

Reviews: Komodo National Park as a conservation area for the komodo species (*Varanus komodoensis*) and sustainable tourism (ecotourism)

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Abstract. Hidyarko AIF, Gayatri AC, Rifa VA, Astuti A, Kusumaningrum L, Mau YS, Setyawan AD. 2021. Komodo National Park as a conservation area for the komodo species (*Varanus komodoensis*) and sustainable tourism (ecotourism). *Intl J Trop Drylands* 5: 27-41. Komodo National Park is a protected area that functions to protect biodiversity, where a protected ecosystem will become inexhaustible, potential germplasm that can be developed to meet future needs. The Komodo National Park is the original habitat for Komodo dragon species (*Varanus komodoensis*) and one of the objects of tourist attraction. The purpose of this study is to see the sustainable function of conservation and tourism in Komodo National Park. Komodo National Park has 2 attractions, namely natural tourist attractions and tourist attractions. The tourism management of Komodo National Park (KNP) is currently through an ecotourism approach. The tourism zone is determined based on part of the Komodo National Park which has the potential for land and marine tourism with a diversity of flora and fauna. The main feature of Komodo National Park is the existence of the ancient giant reptile Komodo dragon as well as an effort to protect the drag so that it does not occur extinction so that protected areas need to be implemented in this area. Komodo National Park has a diversity of flora and fauna in Indonesia that must be protected and preserved, the aquatic fauna between the waters of *Cheilinus fasciatus*, *Scarus flavipectoralis*, *Ctenochaetus striatus*, *Scolopsis margaritifera*, and land fauna such as Long-tailed macaque (*Macaca fascicularis*) and Asian palm civet (*Paradoxurus hermaphroditus*). The development of ecotourism in protected areas must pay attention to the suitability of the use patterns in the conditions of Komodo National Park.

Keywords: Ecotourism, Komodo National Park, protected areas, tourism zone

INTRODUCTION

Komodo Island is one of the islands in the East Nusa Tenggara Islands, Indonesia. This island is the original habitat of the Komodo dragon (*Varanus komodoensis*) (Figure 1) (Kurniawati and Ratunnisa 2016). The island which Komodo dragons inhabit is named after the name of this animal when it was discovered in 1910, namely Komodo Island (Pulau Komodo). Komodo is an endangered animal with a population of less than 4000 in the wild. As an effort to protect Komodo dragons, in 1980 on this island a conservation area was formed which is now known as the Komodo National Park (Situmeang 2012). Komodo National Park is located in Komodo Sub-district, West Manggarai District, East Nusa Tenggara, Indonesia (Figure 2) (Gibson et al. 2020). The Komodo National Park area is an archipelago consisting of several small and medium islands with a total area of 1817 km². The islands in the Komodo National Park area have an area of more than 603 km² (60300 ha) and the marine park area is about 1214 km² (121400 ha).

The Komodo National Park area is divided into several zones. The zoning was made as a process of arranging space within the national park into easily identifiable zones. The zones in Komodo National Park include core zones, jungle zones, marine protection zones, land tourism utilization zones, marine tourism utilization zones, traditional land use zones, traditional marine use zones, special pelagic use zones, special zones for traditional community settlements (Figure 3). The division of the zone is based on land function, land use and land potential. For example, tourism zones are defined based on the part of the national park that has land and sea tourism potential (Walpole et al. 2008). Based on the zoning above, the zoning system that has not been included is the community business potential zone. This zone becomes important if the Komodo National Park area develops rapidly to become a tourism center and a community media resource to support tourism (Adil 2018). Data from the Komodo NP Office were obtained from the top 10 countries with the most visitors in 2008-2015 and some image documentation in Komodo National Park (Kurniawati and Ratunnisa 2016).



Figure 6. Komodo (*Varanus komodoensis*) in Komodo National Park, Indonesia (KSDAE 2021)

The Indonesian tourism industry continues to experience rapid industrial development. Tourism is one of the potential sectors that influence economic development such as job creation for local residents, infrastructure development, and as a medium in understanding the culture of an area (Sokhanvar et al. 2018). In order to achieve maximum sustainability and tourism goals, the management or management of the implementation of tourism is an important thing to pay attention to (Gabur and Sukana 2020). Ecotourism is one part or sub-sector of the tourism industry which is visited by many domestic and foreign tourists (Yilma et al. 2016). The concept of ecotourism is to combine environmental aspects with sustainable tourism aspects. Ecotourism aims to maintain the use and conservation of natural resources, especially biodiversity (Imran 2012). Ecotourism is a responsible concept for protecting the environment and the living things that live around protected areas (Safaradabi 2016). Ecotourism can act as a model for sustainable tourism development to provide a tourism model for local governments and local communities that have economic benefits and social and ecological benefits (Nurinsiyah et al. 2015). Ecotourism will create a stable situation by following a living philosophy of life and based on intrinsic and inner values (Safaradabi 2016). Ecotourism creates an environmental management tool for local governments while providing an alternative source of income for local residents while avoiding unsustainable land use (Koens et al. 2009). Ecotourism is related to local government policies used to preserve the environment and culture of protected areas (Seifi and Ghobadi 2017). There are several criteria to make an area into an ecotourism area, namely: (i) the area must have a special uniqueness and cannot be found anywhere else; (ii) the readiness of the local community to participate in the project to be built; (iii) the allocation of the area is not in doubt; (iv) accommodation facilities and other supporting facilities are available (Pratiwi et al. 2017). In the concept of ecotourism, attraction is one of the important things. Attraction is the main factor that influences tourists to get pleasure and experience in visiting tourism (Ramadhan 2016).

The Komodo National Park area consists of three large islands, namely Komodo Island, Rinca Island and Padar Island (Jamu 2014). Each island has its own fascination. Komodo Island has tourist attractions in the form of Loh Liang, Rinca Island with its tourist attractions, namely Loh Buaya and Padar Island with its tourist attractions, namely South Padar and Long Beach, located in the western part of Padar Island and several small islands around it. Padar Island is the third-largest island. The Padar Island is located between Rinca Island and Komodo Island (Komodo National Park Hall 2018). The main attraction of ecotourism on Komodo Island is the Komodo dragon itself, spread across several islands, including Komodo Island, Rinca Island, and Padar Island (Parta 2019). Considering that Komodo dragons are endangered animals, the tourism management of Komodo National Park is currently using an ecotourism approach. The resource management strategy used in the implementation of tourism on Komodo Island should refer to conservation principles, so that the preservation of Komodo can be maintained and tourism activities can be carried out in a sustainable manner (Suryani et al. 2016).

