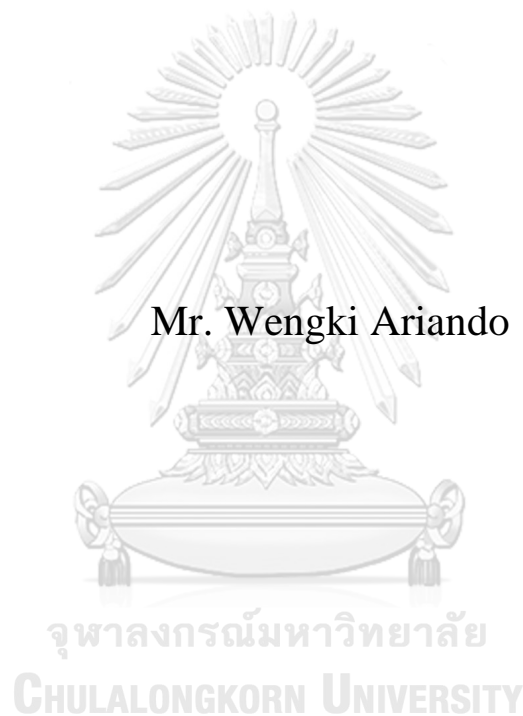


Traditional Ecological Knowledge of Indigenous Peoples on  
Climate Change Adaptation: A Case Study of Sea Nomads  
“Orang Suku Laut”, Lingga Regency, Riau Islands Province,  
Indonesia



Mr. Wengki Ariando

A Thesis Submitted in Partial Fulfillment of the Requirements  
for the Degree of Master of Arts in Environment, Development and  
Sustainability  
Inter-Department of Environment, Development and Sustainability  
Graduate School  
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ความรู้ดั้งเดิมด้านนิเวศวิทยาของชนพื้นเมืองในการปรับตัวต่อการเปลี่ยนแปลงสภาพภูมิอากาศ:  
กรณีศึกษา กลุ่มชินอแมต “อุรัง ชุก ลีวด” เมืองลิงกา จังหวัดเกาะเรียว ประเทศอินโดนีเซีย



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สาขาวิชาสิ่งแวดล้อม การพัฒนา และความยั่งยืน สหสาขาวิชาสิ่งแวดล้อม การพัฒนาและความ  
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Field of Study	Environment, Development and Sustainability
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เวงกี อารีอันโต : ความรู้ดั้งเดิมด้านนิเวศวิทยาของชนพื้นเมืองในการปรับตัวต่อการเปลี่ยนแปลงสภาพภูมิอากาศ:  
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กาล

ความรู้ดั้งเดิมด้านนิเวศวิทยาได้มีการยอมรับบทบาทสำคัญของชนพื้นเมืองในการต่อสู้กับการเปลี่ยนแปลงสภาพภูมิอากาศในระดับนานาชาติ การปฏิบัติและความเชื่อทางวัฒนธรรม และความสามารถในการปรับตัวของชนพื้นเมือง อูรัง ซูกู ลีวค ชนพื้นเมืองของประเทศอินโดนีเซียที่อาศัยอยู่ในทะเล อาจนำมาพิจารณาเป็นตัวขับเคลื่อนสำคัญ นำไปสู่ประสิทธิภาพในการปรับตัวต่อการเปลี่ยนแปลงสภาพภูมิอากาศ การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อศึกษาองค์ความรู้เชิงนิเวศแบบดั้งเดิมของชนพื้นเมืองในการปรับตัวต่อการเปลี่ยนแปลงสภาพภูมิอากาศของชนพื้นเมือง อูรัง ซูกู ลีวค อำเภอลิงกา จังหวัดเกาะเรียว ประเทศอินโดนีเซีย สำหรับนโยบายที่เหมาะสมต่อการเปลี่ยนแปลงสภาพภูมิอากาศในชุมชน ข้อมูลวิจัยมีมาจากการค้นคว้า และข้อมูลปฐมภูมิมาจากการสังเกตการณ์ภาคสนามและการสัมภาษณ์เชิงลึก โดยใช้แบบสอบถามถึงโครงสร้าง จากจำนวนผู้ตอบแบบสอบถามทั้งหมด 77 คน ที่ทำการเลือกโดยใช้วิธีการสุ่มตัวอย่างแบบเจาะจง ซึ่งประกอบด้วย ชนพื้นเมือง อูรัง ซูกู ลีวค (ร้อยละ 37.66) และผู้มีส่วนได้ส่วนเสียที่เกี่ยวข้อง (ร้อยละ 62.34) การสัมภาษณ์กลุ่มชนพื้นเมือง อูรัง ซูกู ลีวค แบ่งออกเป็นสี่กลุ่ม ได้แก่ ผู้ใหญ่บ้าน (ร้อยละ 31.03), ผู้สูงอายุ (ร้อยละ 25.59), เยาวชน (ร้อยละ 24.14), ผู้หญิง (ร้อยละ 17.24) ข้อมูลที่ได้นำมาถูกวิเคราะห์โดยใช้วิธีทางสถิติการวิเคราะห์เชิงพรรณนาและเนื้อหา การศึกษาพบว่าผู้ตอบแบบสอบถามทุกคนเข้าใจดีเกี่ยวกับการเปลี่ยนแปลงสภาพภูมิอากาศ และผู้ตอบแบบสอบถามร้อยละ 97.12 ให้ความสำคัญของการเปลี่ยนแปลงสภาพภูมิอากาศและผู้ตอบแบบสอบถามร้อยละ 98.28 ตระหนักว่าสภาพภูมิอากาศในปัจจุบันกำลังเปลี่ยนแปลง องค์ความรู้เชิงนิเวศแบบดั้งเดิมของชนพื้นเมือง อูรัง ซูกู ลีวค พบว่าเป็นกิจกรรมที่เพียงพอในการต่อสู้กับการเปลี่ยนแปลงสภาพภูมิอากาศผ่านการเชื่อมต่อระหว่างการปฏิบัติทางวัฒนธรรมของพวกเขา (ร้อยละ 53.3) ความเชื่อทางวัฒนธรรม (ร้อยละ 33.3) และความสามารถในการปรับตัว (ร้อยละ 13.4) องค์ความรู้เชิงนิเวศแบบดั้งเดิมในการปฏิบัติทางวัฒนธรรม ได้แก่ การพยากรณ์อากาศ วิธีการตกปลาแบบดั้งเดิม ยาแผนโบราณ การเตรียมความพร้อมต่อภัยพิบัติ คาราศาสตร์ทางวัฒนธรรม การเพาะเลี้ยงสัตว์น้ำ การอนุรักษ์ป่าชายเลน และการอนุรักษ์แนวปะการัง ในขณะที่เดียวกัน สำหรับความเชื่อทางวัฒนธรรมของชนพื้นเมือง อูรัง ซูกู ลีวค นั้นรวมถึงกฎหมายจารีตประเพณี มนต์และลาภา พิธีสืลให้พร พิธีล้างความชั่วร้าย และวัสดุเอกประสงค์ สำหรับความสามารถในการปรับตัวนั้น สถาปัตยกรรมพื้นถิ่นและการย้ายถิ่นในพื้นที่เป็นองค์ความรู้เชิงนิเวศแบบดั้งเดิมของพวกเขา สำหรับนโยบายและโครงสร้างการพัฒนาที่เกี่ยวข้องกับการเปลี่ยนแปลงสภาพภูมิอากาศที่เกี่ยวข้องกับชนพื้นเมือง อูรัง ซูกู ลีวค นั้น พบว่าไม่มีโครงการใดในปัจจุบันจากข้อมูลของเจ้าหน้าที่ของรัฐและผู้มีส่วนได้ส่วนเสียที่เกี่ยวข้อง อย่างไรก็ตาม มีการวางแผนที่จะพิจารณาองค์ความรู้เชิงนิเวศแบบดั้งเดิมเกี่ยวกับการปรับตัวแบบอัตโนมัติของชนพื้นเมือง อูรัง ซูกู ลีวค รวมถึงแนวทางในแผนปฏิบัติการอินโดนีเซียเรื่องการปรับตัวต่อการเปลี่ยนแปลงสภาพภูมิอากาศ การศึกษาครั้งนี้ขอแนะนำการมีส่วนร่วมของชนพื้นเมือง อูรัง ซูกู ลีวค แบบการมีส่วนร่วมแบบฉันทานุมัติที่ได้รับการรับรู้ การบอกแจ้งล่วงหน้า และความเป็นอิสระ (FPIC) ในการปกป้ององค์ความรู้เชิงนิเวศแบบดั้งเดิมเกี่ยวกับการปรับตัวต่อการเปลี่ยนแปลงสภาพภูมิอากาศที่เป็นมิตรต่อสิ่งแวดล้อม

