump to possible solutions. It should also not be so broad that it impedes the flow of ideas (rather than generating them). A good "How Might We" question should allow someone to come up with ten different ideas easily" - David Kelley & Tom Kelley, authors of Creative Confidence (2015)

Using the How Might We Questions method, the authors tried to see the identified problems as an opportunity for innovative design thinking. By framing the challenges as How Might We Questions, they set themselves up for a creative solution. The collected insights and identified problem areas were considered in this question form so that they offer the chance to be answered in a variety of ways. The questions do not frame one particular solution, but give a frame for innovative thinking.

First the authors focused on the statements that have been collected and rephrased them so that several How Might We Questions could be collected. After that, the list of the questions was narrowed down to those that generated a high number of possible answers and became a launchpad for further brainstorms.

The following questions were chosen to work further on:

- 1. How might we shift the focus away from unsustainable land use as a source of income?
- 2. How might we reconnect people to nature to protect the local ecosystem?

#### **8.3 BRAINSTORMING (OF)**

Another method that was applied in the Ideation phase is brainstorming. Widely used and relatively easy to conduct, it is a popular approach to develop a wide array of ideas. The Design agency IDEO.org (2021) explains that "[...] the goal isn't a perfect idea, it's lots of ideas, collaboration, and openness to wild solutions." The agency also lays out seven steps that have been followed in the Brainstorming session of this project:

1. Defer judgment. You never know where a good idea is going to come from. The key is to make everyone feel like they can say the idea on their mind and allow others to build on it.

2. Encourage wild ideas. Wild ideas can often give rise to creative leaps. In thinking about ideas that are wacky or out there we tend to think about what we really want without the constraints of technology or materials.

3. Build on the ideas of others. Being positive and building on the ideas of others take some skill. In conversation, we try to use "and" instead of "but."

4. Stay focused on the topic. Try to keep the discussion on target, otherwise you can diverge beyond the scope of what you're trying to design for.

5. One conversation at a time. Your team is far more likely to build on an idea and make a creative leap if everyone is paying full attention to whoever is sharing a new idea.

6. Be visual. In live brainstorms we write down on Post-its and then put them on a wall. Nothing gets an idea across faster than drawing it. Doesn't matter if you're not Rembrandt!

7. Go for quantity. Aim for as many new ideas as possible. In a good session, up to 100 ideas are generated in 60 minutes. Crank the ideas out quickly and build on the best ones.

Following these steps, the authors came up with 35 ideas on virtual Post-Its and subsequently clustered these into eight main topics, as shown in Fig. 8.



Figure 8: Grouping Brainstorming Results into Similar Categories

## 8.4 MAIN EMERGING IDEAS (VV)

Based on the collected findings of the ideation phase, the individual ideas were each treated in greater depth. To this end, brainstorming was repeated and expanded upon. As the intensity of the brainstorming increased, clear directions gradually began to manifest themselves. In the beginning, eight possible approaches could be identified.

The first was to focus on the aspect of education. The goal here was clearly to impart knowledge to students of municipal schools and universities. Workshops or guest lectures on the topic provided by the institute at respective locations were discussed early on. Cooperation with the already existing initiatives "Senckenberg School" and the "Senckenberg Young Scientist Program" was also considered.

The aspect of ecotourism found high appeal at this point and was outlined in various forms. On the one hand, the idea of including Senckenberg as part of a more diminutive form of scientific ecotourism was put forward. On the other hand, plans were drawn up for a "simple living" concept. Here, tourists should have the opportunity to experience the local perspective on daily life first-hand. Both ideas aimed to create an additional source of income for the local population. Another view, a mobile application, would ensure that tourists and locals can better monitor various aspects of sustainability and fairness.

In a similar vein, the concept of a platform was thrown into the room. This would represent a central contact point for all stakeholders involved. In addition to information on activities, technical knowledge from scientists and local values would be communicated here.

In the sense of further networking of local forces, the idea of a new kind of community emerged. For example, a group of indigenous people could be created as a kind of jaguar rescue team for this purpose. This would enable communities to protect the jaguars, as well as livestock, easing human-wildlife tensions.

A less specific idea and more general approach was the possible cooperation with other NGOs. This would have the great advantage that it would no longer be necessary to fight alone against an oversized power, but mutual support could be built. Here, names such as the WWF, with its numerous success stories regarding nature conservation, were mentioned (WWF, 2021).

As mentioned with the ecotourism idea, it was necessary to focus on the livelihoods of the local population. To create possible alternative incomes, aspects such as the sale of handmade goods and increased fair trade exports to Europe were considered. In addition, to show future generations an alternative to livestock farming, technical workshops could be held at local schools. This would generate new job opportunities. The idea of a camera trap initiative also originated here. In this case, local participants would be paid for each photo taken of, for example, a jaguar.

Another issue that should be addressed is how to attract attention. To create a stir among the local population, ideas were put forward, such as various social media campaigns in cooperation with local influencers or photo and film competitions in the context of the local flora and fauna.

Last but not least, the potential direction of entertainment emerged from this aspect. Documentary films and informative podcasts would bring the growth of national and international attention in this regard.

#### 8.5 HOW NOW WOW MATRIX (OF)

The outcome of the Brainstorming lacked a prioritisation. Therefore, the How Now Wow Matrix was deployed to narrow down the number of ideas and focus on the most promising ones. The matrix focuses on two dimensions: feasibility and originality. The originality is displayed on the x-axis and feasibility on the y-axis (Przybylek & Kowalski, 2018).

The first quadrant is the "How" section. Ideas that are ascribed to this section are considered innovative. However, they are also particularly hard to implement. They can be kept there for future consideration when new resources or technology might allow for these to become easier to implement (Przybylek & Kowalski, 2018).

The second quadrant in the 2x2 matrix is, in a variation of the model called the How Now Wow Ciao Matrix, sometimes considered to be the "Ciao" section. This contains ideas that are not being pursued further due to their low level of originality and high level in the difficulty of implementation. This section was filled out implicitly by leaving out ideas that were thought to fall under this category (Designthinking-Methods, 2021).

The "Now" section falls into the third quadrant. Ideas are easy to implement but also low in originality. Typically, this section contains the low-hanging fruits that have either already been implemented, or some examples of these being implemented can be found in other projects (Designthinking-Methods, 2021).

Finally, the fourth quadrant contains ideas that are easy to implement but also high in originality. This "Wow" section can have breakthrough ideas that should be considered further (Designthinking-Methods, 2021).

#### Figure 9: How Now Wow Matrix for Identifying Ideas of High Innovation and Feasibility



The How Now Wow Matrix created throughout this project can be seen in Fig. 9. The categorisation of the brainstormed ideas into the matrix helped the authors focus on the more promising options. The benefits of the method not only lie in its final output, however. Creating the matrix was further beneficial, as each idea was reflected upon and discussed once more along previously specified dimensions (namely originality and implementation). The discussion this process sparked allowed for a better collective understanding of some ideas and further development.

# **INITIAL CONCEPTS**

#### 9. INITIAL CONCEPTS (VV)

After completing the How Now Wow Matrix, four initial concept ideas were synthesised from the eight aforementioned approaches based on thorough evaluation and consideration. These were elaborated upon in terms of a general idea overview, the desired effect, the target group, an approximate process, and possible support and possible obstacles. Subsequently, four concepts were applied to the institute's wheel-like sustainability model to ensure compliance with the desired effects.

