Community Conserved Areas in Sabah, Malaysia: Sustainability and Impacts on Livelihoods

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Abstract

Community conserved areas (CCAs) have tremendous potential for supporting biodiversity conservation, providing ecosystem services, conserving local ecological knowledge and providing better livelihood outcomes for communities. This study was conducted in two CCAs around the Kinabalu Ecolinc zone, Sabah, Malaysia to: i) understand the factors contributing to the sustainability of CCAs, and ii) assess the impacts of CCAs on the livelihoods of indigenous communities. In each CCA, 80 household interviews and one focus group discussion were conducted. Household interviews collected information on their livelihood capitals, participation in Kinabalu Ecolinc activities, satisfaction with Ecolinc's activities, and perception on Ecolinc's management, benefits and sustainability. Information on their CCA management strategies, livelihood and tourism development activities, and the sustainability of the CCAs based on Ostrom's Design Principle (ODP) were collected through focus group discussions. Both CCAs are found to be sustainably managed by their respective communities, conforming to all eight ODPs. Principles such as conflict resolutions (ODP 6), gaining formal recognition (ODP 7) and having nested enterprises (ODP 8) could be further enhanced to strengthen the land tenure security for the long-term sustainable management of the CCAs. Participation of the communities in CCA projects' management affects the sustainability of the project. CCAs and Ecolinc's activities have a positive contribution to the livelihoods of indigenous communities. Continuous institutional support from government and private sectors would be essential for community development projects, especially in communities that face more shortages in food security. This study proves that indigenous communities are capable of managing their natural resources sustainably and provides insights on the factors that could enhance the sustainable management of CCAs.

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Acronyms and Abbreviations

Initial	Description
AIM	Amanah Ikhtiar Malaysia
CBD	Convention on Biological Diversity
CCA	Community Conserved Area
COP	Conference of Parties
GOMPITO	*Koisaan momogompi tinungkusan gulu-gulu om kotolunan sandad* or Cultural Heritage and Environmental Conservation Association
ICCA	Indigenous and Community Conserved Area or Indigenous Peoples and Community Conserved Territories and Areas
IUCN	International Union for Conservation of Nature
JICA	Japan International Corporation Agency
JKPA	Jawatankuasa Pemegang Amanah
JKPAHLK	Jawatankuasa Pemegang Amanah Hutan Lindungan Komuniti
JPKK	Jawatankuasa Pembangunan dan Keselamatan Kampung or Village Development and Security Committee
KDCA	Kadazandusun Cultural Association
KKNB	Kooperasi Koonduan Kiau Nuluh-Bersatu
KRT	Kumpulan Rukun Tetangga
LMMA	Locally Managed Marine Area
MOTAC	Ministry of Tourism, Art and Culture
NPP	National Physical Plan
ODP	Ostrom's Design Principle
PA	Protected Area
PEMANGKINA	Persatuan Malim Gunung Kinabalu
RELA	Malaysia Volunteers Corps Department
SLF	Sustainable Livelihoods Framework
UMS	Universiti Malaysia Sabah
WPC	World Parks Congress

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Chapter 1: Introduction

1.1 Background

In recent decades, the concept of Indigenous and Community Conserved Areas (ICCA) has gained wider recognition in discussions on protected areas (PA) management both nationally and internationally. The term ICCA had been notably highlighted during the International Union for Conservation of Nature (IUCN)'s 5th World Parks Congress (WPC) held in 2003. It suggested a diversification to the conventional conservation approaches of PA by including the indigenous and local communities living within them (Borrini-Feyerabend, et al., 2004; Pathak, et al., 2004). The importance of having full participation of indigenous and local communities in the management and establishment of PA was stressed (DeRose, 2004). Following that, the 7th Conference of Parties to the Convention on Biological Diversity (CBD COP7) in 2004 approved the Programme of Work on Protected Areas which urges countries to support and recognise ICCA. These two events emphasised the importance of garnering the support and participation of indigenous and local communities in PA where their livelihoods and interests may be affected (Borrini-Feyerabend, et al., 2004).

There are several concepts that define ICCA. IUCN defined it as "natural and/or modified ecosystems containing significant biodiversity values, ecological services, and cultural values, voluntarily conserved by indigenous, mobile and local communities, through customary laws and other effective means" (Borrini-Feyerabend, et al., 2004; Kothari, 2012; Sajeva, et al., 2019). There are three distinct features of ICCA (Pathak, et al., 2004; Berkes, 2009; Jonas, et al., 2017). One of the key features when identifying an ICCA is it involves a community (or communities) closely connected to the ecosystem culturally and/or because of livelihood needs. Second, management decisions of the community effectively lead to conservation, even though conservation may not be the primary objective. Third, the community is the major decision maker, and community institutions have the capability to enforce regulations.

ICCA may exist in formally designated PA, outside of formally designated areas and sometimes an overlap between the two with various ecological, cultural, economic and political conditions (Kothari, 2012). They can also fit across the different categories of protected area under the IUCN classifications. Prior to the term ICCA, the term community conserved area (CCA) was used in the earlier stages including during the WPC in 2003 and CBD COP7. At present, the term has evolved to 'Indigenous Peoples and Community Conserved Territories

and Areas' while still retaining the acronym ICCA (Kothari, 2012). Locally, they are also known in multiple terms such as Indigenous Protected Areas in Australia (Smyth, 2015), indigenous reserves in South America (Hernandez Marentes, et al., 2022; Solis-Aguilar, et al., 2022), community reserves in India (Edake, et al., 2019) and village common forest in Bangladesh (Nath, et al., 2020). 'Community forest' is another commonly used term when referring to terrestrial ICCA, whereas for marine ecosystems the commonly used term is 'Locally Managed Marine Area (LMMA)' (Kothari, 2012; Long, et al., 2021). Human populations have adapted to and evolved their lifestyles over thousands of years based on their surrounding environment and natural resources (Borrini-Feyerabend, et al., 2004; Artelle, et al., 2019). This leads to a symbiosis between the communities and their environment where they constantly manage, modify, conserve and even enrich the biocultural landscapes where they live (Schuster, et al., 2019).

The concept of ICCA may fit well for many of the landscapes where indigenous communities live, but the communities have raised concerns that their territories should not only be valued for the conservation of species or ecosystems as in the conventional PA frameworks. It should instead be seen as landscapes or seascapes which are connected to the socio-cultural, economic, spiritual, political and other aspects of the community's livelihoods (Kothari, 2012; Dawson, et al., 2021). The planning and management of ICCA should consider the needs, social and cultural variables, and interpretation of conservation by the communities (Axford, et al., 2008). Certain communities have shifting or transient boundaries depending on their movement and traditional ways of life which allows for ecosystem and species recovery, hence may not fit in the conventional PA norms (Kothari, 2012).

In an effort to tackle climate change, the European Union funded the state of Sabah, Malaysia to implement a forest conservation project beginning on December 2013. The project aims to contribute to the sustainable and low carbon development in Sabah through sustainable forest management and community development. One of the selected sites is the Kinabalu Ecolinc zone. The Kinabalu Ecolinc is a long-term project initiated in 2010 by Sabah Parks to improve the ecological connectivity between Kinabalu Park and Crocker Range Park. These two parks are physically separated by a corridor of fragmented forests for a distance of at least 10km. The main coordinator for the forest conservation project is Sabah Forestry Department, whereas the implementing agency for Kinabalu Ecolinc activities is Sabah Parks. There were four activities identified for improving the ecological connectivity (Martin, et al., 2015):

1. Establishing community conserved areas (CCA) that is managed by the local community voluntarily, with support from the government and its agencies
2. Community based restoration of degraded habitat in CCA and adjacent areas
3. Development of sustainable agriculture for livelihoods and enhanced land management
4. Enhancing forest-related community tourism options to support forest management

In June 2014, the Kinabalu Ecolinc project team was established to begin the project implementation. They introduced the concept of CCA and engaged with the indigenous communities within the Kinabalu Ecolinc zone. Nine villages were identified as potential CCA (Martin, et al., 2015), but only two of them were established by the end of the project period. The two CCAs are Bundu Tuhan village and Kiau Nuluh-Bersatu village. This study will explicitly discuss about CCAs.

1.2 Rationale of this research

CCAs have tremendous potential for supporting sustainable use of biodiversity-rich landscapes, the protection of ecosystem services, and the development of new economic opportunities for communities (Vaz & Agama, 2013). Absence of sustainable management in the CCAs will lead to natural resource degradation and biodiversity decline which will in turn adversely affect the livelihoods of people who are dependent on it (Kazungu, et al., 2020). Some earlier studies in Sabah described the communities use of natural resources, social structure and their traditional practices (Appell, 1995; Lye, 1998). George Appell (1997) looked at the influence of religion on the ecological and social consequence among the Rungus Dusun. There is a report which mentions a number of CCAs in Sabah that deserves recognition. It details the enabling institutions, traditional knowledge, customary practices and the strengths and weaknesses of the CCAs (Cooke & Vaz, 2011). A few reports were published regarding the legal framework in Malaysia regarding CCAs or community management of natural resources (Vaz, 2012; Bulan & Maran, 2020). It shows that the concept of CCA has been implemented in Sabah, but none of them are monitored for its effectiveness. There were no studies done to understand the sustainability of the CCAs, factors contributing to the sustainability of the CCAs and the impacts of CCAs on the livelihoods of communities.

1.3 Aim and objectives of this research

Since the two villages were established as CCAs, there has not been any study done to monitor their sustainability and impacts on the participating indigenous community. The aim of this study is to understand how indigenous communities manage their CCA sustainably. This study has two objectives: 1) Examine the factors that contribute to the sustainable management of CCAs and 2) Evaluate the contribution of CCA related interventions on the livelihoods of the indigenous community.

Chapter 2: Literature Review

2.1 Status and management of ICCAs in Malaysia and the global context

Indigenous and local communities own or govern at least 32% (43.5 million km^2) of the world's terrestrial environment (WWF, et al., 2021). There are no global estimates for marine and coastal environments of ICCAs due to the lack of data (Garnett, et al., 2018; WWF, et al., 2021). Potential ICCAs cover an area of 17% across the globe and if they are recognised for their contributions to conservation alongside with the network of protected areas, the coverage could add up to 31% (about 41 million km^2) of land globally (UNEP-WCMC and ICCA Consortium, 2021). This signifies a significant area of the Earth which are not protected, but could contribute to the conservation of biodiversity and ecosystems (Dudley, et al., 2018; Pimm, et al., 2018). A global ICCA registry was initiated in 2008 and it attempts to compile a list of ICCAs worldwide with data which are voluntarily provided by the communities themselves (ICCA Registry, n.d.). ICCAs around the world may have various governance and management structures such as the Australia's Indigenous Protected Areas which are state-recognised tenure (Smyth, 2015; Rist, et al., 2019) and Nepal's sacred sites in the Himalayas known as *beyul* which exists within or outside of state protected areas (Stevens, 2013; Skog, 2017). Some areas are fully managed by the community even though it is located on state land (Sinthumule & Mashau, 2020). There are areas with shared governance between the state government and the community, for instance, communal reserves or forests in the Amazon basin (Fisher, et al., 2020; Humphries, et al., 2020). Many of the ICCAs remain unrecognised and some of the communities are even vilified for their management practices due to the

imposed laws on overlapping terrains (Tauli-Corpuz, et al., 2020; UNEP-WCMC and ICCA Consortium, 2021).

In Malaysia, the concept of community conserved areas has drawn considerable attention in the state of Sabah. The report by Cooke and Vaz (2011) states three features to identify ICCAs. First, there should be a well-defined user group with a strong cultural, sense of identity and/ or dependence for livelihood or well-being at a well-defined site. Secondly, the user group is the main decision maker and implements the management decisions at the site. The third feature states that the user group's management decisions and efforts lead to conservation of habitat and biodiversity. These features highly coincide with the features described by Pathak, et al. (2004) which is used to identify ICCAs globally. The ICCAs in Sabah are of mixed management, some are situated within a formally protected area and co-managed with the state authorities, some are gazetted as Native Reserves which allows for a large proportion of management to be decided by the community themselves, but the state authorities still hold the ultimate decision, whereas others are situated in lands classified as forest reserves where state authorities hold the ultimate management decision (Vaz & Agama, 2013). However, the state authorities have been flexible in most cases and there appears to be no conflict between the communities and state authorities thus far. The communities are still allowed to stay in the parks or forest reserve and practice their livelihoods which in many cases helped in safeguarding the landscapes' biodiversity from large-scale developments and encroachments from outsiders (Majid Cooke & Vaz, 2011; Vaz, 2012).

2.2 Importance of ICCAs

Indigenous and local communities are often intricately linked with the vast areas and ecosystems that they live in. It provides the communities the means of spiritual, socio-cultural, political, economic and physical well-being (Brown, et al., 2006; Oviedo, 2006; Jana & Paudel, 2010). Through these links, the communities also promote the conservation of ecosystems and threatened species in ICCAs across different biogeographic regions (Tran, et al., 2020). Traditional indigenous territories encompass up to 22% of the world's land surface and they coincide with areas that hold 80% of the planet's biodiversity (Sobrevila, 2008). This shows that many of the world's biodiversity hotspots overlaps with areas occupied by indigenous communities and it presents a great opportunity to enhance conservation efforts in ICCAs. In

Australia's Western Desert, the indigenous community's practice of burning while hunting for small game has allowed the area to regenerate and maintain a high species richness in small patches which leads to a higher diversity in the surrounding landscape (Bird, et al., 2008). In a study by Colding and Folke (1997), they found that roughly one-third of species-specific taboos by the indigenous community are listed as threatened species in the IUCN Red List.

ICCAs are valuable in terms of providing, regulating and maintaining ecosystem services such as water security, soil conservation, carbon storage, flood control, disease regulation and aesthetic values to the communities living there and other urban communities in the vicinity (Jana & Paudel, 2010; Majid Cooke & Vaz, 2011; Mengist, et al., 2022). Existing ICCAs are often found located between protected areas, thus can serve as corridors and linkages for species ensuring the connectivity of wildlife habitats and enabling a healthy gene flow (Brown, et al., 2006; Oviedo, 2006; Garnett, et al., 2018). Indigenous communities have been able to maintain a sustainable stable-state of resource abundance and create resilient ecosystems in landscapes they live in (Winter, et al., 2020). Their approaches increased the quality and quantity of key ecosystem services, such as clean water, sediment retention, nutrient cycling, species richness and abundance and human wellbeing. In terms of economic value, the ecosystem services that a tropical forest in India provides is estimated to be between USD 203 to 2294 per hectare per annum (Ninan & Kontoleon, 2016). When considering air flow regulation itself, the ecosystem service value it provides is estimated to have a median of USD 847 per hectare per annum (Taye, et al., 2021). The values demonstrate the relative importance of ecosystem services to humans which can also be useful to guide discussions on forest resource management.

Many indigenous and local communities rely on their ICCAs for livelihood resources, such as food, water, materials for shelter and medicine (Bera & Maiti, 2022; Bodmer, et al., 2023). Besides providing livelihood resources, ICCAs are also important for providing economic income for the communities. Examples of income sources deriving from ICCAs are the sale of forest produce or marine produce, agroforestry and ecotourism (Abukari & Mwalyosi, 2020). If the communities are faced with crises or external shocks due to climatic or economic instability, ICCAs can provide food security to those who have limited options to cope (Girma, et al., 2023). ICCAs play a fundamental role in providing communities with livelihood security, thus protecting them from the risks of hunger, malnutrition, diseases and homelessness (Basavarajaiah, et al., 2020; Robidoux, et al., 2021).

In ICCAs, local ecological knowledge, rituals and practices are built and passed down through generations. This may include knowledge on edible flora and fauna, traditional medicine, paying respect to memories of ancestors or deities, knowledge on ritual places and guarding of burial sites (Mavhura & Mushure, 2019). The application of their local ecological knowledge is found to beneficial for natural resource management, providing livelihood security and conservation of biodiversity (Karnad, 2022; Sinthumule, 2023). In the Himalayan region of India, farmers have been planting hundreds of rice, vegetables and bean varieties to revive agro-biodiverse practices and are involved in forest conservation activities (Kothari, 2012; Mudigere Sannegowda & Garkoti, 2022). In the Peruvian Andes, the Quechua indigenous community has been maintaining their traditional knowledge in cultivating their crops including the potato for over 7000 years. This biocultural heritage site also known as Potato Park is an agro-biodiverse area boosting about 1200 varieties of potatoes and provides food security through a variety of other crops planted such as quinoa, amaranth and oca (Alejandro, 2008; Swiderska & Argumedo, 2022).

