

**Nino Konis Santana National Park, Democratic
Republic of Timor-Leste (RDTL)**

Baseline Study Report

February 2021

**Submitted to
UNESCO, Office Jakarta
Regional Science Bureau for Asia and Pacific**

Augusto da Silva, PhD
National Consultant
Aimutin, Comoro, Dom Aleixo, Dili, Timor-Leste

Table of Contents

Table of Contents.....	i
List of Figures.....	ii
List of Tables.....	ii
EXECUTIVE SUMMARY	iii
1 INTRODUCTION	1
1.1 Background.....	1
1.2 Objectives of the Study	1
2 METHOD	2
2.1 Document review	2
2.2 Interviews/Consultation with key stakeholders	3
2.3 Data Analysis.....	4
3 BASELINE INFORMATION ON THE IMPORTANCE OF NKSNP.....	4
3.1 Geography and climate.....	4
3.2 Geology of NKSNP	8
3.3 Land cover.....	9
3.4 Biodiversity	12
3.4.1 Forest	12
3.4.2 Fisheries.....	13
3.4.3 Birds	14
3.4.4 Other important animals in the NKSNP	15
3.5 Socio-economic activities.....	15
3.5.1 Population.....	15
3.5.2 Land tenure	19
3.6 Cultural value.....	22
3.7 Tourism.....	23
3.8 Maritime Transportation	23
3.9 Ecosystem services and threats.....	24
4 ZONATION OF NKSNP	25
5 Governance of NKSNP	28
6 CONCLUSION AND RECOMMENDATIONS.....	30
6.1 Conclusion.....	30
6.2 Recommendations.....	31
REFERENCES	36

APPENDIXES	39
Appendix 1: List of multi-stakeholder consulted	39
Appendix 2: Questionnaire	40

List of Figures

Figure 1: The Nino Konis Santana National Part with the red dots denoting terrestrial boundary.	2
Figure 2 Areal Distribution of the NKSNP based on altitude (data source: Mau, 2010, p. 17).....	5
Figure 3: Proportion of areal distribution according to slopes (data source: Mau, 2010, p. 16) ...	6
Figure 4: El Niño and La Niña in Lautem Municipality (source: SoL, 2012)	7
Figure 5: Current rainfall in Lautem municipality.....	7
Figure 6: Land cover classification based on Satellite Imagery Landsat TM (Source: PEKA-UNESCO, 2014)	11
Figure 7: Land use portrait of Nino Konis Santana National Park (PEKA-UNESCO, 2014)	11
Figure 8: Number of Households and population of NKSNPBR in 2015 and 2019	16
Figure 9 Households bordering NKSNP and their engagement in farming and fishing activities	17
Figure 10: Agricultural households by number of large animal rearing (Suco: develop using data Timor-Leste agriculture census 2019)	18
Figure 11: Agriculture holdings by male and female holder	20
Figure 12: Households agriculture holdings by tenure by holders	21
Figure 13: First option for NKSPBR zonation (Source: PEKA-UNESCO, 2014)	27
Figure 14: Second Option for NKSPBR Zonation (Source: PEKA-UNESCO, 2014)	27

List of Tables

Table 1: Percentage of land covers classes per category according to Mau	9
Table 2: Percentage of land covers classes per category according to UNESCO	10
Table 3: Number of agricultural household holdings cultivated Crops/plants/trees by size-class of cultivated area.....	18
Table 4: Zones distribution across 6 villages of the NKSNP (Area in km ²).....	25
Table 5: Zones distribution across 6 villages of the NKSNP (Area in km ²).....	26

EXECUTIVE SUMMARY

The Nino Konis Santana National Park (NKSNP), declared through the Government resolution, no. 8/2007 of August 1, is home to many endangered flora and fauna species. It is as one of the Wallacea Biodiversity hotspots that are rich in ecological habitats, marine biodiversity and landscape uniqueness. It also directly supports the livelihoods of approximately 13,884 people, across 9 villages, who have been living in the NKSNP for generations. As such, ensuring the sustainability of biodiversity and its inhabitants is essential and requires a management system that serves both purposes. Therefore, the government of Timor-Leste through Directorate General of Forestry (DGoF) of the Ministry of Agriculture and Fisheries (MAF) has been working with UNESCO to nominate the NKSNP as a Man and Biosphere (MAB). This would ensure the NKSNP is sustainably managed using a zonation management plan that has congruent positive impacts on biodiversity conservation and sustainable resources utilization by the park users.

With this as a context, this study collects baseline information which will subsequently be used to update nomination form for the registration of the NKSNP as a UNESCO Biosphere Reserve. The information was gathered through literature review and consultation with relevant stakeholders in order to understand the importance of the NKSNP.

The study has collected some new information including the change in the overall park size, from the initial size of 123,600 ha to 130,600 ha, consisting of 72,000 ha terrestrial environment and 58,600 ha marine environment. This change was due to the addition of 3 more villages to the NKSNP. The three villages are Fuat, Lore 2 and Ilomar 1. The change was necessary to provide a corridor for the movement of important species found in the area as well as ensuring forest connectivity. Other changes include the identification of endangered and endemic species, identification and preservation of cultural sites and paintings and new policies and laws have been developed for conservation objectives. The study also identified development plans and policies from relevant sectors. Tourism sector has developed a plan in place to implement in Jaco for tourism sites and visitor management. The Director of Cultural Patrimony reported to have a plan in place for more research in the NKSNP in order to identify and preserve cultural objects for tourism and educational purposes.

Another result from this study is the collection of essential information on the result of studies and plans from the National Petroleum and Minerals Authority about hydrocarbon reserves beneath the NKSNP. It was reported that through a preliminary study, the Petroleum Authority

has identified a potential accumulation of hydrocarbon in the NKSNP. Therefore, the Petroleum Authority has planned for more studies to have in depth understanding about the reserve.

The study also further highlights challenges and threats facing the NKSNP. This includes habitat destruction and fragmentation, illegal hunting and logging and climate change among other factors.

The study is unable to update data on potential zones distribution of the additional villages. Therefore, efforts need to be taken in order to finalize the mapping, incorporating new areas into the potential distribution map. It is therefore recommended that UNESCO to continue supporting the Directorate General of Forestry, both in terms of technical and financial, in order to finalize the pending activities. This would result a final boundary and potential area of each zone of the NKSNP. The stages that need to be taken in order to finalize mapping and determine permanent boundaries for each zone are:

- Undertake participatory mapping exercise, involving stakeholders at both national and local levels, to determine potential sites for each zone of the three new villages. This should include a visit to each village and hold meetings with relevant stakeholders. Participants in this participatory meeting should include villagers and sub-village chiefs, traditional leaders, youth and women leaders and elderly people. During the meeting participants will be asked to map their village for ritual or cultural sites, recreational sites, agricultural sites, firewood collection sites, identify important caves, etc. upon completion of the participatory mapping exercise, participants would be asked to accompany the team to directly observe the site in order to take coordinate point for digital mapping purposes;
- When undertaking mapping exercise, socio-economic data can also be gathered through interviews with selected stakeholders, discussions with communities and field observation;
- When the first two activities have been completed; a final stage of the mapping exercise can be carried out with all other villages to determine total area and permanent site boundaries of each zone. This should include activities such as walking through villages or parks to observe and verify all potential sites for zones and make final decisions for core, buffer and transition zones. Villagers' participation in this exercise important to ensure that they understand and comply with the management criteria for each zone.

1 INTRODUCTION

1.1 Background

Timor-Leste has been blessed with magnificent biodiversity and an amazing amount of natural resources. It has bountiful forests and a coastline of about 765 km and 75,000 km² of Exclusive Economic Zone waters which are rich in biodiversity. Since the restoration of its independence, the country has been trying to protect its environment, the fabric of life, for the current and future generation. This led to declaration of 46 Protected Areas and 2 National Parks throughout the country. One of the NKSNTs is the Nino Konis Santana National Park (NKSNT) which is located at eastern most of Timor Island. The NKSNT was declared through the Government resolution, no. 8/2007 of August 1. Nino Konis Santana was a revered Indigenous Timorese freedom fighter. He was born on 12 January 1957 in Tutuala, Lautem Municipality and led FALINTIN¹ between April 1993 and his death on 11 March 1998 (Babo-Soares, 2003).

This National Park is home to many endangered flora and fauna species. It is as one of the Wallacea Biodiversity hotspots that are rich in ecological habitat, marine biodiversity and landscape uniqueness. It also directly supports the livelihoods of approximately 13,884 people across 9 villages who have been living in the NKSNT for generations. As such, ensuring the sustainability of biodiversity and its inhabitants is essential and requires a management of the NKSNT that serves both purposes.

Therefore, the government of Timor-Leste through Directorate General of Forestry (DGoF) of the Ministry of Agriculture and Fisheries (MAF) has been working with UNESCO to promote NKSNT as a Man and Biosphere (MAB). This would ensure the NKSNT is sustainably managed using a zonation management plan that has congruent positive impacts on biodiversity conservation and sustainable resources utilization by the park users.

1.2 Objectives of the Study

The objective of this study is to collect baseline information which can be used to update the draft nomination form of the Nino Konis Santana National Park Biosphere Reserve (NKSNTBR). The study also provides a set of recommendations for UNESCO's forthcoming Count Strategic Document. Specifically, the study seeks to analyze:

1. Existing conditions of NKSNT

¹ *Forças Armadas da Libertação Nacional de Timor-Leste*, The Armed Forces for the National Liberation of Timor-Leste, which was established on 20 August 1975.

2. Information on the importance of the NKSNP from different sectors.
3. Challenges for the NKSNP governance

2 METHOD

Geographical scope of this study is the NKSNP, which borders 9 villages in the Lautem Municipality. These villages are Com, Bauro, Mehara, Tutuala, Muapitine, Lore 1, Lore 2, Fuat and Ilomar 1. The NKSNP also incorporates Jaco Island, in the eastern tip of Timor Island (fig. 1).

A mixed-method was used in this study for data and information gathering, namely: Document review and interview (consultation with key stakeholders).

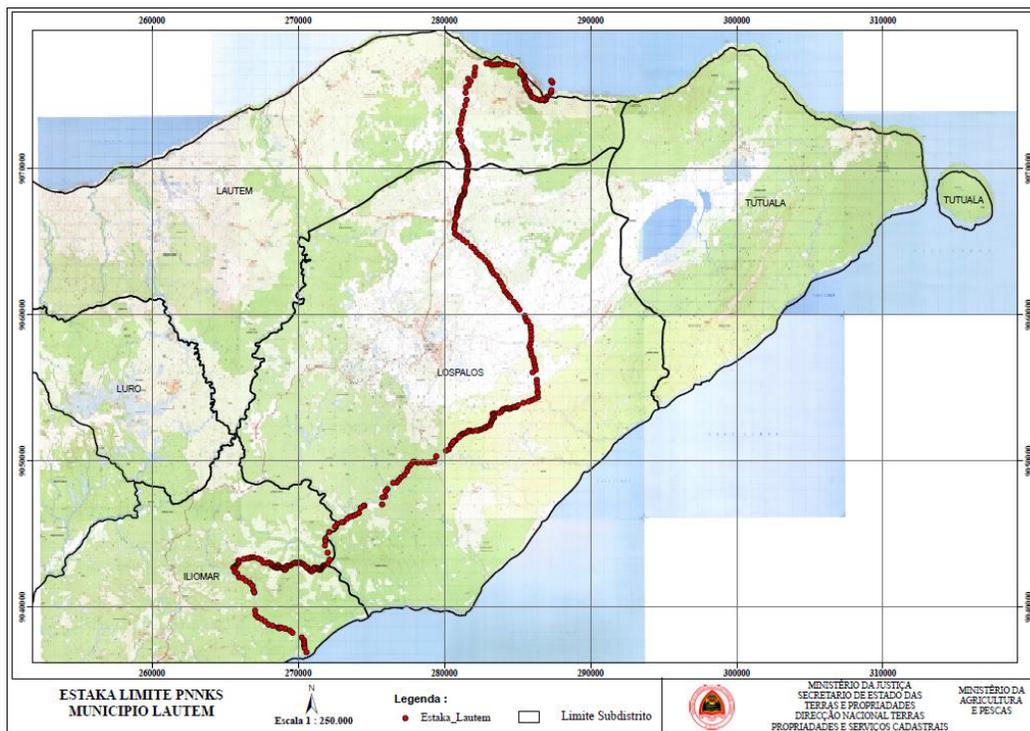


Figure 1: The Nino Konis Santana National Part with the red dots denoting terrestrial boundary.

2.1 Document review

Document analysis was used to systematically review and analyze relevant literature. This was done in order to obtain necessary information about the NKSNP. Various documents in the form of reports, publications, and policy documents as well as information from the website were

collected. This activity continued throughout the study period, to ensure a current understanding of the issues.

The outcome of this exercise was grouped into relevant aspects such as geographical conditions, land use pattern, habitat types, flora and fauna species, socio-economic and cultural practices of the population within the boundary of the NKSNP. The information collected in this exercise was used to improve the understanding of the NKSNP, as well as to provide additional avenues for enriching information gathered from interviews.