#### 9.1 CAMERA TRAP PIGGY BANK (KS)

The first concept designed was called the Camera Trap Piggy Bank. The main idea of the concept was to give landowners, on the one hand, economic incentive to protect jaguars, and on the other hand, to educate and create awareness about the consequences of the loss of a species on biodiversity. Therefore, the idea was suggested to work with the already existing infrastructure of Senckenberg's camera traps and WildLIVE! Citizen science program, and to develop a solution approach from it.

A general timeline of the Camera Trap Piggy Bank was proposed at this project phase (See Fig.10). The first step of this concept would be determining possible donors and funding, as installing and purchasing the cameras and providing payments as an economic incentive are highly cost-intensive. Next, the landowners and farmers willing to participate must be reached and included in the project. For this step, already established contacts and marketing tools such as flyers and brochures can be used. With the successful launch of the project, it must be considered that more people would be needed for the data analysis. Therefore the number of citizen scientists could be increased to examine the data. The next step would be to expand the project as far as possible, including more landowners and extending the project to more expansive areas. Additional thought was that an app could encourage more people to participate and give the images a specific platform and communicate the content in a playful, gamified way.



#### Figure 10: Proposed Timeline of the Camera Trap Piggy Bank

The Camera Trap Piggy Bank concept provides several advantages for the peaceful coexistence of human and nature. Besides that, it bolsters data collection for the Senckenberg institute and builds off the already existing and well-established WILDLIVE! Program. Further support for this concept includes the successful example of Cameras for Conservation by the CGO, as previously mentioned in this report, which operates in several regions, including Mexico and Belize in South America (Huggins et al., 2021).

In terms of challenges, this concept is dependent on landowners' willingness to join the program, citizen scientist participation, and available funding. These complexities frame some of the issues that would need to be explored if moving forward with this solution concept.



#### Figure 11: Camera Trap Piggy Bank Applied to Senckenberg's Wheel Model

The Camera Trap Piggy Bank is applied to the institute's wheel model (See Fig. 11). It shows that the provided income influences society. The suggested approach gives a feeling of responsibility among the farmers and landowners, which leads to awareness creation for the problems described. This is also mentioned in the sustainability sector. The idea encourages the landowners to protect the local ecosystem and the jaguars. The science approach in the wheel describes how citizen scientists of the WILDLIVE propel the project! program and enhances adequate wildlife documentation.

## 9.2 LOUDER VOICE FILM COMPETITION (VV)

The second concept designed was called Louder Voices Film Competition. The basic idea of this concept was to give the local young population a platform to amplify the already active voices. Participants of the competition should be entrusted with the task to deal with species protection and land-use change intensively. Subsequently, messages learned from the findings were to be creatively processed in the audiovisual medium of film.

Thus, in the long run, the connection of the population to nature should be strengthened, and local messages regarding the current crisis should be creatively communicable.

The medium of film was chosen because it has always had the power to bring people together, regardless of their origins and beliefs, and transport them to distant places. Most creatively, new impressions, perspectives, and feelings can be conveyed almost immediately to an audience (Films for the Forest, 2019).

#### Figure 12: Proposed Timeline of the Louder Voice Film Competition



The Louder Voices Film Competition process has been planned in multiple phases as follows (See Fig. 12). In the beginning, the competition should be successfully established among the participants. The basis for this is a platform, such as a website, on which the central part of the competition will take place. Here, the participants would learn about the framework conditions of the competition and then have the opportunity to submit their results at a later point in time. There would also be extensive support for the participants in this phase. Members of the Senckenberg institute could offer scientific expertise on the topic. This should set a certain scientific standard for the individual film projects and spread sustainable professional knowledge among the participants.

In terms of technology, volunteers from the film industry in Bolivia or Germany would offer their know-how to the participants. Technical aspects, such as cameras, video editing, and sound production, could be taught in workshops on-site or tutorial series. Also, shared equipment could be hoped for to support the part of the film industry.

Since the project stands and falls with its participation rate, it is essential to be clear about the target group of the competition. The focus would be on the younger generation, especially university students. A particular emphasis could also be placed on film schools or schools providing conservation courses. This can be attributed to the academic degree and the potential future influence of these generations. Furthermore, it can be stated that among the said target group, there is already a high level of engagement regarding this crisis. One would, therefore, additionally amplify the already loud voices (Spickenbom, 2021). Hence the name "Louder Voices".

To reach said target group, traditional means of communication such as social media, brochures and other campaigns would be used. The influence of the lecturers at the respective schools and universities should not be underestimated. Since they can significantly impact students' opinions, it is also essential to get them excited about the cause.

In terms of social media, there is a plan to get local influencers on board. Actions such as the 2019 fundraiser for the Amazon emergency, driven by Bolivian influencer Valeria Hinojosa, show the huge impact influencers can have on a project (BoldLatina, 2019).

Such a community could be an ideal platform to inspire students in the follower circle to participate in the competition.

Of course, in addition to communication, there must also be a particular incentive for the participants. This could be achieved by awarding a prize at the end of the competition. When choosing the prize, attention must be paid to its meaningfulness and value. For example, professional film equipment would be conceivable to considerably promote talent beyond the end of the competition.

The next phase of the concept is dedicated to the publication of the results. After the participants have submitted their films, a voting system decides on the winner or winners. There is the option to include participants in the voting to increase engagement further.

Giving the award ceremony a momentous characteristic could be held as an event in the universities, respective communities, or Senckenberg institute.
To get international attention and not disadvantage anyone, the event could be followed live and digitally. As a result of the competition, the content produced must remain freely available afterwards. For this purpose, the films will be uploaded to a platform such as YouTube or the Senckenberg website.

To promote the event, it is again important to think about possible collaborations with NGOs or influencers. Through them, there is the possibility to expand the audience spectrum significantly.

To make a positive contribution in the future, the final phase deals with the potential expansion of the concept. The most immediate measure at this point would be to hold the competition annually. This would allow more specific and timely topics to be addressed. Further national and international NGOs and well-known faces could be contacted for possible cooperation to generate additional attention. For example, organisations such as The Leonardo DiCaprio Foundation and Films for the Forest could be reached. Furthermore, the final event could be extended to the Senckenberg museum. Here a kind of gala might be organised, which celebrates the event like a film festival.

The aforementioned high level of commitment of the younger generation would speak in favour of this concept. Amplifying local voices generally create more attention for the issue and further motivates active engagement. In cooperation with the institute, a sustainable relationship with local agents could be established. Similar events, such as the Films for the Forest Festival, show that the participants' creativity is well received by the public (Films for the Forest, 2021). Support could be found at various contact points. Already established contacts, like the team around the German production "Willi und die Wunderkröte" could be consulted, for example. Similarly, thinking entities, such as ecological influencers or NGOs represent an excellent opportunity for effective and sustainable collaboration. Furthermore, there is the possibility that the material produced would increase international interest in the region, similar to tourism as a result of the hit series "Narcos" produced in Colombia (Tanzi, 2018).

As mentioned earlier, the concept is highly dependent on the rate of support and participation. Thus, gaining a certain momentum of the idea is crucial for success. Finally, it should be noted that while similar festivals prove that the concept can be successful, there is a risk of remaining in their shadow.