2.3 Recognition of ICCAs

Although there are numerous places in Malaysia which are known as either native reserve, heritage reserves or community forests, they are not necessarily considered as ICCA by default. These areas may even hold the key features of an ICCA as described by IUCN, but it should not be considered as one without the request and informed consent of the concerned community (Massey, et al., 2011; Smyth, 2015). The feature that explains an ICCA as an area which is either intentionally conserved or conserved as an unintended outcome due to their livelihoods or management decisions plays a critical role in the process of ICCA recognition.

When faced with social or ecological changes, an area which has been recognised as an ICCA may have a better chance at retaining its conservation value. However, areas which are conserved as an unintended outcome of their livelihoods may risk dealing with conservation agendas, even though conservation was not their main intention since the beginning (Massey, et al., 2011). The consequences of this would be restricted land use, loss of management rights and having an influence towards the local perceptions on land rights and ownership (West & Brockington, 2006). It is important that the communities are well versed with the definition of

ICCAs and the various mechanisms that contributes to conservation whether as the main intention or an unintended outcome, before discussing the options to recognise it as an ICCA.

2.4 Challenges towards the sustainable management of ICCAs

Unwanted development projects by outsiders may threaten the sustainability of ICCAs. Parties who want to take over the ICCA territories for mega development projects such as logging, and dam construction often propose attractive schemes to the villagers. If the communities are not cautious and did not put strict controls to fend off unwanted development activities, the ICCA would be vulnerable to exploitation (Majid Cooke & Vaz, 2011; Tran & Neasloss, 2020).

The lack of capacity among community leaders or ICCA managers would lead to poor monitoring of the ICCAs, mistrust, conflict and poor participation from the community which in turn reduces the management effectiveness of ICCAs (Sinha & Suar, 2005; Zeng & Gerritsen, 2015; Jumani, et al., 2022). Community leaders or managers who are perceived to be unfair and less representative of the community could lead to a collapse of the management structure and community compliance (Golebie, et al., 2021). When there is a lack of transparency and inclusiveness in the management, the lack of equity in sharing of benefits towards marginalised groups of the community may also arise (Kenfack Essougong, et al., 2019; Cadman, et al., 2023). Considerable time and resources should be invested to build trust and equity with the community, especially if the ICCA manager involves an external party (Nikolakis & Hotte, 2022; van Putten, et al., 2022).

National legislations, policies and institutions may pose challenges to ICCAs (Tran, et al., 2020), especially when the ICCA is not recognised within the state. If the ICCA is located within a specifically designated protection status such as a forest reserve, there may be legislations and policies in place that hinder certain activities within the reserve and restrict the community's access (Majid Cooke & Vaz, 2011; Vaz, 2012).

Other environmental threats such as climate change (Schlingmann, et al., 2021), tourism impacts (Jordan, et al., 2019), invasive species (Shrestha, et al., 2019) and market pressures for increasing resource extraction would also pose a challenge to the sustainable management of ICCAs (Licona, et al., 2011; Tran, et al., 2020). These threats can negatively

impact the livelihood of communities, especially those who are highly dependent on natural resources (Venugopal, et al., 2019).

Chapter 3: Methods and Materials

3.1 Study areas

Both CCAs in this study are located in between two protected areas, namely, Kinabalu Park and Crocker Range Park in Sabah, Malaysia (Figure 1). The area between the two protected areas is known as the Kinabalu Ecolinc zone. One of the CCA is located in Bundu Tuhan village (5°59'2"N, 116°31'48”E) in Ranau district. It is a village that comprises of eight main hamlets, namely Sokid, Tawo-Tawo, Kapatahan, Komot Tengah, Gondohon, Bundu Tuhan, Paka and Hamad. The population consists of more than 3000 indigenous people from Dusun ethnicity. It is important to note that the concept of CCA had already existed before the initiation of Kinabalu Ecolinc and their CCA contains all three features of a CCA or ICCA as described by Pathak et al. (2004) and Cooke and Vaz (2011).

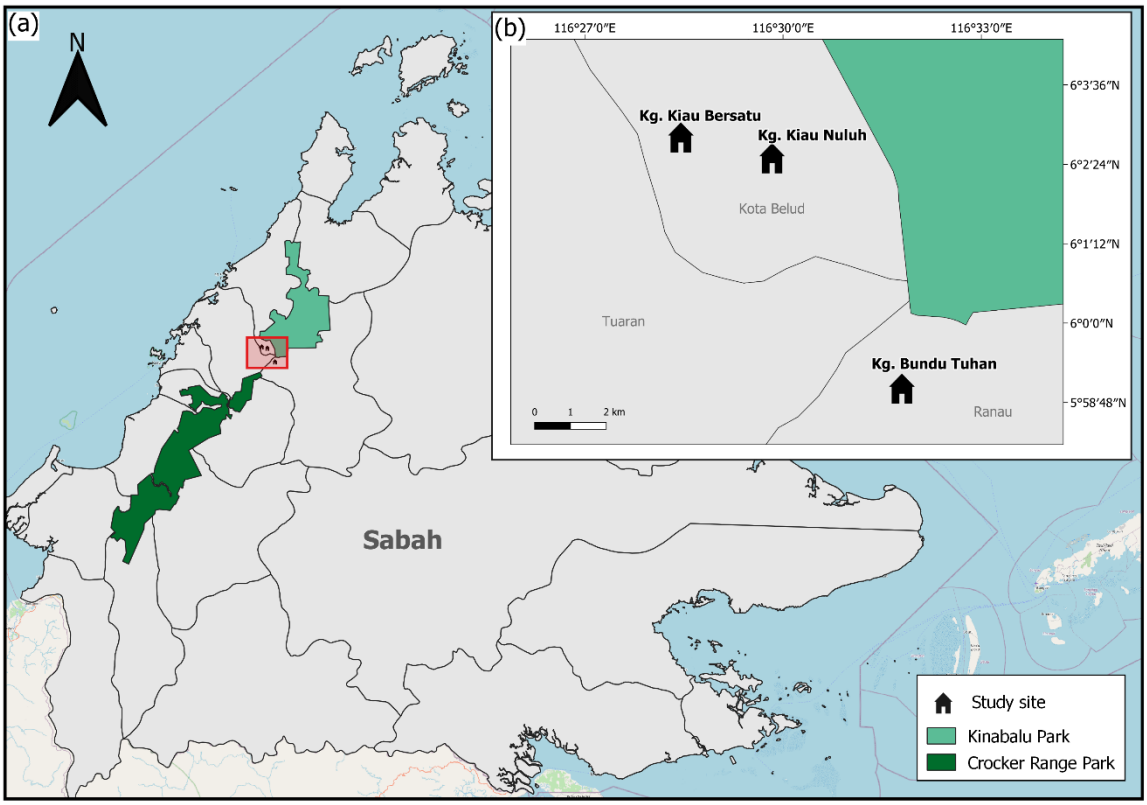

Figure 1: (a) Map of Sabah, Malaysia with the study areas indicated in between Kinabalu Park and Crocker Range Park; (b) Map of the study sites in their respective district.

The other CCA is located in Kiau Nuluh-Bersatu village. Kiau Nuluh-Bersatu village is actually a combination of two neighbouring villages, namely Kiau Nuluh (6°2'32"N, 116°29'50"E) and Kiau Bersatu (6°2'50"N, 116°28'27"E). Kiau Nuluh has about 950 people, whereas Kiau Bersatu has about 500 people. Jointly, Kiau Nuluh-Bersatu village holds a population of about 1450 people and are also from the indigenous ethnic called Dusun. Kiau Bersatu village was established in the 1960s by a number of villagers who migrated from Kiau Nuluh. In 1987, a small neighbouring village known as Gahui village agreed to join Kiau Bersatu and is now administered in unison as Kiau Bersatu (Labeh & Dalansu, 2021). The concept of CCA in Kiau was already present before Kinabalu Ecolinc project, however, it has not gain any gazettement from the government. The CCA in Kiau was voluntarily set aside by the community for its cultural, heritage and biodiversity value. Hereafter, Kinabalu Ecoliinc project will be referred to with the term Ecolinc.

3.2 Conceptual framework

Sustainable management of CCAs

The term 'tragedy of the commons' is described as the tendency of humans to overexploit common pool resources because of the lack of individual ownership and restrictions in place to limit extraction (Hardin, 1968). Hardin (1968) claims that only state-owned and private properties are capable of conserving its finite resources, thus preventing it from environmental degradation. However, Ostrom (1990) argued that the long-term sustainability of common pool resources can be maintained when governed by a community of users. A set of eight design principles, known as Ostrom's Design Principles (ODPs), was identified as characteristics that contribute to the sustainable management of common pool resources. In this study, Ostrom's design principle (ODP) along with additional breakdowns in principle 1, 2 and 4 by Cox, et al. (2010), is used as a tool to examine the factors that contribute to a sustainable CCA (Table 1). ODPs are used as a guidance tool in formulating questions to assess the CCAs' management strategies and status of the CCA. These principles aid our understanding on the formal and informal institutions involved when communities manage common pool resources (Polski & Ostrom, 1999; Seward & Xu, 2019; Haider, et al., 2019). Studies on various common pool resources including water bodies, forests and fisheries have found that when more design principles are present, the probability of sustaining it successfully

is higher (Cox, et al., 2010; Baggio, et al., 2016; Wang, et al., 2019). Apart from that, the sustainability of CCA intervention programmes is found to be associated with participation from the local or indigenous communities. When the communities are jointly involved in the management, there will be more equitable sharing of power and responsibilities (Foli, et al., 2017; Hajjar, et al., 2021). It could also improve relationship and build trust with the project authorities which leads to a more sustainable CCA management (Sheikh, et al., 2019). Community participation in CCA interventions is also assessed in this study.

Table 1: Design principles that characterises the long-term sustainability of common pool resources. Source: Cox, et al. (2010)

	Design Principle
1	Clearly defined boundaries a) User group b) Resource boundaries
2	Congruence between appropriation and provision rules and local conditions a) Appropriation and provision b) Congruence with local conditions
3	Collective choice arrangements
4	Monitoring a) User behaviour and resource conditions b) Monitors are accountable to or are the users themselves
5	Graduated sanctions
6	Conflict resolution mechanism
7	Minimal recognition of rights to organize
8	Nested enterprise

Livelihood analysis

One of the goals for CCAs establishment is to improve the livelihoods of the participating indigenous community. This research uses the sustainable livelihoods framework (SLF) (Scoones, 1998; Department for International Development, 1999) to examine how a number of livelihood capitals in a given context enables a person to pursue different livelihood

strategies in order to achieve desirable outcomes. Figure 2 demonstrates the sustainable livelihoods framework by DFID (1999). It highlights the important factors which affect livelihoods and how they are linked to each other. Desired livelihood outcomes include more income, increased well-being, reduced vulnerability, improved food security and more sustainable use of natural resource (Department for International Development, 1999; Robinson & Fuller, 2010; Bennett & Dearden, 2014). The livelihood strategy adopted by a person will be a result from the combination of capitals along with the institutional processes such as laws, policies and practices in place. A livelihood is sustainable when it can maintain their livelihood capitals or enhance capabilities without depleting its natural resource base. The SLF has been widely adopted and is used to analyse the livelihood impacts of any intervention (Islam, et al., 2019; Mai, et al., 2020). In this research, the framework will be used to analyse the impacts of Ecolinc project on the livelihood strategies and capitals of the community in order to achieve the livelihood outcomes (Robinson & Fuller, 2010). A review of policies relating to CCAs in Malaysia was also done to explain the processes that influence the community's livelihoods.

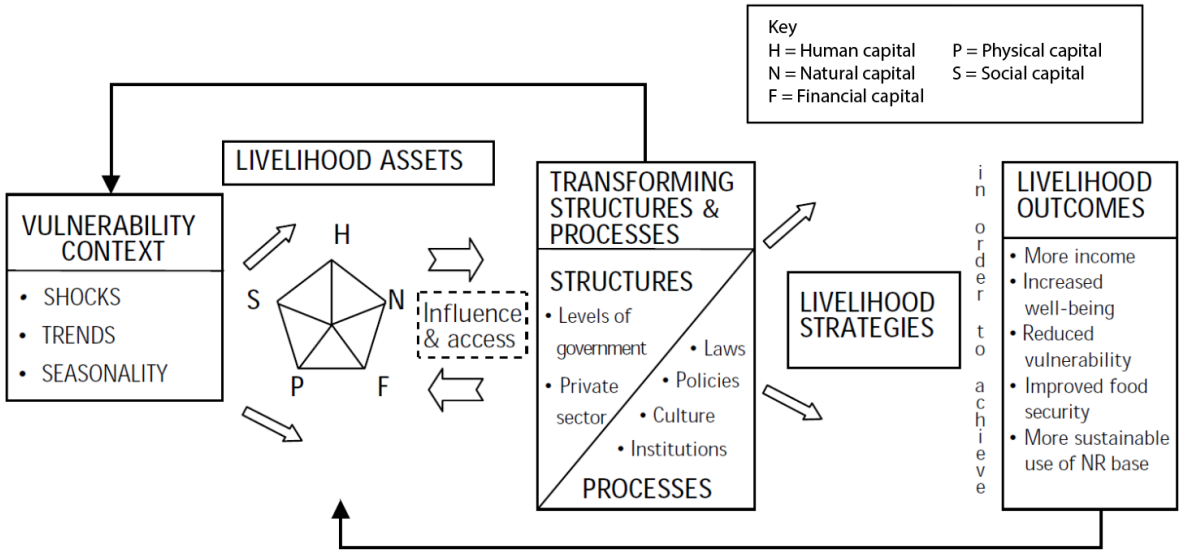

Figure 2: Sustainable livelihoods framework for understanding the factors that affect livelihoods and its multiple interactions as denoted by the arrows. The arrows do not imply direct causality rather the level of influence, where larger arrows mean more influence. Source: DFID (1999).

3.3 Data Collection Tools

A semi-structured questionnaire was developed for household interviews (Annex I). The questionnaire records the livelihood capitals possessed, participation in Kinabalu Ecolinc activities, satisfaction with Ecolinc's activities (rated on a five-level Likert scale: 1="very unsatisfied", 2="moderately unsatisfied", 3="neither satisfied nor unsatisfied", 4="moderately satisfied", 5="very satisfied") and their perception on a) involvement of communities in the project management and governance, b) benefits of Ecolinc to the community's livelihoods and c) sustainability of Ecolinc activities. A five-level Likert scale was used to record the respondents perception: 1="strongly disagree", 2="disagree", 3="neither agree nor disagree", 4="agree", 5="strongly agree".

The questionnaire developed for focus group discussions consist of three main sections (Annex II). The first section discusses the background of Kinabalu Ecolinc project and their contribution to the ecological, social and economic aspects in the village. The second part includes the CCAs' management strategies and status of the CCA based on Ostrom's Design Principles. The third section discusses the tourism and livelihood development activities in the villages.

Ethics approval for this study was obtained from the Science and Engineering Research Ethics Committee of the University of Nottingham Malaysia (*Application Identification Number - VL290921*). A written consent was obtained from all participants who took part in this study. Participants were also made aware that the responses collected are kept anonymous with no traces of individual identification.

3.4 Data collection

Information on the management strategies of the CCAs were gathered through past reports. It was then validated and updated with data garnered through focus group discussions. A review of policies on CCAs in Malaysia was done to understand the enabling processes that may affect the community's livelihoods. Household interviews and focus group discussions were conducted with guidance from ODPs and the SLF as explained in the conceptual framework. Household interviews were conducted to collect data on household livelihood capitals and strategies, and the impacts of Ecolinc on the livelihoods of communities. Focus group discussions were held to collect information on the Ecolinc's contribution as well as the CCAs' management strategies and sustainability. Household interviews and focus group discussions are methods that are most common and widely used by researchers when assessing

the livelihood of communities, impact of any intervention on their livelihoods (Aye, et al., 2019; Kumar, et al., 2019; Ken, et al., 2020) and sustainability of their CCAs (Massiri, et al., 2019; Nath, et al., 2020; Perfect-Mrema, 2022).

Pilot interviews were conducted through online conference settings with a few villagers from Bundu Tuhan and Kiau in October 2021. The pilot helped to refine the language and terms used to better adapt to the communities understanding of the questions. The sample size was determined using an equation with a precision level of ±10% (Israel, 1992). Below is the equation adapted from Israel (1992) to calculate the sample sizes (Equation 1). Based on the estimated number of households in Bundu Tuhan of about 500, the sample size is calculated to be 83 households. The estimated number of households in Kiau is 240 which leads to the sample size of 71 households. For data collection, the larger sample size was selected and rounded off. This results in a decision to interview 80 households per village as an effort to obtain equal sample sizes.

$$n = \frac{N}{1 + N(e)^2}$$

Equation 1: Sample size calculation.

n is the sample size; N is the total household number; and e is the level of precision.

