Pangatalan: an example of a sustainable island as a part of a biosphere reserve

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Abstract: Sulubaai Environmental Foundation (SEF), a Filippino non-profit organization created in 2012, has been devoted to implement ecosystem protection through targeted actions together with a self-sufficient sustainable development in Pangatalan Island (Shark Fin Bay). Before 2012 vegetation was exploited to produce charcoal, a very impacting activity that left only 306 trees on the island. Marine surveys revealed a similar situation underwater, with more than 60% of coral reef turned into rubble with a direct decrease in fish biomass. During time SEF replanted over 50,000 of native plants and 9.000 of mangrove trees. One goal of SEF is to increase the protection of natural resources. For this reason a Marine Protected Area has been implemented in 2016 and a coral restoration project has started. 85% of the electricity used on the island comes from 20 kW solar-powered system making Palangatan Island a zero-Carbon emission place. Food comes from a 2 ha organic farm initiated and developed by the foundation on the main land nearby the island. Water used on the island comes from the mountain nearby thanks to a gravity-based system, making water use 100% green. SEF is promoting up-cycling of materials in order to reduce the ecological footprint: thus SEF re-uses dismantle wood from old buildings of the surrounding villages and material waste (e.g. iron, wood) is donated to who can re-use it. We believe that with its zero-carbon emission policy and eco-friendly actions SEF can be considered has an example for Biosphere Reserve strategies implementation considering ecosystems conservation, sustainable development and overexploited natural resources restoration.

INTRODUCTION

The term 'biodiversity' refers to all the natural resources that provide useful goods and services for mankind. While biodiversity has a number of important functions, recently, many of them have been heavily threatened due to human activities (Naumann, 2001). Loss of biodiversity means loss of resources and ecosystem services and thus threats human sustainability in the biosphere (Rhee *et al*., 2004; Young *et al*., 2005). Palawan is an archipelago composed of main island and more than 1,700 smaller islands. Based on the IUCN classification, it has 105 out of the 475 threatened species of the Philippines. Among the 105 threatened species, 67 are endemic to the Philippines. Among these 67 Philippine endemic species, 42 species are endemic to Palawan. The high biodiversity with a high ratio of endemism makes the protection an essential action to preserve the economic value of Palawan which has been declared a Biosphere Reserve in 1991 (Sandalo and Baltazar, 1997). Biosphere reserve are usually public land, but sometimes, it can partially be owned by private or belong to non-governmental organizations (Ozyavuz *et al*., 2006). Indeed, another way to preserve biodiversity is for Non-Governmental Organizations (NGOs) to lease or maintain buffer zones or sensitive areas that need to be restored or where biodiversity need be preserved. It is essential to develop effective strategies for sustainable use of biodiversity to increase economic benefits for local people and to have positive changes in the conservation of local resources. Hence, sustainable tourism has been recognized as an important strategy to the development of local economy (Hakim *et al*., 2012). Moreover, ecotourism might be used to spread a new approach of living, identified as sustainable life style. Being sustainable is based on the total respect towards natural elements with forms of self-production of local

organic food through zero-mile farming methods. Material used for building must be sustainable and activities must promote renewable energies for as much it is possible to achieve energy self-sufficiency (Delendi, 2017). Water consumption should be limited and resources have to be shared with local communities. Waste should be limited and re-use of materials has to be promoted. Located in Pangatalan Island, Sulubaai Environmental Foundation (SEF) is a non-profit organization who is running a sustainable development project on ecosystem restoration and ecotourism acting as an example of sustainable island as a part of Palawan Biosphere Reserve. The aims of this paper are to show how to reconcile conservation of biodiversity and biological resources with their sustainable use.

MATERIALS & METHODS

Situated in the South-Est corner of Shark Fin Bay, Pangatalan Island with the MPAcovers 41.91 ha. The global area includes 2.34 ha of mangrove, 22.55 ha of shallow reefs, 17.02 ha open water for a total of 13 different ecosystems. The approach of SEF was to follow a sustainable development model (Fig.1) incorporating human and social development, environmental protection and economic resources. According to our model, SEF developed a net of projects to achieve the eco-sustainability on Pangatalan Island: (1) island revegetation and mangrove replanting, (2) marine protected area and marine ecosystem restoration, (3) eco-friendly structures and lifestyle, (4) staff training and sustainable tourism.