2.2 Interviews/Consultation with key stakeholders

Semi-structured interviews were used to obtain information, perspectives and interpretation of key stakeholders. The rationale for using this approach was to allow stakeholders to provide answers in their own words to the questions. During the course of this study, the consultant, with the support from the Head of Department of Protected Areas of DGoF, MAF conducted many meetings and discussions with different stakeholders in order to get their views and perspectives on the importance of the NKSNP. Respondents included the Head of Departments Areas, National Directors and Director Generals from relevant sectors (see annex 1 for list of stakeholders consulted).

To avoid losing focus, an interview schedule was used (see annex 2) to direct the interview and to ensure the main elements of questioning were covered and tailored to the specific stakeholder roles and responsibilities. This was important because it helped not only the line of inquiry but also allowed for follow up questions or sought clarification from the stakeholders. The emphasis was placed on the thematic areas such as the importance of the NKSNP to relevant sectors, activities and plans.

At the beginning of each meeting, participants were given a comprehensive briefing about the purpose of the meeting by the Head of Department of Protected Areas and National Park of the Ministry of Agriculture and Fisheries. This briefing included details regarding the way in which nomination for biosphere reserve has been prepared, what needed to be done in order to conclude the process. Each meeting lasted for between 45 to 2 hours, depending on the topic of discussion.

Overall a total of 13 stakeholders were consulted during the course of this study. The analysis of information gathered is discussed in the next section.

2.3 Data Analysis

This was a qualitative study. Therefore, analysis follows a reciprocal process of data collection and analysis where a periodic analysis was carried out after each meeting before doing further interviews/consultation. The final analysis was conducted after all meetings have been completed. The result of this analysis was augmented with quantitative secondary data which was collected from population census in 2015 and Timor-Leste Agriculture Censu in 2019 in order to obtain a clear information on situation, population and socio-economic activities within the NKSNP.

The qualitative analysis was started by reviewing meeting and discussion notes. The meetings and discussions were carried out in Tetum, a national language of Timor-Leste. All information was kept in the original language and only translated relevant materials into English when needed to facilitate the analysis, especially for theming or categorizing meeting notes.

The quantitative data which was obtained from the population- and agriculture- census in 2015 and 2019 respectively used to do analysis on socio-economic factors and present results in tables and graphs for interpretation.

3 BASELINE INFORMATION ON THE IMPORTANCE OF NKSNP

3.1 Geography and climate

The Democratic Republic of Timor-Leste (RDTL) is located in South-East Asia and covers an area of about 14,954 km² (NSD & UNFPA, 2011), comprising the eastern half of the island of Timor, the enclave Oecusse which is nestled inside Indonesian West Timor, and the two smaller islands – Atauro to north and Jaco on the tip. Other than Indonesia, with which Timor-Leste shares common borders, its closest neighbour is Australia, with Darwin about 400 nautical miles away (RDTL, 2010). It emerged as a sovereign state in 2002 after almost 500 years under foreign occupation and administration by Portugal, Indonesia, and the United Nations (UN). Timor-Leste is administratively divided in 13 municipalities, 65 administrative posts, 452 villages, with the total population of about 1,066,409.

One of the municipalities where the NKSNP is located is Lautem. The municipality consists of 5 Administrative Posts which is divided into 34 villages. The NKSNP occupies 9 villages² across 4 Administrative Posts, covering 130,600 ha (1,306 km²) which consists of 72,000 ha (720 km²) of terrestrial area and 58,600 ha (586 km²) of marine areas. These 9 villages are Com, Bauro, Mehara, Tutuala which include Jaco Island, Muapitine, Lore 1, Lore 2, Fuat and Ilomar 1. Initially, when the area was declared as national park in 2007, it covered only 123,600 ha (1,236 km²), consisting of 68,000 ha (680 km²) of terrestrial area and 55,600 ha (556 km²) of marine areas across 6 villages. Three 3 villages – Lore 2, Fuat and Ilomar 1 was incorporated in the NKSNP, contributing 7,000 ha (4,000 ha terrestrial area and 3,000 ha marine area).

In terms of altitude, the NKSNP cuts across 0-995 m above sea level (ASL) (fig. 2). Despite, the additional area has not been categorized according to altitude and sloping, the majority of the NKSNP is situated at 0-500 m above sea level with slope 0-50 % (fig. 3) as the uncategorized land is only 4,000 ha. Topographically, the flat coastal line area stretches from the northern area (in the vicinity of Com) to the south (Lore). But in the north and south side of Lake Iralalero, lies a low plateau, which drops relatively steeply to the sea (Cowie, 2006; Miksic, Goh & O’connor, 2011).

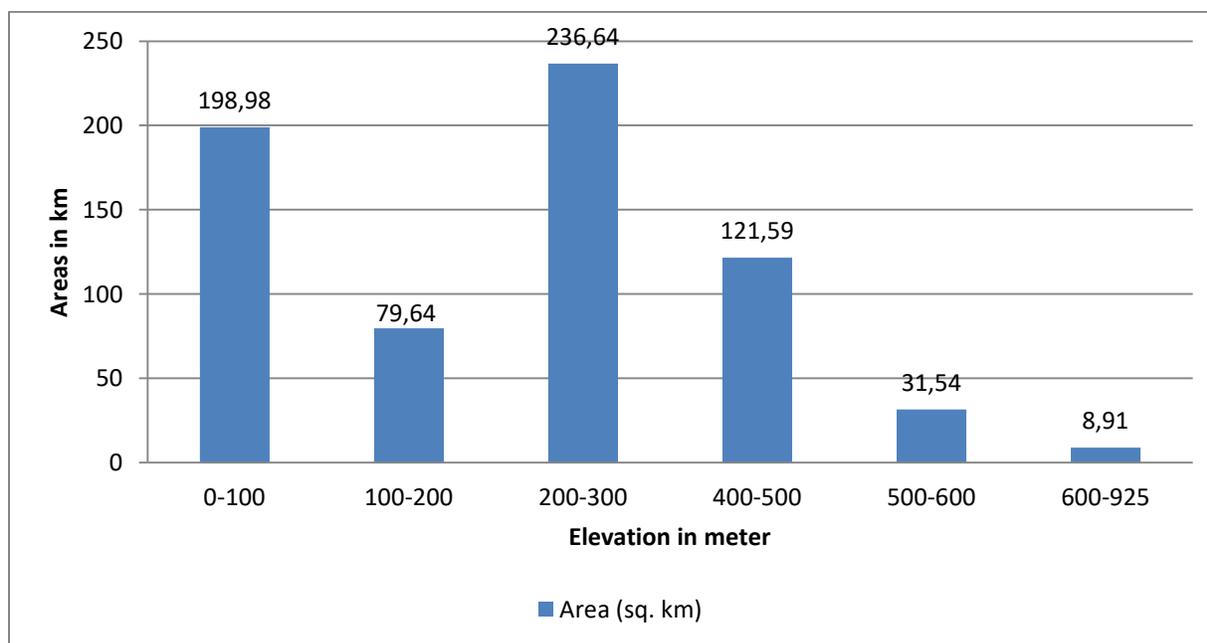


Figure 2 Areal Distribution of the NKSNP based on altitude (data source: Mau, 2010, p. 17)

² When it was declared in 2007, the park covers only 6 villages Com, Bauro, Mehara, Tutuala, Muapitine, Lore 1. However in 2018, due to forest connectivity and to provide a corridor for the movement of important birds and other wildlife, 3 more villages (Lore 2, Fuat and Ilomar 1) were added to the NKSNP.

As it can be seen in the figure 2 that more 515 km² of the terrestrial area lies at an altitude of 0 to 300 m asl, with a slop of 0 to 5 m (see fig. 3).

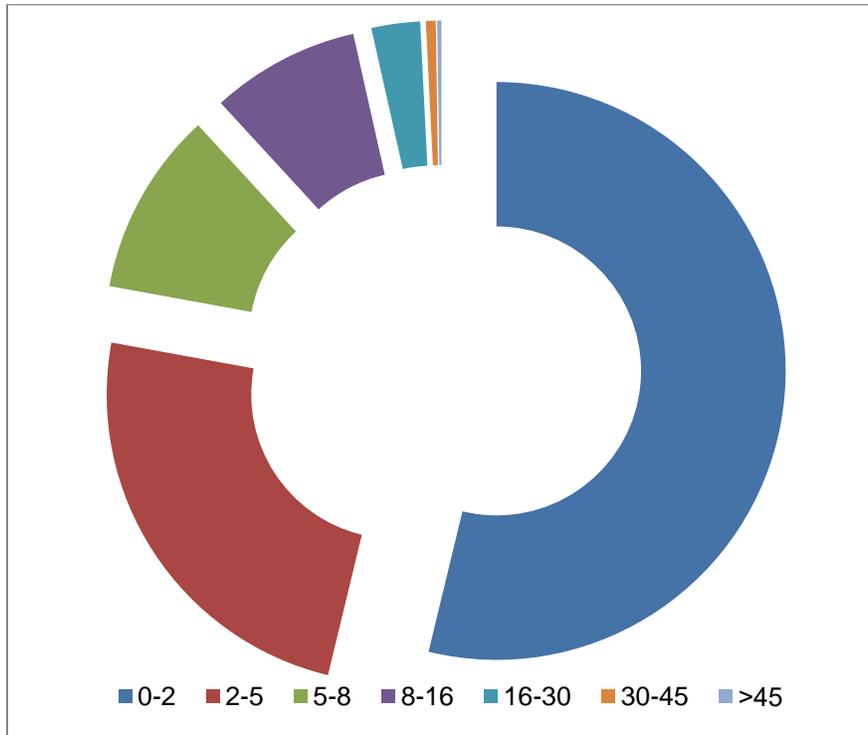


Figure 3: Proportion of areal distribution according to slopes (data source: Mau, 2010, p. 16)

Lautem's climate, as Timor-Leste's in general, is often influenced by the Asian monsoon system and El Niño Southern Oscillation (ENSO), which determines the alternation of erratic phases of drought and flood periods (Fox, 2003; Barnett et al., 2007). During an El Niño period, the country experiences long drought conditions, while in La Niña there is respite and it experiences an extended wet season, which can cause flooding (Fox, 2003). In Lautem municipality, rainfall can change from one season to the next. During a time of El Niño, the municipality experiences less rainfall and the dry season can be very dry. During the La Niña period, there is usually a lot more rain especially around May and June (SoL, 2012) (see fig. 4).

The rainfall distribution across four Administrative Posts, where the NKSNP is located, follows a similar pattern where it has two peaks, bimodal rainfall pattern, resulting in two peaks, one in December and another in May (SoL, 2012, see also Barnett et al., 2007). As shown in figure 5 the average rainfall in Lautem Municipality in 2000 is around 1,400 mm to 2,500 mm (SoL, 2012). According to Trainor (2010), at the highest altitude of Paitchau Mountains, the annual rainfall can reach 2.500 to 3000 mm.

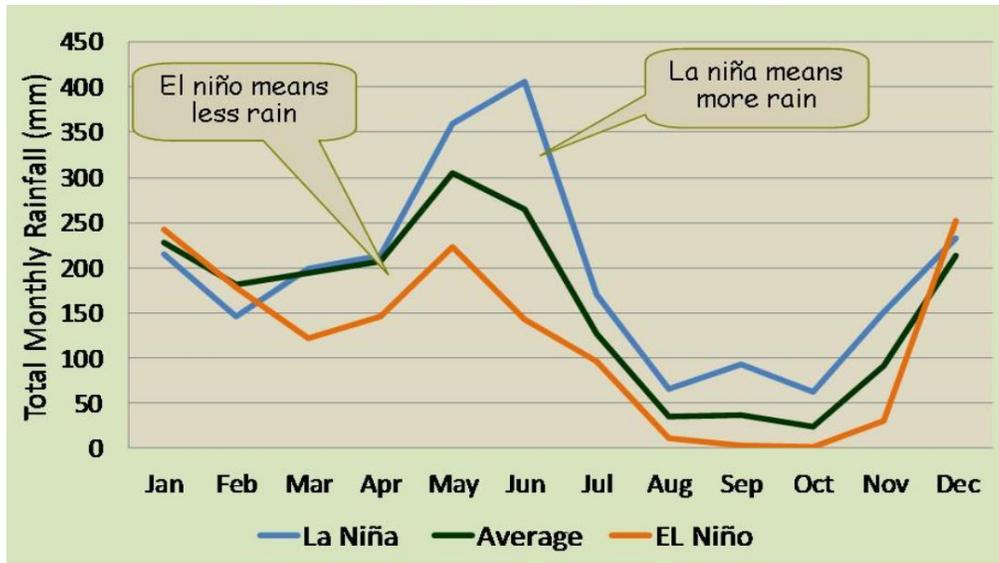


Figure 4: El Niño and La Niña in Lautem Municipality (source: SoL, 2012)

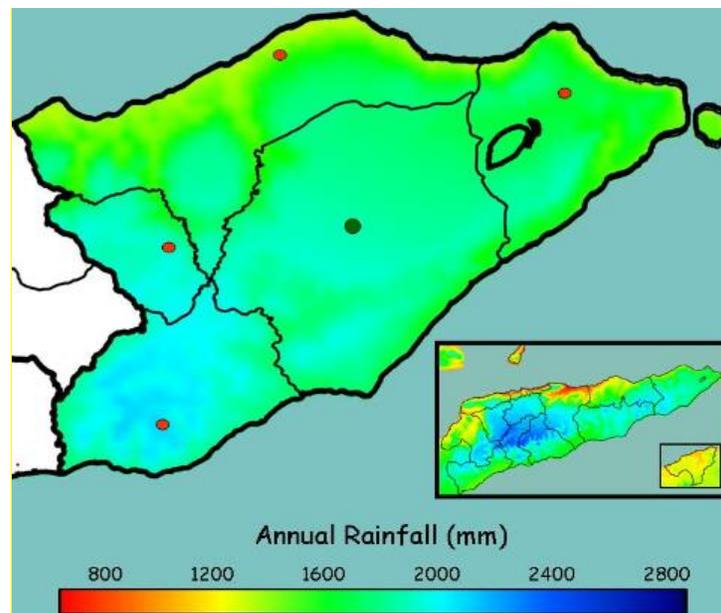


Figure 5: Current rainfall in Lautem municipality

In terms of temperature, the municipality has a tropical climate with little temperature variations throughout the year with an average temperature of 27°C in the coastal areas and 25°C in the highlands (Kirono, 2010). This resonates with SoL (2012) assertion that the temperature is cooler at the higher altitudes (SoL, 2012). This climate data is very important in terms of planning for alternative livelihoods activities for the NKSNP users as well as for adaption and

mitigation measures to climate change which will have significant impacts in Timor-Leste, including the NKSNP.