Household interviews and focus group discussions were conducted between November 2021 to March 2022. During the initial stages of data collection, COVID-19 restrictions in place did not permit my entry to the study areas. Hence, research assistants who were also villagers of the study area were recruited to aid in conducting the interviews. When entry to the study areas is allowed at the end of February 2022, permission to visit the study sites were sought from the respective village heads for completing the remaining household interviews and conduct a focus group discussion in each village. A mixture of snowball and convenience sampling was applied to gather participants for the household interviews. Each household interview was represented by an adult member of the particular household. Participants of the focus group discussions included the village head, CCA committee chairman and CCA committee members. The household interviews and focus group discussion were conducted mainly in Malay language. Occasionally, the research assistants would use their own native language, Dusun, to facilitate the interviews.

3.5 Data analysis

Descriptive statistics such as mean, standard deviation, percentage, range and frequency were used to describe the demographic of respondents and livelihood capitals from the household interviews. Data was checked for normality and variance homogeneity using Shapiro-Wilk normality test and F-test respectively. Wilcoxon rank sum test was used to test for significant differences between the two villages' household income, landholding, involvement of villagers in Ecolinc project management, contribution of Ecolinc to the community's livelihoods, success of Ecolinc in achieving its environmental deliverables and the sustainability of Ecolinc's activities. Wilcoxon rank sum test was chosen because data for all the variables were not normally distributed and did not have a homogenous variance. Fisher's exact test was used to test for significant differences in main sources of household income between the two villages. Many of the household income sources had sample sizes of less than five, therefore Fisher's exact test was selected. Pearson's chi-squared test was used to test for significant differences in the food security and social cohesion between the two villages. Significant differences in responses between villages were tested to identify the different factors that can contribute to decision making in their respective CCA management. All statistical tests were conducted using R (version 4.3) with a 0.05 significance level.

Chapter 4: Results

4.1 Management strategies of studied CCAs

In Bundu Tuhan, an area of 1263 ha has been gazetted as a native reserve in 1983 under the provisions of the Sabah Land Ordinance 1930. The management structure has been described in a few reports done on ICCAs in Sabah (Vaz, 2012; Bulan & Maran, 2020). However, there are some slight changes to the structure as demonstrated in Figure 3. The highest level of the management structure is the *mesyuarat permuafakatan* or general assembly (Bundu Tuhan Protokol, 2015). This assembly is attended by all the village heads, customary elders, board of trustees and villagers. *Jawatankuasa Pemegang Amanah* (JKPA) or also known as the board of trustee is the main committee that governs matters related to the CCA in Bundu Tuhan. They can make suggestions or share ideas, which will then be brought forward to the general assembly for decision making. JKPA members are elected through the general

assembly by the community. On the same level as the JKPA is the *pemegang adat* or the customary repository arm of Bundu Tuhan community. *Pemegang adat* members consist of the *Ketua Anak Negeri* or Native chief, *wakil Ketua Anak Negeri or* the Native chief's representative and all eight main hamlet village heads. The village heads used to be fully elected by the community themselves, however, nowadays they are elected by the governing political party with support from the villagers. Members of *pemegang adat* are also members of the JKPA by default. The four *mosinggo'* are committees overlooking different aspects; i) conservation, traditional river restriction, forest reserve and bio-cultural committee; ii) village fund development, economy and tourism committee; iii) housing and infrastructure committee; and iv) grazing area, livestock and farming committee.

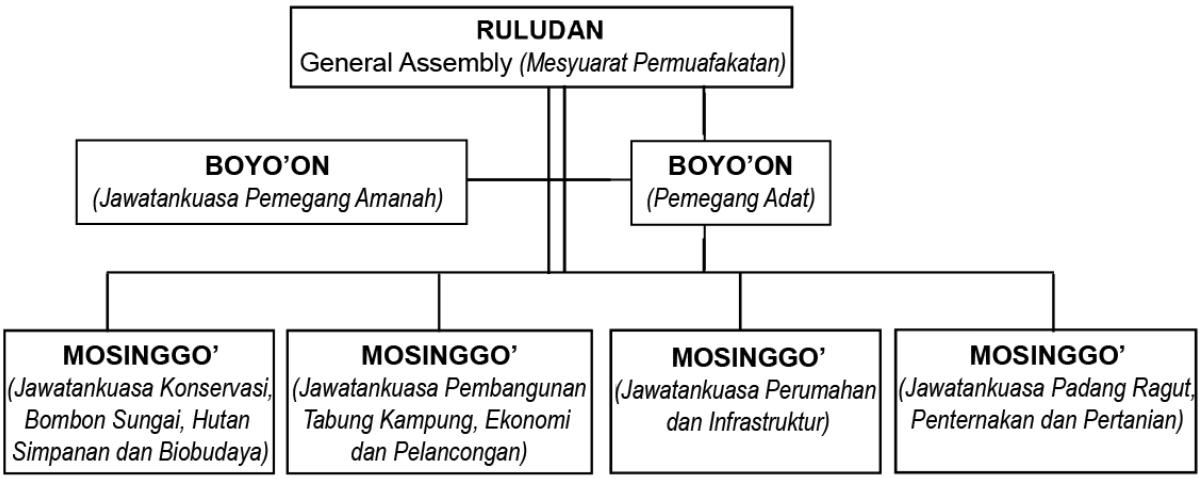

Figure 3: Management structure of Bundu Tuhan's native reserve. The bolded texts are the terms in Dusun language, whereas the italic texts are Malay language. Source: Bundu Tuhan Protokol (2015).

In December 2014, a memorandum of understanding (MOU) was signed between Bundu Tuhan community and Kinabalu Ecolinc, Sabah Parks. The MOU was to mark their mutual support, where Bundu Tuhan's CCA was to be a role model for the other potential CCAs and also to signify the community's support for the project. Kinabalu Ecolinc would in turn support the community through acknowledging the community's effort in managing and conserving their forest, subsequently recognising them as the first CCA in Sabah.

The community at Kiau Nuluh-Bersatu voluntarily sets aside and manage a community forest about 486 ha. Although the community forest had existed long before Kinabalu Ecolinc, Ecolinc has supported the community to establish a Board of Trustee and submit the land application for obtaining legal land tenure. The village had registered for an organisation called GOMPITO, which is an acronym for a Dusun term for *Koisaan momogompi tinungkusan gulu-gulu om kotolunan sandad* or Cultural Heritage and Environmental Conservation Association. It was registered under the registrar of Societies in 2001 and has a subcommittee known as Jawatankuasa Pemegang Amanah Hutan Lindungan Komuniti (JKPAHLK). JKPAHLK is the board of trustee formed through Ecolinc's support as part of their effort to recognise and establish new CCAs. Thus far, GOMPITO has been the main committee involved in CCA related projects. Once Kiau's CCA is formally gazetted, the role of managing CCA related matters would be shifted to JKPAHLK, whereas GOMPITO would focus on tourism related matters. The members of JKPAHLK consist of village heads from Kiau Nuluh and Kiau Bersatu, chairman of GOMPITO, members of *Jawatankuasa Pembangunan dan Keselamatan Kampung* (JPKK) or Village Development and Security Committee, village elders and knowledgeable members of the community. JPKK members are government elected representatives of the village tasked to carry out community development activities. GOMPITO has been actively discussing with the relevant state authorities such as the Sabah Department of Land and Surveys, district officer and elected parliament representative to gazette their community forest as a native reserve under the provisions of the Sabah Land Ordinance 1930. After discussions during Ecolinc, the project staff suggested that the community apply for residential reserve status instead. Currently, the community forest area is under the title of state land.

4.2 Policies on CCAs in Malaysia

In Malaysia, the highest planning document that translates strategic and sectoral policies in the spatial and physical development framework is the National Physical Plan (NPP). NPP3 which is designated for year 2016 to 2025 mentions a strategic action to encourage community involvement in conservation efforts by incorporating the concept of ICCAs (Table 2). It includes establishing, recognising and preparing a management plan together with the communities with support on technical and financial aspects. Similarly, it is stated in the National Policy on Biological Diversity (2016-2025) that CCAs are to be an integral part of the protected areas network in Malaysia. It highlights that a framework to recognise and support CCAs should be developed and implemented. The policy also

states under one of its action points that a registry of CCAs in Malaysia is to be created and more communities to adopt the CCA model. Additionally, indigenous and local communities are to be recognised, supported and empowered as custodians of biodiversity in the country.

At the state level, the Heart of Borneo Strategic Plan of Action (2014-2020) and Sabah Biodiversity Strategy (2012-2022) apply to the study areas. They both mention supporting the establishment of ICCAs together with the communities and increasing the land areas which are managed as an ICCA significantly. Although the two action plans are in their final years of implementation, there still isn't any official registry of ICCAs in the state or the country. The establishment of ICCA was also not effective because apart from Bundu Tuhan which has been exposed to the concept of being an ICCA in 2011, Kiau CCA is the only addition to it. The latest National Forestry Policy (Ministry of Energy and Natural Resources, 2021) and Sabah Forest Policy 2018 (Sabah Forestry Department, 2018) did not mention CCAs, but call for more local communities to participate in forest management and community forestry programmes.

Table 2: List of policies and strategic plans that supports CCA establishments and local community's involvement in biodiversity conservation.

Policy	**Target actions**
National Physical Plan 3 (2016-2025)	Under the strategic direction KD1: Sustainable Management of Natural Resources, Food Resources and Heritage Resources • Action KD1.1B: Encourage community involvement in conservation efforts. Incorporating the concept of ICCAs including the following steps and principle: i) Establishment of ICCA ii) Community involvement iii) Recognition iv) Determine the boundaries of ICCAs v) Implementation of ICCA vi) Management protocols for ICCAs vii) Technical and financial support

	• Action KD1.6B: Prepare a conservation management plan with the communities' involvement and adoption of ICCA concept (Federal Department of Town and Country Planning, 2016)
National Policy on Biological Diversity (2016-2025)	• Target 2: By 2025, the contributions of indigenous peoples and local communities, civil society and the private sector to the conservation and sustainable utilisation of biodiversity have increased significantly. Action 2.1: Recognise, support and empower indigenous peoples and local communities. It involves recognising and supporting the roles of indigenous peoples and local communities as custodians of biodiversity. • Target 6: By 2025, at least 20% of terrestrial areas and inland waters, and 10% of coastal and marine areas, are conserved through a representative system of protected areas and other effective area-based conservation measures. Action 6.3: Develop community conserved areas as an integral part of our protected areas (PA) network. This action entails: i) developing and implementing a framework for recognising and supporting CCAs ii) creating a network of CCAs across landscapes and seascapes, and to recognise CCAs as an integral part of Malaysia's PA network iii) developing a database of CCAs and integrate it into the national biodiversity clearing house mechanism iv) encouraging more indigenous peoples and local communities to adopt the CCA model and provide them with the necessary support

	(Ministry of Natural Resources and Environment, 2016)
Heart of Borneo Strategic Plan of Action (2014-2020)	Program 2: Protected areas management • Code 2.3.a: Support the establishment of an ICCA network among the three countries; Malaysia, Brunei and Indonesia. • 2.3.b: Collaborate with indigenous communities within Protected Areas and Forest Reserves: implement the Community Uses Zone (CUZ) at Crocker Range Park. • 2.3.c: Conduct training and awareness programmes on intellectual rights and "Free, Prior and Inform Consent" (FPIC) for local communities. • 2.4.b: Establish the Kinabalu Ecolinc (Sabah Forestry Department, 2018)
Sabah Biodiversity Strategy (2012-2022)	• Strategy 1: Engaging the people of Sabah Target 1.3: By 2022, land that is managed as ICCAs has increased significantly. It will be met by implementing actions and activities that: i) support community-based conservation ii) support collaboration with indigenous communities within Protected Areas and Forest Reserves Action 1.11: support the establishment of ICCA network • Strategy 5: strengthening our capacity to manage biodiversity

	Target 5.2: By 2022, civil society organizations and local communities have developed the capacity to contribute substantially to managing Sabah's biodiversity. It will be met by implementing actions and activities that: i) strengthen capabilities of civil society ii) strengthen capabilities of indigenous communities Action 5.16: establish a registry of CCAs in Sabah (Sabah State Government, 2012)

4.3 Understanding the sustainability of CCAs through Ostrom's Design Principles

The presence of ODP in the CCAs of Bundu Tuhan and Kiau are described here.

Principle 1: Clearly-defined boundaries

The first principle is often broken down into two components. The first one is to identify the user group of the particular resource, whereas the second one is to identify the boundaries of the resource. If these are clearly defined, it is then clear what is being managed and for whom (Ostrom, 2005). Having a user group defined could reduce the risk of free-riding outsiders who did not contribute to the area from the benefits of the resource area.

In both villages, the users of the CCA are their own villagers. Bundu Tuhan has about 3500 villagers, whereas Kiau has about 1450 villagers (Table 3). The CCA boundary in Bundu Tuhan has been clearly demarcated by the villagers together with the Lands and Survey Department in Sabah. Historically, the community had a customary boundary that was decided upon discussions with other village heads. This customary boundary formed the basis of the CCA boundary in Bundu Tuhan and it was later on officially gazetted as a native reserve in 1983. Bundu Tuhan's CCA has an area of 900 ha and the community calls it as '*Hutan Winokok*'.

Kiau Nuluh and Kiau Bersatu villagers mutually agreed to set aside 486 ha of forest as their CCA. As a result, the village is referred to collectively as Kiau Nuluh-Bersatu village

when discussing matters related to their CCA. Their CCA is known locally as *'Hutan Lindungan Komuniti'.* The boundary has been set and demarcated by the community themselves. Although Kiau has yet to receive any official gazettement for their CCA, the community has been actively discussing the matter with the local authorities to gain a formal recognition for their CCA.

Table 3: Status of Ostrom's Design Principles in the studied CCAs.

Principle	**Bundu Tuhan**	**Kiau Nuluh-Bersatu**
1. Clearly defined boundaries		
1A Clearly defined user group		
Who are the CCA users?	Bundu Tuhan villagers	Kiau Nuluh and Kiau Bersatu villagers
User group size	~3500 people	~1450 people
1B Clearly defined resource boundary		
Is the CCA boundary clear?	Yes	Yes
Who sets the boundary?	Community	Community
Size of the CCA	900ha	486ha
2. Congruence between provision rules and local conditions		
2A Congruence between rules that assign benefits and rules that assign costs		
Rules for CCA management and resource use	Present	Present
Who forms the rules?	Community	Community
2B Rules are well matched to local conditions		
Are the rules/ management plan updated periodically?	Yes	Yes
3. Collective-choice arrangements		
Management authority of CCA	Community - JKPA & *Pemegang Adat*	Community - GOMPITO
Nature of management	Communal	Communal

User participation in CCA related meetings	JKPA committee members. All villagers can voice their concerns or issues to the village head or JKPA chairman.	All villagers are welcomed to join, but are usually only attended by GOMPITO members and other villagers who are involved.
Authority to modify rules	All villagers through the general assembly	Protocol committee of Kiau Nuluh-Bersatu
Acceptance of rules by users	High	High
4. Monitoring		
4A Monitoring of user behaviour and resource conditions		
How is user behaviour monitored?	All villagers are responsible to report any violations	All villagers are responsible to report any violations
How regular is the CCA monitored?	Not regular – only upon receiving reports	Not regular – approximately 6 months once
4B Monitors are accountable to or are the users themselves		
Who monitors user behaviour?	Community	Community
Who monitors the CCA condition?	Community	Community
Who monitors ecotourism activities in the CCA?	Tourist guides	Tourist guides
Has monitoring been effective?	Yes	Yes
5. Graduated sanctions		
Are there graduated sanctions?	Yes	Yes
Who decides the sanctions?	Native chief, native chief representative and village heads	Village heads

6. Conflict resolution mechanism		
How are conflicts between community members, neighbouring village or external parties resolved?	Locally by the community and village leaders	Locally by the community and village leaders
Unresolved conflicts	Overlapping Native reserve boundary with Tenompok forest reserve	None
7. Minimal recognition of rights to organise		
Is the community's CCA management recognised by authorities?	Formal recognition	Informal recognition
8. Nested enterprises		
External support for CCA management	Letter of agreement with District Officer and Deputy Chief Minister	Land and Surveys Department facilitated for CCA boundary demarcation
Local authorities monitor against community failures	No	No
Local authorities monitor violations on forest management	No	No
Local authorities support the community's monitoring efforts	No	Allowance from Sabah Park to honorary ranger
Evidence of CCA sustainability	Moderate to High	High

Principle 2: Congruence between provision rules and local conditions

The second principle is also divided into two components: 1) having rules that are equitable in terms of their inputs and benefits from the CCA and 2) having rules that are suited to their local conditions. Each village has their own set of rules and management guidelines pertaining to their CCA. Rules were formed by the community and are also adapted to the

current situation, for example, the protocols set in Bundu Tuhan are reviewed once in every ten years or when there is a need to. Bundu Tuhan community first published a book on the protocols and their village development plans in 2005 and later updated it in 2015. It is similar in Kiau, where rules are periodically updated when there is a need to fit it with the present. They first published their protocol in a book on their traditional systems in 2018 and reprinted it in 2021 after making some amendments. Both CCAs in Bundu Tuhan and Kiau applies the concept of '*bombon'* which is a customary practise to communally protect or conserve an area by restricting any natural resource extraction. Villagers in Bundu Tuhan will require a permission from the JKPA if they were to extract any resources from the CCA. Similarly, villagers in Kiau would require the permission from the JKPAHLK or JPKK in their village. All resource extraction is only allowed for personal and non-commercial purposes. The villagers no longer depend on hunting and timber from the CCA for their sustenance. Villagers who still rely on firewood for cooking only extract fallen or dead wood from their agricultural lands which are located outside of the CCA. Occasionally, they will harvest wild fruits and vegetables from the CCA when it is in season.