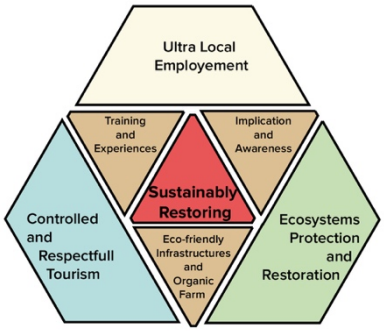

Figure 1 : Sustainable development model of Sulubaai Environmental Fundation

Vegetation and Mangroves replanting

During previous occupations of Pangatalan Island, vegetation and trees have been cut down to be sold. In 2013 the DENR estimated the remaining vegetation to number 306 trees. Similarly 0.85 ha of mangrove have been cut down to facilitate the access to the island and to produce charcoal in the past. An evaluation of the main impacted species defined *Rhizophora stylosa*, *Rhizophora apiculata*, *Rhizophora mucronate* and *Sonneratia alba* as the most impacted. After a first assessment, SEF decided to start an intense replanting action to restore the mangrove population and the wild vegetation. The eastern zone of the mangrove is strongly exposed to wave actions and soil erosion from December to April. For this reasons SEF planned to replant *Sonneratia alba* in the external part, since *Sonneratia alba* is known to be resistant to tough conditions, hoping that its presence will increase the survivorship for *Rhizophora ssp*. To help the regrowth on the eastern zone, a 35 m long dike was built with the purpose to reduce the wave action and facilitate sediment accretion. Furthermore, 3,000 *R. stylosa*, 500 *R. mucronate* and 2,500 *R. apiculata* were planted on the western zone where conditions were positive for their growth.

Marine protected area and marine ecosystem protection

Established in 2016, the Marine Protected Area (MPA) of Pangatalan Island covers 40 ha, including 11.3 ha of coral cover: a fringing reef surrounding the island and an isolated patch reef on the north side. The MPA is divided in zones : a no-take zone (where no activities are

allowed), a snorkeling-and-diving zone (where only recreational activities are allowed) and a coral-restoration zone. Indeed, in 2016 SEF designed an artificial structure, Sulu-Reef-Prosthesis (SRP) to restore parts of the reef where coral mortality was high and structural strength was lost.

Eco-Friendly structures and lifestyle

SEF made all the constructions with sustainable materials and with respect of natural resources. Buildings and furnitures are completely in wood promoting the re-use, indeed materials come from dismantled building. Electricity is produced by a 20 kW (Fig.2) solar panel system, which is enough to provide power for all the activities. Pangatalan Island is supplied in water by a gravity flow pipe with the collecting point situated in a river on Maytiguid Island. The water treatment consists in a 3 steps septic-tank treatment before ground spreading in bush with filtering plants (ferns and blue ginger) to guarantee a complete absorption. In order to promote the self-production of food, a 1.2 ha organic farm was implanted on the main land. The organic farm (Fig.2) has been divided in: (1) 900 m^2 vegetable garden, (2) 12 terraces used to plant rice and extra vegetables, (3) livestock which include pigs, chickens and ducks, (4) 1.2 ha fruit trees.

Figure 2 : Solar panel system (left) and organic farm (middle and right) of SEF

Staff training and sustainable tourism

The philosophy of SEF is based to bring awareness to people from every horizon. The project focus on ultra-local employment as 98% of the team comes from the nearest villages. Mostly of them have only a few working experiences and almost no qualification, so SEF train them on the Island and try to build up their skills.

SEF is born as a private initiative, so one important aspect is to establish a financial income to secure the funds necessary to implement all actions. The foundation welcome visitors on the island in a responsible and respectful way. Only exclusive rent of the island is allowed, so that no stranger are mixed. In order to keep the conservation of natural resources, rent takes place for only 3 months of the year and provides funds necessary for the annual functioning cost and projects funding.