3.2 Geology of NKSNP

Early studies have shown the potential terrestrial area of the NKSNP as a possible place for oil and gas discoveries. For instance Charlton (2002, p. 367) indicates the large domal culminations beneath the extensive quaternary reef plateaux in the extreme northeast of Timor-Leste warrant consideration with regard to hydrocarbon exploration. The study reveals that the topography in several of these plateaux demonstrates a clear domal form of these former reef terraces with maximum elevation in excess of 500 m. It is also possible that Jaco Island may also represent such a culmination. Charlton further states that it has been observed in the past that several oil seeps occur off the domal crests in easternmost domes in the Lautem plateau; which could mean that these seeps might be from the spill points of substantial structural traps beneath the domes (see also Rau, 2002).

During this study, the Petroleum and Minerals Authority of Timor-Leste were also consulted to understand their views and priorities relevant to the NKSNP. As such, when asked about Petroleum and Minerals potentials within the NKSNP and what has been carried out since 2015 at the NKSNP, in terms identification of the potentials and plan for the future, the President of the National Petroleum and Minerals Authority (ANPM) stated the ANPM has carried out an initial study at the NKSNP where it considers the whole NKSNP area as potential area for petroleum because results of the survey indicate a potential deposit of hydrocarbon beneath the surface of the NKSNP. Therefore, the whole NKSNP has been designated as “block A” which requires more study to determine with certainty whether resources beneath the surface are in fact a hydrocarbon accumulation or just water. The low anomalies from the initial study indicate petroleum potential is beneath Lake Iralalaro at lower depth, while at higher depth between 2,000 and 3,000 meters, where usually hydrocarbon deposit locates, shows the whole NKSNP has a potential for the petroleum deposit.

Despite this, the President of ANPM stated that the law that governs terrestrial resources which has just been approved also gives high consideration to biodiversity and cultural heritage. Therefore, when identified with certainty that resources beneath the NKNSP are indeed hydrocarbon accumulation, decision for drilling will not be straightforward as other stakeholders will be included in the decision making. It will also require an Environment Impact Assessment because there is a need to strike a balance as Timor-Leste is not a developed country.

When underlined that zonation within MAB system might not allow certain activity be carried out in the core zone, and that the government has declared the area as a national park, how can be ensure that petroleum activities will not have significant negative impact on biodiversity; the President of ANPM stated that ideally this kind of communication should have occurred earlier to ensure that the ANPM can have all necessary information about the criteria of each zone within MAB system. However, it was indicated that when drilling on the terrestrial environment, the impact would be minimal in comparison to drilling in the marine environment because there are technology and drilling method available to access petroleum resources without actually drilling on the area.

The narrative shows that the ANPM has identified the NKSNP as a potential area for petroleum activities. Therefore, there is a need to strengthen coordination and communication with the ANPM in the management of the NKSNP for joint decision making and implementation.

3.3 Land cover

The NKSNP covers 130,600 ha (1,306 km²) consisting of terrestrial area of 72,000 ha (720 km²) constituting lowland, tropical and monsoon forest; and 58,600 ha (586 km²) of marine area, which is part of the Coral Triangle areas.

Several attempts have been carried out to map land cover of the NKSNP (see Mau, 2006; UNESCO, 2012; & PEKA-UNESCO, 2014). However, the mapping only covers the 6 out of 9 villages which were initially declared as the composition of the NKSNP (table 1 and table 2).

Table 1: Percentage of land covers classes per category according to Mau

Category	Class	Area (ha)	% of Area
Agricultural Land	Food crops arable	4,976	7.33
	Rice field	291	0.43
	Small holder	1,122	1.65
Forested land	Forests	34,055	50.14
	Bare land	2,985	4.39
	Woodland	13,930	20.51
Non-productive dry land	Grassland	7,371	10.85
Non-productive wetland	Shrubs	2,375	3.50
Rural settlement	Village and mixed-garden	669	0.98
Water bodies	Lake	149	0.22

Source: Mau, 2010

Table 2: Percentage of land covers classes per category according to UNESCO

Category	Class	Area (ha)	% of Area
Agricultural Land	Shifting cultivation	339	0.50
	Food and commercial tree	11,624	17.17
Forested land	Moist lowland forest-dens	37,787	55.81
	Dry lowland forest-sparse	1,718	2.54
	Secondary lowland forest	577	0.85
	Littoral forest	393	0.58
	Degraded forest	5,483	8.10
Non-productive dry land	Grassing	3,213	4.75
Non-productive wetland	Wetland	4,724	6.98
	Swamp forest	278	0.41
	Mangrove	6	0.01
Rural settlement	Settlement	478	0.71
Water bodies	Iralalero Lake	1,086	1.60

Source: UNESCO, 2012

As it can be seen from Table 1 and Table 2, both authors categorized land cover of the NKSNP Park into 5 categories. From these 5 categories, Mau (2010) further categorized them into 10 classes, such as food crops arable, rice field, smallholder, forests, bare land, woodland, grassland, shrubs, village and mixed garden, and lake; while UNESCO (2012) divided them into 13 classes, namely shifting cultivation, food and commercial tree, moist lowland forest – dens, dry lowland forest – sparse, secondary lowland forest, littoral forest, degraded forest, grassing, wetland, swamp forest, mangrove, settlement and Iralalero lake. This reflects the differences portrayed in the maps (see fig. 6 & fig. 7).

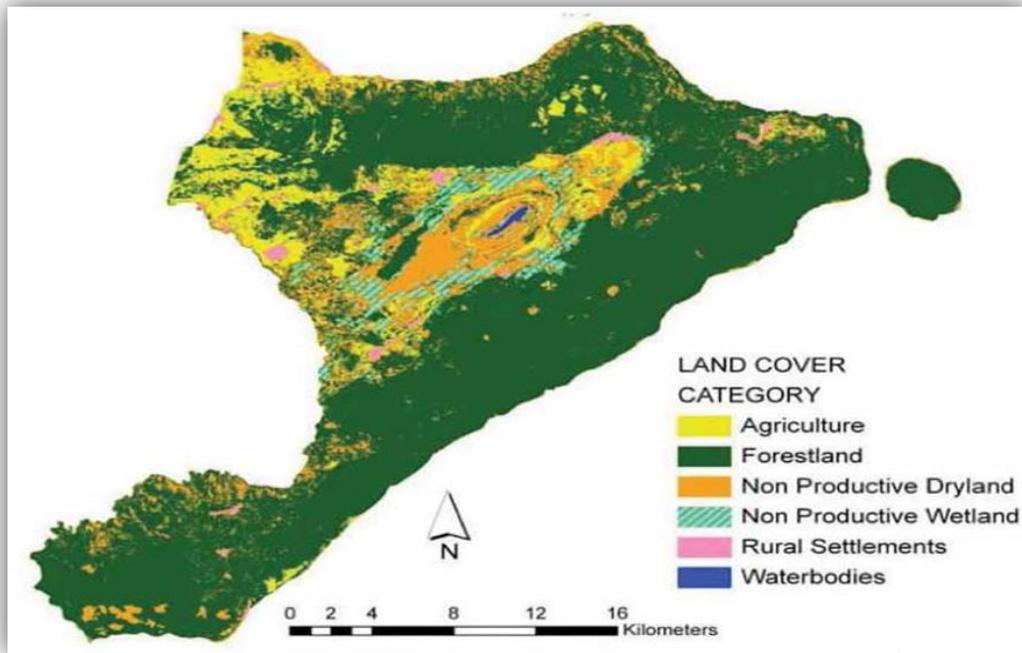


Figure 6: Land cover classification based on Satellite Imagery Landsat TM (Source: PEKA-UNESCO, 2014)

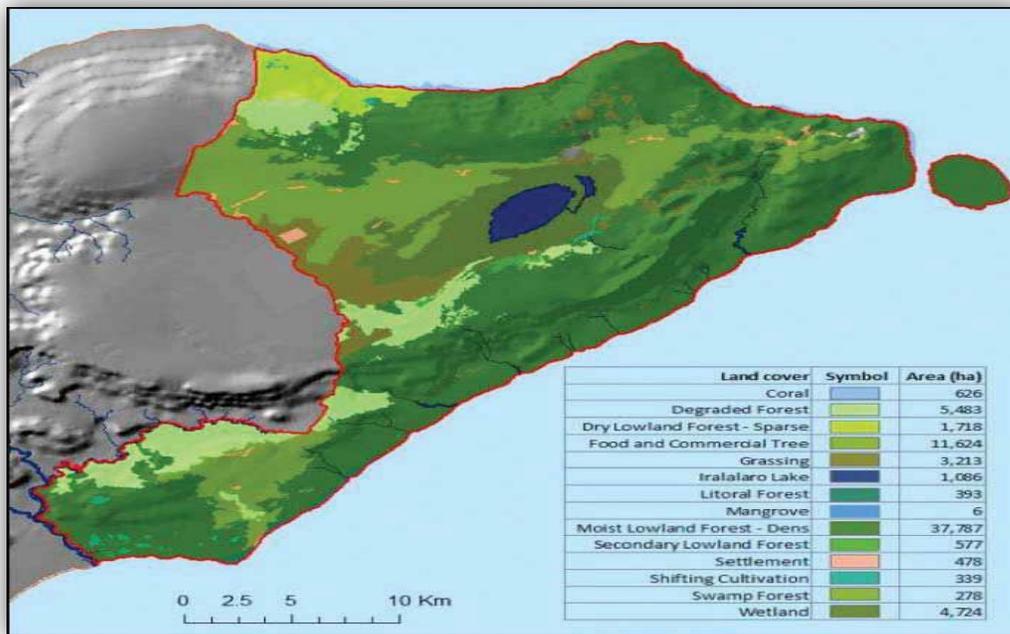


Figure 7: Land use portrait of Nino Konis Santana National Park (PEKA-UNESCO, 2014)

PEKA-UNESCO (2014) considered the land cover classification by UNESCO (2012) as more accurate because it gave more detail than the classification by Mau (2010). As such PEKA-

UNESCO selected the classification by the UNESCO in 2012 for zonation analysis (see zonation section).

When asked about the land cover, the Head of Department of Protected Areas and the NKSNP manager indicated that land cover categorization by UNESCO was done through a participatory mapping exercise with communities' participation across the 6 villages. The map really resonates with realities on the ground. Despite this, it is important to note that 9 years has lapsed since the UNESCO's classification in 2012. It might be necessary to recheck the classification, taking into consideration changes that might have occurred during the period. In addition, 3 more villages have been incorporated into the NKSNP so there is a need to have a follow up survey and mapping activities in order to finalize the land use classification and update zones categorization according to the MAB system.

When asked about national park demarcation and categorization including the new three villages, the National Director of Natural Reserve stated, due to limited resources the directorate has only finalized the demarcation boundary of the NKSNP while it has not been able to undertake extensive survey to identify the potential distribution of the three remaining villages. Therefore, part of the priority is to mapping exercise for potential distribution in order to be able to finalize domination processes and site management afterwards.

3.4 Biodiversity

As described before, the NKSNP consists of both terrestrial and marine environments with magnificent biodiversity and amazing amount of natural resources. Many species, both terrestrial and marine, have been identified with more to be identified. This is because many plant communities thought to be endangered at regional level and some listed by IUCN as threatened species are found in the NKSNP with many other species identified had not been previously recorded from Timor in the literature (see Cowie, 2006). According to PEKA-UNESCO (2014) the NKSNP area consists of at least 12 vegetation communities (habitat type) with extensively high diversity, intact and internationally significant terrestrial landscape and marine protected zone.