Principle 3: Collective-choice arrangements

This principle emphasizes that most of the individuals affected by the rules are also the one who have the rights to modify the rules. When individuals that are affected by the rules have the rights to participate in making or modifying them, the rules are deemed to be more suitable for the local conditions and fair for the participants (Ostrom, 1990; Ostrom, 2005). The nature of CCA management in Bundu Tuhan and Kiau are by the community, which is usually led by their respective JKPA. In Bundu Tuhan, the community could voice out their opinion and participate in decision making through a quorum in their general assembly known as the '*mesyuarat permuafakatan'*. Decisions to change or modify their rules are also made through this assembly. The community leaders in Bundu Tuhan including JKPA members are re-elected every 3 years or less. JKPA members will hold a meeting at least once a month and villagers are free to raise their matters to any of the village leaders. In Kiau, management decisions relating to their CCA are usually decided by members of GOMPITO. All villagers are welcomed to join the meetings, but it is usually only attended by villagers who are involved in the particular activity or project that is ongoing. For example, during Ecolinc, meeting attendees are mostly villagers who are involved with Ecolinc activities. Involved villagers are usually those who are available, interested and willing to take part in the project's activities at

the given period of time. Acceptance of rules by the community in both villages is considered high. Very few cases of violation happened from within the community in Bundu Tuhan, whilst in Kiau, so far there hasn't been any cases of violation either by the villagers or outsiders.

In terms of the community's involvement in the Ecolinc project management and governance, villagers in Bundu Tuhan rated a lower median score (3.58) than Kiau (3.92). A Wilcoxon rank sum test showed that this difference is statistically significant (W = 2238.5, p=0.001). Figure 4 is a boxplot of the score from Bundu Tuhan and Kiau community respectively on whether the community was involved and had their local values considered.

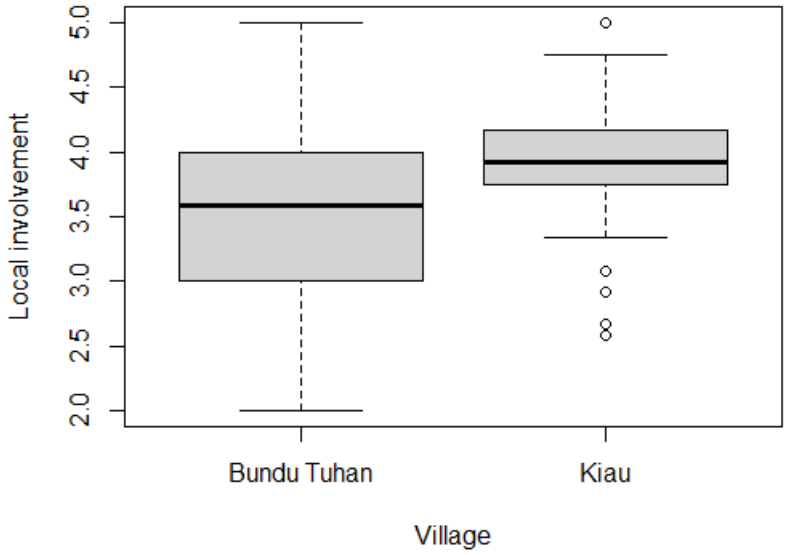

Figure 4: Box plot of community involvement in Kinabalu Ecolinc project's management and governance in each village. The lower and upper box boundaries are the first quartile and third quartile respectively, while the line inside the box is the median. Circles represent outliers. Response is recorded in the following 5-step ordinal scale: 1='strongly disagree; 2='disagree; 3='neither disagree or agree', 4='agree'; and 5='strongly agree'.

Principle 4: Monitoring

Principle four has two components; a) monitoring user behaviour and resource conditions; and b) monitors are accountable to or are the users themselves (Cox, et al., 2010). Enforcement of rules is crucial for a good CCA management and to keep violator levels down. Monitoring of the CCA in Bundu Tuhan are conducted by the community. They monitor the

CCA forest only when there are any complaints or reports, but plan to have a more regular schedule in the future. The community themselves police each other's behaviour and anyone found to be violating the rules will be reported to the JKPA. Kiau has a similar monitoring system to Bundu Tuhan, where user behaviours are monitored by the community themselves. Monitoring of Kiau's CCA is done approximately every 6 months by the community. There is one villager from Kiau who was appointed as an honorary ranger by Sabah Parks to patrol the Kinabalu Park forest which is adjacent to Kiau's CCA. While on patrol, the honorary ranger would at the same time monitor the CCA which is just neighbouring the park's area. Approximately once every two months, GOMPITO committee members also monitor the ecotourism trails in their CCA. Whenever there are tourists in the CCA, the guides will be responsible to inform about the dos and don'ts, as well as ensuring their compliance throughout. Tourists are required to observe the local taboos when visiting the CCA. The local taboos include using only polite words, refraining from indecent behaviour, never remove a leech harshly or crush it with a hard object, no yelling, no imitation of animal sounds, no killing of any fauna and never pack any food with brown rice or wild yam.

Principle 5: Graduated sanctions

Sanctions that are imposed on the violators are decided based on the seriousness of the offence. A lower sanction initially could serve as a notice and warning to the other users. Besides, it could deter the same violator from breaking more rules since there are repercussions for their misconducts. Each village has their own set of protocols and sanctions that were identified by the community themselves. Offenses involving violations to their traditional and customary taboos will also be punished based on their customary sanctions. Both villages even had all the protocols and sanctions published in a book and shared it throughout their community respectively. In Bundu Tuhan, the sanctions are decided by the Native Chief together with the village heads. There is a '*balai adat'* or customary hall in Bundu Tuhan which is used as a venue to deal with cases of rule violations especially when it involves customary rules being broken. Previously, there were cases of outsiders who littered in Bundu Tuhan village area while driving through the roads. The offenders were asked to pick the rubbish up, then they were required to compensate with a live chicken or pay the price of it. If anyone were to trespass their CCA or harvest any fauna from their *bombon* area, the violator would have to compensate a live cow or pay the equivalent value of it in cash. Thus far, no one has broken the rules in Kiau's CCA, but it is understood that the village heads would enforce the sanctions

if there are any violations. For offenses related to their customary taboos in Kiau, such as speaking impolitely in the CCA and mocking the wildlife in the forests, the sanction is to pay a live chicken along with salt, tobacco, matches and rice. The items are then cooked and shared within the community as a means to prevent any ill happenings towards the violator as well as other people and spirits in the vicinity. Those who are not able to provide the items stated would have to pay the equivalent value of about RM50.77 (Labeh & Dalansu, 2021). Violations related to the extraction of forest resources in Kiau CCA will be imposed a fine of RM1500 and a live goat compensation. All the harvest or hunt that was gathered by the violator will then be confiscated by the community in Bundu Tuhan and Kiau respectively.

Principle 6: Conflict resolution mechanisms

Both villages resolve their conflicts locally, either by the community themselves or mediated by the village heads. There are no unresolved conflicts reported in Kiau. Bundu Tuhan on the other hand has an unresolved conflict with the forestry department regarding an overlapping land area. Despite being gazetted as a native reserve in 1983, a part of the native reserve was also gazetted as the Tenompok forest reserve in 1984. This overlapping area faces insecure land tenure because a forest reserve is managed by the state government and the community would have no rights over the land. If the overlapping area is considered as a forest reserve, the community in Bundu Tuhan would lose their management and harvesting rights because a forest reserve has its own set of rules defined by the government.

Principle 7: Recognition of rights by authorities

Forest land tenure and recognition of rights remain a challenge in both Bundu Tuhan and Kiau. Since Bundu Tuhan has been gazetted as a native reserve in 1983, it is considered as a formal recognition by the state government that the community owns and has the right to manage the land. There are no restrictions by the government for the community to harvest any resources in the native reserve. All resource extraction within the CCA is regulated by the JKPA and will only be allowed for personal non-commercial uses. Although the CCA in Bundu Tuhan with an area of 900ha has been gazetted as a native reserve, approximately 760ha of it overlaps with a forest reserve that was gazetted in 1984 known as the Tenompok forest reserve. This conflict of boundary is posing a challenge to the recognition of the community's rights and the CCA. The villagers have been managing the forest sustainably for generations, so they

are persistently claiming their rights to the land and wishes for the authorities to be able to truthfully evaluate the capabilities of the community.

Kiau's CCA is legally a state land which is open to other land title applications. The villagers do not have any formal recognition over the land. They have actively met all the relevant government officials including the district office, Sabah Department of Lands and Surveys and the elected parliament representative. The community were told that the process to gazette a native reserve is lengthy and would take a long time to be approved. They were then advised to apply for the CCA to be gazetted as a residential reserve which has a better chance of success. The community has continuously expressed desires to gain formal recognition to their land including if being gazetted or recognised as a CCA would be a form of official endorsement and support for their conservation efforts. Securing the land tenure would ward off external interests in buying over their land.

Principle 8: Nested enterprises

Bundu Tuhan community has a letter of agreement with the current District officer and Deputy Chief Minister of Sabah that indicates their support for the community to manage the CCA including the community's right to the overlapping land with Forestry Department. During the CCA boundary demarcation in Kiau, the Land and Surveys Department of Sabah facilitated in marking the CCA boundary. None of the local authorities monitor against community failure and violations on forest management in any of the villages. Sabah Parks indirectly supports Kiau in their CCA monitoring by providing the honorary rangers with some allowance for their patrols.

Both villages in this study demonstrated that their CCAs conform to all the eight Ostrom's design principles. Resource extraction from the CCAs is regulated by the community's respective CCA management committee. There is a high compliance to the CCA rules by the users and the enforced sanctions served as a warning that there will be repercussions for those who violate the rules. Despite having portrayed evidence of CCA sustainability, both the CCA are still lacking secure land tenure. The conflicting land boundary between Bundu Tuhan's CCA and Tenompok forest reserve may threaten the forest management institutions. Meanwhile, the CCA in Kiau has not yet received any formal recognition granting them the rights over the land. A long-term land tenure will be a crucial

element to ensure a greater sustainability of the CCAs (Murali, et al., 2006; Dawson, et al., 2021). Assuring the community's rights to use and manage their CCAs is important for their continuous participation in conserving the land. Outstanding conflicts should be addressed as soon as possible to prevent severing the trusts and cooperation from the communities.

4.4 Household livelihood capitals and Kinabalu Ecolinc project contribution on livelihoods

Respondents in Bundu Tuhan were 33% male and 67% female with an age range between 18 to 75 years. Kiau had 41% male respondents and 59% female respondents with an age range between 23 to 89 years.

Human capital

The mean ± SD household size in Kiau is slightly larger (8. 0 ± 4.2) than Bundu Tuhan (6.9 ± 3.0). In Bundu Tuhan, there is a higher number of households who have at least a college degree (77.6%) compared to Kiau (50%). The number of households who had received a postgraduate education in Bundu Tuhan is also three times higher (15%) than Kiau (5%). The number of households who had at least a member who had a chronic disease or disability affecting their ability to work in Kiau was at least two times higher than in Bundu Tuhan (Table 4). Kiau villagers are seen to still be highly dependent on traditional medicine or a traditional practitioner for their healthcare compared to Bundu Tuhan.

A project introduction and environmental awareness talk was held in both villages during the beginning phase (2014) of the project. Villagers who attended the awareness talk gained knowledge on environmental conservation, Ecolinc project objectives, threats to the environment, importance of a balanced ecosystem, impacts of environmental degradation and organisations related to environmental conservation. In both villages, there were handicrafts workshop and training on accounting for carbon in trees. Another activity Ecolinc conducted in Bundu Tuhan was the small grants for sustainable farming programme. Through this programme, about 30 families in Bundu Tuhan received some amount of financial aid and technical support sustainable agriculture practices. Households in Bundu Tuhan who received the small grant for sustainable agriculture still largely practised what they have learnt in their own farms including making organic fertiliser and integrated pest management. They are also more aware about the environmental impacts of excessive pesticide or herbicide use, the role of microbacteria in farming

and organic farming. Plant nursery management trainings were provided to a few villagers in Bundu Tuhan. Villagers who were involved with the management and maintenance of the plant nursery still remembers the knowledge learnt, however, the nursery is no longer functioning. A beads craft workshop was also conducted in Bundu Tuhan.

Kiau villagers did not receive any sustainable agriculture workshop from Ecolinc, instead they receive tourism related trainings. There were trainings provided for homestay establishments, a tourist guide course and a basic conversational English language course. Homestay trainings were specifically provided to villagers from Kiau Bersatu who were interested. The reason was because there were no homestays established in Kiau Bersatu yet, whereas in Kiau Nuluh, there were already a few pre-existing homestays. Besides that, Kinabalu Ecolinc project invited villagers from Kiulu village who were experts in bamboo preservation techniques to conduct a workshop for Kiau villagers. Sturdier and better-quality houses could be made by using this preservation technique, though the villagers in Kiau commented that there needs to be a proper disposal for the chemicals that are used in the process. Since the chemicals used can bring serious harm when not properly disposed, they closed down the concrete tank that was built for that purpose and no longer practise the methods that were taught.

After the project ended, 10 households in Bundu Tuhan still applies the knowledge learnt through Ecolinc project's activities. Eight of them were recipients of the small grants for sustainable farming, while two were participants of the bead craft training. Two participants from the beads craft workshop are still practising the craft techniques as well as applying the entrepreneurship skills they have learnt during the workshop to gain side incomes. Activities that were no longer pursued in Bundu Tuhan after the project ended were handicrafts using bamboo and rattan, and plant nursery management. Difficulty in obtaining raw material around their village and time commitment issues due to having another primary job were reasons the villagers did not carry on the handicraft's activity.

There are nine households in Kiau who applied the training received for their livelihood. Two of them were involved in the tourist guide course, four participated in the homestay course and three others attended the English language course. There is a total of 11 households that underwent the homestay training, but there has been delays in receiving their license due to COVID-19. The participants finished their homestay and English language course not long before COVID-19 came about, thus, had limited chance to use or practise the skills they had learnt.

Overall, the participants in both villages were satisfied with the trainings provided (median = 4). Those who were dissatisfied mainly commented that the time of the workshop

or training was too short to practice the knowledge they had just learnt. Several participants also mentioned that it would be better if they had follow-up sessions to what they have learned.

Table 4: State of human capital in Bundu Tuhan and Kiau Nuluh-Bersatu villages. Values stated are either mean ± SD or percentages.

Human capital	**Bundu Tuhan**	**Kiau Nuluh-Bersatu**
Mean household size	7 ± 3 (range=2-20)	8 ± 4 (range=1-22)
Highest household education (%)		
Primary	-	1.3
Secondary	22.5	48.8
Pre-university	38.8	22.5
Degree	23.8	22.5
Master/PhD	15	5
No. of school going children	2 ± 1 (range=0-5)	2 ± 2 (range=0-12)
Male	1 ± 1 (range=0-5)	1 ± 1 (range=0-7)
Female	1 ± 1 (range=0-4)	1 ± 1 (range=0-5)
Chronic disease/ disabilities in family (%)	12.4	27.5
Healthcare access (%)[a]		
Traditional medicine/ practitioner	6.25	55
Clinic	95	68.9
Hospital	71.25	45.1
Involvement in Kinabalu Ecolinc activities and received training	18.8 (15 hh)	33.8 (27 hh)
Knowledge applied for livelihood	12.5 (10 hh)	11.3 (9 hh)
Satisfaction with activities (1-5 scale)[b]	3.7 ± 0.8	3.9 ± 0.7

[a] This is a multiple response question. Respondents may select more than one response.

[b] Rated on a five-level likert scale: 1=”very unsatisfied”, 2=”moderately unsatisfied”, 3=”neither satisfied nor unsatisfied”, 4=”moderately satisfied”, 5=”very satisfied”.