RESULTS and DISCUSSION

Restoration of natural resources

Restoring natural resources preserves biodiversity and public enjoyment not only for ourselves but for future generations (Kanner, 2015), but it requires rehabilitation of both structures and functions. Since 2013, 50,977 plants and trees from 64 varieties have been replanted in wild and gardened vegetation (see Annex 1) to reduce the run-off of sediment on the coral reef. Soil

erosion has been also reduced through the setting of terraces and the increase of shade created by plants reduced the watering consumption. The purpose of the mangrove replanting was also to stop the sediment run-off. Looking at the results of mangrove replanting, a 25% survivorship rate was observed on the east side, while it was nearly 100% on the west side. Similarly, some parts of the reef have suffered from previous damages leading to extremely low coral cover and structure lost in the north part of the island. From 2017 to 2019 more than 200 SRPs have been placed and more than 1,600 coral fragments have been replanted on the rubble path whiting the MPA, showing a 76% survivorship rate. Nowadays, there are different ways to address value to natural resources. This valuation is mostly made looking at the economic values provided by that specific ecosystem (Chen *et al.*, 2017). However, it seems that stakeholders are starting to understand that the appropriate remedy for natural resource damages would be to bring back those resources through restoration actions rather that attribute a monetary compensation (Kanner, 2015).

Promoting a sustainable life-style financed by sustainable tourism

Local communities strictly rely on traditional knowledge, which is passed on from one generation to the next, usually by word or example within a specific group of people (de Berdt Romilly, 2005). In this kind of contest, an innovative approach to articulating sustainable development is to recast it as a pre-existing thinking and development pathway that has been practiced by poor communities over time. SEF is promoting a sustainable life-style working together with local communities. In order to promote a long-term acceptation and to initiate a change. The foundation attempts to get people involved and bring awareness to the young generation as well as to the rest of the community. The *modus operandi* used by SEF is: 1) to have a participative approach with the local villages (e.g. be present to the village meetings and providing support for local needs); 2) to offer job opportunities for people coming from nearest villages and train them. Indeed, to date SEF is proving jobs for 21 members (6 gardeners, 3 farmers, 3 house keepers, 1 masseur, 2 chefs, 3 general maintenance technicians, 1 boat technician and 2 guards). The foundation relies on the organic farm for vegetables and fruits, but protein sources are purchase from the nearest villages in order to increase the local economy, trying to prize a responsible approach. Fish is provided only by fishers that apply sustainable fishing activities as well as for the other products. Furthermore, all activities on the Island, such as energy or water consumption, are shaped to reduce the ecological footprint, an approach that made SEF to be rewarded as a zero-carbon emission resort from PCSD in June 2019. Studies report that sustainable tourism will become the key to enhance economic growth and biodiversity conservation as well as community development in many developing countries (Chen *et al.*, 2017; UNESCO, 2007). Principally, it should be understood that the idea of biodiversity conservation cannot be separated from any tourism planning or development (Hakim *et al.*, 2012). The project of sustainable development of the island is financially based on eco-tourism. Construction on the island only represent 5% of the total surface and the bungalows are very integrated in the landscape, decorated with local materials, and sustainable.

CONCLUSION

Conservation of biological diversity, training, monitoring, information sharing, and experience exchanging at a global level are fundamental elements for the sustainable development in Pangatalan Island. SEF worked through the relationship between conservation of biodiversity,

local cultural and socioeconomic development in Palawan. In this paper we shown the effectiveness of the participatory approach for sustainable resources management. Through a Responsible Tourism Policy, SEF intends to transmit information and awareness about its commitment to the principles of sustainable development, promoting high value experiences. We believe that with his zero-carbon emission policy and eco-friendly actions SEF can be considered has an example for Biosphere Reserve strategies implementation considering ecosystems conservation, sustainable development and overexploited natural resources restoration.

POLICY FOR FUTURE IMPLICATIONS

The future actions that SEF would like to implement are:
1) To be a model of sustainability for other islands in Asia-Pacific.
2) To build a network of participative Marine Protected Areas.
3) To develop an educational platform called “Sea academy”.

ACRONYMS

DENR: Direction Environmental National Resource
IUCN: International Union for Conservation of Nature
MPA: Marine Protected Area
PCSD: Palawan Council Sustainable Development
SEF: Sulubaai Environmental Foundation
SRP: Sulu-Reef-Prosthesis

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