#### Figure 13: Louder Voice Film Competition Applied to Senckenberg's Wheel Model

Applied to the institute's wheel model, society is influenced by the amplification of interested and motivated visions (See Fig. 13). The sustainability aspect can be described in that the competition generates attention for the region's crisis and likely inspires other voices to take the initiative. Science finds itself in the wheel in the form of the Senckenberg institute. The institute takes on the role of a supporter in the concept, which can help define the necessary scientific framework. There is an opportunity for citizen scientists to play a role as the audience.

## 9.3 SENCKENBERG YOUNG SCIENTISTS GLOBAL (AD)

The third concept designed was called the Senckenberg Young Scientist Global. The main idea was to expand the current Young Scientists program, which Senckenberg Research Institute in Germany offers, to include interested young locals from Bolivia by supporting them.

"The program in Germany acts as "an interface between students, supervisors and their administration providing a platform to network, learn and share and exchange ideas about various scientific practices and projects for the young scientists" (Senckenberg Gesellschaft für

### Naturforschung, 2020).

However, the program is only limited to Senckenberg locations. There are monthly meetings conducted for participants where discussions are led by the leading and local speaker on topics, from their active working groups, who are always looking for feedback and ideas from their fellow Young Scientists. The program also organises annual retreats that are held alternately in Frankfurt and at the other Senckenberg locations. The retreats include workshops, guest lectures, and interactive discussions with students on Young Scientist-specific topics, such as mentoring, third-party funding, etc. These retreats are planned with excursions and field studies for the participants (Senckenberg Gesellschaft für Naturforschung, 2020).

It has been identified that there is already a high level of interest and participation of the youth regarding uplifting the status of the current threat to biodiversity in Bolivia. Moreover, there is a lack of established science communities in the area (Romero-Munoz, 2021). Hence, extending this platform into Bolivia and targeting the local youth who show signs and interests in environmental efforts can help build a scientific community in Bolivia to foster conservation.



#### Figure 14: Proposed Timeline for the Senckenberg Young Scientists Global

The first step towards this idea would be reaching out to the youth (See Fig.14). This could be achieved by advertising the program through conducting workshops in schools, universities, or community gatherings, distributing flyers, brochures, etc., and also through social media platforms. To further engage the youth interested in the program, a pen-pal/buddy program could also be organised where the current young scientists in Germany reach out to Bolivian's young population.

In the following steps, an audience that exhibits interest could then be admitted to the Senckenberg Young Scientist Global Program, where youth from all over the globe would collaborate on various pressing environmental threats. There would be guest lectures, discussion panels, and hands-on activities with the youth and local communities.

Building on the idea, an incentive of a scholarship for Senckenberg Schule and job opportunities concerning field surveys or research activities for relevant professions would also be implemented for the participants to set about their scientific career.

The program would need to be expanded to collaborate with other organisations, to reach a larger audience and develop funding grounds through fundraisers like GoFundMe campaigns. It would be an added advantage to collaborate with an organisation who are already working on similar projects, for example WWF (World Wildlife Fund) where "The 2012 Fuller Symposium brought together a diverse set of thought leaders to share insights into the role that science, innovation, and policy can play in combating these crimes. Through presentations and panel discussions, experts discussed how illegal wildlife trade weakens government authority, wreaks economic havoc, threatens food security, and creates civil instability among communities that are disenfranchised as their natural resources are stolen (WWF, 2021)".

Furthermore, collaborating with schools and universities by providing the students with a platform to document their experiences through blogs, videos etc., could also be a promising approach. Through this collaboration, exchange programs for both German and Bolivian participants within Senckenberg have also been considered future steps. Following the footsteps of the initial Young Scientists program, annual retreats could be held for German scientists in Bolivia, which might lead to substantial benefits regarding research ecotourism. The retreats could host festivals like "International Day", extending the network towards international universities. The ultimate cumulative effect will be a stepping stone in the scientific and conservation fields of Bolivia.

While establishing the fact that the Senckenberg Young Scientists Global program would act as a foundation and provide support, contacts, and resources into the program's extension, the authors' challenges faced have not been ignored by the authors while framing this concept. A lack of an existing science community in the area, determining funding means for scholarships, and attracting locals to participate in the program are obstacles that have been considered.



Figure 15: Senckenberg Young Scientists Global Applied to Senckenberg's Wheel Model

Applied to the institute's wheel model (See Fig.15), society is impacted by providing skills and resources to uplift young locals' standing. Sustainability is addressed by providing an opportunity for young locals to develop their career in conservation fields. In terms of science, this concept contributes to the current scientific community in Bolivia with support from the Senckenberg institute.

## 9.4 RESEARCH ECOTOURISM PROTOTYPE (AD)

The fourth concept designed was called Research Ecotourism Prototype. The basic idea of this concept was to use research ecotourism as a prototype to test whether this industry could provide an alternative income to cattle ranching in the region. Through this approach, the intention was to build a platform for tourism based on research activities set in motion by Senckenberg, creating an economic model that locals would run.

The authors found inspiration for this concept from Earthwatch, which is an environmental conservation organisation, whereby their "unique citizen science model", Earthwatch "empowers

individuals to take collective action through scientific research and conservation. By pairing scientists with non-scientists in research locations around the world" (Earthwatch, 2021)."





The initial stretch of this concept starts with a small-scale establishment where locals interested in making a profit would host researchers from abroad in their homes as guests (See Fig. 16). This would, in turn, create the foundation of a homestay model. Apart from research practices being the main focus of this program, the ecotourism aspect would promote the appropriate use of national parks, protected areas, wildlife, and forest reserves in and around Chiquitania. The role of homestays would be to emphasise cultural and traditional practices and create a sincere interest and engagement among the local people in the region (Bhuiyan, 2011).

To facilitate an environment for the researchers, scientific programs, guest lectures, excursions, and various environmental research activities would be held by Senckenberg, attracting students and citizen scientists. The program would be advertised through traditional methods like conducting campaigns in German schools and universities, distributing flyers and brochures, social media, etc. It would be beneficial to establish a website to attract tourists.

As mentioned in the previous concept, there could be an opportunity to combine this solution with the Senckenberg Young Scientist Global final stages, where Young German Scientists might have a chance to visit Bolivia for retreats and stay with local families.

The next phase in this project would be expanding the network to more local families interested in offering homestays, collaborating and gaining support from respected NGOs and CSOs, and developing funding means. Joining hands with various other organisations would also help with the area's marketing and reach out to mainstream tourists globally. More local houses could become homestay opportunities, which would attract budget tourists because of the affordable price (Bhuiyan, 2011).

This entire concept can keep growing, establishing ecotourism as a whole program run by locals focusing on wildlife and traditional local culture. Furthermore, locals could set up training programs to encourage others to do the same. This growing economic activity could, in due course of time, attract the attention of the government. Drumm et al. explain that it is important to have all relevant stakeholders contributing positively to an ecotourism experience, as described below and clarified in Fig. A1 of the Appendix (2005).

"A key to the success of ecotourism is the formation of strong partnerships so that the multiple goals of conservation and equitable development can be met. Partnerships may be difficult because of the number of players involved and their different needs, but forging relationships is essential (Drumm et al., 2005)."