Natural capital

The mean ± SD size of land owned by villagers in Kiau (6.95 ± 5.51 acre) is larger than in Bundu Tuhan (1.66 ± 3.99 acre) (Table 5). The median landholding per household in Bundu Tuhan (0.5 acre) is lower than the median in Kiau (5 acre). A Wilcoxon rank sum test shows that there is a significant difference ($W=599$, $p<0.001$) in landholding between the two villages (Figure 5). The majority of villagers in Kiau plant pineapples and rubber for their livelihood means. Some villagers plant coffee, cacao and fruit trees to supplement their income. Vegetables and paddy are mainly planted for their own sustenance. Meanwhile, in Bundu Tuhan, vegetables are mainly planted for their livelihood means. Coffee, flowers and fruit trees are also planted by some to gain income. The main source of irrigation in Bundu Tuhan are from streams and tap water, whereas in Kiau they rely mainly on rain and streams around their agriculture plots (Table 5).

As part of Kinabalu Ecolinc's second objective, Bundu Tuhan's community together with Kinabalu Ecolinc built a plant nursery in 2017. A few members of the community were trained to manage and maintain the nursery. The nursery built in Bundu Tuhan was mainly to cultivate fruit trees as part of the reforestation efforts. Saplings that were cultivated are then planted around the residential area of Bundu Tuhan, but many of them either died or did not grow well. Consequently, the nursery ceased its operation and is not currently functioning. There was no reforestation activity conducted in Kiau during Ecolinc. Although reforestation was stated in their plans and discussed with Kiau villagers, it was never actualised till the project ended.

Table 5: State of natural capital in Bundu Tuhan and Kiau Nuluh-Bersatu villages. Values stated are either mean ± SD or percentages.

Natural capital	**Bundu Tuhan**	**Kiau Nuluh-Bersatu**
Mean landholding (ac)	1.66 ± 3.99 (range=0-30)	6.95 ± 5.51 (range=0.016-25)
own agriculture land	1.54 ± 3.85 (range=0-30)	4.99 ± 4.21 (range=0.014-24)
own home garden land	0.06 ± 0.13 (range=0-0.5)	0.18 ± 0.75 (range=0-5)
own forest land (uncultivated)	0.06 ± 0.46 (range=0-4)	1.79 ± 2.86 (range=0-15)

Sources for irrigation (%)[a]		
Stream	55	45
Rainwater	13.8	88.8
Pond	5	0
Tap	30	0

[a] This is a multiple response question. Respondents may select more than one response.

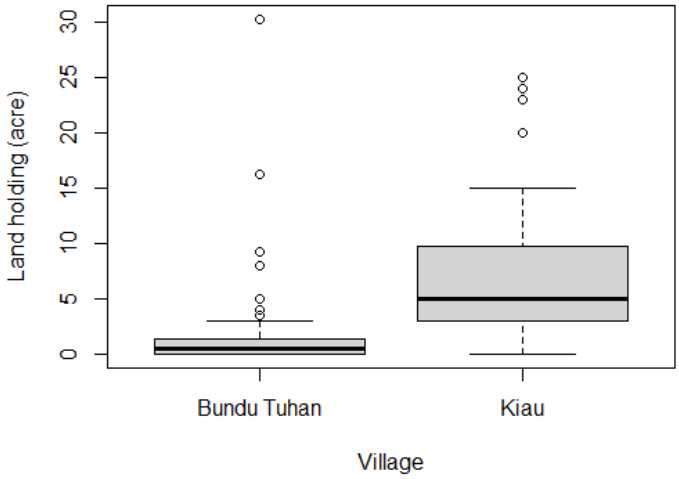

Figure 5: Box plot of landholdings (acre) per households in each village. The lower and upper box boundaries are the first quartile and third quartile respectively, while the line inside the box is the median. Circles represent outliers.

Physical capital

All houses in Bundu Tuhan and Kiau uses zinc as their roof, with an exception of one house in Bundu Tuhan which has a combination of both zinc and tiles. The majority of households in Bundu Tuhan (41.3%) and Kiau (43.8%) have a mixture of concrete and wood as their house wall material (Table 6; House wall). Households in Kiau uses more bamboo as their house wall material compared to Bundu Tuhan. Main water sources (Table 6; Household water source) that the villagers in Bundu Tuhan depend on for their daily uses such as cooking, drinking and washing are from the stream (63.8% of households), tap (52.5%) and pond (16.3%). Stream water in Bundu Tuhan flows from the mountain into Winokok river and

through smaller streams which feeds directly into the individual households through pipes. Tap water are those supplied through a treated water system by the government. Pond water refers to water that flows from river tributaries into a man-made pond which is usually shared between 10 or more neighbouring households. It is then connected to the houses through the main water inlet pipe. The main water inlet pipe is sometimes fitted with a filtration system, either store-bought or self-made. Villagers in Kiau fully depend on the small streams flowing from the mountain and forests surrounding their village for their daily water uses. It is supplied through connecting pipes to each household without any filtration system.

There are only two households in Bundu Tuhan that reared cattle; one household had two and the other had six (Table 6; Livestock mean). Pigs are only reared by one household in Bundu Tuhan. Poultry reared in the two villages are most commonly chicken and to a lesser extent ducks. Nearly half of the households (48.8%) in Kiau reared poultry, while in Bundu Tuhan only a quarter household (25%) reared them. The number of poultry that each household owns varied from two to 20 in Bundu Tuhan and ranged from one to 100 in Kiau. Villagers in Kiau rear poultry mainly to keep as pets or for their own sustenance. They would occasionally sell it to neighbours if there are requests. Livestock in Bundu Tuhan are either kept by the households for their own sustenance or sold to people who are interested in buying. Aquaculture in both villages involve cultivating tilapia fish in man-made ponds. A higher number of households in Kiau are recorded to practise aquaculture. Some of the ponds are located further away from their homes and are not guarded or fenced, hence the fishes are easily predated by egrets and otters. None of the villagers actively sell their fishes in the markets. In most cases, it is for their own consumption and occasionally sold to neighbours. In Kiau, one household actively farms stingless bee to gain additional income.

Cooking energy for every household was recorded on a percentage likelihood basis, where they were asked to rate the types of energy they used most commonly and the total has to add up to 100%. On average, most households in Bundu Tuhan and Kiau uses gas for their cooking (Table 6; Cooking energy). However, the use of firewood for cooking is at least three times higher in Kiau compared to Bundu Tuhan. One household in Bundu Tuhan was found to use solar energy for their cooking and lighting energy. Bundu Tuhan villagers generally possess more appliances than Kiau villagers, including transportation such as cars and motorcycles. The tillers owned by a few households in Bundu Tuhan were provided by Kinabalu Ecolinc project as part of the agriculture financial aid under the small grants for sustainable agriculture

programme. Villagers in Kiau do not use any tillers since it is not suitable to be used on steep and hilly geographical conditions.

In the context of ecotourism, a forest trail in the CCA of Bundu Tuhan has been identified and developed during Ecolinc. It is a new ecotourism attraction in Bundu Tuhan known as Hatob Trail and had just come into operation after the ease in COVID-19 restriction orders this year. The community started accepting visitors to the trail at the end of February 2022. Ecolinc provided funds to build huts along the forest trail as a resting station for visitors and the community to utilise while on patrol in their CCA. Additionally, a community hall which is also known as '*Balai Komuniti Kampung Bundu Tuhan*' was completed in 2020. When building the community hall, Bundu Tuhan villagers supplemented with their own community funds to cover about 50% of the total cost. There were also 14 camera traps provided to Bundu Tuhan for monitoring the presence of wildlife in their CCA.

Livelihoods development activities in Kiau were mainly focused on ecotourism enhancement. An ecotourism trail was developed in Kiau Bersatu connecting to the CCA forest. Ecolinc provided funds to build infrastructures in Kiau such as a tourist information centre which also functions as an office for GOMPITO meetings, toilets and a lookout point in their CCA. In Kiau Bersatu, two recreational ponds were also built as a tourist attraction.

Table 6: State of physical capital for households in Bundu Tuhan and Kiau Nuluh-Bersatu villages. Values stated are either number of households or percentages.

Physical capital	**Bundu Tuhan**	**Kiau Nuluh-Bersatu**
Livestock mean (number of hh)		
Cattle	4 (n=2)	-
Poultry	9.05 (n=20)	16.31 (n=39)
Pig	3 (n=1)	-
Aquaculture	1 hh	18 hh
Stingless bee	0	1 hh
House roof (%)		
Zinc	98.7	100
Zinc, tiles	1.3	-
House wall (%)		
Bamboo only	-	6.3

Bamboo mix	1.3	6.4
Concrete only	20	11.3
Concrete mix	61.5	50.1
Wood mix	16.3	20.1
Zinc only	-	5.0
Household water source (%)		
Stream	63.75	100
Pond	16.25	-
Tap	52.5	-
House lighting (%)		
Electricity	98.7	100
Solar	1.3	-
Appliances (%)		
Television	86.3	77.5
Radio	37.5	21.3
Bicycle	15.2	16.3
Motorcycle	37.5	18.8
Car	81.4	67.5
Satellite channel	65	43.8
Wifi device	11.3	5
Agriculture tools (%)		
Pesticide sprayer	-	8.8
Grass cutter	3.8	77.5
Tiller	18.8	-
Cooking energy (%)		
Firewood	4.6	15
Gas	68.8	55
Electricity	26.4	30
Solar	0.2	0

Financial capital

A large percentage of the villagers in Kiau (72.5%) depend on agriculture as their main source of income and the number is almost twice the number of households in Bundu Tuhan (32.3%) (Figure 6). Kiau village also has a higher number of households (11.2%) that depend on tourism as their main income source compared to Bundu Tuhan (1.3%). The majority of households in Bundu Tuhan are either employed in the public service, private sector or have businesses of their own as a means of gaining income (Table 7; Main income sources). It is also shown that the mean household income in Bundu Tuhan is almost two times higher than in Kiau (Table 7; Mean household income). A Wilcoxon rank sum test indicated that there was a significant difference ($W=4200.5$, $p<0.001$) between the median household income in Bundu Tuhan (RM 1250) and in Kiau (RM 1000) (Figure 7). The chi-square test of independence showed that food security differed significantly between Bundu Tuhan and Kiau ($\chi^2 = 21.16$, df=2, p-value <0.001). This could explain the higher number of households in Bundu Tuhan to have food security (Figure 8) and savings compared to Kiau (Table 7; Savings). The income of Bundu Tuhan villagers could also explain the higher number of appliances and vehicles owned (Table 6; Appliances).

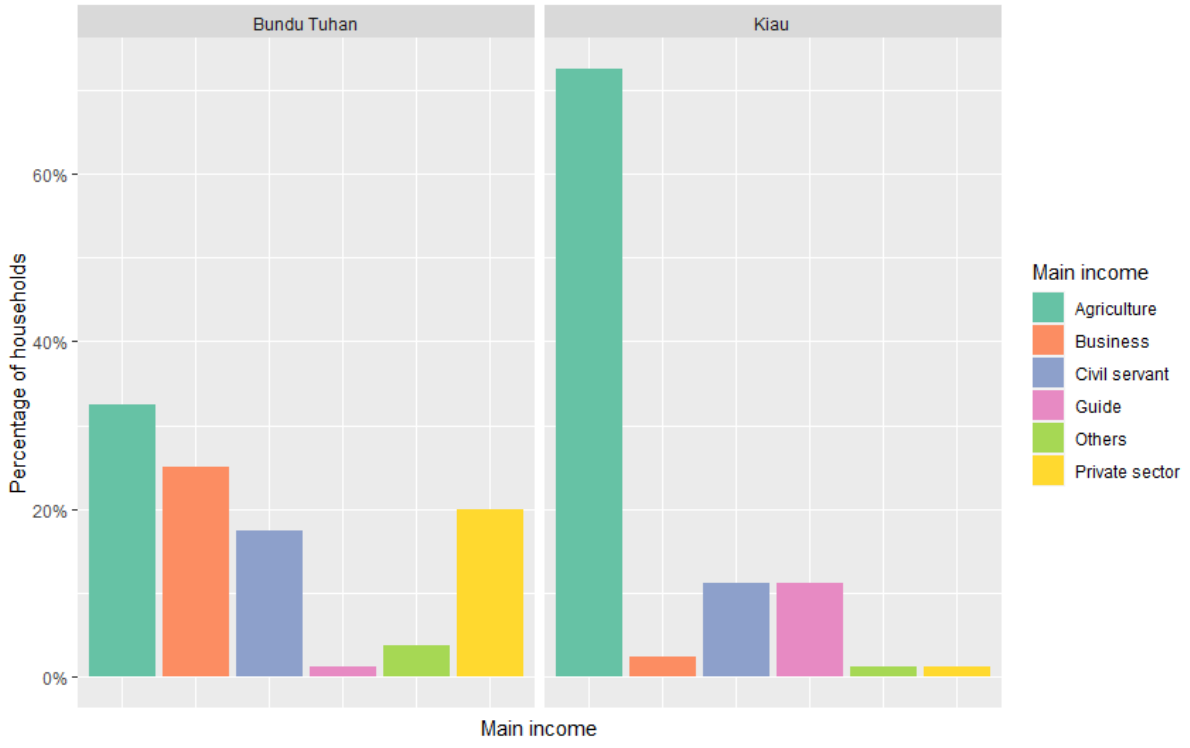

Figure 6: Main income sources for households in each village.

As part of the small grants for sustainable agriculture, Ecolinc provided some financial aid to 30 families in Bundu Tuhan to support the development of sustainable agriculture and livelihoods of the community. The amount of the financial aid was predetermined based on the condition and needs of the individual farms, each ranging between RM500 to RM3000. Most of the grant recipients bought farm equipment that could enhance their watering system and to build a rain shed for their crops. They also used the funds to buy organic fertilisers, vegetable seeds, and other tools for their farm operations. Some of them also paid for the labour who worked in their farm/ helped build the structures.

Table 7: State of financial capital for households in Bundu Tuhan and Kiau Nuluh-Bersatu villages. Values stated are either mean ± SD or percentages.

Financial capital	**Bundu Tuhan**	**Kiau Nuluh-Bersatu**
Main income sources (%)		
Agriculture	32.3	72.5
Mountain/ tour guide	1.3	11.2
Businesses	25	2.5
Civil servant	17.5	11.2
Private sector employee	20.0	1.3
Others (retiree, self-employed, pocket money from children)	3.8	1.3
Mean household income per month (RM)	2116.88 ± 2094.52 (range=500-10000)	1247.25 ± 1261.97 (range=0-9000)
Food security (%)		
Surplus	31.2	8.8
Sufficient	66.3	71.2
Shortage	2.5	20
Savings (%)	75	55

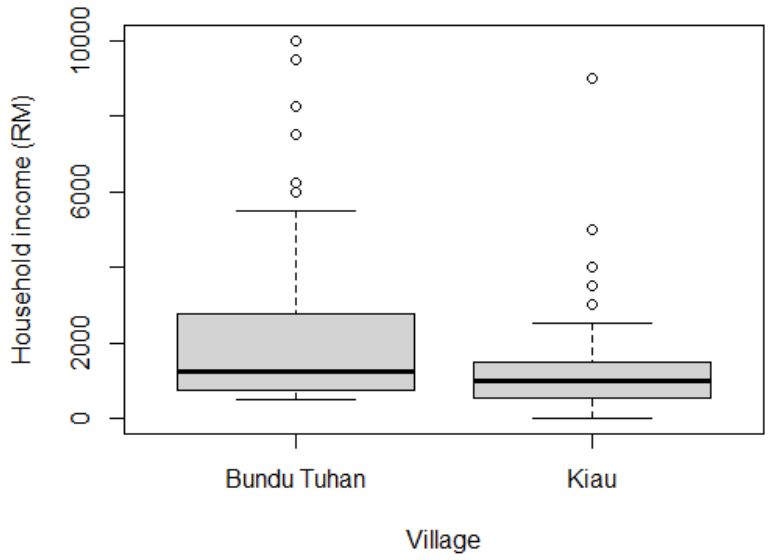

Figure 7: Box plot of household income (RM) in each village. The lower and upper box boundaries are the first quartile and third quartile respectively, while the line inside the box is the median. Circles represent outliers.

