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Involving Alalay's population in the rescue of their natural heritage

Imagine you could live near a lagoon. That you could wake up and see from your window all the plants and animals that surround this peaceful place. Imagine you could say you live next to the most important ecotourism center in your country. Sounds like a dream right? Well, it is not. The population of Alalay, Cochabamba Bolivia, does have the privilege of living close to a lagoon. However, the poor politics to properly preserve it, plus to the lack of information and education within the population itself, has caused that instead of habiting nearby a beautiful place they are living right next to a garbage dump that could even compromise the health of those who live within reach. Not to mention it is not at all close to being an ecotourism center.

Before understanding Alalay it is important to have context regarding Bolivia itself. This developing country is located in the middle of South America, with 1 098 581 km² and a population density of only 10 habitants per square kilometer. This country counts with a vast diversity regarding its landscape, therefore Bolivia can be divided into three main regions: Andean region in the southwest, sub-Andean region in the center and the Llanos region in the northeast. Cochabamba, the state where the municipality from Alalay is located belongs to the sub-Andean region. This area comprehends 13% of Bolivia's territory. Its geography is based on valleys and *yungas* with a dominating mild to warm weather (15-25 °C). The main economic activity for this region is agriculture (EcuRed, n.d.).

Alalay lagoon is located in the municipality with the same name in the west of Cochabamba. 1738 men and 1709 women (3447 total population) form this community. Initially the research showed that this is a completely rural population. However, it is not, not even close. Actually, all around the lagoon is an urbanized zone. As almost every other ecosystem that can be found near an urbanization, Alalay's lagoon suffers from the pollutants generated by humans. Even if this is not an ecotourism center, it is indeed a common area, more similar to a park, a place where people can go to exercise, take a walk, ride their bicycles or enjoy the neglected viewpoints with sight to the lagoon (danyk 1993, 2019).

To substantiate the fact that Alalay is not a completely rural community, the lagoon was searched on Google Maps. As seen from the satellite point of view, it is surrounded by streets, avenues, restaurants, malls, shops, sport clubs, hospitals, schools, banks, supermarkets, among other local businesses. By touring the streets close to the lagoon with the street view from Google Maps, it can be appreciated that the highly populated Alalay area (close to the lagoon) is moved by small businesses. Clearly, this is not a very rich area economically speaking, as plenty of houses can be seen with sheet ceilings and many others with no finishes. Through the same tour it could be noticed that the lagoon itself does not count with any protection around it, all that can be found are some signs, not many, that indicate not to throw garbage. It also does not seem to be a touristic place, and overall the avenues that surround it overshadow the lagoon.

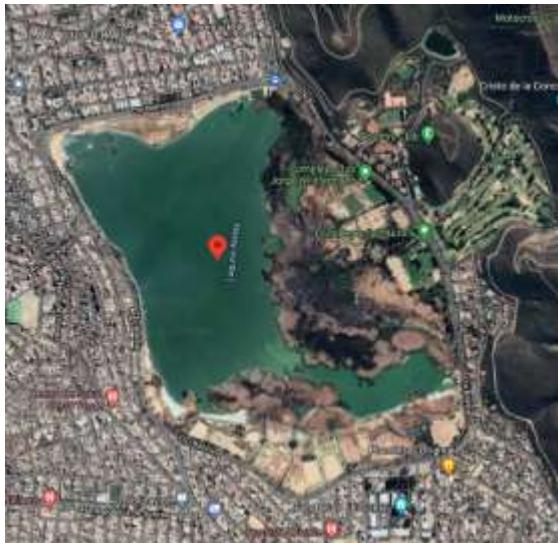


Figure #1. Urbanization around Alalay lagoon. Google Maps Satellite view (08/18/2021). Alalay Lagoon Cochabamba Bolivia. Retrieved 08 18, 2021, from <https://www.google.com.mx/maps/place/Laguna+Alalay/0.17.4100058,-17.41395946,3745m/data=!3m1!1e3!4m5!3m4!1s0x93e3715e66c27c75:0x1957dbbb8115f3fe!8m2!3d-17.4078327!4d-66.1385519>

Regarding its ecological value, the environmentalist Jaime Ponce mentions that the lagoon is known as a resting point for several migratory birds. Such is the case of the *Phoenicopterus roseus* or flamingo, he also mentions that most of the species that permanently inhabit it are fishes, also, he states that some of those have already disappeared (Unitel Bolivia 2020).