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สาขาวิชา สิ่งแวดล้อม การพัฒนา และความยั่งยืน ลายมือชื่อนิสิต .....  
ปีการศึกษา 2561 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

# # 6087596820 : MAJOR ENVIRONMENT, DEVELOPMENT AND SUSTAINABILITY

KEYWORD: Traditional Ecological Knowledge (TEKs), Indigenous Peoples (IPs), Climate Change Adaptation, Indonesian Sea Nomads, Orang Suku Laut

Wengki Ariando : Traditional Ecological Knowledge of Indigenous Peoples on Climate Change Adaptation: A Case Study of Sea Nomads “Orang Suku Laut”, Lingga Regency, Riau Islands Province, Indonesia . Advisor: SANGCHAN LIMJIRAKAN, D.Tech.Sc.

At the international community, Traditional Ecological Knowledge (TEKs) have been recognized and acknowledged the important roles of indigenous peoples to tackle climate change. The cultural practice, cultural belief and adaptive capacity in managing nature by the *Orang Suku Laut* (OSL), Indonesian indigenous group who are living as nomads in the sea, would be considered as the key drivers to achieve the effectiveness of climate change adaptation (CCA). This research aimed to study the TEKs of indigenous peoples on CCA of the OSL, Lingga Regency, Riau Islands Province, Indonesia, for appropriate CCA policy implemented at their communities. Data collection was obtained from the desk study as a secondary data, a field observation, and an in-depth interview for a primary data by using a set of semi-structured questionnaires. The number of respondents (n=77) were selected by using the purposive-sampling method which consists of the native’s OSL (37.66 percent) and related stakeholders (62.34 percent) who are working with the OSL including government officials, society, expert and academic, non-governmental organization, and private sector. The OSL interviewed was divided into four groups, namely headmen (31.03 percent), elder (27.59 percent), youth (24.14 percent), and women (17.24 percent). They are living in the land and staying in the boat. Data collected were analyzed using the statistical and descriptive and content analysis. The study found that all of the respondents well comprehended about climate change and its impacts. 97.12 percent of the respondents knew the meaning of climate change, and 98.28 percent realized that the current climate is changing. Therefore, the TEKs of the OSL was found as adequate activities in combating climate change through the interconnection among their cultural practice (53.3 percent), cultural belief (33.3 percent), and adaptive capacity (13.4 percent). The TEKs on cultural practices are weather forecasting, traditional fishing method, traditional medicine, disaster preparedness, cultural astronomy, aquaculture, mangrove conservation, and coral reef conservation. Meanwhile, for the cultural belief of the OSL included customary law (*Pantang Larang*), mantra and spell (*Pengasih* and *Ilmu*), blessing ceremony (*Zemah Kampung*), washing ceremony (*Melange Ceremony*), and multiple purposes materials (*Kajang*). For adaptive capacities, vernacular architecture and local migration are their TEKs. The study also found that their TEKs on CCA has degraded by generations. Regarding policy and development project on CCA related to the OSL, it disclosed that there is no CCA' project for them presently both from governmental officials and related stakeholders. Nevertheless, they plan to take consideration for the TEKs regarding the autonomous adaptation of the *Orang Suku Laut* as well as guided by the Indonesian action plans on CCA (RAN-API). The study would highly recommend the involvement of the OSL through the Free, Prior, and Informed Consent (FPIC) participation in protecting the TEKs on CCA as friendly environmental practice.

Field of Study:	Environment, Development and Sustainability	Student's Signature .....
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## LIST OF ABBREVIATIONS

AMAN	<i>Aliansi Masyarakat Adat Nusantara</i> (alliance of indigenous peoples of the archipelago)
BMKG	<i>Badan Meteorologi Klimatologi dan Geofisika</i> (meteorology, climatology, and geophysical agency)
CAF	Cancun Adaptation Framework
CCA	Climate Change Adaptation
COP	Conference of the Parties
COREMAP	Coral Reef Rehabilitation and Management Program
CSO	Civil Society Organization
CTI	Coral Triangle Initiative
DJF	December-January-February
EDS	Environment Development and Sustainability
ENSO	El-Nino - Southern Oscillation
FPIC	Free Prior and Informed Consent
GHG	Greenhouse Gas
GIS	Geographical Information System
GPS	Global Positioning System
ICCSR	Indonesia Climate Change Sectoral Roadmap
ICCTF	Indonesia Climate Change Trust Fund
ILO	International Labour Organization
IOD	Indian Ocean Dipole
IPCC	Intergovernmental Panel on Climate Change
IPMG	Indigenous Peoples Major Group
IPPF	Indigenous Peoples Planning Framework
IPs	Indigenous Peoples
IUCN	International Union for Conservation of Nature
IUU	Illegal Unreported Unregulated
IWGIA	International Work Group for Indigenous Affairs
JJA	June-July-August
KAT	<i>Komunitas Adat Terpencil</i>

	(isolated and vulnerable community)
LCDI	Low Carbon Development Initiatives
LCIPP	Local Communities and Indigenous Platform
MAM	March-April-May
MHA	<i>Masyarakat Hukum Adat</i> (indigenous peoples of Indonesia)
MJO	Madden-Julian Oscillation
MPR	<i>Majelis Permusyawaratan Rakyat</i> (people consultative assembly)
NDC	National Determined Contribution
NGO	Non-Governmental Organization
NWP	Nairobi Work Program
ONI	Ocean Nino Index
OSL	<i>Orang Suku Laut</i>
PLN	<i>Perusahaan Listrik Negara</i> (Indonesia state electricity corporation)
PT	<i>Perseroan Terbatas</i> (limited liability company)
RAD-TPB	<i>Rencana Aksi Daerah-Tujuan Pembangunan Berkelanjutan</i> (Local action plan on sustainable development goals)
RAN-API	<i>Rencana Aksi Nasional-Adaptasi Perubahan Iklim</i> (National action plan on climate change adaptation)
RAN-GRK	<i>Rencana Aksi Nasional-Gas Rumah Kaca</i> (National action plan on greenhouse gas emission reduction)
RAN-TPB	<i>Rencana Aksi Nasional-Tujuan Pembangunan Berkelanjutan</i> (National action plan on sustainable development goals)
REDD	Reducing Emissions from Deforestation and Forest Degradation
RZWP3K	<i>Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil</i> (coastal and small islands zoning plan)
SDGs	Sustainable Development Goals

SNC	Second National Communication
SON	September-October-November
SST	Sea Surface Temperature
TEK	Traditional Ecological Knowledge
TNA	Technology Needs Assessment
TNC	Third National Communication
UNDP	United Nations Development Programme
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNFCCC	United Nations Framework Convention on Climate Change
UNIPP	United Nations Indigenous People Partnership
UNPFIP	United Nations Permanent Forum on Indigenous Peoples
USAID	United States Agency for International Development
WCIP	World Conference on Indigenous Peoples
WMO	World Meteorological Organization



# CHAPTER I

## INTRODUCTION

### 1.1 Background and Importance of the Study

Regarding climate change, socio-economic, and biophysical global interaction has made a transformation of communities in their way of life and thinking. One of the vulnerable groups to climate change impact is Indigenous Peoples (IPs). The IPs are native and successor of distinctive cultures and ways of linking with people and the environment whose have treasured cultural, social, economic, and also political characteristics that are diverse from those of the resolute societies in which they are living (United Nations, 2013). In the present time, the IPs are encountering the degraded of beliefs and knowledge for their livelihood. Therefore, many traditional societies of the IPs are suffering to keep their local cultures and intergenerational knowledge transmission because of globalization (Beckford, 2017). According to Alexander et al. (2011), the knowledge of the IPs could present a comprehensive expansion of knowledge in general and understanding of global warming and sea-level rise for years.