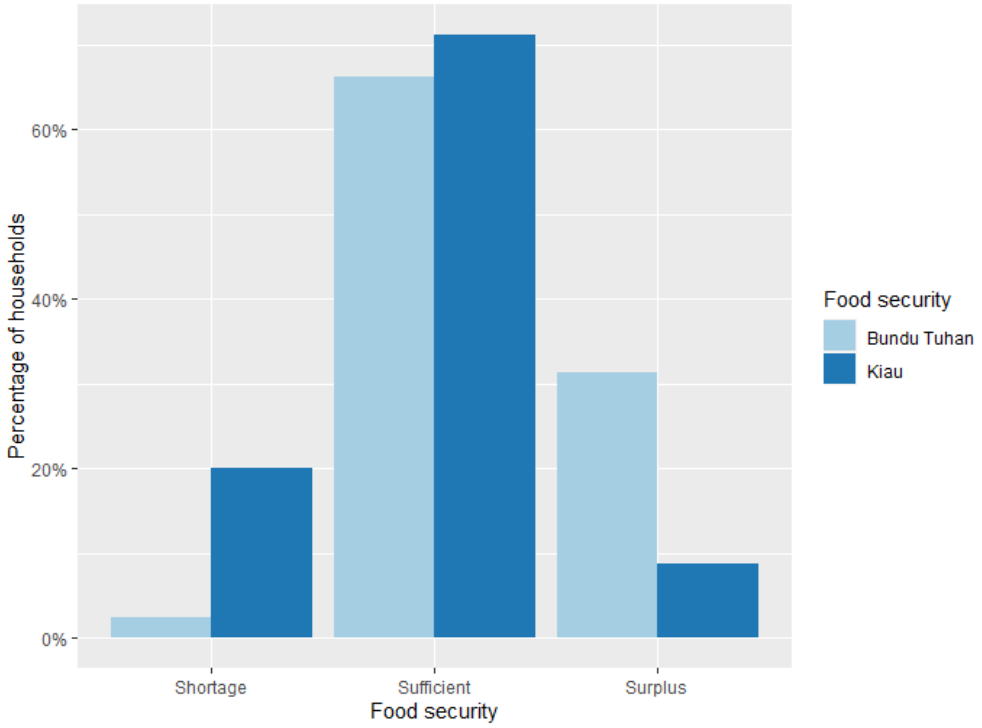

Figure 8: Food security status in the two villages.

Social capital

The social cohesion of villagers in both villages is considered strong (Figure 9). The chi-square test of independence showed that the social cohesion in Bundu Tuhan and Kiau differed significantly (χ^2 = 60.56, df=2, p-value <0.001). When asked about the number of people willing to help when faced with any problems or difficulties, more than 60% of households in Bundu Tuhan answered at least 10 people or more. Meanwhile, more than 60% of households in Kiau mentioned that all villagers would lend a helping hand (Table 8; No. of people willing to help). At least two-third of households in both villages engage in knowledge exchange with their neighbours and relatives. Knowledge and experience in crop management, ecotourism guiding, traditional knowledge, environment, cooking, entrepreneurship, healthcare and general issues are amongst topics that were commonly shared amongst the villagers.

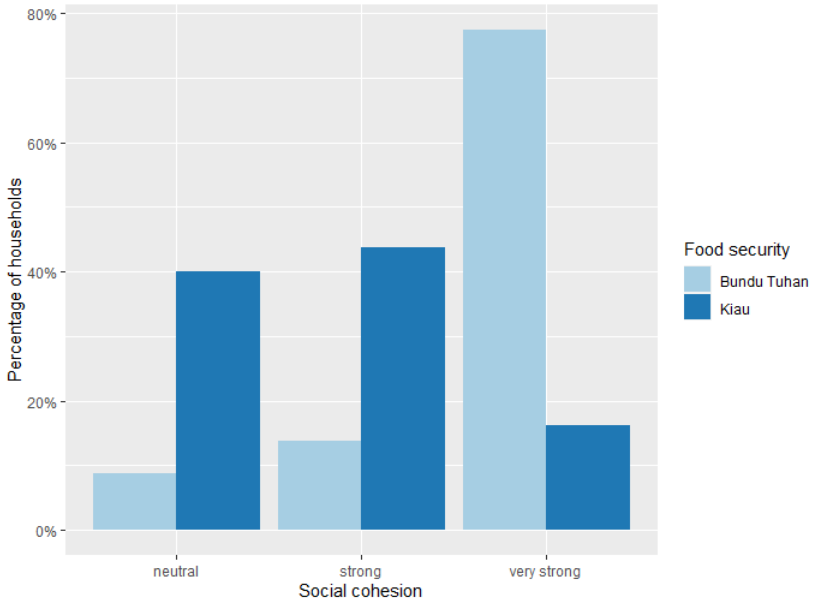

Figure 9: Villagers' perception on the social cohesion in their respective village.

Bundu Tuhan villagers are involved in 12 organisations, whereas Kiau villagers are involved in 14 organisations (Table 8). In Bundu Tuhan, there were households involved in governmental organisations such as JPKK where the member is a government elected representative of the village tasked to carry out community development activities, Malaysia Volunteers Corps Department (RELA) members usually contribute to the village in terms of security, Army Veteran members would receive pension or welfare support and members of

the National Farmers Organisation would benefit from receiving government subsidies, incentives and schemes to support their agricultural activities. Kumpulan Rukun Tetangga (KRT) is a neighbourhood organisation, where members rotate to guard their village. JPKK members would usually receive important updates on current issues or any announcements from the government departments to be shared with their community. Good Sheperd Services empowers the community, especially women and youths by providing entrepreneurship trainings, awareness campaigns on issues such as domestic violence, employment opportunities and scholarships for students. Fondacio Asia provides trainings to empower youths and social development projects for poor communities, while giving their members the opportunity to experience the diverse cultures in Asia. Amanah Ikhtiar Malaysia (AIM) is a microcredit organisation who provides financial aid, wellbeing support and insurances for community members who are in need. Gonding Gen is an informal organisation initiated by the youths of Bundu Tuhan to research, recollect and revive their tribal songs and *hiis* which is a Dusun term for of their traditional poems. Bundu Tuhan Social and Recreational Club are for the community to organise and take part in social and recreational activities in the village.

Table 8: Social capital variables for households in Bundu Tuhan and Kiau Nuluh-Bersatu villages.

Social capital	Bundu Tuhan	Kiau Nuluh-Bersatu
No. of organisations involved	12	14
No. of household involved in at least 1 organisation	30	52
No. of people willing to help	>60% says at least 10 people or more (range from 1 to all villagers)	>60% says all villagers (range from 0 to all villagers)
Knowledge sharing (%)	72.5	93.25
Participation in community activities (%)[a]		
Forest patrol	21.3	15.8
Village clean-up	97.5	100
Community farming	28.9	2.6
Religious events	89.1	89.4
Rituals/ festivals	77.7	94.6

Infrastructure maintenance	52.7	59.1
Social cohesion (%)		
Very Strong	77.5	16.2
Strong	13.7	43.8
Neutral	8.8	40

[a] This is a multiple response question. Respondents may select more than one response.

Kiau villagers are members of governmental organisations such as JPKK (same as the one in Bundu Tuhan), a political party and Cocoa Association which is under the Malaysian Cocoa Board. A villager mentioned that being a part of the political party would enable them to provide aid to villagers who are in need. Members of the Cocoa Association would receive guidance and technical support in terms of cultivating cacao from the board's staff. They would encourage and assist the farmers to start cacao cultivation on their abandoned and uncultivated land. There are a few organisations pertaining to culture and tradition preservation that Kiau villagers are engaged with, for example, GOMPITO, Kadazandusun Cultural Association of Sabah (KDCA) and *Persatuan Kebudayaan Kiau* or Kiau Cultural Association (Table 9). Tourism activities in Kiau Nuluh are usually managed by Guas Nabalu, whereas in Kiau Bersatu it is managed by the Ecotourism Association of Kiau Bersatu. Mountain Guide Association (PEMANGKINA - *Persatuan Malim Gunung Kinabalu*) manages tourism activities related to Mount Kinabalu, thus providing job opportunities to its members. Mountain guides from the village are members of PEMANGKINA by default and they would receive information on ecotourism activities through the organisation. Kooperasi Koonduan Kiau Nuluh Berhad (KKNB) is a women-based pineapple processing corporation in Kiau Nuluh. It was initiated by Good Shepherd Services after the devastating Mount Kinabalu earthquake in 2015 to provide the women in the village an alternative source of income generation. Most of the households has at least one female who is a member of KKNB. Besides learning about processing pineapple products, members mentioned that they were able to build teamwork and foster relationships with each other through its activities. PACOS trust and Rotary Club usually provides training or courses for community development. Villagers who are members of Youth Association would receive trainings on leadership and provide opportunities to nurture their potentials. Following the model of Bundu Tuhan's CCA, Ecolinc facilitated Kiau to set up their board of trustee, known as JKPAHLK as described earlier for managing their CCA. Table 9 lists all of the organisations for both villages.

All the households have participated in at least one of the social development activities carried out in the village (Table 8; Participation in community activities). Village clean-ups are held at least once a year and every household will send at least one representative to join the event. However, some villagers have mentioned that the usual turn up rate is low, approximately 30% of all households. Cleaning of cemeterial sites is carried out once in every three months in Kiau and every household sends one or more representative. Although there are no community farms in both the villages, some villagers do help out in their relative's or neighbour's farms. Forest patrols in Kiau is not regular, but it is done at least once in every 6 months. Honorary rangers who are also members of GOMPITO will monitor the forests and their allowance is provided by Sabah Parks. Similarly, there is no regular forest patrol in Bundu Tuhan. It is only conducted when reports or complaints are received.

Table 9: List of organisations that villagers from Bundu Tuhan and Kiau Nuluh-Bersatu are involved in.

Bundu Tuhan	Kiau Nuluh-Bersatu
• Amanah Ikhtiar Malaysia (AIM) • Army veteran • Fondacio Asia • Gonding Gen • Good shepherd services • Jawatankuasa Pembangunan dan Keselamatan Kampung (JPKK) / Village Development and Security Committee • Kadazan Dusun Cultural Association (KDCA) • Kumpulan Rukun Tetangga (KRT) • National Farmers Organisation • RELA (Malaysia Volunteers Corps Department) • Social and recreational club Bundu Tuhan	• Cocoa association under Malaysian Cocoa Board • Ecotourism association of Kiau Bersatu • GOMPITO • Guas Nabalu • Jawatankuasa Pembangunan dan Keselamatan Kampung (JPKK) / Village Development and Security Committee • Kadazandusun Cultural Association Sabah (KDCA) • Kooperasi Koonduan Kiau Nuluh Berhad (KKNB) • Mountain Guide Association (PEMANGKINA - Persatuan Malim Gunung Kinabalu)

• Taxi association	• PACOS trust • Persatuan Kebudayaan Kiau • PERWANSA (organisation for pineapple processing in Kiau Bersatu) • Political party • Rotary club • Youth association

4.5 Livelihood strategies and diversification

Agriculture remains as one of the main livelihood strategies in both villages (Table 10). Villagers in Bundu Tuhan who are engaged in agriculture mainly sells vegetables and to a lesser extent herbs, coffee, pineapple and flowers. Crops planted for selling in Kiau are mainly rubber (90% of households) and pineapple (78%). Some households also planted cacao, coffee, vegetables and fruits for selling. Paddy and vegetables are principally planted for their own sustenance and sold only if there are surpluses or when they need additional income. Livelihood diversification is prominent in Kiau, where villagers engage in multiple income generating means. When asked whether depending agriculture alone could provide an adequate income for their households, more than 55% of the households in Kiau said that it was insufficient. Similarly, more than 85% of households who depend on agriculture for their income in Bundu Tuhan said it was not sufficient. They had to diversify their income sources to cope and provide for their households. Most of the villagers in Kiau diversify their agricultural income by getting involved in tourism either as tourist guides or homestay providers. Tourism as a livelihood strategy is also more prominent in Kiau. There are various hiking routes in the CCA of Kiau that leads to attractions such as waterfall and mountain peaks. Kiau also boasts their own village tour for tourists to experience the culture, history and farming activities around the village. Since the location of Kiau is near the foothills of Mount Kinabalu, a UNESCO World Heritage Site which is a major attraction for both national and international tourists, many villagers work as mountain guides and porters.

Business and remittance/non-farm wages as a livelihood strategy is more prominent in Bundu Tuhan compared to Kiau. Business could involve small businesses, village grocery store and restaurants. Remittance and non-farm wages refer to households that gain their income

from either working in the public or private sector. For instance, as teachers, lawyers, engineers, land surveyors, clerk and shop assistants. Although some professions such as teachers may still be working in the school at the village, other professions could be a strategy of migration to seek livelihoods in nearby towns or larger cities. Households that depend on doing business or non-farm wages as their main income source also report that they have less time to work in their farms. This reflects the lower percentage of households in Bundu Tuhan who does agriculture as their livelihood mean.

Table 10: Household livelihood strategies for villagers in Bundu Tuhan and Kiau Nuluh-Bersatu.

Livelihood strategies	Bundu Tuhan (%)	Kiau Nuluh-Bersatu (%)
Agriculture only	27.5	38.8
Agriculture, business	6.3	1.3
Agriculture, business, private sect	0	2.5
Agriculture, carpentry	1.3	2.5
Agriculture, carpentry, tourism	0	1.3
Agriculture, private sect	1.3	1.3
Agriculture, private sect, tourism	0	2.5
Agriculture, public sect	1.3	11.3
Agriculture, tourism	0	27.5
Agriculture, retirement funds	1.3	0
Agriculture, wage labour	0	1.3
Allowance	3.8	0
Allowance, retirement funds	1.3	0
Business only	20.0	0
Business, private sect	2.5	0
Business, public sect	2.5	0
Business, tourism	0	1.3
Carpentry only	1.3	0
Private sect	16.3	0
Public sect	12.5	3.8
Tourism only	1.3	5.0

4.6 Extent of communities' dependence on CCAs

Communities in Bundu Tuhan and Kiau still depend on some traditional herbs for medicinal purposes. Although most of the herbs are now gathered from around their agriculture land, they would occasionally enter the CCAs to collect herbs that are not found outside. Considering both villages depend on the river streams and tributaries for their daily uses including consumption, the CCA proves to be an important water source. Furthermore, the watershed area of their CCA also serves as an important water source to other neighbouring villages. Although some of the villagers still depend on firewood for cooking, they only collect them from their agriculture land. All flora and fauna in both the CCAs are protected, hence, any villager who wants to collect any resources are required to obtain a permission. Often times, the villagers enter the CCA only to harvest the wild fruits when they are in season. Villagers in Kiau would occasionally collect rattan for their personal uses such as handicrafts or building materials for their households. Both CCAs act as ecotourism attractions for local and international visitors. They each boast their own unique attractions. Bundu Tuhan has historical sites, the newly developed hiking trail within their CCA and homestays, while Kiau has hiking trails within and around their CCA, village tour activities, waterfall and homestays. Villagers in Kiau are more dependent on tourism in their village as their main and secondary sources of income compared to Bundu Tuhan. During situations of food scarcity, the CCAs may be an important food source for the villagers in need, where they could harvest wild vegetables and fruits.

4.7 Contribution of Ecolinc to communities' livelihoods

Ecolinc facilitated Kiau in their application for an area of 78.3 ha to be officially gazetted as the community's land. The community in Kiau together with Kinabalu Ecolinc staff surveyed and marked the CCA boundary. This activity was a part of the Kinabalu Ecoinc project's objective to establish CCAs and gazette them as native reserves. During Kinabalu Ecolinc project period (2013 to 2021), the 78.3ha was supported for approval during the land utilisation committee meeting. The remaining CCA boundary has already been marked by the community and they had also informed the district office that their CCA 486ha in total. The villagers will continue applying the land title for their remaining CCA after the first one has been officially approved.

The activities that were carried out by Kinabalu Ecolinc in each village varied. Job opportunities were provided to the villagers with funds from Kinabalu Ecolinc project during the construction of infrastructures in both villages. However, all of the job opportunities created

during Ecolinc works on a temporary basis. Villagers in Bundu Tuhan and Kiau agreed slightly that Ecolinc's activity benefited their livelihoods (Figure 10). A Wilcoxon-rank sum test indicated that there was no significant difference (W = 2631.5, p-value = 0.052) between the median score of Bundu Tuhan (3.36) and Kiau (3.73).

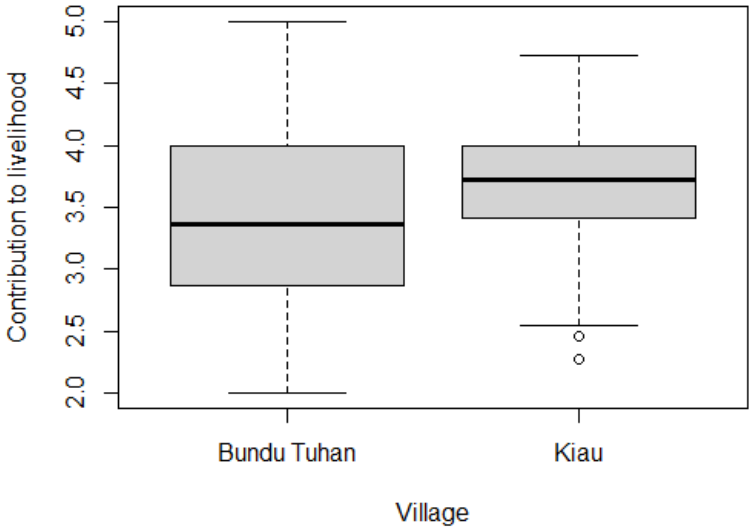

Figure 10: Box plot of the villager's response on Kinabalu Ecolinc project's contribution to livelihoods in each village. The lower and upper box boundaries are the first quartile and third quartile respectively, while the line inside the box is the median. Circles represent outliers. Response is recorded in the following 5-step ordinal scale: 1='strongly disagree; 2='disagree; 3='neither disagree or agree', 4='agree'; and 5='strongly agree'.