Achieving a constructive balance among stakeholders involved could be considered as achieving success establishing ecotourism in Chiquitano. Once this harmony is established, there is a conducive environment for creating and maintaining protected areas, which are crucial to the success of this ecotourism model. "National parks represent the pinnacle of protected areas, providing the strongest guarantee of long-term conservation. They offer an unmatched set of ecological attributes, cultural value, and economic benefits to local communities. Parklands are among the oldest and most durable conservation tools, and certainly the best known and loved (Tomkins Conservation, 2019)".

As every step comes with a challenge, many limitations have also been identified. Considering the infrastructure, low standard of accommodation, unacceptable bathroom and toilet facilities, and lack of hospitality experience would have to be taken care of. Other challenges such as brand image issues, meeting international standards, and training facilities would be crucial in marketing and campaigning the prototype (Bhuiyan, 2011). In this entirety, the project demands a significant investment. Furthermore, the authors noted that ecotourism should not be implemented as the only solution, as conditions can be unpredictable in the tourism industry. This has been demonstrated during the Covid-19 pandemic. However, appropriate planning, implementation, operational regulation and management, development, and financial allocation would support sustainable ecotourism development in the area.



#### Figure 17: Research Ecotourism Prototype Applied to Senckenberg's Wheel Model

Applied to the institute's wheel model (See Fig. 17), the society supports the local economy and promotes a grassroots change. Providing an alternative source of income diverts away from cattle ranching and the destruction of forests, enhancing more sustainable income sources. Science is highlighted through the Senckenberg Research Institute by providing opportunities to enable research ecotourism.

#### 9.5 MUSEUM CONCEPT & RELATION TO SOLUTIONS (AD)

The opportunity to connect the proposed solution concepts with the Senckenberg museums was explored to create a synergistic effect. The Senckenberg society consists of three museums: the Natural History Museum of Frankfurt, Dresden, and Görlitz, collectively referred to as the Senckenberg Museum from now on. They present exhibitions on important natural science topics and host the results of Senckenberg research (Senckenberg Gesellschaft für Naturforschung, 2021). Concerning this project, the supervising professor provided feedback about the potential of including these facilities into an entire concept, creating a platform where "Culture Meets Science".

The main idea of this concept was to integrate the solution mentioned above ideas within the functioning of the Senckenberg museum infrastructure. Each of the proposed solutions could be highlighted as content for the museum as we move into a new era of learning via exhibits (online and offline) and social media engagement. The authors contemplate this concept as a helpful strategy of using the museum platform as an incentive to attract more participants for each idea and reach a larger audience by exhibiting the participants' work and experiences.

To integrate the first solution of the Camera Trap Piggy Bank in the museum, the pictures and videos obtained could be displayed in the exhibition. As more images are captured, it could be possible to follow perhaps a story of any of the wildlife in due course of time. For instance, if a female leopard brings cubs into the world, an exhibition series could follow. The authors concur that he would generate a lot of attention from various sectors and organisations, laying a foundation for funding opportunities.

Switching over to the second solution, the Louder Voices Film Competition, the publications of the results could be displayed in the museum. Additionally, special screening events could be organised for interactive opportunities, motivating the participants further. This would make incredible storytelling enjoyable and compel or draw the visitors to engage in interactive stations, workshops, and events.

Now, coming over to incorporating the third solution, 'Senckenberg Young Scientist Global, in the museum, a platform like a social wall could be created where the students could act as influencers, story-telling their journey. An example of this idea would be Schallaburg, a renaissance castle and museum in Lower Austria, which presents a themed exhibition annually that is immensely elaborate and immersive. "Crafty Hands" was one such exhibition about the wonder of the human hand. The website explains how the museum utilised creative documentation via social media, both online and in-person.

"For the first time ever, Schallaburg combined the exhibition with a social media element by setting up a social wall for people to post their own work to... as they didn't want to limit the experience to those who have an Instagram account. Hence, they looked for a way to show the posts on a screen within the exhibition as well (Katschthaler, 2019)".

Regarding infusing the fourth solution, the Research Ecotourism Prototype, apart from the research findings displayed at the exhibition, the guests' experience of living with the locals, including the diverse cultural and traditional practices they discover, could be publicised. The featured material for each idea in the museums could include people's experiences, moving stories, and inspirational activities congregated through social media platforms.

DECISION-MAKING BASED ON CLIENT FEEDBACK

## 10. DECISION-MAKING BASED ON CLIENT FEEDBACK (DJ)

The initial solutions were presented to Senckenberg at the Second Interim Presentation and received positive feedback with some constructive remarks. These covered how to obtain funding, the need for thoughtful consideration regarding the film festival, and the complexities surrounding the field of ecotourism. Furthermore, the idea of potential collaboration on the Senckenberg museum was supported by an actual upcoming exhibit. This feedback was crucial for further developing an appropriate and innovative solution.

## **10.1 FOCUS ON FUNDING (KS)**

Since the presented concept solutions depend on possible funding, Senckenberg recommended considering this aspect in detail. Therefore, other ways of raising money were researched, and potential partners supporting the projects were identified. This also led to the exploration of funding campaigns like crowdfunding platforms and precisely the newer approach of subscription-based funding.

## **10.2 CONSIDER APPROACH OF THE FILM FESTIVAL (KS)**

In-depth feedback from Senckenberg noted a central point about the Louder Voice Film Competition that should not be ignored. To take particular account of local and cultural conditions, the approach of the film competition must be careful not to put the cattle ranchers in a bad light. As the conflict between the ranchers and the surrounding ecosystem is a charged issue, the filmmakers might portray land-use change and poach drastically from an ecological perspective. This could exacerbate and aggravate the already existing differences. Since this must be avoided at all costs, it was decided to find a compromise that allows the filmmakers their creative freedom and protects the ranchers. Therefore, guidelines were considered within the framework of the film competition to ensure that this conflict is communicated appropriately and constructively. It was concluded that the Louder Voices Film Competition without any guidelines could still be a viable approach for change but not suitable for Senckenberg's project brief and, therefore, would be better implemented by another organisation.

## 10.3 CONSIDER PREPARATION FOR RESEARCH-ECOTOURISM (KS)

Additional feedback from Senckenberg pointed out that to enable environmental compatibility, social compatibility, and optimal value creation through ecotourism, a sound thought-out preparation over a long period is required. This includes cost-intensive practices such as the development of infrastructure and education and awareness programmes for the locals and tourists. To sustainably establish ecotourism on a small scale, a mature concept must be developed to find long-term solutions. This would go beyond the project's scope, as the focus should instead be on solutions that can be implemented quickly and are not too costly.

## **10.4 POTENTIAL MUSEUM OPPORTUNITY (AD)**

It was also identified during the feedback session that the Senckenberg museum already planned to open a museum exhibit based on the WildLIVE! Program, where they would exhibit works and findings of Senckenberg researchers from the Chiquitano region in Bolivia. The authors found this a well-founded opportunity to expand on this idea and build an even larger assemblage.

## **CONCEPT DEVELOPMENT**



## **11. CONCEPT DEVELOPMENT (VV)**

Based on the institute's positive feedback, the general question arose as to the continued focus of the project. The initial plan to ultimately focus on a single concept and thus increase effectiveness turned out to be problematic given the said feedback. All ideas carried a great potential in terms of sustainability. In subsequent consultation with staff members of the institute and the professor supervising the project, it was decided to prioritise the concepts for this reason. The images were to be tested for fundamental aspects of feasibility and effectiveness.