The IPs have the capability and understanding to adapt themselves to climate change, known as Traditional Ecological Knowledges (TEKs). The TEKs are a comprehensive knowledge of species, environments, and their interactions accrued and passed down over multiple generations (Drew, 2005). The TEKs denote the experience obtained over thousands of years of direct human contact with the environment particularly in climate change adaptation (IPCC, 2014). The TEKs consist of community beliefs, best practices, and capacities to adapt the uncertainty and impacts of climate change (Berkes, 1993). Furthermore, cultural beliefs as chiefly practices in many years are becoming the challenges for current generations. Whereas, the TEKs are always unsynchronized in any project development and implementation. The reconstruction of the IPs in culture stemming from climate change has transformed because of the fragmentation of the culture, countryside, and language (Sánchez-Cortés & Chavero, 2010).

In this regard, the IPs and climate change adaptation have proofed a mutual relation to each other. The IPs are accomplished group in managing the natural balance with their TEKs as adaptive capability and recognized as a vulnerable group to climate change. Besides, they also the contributor to natural degradations if they misplace the TEKs and external factors. The external factor include the unsuitable development program and the lack of regulation for the IPs. In 2014, the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) Working Group II stated that the IPs have a role as the cultural dimension in combating climate change by their TEKs. Unfortunately, the IPs are infrequently considered in academic, policy and public discourses on climate change (Salick & Ross, 2009). A less of research on climate also assuredly holds such roles (Ford et al., 2012). Indeed, the integration of TEKs with available scientific knowledge could be a pathway for constructing the adaptability of climate change (Negi et al., 2017).

In Indonesia, the IPs are *Masyarakat Hukum Adat* who defined as Indonesian citizens who possess unique characteristics, live in harmony according to their customary law, have a bond to the ancestral origins and residence equality (Warman, 2014). The IPs have a healthy relationship between daily environmental activities and the value system that determines economic, political, social order, culture, law and utilize one area for generations. Nowadays, the IPs in Indonesia are suffering in their right and their livelihood losses. The IPs who live on land, they have been championed by the Non-Governmental Organization (NGO) and the government policy in the project of Reduce Emissions from Deforestation and Forest Degradation (REDD). While the IPs who live in the sea and coastal areas namely *Orang Suku Laut* (Sea Nomads) have a limited development project in protecting their beliefs and their knowledge in adapting to climate change. The research on the TEKs of the *Orang Suku Laut* in Indonesia is quite challenging in providing information and opportunity to both national and local governments to develop climate change policy and to implement appropriate climate change adaptation projects based on adaptive capacity through their the TEKs. Importantly, this study would provide valuable recommended policy guidance at both of local and national governments.

## 1.2 Research Objective

- To study the traditional ecological knowledge of indigenous peoples on climate change adaptation of the *Orang Suku Laut* (Sea Nomads), Lingga Regency, Riau Islands Province, Indonesia for appropriate climate change adaptation policy implemented at their communities.

## 1.3 Research Questions

- What traditional ecological knowledge and adaptive capacity of indigenous peoples in climate change adaptation are? and how their implications are being?
- What are the national and local policies implemented on climate change adaptation at the indigenous peoples communities studied?

## 1.4 Scope of the Study

- The study focused on indigenous peoples in Indonesian Sea Nomads “*Orang Suku Laut*”, Lingga Regency, Riau Islands Province.
- The traditional ecological knowledge practices of the indigenous peoples were studied in a general perspective which is related to climate change adaptation.
- Primary and secondary data of the traditional ecological knowledge of the indigenous peoples, the *Orang Suku Laut* obtained from desk studies, direct observation, and primary data were collected using semi-structured questionnaire and in-depth interviews.
- In-depth interview using a purposive sampling method was applied to stakeholder involvement in the study area.
- The climatic data was used to support the evidence for climate change in the study area, such as temperature, rainfall, wind speed, wind direction, and Nino 3.4 index for 31 years (1987-2018).
- The socioeconomic data was collected from the local institutions and organizations who are working with the *Orang Suku Laut*.

- Policy analysis was conducted using documents related to climate change adaptation and indigenous peoples particularly for the *Orang Suku Laut* at national level to local level.
- Both quantitative and qualitative approaches were applied to data analysis.

### 1.5 Expected Outcomes

The expected outcomes of this study follow:

- A set of traditional ecological knowledge and adaptive capacity of the *Orang Suku Laut* in climate change adaptation.
- A suitable climate change adaptation policy implemented for the *Orang Suku Laut*.

### 1.6 Operational Definition

- Climate Change

Climate change alludes to a change in the state of the climate that can be identified such as using statistical tests, whether due to natural and climate variability or as a result of human activity in long-term periods by directly and indirectly impacted to human activity (IPCC, 2007). Climate change is not a purely scientific problem which defining human behavior as anthropogenic drivers to this apparent warming of the planet but also looking global change in all sector lies on the human in the social and economist views (Urry, 2015). Climate change has two options for minimizing and tackling the impacts, and there are adaptation and mitigation. Mitigation focuses on climate process drivers and adaptation on impacts and vulnerabilities. Adaptation and mitigation options should be considered to implement over the next two to three decades, and their inter-relationship with sustainable development (IPCC, 2007).

- Climate Change Adaptation

Climate change adaptation is the capability to anticipate the adverse impacts of climate change and to take relevant actions to prevent the impacts or taking advantage of opportunities that may occur (IPCC, 2007). According to

UNFCCC (2014), climate change adaptation is the adjustments of climate change (process, practices, and structures) in ecological, social, or economic systems in response to actual or expected climatic stimuli and their impacts and also to occur the benefit from opportunities associated from them. Adaptation in climate change is a process through which societies make themselves better able to cope with an uncertain future and entails taking the right measures to reduce the adverse effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes (UNFCCC, 2007). Additionally, Epule et al. (2017) explained there is four adaptation option in climate change adaptation: technical, indigenous problem solving, social, and economic related to adaptation option.

- Adaptive Capacity

Adaptive capacity is the attributes of a system to adjust its characteristics or behavior, to expand its coping range under existing climate variability, or future climate conditions (IPCC, 2014). Adger and Vincent (2005) affirmed that adaptive capacity is a vector of resources to represent the asset base from adaptation actions and investments that can be determined and deliberated at several scales, from the individual to the nation. Therefore, adaptive capacity was also defined as the capability of living for the social-ecological system in adjusting the responses to change the internal demands and external drivers (Carpenter & Brock, 2008). Indeed, the adaptive approaches are defined as acceptance of anthropogenic climate change impact and attempt to adapt to a new climatic environment or prevention of change and attempt to maintain current systems under new climatic variations (Tanner-McAllister et al., 2017).

- Indigenous Peoples

Indigenous Peoples (IPs), native and successor of distinctive cultures and ways of linking with people and the environment whose have treasured cultural, social, economic, and also political characteristics that are diverse from those of the resolute societies in which they are living (United Nations,

2013). The International Labour Organization's (ILO) Convention concerning Indigenous and Tribal Peoples in Independent Countries Number 169 defined that the IPs as population inhabited in the country or a geographical region at the defeat as a group or the establishment of the boundaries in national or local level. The IPs are irrespective of their legal status, preserve some or all of their own social, economic, cultural and political institutions, and they have some respects, and such claims that can adequately and safely be treated as a special case (Sanders, 1999). In Indonesia, the IPs is recognized as *Masyarakat Hukum Adat*, the Indonesian citizens who possess unique characteristics, live in harmony according to their customary law, have a bond to the ancestral origins and residence equality (Warman, 2014).