The ecotourism potential in this National Park is in fact very competitive in global marketing because it has succeeded in bringing in more than 50,000 people per year and 85% of them are foreign tourists (Iriyono et al. 2013). The high level of tourism activities in this national park, indirectly seems to have an effect on the condition of the existing Komodo dragon population (Ardiantiono et al. 2018). This is evidenced by the declining distribution and population of Komodo dragons in the last three decades. According to data from the Komodo National Park Office (2018), the population of Komodo dragons on Padar Island is seven. In addition to tourism, as the main prey, deer hunting has also been another factor causing the decline in the Komodo dragon population (Jessop et al. 2007). With this population decline, special attention and conservation efforts are needed for Komodo dragons.

PROTECTED AREA - KOMODO NATIONAL PARK

Act No. 26 of 2007 concerning Spatial Planning, which was followed up by Government Regulation No. 26 of 2008 concerning National Spatial Planning, it is stated that what is meant by a protected area is an area designated with the main function of protecting environmental sustainability which includes natural resources and artificial resources, as well as the historical and cultural values of the nation, in the interest of sustainable development. This protected area will still be an attraction for tourists, without disturbing the function and environmental sustainability. The development of attractions in this area is a protected area in the form of green open spaces and has the potential to prevent the development of illegal wildlife observation and captive attractions (Darsiharjo et al. 2016). Protected areas consist of areas that provide protection for subordinate areas, local protected areas, nature reserves, nature conservation and cultural heritage, areas prone to natural disasters, geological protected areas and other areas

(Mokodongan et al. 2014). Based on the IUCN there are several categories of protected areas, namely: 1) hard/wild areas for nature protection; 1a) protected areas for research; 1b) protected area for nature conservation, 2) protected area for ecosystem protection and recreation, 3) protected area for conservation, 4) protected area for conservation management, 5) for tourism and landscape, 6) preserve natural resources for ecosystem sustainability. The Komodo National Park area as a form of national park functions to protect the ecosystem and biodiversity. A protected ecosystem will become potential germplasm, will not run out, and can be developed to meet human needs in the future (Anshori 2005).

The Komodo National Park area and its surroundings are one of the areas designated as national strategic areas (KSN) as stated in Government Regulation No. 13 of 2017 concerning National Spatial Planning. The determination of this area is because the Komodo National Park area and its surroundings located on Flores Island and Sumbawa Island have the potential and strategic importance to be developed as a driver of the national economy and protection of biodiversity. The development of the area, an agglomeration of natural and socio-cultural wealth located in West Manggarai and Bima districts, is expected to provide some basic information that is useful for structuring and managing coastal and coastal areas as part of Integrated Coastal Area Management. The National Strategic and Important Values that have been outlined in the National Strategic Area Zoning Plan (RZ KSN) of Komodo National Park are expected to optimize the potential for water development, and provide legal certainty and minimize problems/conflicts on the use of water areas in the Komodo National Park Area KSN and its surroundings. Conservation Areas and Protected Biota Conservation areas within the Komodo National Park include: (i) Banta Island Regional Water Conservation Area which has been established by the Decree of the Governor of NTB No 523-505 dated 25 May 2016; (ii) Reserve for the Coconut Island Regional Water Conservation Area that has been allocated in the Perda RZ WP3K NTB document; (iii) Reserve for Longos Island Regional Water Conservation Area that has been allocated in the Perda RZ WP3K NTT document; (iv) Komodo National Park which has been established by the Decree of the Minister of Forestry and Plantations No. 172/KPTS-II/2000 (Suraji et al. 2020).

The determination of the Komodo National Park Conservation Area was based on the Decree of the Minister of Forestry No. 172/Kpts-II/2000 dated June 29, 2000 with a total area of 173,300 ha, of which the water area is 114,801 Ha and the land area is 58,499 Ha. The zoning of Komodo National Park was approved based on the Decree of the Director-General of Forest Protection and Nature Conservation No. SK.21/IV-SET/2012 concerning Zoning of Komodo National Park (Ministry of Forestry 2012). Protected areas that are used as tourist areas in Komodo National Park must be able to maintain and accommodate the things that become criteria as protected areas. Papagaran Island is one of the small islands located within the Komodo National Park area, and as a traditional use zone in accordance with the 25 years management plan

initiated by the Government of the Republic of Indonesia through the Komodo National Park Center (BTNK). More than 280 fishermen households depend on coastal resources around the small island (Sudaryanto and Herdiansyah 2018).

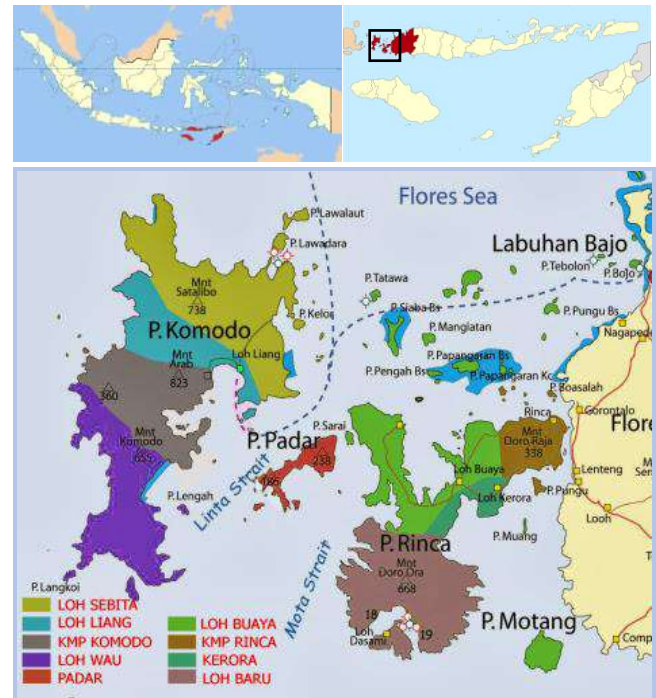


Figure 2. Map of the Komodo National Park area, Indonesia. Source: pariwisata-tourisme-flores.blogspot.com