3.4.1 Forest

When asked about forest conditions within the NKSNP, the Head of Department of Protected Areas and the NKSNP Manager stated the NKSNP consists of closed forest vegetation, tropical primary forest, coastal forest, deciduous forest. It is the only large remaining primary forest in

the country. Their accounts echoed what the literature describes about the forests in the NKSNP. For instance studies (see Cowie, 2006) have recorded 730 tree species for Jaco-Tutuala and Lore area, with 391 taxa presently identified to species level. Other trees such as *Intsia bijuga*, *Pterocarpus indicus*, *Santalum album* that have been listed as threatened species by IUCN are also found in the NKSNP. Additional species that may be threatened include tree species such as *Antiaris toxicaria*, *Neosomitra podagrica*, *Carallia brachiata* and *Eleocharis geniculata*. The area also contains a significant population of *Cycas rumphii*, a taxon listed as Near Threatened by the IUCN.

Many other publications (see Cowie, 2006; trainor, 2010; McIntyre, 2011) have described the area as having high biodiversity. The tropical forest dominates the forest area in Lore, Muapitine, Mehara and Tutuala village. Tropical forest in these villages consists of drier primary and secondary forest, while the tropical evergreen forest can be found in Malahara area. The area near Lore is a coastal evergreen forest adjacent to the beach. The remaining part is savanna and wetland (Evergreen swamp forests), found in Iralalero Lake, Bauro region. According to the Head of Department of Protected Areas, the forest in these areas are still pristine and need to be protected to provide ecosystem service, attracting tourists and providing alternative revenue to the State in the future.

It was also identified through discussion with the National Director of Natural Conservation and Head of Department of Protected Areas that Sandalwood, *Santalum album*, have developed an adaptation mechanism in the NKSNP where it can also grow well in the coastal area, saline environment, where they usually not grown well, and also in the upland and mountainous areas. This opens up opportunity for more research, when the NKSNP is inscribed to UNESCO biosphere reserve in order to understand the adaptive capacity of sandalwood to the saline environment.

3.4.2 Fisheries

As discussed before, the NKSNP also includes 58,600 ha of marine environment, which is part of the Coral Triangle zone, an underwater area which supposedly contains the world's greatest diversity of both coral and coral reef fish. This means that the NKSNP is located at the location of spawn tuna, marine nursery, and immigration of southern bluefin, bigeye, yellowfin, skipjack and albacore tuna of Indian Ocean, Southwest and Pacific Ocean, where most tuna fish catch occurs. Through Coral Triangle Initiative, studies have identified Timor-Leste sea is home to over 500 fish species, with many more to be identified (dos Reis Martins, 2020).

Major catches of pelagic and demersal species in our marine waters including Mackerel scads, Snapper, White shrimp, etc. Some major commercially important tuna species are also found in Timor-Leste marine waters such as skipjack, yellowfin, bigeye, albacore, mackerel, bluefin, longtail and southern bluefin (dos Reis Martins, 2020).

When asked about the fisheries plan and activities in the NKSNP, the National Director of Fisheries Management indicated that MAF has established some Marine Park in Com – Lore – Tutuala and Marine Protected Areas (MPA) in Lautem and established co-management of the MPA. Currently, there are 6 Marine Protected Areas and 1 Dugong (*Dugong dugong*) protection site established in Lautem within the NKSNP. This narrative seems in agreement with existing report which underlines that marine protected zone has high diversity, such as fishes, turtles, dugongs, whales, dolphins, sharks, and part of 'The Coral Triangle', which constitutes the greatest biodiversity of coral reef and fishes in the world (PEKA-UNESCO, 2014).

As for freshwater fish and turtle, there are two endemic species of freshwater fish *Craterocephalus loisapi* and turtle *Chelodina timorensis* found only at Lake Iralalara in NKSNP (Grantham et al., 2010). This was confirmed through discussion with the Head of Department of Protected Areas. The habitat of these species needs to be protected for the benefit of the current and future generation.

In terms of fisheries governance, several laws have been developed and approved by the government to govern the fisheries sector including those in the NKSNP (see governance sector).

3.4.3 Birds

IBA (2021) listed 16 Important Bird Areas (IBAs) in Timor-Leste, where three of them are located in the NKSNP, namely Mount Paitchau – Lake Iralaloro, Lore and Jaco Island. These sites are supporting a range of species. For instance, a total of twenty-four restricted-range species have been recorded in Mount Paitchau – Lake Iralaloro. This includes the Endangered Timor Green-pigeon, and the Critically Endangered Yellow-crested Cockatoo (IBA, 2021; see also Cowie, 2006). In addition, Lake Iralaloro is the most significant freshwater site in Timor-Leste and Nusa Tenggara, supporting at least 50 waterbird species including large populations of ducks and rails (IBA, 2021). In Lore, a total of Twenty-four restricted-range species have been recorded, including the Endangered Timor Green-pigeon, and the Critically Endangered Yellow-crested Cockatoo; and eight restricted-range species have been recorded in the Jaco

Island (IBA, 2021), but due to its limited isolation (only about 900m from the mainland), it is anticipated that more of these species will be found the area in the future.

During the study, when asked about the birds' species in the NKSNP, the Head of Depart of Protected Areas stated that Timor-Leste has recorded 168 bird species, which is about 87% of birds in Wallacean region. Timor-Leste has also recorded 19 birds as threatened species. In addition, Timor-Leste has a high number of endemic bird species. In fact, about 35 species are endemic in the Timor-wetar zone, of which 24 endemic have been recorded in the NKSNP.

The NKSNP also contains a high number of bats, which has very important function for forest regeneration, especially through spreading seeds. According to Cowie (2006) around 16 bat species have been recorded in the NKSNP, with four species might be new to natural sciences.

Through discussion with the Director General of Environment, National Director of Biodiversity and Head of Department of Protected Areas, it became clear that despite birds having been the most studied in the NKSNP, more studies were needed to further identify the diversity and distribution of the aves. The National Director of Biodiversity underlined that due to limited resources, limited efforts have been carried out to study about biodiversity in the NKSNP.

3.4.4 Other important animals in the NKSNP

There are also other undescribed giant rats known from sub-fossil deposits, which might have now gone extinct. Many other wild animals such as rusa deer, monkey and marsupial cuscus among others are also found in the NKSNP. According O'connor, Pannell & Brockwell (2011), apart from some birds, bats and murids; several mammals have been introduced from outside the island during late prehistoric and historic times when people had started inhabiting the area. Despite this, they have adapted well to the situation and need to be protected for future generations.

3.5 Socio-economic activities

3.5.1 Population

There are nine villages bounding the NKSNP such as Fuat, Ilomar 1, Com, Bauro, Lore 1, Lore 2, Tutuala, Méhara and Maupitine. According to the agriculture census, the total population of the nine villages in and around the NKSNP is 13,884 people (TLAC, 2020), while the cumulative population for the nine villages according to population census in 2015 were 14,775 people. This represents a reduction of more than 6 percent. As it can be seen from the

figure below that Tutuala and Mehara villages experienced a significant reduction in its household number, followed by Bauro and Iliomar 1. While the villages that experienced an increase in their household numbers are Muapitine, Lore 1, Fuat and Fuat.

It was identified as a difference in the number of population because many young Timorese have left for overseas to search for better opportunities (da Silva, 2021). This certainly resonates with an account from McWilliam (2015) who observes that many young people from Lospalos had left their villages to work and live in the UK where they send back to their families in Lospalos to build their houses. However, because the population reduction in Tutuala and Mehara was very significant, DG Statistics of the Ministry of Finance was consulted, where it was indicated that the difference was due to different approaches used in the both Population Census in 2015 and Timor-Leste Agriculture Census in 2019. In the former, the de jure population approach means counting all populations regardless of their whereabouts during the census, while the latter only counts the population who stay in the village during the census time. This means that less population are living in the NKSPBR in 2019 than 2015 which might also reduce their negative impact on the environment and biodiversity in the area (see fig. 8).

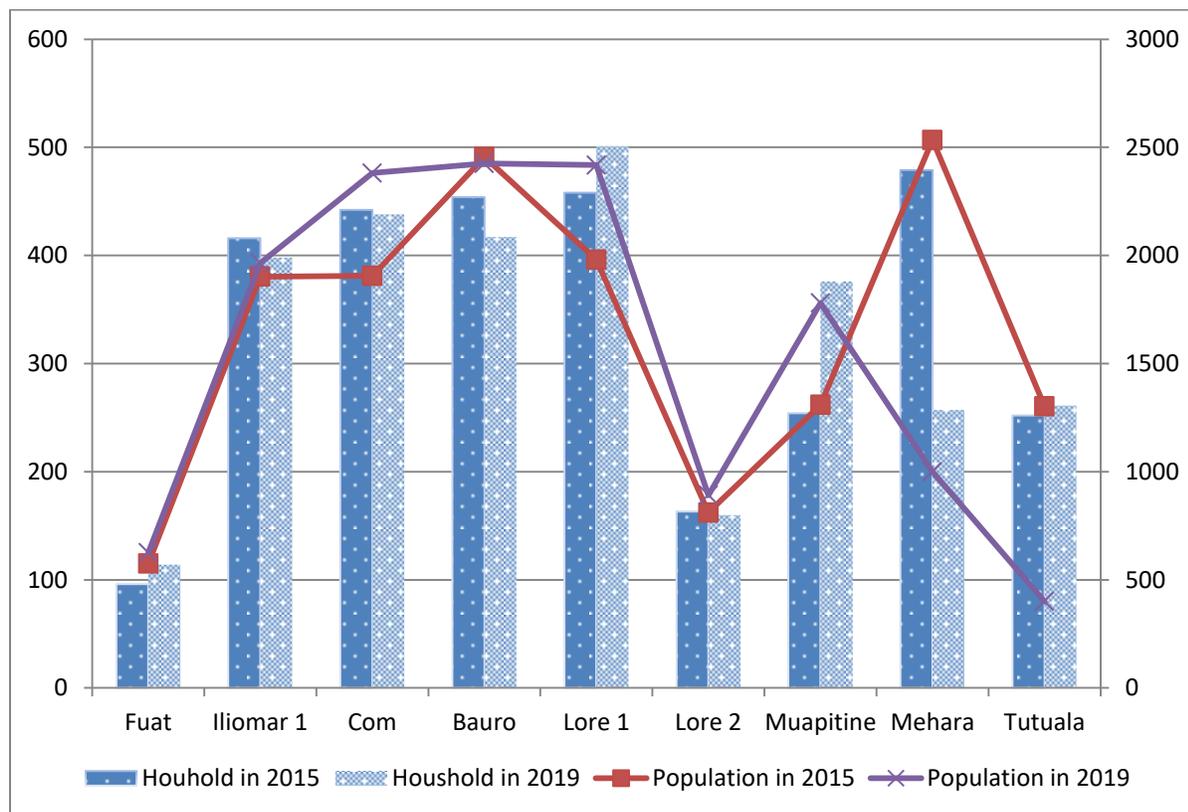


Figure 8: Number of Households and population of NKSNPBR in 2015 and 2019

In terms of household activities, majority households bordering the NKSNP involved in farming activities as well as rearing livestock figure 9, table 3 and figure 10. These livelihoods activities, as in many other rural communities throughout the country, are not just an economic activity, but also a way of life, where household livelihoods are compromised when they stop producing food (da Silva, 2010). As it can be seen, in the figure 9 below depicts that most of the households across the 9 villages were listed as farming households with a small number of households engaged in fishing activities, mainly in Com and Tutuala.