If Ecolinc's project activities are sustainable, villagers will continue to execute them as part of their livelihoods even after the project has ended. The relationship between the villagers and the project's staff or organisation will also persist. Villagers from Bundu Tuhan gave a lower score compared to Kiau on the project's activity sustainability (Figure 11). The Wilcoxon-rank sum test indicated that there was a significant difference (W = 2429, p-value < 0.001) between the median score of Bundu Tuhan (3.7) and Kiau (4.0).

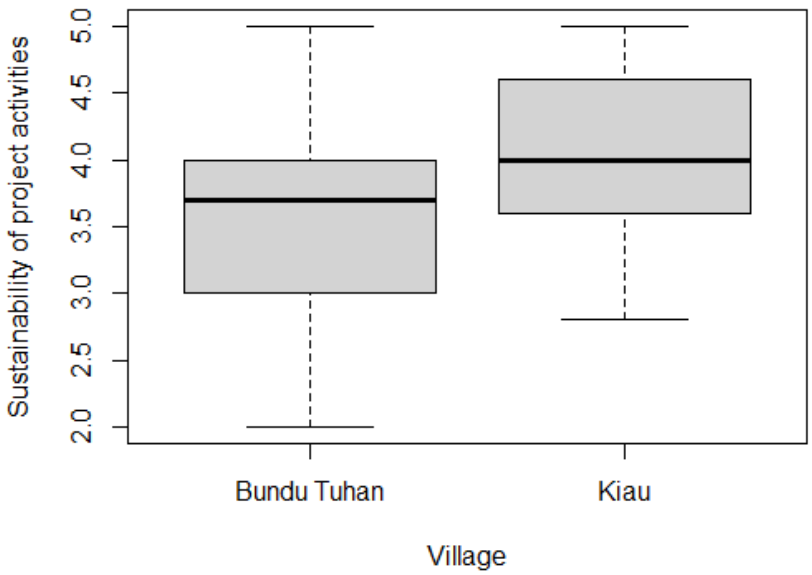

Figure 11: Box plot of the sustainability of Kinabalu Ecolinc project activities in each village. The lower and upper box boundaries are the first quartile and third quartile respectively, while the line inside the box is the median. Circles represent outliers. Response is recorded in the following 5-step ordinal scale: 1=’strongly disagree; 2=’disagree; 3=’neither disagree or agree’, 4=’agree’; and 5=’strongly agree’.

4.8 Contribution of other related CCA projects to the livelihoods of communities

Over the years, various organisations have conducted trainings and programmes in the two villages associated with their CCA and livelihood development.

Global Diversity Foundation provided some workshops on community forest management with the villagers in Bundu Tuhan. Japan International Corporation Agency (JICA) learned about the CCA management of Bundu Tuhan and used their CCA as a role model when discussing about sustainable community forests. ERE consulting group had previously studied the wildlife presence and their movement patterns in Bundu Tuhan’s CCA. During the interview period of this study, the villager leaders mentioned that University Malaysia Sabah (UMS) had offered to provide ecotourism training for guides in Bundu Tuhan and they were in the midst of the discussion stage. UMS had also previously conducted a stingless bee farm training, but few are reported to still keep them as it is not easy to succeed. Tambunan community college provided some courses for the youth and community on bread

making, electronics, furniture then they were able to produce items they need either for their households or livelihoods. For instance, chairs, tables, aquaculture materials and bread.

In Kiau, the district office had built roads to connect their village, provided electricity and some agriculture aid. Borneo Eco Tours, a private tour company, introduced hiking trails, conducted training for guides and provided funds to build huts along trails in Kiau. PACOS trust provided training for women empowerment, producing compost fertilisers and mapping of Kiau's CCA. They also made a 3D model of Kiau including tourism attractions around the village for exhibition purposes. Ministry of Tourism, Art and Culture (MOTAC) provided homestay trainings. After the earthquake in 2015, Good Shepherd provided training for the women to produce their own community product. Good Shepherd built a pineapple processing centre which provided an alternative income for the community and provided financial loans to the villagers. A plant nursery was built in 2015 by Rakuno Gakuen University, KOPEL Bhd., and JICA for community-based forest restoration program in Kiau. However, the trees did not grow well and the nursery was later demolished.

Chapter 5: Discussion

5.1 Challenges to the long-term sustainability of the CCAs

Both villages in this study had demonstrated that all of Ostrom's eight principles were incorporated in their respective CCA governance. The traditional beliefs and systems present in the CCAs contain similar institutional elements of ODP that contribute to the sustainable management of common pool resources (van Ast, et al., 2014). However, some of the principles could be further strengthened to enhance the sustainability of the CCAs.

Principle 6 on having a conflict resolution mechanism needs to be further addressed in Bundu Tuhan owing to the unresolved conflict with the state government. The conflicting land boundary between Bundu Tuhan community and the forestry department could pose a significant threat to the long-term sustainability of their CCA. It affects the first and seventh principle on having a clear CCA boundary and recognition by the government respectively. The decision of the government to reclaim the overlapping land as a forest reserve would severe relationships with the community and result in broken trust between the villagers and the forestry department. The villagers' plan to implement more ecotourism activities in their CCA has also been halted due to this conflict. Based on the management practices of villagers in

Bundu Tuhan's CCA, their customary land could be protected for future generations without any destruction or environmental degradation.

On the other hand, Kiau's CCA needs to strengthen principle 7 on obtaining a formal recognition from the government authorities. The process of establishing Kiau's community forest to gain an official gazette for their CCA is supported by the relevant authorities such as the District Land office and Departments of Lands and Surveys during the implementation period of Kinabalu Ecolinc project. Recognition of the traditional system of governance could also ensure that the community leaders have the authority and the legitimacy to enforce the regulations in place (van Ast, et al., 2014). The traditional practices and customary taboos incorporated into their CCA management could also contribute to the conservation of its natural resources which could in turn lead to a more sustainable CCA (Christiawan, 2018).

Principle 8 on nested enterprise of governing the CCAs could also be expanded for both villages. Having a higher-level authority to monitor violations on their CCA management and any community failures would be beneficial in maintaining the credibility and viability of the community's conservation efforts (Kashwan & Holahan, 2014). Multiple reinforcing layers of governance for monitoring their CCA could enhance the effectiveness of patrol measures, especially when dealing with violations by more powerful external parties (Hayes & Persha, 2010). The local authorities could also complement the community's effort of managing their CCA by providing support in terms of financial aid, trainings or other collaborative efforts. Building interconnected relationships could enhance the responsibility of governing the CCAs.

Policies are processes that could influence the individuals access to their capitals and in turn their choice of livelihood strategies (Nguyen, et al., 2020). The emphasis on CCAs in numerous policies in Malaysia indicate value in recognising and conserving them. However, there should be more incentives in place that would allow the relevant authorities to put them into action (Inoue, et al., 2021). The successful implementation of the policies and action plans can support the livelihood development of communities while ensuring the sustainability of CCAs (Wang, et al., 2022).

5.2 Land tenure security

In the case of Bundu Tuhan's CCA, although they have a clear boundary demarcation of their CCA as described by Ostrom's first design principle and a formal land recognition by the government as described by Ostrom's seventh design principle, the overlapping land boundary creates a conflict where the villagers become threatened by having an insecure land tenure. The main challenge in Kiau's

CCA is also the land tenure security. External parties are interested in buying over the land and developing it (Chin, 2018). Despite having applied for a land title, the process to obtain an official gazettement is time consuming. Consecutively, whenever a change in government occurs, the person governing the district office may also change. This would impede the land title application which was already in process with the former government because it would often be left unattended by the new governing authorities. The villagers would have to begin their application process almost entirely. Unclear boundary and insecure land tenure would increase the vulnerability of the land being exploited by external users (Murdiyarso, et al., 2012). In many forest conservation projects across the globe where tenures were insecure, the successes of the projects are hardly met as attempts to prevent intrusion of external users, for instance, loggers or governments allocating concessions to industrial or private sectors, are usually futile (Sunderlin, et al., 2014). Land tenure security plays an important role in encouraging the sustainable management of CCAs and the development of sustainable livelihoods for communities living there (Soe & Yeo-Chang, 2019; Sauls, et al., 2022).

Since land tenure often lies under the national level actions, it is crucial to address them before any local level interventions or actions (Wertz-Kanounnikoff & Angelsen, 2009). National policies and higher-level measures are necessary when implementing projects such as the Kinabalu Ecolinc project as it is often beyond the boundaries of a project site or local stakeholder. Clarifying the tenure would enable the right users of the CCA to be more motivated to protect and be accountable for their actions and implementation that has been agreed upon (Jashimuddin & Inoue, 2012). It is essential to have conflict resolution mechanisms to address land tenure when it arises (Duchelle, et al., 2014; Saeed, et al., 2017). Besides the inclusion of local and indigenous communities in legal frameworks, the implementation of relevant action plans and policies should also be mainstreamed (Aggarwal, et al., 2021).

5.3 Contribution of social capital

Presence of collective action is deemed as an integral asset for the sustainable management of the CCAs (Nath & Inoue, 2010; Negi, et al., 2018). When the social cohesion in a community is strong, individuals in the community would feel more motivated to participate in communal activities including those related to their CCA (Baynes, et al., 2015). All the households in both villages have participated in at least one of the community activities. Most of them took part in village clean-ups, religious events, rituals, festivals and infrastructure maintenance in their village. The strong social cohesion in both villages may also be a result of their active participation in those communal activities. Nevertheless, the differences between the two villages' social cohesion could be due to the higher number of neutral

responses from Kiau. As the communities in both villages continue to depend on the CCAs for their livelihoods, they also develop a sense of ownership and increasingly value the CCAs, which then motivates them to contribute to collective action (Gatiso, 2019). Community collective action usually promotes resistance to development that would degrade habitats, such as dams, logging, tourism, over-fishing, agricultural expansion and mining (Kothari, 2012; Kongkeaw, et al., 2019; Hernández-Aguilar, et al., 2021). It is a result of the communities having shared interests and desires to manage their CCAs sustainably (Assuah & Sinclair, 2019; Nath, et al., 2020).

Villagers in Bundu Tuhan and Kiau expanded their networks through their involvement in Kinabalu Ecolinc project activities. Besides Ecolinc project staffs, they have also worked together with other organisations during the project period such as Department of Agriculture Sabah, a Beads Craft Enterprise, PACOS Trust, Amanah Ikhtiar Malaysia, Forestry Department, MOTAC and Sabah Tourism Board. Majority of the households interviewed agreed that Ecolinc project increased their network connections to other organisations. If the organisations were to continue their collaboration and maintain their trustworthiness, the social relation will be beneficial for fostering cooperative actions with the communities (Fischer, et al., 2019).

Encouraging the participation of local communities and providing them with the necessary support would present them with more opportunities to improve their livelihoods without putting the burden of protecting the natural resources solely on the community (Delgado-Serrano, 2017). Providing financial and technical support for community patrolling and monitoring of activities within CCAs could incentivise the communities to take on a more active role (Ramirez, et al., 2019). Enforcement and monitoring are usually more efficient when communities conduct the patrols. When local communities are able to exercise effective control and are actively involved in the ICCAs, positive environmental outcomes and improved livelihoods can be achieved (Shrestha, et al., 2022).

5.4 Livelihoods of the community

It is evident that households in Kiau faces more shortages in terms of their food security. Agriculture is the main source of income for the majority of households in Kiau and the earnings from it can be inconsistent. There are crops such as pineapple that do not fruit all year and some of the vegetables planted are sold only when there are market demands, hence income can be seasonal. This is further supported by the lower range and median household income in Kiau compared to Bundu

Tuhan. Many villagers in Kiau commented that they would usually make do with all their available agricultural produce whenever they face food scarcity. Some of the households would also engage in more odd jobs around their village either as carpenters or mountain porters to gain secondary incomes to cover their expenses. Many households in Bundu Tuhan are no longer depending on subsistence agriculture and boasts members with professional qualifications working in the civil service and private sectors as teachers, nurses, lawyers, doctors and accountants (Vaz & Agama, 2013). The higher income and savings in Bundu Tuhan may also explain the higher number of appliances and vehicles owned. Livelihood development programmes could come up with strategies to improve the food security of the communities. Trainings or workshops on small businesses and sustainable agriculture would benefit the communities, especially in Kiau as the majority of households depend on agriculture as their main income source. It is important to address food insecurity to prevent communities from malnutrition, poor physical health and impacts on their cognitive development (Paslakis, et al., 2021).

Although the response for Ecolinc's contributions to the communities' livelihoods did not differ between the two villages, the median score was only denoting slightly agree. This could be due to the lack of alternative income generation activities and job opportunities that lasts after the project ended. Additionally, villagers in Kiau felt there was a lack of activities on sustainable agriculture and trainings to empower the communities on small businesses. There needs to be a follow up for some of the courses such as the English language course and homestay management workshops so that the community is empowered to confidently apply their skills. Sustainable agriculture workshops should also be conducted in Kiau as many households still depend on agriculture as their main source of income. No trainings were provided for alternative income generation or small businesses. However, there are opportunities to create and market unique products from their CCA that would not put a pressure on the natural resources. For example, pineapple products in Kiau which was initiated by Good Shepherd.

Villagers in Bundu Tuhan gave a lower score for their involvement in Ecolinc's management and governance compared to Kiau. They felt that the project authorities did not consider the local values and incorporate local knowledge. They also felt the project activities did not fully align to their community's development needs and village's management plan. This could be the reason affecting Bundu Tuhan's response on Ecolinc's sustainability. Ecolinc project's sustainability in Bundu Tuhan is less than in Kiau, with more villagers rating 'neither agree nor disagree'. They were not fully convinced that there will be continuous support from the project authorities after the project ended and whether the coordination with the other stakeholders involved would continue. Bundu Tuhan villagers collaborated with Sabah Park in

the Ecolinc project with the understanding that they will be the role model for other new CCA establishment, since they are already an existing CCA before Kinabalu Ecolinc project started. They hoped to gain support and acknowledgement from Ecolinc on their effort in protecting and managing the forest as the first CCA in Sabah. During the final stages of the project, Ecolinc stated that Bundu Tuhan is also a newly established CCA under Ecolinc project. The villagers objected to the statement because they have been managing the forest in accordance to the concept of CCA before Ecolinc came about. Although they do not widely use the term CCA to refer to their community forest, they believe they deserved the recognition for their managing capabilities on their CCA. Subsequently, the project authorities did not manage to give a satisfactory answer to the villagers. Hence, towards the end of Ecolinc, the villagers' relationship with the project authorities weakened.

Since this study took place during the COVID-19 pandemic, there have been restrictions in terms of visits to the villages and their CCAs. There were no ground validations done inside the CCAs. Besides that, the forestry department and Ecolinc project officers were not involved in the interviews. When using ODPs to understand the sustainability of CCAs, the higher number of ODP present is linked with a higher sustainability of the CCA. However, there is no complete measure of sustainability when using this method. Future studies can incorporate the social-ecological systems framework for a more extensive analysis of the factors contributing to the sustainability of CCAs. In-depth interviews with a few of the local authorities could possibly provide insights into the legal situation and collaborative actions. It would also be useful to include the villages that were considered potential CCAs but were not established at the end of Kinabalu Ecolinc project period in future studies for a comparison. Findings from this study can be used to establish new CCAs in other parts of Malaysia by considering the local contextual factors.

Chapter 6: Conclusions and Policy Implications

Both Bundu Tuhan CCA and Kiau CCA have been proven to be sustainably managed by their respective communities. All eight ODPs were found to be present in both CCAs. However, the long-term sustainability of the CCAs could be further strengthened by having a formal recognition of their land tenure (ODP 7) and support from the government in the form of nested enterprises (ODP 8). For Bundu Tuhan, the conflict due to overlapping land boundaries is linked to ODP 7 and should be resolved (ODP 6). The traditional and customary practices of communities in Bundu Tuhan and Kiau contribute to the protection and

conservation of resources in the CCA. Formal recognition and tenure security of the CCAs in Bundu Tuhan and Kiau would be key to encourage continuous participation from the community. It could also serve as a sign that their conservation efforts are seen and recognised, which could increase the motivation of the community to manage the CCAs sustainably. Recognition of the CCAs simultaneously secures the rights of communities to access, use and manage the forests. These recognitions are important for the conservation of the ecosystem that would also benefit the community's livelihood in the long term. Following that, a CCA registry should be established in Malaysia. Although it has already been stated in Malaysia's national and state action plans, such as the National Physical Plan 3, Heart of Borneo Strategic Plan and Sabah Biodiversity Strategy, it has not been brought into action. There should be a mechanism in place to facilitate those action plans into actualisation.