- Traditional Ecological Knowledge

Traditional Ecological Knowledges (TEKs) are a comprehensive knowledge of species, environments, and their interactions accrued and passed down over multiple generations (Drew, 2005). The TEKs retrieve to the knowledge in accordance to the IPs and local peoples based on direct contact with the environment over many hundreds of years (Berkes, 1993). Berkes (2012) stated, there is no universal definition of the TEKs, but he offers three facets on which the TEKs might be outlined: firstly empirical, grounded, knowledge of species and environmental phenomena. The second one is the practices that individuals carry out concerning their environment and livelihood activities. Also, the last one as the beliefs and values which shape how they interact with their environment. Moreover, the TEKs are useful in defining prior environmental baselines, identifying impacts that need to be mitigated, providing observational evidence for modeling, providing technologies for adapting, and for identifying culturally appropriate values for protection from direct impacts or the impacts of adaptation measures themselves (Williams & Hardison, 2013).

- Sea Nomads: *Orang Suku Laut*

Sea nomads are as the strong sailor has the capacity to use their traditional ecological knowledge in managing the environment and facing climate change. Sea nomads in Indonesia often refer to the *Orang Suku Laut* as *Orang Laut* (sea people) and *Suku Sampan* (boat tribe) (Chou, 2003). The *Orang Suku Laut* diverse congeries of variously named groups inhabiting the Riau, Lingga Archipelago, Batam, and also in the coastal line of eastern Sumatra and Southern Johor and Singapore (Chou, 2006). According to Hidayah (2015), the *Orang Suku Laut* is staying as nomads and regularly move on depending on the current season and the availability of foods in their area. They will return ashore during the southern monsoonal season. Currently, sea nomads are scattered in the Lingga Regency, Riau Islands province. In the Lingga Regency, the *Orang Suku Laut* is located in five sub-regencies namely Lingga, North Lingga, Senayang, Selayar and West Singkep. The *Orang Suku Laut* was very primarily concentrated to be some significant crossroads of maritime commerce related coastal and strand peoples from a common cultural matrix (Sather, 2006).

## **CHAPTER II**

### **LITERATURE REVIEWS**

#### **2.1 Indigenous Peoples**

##### **2.1.1 Background and Concept**

The United Nation Division for Social Policy and Development on Indigenous Peoples (IPs) stated that the IPs are successor and native of distinctive cultures and ways of linking with people and the environment whose have treasured social, cultural, economic, and political characteristics that are distinct from those of the assertive societies in which they live (United Nations, 2013). Despite their cultural differences, the IPs from around the world stand up to share their experience and joint problems related to their right protections as distinct peoples (United Nations Economic and Social Council, 2017). The United Nations Indigenous People Partnership (UNIPP) estimated that there are approximately 400 million the IPs in the world, belonging to 5,000 different groups in 90 countries worldwide. The IPs are found in every region of the world. About 70 percent of them lives in Asia and constitutes about 5 percent of the world's population (Department of Economic and Social Affairs United Nations, 2015). Tauli-Corpuz et al. (2009) found the IPs in Asia region as the most frangible ecosystems ranging from tropical rainforests, high mountain areas, low-lying coastal areas, and floodplains as well as temperate forests. The lack definition of the IPs brings the category within contemporary international human rights discourse and practice as nongovernmental and intergovernmental organizations concerns in all levels (Sanders, 1999).

Presently, the IPs are arguably among the most disadvantaged and vulnerable groups of people in the world for climate change (Division for Social Policy and Development Indigenous People United Nations, 2018). The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) agreed for a definition of the IPs as the group that has the right to determine their own identity or membership under their customs and traditions (United Nations Economic and Social Council, 2017). Tauli-Corpuz et al. (2009) also stated the IPs as survivors who depended on



the land and natural resources from the ecosystems and the forefront of climate change impacts and threats. The IPs have their knowledge, traditional belief, community spirit, cultures, and languages as a distinctive group but they often face the misplace in development part (Ford et al., 2016).

In 2014, the Fifth Assessment Report of the IPCC Working Group II reported that the IPs have a role as the cultural dimension in combating climate change by their TEKs. The indigenous knowledge and knowledge-based practice are the backgrounds of indigenous resilience in building the capacity for climate change impacts (Nakashima et al., 2012). According to Chisanga et al. (2017), the TEKs indicated the knowledge which is generated by the community over an extended period of empowering themselves to learn from their environments. Moreover, the traditional ways of observing, understanding, and making sense of environmental change are the drivers to make the TEKs holders becoming a reasonable observer of climate change (Lejano et al., 2013). Indeed, incorporating the TEKs could add value to the development of sustainable climate change mitigation and adaptation strategies, because they are rich in grass root understanding contents, and planned in conjunction with local people (Nyong et al., 2007).

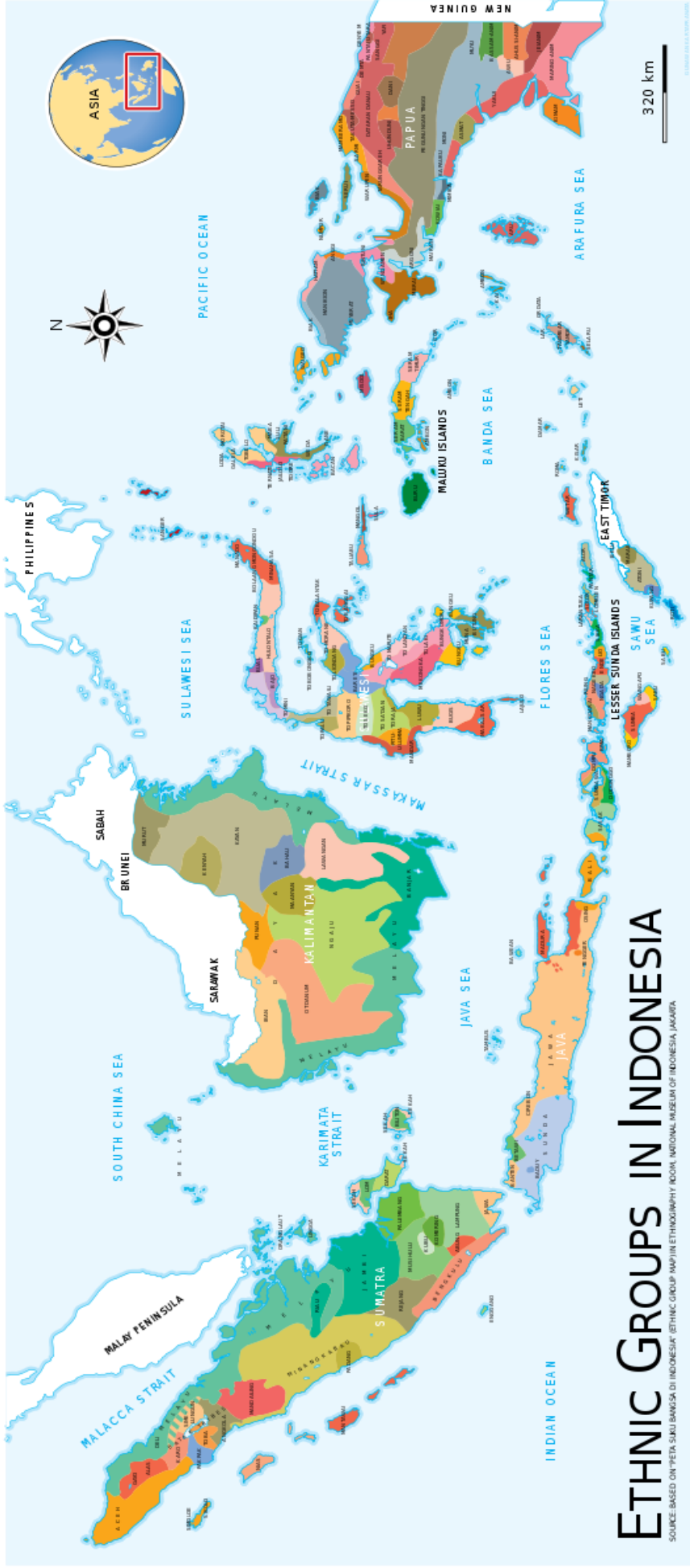
The IPs have been attracting the global attention to the development of strategies and for climate change adaptation policy despite the growth of their best practice to support the programs based on their needs (Petheram et al., 2010). The indigenous adaptation strategies such as cultivation, rainwater harvesting, and ecosystem services could highligh emerging countries to minimize their vulnerabilities to climate change impacts regarding improve and mainstreaming them into national and possibly global climate change adaptation plans (Opare, 2016). According to Palframan (2014), further directions for scientists, policy-makers, and practitioners whose dealing with climate change adaptation are suggested to integrate the TEKs and the experiences of frontlines experts in key policy arenas. The United Nations Permanent Forum on Indigenous Peoples (UNPFIP) built and provided the platform to identify opportunities for concrete action to recognize and strengthen the IPs' rights to lands, territories, and resource for member states. The platform will be launched on April

2018 and supported by all of the United Nations agencies and other related stakeholders for effective strategies to realize those rights (Departement of Social and Economic Affairs United Nations, 2018).