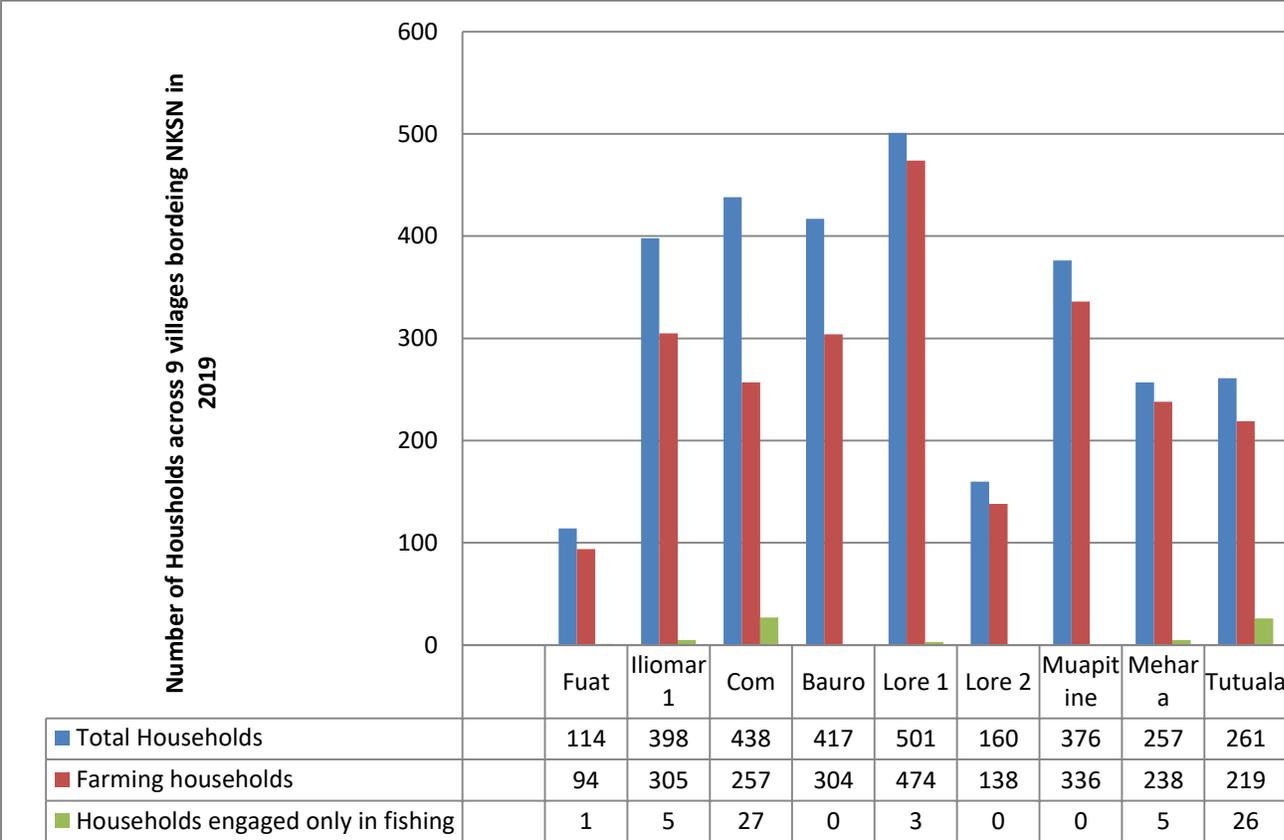


Figure 9 Households bordering NKSNP and their engagement in farming and fishing activities

When analyzing the number of households involving the crops production in the last 12 months, it was found the majority of households between 0.02 and 3.99 ha; followed by those engaged in cultivation of less 0.02 ha. It was identified that a small number of households involved in the cultivation of crops between 20 and 100 ha (see table 3).

Table 3: Number of agricultural household holdings cultivated Crops/plants/trees by size-class of cultivated area

Socu	<0.02 ha	0.02-0.99 ha	1.00-3.99 ha	4.00-9.99 ha	10.00-19.99 ha	20.00-49.99 ha	50.00-99.99 ha	100 ha & over	Number of agricultural household holdings cultivated crops/plants/ trees
Fuat		8	47	27	1	3			86
Iliomar 1	66	92	75	21	6	5		1	266
Com	41	117	23	3		2	1		187
Bauro	3	11	108	109	23	9	2		265
Lore 1	18	311	55	50	2			2	438
Lore 2		68	46	4	1				119
Muapitine	7	259	31	1	1				299
Mehara	32	35	70	57	28	5		1	228
Tutuala	128	19	2		1	2	4	3	159

When analyzing households' involvement in rearing animals, it was noted that the majority of households having zero to 3 large animals, followed by those who have 3 to 5 and 5 or more. These trends cut across all the 9 villages bordering the NKSNP (see fig. 10).

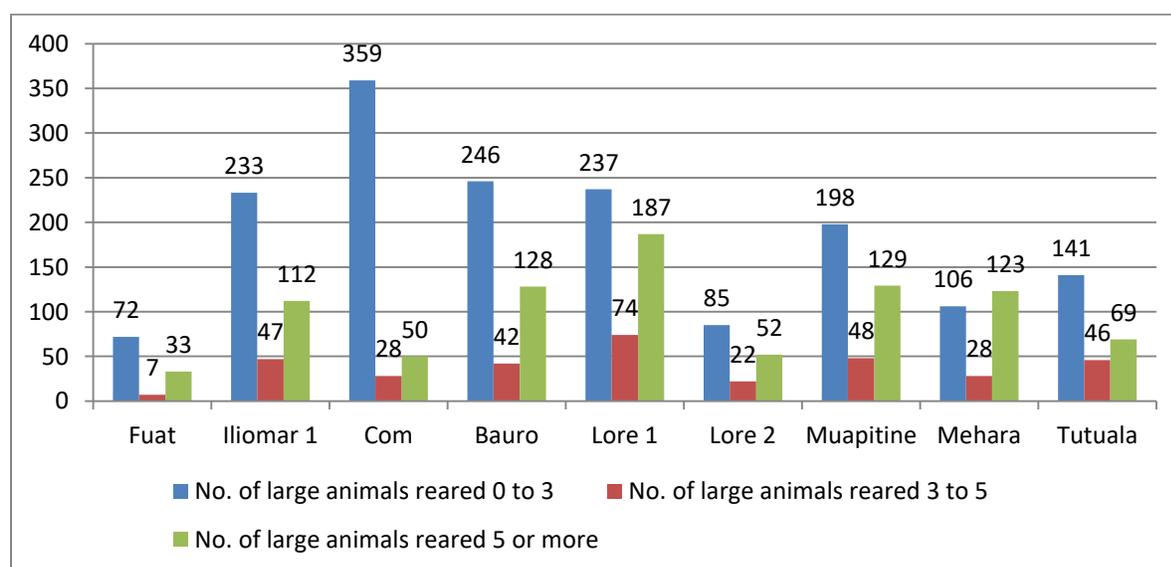


Figure 10: Agricultural households by number of large animal rearing (Suco: develop using data Timor-Leste agriculture census 2019)

This means that households will continue to have high demand for pasture for their livestock. In the future it would be necessary to find alternative feeding system for the livestock. As such communities need to be engaged at early stage of any discussions that may have any direct or indirect impacts on them, especially when areas such as Lake Iralalero that have been used for grazing put into core zones based on the MAB system.

3.5.2 Land tenure

Land tenure is a complicated issue and can affect the management of the NKSNP, despite the declaring the site as a National Park, with the communities through sustained consultations were willing to hand over their lands to the State, according to PEKA-UNSECO (2014), traditional wisdom and culture have a strong influence in land tenure in the NKSNP. At the local level, there is a traditional regulation in place that organizes land utilization and who can own land. Historically, the ratu (a clan) is a traditional culture that power to organize the ownership scheme of the land. Mau (2010 in PEKA-UNESCO, 2014) listed a number of ratus as being the owner of the NKSNP. These ratus are Cailoro Ratu, Renu Ratu, Puitical Ratu, Aca Cao Ratu, Lavera Ratu, Pair Ratu, Konu Ratu, Kati Ratu, Marapaki, Latu Loho, Vacuumura, Masipan, Serelao and Naza Ratu and many others have special history and complex mythologies interconnection with the nature.

This intricate relationship is built on mutual exchange and alliance. Those who first arrived in the land (village) are the owners of the land and have more power than new comers (McWilliam, 2005; Fox, 2008), including authority to make decisions. Therefore, understanding local conceptions of authority and how the connections between local realities and other values that influence decision-making are played out is essential for a successful implementation of a development program. In other words, some people are given more authority to make decisions representing the community than others and the decisions made by those with customary authority have more weight in comparison with the officially elected leaders (Cummins & Leach, 2013; da Silva, 2020). It would be important to properly consult village authorities, traditional leaders as well as ensuring their involvement when developing and implementing site management plan of the NKSNP to build ownership and ensure sustainable implementation.

Despite this, when analyzing agriculture holders between male and female, the result shows that majority of land holders are male (fig. 11). This is very similar to many title holders around the country. This could also mean those who have more power in the households are male. However, it would be important to observe that a common policy that has been implemented by relevant ministries, both at the national and local levels, has at least 30% women participation in all activities including decision making.

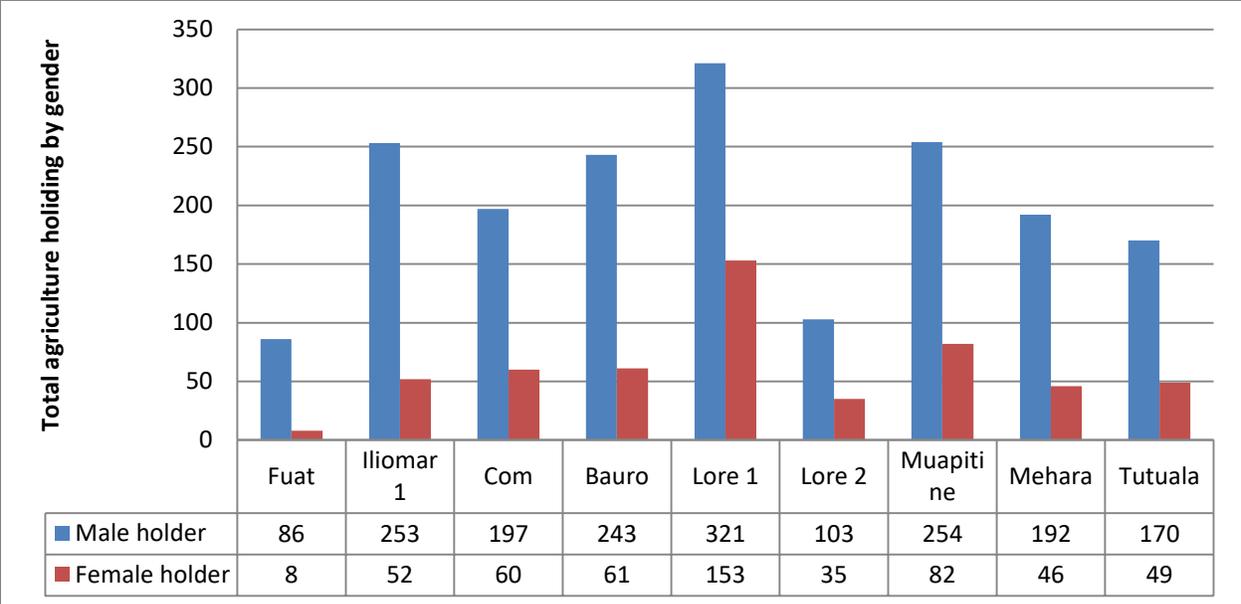


Figure 11: Agriculture holdings by male and female holder

When looked further into agricultural holdings by tenure by the holders, it was identified that most of the holders with no formal recognition or without certificate, followed with holders having a number of references of certificate, certificates issued during Indonesian occupation or colonial Portuguese rule (fig. 12). This means that most of land will need to be registered sometime in the future. When the formal process starts, that’s when conflict over claims occurs, which may also happen in the NKSNP. As discussed before, decisions to own lands are made by those who have the authority or being the authority to decide. This is a very delicate situation as it involves a relationship that is built on mutual exchange and alliance.