In the 175 hectares of lagoon and its surroundings, 184 species of birds can be found. Among them the *Oreopsar bolivianus* or Bolivian thrush, stands out, since it is an endemic species (Balderrama T. et al., 2018, 3).



Figure #2. Photography of the Bolivian Thrush. Greenhalg, R. (2015, 11 09). *Tordo Boliviano* [Photography]. ebird.org. Retrieved 08 18, 2021, from <https://ebird.org/species/bolbla1?siteLanguage=es>

As for the flora, we can mention the almost nonexistent carob tree (*Ceratonia siliqua*), plus the rare macrophytes like the water sequins (*Wolffia columbiana*), different green algae (*Rhizoclonium sp.* and the *Enteromorpha sp.*), and the floating pennywort (*Hydrocotyle ranunculoides*) (Morales & Rivera, 2013).

It is such the great variety of species that inhabit this lagoon and its importance, that it is considered “one of the last remnants of an almost extinct aquatic ecosystem of high biodiversity in the inter-Andean valleys of Bolivia” (Comité de Recuperación, Mejoramiento y Preservación de la Laguna de Alalay, 2012).

In addition, the lagoon plays a crucial role in the city, since it functions as its “lung” while keeping moist air. Another key trait the lagoon possess is that it prevents the flooding of the cities close to Rocha River, which directs water to the lagoon and therefore exists as a “regulating vessel for flows from the river” (Comité de Recuperación, Mejoramiento y Preservación de la Laguna de Alalay, 2012).

Despite all the qualities that Alalay lagoon has, the reason why it is a common headline in the news is due to the multiple disasters that have taken place there in the last 10 years. More than once such disasters have been caused by the locals. An example of this is the fire that occurred on September 23th, 2015, caused by a local, according to the authorities, at the southeast region of the lagoon. Due to the wind, the fire extended to the central part of the lagoon, as well as its north. Consequences of this tragedy were seen just a year later when many fishes were found dead on the surface. The biopsy of the fishes revealed the presence of a cyanobacteria caused by the sudden change in the number of mineral salts and nutrients in the water due to the fire. Gill irritation was also found, this because of the lack of oxygen in the water of the lagoon (Los Tiempos Bolivia, 2015).

After getting to know its conditions, it is no surprise that a recent study by the Major San Simon University (*UMSS*) demonstrates that the Alalay lagoon has two species of fungus, two different kind of viruses, five species of protists and 101 different types of bacteria. Such bacteria can be harmful to animals and to humans as well (it is specified that especially humans with a low immune system are in danger). The same study concludes that there are 3 main thing that need to be done to rescue the Alalay lagoon, in their own words: “the regrinding of sludge to eliminate the diffuse source of nutrient entry; the control and / or elimination of main inputs (sewers, illegal discharges, etc.) and finally, a biological manipulation to produce a change in the dominant group of phytoplankton” (Campero et al., 2020).

The lagoon is not only being contaminated by individuals, but also by hospitals close to the area. In a different study by Carla Fernández, an investigator for the *UMMS*, hospital waste was found in the lagoon. This waste can cause digestive and respiratory infections to everyone who has contact with the water. The combination of all these pollutants has caused the lagoon to give off methane gas and hydrogen sulfide. After all this discoverings were made, Ever Jiménez, representative of the Committee for the Recovery, Improvement and Preservation of the Alalay Lagoon or *Crempla*, said that they would ask the authorities for further studies to find out whether the pollution in the water can affect the population who lives close to the lagoon or not. Meaning that neither the authorities nor the locals are safely living near to it (Tapia Callao, 2021).