### **2.1.2 Indigenous Peoples in Indonesia**

Indonesia had a population of approximately 237 million and based on the data of the National Census 2010 recognized 1,128 ethnic groups (International Work Group for Indigenous Affairs, 2017) as shown in Figure 2.1. The Ministry of Social Affairs identified some indigenous communities that fondly named as *Komunitas Adat Terpencil* (KAT) that are isolated and vulnerable community (Ministry of Social Affairs, 2018). According to Minister's Decree of Ministry of Home Affair Indonesia Number 52 the Year 2014 on the guidelines of rules and right protection for the IPs, it explained that the IPs in Indonesia context is *Masyarakat Hukum Adat* (MHA) who defines as Indonesian citizens who possess unique characteristics, lives in harmony according to their customary law, have a bond to the ancestral origins and/or residence equality (Warman, 2014). They have a strong relationship between daily activities with the environment, and the value system that determines economic, political, social order, culture, law and utilize one area for generations. In the context of the MHA in coastal line and small islands, their rights and terms are acknowledged in the Indonesian Act No. 1 the Year 2014.

According to the International Work Group for Indigenous Affairs (International Work Group for Indigenous Affairs) in 2017, the third amendment to the Indonesian Constitution recognized the IP's rights in Article 18b-2. In more recent legislation, there is an implicit recognition of some rights of the IPs, including Act No. 5 the Year 1960 on Basic Agrarian Regulation, Act No. 39 the Year 1999 on Human Rights, Act No. 27 the Year 2007 on Management of Coastal and Small Islands, Act No. 32 the Year 2010 on Environment. The IPs are also enlightened in the People Consultative Assembly (*Majelis Permusyawaratan Rakyat / MPR*) Decree No. X the Year 2001 on Agrarian Reform. In more details, the definition of the IPs in Indonesia in specific meaning based on the context (Table 2.1).



**Figure 2.1** Indonesia ethnics groups map.  
Source: International Working Group for Indigenous Affairs (2017).

**Table 2.1** The Specific Definition of the Indigenous Peoples in Indonesia

Regulation	Definition
Act No. 41 the Year 1999 on Forestry	<ol style="list-style-type: none"> <li>1. The community is still in the form of <i>paguyuban (rechtsgemeenschap)</i></li> <li>2. There is an institution in the form of its traditional ruling device</li> <li>3. There is a clear customary law area</li> <li>4. There are legal institutions, especially customary courts, which are still adhered to</li> <li>5. There is still a collection of forest products in the region forests to meet the needs of daily life</li> </ol>
Act No. 18 the Year 2004 on Agriculture	<ol style="list-style-type: none"> <li>1. Society is still in the form of <i>paguyuban (rechtsgemeinschaft)</i></li> <li>2. There is an institution in the form of a traditional ruling device</li> <li>3. There is a clear customary law area</li> <li>4. There are institutions and legal instruments in particular the customary judiciary that is still adhered to</li> <li>5. There is an inauguration with local regulations.</li> </ol>
Act No. 32 the Year 2009 on the Protection and Management of the Environment	<ol style="list-style-type: none"> <li>1. Community groups from generation to generation living in the region</li> <li>2. The existence of ties to the origin of the ancestors</li> <li>3. A strong relationship with the environment</li> <li>4. The existence of systems that determine the rules economic, political, social, and customary law</li> </ol>
Act No. 6 the Year 2014 on the Village	<ol style="list-style-type: none"> <li>1. Having the territory which at least fulfills one or all of the elements</li> <li>2. A society whose citizens share feelings in a group</li> </ol>

3. Customary government institutions
4. Customary property and / or objects
5. The tools of customary law norms

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Source: Warman (2014).

Keraf (2010) mentioned several characteristics that distinguish the IPs in Indonesia context from other community groups as follows:

- a) The IPs inhabit the lands of their ancestors, either wholly or partially.
- b) The IPs have the same lineage, originating from the natives of the area.
- c) The IPs have a distinctive culture, which concerns religion, tribal system, clothing, dance, the way of life, tools of daily living, including to earn a living.
- d) The IPs have their own language.
- e) The IPs usually live apart from other groups of people and refuse or be cautious about new things coming from outside the community.

In Indonesia, one of the NGOs that worked closely to the IPs is the *Aliansi Masyarakat Adat Nusantara* or Alliance of Indigenous Peoples of the Archipelago (AMAN). The AMAN is an independent community organization with the vision to create justice and prosperous life for all the IPs in Indonesia and to represent and advocate for the IPs issues in local, national, and international levels. The AMAN works with 2,332 indigenous communities across Indonesia with 17 million individual members (The Indigenous Peoples' Alliance of the Archipelago, 2018). Therefore, the AMAN estimates that the number of the IPs in Indonesia lies between 50 and 70 million people (International Work Group for Indigenous Affairs, 2017).

In terms of the IPs and National Planning for climate change adaptation, Herawati (2017) concluded in the world bank's report on title *Indigenous Peoples Planning Framework* that there are several regulations and policies related to the IPs in Indonesia as shown in Table 2.2.

**Table 2.2** Laws and Regulation Related to the Indigenous Peoples in Indonesia

Law / Regulation	Summary
The 1945 Constitution of The Republic of Indonesia (Amendment) Chapter 18 - clause 2 and Chapter 281 - clause 3.	<i>Chapter 18(2):</i> The State recognizes and respects units of indigenous communities and their traditional rights as long as they live, and in accordance with the development of society and the national principles as set out in the legislation.
	<i>Chapter 281(3):</i> The cultural identity and the rights of traditional communities are respected in line with the times and civilization.
Act No. 41 the Year 1999 on Forestry (and Constitutional Court Decision No. 35/PUU-X/2012).	<p><i>Chapter 67(1):</i> The IPs along by the fact still exist are recognized the right to collect forest products to meet the needs of daily life the indigenous peoples concerned; conduct forest management activities based on customary law and not contrary to law; and empower to improve their welfare.</p> <p><i>Chapter 67(2):</i> Affirmation of existence and abolishment of the IPs as referred to in paragraph (1) shall be determined by the Local Regulation.</p> <p>Explanations of Chapter 67(1): The IPs existence is recognized based on the definition of the IPs.</p>
Ministry of Home Affairs, Regulation No. 52 the Year 2014 on the Guidelines on the Recognition and Protection of the IPs.	The IPs are Indonesian citizens who have distinctive characteristics, live in groups harmoniously according to their customary law, have ties to the ancestral origin and/or similarity in residential location, have a strong relationship with the land and the environment, as well as have value system which determines the economic system, political, social, cultural, legal and utilize a single region for generations.
Ministry of Forestry Regulation No. 62 the Year	<i>Chapter 18a:</i> The IPs are a group of people who are bound by customary law as part of the group member that shared