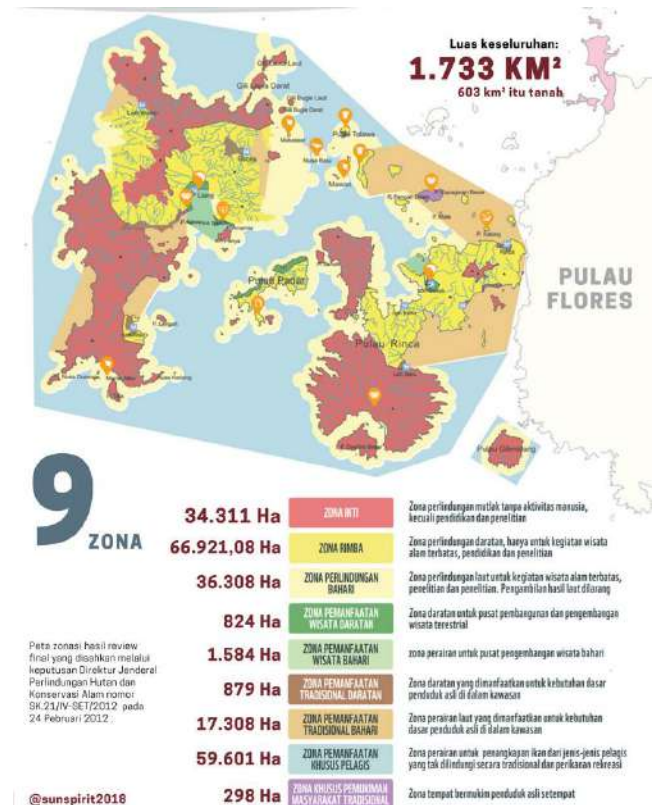


Figure 3. Komodo National Park zoning, Indonesia. Source: sunspiritforjusticeandpeace.org

In accordance with the mandate of the Law of the Republic of Indonesia No. 32 of 2014 concerning Marine Affairs Article 42, as well as maritime and marine policy directions and listed in the 2015-2019 RPJMN, considering that the Komodo National Park area is one of the national strategic areas, it is necessary to prepare a Presidential Regulation on Komodo National Park KSN Zoning Plan (Suraji et al. 2020). Regulations regarding zoning are provisions that regulate the use of space and elements of control that are prepared for each designation zone to conform to its designation (Budhianti 2019). Komodo National Park is divided into 9 zones, namely core zone, jungle zone, marine protection zone, land tourism utilization zone, marine tourism utilization zone, traditional land use zone, traditional marine utilization zone, special pelagic use zone, special residential zone traditional society (Adil 2018). The division of this area is based on the land use and land potential of each area. The zone areas include the core zone is 34311 ha, jungle zone 66921.08 ha, marine protection zone 36308 ha, land tourism utilization zone 824 ha, marine tourism utilization zone 1584 ha, land traditional use zone 879 ha, marine traditional use zone 17308 ha, pelagic special use zone 59601 ha, special zone for traditional community settlement 298 ha (Figure 2).

Each zoning of Komodo National Park has a different area function. The core zone is a zone that focuses on area conservation (Oktaviani et al. 2021). There should be no human activities in the core zone, except activities related to research and education. The jungle zone is a protection zone, this zone can be used for limited nature tourism activities, research and education. The marine protection zone is a zone that focuses on marine/water conservation, in this zone limited natural tourism activities are allowed, but no marine product collection activities are allowed. Land tourism utilization zone is an area used for a mainland natural tourism center. Marine tourism utilization zone is an area that is used as a center for marine natural tourism. There is a favorite destination for scuba divers or snorkeling in this zone because it has tourist attractions such as coral reefs, sharks, and various other marine biotas (Kusnanto et al. 2018). Traditional land and maritime use zones, zones used for accommodation activities for the basic needs of indigenous people with special utilization rights permitted by the Head of the National Park Authority. Komodo dragon. In the traditional marine use zone, marine products can be harvested using environmentally friendly tools (fishing rods, hutate, and umbrellas). The special pelagic zone is a zone in which fishing activities and other unprotected marine products can be taken as well as tourism/recreational activities. Furthermore, the special settlement zone, the zone used to settle the natives.

These zones are spread over 3 major islands, namely Komodo Island, Rinca Island and Padar Island. Komodo Island is the largest island, this island is mostly a core zone and a jungle zone. The second largest island in the Komodo National Park area is Rinca Island. This island has a beauty that is no less interesting than Komodo Island. In addition, Rinca Island has several species of animals that are not found on Komodo Island such as the Rinca rat (*Rattus rintangus*), Wild horse (*Equus caballus*) and Long-tailed

macaque (*Macaca fascicularis*). Rinca Island has also a savanna area which is the habitat of various wild animals such as deer, buffalo, horses, all of which are a source of food for the Komodo dragon. Limiting the distribution of settlements in the savanna area is an action to maintain the survival of the Komodo dragon (Adil et al. 2017). Next, the smallest is Padar Island. The mainland of Padar Island is divided into 3 core zones, namely the core zone in the small Padar and Batubilah island, the jungle zone at several points in the south and west of Padar Island, and the northern, eastern and southern land tourism utilization zones. Then, for the part of the waters in the Padar Island area as a whole, it is included in the marine protection zone.

TOURIST ATTRACTION

Tourism potential is the most important component for developing tourist areas and maintaining tourism resources (Rijal et al. 2020). The ecological carrying capacity aspect is the ability of the environment to provide a tourist attraction (Butarbutar and Soemarno 2013). Tourist attraction is everything that has uniqueness, beauty and value in the form of a diversity of natural, cultural and man-made wealth that is the target or purpose of visiting tourists (Susila and Pramono 2020). Komodo National Park has 2 kinds of attractions, namely marine tourism attractions and mainland tourist attractions. Marine tourism that can be done includes snorkeling, diving, canoeing, and others. Meanwhile, activities on the land include animal watching, hiking and camping. Animal watching is a form of tourist attraction that comes from the diversity of natural wealth in the form of fauna or endangered animals used as objects that can attract visitors. The animal watching tourist attraction is distinct from other attractions, because it includes various species in different locations and pays attention to the typology of visiting tourists (Tapper 2006). Animal watching pays attention to typology to maintain animal quality and protect animals in vulnerable areas. Animal watching tourism product is a tourism product that is used to distinguish the animals watched from their natural habitat. Tourism products can be interpreted as interrelated components and support tourism activities (Gabur and Sukana 2020).

There are several tourist attractions in Komodo National Park, especially in Loh Liang, Loh Buaya and Pandar Island (Figures 4-6).

Loh Liang on Komodo

One of the tourist destinations that are the mainstay of Komodo Island is Loh Liang. Loh Liang is the main welcome area for tourism activities (Mayasari 2006). Loh Liang is dominated by a savanna ecosystem consisting of 5 valleys, including two broad valleys, namely the Banunggulung valley and the Poreng valley (Muslich and Priyono 2005). At this location, visitors can see directly the Komodo dragons and local plants that grow in the area (Ahmad and Yunita 2019). Besides being able to see Komodo dragons directly, visitors can also observe deer, wild boars, and birds as well as climbing. Then, in Loh

Liang, a mangrove area, activity that can be carried out include observing sea birds (Butchart et al. 1996).