Different governmental plans have tried to rescue and safeguard the lagoon, yet, it can be assumed that all of them have failed, as every administration has to modify or upgrade the previous plan. It has been possible to find a register of such modifications since 2004. Nonetheless, in 2019 the past administration in Bolivia started working on removing settlements from the lagoon, absorption of salt minerals, soil improvement and reforestation of native species in the area. It is important to note that they are using native species as the lagoon has also suffered with the introductions of invasive ones. Although, the last administration was expecting that the current one would deal with the real problem, which is the sludge at the bottom of the lagoon. Therefore, even though it is not a guarantee, the government is already working on doing its part, dealing with the more complex problems that the lagoon has (Los Tiempos Bolivia, 2021).

Throughout the research, I have concluded that it is time for the citizens to do their part in order to preserve the Alalay lagoon. There are two major reasons for this. First, big part of the problem is that they and their small businesses many of the trash in the lagoon. Second, a place like this should be a symbol and a reason of pride to its locals, it is fundamental that they start appreciating it as one. In order to achieve this, I propose that university students from all over the country do social service to take care of it.

By taking them to the lagoon, they will not only be able to experience the problems of it first-hand, but they will also be able to appreciate all of its qualities, biodiversity, weather and mainly its role as an ecosystem. These way students will understand why it is important to take care of every single aspect of it. There are multiple benefits of implementing a social service focused on the Alalay lagoon. By doing this, Universities will reinforce students' commitment with the society, they will relate students' profession with other disciplines, and at the same time, they will raise awareness within the population towards how to properly take care of their natural heritage, while providing them with useful information on how to do it. All of this will help students to consolidate their academic and professional training.

During their social service, the younger generations would learn to treat the lagoon respectfully, thus anticipating a better future for it. This could eventually translate into the locals pointing out malpractices from other citizens, institutions or the government itself. By giving the students the responsibility and the common goal of taking care of the lagoon, unconsciously they will start to appreciate it as a symbol of pride.

Another side benefit of the social service is the fact that students do not require a payment. This would facilitate the continuity of the program, since there is not a very extensive funding. Ideally, if any money is needs, the institutions involved could raise the necessary funds by splitting the expenses between all the parties. Anyhow, I reiterate the fact that no large expenses are expected.

It is fundamental to clarify that the project must not start until the authorities confirm that it is safe to be near the lagoon. If this is the case, the project will await until authorities confirm that being close to the lagoon does not causes a danger to anyone.

To take off with the project an invitation letter will be sent to two Universities. First to the Mayor San Simon University or *UMSS*, by its acronym in Spanish. I would pick this institution as it has multiple research on the Alalay lagoon, meaning they are familiar with the problem, with this information they could enrich the project. Another reason is that they have different degrees that could benefit from the program, for example Legal and Political Science, Social Sciences, Rural and Territorial Development and in Agricultural and Livestock Science. The other invitation would go to the Bolivian Catholic University San Pablo. They also have plenty of research on the lagoon, and have different degrees that could benefit the project like Environmental Engineering and even Graphic Design or Visual Communication. Besides, they are a bigger institution; therefore, their implication on the project would bring more eyeballs into it. Their widest variety in degrees opens up much more possibilities to the project.

In spite of these two Universities being suggested, if any other Universities are interested they can reach any of the two universities suggested to coordinate their participation. In order to keep a structured plan, a social service committee must be created among all the institutions involved. Bolivia has more than 50 universities, among the ones that could potentially contribute are: Mayor *San Andrés* University, Private Bolivian University and *Gabriel René Moreno* Autonomous University.

With the purpose of keeping the project as effective as possible, only at least second year students would be admitted, since it will be required that the participants already count with the basic knowledge provided by their degrees for their tasks.