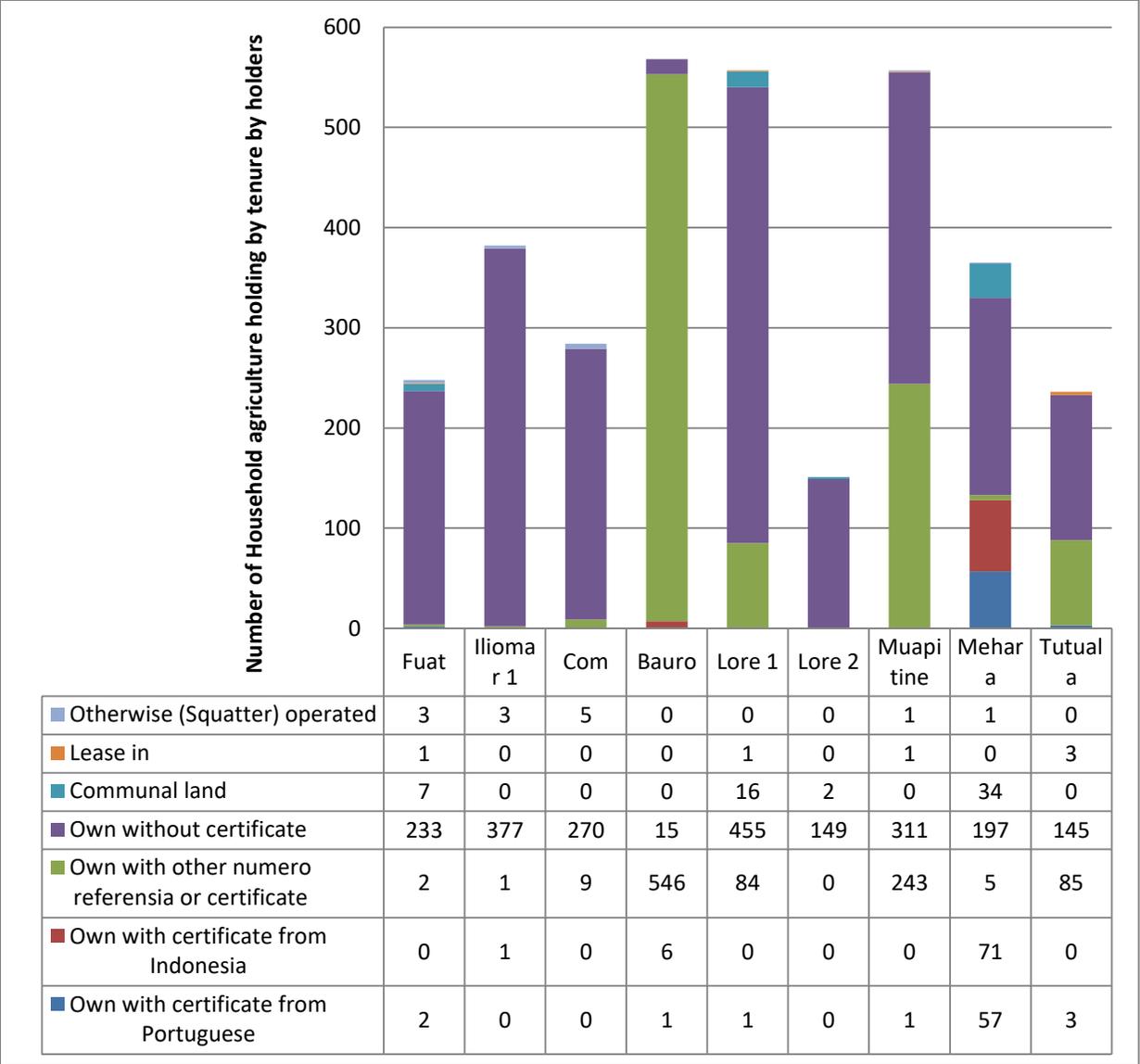


Figure 12: Households agriculture holdings by tenure by holders

The analysis in this section clearly shows that households across the 9 villages bordering the NKSNP were mainly subsistence farming, which engage in mixed farming activities as well as rearing livestock. In addition, existing literature also indicates that hunting and fishing form an integral part of the economy of villagers. Local people often hunt wild animals such as monkeys, cuscus, deer and wild pigs for proteins. In coastal areas such as in the villages of Com and Tutuala, villagers also exploit a range of marine resources, including pelagic fish species, shellfish, turtle (ipitu) and seasonally occurring sea worms (meci) and sardines (api moko) (O’connor, Pannell & Brockwell, 2011), which resonates with analysis presented in figure 9 that among the 9 villages, Com and Tutuala also engaging in fishing activities.

3.6 Cultural value

The NKSNP is home to many important cultural places for Fataluku people and for those interested to understand the cultural values of the local people. Many anthropologists and archeologists have identified several sites that communities used for cultural or ritual practices including mythological sites, rock art sites, caves and shelters, fortified walled village sites, shell middens, and burial sites (see O'Connor & Pannell, 2006; O'Connor, Pannell & Brockwell, 2011). According to these researchers, between 2000 and 2005, through extensive research carried out in the NKSNP has located more than 200 cultural sites.

When asked about the importance of the NKSNP for cultural research and discoveries, the National Director of Cultural Patrimony stated, the NKSNP contains a lot of cultural and ritual evidences. For instance, in Tutuala alone, 31 sites have been identified with a total of 6,696 paintings. This was listed in 2017, and the area has many more objects which need to be preserved. Each object requires its own narrative so escavation is necessary. However, there are limited resources at our disposal. The objects have all been analyzed in Australia because of the limited capacity and resources to facilitate the analysis in the country.

In the future more identification of the sites and paintings will be required in the NKSNP to identify and save important cultural objects before they are disappeared. Through collaboration with Australia, the National Directorate of Cultural Patrimony has been able to discover and preserve some important objects and have been used as educational objects for students. These objectes need to be preseved for tourism educational objectives at the NKSNP. The NKSNP is a very important place for cultural research and discoveries and as such more need to be done in the furture. There is a plan in place to preserve cultural sites in order to provide revenue to the state in the future.

The Cultural Patrimony Directorate also worked with UNESCO to verify all traditional houses in Lospalos. This will be continued in the future until it is completed.

There is a plan in place to to establish foot paths to the cultural sites in order to attract tourists. For this to happen, cooperation between all relevant stakeholders is important. There is also a need for a site management plan for the NKSNP which will guide all activities in the future.

3.7 Tourism

Timor-Leste Strategic Development Plan 2011-2030 designates Lautem municipality for Tourism development, which will be part of the tourism corridor from Hera to Com. The plan lays out Tutuala as a priority in tourism infrastructure development including rehabilitation of Pouzada Tutuala. A center of tourism with accommodation like homestay would be built in Com, a visit center would be built within the NKSNP, tourist information center would be built in Lospalos and the road from Lautem-Moro to Lospalos and Tutuala will be rehabilitated.

When asked about the tourism plan and policy for the NKSNP or activities that have been carried out in the NKSNP, the acting Director General of Tourism stated that in 2016 the tourism sector had identified some historical places in the NKSNP for tourism purposes. It was also identified that some basic infrastructures needed for tourism development were missing. A plan has been prepared for implementation in the NKSNP. However, due to the change in the government, the implementation has been delayed.

The tourism sector also has a master plan for tourism development in the country which divided the country into three zones, west, central and east. In the east, the focus will be on the NKSNP, which is also a priority for the Ministry of Tourism.

Apart from the master plan, the Ministry of Tourism also carried out meetings with local people in Tutuala, discussing site management and visitor management and installing signs on the site. In 2021, the Ministry has planned to have more discussions with local authorities prior to producing a management model that is culturally sensible and acceptable to communities. This will allow visitors to provide small contributions for the site management.

The Acting Director General also stated, it would be important to speed up the process of finalizing nomination process of the NKSNP to be a UNESCO biosphere reserve; as well as finalizing the Site Management plan in order to guide all activities in the NKSNP, including tourism development.

3.8 Maritime Transportation

Maritime transport sector has a plan in place to build a temporary zette in Lore in order to provide transport facilities to the population. According to the National Director of Maritime Transportation, the government through the Ministry of Transport and Communication has

instructed its directorate to observe possible sites in Lore for temporary zette. As such, the directorate has hand-marked a site in Lore for the purpose.

When explaining that the government has added the coastal area of Lore, Fuat and Ilomar 1 to the NKSNP, the National Director of Maritime Transport replied that there should be continued discussions with relevant stakeholders in order to ensure the construction of the zette does not pose negative threats to biodiversity in the protected areas. Alternatively they can find suitable site in the area which might have minimal impacts on the biodiversity.

When asked about the vessels licensing and unflagged vessels or vessels that have changed their functions from their license, the Director stated, there are many challenges facing the sector. However, in the future, all vessels need to be registered following specific set rules and regulations; there will be efforts to identify all vessels, etc and ensure that their operations adhere to laws and regulation. These approaches would reduce people from violating their licenses.

3.9 Ecosystem services and threats

The NKSNP has many other significant functions, in addition to those that have been described above. These include provision of water sources, tourism activities and potential climate change mitigation. According to Grantham et al (2010) that NKSNP has around 22.500 ton/km² carbon stocks. This coupled with the non-conventional mixed farming practices in the area would further help mitigate climate change through increasing soil carbon sequestration, which helps build soil carbon banks rather than releasing carbon into the atmosphere. According to IPCC (2001, p. 25), agriculture such as mixed farming in the villages bordering the NKSNP could contribute to biological mitigation options, which were estimated to about 100 Gt C (Giga tone cumulative) by 2050 globally, or 10–20% of projected fossil-fuel emissions during the same period (see also da Silva, 2020).

Therefore, approaches to agricultural development in the NKSNP should make people live in harmony with the earth, which can contribute as a solution to climate change (McMichael, 2011).

Despite all the benefits, there are many problems facing the NKSNP including habitat destruction or conversion, illegal logging, slash and burn agriculture, unregulated harvesting and collection, fire, weeds and grazing. These threats might pose serious problems for biodiversity conservation in the future. According to the NKSNP manager and the Head of department of Protected Areas of the Ministry of Agriculture and Fisheries, habitat fragmentation and

destruction, conversion of forested land to other uses, illegal harvesting and hunting, invasive species can cause serious problems to biodiversity in Timor-Leste, including the NKSNP.

The global climate change might have a significant impact on biodiversity conservation in the NKSNP. Scientists predict that the climate of the Lautem municipality will change, similar to other parts of the country. Projection shows that over the next 40 years, Lautem will get 10% more rain and the temperature will rise by around 1.5°C (SoL, 2012). However, evidence from a recent report on rainfall and temperature in Timor-Leste shows the temperature has already increased of an average of 1°C and rainfall has dropped 19% since 1974, based on an analysis of changes in temperature and rainfall between the periods 1954–1974 and 2004–2012 (SoL, 2014a). Despite the data only covering a very short time, it does confirm the early projections from Kirono (2010) that Timor-Leste would experience higher temperatures among others. As such, it is important to consider climate change as a cross cutting issue in all programs and activities that would be implemented in the NKSNP in order to increase the awareness of the communities and decision-makers, both at local and national levels.

4 ZONATION OF NKSNP

Many in the past have attempted to propose zonation of the NKSNP based on IUCN category V, which encompasses the interest of human needs and natural preservation. For instance, in 2010 Mau provided a model for the zonation of the NKSNP through research project through observation using High Conservation Value Areas (HCVAs) approach.

Based on the analysis HCVAs, Mau (2010) proposed the following zones across the 6 villages within the NKSNP. Despite this, Mau (2010) indicated this was only initial attempt and communities' participation is required to finalize the zonation.

Table 4: Zones distribution across 6 villages of the NKSNP (Area in km²)

Zone	Villages						Total	%
	Bauro	Com	Lore 1	Tutuala	Mehara	Muapitine		
Core	0	0	57.12	88.5	30.52	4.64	180.78	26.70 [26.75]
Buffer	11.81	19.01	30.96	16.67	95.46	41.36	215.27	31.80 [31.85]
Transition	87.12	40.34	44.78	13.8	63.83	29.96	279.83	41.33 [41.40]
Total	98.93	59.35	132.86	118.97	189.81	75.96	675.88	99.83 [100]

The table 4 shows the proposed area for core zone: 180.78 km², buffer zone: 215.27 km² and transition zone: 279.80 km².

In 2014, a further attempt was made by PEKA-UNESCO who proposed two options for zonation of NKSNP. They used a multi-criteria analysis to delineate zones of the NKSNP according to category 5 of IUCN, namely core zone, buffer zone, and transition zone.

For core zone, they assessed land suitability through habitats (land cover), species (threatened bird species, Cockatoo sulphure), and outstanding natural features (wellspring and cave, obtained from participatory mapping). For buffer zone, the analysis was focused on preserving cultural and landscape assets, restricting land use to traditional and environmentally compatible activities. In the analysis they considered the physical distance of 1500m to core zone and cultural heritage sites (Archaeology and Tei Lulik, obtained from participatory mapping), compatible land uses (based on land cover), and landscape assets (ratu). For transition zone, the analysis focused on agricultural and settlement area (based on land cover and participatory mapping) and transportation facilities (road).

Table 5: Zones distribution across 6 villages of the NKSNP (Area in km²)

Zonation	Option 1		Option 2	
	Area (ha)	% of area	Area (ha)	% of area
Core	26,806	39.7	25,594	37,9
Buffer	19,718	29.2	18,507	27,4
Transition	20,988	31.1	23,411	34,7
Total	67,512	100	67,512	100

Based on this multi-criteria analysis they proposed two options for NKSNP zones. For first option, core zone: 26,806 ha, buffer zone: 19,718 ha and transition zone: 20,988 ha. For the second option, core zone: 25,594 ha, buffer zone: 18,507 ha and transition zone: 23,411 ha (see fig. 13 for option 1 and fig. 14 for option two).

This means that areas designated in the second option for core and buffer zones are smaller than first option due to some areas of core zone being changed to buffer zone as well as buffer zone were changed to transition zone.