Loh Buaya on Rinca Island

Loh Buaya is one of the tourist areas in KNP. Loh Buaya has the main attraction because of its authenticity and natural beauty, especially the savanna panorama and underwater panorama. Savanna is the dominant ecosystem in Loh Buaya. In this ecosystem, tourists can directly observe Komodo dragons, deer (*Cervus timorensis*), Long-tailed macaque (*Macaca fascicularis*), Wild horses (*Equus caballus*) and buffalo (*Bubalus bubalis*) (Garsetiasih 2001). The attractions of marine tourism in Loh Buaya are fishing, snorkeling, diving and canoeing (Lun 2016). In addition, tourism activities that can be carried out are observing wildlife and observing bats (Kodir et al. 2019).

Padar Island

Padar Island is a small island located between Komodo Island and Rinca Island. Padar Island has the main attraction, namely South Padar and Long Beach, located west of Padar Island. Padar Island is the third largest island after Komodo Island and Rinca Island (Leha et al. 2021). Padar Island has become an UNESCO world heritage because it is part of the Komodo National Park (Narulita et al. 2012). Padar Island is included in the jungle zone and the tourism activities are limited. The basis of the attractions of Padar Island is the beauty of the natural scenery both on land and at the sea. Tourism activities on Padar Island are divided into 2 parts, in South Padar in the form of trekking, adventure and bird watching. Meanwhile, in Padar Barat, tourism activities include snorkeling and swimming at Long Beach.

KOMODO NATIONAL PARK BIODIVERSITY

Komodo National Park, located in West Manggarai District, Indonesia applies ecotourism-based tourism management (Liestiandre et al. 2019). Apart from tourism, other activities carried out in the Komodo National Park area are related to the conservation of the Komodo dragon and other biodiversities (Ziku 2015). Komodo dragon is an ancient reptile that has high conservation value and is included in the flagship species of KNP. The Komodo dragon is the largest lizard in the world, with prominent conservation value as a species that protects the ecosystems of southeastern Indonesia (Ariefiandy et al. 2015). Species with limited distribution will decline rapidly because they are very sensitive to global change processes (Ariefiandy et al. 2013; Davis et al. 2016). Komodo dragons are also top predators and have isolated island distributions, making them very sensitive to environmental changes (Ariefiandy et al. 2021). The Komodo dragon's small home range with isolated populations can cause habitat decline and habitat loss. Only about 80 km² of potential Komodo dragon habitat is protected and conserved (Jones et al. 2020). Given the high risk of extinction this species faces, a multidisciplinary approach is needed in the conservation program that addresses the species itself and its habitat

(Estoque et al. 2012). The limited range of Komodo dragons causes the Komodo dragon to be categorized as "Vulnerable" by the Word Conservation Union (IUCN 2014).



Figure 4. Loh Liang in Komodo National Park, Indonesia. Source: www.getlostsafely.com



Figure 5. Loh Buaya in Komodo National Park, Indonesia. Source: portal.manggarai Barat.kab.go.id



Figure 6. Iconic scenes of Padar Island in Komodo National Park, Indonesia. Source: www.cnnindonesia.com

The Komodo dragon is also included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is a regulation that deals with issues such as exploitation of nature for profit; trade-in illegal goods; killing or capturing wild animals; and the use of animals for purposes deemed repugnant. Certain species included in the appendix to the CITES citation are those vulnerable to extinction. It is necessary to conserve and apply trade restrictions as a contribution to international conservation (Hutton and Dickson 2000). The Komodo dragon is included in Appendix I due to its demographic decline and limited distribution. The Komodo dragon sales are about 0.0010% of the global sales percentage (Pernetta 2009). The level of sales of live Komodo dragons tends to be higher than the trade of komodo skins (Murphy et al. 2002).

The Komodo dragon is endemic to five small islands in eastern Indonesia, with four populations in Komodo National Park and several fragmented populations on Flores (Ariefiandy et al. 2013). Komodo dragons are top predators with the dominant species are prey: deer, wild boar, and buffalo (Bull et al. 2010). Anthropogenic activities such as poaching can reduce the Komodo dragon population outside and inside the Komodo National Park area. Ecotourism is the right solution to protect endangered species that will become extinct (Portia and Ulfah 2019).

In addition to Komodo as a flagship species, the Komodo National Park area that dominated by grassland (savanna) also has other diverse fauna species. There are 277 species of animals found that currently living inside the park. Those animals are believed to be a mix of Asian and Australian biodiversity. Among those numbers, there are 32 species of mammals, 128 species of birds, and 37 species of reptiles. The marine habitats found in the park are mangrove forests, seagrasses, and coral reefs ecosystem. There are 253 species of corals that have been successfully identified. More than 1,000 species of fish live in that ecosystem (KSDAE 2021) and 25 species of whales and dolphins (Putra and Parno 2018). Some interesting animals are shown in Figures 7-11.

Mammals that are relatively abundant in the Komodo National Park area are Long-tailed macaque (*Macaca fascicularis*) and Asian palm civet (*Paradoxurus hermaphroditus*) (Jessop et al. 2006). The long-tailed monkey is a semi-arboreal, omnivorous species and is distributed throughout the islands of Southeast Asia to mainland Asia (Supriatna and Wahyono 2000). Other mammal species such as Javan rusa (*Cervus timorensis*), Wild boar (*Sus scrofa*), Rinca rat (*Rattus rintjanus*), Water buffalo (*Bubalus bubalis*) and Wild horse (*Equus caballus*), Asian wild dog (*Cuon alpinus*) (Djuanda 2009). Komodo National Park found about 18 species of herpetofauna. Among them, there were 2 species of amphibians, namely *Fejervarya cancrivora* and *Kaloula baleata* (Kennedi et al. 2020) and 16 species of reptiles, including Indian cobra (*Naja naja*), Russell snakes (*Viperia russeli*), White-lipped pit viper (*Trimeresurus albolabris*), pythons (*Python* sp.), sea snake (*Laticauda colubrina*), gecko (*Gekko* sp.), Hawksbill turtle (*Eretmochelys imbricata*), Green turtle (*Chelonia mydas*) and lizards (Scincidae, Dibamidae, Varanidae).

There are also several species of birds including, Christmas frigatebird (*Fregata andrewsi*), Eurasian whimbrel (*Numenius phaeopus*), Red-backed buttonquail (*Turnix maculosa*), Zebra dove (*Geopelia striata*), Rainbow pitta (*Pitta australis*), Pied bush chat (*Saxicola caprata*), Helmeted friarbird (*Philemon buceroides*), Black-naped oriole (*Oriolus chinensis*), Orange-footed scrubfowl (*Megapodius reinwardt*), Blue-tailed bee-eater (*Merops philippinus*), Yellow-crested cockatoo (*Cacatua sulphurea*) and Green junglefowl (*Gallus varius*). The most common species encountered is Large-billed crow (*Corvus macrorhynchos*). Crows are vultures that have an important role in maintaining the balance of the ecosystem. Based on estimates, more than 1000 small yellow-crested cockatoos were found on Komodo Island (Reuleaux et al. 2020). Other bird species, namely eagles, there are about 5 species of eagles found in the Komodo National Park area, namely White-bellied sea eagle (*Haliaeetus leucogaster*), Brahminy kite (*Haliastur indus*), Black-winged kite (*Elanus caeruleus*), Bonelli's eagle (*Hieraetus fasciatus*) and Spotted kestrel (*Falco moluccensis*).