Based on the knowledge gained from this, the most viable products were then synthesised from the concepts. Subsequently, the overarching concept began to be finalised.

## **11.1 PRIORITISATION MATRIX (VV)**

To understand resources and management better, a prioritisation of the previous concepts was carried out. For this purpose, two prioritisation matrices were prepared. Within the two matrices, the individual images were compared and evaluated according to various aspects. In the first matrix, factors such as time frame, costs, and objectives were considered.

Figure 18: Version A of a Prioritisation Matrix for the Initial Concepts



The Prioritisation Matrix in Fig. 18 revealed the following results:

In this context, the camera trap concept turned out to be relatively time-efficient. The costs, however, were very high due to the necessary technology and other financial aspects. The benefit of the concept in its role as an incentive for land users turned out to be very high.

The Film Competition required an average time frame and turned out to be less intensive than the Camera Traps in terms of cost. The benefit of the concept, which lies in the attention to the stories of the participants and the motivation of the audience, could be classified as relatively low about the prerequisite of lively participation.

The Young Scientists concept assumed very high values, especially in terms of time frame and costs. The benefit, however, which lies in the encouragement of the initiative, was considered relatively high.

Research Ecotourism turned out to be the most cost and time-intensive concept of the four. However, in the form of an incentive for local populations, the benefits were ranked as the highest.



#### Figure 19: Version B of a Prioritisation Matrix for the Initial Concepts

To test the validity of the findings from the first matrix, a second matrix was prepared, as seen on the right of Fig.19. This was based more on feedback from the institute and focused primarily on cost and timeframe. The results of the second matrix largely coincided with those of the first matrix.

Research Ecotourism Prototype was identified as the concept with the highest cost and the most extended time frame. This decision was based, among other aspects, on the fact that it would take a long time for the project to prove profitable for the local population. A long-term buildup phase would require mainly investment, financial and timewise (Spickenbom, 2021).

Despite its positive feedback, the Senckenberg Young Scientists concept followed in the ranking. Input from the institute revealed that the idea would entail a lot of effort apart from the actual core. Considering factors such as organisational effort and language and cultural barriers, it would be challenging to create a two-way experience. To successfully execute a concept like this, it should be ensured that the experience for participants is a good one (Spickenbom, 2021).

Compared to the two concepts mentioned above, more petite in time and cost frame was the Louder Voice Film Competition. Through feedback, however, it quickly became clear what complexity the concept could entail. There is already a tense relationship in the region regarding the topic dealt with by the competition. The institute is trying not to get caught between fronts to continue its work in the area. In addition, there is the question of the budget. If smartphones are primarily used as film equipment, this would positively affect the budget issue. If not, higher costs for the procurement or rental of said equipment would have to be expected.

To fully confirm the result of the first matrix, the choice of the most viable product again fell on the concept of the camera trap. Of all the ideas, this one would be the most likely to be implemented since it would be possible to work with an already existing knowledge and infrastructure base. The framework could also be estimated much better in terms of financing than for the other concepts (Spickenbom, 2021). The culmination of the two Prioritisation Matrices is presented in Fig 20, where timeframe, costs, and objectives are ranked on a graph. The lowest total scores can be seen at the bottom of the image.



#### Figure 20: Results from Prioritisation Matrices of the Initial Concepts

## **11.2 SYNTHESIS OF SOLUTIONS (VV)**

Based on the findings from the prioritisation and consultation with the supervising professor, it was decided to put the most expensive and time-consuming of the four concepts on the back burner and concentrate all the more on the most efficient concepts. This included considering how to achieve a minimum viable product (MVP). It was also decided based on feedback from the institute to focus less on a single concept but rather to pursue all three remaining images and weave them together effectively.





## **11.3 OVERARCHING THEME (VV)**

Since the three remaining concepts were primarily concerned with media, and discussions with the institute determined that they complemented each other well, the decision was made to integrate the concepts into an overarching framework. This allows for more informed future planning and more effective application due to the variable facets of each idea. Because of the media similarities, the overarching theme was given the name "Action! For the Chiquitano Dry Forest - Senckenberg in Motion" about film projects and other visual media. Under this umbrella, the individual concepts of Camera Trap, Film Competition, and Leading Roles are effectively brought together as a strategy that potentially builds on each other. Furthermore, all three ideas can be applied to the region, the digital world, and the Senckenberg Museum.



# FINAL SOLUTION

## **12. FINAL SOLUTION (KS)**

Based on extensive research, feedback, group discussions, and Interim presentations, a total of three solutions were designed: the Camera Trap, Film Competition, and Leading Roles. The solutions function as a whole and are interlinked and combined in the overarching Senckenberg museum exhibition (See Fig. 22). In this way, a holistic, structured solution process could be presented. In the following, the final solutions are explained in detail.

Figure 22: Final Solution of Three Programs Leading into Overarching Theme

## 12.1 CAMERA TRAP (KS)

The basic idea of the Camera Trap Piggy Bank solution remained in the project, but after consideration and several feedback loops, the statement was further executed and improved. The concept that the landowners and farmers are paid for every image captured on their land was still the key objective, but some aspects were expanded and considered more deeply.

To set the scope of the project more accurately, the intended outcome was precisely defined. Various aspects were highlighted. The project would be a direct incentive for landowners to protect the ecosystem and prevent jaguar poaching. Furthermore, it would provide a livelihood for individuals through working as staff for the project. Another important fact would be that the captured images would bolster the existing data collection of the Senckenberg institute. Besides that, the project will create awareness of the threat to the ecosystem and biodiversity loss.

The direct target group of the project was moreover identified as the landowners, with secondary target groups of community members to become staff and citizen scientists to process the images. To get a more precise insight into how the project could proceed and to be able to plan the individual steps better, a user journey was created (See Fig. 23).



#### Figure 23: Proposed User Journey for Camera Trap

As this solution depends heavily on how many landowners and farmers participate, the first step would be that as many of them as possible are approached to join the program. For this, already established contacts to the communities could be used. When they accept, the program team members of the Senckenberg institute start to install cameras on the landowners' property. After successfully launching the project, the landowners will be paid whenever a relevant animal image is captured.

Furthermore, all relevant photos collected will be entered in a contest, where the participating farmers and landowners can win an additional bonus. To constantly improve the program, the participants are asked for feedback, encouraged to continue, and they can refer other landowners to make the program grow in the long run.

To plan the project more precisely, an approximate list of the costs required for staff and equipment was calculated. For each study area, one scientific coordinator of the Senckenberg team would be needed, and 5 to 7 local employees to be tech coordinators or field assistants. Cost-wise, a budget of 50,000 dollars was calculated for an estimate of 250 cameras that would be needed to install the cameras on five rotating study areas. Further, 40,000 dollars for staff per year and 30,000 dollars for landowners per year were calculated based on the average salary in Bolivia (CEIC, 2021).

To get the project running and create awareness, already established contacts would be used, as well as directly approaching landowners and community leaders. Furthermore, as a marketing tool, brochures and flyers in Spanish would be distributed.