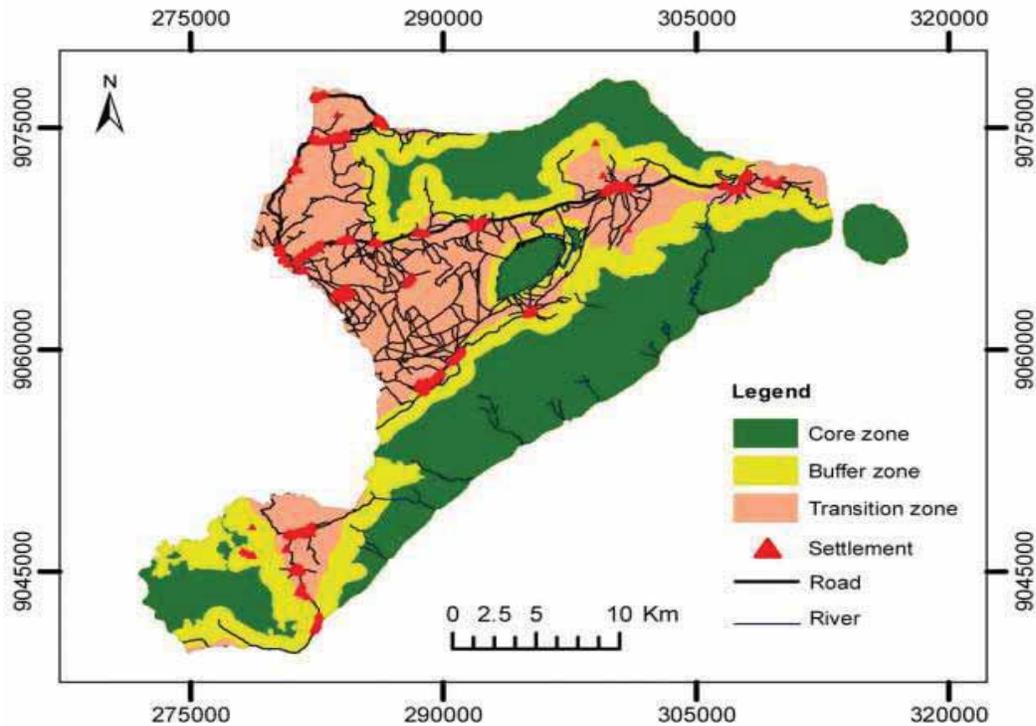


Figure 13: First option for NKSPBR zonation (Source: PEKA-UNESCO, 2014)

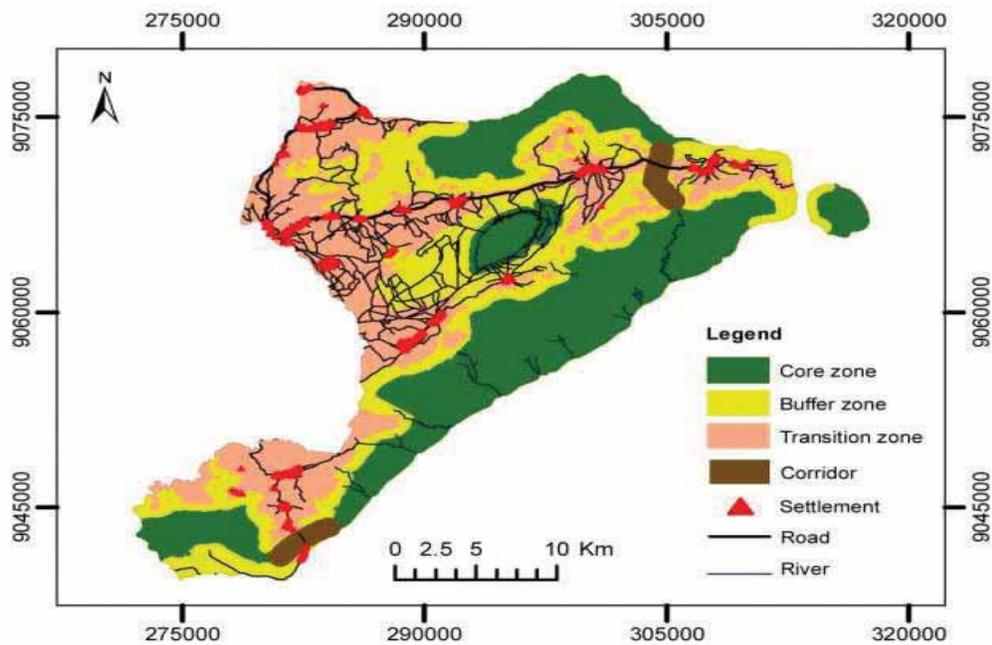


Figure 14: Second Option for NKSPBR Zonation (Source: PEKA-UNESCO, 2014)

These are two interesting options to set zone for the 6 villages. However, since there have been three additional villages, a further participatory mapping exercise is necessary to determine

potential sites for each zone for the three new villages. This would include visiting and having meeting at each village. Participants would include village and sub-village chiefs, traditional leaders, youth and women leaders and elderly people. The participants can be asked to map their village for ritual or cultural sites, recreational sites, agricultural sites, firewood collection sites, identify important caves, etc. Upon completion of the participatory mapping exercise, participants should be asked to accompany the team to directly visit the site to take coordinate point for digital mapping purposes. This would be followed with a final stage of the mapping exercise where all other villages to determine the site boundaries. This means walking through the villages or the park to observe and verify all potential sites for zones and make final decision for core, buffer and transition zones. This will need to be carried out with villagers to make sure that they understand and comply with the management criteria for each zone.

5 Governance of NKSNP

Since the restoration of its independence, Timor-Leste has been trying to protect its environment for the benefits of current and future generations. The Constitution underlines that it is part of fundamental objectives of the State the duty to protect the environment, preserve natural resources, affirm and enhance the personality and cultural heritage of the people Timorese (article 6, paragraph f and g). This article intertwines with other articles such as 61 on environment and article 139 on natural resources, aims to safeguard sustainable economic development, guarantee the right of citizens to an environment of human, healthy and ecologically balanced life and the duty to protect and improve it for future generations. This has been fully reflected in policies and laws governing the NKSNP.

As at the early 2021, the NKSNP is governed by the following documents:

- Law N.º 14/ 2017 of August 2 about the Legal General Regime of Forestry;
- United Nations Transitional Administration in East Timor (UNTAET) – the Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Timber from East Timor as well as the burning of any destruction of forest;
- United Nations Transitional Administration in East Timor (UNTAET) - the Regulation 2000/19 on Protected Areas to protect designated areas; endangered species; coral reefs; wetlands, including mangroves; historic, cultural and artistic sites; and biological resources; as well as the conservation of biological diversity of Timor-Leste;
- Government Resolution No. 8/2007 of August 1 on the declaration of National Park

- Decree Law 26/2012 – Environmental Base Law: Environment base law Article 27: This article under this decree law provide the principle of biodiversity protection and state must take a led, including protection of endangered species, in-situ protection, and national protected system to ensure the sustainability;
- Decree law No. 6/2020 of February 6 – Legal regime of protection and conservation of biodiversity;
- Decree Law 5/2016 on Protected Area: This decree law provides general guideline on the protected area in Timor-Leste;
- Biodiversity strategic action plan – approved by Council of Ministry on 15 of February 2012: The document presents a framework for guiding approaches to biodiversity conservation and ecosystem management, and is addressed to district authorities and sub-district, civil society and the private sector;
- Decree Law No. 5/2004 - General Regulation on Fishing: Provide the general guidance on the importance of fisheries and sustainable exploration and encourage to create the employment through the fishery industry;
- Law No.6/2004 on Legal: Basis for Management and Regulation of Fisheries and Aquaculture;
- Decree Law 14/2004 – Offences of Fisheries: Provide the legal framework on the type and method of fishing activity that prohibited as they will damaged in fisheries industry and to protect aquatic environment and achieve sustainability in fishery;
- Government Resolution 9/2007 - National Policy of Forestry sector: The National Development Plan emphasizes the importance of a sustainable approach to the development and management of national forest resources. It recognizes the importance of forests for their biological diversity and that the conservation of forests is a priority task in planning forest development;
- Joint Ministerial Diploma No. 18/II/2017 (MTCI & MAF), List of Protected Aquatic Species;
- Decree Law No. 6/2004 of April 21, General Basis of the Legal Regime of Fisheries and Aquaculture Management and Planning.

6 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study was done in order to collect baseline information which will be used to update nomination form for the registration of the NKSNP as a UNESCO Biosphere Reserve. As such, the information was gathered through literature review and consultation with relevant stakeholders in order to understand the importance of NKSNP.

The study has collected some new information which can be used to update nomination form. There is an increase in overall park size, from initial size of 123,600 ha to 130,600 ha, consisting of 72,000 ha terrestrial environment and 58,600 ha marine environment. This change was due to the inclusion of 3 more villages to the NKSNP such as Fuat, Lore 2 and Ilomar 1. This change was done to provide a corridor for the movement of important species found in the area as well ensuring forest connectivity. Other changes include the identification of endangered and endemic species, identification and preservation of cultural sites and paintings and new policies and laws have been developed for conservation objectives. The study also identified development plans and policies from relevant sectors. Tourism sector has a plan in place to implement in Jaco for tourism sites and visitor management. The Director of Cultural Patrimony reported to have plan in place for more research in the NKSNP in order to identify and preserve cultural objects for tourism purposes.

Another result from this study is the collection of essential information on the result of studies and plans from the National Petroleum and Minerals Authority about hydrocarbon reserves beneath the NKSNP. It reported that through a preliminary study, the Petroleum Authority has identified potential accumulation of hydrocarbon in the NKSNP. Therefore, the Petroleum Authority has planned for more in depth studies to ensure whether resources below the surface indeed petroleum.

The study also further highlights threats facing the NKSNP. This includes habitat destruction and fragmentation, illegal hunting and logging and climate change among other factors.

The study is unable to update data on potential zones distribution of the additional villages. Therefore, efforts need to be made in order to finalize the mapping, incorporating new areas into the potential distribution map.

6.2 Recommendations

1) The report shows more efforts need to be made to finalize the mapping- and understand the distribution- of potential zones within the NKSNP, in light of the 3 additional villages. Through discussion with National Director of Nature Conservation, it was learned that despite the perimeter of the NKNSP including the three additional villages has been finalized, more work is required to do socio-economic analysis of the three new villages as well identification of the existing resources for zonation objectives. In addition, it was revealed that despite the potential distribution of zones for the 6 villages were already marked, it is necessary to further survey the area in order to verify the zones and determine boundaries or space between each zone. Therefore, it is recommended that UNESCO to continue supporting the Directorate General of Forestry, both in terms of technical and financial in order to finalize the pending activities. This would provide final boundary and potential area of each zone of the NKSNP. The stages that need to be taken to finalize mapping and determine permanent boundaries for each zone are:

- Undertake participatory mapping exercise, involving stakeholders at both national and local levels, to determine potential sites for each zone of the three new villages. This should include a visit to each village and hold meetings with relevant stakeholders. Participants in this participatory meeting should include villagers and sub-village chiefs, traditional leaders, youth and women leaders and elderly people. During the meeting participants will be asked to map their village for ritual or cultural sites, recreational sites, agricultural sites, firewood collection sites, identify important caves, etc. upon completion of the participatory mapping exercise, participants would be asked to accompany the team to directly observe the site in order to take coordinate point for digital mapping purposes;
- When undertaking mapping exercise, socio-economic data can also be gathered through interviews with selected stakeholders, discussions with communities and field observation;
- When the first two activities have been completed; a final stage of the mapping exercise can be carried out with all other villages to determine total area and permanent site boundaries of each zone. This should include activities such as walking through villages or parks to observe and verify all potential sites for zones and make final decisions for core, buffer and transition zones. Villagers' participation in this

exercise important to ensure that they understand and comply with the management criteria for each zone.

- 2) It was learned through consultation with sectoral stakeholders that there is a need to speed up the establishment of the Man and Biosphere (MAB) committee. This would facilitate a cross-sectoral and multi-level coordination. Relevant stakeholders need to be part of the committee and a secretariat needs to be established for the purpose. This would require sustained finance support for its operation. It is recommended for UNESCO to follow up the process of establishing the MAB committee and ensure the importance of country ownership.
- 3) Various stakeholders voiced their concerns over the MAB nomination process, which has been taken a lot time and has not been completed. It was suggested that those who involve in the process need to be serious in order to finalize the process and move on the implementation. Due to the long and often very slow process, there was an alternative process taken up by Conservation International (CI) to produce different management zones for the NKSNP. CI has planned to produce a zoning system for the NKSNP and be finalized through a ministerial dispatch. However, CI indicated to be willing to withhold its zonation process and support the MAB nomination process, with a note the process should be speed and be finalize according to the timeline (by the end of 2021). Therefore, it is recommended that the nomination process should be speed up and pending activities should be completed in timely manner. This includes the establishment of MAB committee, finalization of mapping exercise in the terrain, updating and nomination form and submission to the UNESCO secretariat.
- 4) It was learned that part of the challenges for a sustained management support for the NKSNP is the lack of resources, both human resources and financial, within the Department of Protected Areas. Currently, they have only 18 personnel including the Head of Department with 44 terrestrial protected and 2 marine protected areas. Of the 18 personnel, 7 forest guards assigned to guard NKSNP, 3 forest guards to Suai while only 8 at the national office. With only 7 guards overseeing 130,600 ha of the national or 720 ha of the terrestrial is a daunting task. Therefore, it is recommended that UNESCO and other relevant agencies support protected areas in Timor-Leste to search for a sustainable management system for protected areas in Timor-Leste. This might involve communities and NGOs in order to leverage challenges facing protected areas in Timor-Leste. Efforts should be made to find alternative mechanisms that are sustainable for the NKSNP.