Meanwhile, for the species of fish found in the waters of Komodo National Park, namely, *Cheilinus fasciatus*, *Scarus flavipectoralis*, *Ctenochaetus striatus*, *Scolopsis margaritifera*, *Hemigymnus melapterus*, *Mobula birostris*, *Scarus dimidiatus*, *Ctenochaetus binotatus*, *Pentapodus trivittatus*, *Parupenic Zebrasoma scopas* (Indrawati et al. 2020). In addition, the diversity of fauna such as reef fish is also abundant. The existence of coral reefs in the waters of Komodo National Park is very useful for increasing the sustainability of coral reefs. Coral reef ecosystems function to support the life of living things. Coral reef ecosystems provide ecosystem services in the form of habitats for breeding, shelter and large wave barriers. In addition to ecological functions, coral reefs are a tourism attraction so that they will have an economic impact on the community (Witomo et al. 2020). Among the fauna species found above, there are 4 protected fauna species, namely, Komodo dragon (*Varanus komodoensis*), Manta rays (*Mobula birostris*), Great white shark (*Carcharodon carcharias*), and Green sea turtle (*Chelonia mydas*).

The diverse ecosystem of Komodo National Park, including savanna (predominantly, 80%), upland forest, monsoon forest and mangrove forest is one of the factors contributing to its high potential for biodiversity (Borchers 2008). Savannahs and savanna grasslands occupy drier areas. Savanna is a grassland that is used by Komodo dragons (Sutomo 2020). The palm tree (*Borassus flabellifer*) is the most dominant and distinctive species in the savanna ecosystem. In addition, there are four species of grass in the savanna, namely *Themeda arguens*, *T. frondosa*, *T. intermedia* and *T. gigantea*. In addition to the 4 dominant grass species in the savanna of Komodo National Park, there are several other grass species, such as *Setaria adhaerens*, *Chloris barbata* and *Heteropogon contortus*. However, the dominant species is the *Themeda arguens* which account for 80% of the savanna cover. The highest density of grass, *T. arguens* found on the savanna. Several other plants in Komodo National Park include rattan (*Calamus* sp.), bamboo (Bambuseae), tamarind

(*Tamarindus indica*), Java olive tree (*Sterculia foetida*) and jujube red date (*Ziziphus jujuba*) (Aqualdo and Malantino 2014).

Another area that dominates is the tropical monsoon forest which is located 500-700 m asl. Some tropical community activities depend on the wet-dry season, especially in the Asian monsoon climate (Opaev et al. 2021). Monsoon forests have an important role in maintaining the microclimate, especially during the dry season. Thus, the resilience of monsoon forests needs to examine the role of fluctuations in rainfall and fires (Hamilton et al. 2020). The species of plants found in the monsoon forest include Kusum tree (*Schleichera oleosa*), Jujube red date (*Ziziphus jujuba*), banyan tree (*Ficus* sp.), noni (*Morinda citrifolia*), gebang palm (*Corypha utan*) and luwi (*Alstonia scholaris*). Komodo National Park also has highland forests. The forest, which is located above 700 m asl, has flora and fauna such as *Calophyllum spectabile*, *Colona kostermansiana*, *Glycosmis pentaphylla*, Purple aril mischocarp (*Mischocarpus sundaicus*), Mountain teak (*Podocarpus neritifolius*), Mengge (*Terminalia zollingeri*), Torres Strait scambler (*Uvaria rufa*), rattans (*Calamus* sp.), bamboo (Bambuseae). In addition, in Komodo National Park there are also about 30 species of orchids. The most dominant type of orchid is the *Dendrobium* orchid with white and orange flowers. Orchids in mountain forests usually live as epiphytes, but in Komodo National Park, two species of amoeboid orchids were found, namely *Nervilia aragona* and *Nervilia* sp. which has a tuber-like part under the ground and during the rainy season will release dormant leaves (Witomo et al. 2020). In Komodo National Park, the diversity of mangrove species found in bays protected by waves is also very diverse. Several species of vegetation, namely *Rhizophora* sp., *Rhizophora*

mucronata and *Lumnitzera racemosa* which are the 3 dominant species of mangrove vegetation. In addition, other species of mangrove vegetation such as *Avicennia marina*, *Bruguiera* sp., *Capparis sepiaria*, *Ceriops tagal* and *Sonneratia alba* (Got 2013).

INVOLVEMENT OF THE PARTIES OF PROTECTED AREAS AS KOMODO NATIONAL PARK ECO-TOURISM AREA

The Komodo dragons living on the Komodo Island in the Protected Area act as first-time occupant actors who have historical origins along with the Komodo dragon (Naufal 2019). The Komodo dragons feel compelled to be involved in the protected area because their village's territory is deliberately created as an animal sanctuary area to the National Park area. During the early stages of determining the Komodo dragon as a protected area, the Ministry of Forestry and international institutions did not properly disseminate information to village communities in the area (Hironimus et al. 2019). In fact, the community here is an important component in supporting protected areas because the people who control the area are not expected to damage or even threaten the fauna in the area, including Komodo dragons. There are currently three villages located within Komodo National Park; (i) Pasir Panjang Village (Kampung Rinca and Kampung Kerora), (ii) Komodo Village (Kampung Komodo), and (iii) Papagarang Village (Kampung Papagarang). The people have been living inside the park for centuries and have been preserving the environment, the dragons' habitat (KSDAE 2021).