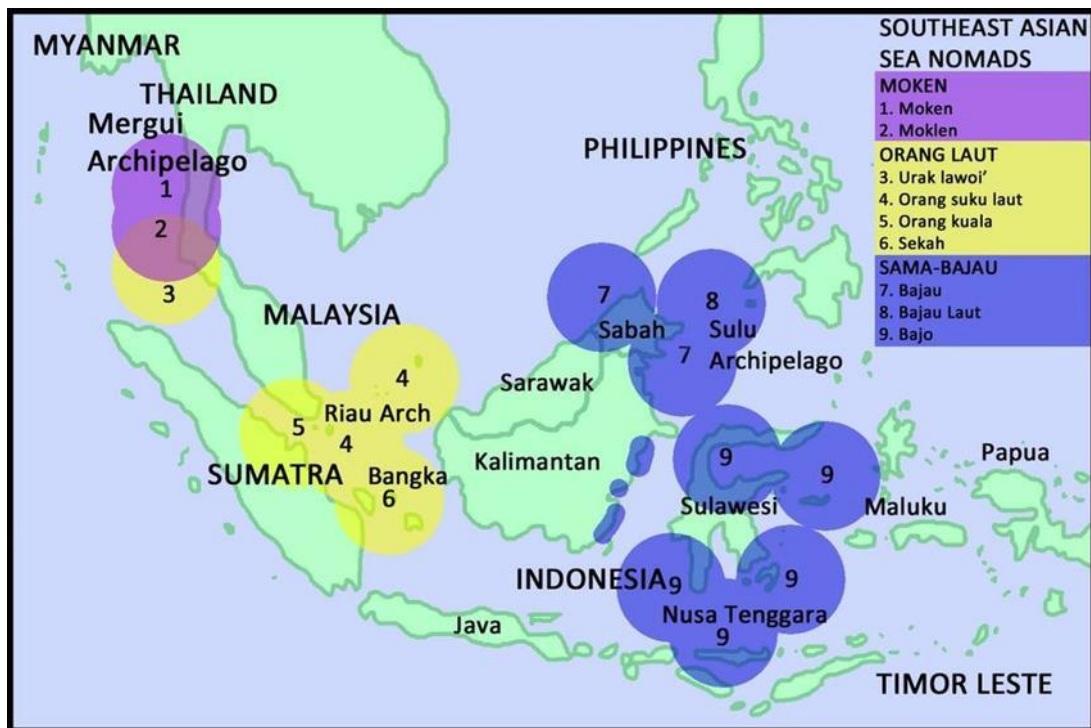
Law / Regulation	Summary
2013 on Amendment of Ministry of Forestry Regulation No. 44 the Year	a partnership of law because of similarities in the basic residence or descent.
2012 on Establishment of Forest Area.	<i>Chapter 18b:</i> The IPs region is the area to live and organize the life of the IPs concerned with clear location and area limits and confirmed by the local regulation.
Joint Regulation of Ministry of Home Affairs, Ministry of Forestry, Ministry of Public Works, and Land Agency No. 79 the Year 2014 on Procedures to Settle Land Ownership Conflict in Forest Area.	<i>Chapter 9:</i> Affirmation of the IP's rights on forest area will be carried out in accordance with the provisions of the applicable legislations.
Regulation of the Minister of Land Agency and Spatial Development No. 9 the Year 2015 on the Procedures to	<i>Chapter 1(1):</i> Communal rights on land are joint rights on land of an indigenous community that granted to specific community living in a forest or plantation area.
Establish the Land Communal rights on the IPs Land and Community Living in the Special Area (Revocation of Minister of Land Agency	<i>Chapter 1(3):</i> The IPs are a group of people who are bound by customary law as part of the group member that shared a partnership of law because of similarities in the basic residence or descent.
Regulation No. 5 the Year 1999 on Guidelines on Resolution of Indigenous Rights of the IPs)	<i>Chapter 3(1):</i> Requirements of the IPs includes a society that is still in the form of <i>paguyuban</i> ; have institution in the form of the customary authorities; have a clear customary law; and there are institutions and legal instruments, in particular customary judicial system is still adhered to.
	<i>Chapter 3(2):</i> Requirements of community groups located in Specific Area (Forest and Plantation area) includes: physically dominating an area for at least 10 years or more in a row; still harvest forest products in a particular region and its surrounding areas to meet the needs of everyday life; the specific area is being the main source of life and

Law / Regulation	Summary
Act No. 6 the Year 2014 on Village	<p>livelihood; and there are social and economic activities that are integrated with community lifestyle.</p> <p><i>Chapter 95(1):</i> Village Official and village community can establish a customary village institution</p> <p><i>Chapter 95(2):</i> Customary village institution is an institution that performs customary functions and become part of the original composition of the village that grew and developed on the initiative of the village community.</p> <p><i>Chapter 96:</i> National, Provincial, City or District Governments to make the arrangements of the IPs units and establish them into Customary Village (<i>Desa Adat</i>).</p>

Source: Herawati (2017).

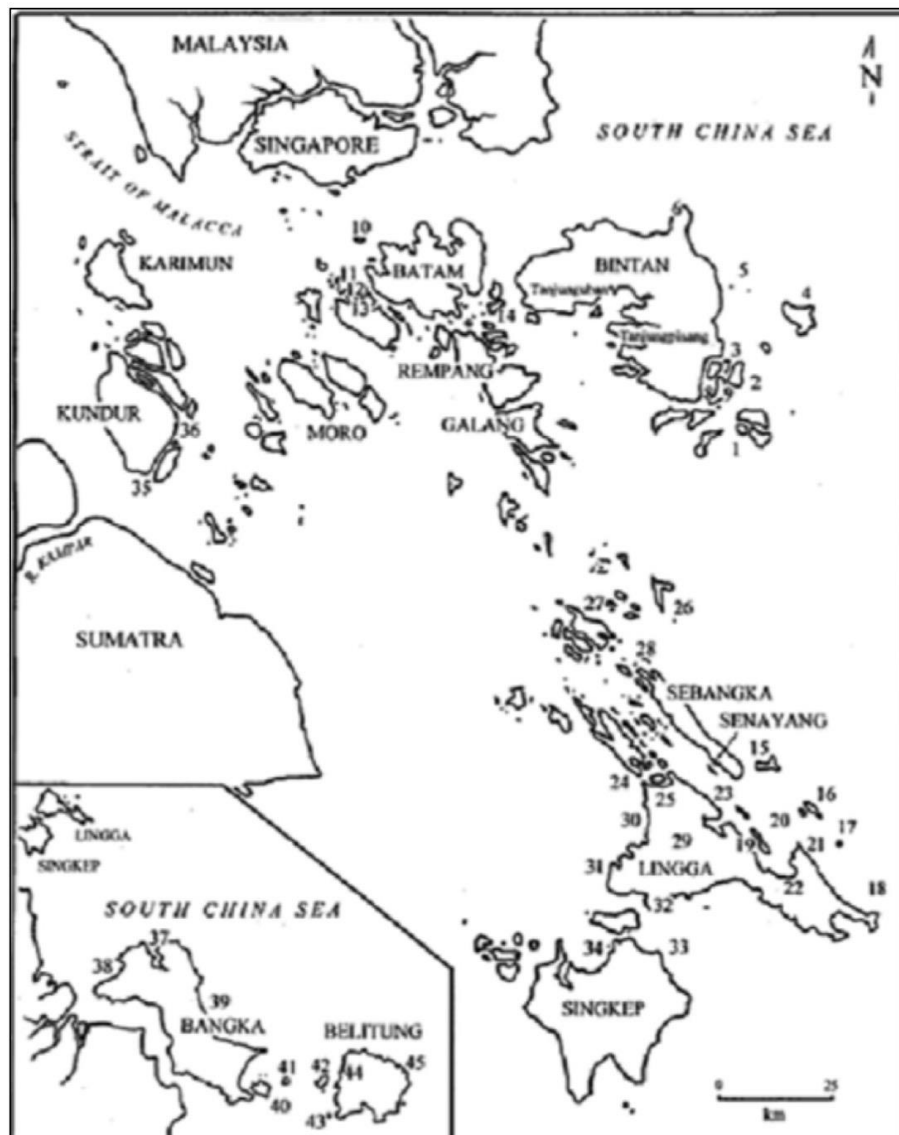
Additionally, the government and the NGOs in Indonesia focus on the project implementing for the IPs who live in the forest because as a part of the Reduction Emissions from Deforestation and Forest Degradation (REDD) work plans. Meanwhile, the forestry IPs have the highest risk of climate hazards because the forest is their livelihood (Tauli-Corpuz et al., 2009). The IPs who are living in the forest is struggling for deforestation and land tenure which dealing with climate change. In Indonesia, many cases of the MHA are facing this conflict particularly with private sectors. Unfortunately, there is almost no specific climate change adaptation project which concerned for the IPs are living in the coastal area and in the namely sea gypsy or sea nomads.