Institutional support from the government and private sectors can strengthen the capabilities of the communities to manage the forest and maintain a sustainable livelihood. The concept of CCA could be emphasised in the National Forestry Policy and Sabah Forest Policy. A more specific action plan for implementing the policies on CCAs and fostering community participation could be made on a yearly basis to drive action. The forestry department should provide continuous technical and financial support to improve the community's livelihoods as well as CCA sustainability. For instance, assisting the communities in monitoring and evaluating the implementation of their management plan. Community participation in all stages of the CCA implementation process is one of the factors contributing to the sustainability of CCA activities. Hence, their participation should be promoted in all stages including when preparing a management plan, implementing the plan and monitoring their CCAs. If CCA activities are sustainable, villagers will continue to execute them as part of their livelihoods even after the project has ended. Besides providing a more sustainable livelihood for the community, it could also contribute in the conservation of natural resources and the ecosystem.

It is essential to have programmes or activities developed based on the availability of natural resources and suitability at the locality. Kinabalu Ecolinc project developed ecotourism facilities and provided trainings to supplement the community's livelihoods through ecotourism activities, but only for a defined period of time. However, these community development projects should be allocated a budget by the government every year as part of their commitment to encourage community involvement in conservation efforts and not dependent on external periodic funding. Capacity building to develop products or community enterprises based on their natural resources could also be supported by the private sector.

Livelihood development activities should be equally allocated to the community and more attention should be provided to villagers who do not have food security. For example, provision of agriculture technology or facilities should be for collective use of the community instead of particular individuals within the community.

This study shows that indigenous communities are capable of managing their CCAs sustainably. Thus, more CCAs across the globe should be identified and recognised by state governments as they present a great opportunity to enhance conservation efforts. Community participation should be encouraged as they bring greater success to interventions that are implemented and could lead to improved livelihoods of the community. The sustainable management of CCAs and the lessons learnt from this study could be used as role models for other communities. It is crucial for future negotiations and policy development whether national or international to take into consideration the significant roles that indigenous communities can play in natural resource management.

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Annexes

Annex I: Questionnaire for household interviews

CCA = Community conserved area

Basic Information of Respondent and Study Site/Village

District: Village: Date:

Sex: Age: Education level:

A. Human Capital

1. Total household members: Male: Female:
2. Highest education level of family members:

Primary Secondary Foundation/ Diploma Degree Masters/ PhD

3. Number of school/ college/ university going students: Male_____ Female_____
4. Do you or your family members have any disease that affects your ability to work:
5. Access to health services: Local practitioner Local health clinic Hospital
6. Did you/ anyone in your household receive any training provided by CCA project/Kinabalu park? Yes No

    a) If yes, what are those?

    b) Who were the trainers?

    c) How many times did you/ your family members attend the training?

    d) What have you/ your family members learnt from such training?

    e) What kinds of benefits did you/ your family members get from training?

    f) Are you/ your family members applying the training knowledge? If no, why?

g) In general, are you/ your family members satisfied with the activities and training that were received? [1. very unsatisfied, 2. moderately unsatisfied, 3. neither satisfied nor unsatisfied, 4. moderately satisfied, 5. very satisfied]

h) What are the reasons for the above answer?

B. Natural Capital

1. What are the landholdings you have and what are their ownership statuses?

Type	**Agriculture**	**Home garden**	**Personal forest land**	**Others**
Size				
Permanent/ Lease (years)				

2. What are the crops you cultivate?

3. Do you practice monocropping or mixed cropping?

4. Do you practice any of these?

- Organic fertilizer
- Use only pesticides or herbicides
- Integrated pest management
- Rainwater harvesting
- Cover crops,
- Mulching
- Zero tillage

5. What is the main source of irrigation?

6. Do you think that you get a sustainable yield from agriculture? Yes/No with reasons.

7. What are the challenges you face when doing agriculture?

8. a) Do you collect any forest products and what is the purpose for it?

b) How often do you collect them?

C. Physical Capital

1. Livestock and numbers: Cow_____ Goat_____ Poultry_____
   Pigs_____ Others_____
2. House condition: Wall: Roof:
3. Where do you get your water sources from and is the water source used only by your household or is it a communal resource?

Water sources	Pipeline	Pond	Tube well	Stream
Individual household				
Communal				

4. Source of lighting:
5. What household assets do you own and what is their estimated monetary value?

Household assets	**Quantity**	**Estimated monetary value**
TV		
Radio		
Bicycle		
Motorcycle		
Car		
Satellite dish/ channels		
Wifi modem		
Agricultural tools:		
Others:		

6. Sources of energy for cooking:

Items	**Proportions (%)**	**Sources**	**Quantity per day/ week/ month**
Firewood			
Litterfall			

Gas			
Biogas			
Others			

D. Financial Capital

1. Occupation
    a) What are the main regular sources of income for your household? (main occupations in descending order)
    b) Do you have any other sporadic sources of income? What are they?

2. What is the monthly household income from all sources?

3. a) Did you/ your family members receive any benefits from CCA establishment project? Yes/ No (If yes, what are those)
    i. Project money (fund distribution)
    ii. Money raised through the project activities (eg from ecotourism/ homestay)
    iii. Job opportunity
    iv. Alternative income generation activities
    v. Others

    b) Do you still receive those benefits from CCA project?

4. Do you/ your household receive any benefits from the village committee? If yes, what are the benefits and how often do you receive them?

5. Considering all sources of income and agricultural yield, what is the situation of food security of your family? shortage, sufficient, surplus

If there is shortage, what are the strategies to cope with shortage?

6. Do you have some savings after paying all the bills and necessities? Yes/ No

E. Social capital

Groups and Networks

1. Are you/ any of your family members involved with any organisations/ groups/ NGOs?
   Yes/ No If yes,
   a) What are those and what are their functions?

   b) How many family members are involved with these organisations/groups?

   c) What are the benefits from joining the group(s)?

2. If you/ your family members suddenly need a small amount of money, how many people do you believe will come forward willingly to help you?

3. Do you/ your family members exchange knowledge on the skills you have with your neighbours? (including any traditional practices) Yes/ No
   What skills are those?

Collective action and cooperation

1. Do you partake in any activities with the community?
   - Patrolling
   - Village clean-ups
   - Community farming
   - Religious ceremony
   - Rituals/ festivals
   - Resource maintenance services (infrastructures, facilities, natural resources)
   - Others
2. What are the benefits or problems of these collective works?

Social cohesion and inclusion

1. How strong is the feeling of togetherness or closeness in your village?

[1. very distant; 2. somewhat distant; 3. neither distant nor close; 4. somewhat close; 5. Very close]

2. What are the benefits of this cohesiveness?

F. Governance

Participation in CCA related activities

1. Do you participate in project planning/monitoring/evaluation meetings (it can be before/ during/ after the project implementation): Yes/ No;

If no-why?

If yes

a. How many times:

	Participated (✓or ✖)	**Provided input**
Budget allocation		Always | Sometimes | Never
Identifying resource priority need of the villagers		Always | Sometimes | Never
Uses and management of forests		Always | Sometimes | Never
Decision making		Always | Sometimes | Never
Benefit sharing		Always | Sometimes | Never
Selection of sites to be included as CCA		Always | Sometimes | Never
Rules and regulations		Always | Sometimes | Never
Sanctions		Always | Sometimes | Never
Others:		Always | Sometimes | Never

2. Assessment of project meetings indices [1= strongly disagree, 2=somewhat disagree somewhat, 3 = neither agree nor disagree, 4=somewhat agree, 5=strongly agree]

i. All participants had a chance to voice out
ii. Comfort and convenience of meeting
iii. Deliberative quality of meeting
iv. Outcomes of meeting reflect the voices of the community

G. Project management and Governance

To what extent do you agree with following statements:

(1= strongly disagree, 2=disagree, 3= neither agree nor disagree, 4=agree, 5=strongly agree)

	1	2	3	4	5
The area selected for CCA establishment was appropriate					
Project authorities consulted the villagers during the planning stage of this project					
Project authority took into consideration the local values					
Project authority considered the development needs of the locals during the planning stage					
Project authority informed local people about project objectives					
Local people were involved in the management and monitoring of project development activities					
Project authority organised regular workshops/meetings with the locals to discuss project planning, management and monitoring					
Project authority incorporate local knowledge in project activities					
Project activities were aligned with development needs of the locals					
Project activities were in line with the village's management plan					
Project authority engaged NGOs and other organisations in project management, monitoring and periodic reviews					
Project authorities were transparent about decisions made					

H. Human Aspects

To what extent do you agree with following statements:

(1= strongly disagree, 2=disagree, 3= neither agree nor disagree, 4=agree, 5=strongly agree)

	1	2	3	4	5
This project provided job opportunities to the local people					
This project supported alternative income generation activities (e.g. livestock, small business, home gardening, nurseries, etc.)					
Benefits from this project helped improve our livelihood					
Participants can collect fuel (dead trees, branches, etc.) from forest					
Project helped to gain knowledge on sustainable agriculture					
Project helped to gain knowledge on tourism and its management					

Project helped to gain knowledge on ecotourism/ sustainable tourism					
Project helped to improve our small business skills					
Project helped to gain knowledge on planning, implementing and monitoring of restoration activities					
Project helped to build up networks with different organizations					
The project authority can be trusted					

I) Sustainability and Challenges

To what extent do you agree with following statements:

(1= strongly disagree, 2=disagree, 3= neither agree nor disagree, 4=agree, 5=strongly agree)

	1	2	3	4	5
Local people will be benefited for a long-term					
Connection between local people and Sabah Park/ Kinabalu Park authority will continue					
Coordination among different stakeholders will continue					
Authority will continuously support local people toward livelihood improvement					
Activities that were implemented are still being monitored and evaluated even after project has ended					

Annex II: Questionnaire for focus group discussion

Name of person recording:

Date:

No. of people attended: M_____ F_____

Project Information

Village:

Status of conserved forest: Native reserve; Forest reserve; Community forest;

Kinabalu Ecolinc project implemented by: Sabah Parks; Sabah Forestry Department; Community; NGOs

Project period:

CCA Project Background and Outcomes – through implementation of the Kinabalu Ecolinc project

1. Previous land uses in the area that has now been demarcated as CCA
2. Peoples' (community) dependency on forests in the CCA (e.g. for food, biomass for cooking, construction materials, selling NTFPs, etc.)
3. Reasons for forest land degradation
4. Background of CCA establishment project (driving agency, objectives, start and end date)
5. Impacts of project: Ecological (e.g. forest area, biodiversity, water flow, planting nurseries, restoration/ replanting & maintenance etc.); Social (e.g. management committee, beneficiaries, access to project benefits, etc.); Economic (e.g. jobs, income, business, skills, support etc.); Partnership (network and relations)
6. Sustainability: Forests; Socio-economy; Partnership
7. Participation (are all villagers involved in planning, management, monitoring, evaluation)
8. Details of project benefit sharing (how are the benefits shared, who determines, who receives)
9. Challenges to sustain the CCA and CCA activities (eg infrastructure and ecotourism) and mitigation measures:

10. Project committee for CCA establishment project (if formed): Who initiate the formation, when was it formed, how was it formed, members and selection, purposes, current situation)
11. Are results of the project shared with the community (periodic updates; final report etc)?

Status of Ostrom's Design Principles

Well-defined boundaries	
CCA boundary	Clear; Unclear; No boundary
Who sets the boundary	
Zonation/ boundaries within CCA itself e.g. zones for resource collection, restoration and strictly prohibited sites	Are there zonations within the CCA? Yes; No
	Are the zone boundaries clear? Clear; Unclear
	What are the zones? And what are the purposes?
	Are there any impacts from the zonation?
	Who identifies the zones and who sets the boundaries?
Area of resource system	Individual forest area: (ha) Collective forest area: (ha)
Are there conflicts with neighbouring villages/ groups due to boundary? If yes, explain.	
Do you find the boundary useful? Reasons	
Who are the users of CCA?	
User groups size	Number of villagers
Do you want less people participating?	

Benefits for individual forest areas? Any problems arising from having that?	
Provision of rules and local conditions	
Are there any rules of CCA management and resource use? If yes, what are those?	
Formation of rules	By Community; Sabah Parks; Sabah Forestry Dept; NGO
How were the rules formed?	
Local acceptance of rules	High; Fair; Poor
Traditional beliefs or practices of users regarding the forest	
Nature of user groups	What is the ethnic composition of the users? If there are others please state. Dusun _____; Kadazan_____ ;
	Which income group do the users belong to? State the proportion. High income group_____ ; middle income group____ ; low income group_____
Adaptive management & learning	Are the rules/ management plan updated periodically or have they been changed to fit the current contexts?
Sustainable practices	If the current management and activities implemented by the community were to be continues, will it preserve the forest so that the future generation can continue to use and enjoy the benefits?
Collective choice arrangements	
Management authority	Community; Sabah Parks; Sabah Forestry Dept; NGO
Nature of management	Individual; Collective
Locals' participation in project related meetings	Are there meetings for people to voice their opinions? How often? Do all villagers participate?

Power to change/modify rules	Community; Sabah Parks; Sabah Forestry Dept; NGO
Monitoring	
CCA/Forest condition	Community; Sabah Parks; Sabah Forestry Dept; NGO
	Regular; Not regular How often?
	Effective; Not effective
User behaviour monitoring	Community; Sabah Parks; Sabah Forestry Dept; NGO
	Regular; Not regular How often?
	Effective; Not effective
Ecotourism activities	Community; Sabah Parks; Sabah Forestry Dept; NGO
	Are number of tourists recorded periodically?
	Regular; Not regular How often?
	Effective; Not effective
Restoration activities	Community; Sabah Parks; Sabah Forestry Dept; NGO
	Are activities recorded? Who records?
	Regular; Not regular How often?
	Effective; Not effective
Provision of graduated sanctions	Yes; No
What are the sanctions?	
Who decides the sanctions?	
Fair and appropriate	Yes; No
Examples of previous sanctions	
Conflict resolution mechanisms	Easy; Complex
How, by who? (between community, with neighbouring villages, external parties)	Locally; External intervention;
Conflicts in the past? How was it solved?	

Unresolved conflicts	
Recognition of rights by authorities	
Land tenure	Individual; State; Communal
Harvesting rights	What is Allowed; Limited; Restricted
Harvesting quantity and frequency	
Any fees involved	
Nested governance	
External support	What support and by who for the management of CCA and related activities
Local authorities monitor	Monitor against community failures Yes; No
	Monitor on violations on forest management Yes; No
	Punishments are appropriate/ fair to locals Yes; No
	Support locals monitoring effort by maintaining credibility and viability including when dealing with external violators Yes; No
Links with higher governance	Low; Medium; High
Elite capture	None, Low, Medium; High
Locals' participation in project related meetings with park authorities	How often
Democratic accountability between locals and authorities	Project continuity and deliverables

Tourism Development through CCA project

1. What infrastructures were built through the CCA project?
2. Were the costs fully borne by the project funds or did the community also bear some of the cost?

3. Ownership of these infrastructure(s):
4. Maintenance of infrastructure: By whom, cost, etc.
5. Are these useful/sufficient to promote ecotourism in your village?

About tourism:

1. Attractions/activities
2. Marketing
3. Who are the tourists/visitors?
4. Fee structure (entry fee, visiting sites-waterfall, guide, porters, homestay, food, etc.)
5. Last few years data: (tourists, local/foreign, fees, stay of duration, sites visited, other activities, etc.)
6. Uses of ecotourism revenues (infrastructure maintenance, community fund, dividend to villagers, fees paid to Sabah park, etc.)
7. Villagers' benefits from tourism
8. Trainings received and benefits
9. Are there trainings/ activities to enhance sustainable tourism / ecotourism?
10. Is there an organisation formed for tourism? What are the purposes?
11. Training providers, fees, etc.
12. As tourism activities expand in this village, are there any impacts caused? (Consider situation before COVID)

    Positive: tourists learn about other cultures, sale of local crafts, employment opportunities, improved infrastructure

    Negative: more external businesses emerging in the area, mass tourism, rising household costs, overcrowding, water cycles may be affected, pollution, more wastes
13. Future plan on ecotourism and CCA

Other CCA/ livelihood development projects

1. Are there any other projects that have been conducted in this village on CCA management and livelihood development activities?
2. What were the activities conducted?
3. Which agencies/ organisations were involved in implementing the project?
4. Were they beneficial and why?