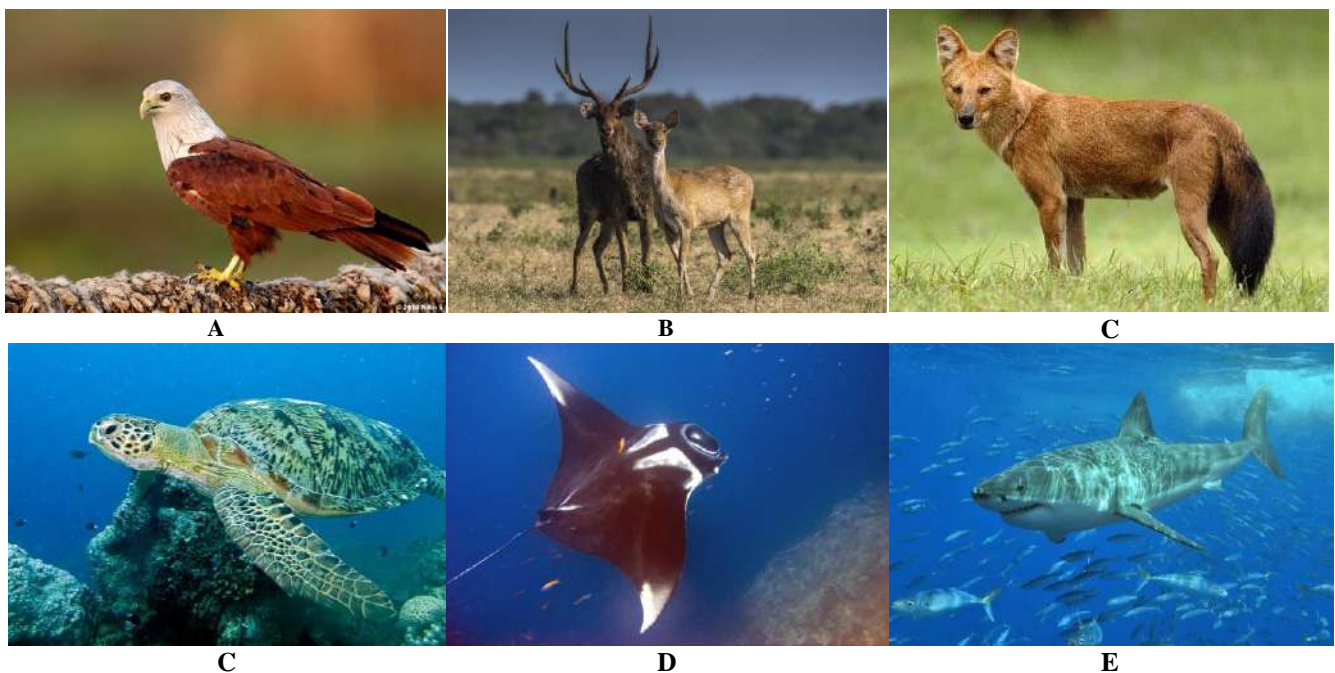


Figure 7. Some impressive fauna of Komodo National Park, Indonesia. A. *Haliastur indus*, B. *Cervus timorensis*, C. *Cuon Alpinus*, D. *Chelonia mydas*, E. *Mobula birostris*, F. *Carcharodon carcharias* (Photos from many sources)



Figure 11. Some plant species of Komodo National Park, Indonesia. A. *Borassus flabellifer*. B. *Ziziphus jujuba*, C. *Uvaria rufa*, D. *Rhizophora mucronata*, E. *Avicennia marina*, F. *Lumnitzera racemosa*

The management of the Komodo National Park Center continues to promote and the KNP Office as a technical coordinator called the UPT (Technical Implementation Unit) for Natural Resources Conservation, has been intentionally responsible for planning protected areas (sector division or zoning) since the determination of the KNP area in 1980 Everything in the National Park is managed by the National Park Authority, even if there are other parties such as the private sector or investors, it is confirmed that it is only a temporary permit (contract permit) which in its implementation is based on existing regulations. So it is undeniable that the KNP Office also invites the private sector to participate in the management of the KNP area through the enactment of government regulation No. 36 of 2010 concerning the Natural Tourism Concession Permit (IPPA).

Komodo National Park in its area has tourist destinations that are integrated into selected tour packages by tour operators in order to become an attraction for tourists from abroad and the archipelago. This is inseparable from the role of the West Manggarai Tourism and Culture Office which coordinates tourism on the West Manggarai District scale through the Tourism Office to manage tourism within the Komodo National Park area only to the extent of increasing the number of tours and promoting tourist destinations to become tourist attractions to the outside world. Thus, the Komodo National Park tourism programs that are run are only related to increasing tourists and collecting data on tourist destinations within the Komodo National Park area (Lukita and Sunarto 2018). The phenomenon of changes in the livelihoods of the Komodo Island community cannot be separated from the intentional element of the government that regulates and

supervises the KNP area into a resource based on natural tourism (Kiwang and Arif 2020). When the existing resources have been used as objects of tourism attraction, then the people of Pasir Panjang Village are involved in gaining access to tourism resources such as Bat islands and Strawberry islands around the Pasir Panjang Village area. Thus, community involvement in the area has the ability to gain access to the benefits of tourism resources at the village scale (Michael 2009).

By regulation, natural resource management at the village scale must be managed professionally by establishing legal institutions recognized by the State through Village-Owned Enterprises (BUMDes) based on village deliberations established and regulated by village regulations (Sembiring 2017). The prevailing regulations regarding village-scale resource management are implemented by village communities in the Komodo National Park area, the community is aware of the potential of natural resources owned by the village and the willingness of the community to take resource management by forming institutions through BUMDes. The village community in the Komodo National Park area deeply regrets the BUMDes institution which is expected to improve the welfare of the community but always conflicts with the rules of the Komodo National Park. One of them is an effort to maintain access to village tourism resources for the welfare of the community through BUMDes. On the other hand, there is awareness from village youth in Komodo Village and Pasir Panjang Village to form a tourism conscious community. This tourism-aware community wants to be better sheltered by BUMDes, a village tourism business division. Both from the community in the area and the private sector with regard to

maintaining access to village-scale resources. The ability to maintain access is carried out through the BUMDes institution by the community in the area. The location of the researchers' concentration was on the actors from the community in the area who use BUMDes and the private sector that runs their business. The role of community actors in the area that is maintaining access is trying to maintain the usefulness of tourism resources through legal regulations in accordance with the law applicable village laws (Puspitasari 2016).

There are useful suggestions for the development of ecotourism in Komodo National Park in Komodo Village, including the following: (i) To the managers of the National Park Authority to continue carrying out more vigorous promotions about the natural charm of Komodo National Park, improve the quality of information services about KNP and develop the existing tourism potential. In addition, for its preservation, attention must be paid to its impact on the economic growth of the Komodo Village community, in this case, the community can benefit directly from the development of ecotourism itself. (ii) To the government to continue to improve and develop infrastructure and tourism supporting facilities in the KNP area and in Labuan Bajo as the main entrance to Komodo National Park (Putra and Parno 2018).

BARRIERS OF KOMODO NATIONAL PARK

As an archipelagic country, Indonesia is divided by the equator (equator-cross country) and is located between two oceans and two continents so that it has a diversity of rainfall, temperature, humidity and wind direction (Kasa and Gunam 2019). The Komodo National Park ecosystem is influenced by the climate resulting from a long dry season, high air temperatures and low rainfall. In addition, Komodo National Park is located in a transitional zone between Asian and Australian flora and fauna (Wallacea Zone) (Fisher et al. 2020). Its aquatic ecosystem is affected by the El-Nino/La Nina impact, which results in warming of the surrounding seawater and frequent strong ocean currents. The various types of ecosystems and habitats that Indonesia has, create an amazing diversity of species and endemism (Keong 2015). However, the rapid and extensive loss of habitat, together with the challenges of climate change can become threats and create significant risks to biodiversity (Purwandana et al. 2014).