- 5) It was also learned that a due process needs to be taken within the Ministry of Agriculture and Fisheries, especially within the department of protected areas. An assessment needs to be carried out in order to understand about challenges in the management of the NKSNP and decide the best solution to reimagining the management of the NKSNP. This might involve decentralizing management into small management units across the 9 villages involving village chiefs and municipal president and administrative posts administrator. This would help address challenges experienced in centralized management system and allow the national department to focus on policies, laws as well as embracing controlling power, rather than implementing or managing activities which might be better carried out at a lower level. This approach warrants a further serious discussion among stakeholders. Therefore, it is recommended for UNESCO to provide necessary assistance in facilitating this process and be able to produce a sustainable management system for the NKSNP. Ideally, a management system that in long run can be self-sustained.
- 6) It was also learned that a site management plan for NKSNP has been drafted at the technical level. This site management will guide how the management of NKSNP can be done and sustained, which involve a multi-sectoral coordination at the national level, while at the local level, it involves communities, village chiefs and traditional leaders (lia nain). It also set how the management for each zone is carried out. However, the document has been at the disposal of the Director General for sometimes. Therefore, it is recommended for UNESCO to work with the office of Directorate General of Forestry to facilitate the coordination and finalization of the site management plan at the technical level. Concerns were raised during stakeholders' consultation that the site management plan which has not been finalized, despite a draft has been finalized at the technical level. The remaining process include briefing relevant sectors and stakeholders, both at the national and grassroots levels, on the plan, a validation workshop at the national level, incorporating stakeholders' inputs from the workshop, presentation of the plan to Council of Ministers for approval. A National consultant with legal qualification can help facilitate and speed up the process as the Director General Office experiences limited personnel.
- 7) Areal studies conducted by the National Petroleum and Minerals Authority shows that there is possibility that the whole terrestrial part of NKSNP has hydrocarbon reserves. More seismic studies are required to ensure the resource beneath the surface is gas reserve or water. It was also revealed that challenges in the coordination between the ANPM and MAF, especially Directorate General of Forestry. Therefore, it is recommended to maintain good

coordination with the ANPM in the view of sharing relevant information and regularly providing information on NKSNP site management plans according to MAB zones.

- 8) It was identified that the National Directorate of Cultural Patrimony had been using an old memorandum of understanding (MoU) between the Ministry of Education (MoE) and the Australian National University (ANU) for archeological research related activities including in the NKSNP. This MoU was in place prior to the declaration of NKSNP. Concerns were also raised by other stakeholders that archeological research through excavation in the NKSNP with the objective of discovering past evidences might lead to more destruction to biodiversity within the NKSNP, with unknown benefits for Timor-Leste as all the analysis were carried out in Australia, as very limited Timorese scientists involved in the process. Therefore, it is recommended to first review the existing MoU for the research into consideration that the NKSNP is a national park and in the nomination process for biosphere reserve with UNESCO. It would be important for future research to involve Tertiary institutions in Timor-Leste for knowledge transfer and be able to carry out research when the cooperation is ceased.
- 9) It was also identified that communities in the NKSNP have reported to have observed an increase in fish stock. This might be due to the implementation of marine protected areas (MPA). However, the National Director of Fisheries Management of the Ministry of Agriculture and Fisheries indicated, it would be necessary to conduct a study in order to understand the situation. Therefore, it is recommended to have a study on fish improvement stock in the MPA of the NKSNP. The result of this exercise can help to inform decision making at the national level and help sensitize communities on the importance of the protected areas and be able to participate in the conservation and protection activities. This would help the government in the blue economy development.
- 10) It was identified that many community members still engage in the hunting activities within the NKSNP. Most often they kill possums and rusa deers that have been listed as protected species in the country. Law enforcement might be necessary but experience has shown it has limited success. Therefore, it is recommended to have a sustained campaign on the protection of protected species in the country both at the national and community levels. This is because a sustained political will from senior politicians and community leaders can influence communities' behaviors toward protected species.

- 11) It also identified past assistance from the government such as distribution of domestic animals and horticultural activities to encourage alternative livelihoods were not successful, as the assistance did not yield any positive results as they were not taken up seriously by communities. Therefore, it is recommended to relevant agencies including UNESCO to find alternative ways in supporting communities that have sustainable impacts in the future.
- 12) Tourism has set a priority for tourism activities in the NKNSP, therefore, it is recommended to speed up finalization and approval of the Site Management System in order to guide all activities in the NKSNP including tourism development.
- 13) It is also recommended for UNESCO to consider extending its assistance into supporting the management of all other protected areas in the country. The support can be done through producing a road map for management for all protected areas in Timor-Leste. This roadmap should involve consultation with all stakeholders at the municipal level and be able to facilitate the sense of ownership at municipal level. This could be carried out through supporting the protected areas department to engage municipal authorities to produce their municipal map of protected areas which can guide agencies interventions in the future.
- 14) Another area needing assistance is capacity building for rangers. Having qualified rangers has been a priority from the previous governments. It would be necessary to have rangers with sufficient facilities for the NKSNP. Therefore, it is recommended for UNESCO to support capacity building in this field as it helps the management of the NKSNP.

REFERENCES

- Babo Soares, D. (2003). Political developments leading to the referendum. In J.J. Fox, & D. Babo Soares (Eds.), *Out of the ashes: destruction and reconstruction of East Timor* (pp. 53–73). Canberra: ANU Press.
- Barnett, J., Dessai, S., & Jones, R. (2007). Vulnerability to climate variability and change in Timor-Leste. *Ambio: A journal of Human Environment*, 36(5), 372–378. doi: [http://dx.doi.org/10.1579/0044-7447\(2007\)36\[372:VTCVAC\]2.0.CO;2](http://dx.doi.org/10.1579/0044-7447(2007)36[372:VTCVAC]2.0.CO;2)
- BirdLife International (2021) *Country profile: Timor-Leste*. Available from <http://www.birdlife.org/datazone/country/timor-leste>. Checked: 2021-01-24
- Charlton, T. R. (2002). The petroleum potential of East Timor. *The APPEA Journal*, 42(1), 351-369.
- Cowie I. (2006). *A Survey of Flora and Vegetation of the Proposed Jaco–Tutuala–Lore National Park, Timor-Leste (East Timor)*. A report to Birdlife International. Northern Territory Herbarium.
- Da Silva, A. L. (2020). *Food Sovereignty: alternative policy for a sustainable national food system in Timor-Leste under climate change*. Germany: Lambert Academic Publishing (LAP).
- Dos Reis Martins, J. (2020). *Resolving Disputes in Relation to Fisheries and Environment*. Presentation to Asean Regional Forum. Presentation note, Dili, Timor-Leste.
- Fox, J. J. (2003). Drawing from the past to prepare for the future: responding to the challenges of food security in East Timor. In H. da Costa, C. Pigging, C. J. da Cruz, & J. J. Fox (Eds.), *Agriculture: new direction for a new nation-East Timor (Timor-Leste)*, Proceedings of a workshop 1-3 October 2002, Dili, East Timor (pp. 106–114). Canberra: ACIAR.
- Fox, J. J. (2008). Repaying the debt to mau kiak: reflections on Timor’s cultural traditions and the obligations of citizenship in an independent East Timor. In D. Mearns, & S. Farram (Eds.), *Democratic governance in Timor-Leste: Reconciling the local and the national* (pp. 119–128). Darwin: CDU Press.
- Grantham, H.S., Watson, J.E.M., Mendes, M., Santana, F., Fernandez, G., Pinto, P., Riveiro, L., & Barreto, C. (2010). *National Ecological Gap Assessment for Timor-Leste 2010*. Prepared on behalf of the United Nations Development Program and the Department of Protected

Areas and National Parks of Timor-Leste by CNRM Solutions Pty Ltd, Byron Bay, New South Wales.

IPCC. (2001). *Climate change 2001: Synthesis report. Summary for policymakers*. Retrieved from <http://www.ipcc.ch/pdf/climate-changes-2001/synthesis-spm/synthesis-spm-en.pdf>.

Mau, R. (2010). Ecosystem and community based model for zonation in Nino Konis Santana National Park, Timor Leste. Thesis. Bogor Agriculture University.

McIntyre, M.A., (2011). *Capacity Development Action Plan for the Programme of Works on Protected Areas, Part 1 Situation Analysis, Timor Leste, 2011*. Prepared for the Department of Protected Areas and National Parks, Ministry of Agriculture and Fisheries, Government of Timor Leste with the assistance of United Nations Development Program, Timor-Leste and the Global Environment Facility. Planning for Sustainable Development Pty Ltd, Landsborough, Queensland, Australia.

McMichael, P. (2011). Food system sustainability: Questions of environmental governance in the new world (dis)order. *Global Environmental Change*, 21(3), 804-812. doi: 10.1016/j.gloenvcha.2011.03.016.

McWilliam, A. (2005). Houses of resistance in east timor: Structuring sociality in the new Nation1. *Anthropological Forum*, 15(1), 27-44. doi:10.1080/0066467042000336698

McWilliam, A. (2015). Rural–Urban inequalities and migration in Timor-Leste. In S. Ingram, L. Kent, & A. McWilliam (Eds.), *A new era? Timor-Leste after the UN* (pp. 225–234). [Acton], ACT: ANU Press.

NSD, & UNFPA. (2011). *2010 Population and housing census of Timor-Leste: Population distribution by administrative areas*. Dili: RDTL. Retrieved from <https://www.mof.gov.tl/wp-content/uploads/2011/06/Publication-2-English-Web.pdf>.

O'Connor, S., Pannell, S., & Brockwell, S. (2011). Whose culture and heritage for whom? The limits of national public good-protected area model in Timor-Lese. In J.N. Miksic, G.Y. Goh, and S. O'Connor, (Eds.), *Rethinking Cultural Resource Management in Southeast Asia: Preservation, Development, and Neglect* (pp 39-66). Anthem Press.

O'Connor, S., & Pannell, S. (2006). Cultural heritage in the Nino Conis Santana National Park, Timor Leste: a preliminary assessment. *Unpublished report*.

- PEKA-UNESCO. (2014). *Mapping of the Existing Condition in Nino Konis Santana National Park Timor Leste*. Unpublished Final Report. PEKA Foundation - UNESCO - Jakarta, Indonesia.
- Rau, J. L. (2002). Mineral–Hydrocarbon Database and Bibliography of the Geology of East Timor. *United Nations Development Programme*.
- RDTL. (2010). *National adaptation programme of action (NAPA) on climate change*. Dili: RDTL.
- Seed of life. (2012). *Map of Annual Rainfall and Temperature in Timor Leste*. Available at <https://seedsoflifetimor.org/climatechange/>.
- Swaminathan, M. S., & Kesavan, P. C. (2012). Agricultural Research in an Era of Climate Change. *Agriculture Research*. Doi: 10.1007/s40003-011-0009-z
- TLAC. (2020). *Timor-Leste Agriculture Census: National Report on Final Census Result*. Dili: Directorate General of Statistics.
- Trainor, C. R. (2010). *Timor's fauna: the influence of scale, history and land-use on faunal patterning*. Faculty of Education, Health and Science. Darwin: Charles Darwin University

APPENDIXES

Appendix 1: List of multi-stakeholder consulted

No	NAME	POSITION	Organization
1.	Mr. Pedro Pinto	Head of Department for Protected Areas, National Directorate of Natural Conservation	Ministry of Agriculture and Fisheries
2.	Mr. João dos Santos	NKSNP Manager, Protected Areas Department, National Directorate of Natural Conservation	Ministry of Agriculture and Fisheries
3.	Mr. João Antalmo	National Director of Natural Conservation	Ministry of Agriculture and Fisheries
4.	Mr. João Carlos	Director General of Environment	State Secretary of Environment
5.	Mr. Rui Pires	National Director of Biodiversity	State Secretary of Environment
6.	Mr. Edson Robert Lopes Noronha	Acting Director General	Ministry of Tourism
7.	Ms. Adelina Soares	Staff from Director General of Tourism Office	Ministry of Tourism
8.	Mr. Gil Paulino Santos Oliveira	National Director Cultural Assets	State Secretary of Cultural Arts
9.	Mr. Celestino Cunha	National Director of Fisheries Management	Ministry of Agriculture
10.	Florentino Mateus Soares Ferreira	President	National Petroleum and Minerals Authority
11.	Mr. João Fátima Fernandes	Head of Maritime Activities Department	Ministry of Transport and Communication
12.	Mr. Alberto Perreira	National Director of Maritime Transport	Ministry of Transport and Communication
13.	Mr. Manuel Mendes	Country Director	CI

Appendix 2: Questionnaire

This guide questions was used selectively for each respondent based on their qualities. It is just a trigger questions. More follow up questions were asked depending on the topics.

- 1) Would you please give some information about activities that have been carried out by/with your department/organization's support?
- 2) How many cultural sites, new species (terrestrial or marine) your department/organization has indentified since 2014?
- 3) To what extend your organization see the importance of the NKSNP? Is there policy or plan for your department/organization to be implemented in the NKSNP in the future? Would you please explain to us your sectoral development policy?
- 4) Is there any research being carried your department/organization within the NKSNP?
- 5) Is there any activity you identified causing any problem to NKSNP?
- 6) What is best way for NKSNP management? What are challenges you observed so far?
- 7) How do you intersectoral cooperation?
- 8) What are challenges facing your sector in terms of carrying out activities in the NKSNP?
- 9) Do you have any thought on how to best manage the NKSNP in the future?