To give the project a more extensive reach and highlight the work put into it, the captured photos would be exhibited in the Senckenberg museum (See Fig. 12.4.2). So the images could be part of a contest, and the person on whose land the best or most valuable photo was taken, would win a bonus. Additionally, profiles about the participating landowners and official portraits could be included in the museum to strengthen an empathetic connection with the museum visitors through story-telling (See Fig. 12.4.2). Also, the exhibition works as a marketing tool and for that to create awareness for the program.

To make the project more global, an online exhibition was also proposed. The need for a website was not included in the budget calculations because there was the idea of a possible collaboration with Macromedia students. The students could volunteer to create a website for the Senckenberg Museum, to highlight the solutions digitally.

It would be beneficial to work together on this program with NGOs like APCOB, CLAWS Conservancy, Panthera, or RESOLVE as partners. These collaborations could open up opportunities for connections with specific communities and potential funding.

There are many opportunities for the project to grow in the future. The program could expand to include more study locations and more landowners. Also, other scientific research could be considered, which could be supported by landowners for economic incentive.

These considerations would contribute to a solution-focused on providing an economic incentive for protecting nature and supporting a real relationship[ between people and the surrounding ecosystem. This would ideally address the current problems of conflict and deforestation in the region.

## **12.2 FILM COMPETITION (VV)**

After evaluating the feedback from the institute and the subsequent prioritisation, the Louder Voice Film Competition was revised as part of the overall theme of the final film competition. The basic idea of the concept remains largely the same, but with the difference that the framework of the competition now deals with the area and the general theme in a positive sense. This prevents the already strained relationship between the younger generation and the land users from becoming even more charged (Jansen, feedback session, June 1, 2021).

It was adjusted to be more about involving land users and encouraging them to reflect on their actions. This is also in the institute's interest, as a positive relationship with said land users is necessary on the ground to engage in dialogue further on without any problems (Spickenborn, feedback session, June 3, 2021).

Regardless, active local voices should still be promoted in this program. The competition remains a platform where the young generation can creatively express themselves about the crisis. Their positive and inspiring stories should motivate the general public to take the initiative for their environment. Especially the younger generations should understand the difference they can make locally if they actively decide to do so. In addition, the competition is intended to communicate the local perspective and approach to the problem to the outside world and encourage action or arouse interest.

The target group for the competition continues to be urban university students in Santa Cruz, primarily those interested in climate and species protection or the medium of film. As mentioned previously, many Bolivian youths are eager to get involved in conservation efforts, which would make up a large portion of this target audience.



#### Figure 24: Proposed User Journey for Film Competition

To give more information about the possible process of the competition, the provided user journey was designed (See Fig. 24). At the beginning, of course, the focus must be on recruiting enough participants for the concept. This should be achieved by using different communication channels. To reach the students, social media hashtags and the lecturers at the respective universities and colleges are increasingly used. For example, on social media, campaigns could be carried out in collaboration with local and similarly-minded influencers. Lecturers also play a significant role in terms of influencing students. In addition to the two channels mentioned above, the somewhat more traditional print campaign method would also be an option. Brochures and posters are written in the native language. For example, they could be distributed at universities.

While the competition participants are being recruited, ideally, a digital platform has already been launched as a point of contact. As mentioned previously, this could be a platform for the Senckenberg museum created by Macromedia students as part of their curriculum. After the students have decided to participate, they can register for the competition on said platform and are subsequently provided with the necessary technical and scientific know-how. This could be done, for example, through a series of digital tutorials. Workshops at the respective schools are not excluded and could add additional support. One or two contact persons at the institute should be available to guarantee the productions' scientific value and support the participants if necessary. Furthermore, volunteers from either the Bolivian or German film industry could be integrated into the project for digital or personal support in the areas of video editing or directing.

Compared to the original concept, it is assumed that participants would use their smartphones for production, which is possible due to technological progress. In the beginning, this makes the idea much more accessible in terms of organisation and, above all, budget planning.

Once the students' productions have been completed in collaboration with the institute, they can be submitted on the platform mentioned above. Afterwards, a jury will vote on the winner of the competition.

A gala will be held to announce the winner. The Senckenberg museum could serve as the venue. The event benefits the purpose to gain more attention for the cause, also internationally. Besides, the gala can be used for financing purposes. After the announcement of the winner, this is presented, of course, at a due award. To pursue the international idea, the event can be held in parallel in Bolivia at a university or institute. Furthermore, a digital live broadcast on social media would be offered. To ensure that the content is still available after the end of the competition, it would be uploaded to the platform. It could also be considered to exhibit the winning films in the museum.

To make the concept as efficient as possible, possible collaborations with NGOs could be considered. Organisations such as "Films for the forest", "Debates Indigenas", or "El Llamado del Bosque" could be viewed as potential partners. All three share similar motives and are strongly committed to supporting active local voices.

Considering a possible future expansion of the concept, the preliminary plan is to hold the event annually. Through this plan, the idea can establish itself with local institutions and become an integral part of the sustainability strategy. Furthermore, through international and celebrity collaborations, the audience and target group can be significantly increased, which should also positively impact funding. Based on a higher budget and regular frequency, more specific topics or problems could also be addressed in the competition in the future.

## 12.3 LEADING ROLES (AD)

To carry on with the film and media terminology and considering the earlier mentioned feedback, the Senckenberg Young Scientist Global program was rephrased to Leading Roles where the basic idea of the concept to a great extent is the same, excluding the framework of the concept, which now branches out in two directions. As the overarching nature of the solution theme reflects that each program can build on each other, Leading Roles here would be represented by the target group for the program, which continues to be the young Bolivians, especially the university students interested in conservation sciences.

The authors found inspiration from The National Geographic Society's program called GeoChallenge, which "empowers young people to learn about issues in their community, engage in critical thinking to identify innovative solutions, and take action as champions for the planet", Hence, admitting the champions would, in turn, be the future leading roles for Bolivia. In addition to this, they provide scholarships and grants for projects, conservationists and researchers, and also young students (National Geographic Society, 2021b).

Expanding upon the initial concept, which was an extension of the Young Scientist Program from the Senckenberg institute, a user journey was designed to give more information about the process (See Fig. 25). After revising the concept, two separate user journeys were considered to be beneficial for this program.



Figure 25: Proposed User Journey for Leading Roles (Scholarship in Germany)

The first approach focuses only on interested young Bolivians providing them with scholarships to study further in science abroad in Germany. After analysing the various courses and scholarships available in the field of science and conservation, the suitable options were narrowed down to universities in Frankfurt and Dresden. It has been identified that language acts as an obstacle for the Spanish speaking youth in Bolivia to attend these school programs, as all the science courses offered are in English (Jansen, 2021). Hence, the authors have also factored in online English-speaking lessons as part of the scholarship for the selected students.

Following are the courses that have been considered: Biodiversity and Collection Management (M.Sc.) in TU Dresden and Conservation Project Management in Frankfurt Spring School. In the following steps, the selected students would attend school in Germany with the scholarship provided and initiate their scientific career. While studying, the student would post on social media about their experiences and engage with them back home. These experiences, in addition, would be highlighted in the online and offline museum of Senckenberg via social media and those mentioned above physical, social media wall (See Fig.12.4.6). After graduation, the students would return to Bolivia with a foundation to pursue conservation and continue being vocal about it. The challenge of providing incentive for students to return home rather than pursue science in Germany has been noted and would need to be addressed.