Increased tourist visits can also be a threat to the sustainability and diversity of the Komodo National Park area resources (Lasso and Dahles 2020), especially marine resources, so it is necessary to arrange the allocation of marine space to protect marine resources and ecosystems, as well as to utilize the potential marine resources in the Komodo National Park KSN. The presence of human settlements in the Komodo dragon's habitat has led to increased interactions between the two which can be negative. Negative interactions or commonly referred to as conflicts are interactions that are detrimental to one or both of the interacting parties. Conflict can occur because of competition between the two parties in utilizing the same

resources and space (Luo 2007). Human-komodo conflicts are found in various areas within KNP and Flores Island, especially in areas with high populations of humans and Komodo dragons. Human-komodo conflicts that occur include Komodo attacks on humans, Komodo dragon attacks on livestock, and human attacks on Komodo dragons (Endo 2013). Wild animal attacks on livestock are one of the most common types of human-wildlife conflict (Karanth et al. 2012). The case of attacks by Komodo dragons has become a concern and has sparked concern among villagers in KNP and Flores. The existence of Komodo dragons in the village is often considered a threat and cases of attacks by Komodo dragons are often the reason for villagers to expel, capture, or even kill Komodo dragons (Sudibyo 2019). Komodo dragons are hunted by residents using dogs, caught with traps and bait, and even killed by poisoning (Gustaman 2020). However, since KNP was established in 1980 as a conservation area and the Komodo dragon was designated as a protected animal, cases of hunting, catching and killing of Komodo dragons are no longer found in KNP areas as reported by Balai KNP in the statistics on types of disturbance in KNP areas during 2007-2012 (BTNK 2013). The expulsion of the Komodo dragon is still being carried out. Villagers used to use wooden sticks and pelt stones to repel Komodo dragons that entered the village (Sunkar et al. 2020).

Another obstacle factor in the development of ecotourism in Komodo National Park is the lack of community participation in tourism development (Benu et al. 2020). Minimal public participation can occur due to limited budgets, apathy and low public awareness, fluctuations in tourist visits, and difficulties in marketing ecotourism products. In an effort to overcome these barriers, communication between park managers and local communities is essential (Ormsby and Kaplin 2005). Communication has 3 main indicators, namely: transmission, clarity of communication and consistency of communication. The communication transmission in question is the process of distributing information about a matter from the Head of the Tourism Office to the head of the tourism section and to the community. Clarity of information plays an important role in supporting the smooth flow of information between the Head of the Tourism Office as a policymaker and its parts and the community as policy implementers. Communication consistency will help the communication delivered by the Tourism Office so that the public can easily understand it. The recipients of communication, namely the community, can also understand the intent and purpose being discussed. The consistency of communication can prevent confusion from the Tourism Office in the field. Based on the observations of researchers, the information submitted by the Department of Tourism and Culture is one form of tourism object development coupled with support from local governments, stakeholders and related agencies, which are very influential in the activities carried out. Forms of support from the West Manggarai District government is evident in the construction of conference halls, boat bridges, and infrastructure improvements (Idris and Destari 2019).

COMMUNITY-BASED TOURISM DEVELOPMENT STRATEGY

The sustainability of ecotourism in protected areas needs to be considered in its development. Several factors that influence the development of protected areas of ecotourism, namely, tourism potential maintained by the community, can empower the surrounding community to manage tourist areas and ecotourism activities that do not negatively impact the environment (Wulandari and Sunarto 2013). These negative impacts can be in the forms of pollution, damage to the physical environment, exploitation of resources and construction of facilities without considering the environmental conditions (Hijriati and Mardiana 2014). The development of ecotourism in protected areas must pay attention to the condition of the protected area. The pattern of spatial use that will be applied must be adapted to the conditions of the protected area (Zambrano 2010). In addition, the accessibility and safety of ecotourism development for protected areas must also be considered. The use and development of ecotourism in protected areas must pay attention to the activities that will be carried out by tourists (Hearne and Santos 2005). Thus, it can minimize the impact caused by these activities. Protected areas as ecotourism areas are permitted because protected forests are high in biodiversity, beautiful, and have diverse landscapes that can become tourist attractions and protect the protected areas (Lelloltery et al. 2020).

The current management of tourism in Komodo National Park (KNP) is through an ecotourism approach. KNP tourism activity is an ecotourism activity related to the Komodo dragon species and its biodiversity (Sulaeman et al. 2019). The tourism potential in KNP is in fact very competitive in the global market because it manages to bring in more than 50,000 people per year, 85% of them are foreign tourists. Good tourism management applies when the tourism sector can provide benefits to the whole community. This can be seen when small businesses in the community are involved in the tourism industry. Ecotourism was born as a form of protest against the model of mass tourism development with an emphasis on environmental conservation, cultural preservation, community participation, economic benefits, and empowerment of vulnerable groups (Cobbinah 2015). Ecotourism has the characteristics of managing landscapes and endangered species directed to resource conservation, community cultural management is directed to community welfare, and conservation activities are directed to efforts to maintain the continuity of resource use for the present and the future (Yustinaningrum 2017). Community participation is important in order to benefit from ecotourism development (Damanik 2013; Moscardo et al. 2017). Ecotourism development must be led by the local government which is part of the development vision. However, it does not rule out the possibility of conflict from the government and local communities, strict regulations, and environmental degradation (Lee and son 2017). Conflicts usually occur when services and facilities do not make local people and tourists comfortable (Ogucha et al. 2016). The involvement of local communities should

start from planning to providing facilities and implementing ecotourism properly (Koens et al. 2009) in the end by forming good institutions that will produce sustainable tourism.

The community of Komodo Village is currently participating in the development of ecotourism on Komodo Island. The participation of the Komodo Village community in the development of ecotourism on Komodo Island cannot be separated from various factors that affect the Komodo Village community itself. Various forms of community participation in Komodo Village in the development of ecotourism on Komodo Island provide various benefits to the people of Komodo Village (Umar 2016). The participation of the Komodo Village community in the ecotourism business, for example as a dragon sculpture craftsman, selling souvenirs, naturalist guides, managing homestays, and renting motorboats. The participation of the Komodo Village community in conservation, namely by being involved in the Forestry Police Partner Community group and Conservation Cadre. Community-based tourism is an important component in the development of sustainable tourism (Asriyani and Verheijen 2020). One of the important elements in sustainable tourism development is careful and effective management of tourism destinations. In ensuring the sustainability of community-based tourism and its tourist attraction in the form of daily social and cultural activities from the community, ideally, it is also supported by safe and comfortable tourism destinations (Sin and Minca 2014). A tourism destination is a stage for the performance of all tourism resources that provide final value for tourist satisfaction. Therefore, the black-and-white management of tourism destinations will determine the following three elementary things; a) the advantages and attractiveness of a destination for the tourist market; b) the level of benefits ecologically, economically, socially and culturally for the region; c) its competitiveness among international tourism destination markets (Damanik 2013).