Before assigning specific tasks, it must be mentioned that every second year student from any degree is eligible to perform its social service at the Alalay lagoon as part of a cleaning bridge. They will be there picking up garbage all around the lagoon and its surroundings. Among these cleaning bridges, there will be students that will perform a ranger task. From them it is expected to prevent visitors from throwing garbage or mistreating the lagoon's flora and fauna. A representative of the social work committee, preferably a professor, will be in charge of evaluating the performance of the students, and it would be reported to the universities whether the students have or have not accredited their social service.

For more fieldwork, I recommend a collaboration between the *UMMS* faculties of Agricultural and Livestock Sciences and Rural and Territorial Development. Students from the Biochemical and Bioprocess Engineering form the Catholic Bolivian University could be invited as well. They would go to the lagoon and labor in gardening. In addition, they would be in charge of reporting to the authorities any nest with eggs or any other mammal that is pregnant. This with the objective to preserve and properly take care of the species that live there. They will also be responsible for reporting any disease or damage that they can appreciate on both flora and fauna. The performance of these students will be evaluated the same way as the others. Although, another professor expert on the area should accompany them to assist them and to teach them the proper gardening techniques.

The students from Environmental Engineering, Tourist Administration plus students from Engineering in Business Innovation (or any other similar degree that the University recommends) from the Catholic Bolivian University must work together on a field study while performing their social work. This with the goal of students to start creating and working on a project that could bring financial benefits for them as well as for the lagoon. It is expected from this group of students to come up with an entrepreneurship at the end of their degrees that is beneficial for them as well as for the lagoon. The creation of these projects, campaigns, entrepreneurship or any other idea students come up with should bring the Alalay lagoon closer to being an ecotourism center. Even though achieving this goal is more in the long term, it is vital to start working on it now. The evaluations of these students will be responsibility of their professors since they will be assessing them throughout the whole process.

The timetable for all the infield practices must be agreed and planned between the universities and the corresponding authorities. For this, I would recommend contacting *Crempla* or Cochabamba's office. Nevertheless, I recommend the social work to be carried out during summer for a period of at least two weeks. This to avoid interrupting students during their classes, while also to taking advantage of the higher transit on the Alalay lagoon during the vacation period; which would be very effective to show the community that the youth is working on protecting the lagoon.

The committee will perform a citizen awareness campaign. This task will be entitled to the students from the Catholic Bolivian University from Graphic Design and Visual Communication and Social Communication degrees with the aid of students from the *UMSS* from their faculties of Agricultural and Livestock Sciences and Rural and Territorial Development. Students from these degrees will run this campaign by creating independent social media for the lagoon, including Facebook, Instagram and TikTok, where everyone can find information about it, as well as daily content, mainly short videos, of people taking care of it and also of people enjoying a safe and clean space. This content must be filmed by the students while they are performing in the cleaning bridges. All the content they create must appeal to a young audience. I recommend that the Universities share as well this content in their social media.

Finally yet importantly, students from the Bolivian Catholic University from the Faculty of Humanities and Education Sciences and students from the *UMMS* on the degree of Psych Pedagogy will work on creating summer camps for Alalay children. Along with the activities that the children perform, the values of solidarity and ecology must be reinforced. They must learn to appreciate and respect Alalay's biodiversity. To evaluate these students, the permission of the parents or tutors will be required at the end of the camp.

The principal goal of all of these tasks and activities is to create an informed and educated community around Alalay's lagoon. When you gather a group of young people and you give them a common objective you are instantly creating a sense of belonging, which leads into community. Entailing the young generations in this project, secures the welfare of Alalay's heritage.

To conclude I would like to emphasize the importance of calling on the locals in the resolution of this problem. No measure or governmental plan will be enough if people themselves do not begin doing their part. It is vital to raise awareness and to empower people to do something about their cultural and ecological heritage. Alalay's populations cannot get used to living near a dangerous lagoon nor a garbage dump; instead, they should be living close to the true beauty, diversity, peacefulness and life that nature offers through a lagoon.

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