**Figure 2.2** Sea nomads in South East Asia map.  
Source: Stacey et al. (2018).

Generally, sea nomads in the South East Asia scatters in Thailand, Myanmar, Philippines, Malaysia, and Indonesia as presented in Figure 2.2. The sea nomads in Indonesia are classified in two groups namely *Orang Laut* and *Sama-Bajau*. The *Orang Suku Laut* or the *Orang Laut* are the sea people, while the *Suku Sampan* are a boat tribe (Chou, 2003). The *Sama-Bajau* is the sea gypsies' groups who are living in the eastern part of Indonesia and the *Orang Suku Laut* is located in the western part of Indonesia. Generally, both group classification is similar depending on the place that they are living in. The *Orang Suku Laut* diverse congeries of variously named groups inhabiting in Riau, Lingga Archipelago, Batam, and also in the coastal area of the Eastern Sumatra and Southern Johor and Singapore (Chou, 2006) as shown in Figure 2.3.



Key:

(1) Orang Pulau Toi, (2) Orang Tanjung Sekuang, (3) Orang Pulau Buton, (4) Orang Mapur, (5) Orang Berakit, (6) Orang Panglung, (7) Orang Tanung Senkuang, (8) Orang Air Kelobi, (9) Orang Pulau Malim, (10) Orang Dapur Arang, (11) Orang Pulau Bertam, (12) Orang Pulau Padi, (13) Orang Pulau Boyan, (14) Orang Nginang, (15) Orang Kentar, (16) Orang Kojong, (17) Orang Pulau Buluh, (18) Orang Mensemut, (19) Orang Sungai Liang, (20) Orang Pulau hantu, (21) Orang Air Kelat, (22) Orang Pongok, (23) Orang Kungki, (24) Orang Linau, (25) Orang Air Batu, (26) Orang Mamut, (27) Orang Pulau Medang, (28) Orang Limas, (29) Orang Pancur, (30) Orang Tembuk, (31) Orang Lelumu, (32) Orang Mentuda, (33) Orang Penuba, (34) Orang Sungai Buluh, (35) Orang Tanung Batu, (36) Orang Sebele, (37) Orang Mantung, (38) Orang Teluk Kampa, (39) Orang Baturasa, (40) Orang Pulau Lepar, (41) Orang Pulau Liat, (42) Orang Pulau Mendenau, (43) Orang Pulau Seliu, (44) Orang Tanung Pandan, (45) Orang Teluk Pring.

**Figure 2.3** Sea tribes in the Riau Archipelago.

Source: Chou (2009).

## **2.2 Climate Change and Indigenous Peoples**

### **2.2.1 Climate Change Adaptation**

Climate change puts adaptation as stress by making the environment even more variable and thus less predictable in the range of both short-term and long-term (Berkes & Jolly, 2001). Fundamentally, climate change adaptation is the capability to anticipate the negative effects of climate change and to take relevant actions to prevent the impacts or taking advantage of opportunities that may occur (IPCC, 2007). Adaptation in climate change could be a process through which societies make themselves better able to cope with an uncertain future and entails taking the right measures to reduce the adverse effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes (UNFCCC, 2007). According to the Fifth Assessment Report of the IPCC Working Group II in 2014, climate change adaptation is the adjustments of climate change (process, practices, and structures) in social, economic, and environmental systems in response to actual or intended climatic stimuli and their impacts, and also to occur the benefit from opportunities associated from them.

In developing countries, climate change adaptation is becoming a priority and has been highlighted by themselves as the main action to do. It is because, in developing countries, there is sufficient information and knowledge available on strategies and plans to implement adaptation (UNFCCC, 2007). Adger et al. (2003) stated that climate change adaptation has attracted the government and public awareness in both developing and developed countries, particularly in the policy contexts and social science research on the adaptive capacity for all sectors (governments, civil society, and markets) to deal with climate perturbations. Epule et al. (2017) explained there are four adaptation options in climate change adaptation including technical, indigenous problem solving, social and economic related to adaptation options.

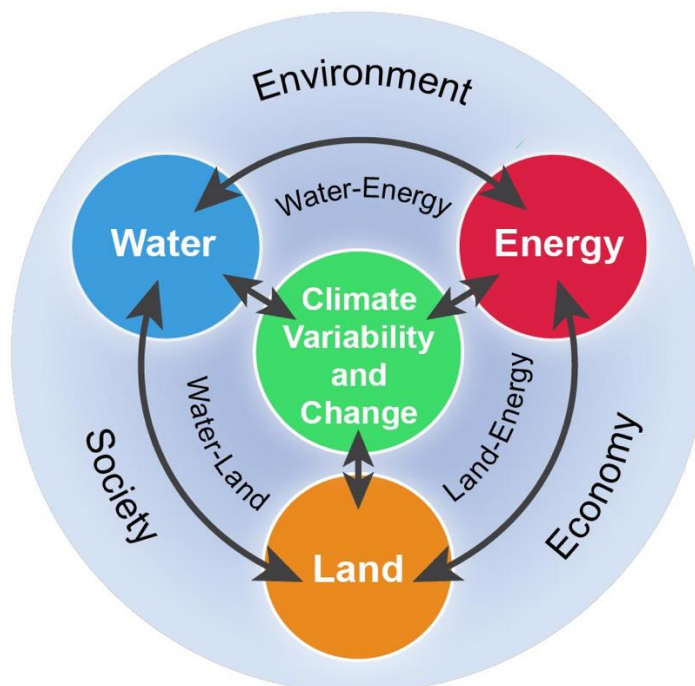
Adaptation to climate change and the IPs are the two terms that related each other. The TEKs of the IPs has validated for many years to adapt to the changes in the climatic system. However, there are two types of assumptions on the relation between the IPs and climate change adaptation (Whyte, 2013b). Firstly, the TEKs of the IPs is

the knowledge mobilization for climate change adaptation. It means that the various types of the TEKs are a tool to mobilize the adaptability of the IPs. The second assumption is a relation between the TEKs and science for adaptation. The TEKs and science often be misunderstanding because the TEKs are based on experiences and do not have valid data. For climate change adaptation, the TEKs should be considered to integrate with science approaches that strengthen the IPs in climate change adaptation and resilience (Egeru, 2012).

### **2.2.2 Climate Variability**

World Meteorological Organization, WMO (2018) defines climate variability as variations in the mean state and other statistics of the climate on all temporal, spatial scales, and beyond the individual weather events. The term of climate variability is often operated to design the deviations of climatic statistics over a given period (month, season, or year) when compared to long-term statistics for the same calendar period. The United States Agency for International Development, USAID (2007) and Dinse (2011) stated climate variability is the way of climate fluctuates and shows the anomalies by yearly above or below long-term average as causing from internal or external variability and can be measured by the deviations.

In 2013, Ariando explained that climate variability could be identified from the deviation or anomalously of climate variables, such as rainfall, air temperature or other variables in consequence of various climate controlling factors influence in a global, regional, and local scale. Hasselmann (1976) pointed out that climate variability might be understood more clearly as the necessary response of the gradually varying parts of the climate system to internal random forcing by the always present the short timescale weather fluctuations. Besides, climate variability as results of climate change has influenced the intensity, spatial extent, duration, frequency, and timing of climate events and extreme weather (IPCC, 2014). In advance, climate change and climate variability impacted to the environment, society, and economy as a direct and indirect interaction through energy, water, and land as the indicators (Sinha, 2015) as shown in Figure 2.4.