However, ideally once returning home, they would become the subsequent leading roles for the conservation community.



Figure 26: Proposed User Journey for Leading Roles (Internship in Bolivia)

Building on the concept, it was perceived that providing an incentive for an internship and possible future job opportunities with Senckenberg could be advantageous in attracting Bolivian students locally (Vargas, 2021). This approach connects with the camera trap idea to fork out the other branch of the user journey (See Fig. 26). Here, the Bolivian students would learn about this opportunity with the Senckenberg Camera Trap team and apply for an internship to participate in and learn about conservation science by becoming part of the team. Students would then carry out their training and document the experience on social media. As communicated before, this documentation would also be highlighted in the museum (See Fig. 12.4.6). Furthermore, the students would later be introduced to job opportunities in fields relative to conservation and with the Senckenberg team.

To plan this program more in-depth, an approximate list of staff requirement, equipment, and budget has been worked out for both user journeys collectively.

One or two contact points from the institute would constitute the staff, who would help guide the students towards the program. The equipment essentials would be nothing more than scholarships with a budget of around 15,000 Euros per student, online English courses with an estimated budget calculated to be 60 Euros for six months, and internships offers could involve a small stipend. The funding has been calculated to a rough estimate by comparing various scholarship offerings from different organisations (DAAD, 2021). The budget estimate for English lessons has been calculated from an English learning application (Rosetta Stone, 2021). To communicate and spread awareness about this program in Bolivia, advertising can be done through flyers, brochures, and conducting workshops through schools. The information can also be uploaded on scholarship comparison sites.

As the courses and scholarship programs have been identified, the possible partners to collaborate this project with could be TU Dresden, Frankfurt Spring School, and DAAD. The authors also suggest the organisation, namely, El Llamado del Bosque, to be considered as a possible resource for recruiting students and determining further local internship opportunities. As the program scales up, compared to the initial concept, retreats could be held hosting German students and scientists expanding the scientific community in Bolivia.

### 12.4 MUSEUM ONLINE & OFFLINE (AD)

As the overarching theme has been established and the programs thoroughly explained, admitting all three solutions into the digital world and the Senckenberg Museum, is considered as the last leg of the framework. After assessing the feedback, the basic concept of the idea remains predominantly the same. However, it was further developed in depth by creating mock-ups to visualise the online and offline platform.

As the Camera Trap solution first proposed, the pictures obtained on the landowner's territory would be exhibited in the online and offline museum (See Fig. 27) (See Fig. 28). In company with that, a picture of the owner and a brief description of the individual's life journey could also be displayed (See Fig. 28). The authors predict that this would act as an advantage to boost their morale and gain increased interest from the international and local community. The plan to set up a contest can be orchestrated in the museum, online and offline, where visitors could vote for the best or most valuable photo.



Figure 27: Mock-up of Camera Trap in the Online Museum

Figure 28: Mock-up of Camera Trap in the Offline Museum



Associating with the Film Competition solution, as stated earlier, the online and offline museum would publish the results and present the films (See Fig. 29) (See Fig. 30). In addition to that, the platform can bring in participants and a place to interact with the contact persons at the institute and film experts.

#### Figure 29: Mock-up of Film Competition in the Online Museum



Figure 30: Mock-up of Film Competition in the Offline Museum



As outlined previously, the concept of a social wall would run in parallel with the Leading Roles solution. The activity would occur on participant's official social media accounts, which link directly to the online museum and are featured on a physical wall at the offline museum (See Fig. 31) (See Fig. 32). To ensure participation in the program, it would be recommended that an eagerness and agreement to engage in social media on the relevant topic be included as a requirement for the scholarship or internship application.

#### Figure 31: Mock-up for Leading Roles on Social Media which links to the Online Museum



Figure 32: Mock-up for Leading Roles in the Offline Museum



## 12.5 FUNDING (OF)

Despite the authors' efforts to keep the cost of the proposed initiatives low, there will likely still be a need for funding from external sources. Therefore, funding sources, namely grants and crowdfunding, have been explored in this section. Extensive desktop research has been conducted focusing on keywords such as wildlife, conservation, biodiversity, media, awareness, extinction, animal protection, and environmental health to identify grants that the solutions above could be eligible to receive. As requirements vary widely, the scope was not always met.

The table below shows three options of grants that the projects proposed in this paper could be eligible to receive:

Institution/initiative	Description
Leonardo DiCaprio foundation	<ul> <li>The Leonardo DiCaprio Foundation is dedicated to the long-term health and wellbeing of all Earth's inhabitants</li> <li>Through collaborative partnerships, we support innovative projects that protect vulnerable wildlife from extinction, while restoring balance to threatened ecosystems and communities</li> </ul>
Big Cats	<ul> <li>The National Geographic Society has awarded more than 14,000 grants for bold, innovative and transformative projects</li> <li>Accept proposals for projects in conservation, education, research, storytelling or technology</li> </ul>
Environmental Media Fund	<ul> <li>EMF is focused on assisting documentary film projects for broad public distribution about the environment, human health, social justice, cultural change and other issues of significant public interest</li> </ul>

Sources: Leonardo Dicaprio Foundation (2019); National Geographic Society (2021a); EMF (2021)

Similarly, the authors researched crowdfunding platforms which could be used to start a fundraising effort and compiled relevant ones in the table below:
#### Table 3: Overview of relevant crowdsourcing platforms

Crowdsourcing platform	Description
Chuffed	Global crowdfunding platform that has supported communities, non- profits, charities and activists to raise over \$70M for over 12,000 projects
GlobalGiving	Provides a global crowdfunding platform for grassroots charitable projects; 28,000 projects have raised \$530M
Crowdfunding.de	Makes the alternative form of financing accessible and understandable for everyone
MightyCause	All-in-one platform for nonprofit fundraising, donor management, marketing, peer-to-peer fundraising and more
Patreon	Helps earn a monthly income by providing rewards and perks to subscribers

Sources: Chuffed (2021); GlobalGiving (2021); Crowdfunding.de (2021); MightyCause (2021); Patreon (2021)

Furthermore, the authors went into detailing how an approach for one of the platforms could look like. The platform of Patreon was chosen due to its recent uptake in popularity and the number of conservation efforts represented on the platform being limited thus far. Patreon is a platform on which users worldwide pay a monthly subscription to get exclusive content and gifts in return. Subscriptions come in tiers from which each user can choose (Patreon, 2021). In the exhibit below, the authors are proposing a tier/reward structure that Senckenberg could apply in order to fundraise:

#### Figure 33: Suggested Structure of Patreon Tiers



Even though the proposed tiers were developed with a specific platform in mind, the authors believe that the titles and reward structure of the different levels could also be used for similar platforms.



### REFLECTION

### **13. REFLECTIONS (DJ)**

The authors presented the final solution with its overarching theme of visual media, the three programs involved, and options for funding to Senckenberg in the Final Presentation. Enthusiastic feedback was received, along with some helpful recommendations for further pursuing this project. To wrap up the entire process of arriving at this presented solution, a reflection is provided below on some key observations and takeaways.