The Komodo National Park tourism development strategy is carried out with community-based tourism (CBT). This approach will place the community as the main actor in tourism development that can minimize the negative impact of tourism development that relies on outside parties (Baksh et al. 2012; Hidrawati et al. 2019). Zoning resources carry out the implementation of conservation strategies in Komodo National Park. As a conservation area, Komodo National Park is only occupied by officers from the Komodo National Park Office. Since it was opened for tourism activities, interactions that may be carried out in Komodo National Park are only limited to tourists buying souvenirs made by local people (Gabur and Sukana 2020). Another strategy implemented in Komodo National Park is holding tourism awareness counseling to the community to increase public understanding of the importance of conservation, then increasing supervision of illegal fishing. In addition, the Komodo National Park community can create distinctive products, collaborate with various competent parties in tourism, such as travel agents, tourism organizations, NGOs and the government (Sanjaya 2018).

Tourism has an impact on foreign exchange earnings, government revenues, prices, distribution of benefits, employment opportunities, ownership and control (Mbaiwa 2003). As the results of the study of the positive impact of the "hot spring" tourist attraction in Marobo with tourism activities, employment opportunities for the surrounding community are also created which can benefit local communities, development in general, and community income (Pieda and Anom 2019). This impact becomes an idea to create a flow of tourism development in an area. Tourism development must be carried out through: (i) Promotion, which is the implementation of marketing efforts that must be carried out in an integrated manner both at home and abroad; (ii) Accessibility, is one of the important supporting aspects because it involves cross-sectoral development; c) Tourism area. These three will be a solution in developing aspects of tourism in Indonesia.

The development of community-based tourism in Komodo National Park has various potentials that are ideal for maximizing it in the form of an action plan, including several obstacles to formulating appropriate and effective strategies. Strategy is a process of determining the value of choices and making decisions in the use of resources that creates a commitment for the organization concerned to actions that lead to the future (Kanom and Zazilah 2019). Strategy can also be interpreted as an integrative general plan designed to empower tourism organizations to achieve their goals through the proper use of resources despite encountering many obstacles from competitors. Development is a process, method, act of making something better, advanced, perfect and useful. Development is a process/activity to promote something that is considered necessary to be arranged in such a way by rejuvenating or maintaining what has been developed to become more attractive and developing (dos Anjos and Kennell 2019). One of the most important things in developing an area into a tourism destination is analyzing and assessing internal and external environmental conditions, which include strengths, weaknesses, opportunities and threats (SWOT analysis). By knowing these conditions development can be carried out properly (Kanom 2015). SWOT analysis can be used as a model in analyzing a profit-oriented and non-profit-oriented organization with the main objective of knowing the state of the organization more comprehensively (Fahmi and Yunus 2013).

Participation of ecotourism actors in conservation efforts

When ecotourism development in Komodo National Park is implemented, it is considered to be a threat to the site. Pressures on the area such as garbage, pollution, collection of biological resources by visitors, vandalism and so on often accompany tourism development (Nepal 2000). Heny et al. (2013) stated that community participation in development is important because basically, the community knows best what is needed. In principle, community participation, especially in the development of tourist villages, is participation in managing resources in their environment (Batt 2009). One

example is participating in keeping the environment clean or the cleanliness of the river means having participated in the preservation of wildlife. Keeping the natural environment clean is the same as maintaining the natural habitat of the wild animals themselves (Zulfa 2015). The existence of local communities has positively impacted forest sustainability (Badola et al. 2012). Local communities have understood the importance of the existence of forests for the lives of surrounding communities, so that community dependence, especially in collecting forest resources, is low and can be controlled (Ginting et al. 2010). Community participation can provide a strong impetus for resource protection in tourism areas (Wang and Tong 2009).

The participation of the people of Komodo Village in the development of ecotourism on Komodo Island has a positive impact on the maintenance of land and marine ecosystems around Komodo Island. The Komodo Village community actively participates in environmental conservation efforts by being involved in the Forestry Police Partner Community and Conservation Cadre (Ziku 2015). The definition of MMP as summarized in the Regulation of the Minister of Forestry of the Republic of Indonesia concerning Community Forestry Police Partners, Chapter I, Article 1 paragraph 4, is a community group around the forest that assists the Forestry Police in implementing forest protection under the coordination, guidance and supervision of the supervisory agency. Generally, communities empowered as MMPs are people living around forests or protected areas (Irfan 2018). The task of the Komodo Village MMP is to carry out land and sea security and provide understanding for the community both inside and outside the area related to zoning. A conservation cadre is a person who has been given education or who has been designated as the successor of natural resources conservation efforts who have awareness and knowledge of natural resources, and is voluntary, willing and able to convey conservation messages to the surrounding community. Through the Komodo National Park Center (BTNK), the government empowers the people of Komodo Village as Conservation Cadres. BTNK establishes and provides guidance related to environmental conservation to Conservation Cadres on a regular basis. Increasing community participation needs to be encouraged through several strategies including community capacity building, regional planning, financing, infrastructure development, institutional development and marketing (Kurniasari et al. 2013).

In conclusion, Komodo National Park covers land area of more than 603 square kilometers of land and 1214 square kilometers of marine habitat with high diversity. The land habitats have 277 species of animals, including 32 species of mammals, 128 birds, and 37 species of reptiles. The marine habitats have 253 species of corals, more than 1,000 species of fish, and 25 species of whales and dolphins. One of the main attractions of the Komodo National Park area is the ancient giant reptile of the Komodo dragon (*Varanus komodoensis*). Komodo dragons are top predators with the dominant species as prey, such as deer, wild boar and buffalo. Anthropogenic activities such

as poaching can reduce the Komodo dragon population outside and inside the Komodo National Park area. Ecotourism is the right solution to protect endangered species that will become extinct. The participation of the people of Komodo Village in the ecotourism business, namely as craftsmen of Komodo statues, selling souvenirs, naturalist guides, managing homestays, and renting motorboats, can increase local economics and conservation awareness; as well as the participation of the Komodo Village community in conservation, such as being involved in the Forestry Police Partner Community group and Conservation Cadre. Meanwhile, the factors that hinder community participation in tourism development are limited budget, apathy and low public awareness, fluctuations in tourist visits, and difficulties in marketing ecotourism products.

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