### **13.1 ADDRESSING LIMITATIONS (DJ)**

One of the main limitations of the project was being geographically far away from the region in question. This made it difficult to gain a sufficient understanding of the situation and the people involved. The lack of connection with local communities and other stakeholders posed a challenge for creating a solution based on human-centred design. These circumstances presented an opportunity to be persistently curious and creative to find relevant information that could guide the process.

To begin handling this limitation, extensive secondary research was performed to provide a contextual foundation. Then creative methods such as watching Youtube videos and children's tv series were then used to strengthen this basis. Next, many valuable contacts provided by Senckenberg were approached for constructive in-depth interviews. This primary research provided a first-hand look into the region, particularly in Alfredo-Romero Muñoz, a Bolivian citizen. To gain a new perspective, professionals in various fields and areas of the world with experience working in rural communities or engaging in conservation efforts were also consulted. These interviews revealed new material that, in many instances, was highly informative and applicable. All of the mentioned methods were essential for building a comprehensive understanding of the problem and placing people at the centre of the solution.

A second notable limitation pertained to the restrictions of working online due to Covid-19 and geographic constraints. Despite this, there was plenty of interaction and collaboration between the authors, Senckenberg, and primary research contacts. This included synergetic design processes on boards within the Miro application and extensive and detailed conversations on Teams and Zoom. The online project development managed to produce exciting ideas with high potential and feasibility. The challenges presented by the limitations were beneficial for learning to adjust to certain restrictions. Furthermore, in some cases, they even gave an advantage by encouraging innovative and less obvious approaches.

### **13.2 ADVANTAGES OF DIVERSITY (DJ)**

Diversity was an asset to this project in many ways. Primarily this included having a diverse team and reaching out to contacts of various professions and regions. The dissimilarities allowed for a multitude of perspectives and specific expertise that could be applied appropriately to certain situations.

The project authors consisted of three nationalities and four background fields, which provided an advantage to the process. Based on observation, working in an international setting helped maintain an open perspective. Additionally, the background fields represented were design, business, film, and environment. The different points of view contributed to a creative but reasonable solution apparent and presented it effectively in an appealing manner.

Similar outcomes were exhibited through the diverse nature of the primary research contacts, where professionals shared experience from varying fields and locations. Their backgrounds ranged from scientists and conservationists to specialists in WASH, Gender, Nutrition and Maternal Health. While much information was shared relating to the project region in Bolivia, some of the specialists carried out most of their projects in South Asia or even worked on a global scale. Gaining insight from different backgrounds and regions was an essential supplement to the information available on the Chiquitano region, as it suggested new possibilities to consider. Considering these different perspectives helped develop an innovative solution to the area while also appropriate for the local and relevant stakeholders.

The cross-cultural and multi-field nature of the project was a definite advantage in developing a suitable solution. Each of the benefits mentioned above highlights the potential of interdisciplinary and international collaboration.

### 13.3 PROCESS AND DECISION-MAKING (DJ)

Throughout this iterative process, the Interim presentations and subsequent feedback from Senckenberg were valuable for advancing the project along a productive trajectory. Before each presentation, it was necessary to condense the gathered information into clear and relevant segments and focus on a few specific ideas. This kept the project moving forward concerning the given timeframe. After the presentations, Senckenberg provided advice regarding which pictures appeared to hold great promise and which potential difficulties might need to be addressed. The result was an increasingly improved and defined concept which culminated in a final solution that was well-received. Some welcome additional feedback to the final solution that emphasises the ever-evolving nature of design thinking and the potential to improve an idea continuously.



## CONCLUSION

### 14. CONCLUSION (DJ)

The team formulated a potential solution for Senckenberg to implement in the Chiquitano Dry Forest region based on an iterative design process. This encompassed understanding the problem, determining where to focus, brainstorming ideas, concept development, and testing solutions to receive feedback. During each phase between Interim presentations, this cycle was repeated in an ongoing process to develop the most appropriate solution during the given timeframe.

Several steps within the process were crucial for developing a solution. Some examples of this would be continued extensive primary and secondary research to understand the stakeholders and local situation, asking questions to reframe the problem, and looking into various but relevant fields for examples, knowledge, and inspiration. Another vital process was defining the approach, which revolved around working together respectfully and effectively with local communities and potential tools that could support. After establishing a direction and mode, of course, multiple design methods fostered the solution development. These included empathy mapping, How Might We Questions, brainstorming, and a How Now Wow Matrix. A Prioritisation Matrix was also implemented to narrow down the final approach. Throughout the process, decisions were made based on feedback from Senckenberg.

The design process led to four initial concepts called Camera Trap Piggy Bank, Louder Voice Film Competition, Senckenberg Young Scientists Global, and Research Ecotourism Prototype. These ideas were presented with the notion that they could feed into the Senckenberg museum as new and engaging content. They received a positive response with some helpful feedback and were further refined into one overarching solution for the final presentation.

The final solution is called Senckenberg in Motion: Action! for the Chiquitano Dry Forest and is composed of three programs, each of which targets unsustainable land use and disconnection to nature. The Camera Trap, Film Festival and Leading Roles programs are all emphasised through various visual media, specifically to be displayed in the Senckenberg museum to raise awareness and interest in-person in Germany and online to a broader reaching audience. The programs within the solution focus on sustainable, scientific and social actions, each powered by Senckenberg at the heart of the approach. This presentation of the final solution was well-received, with some minor additional feedback to be considered, as well as an eagerness to begin implementation on parts of the approach. As this concept consists of multiple programs, it can act as a modular solution where each program is implemented separately at the appropriate time. Therefore, Senckenberg has flexibility when it comes to putting the plan into action. The project is ready to move forward, and the authors are prepared for any further cooperation that can support Senckenberg with initiating this solution into motion.

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### Table A2: Legal framework guiding land and forest governance in Bolivia from 2006 to2014 (Müller et al. 2014)

Law No. 3545 on Community Redirection of the Agrarian Reform	Modifies Law 1715 (INRA Law), accelerates collective land titling and establishes that all available public lands should be provided preferentially in favor of indigenous peoples and communities or peasants that have no or insufficient lands
Law No. 3760 ratifying the Rights of Indigenous Peoples	Raises the United Nations Declaration on the Rights of Indigenous Peoples to the rank of law
Law No. 071 of Rights of Mother Earth	Recognizes Mother Earth's rights, as well as the obligations and duties of the Plurinational State and society to ensure respect for these rights
Law No. 144 of Productive Agricultural Community Revolution	Aims at establishing rules for the process of the Productive Agricultural Community Revolution for food sovereignty, establishing the institutional and political bases and technical, technological and financial mechanisms of production, processing and marketing of agricultural and forest products
Framework Law No. 300 of Mother Earth and Integral Development for Living Well	Promotes articulation of rights, establishes sectoral bases, technical instruments and guarantees for the rights of Mother Earth. It bans the marketization of livelihoods and the processes that support them. It also establishes the Plurinational Authority of Mother Earth, mitigation and adaptation mechanisms and a financial mechanism for the implementation of the climate and environmental agenda in Bolivia

Law No. 337 on	Enacted in order to regularize illegal clearing through immunity from
Support to Food	fines for clearing performed until end-2011 to contribute to food security.
Production and	It is generally perceived as an instrument to facilitate the expansion of
Forest Restoration	the agricultural frontier, although it includes commitments to reforest
	and restore ecological reserves

### Figure A1: Ecotourism partnership needed for success