**Figure 2.4** Climate variability and climate change impacts.  
Source: Sinha (2015).

Despite progress in understanding climate variability, it has appeared through the combined efforts of theoretical studies, numerical modeling experiments and statistical analysis of climate observations (Hans & Antonio, 1999). Climate variability impacts in rising the natural disasters such as drought, flood, storm surge, hurricane, and extreme weather event as an impact from climate change activities (Banholzer et al., 2014). During the past four decades in Indonesia, floods, droughts, storms, landslides, and forest fires have posed the most significant threats to livelihoods, economic growth, and environmental sustainability (World Bank, 2011). Indeed, the characterization of the sensitivity of extreme events to climate change might be expanded to situations more representative of climate variables (Richard & Barbara, 1992). Thornton et al. (2014) also supported that climate variability has substantial impacts on biological systems and the smallholders, communities, and countries as a continuous system.

The Fifth Assessment Report of IPCC report in the Working Group II in 2014 presented climate variability as an impact of climate change that needs adaptation and

mitigation to reduce the climate hazards and improve the climate resilience. The climate variability drives short-term changes in climate pattern from the scale over months, seasons, and years. According to Xu et al. (2017), how the variability of climatic dynamics at the global scale directly affects human adaptation to climate change are still undiscovered. Furthermore, knowledge and experience in coping with climatic variability exist within local communities, and indigenous coping strategies are the essential elements to succeed the adaptation plans (Pandey et al., 2018).

Climate variability and the IPs have a strong relation. The variability of weather creates the high uncertainty of climate pattern (Crane et al., 2011). Meanwhile, climate variability changed the patterns of wildlife or plant growth, vegetation and human consumption to dietary calories (Galvin et al., 2004). Undoubtedly, it would be impacted on sustainable livelihoods of the IPs as well. Eleonor et al. (2010) mentioned the rising and setting of the sun, the direction of the wind, the amount of rainfall and the turning of the seasons all have meaning and relationship to how life goes in a community as part of life and their cultural beliefs.

### **2.2.3 Climate Change Impact**

Climate change alludes to a change in the state of the climate that can be identified for example using statistical tests, whether due to natural and climate variability or as a result of human activity in long-term periods by directly and indirectly impacted to human activity (IPCC, 2007). Climate change is not a purely scientific problem which defining human behavior as anthropogenic drivers to this apparent warming of the planet but also looking global change in all sector lies on the human in the social and economist views (Urry, 2015). Nowadays the misunderstanding on climate change often makes a miss-definition of climate change itself. Climate change knowledge is the critical point the meaning before figuring out the impacts and taking action. The understanding of climate change is common tools to emphasize the knowledge of a community. Then, the data from climate change knowledge can figure out the impacts and followed by action to tackle climate change. However, Clifford and Travis (2018) analyzed climate change knowledge that placed in the people perspective of previous into three categories as follows:

- a) People often focus on climate-related proxies that might be disregarded as tangential within narrow definitions of climate.
- b) People use rubrics to structure climate knowledge, and they understand climate as relational and connected.
- c) Climate knowledge does not isolate individual climate elements but accentuates the complicated way that many processes together constitute climate.

According to Inamara and Thomas (2017), climate change impacts posed increasing of the challenges in building the strategy and integrating the different skills and knowledge at all levels of the community. Admittedly, the massive movement of climate change has impacted on economic and social life. For example, in agricultural productivity, climate change could be revealed through drastic changes both in production and in the relative prices of commodities (Dudu & Çakmak, 2017). From a gender perspective, climate change vulnerabilities are a specific coping strategy, and the affected communities are compelled to send male members away from home in search of alternate sources of livelihoods (Nizami & Ali, 2017). In the youth perspective, climate change is an crucial concern for environmental changes according to believe, lifetime, social life due to global warming (Schreiner et al., 2005).

Macchi et al. (2014) mentioned the main impact of climate change that deduced by the communities was a significant depletion in outputs of staple and cash crops, mainly due to reduced overall water availability and lack, or inappropriate precipitation season, and increased the occurrence of crop pests and diseases as well. A variable of the changing climate can magnify and unmask the ecological, socio-political weaknesses, and extend the risk of the public health crisis of socially vulnerable regions (Sorensen et al., 2017). Therefore, Inamara and Thomas (2017) reported that climate change had caused the uncertainty of changing such as seasonal variability, sea level rise, loss of biodiversity that directly affected to the cultural degradation.

Climate change related risks encompass an intensification of extreme weather events, such as fluvial and pluvial flooding, droughts, storms, and heat stress (Runhaar et al., 2015). Further, it processes the socio-economic impacts of more severe (IPCC, 2014). Nay et al. (2014) stated that the governance of climate finance, operational term, practitioner and researchers, and community involvement are the important elements and also the challenges for climate change development projects. Therefore, incorporating climate change should be recognized into policy planning and management across a range of areas, from natural resource management to health, infrastructure, training, and education (Petheram et al., 2010).

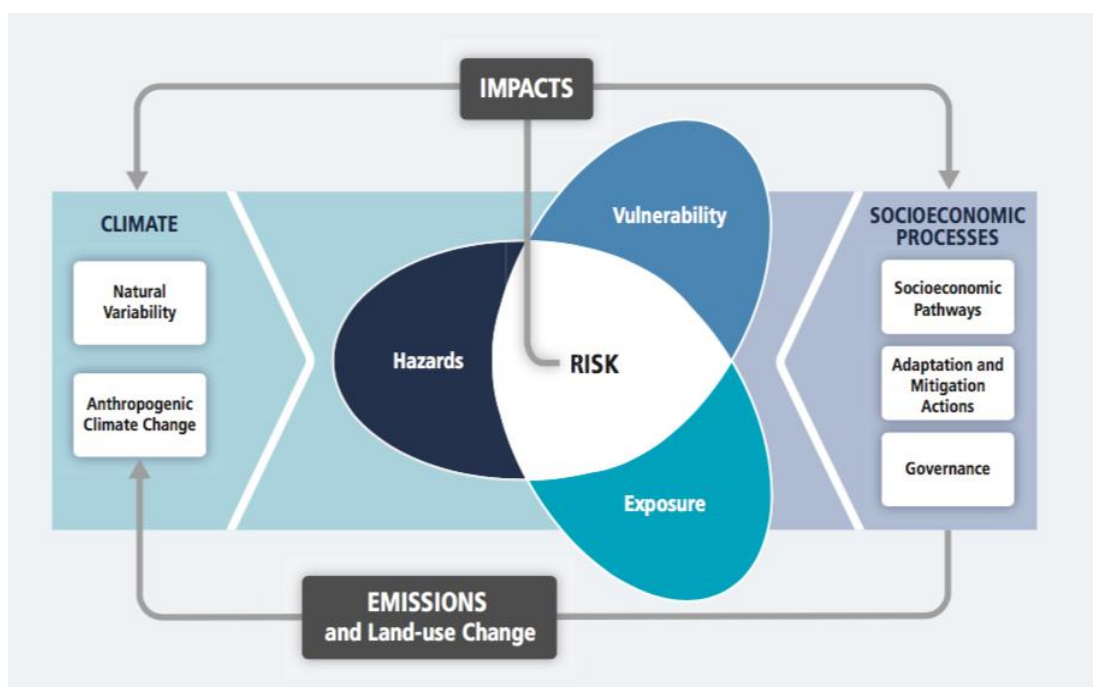
For indigenous communities, climate change would add to arrange the complex challenges especially about hazards, such as fire and floods, and local environmental management issues in association with invasive species (Bardsley & Wiseman, 2012). Nakashima et al. (2012) stated that the IPs are particularly vulnerable to climate change attributable to their dependence upon resource-based livelihoods and the location of homelands in distinctive habitats, such as polar regions, desert margins or high-altitude areas as well. The traditional livelihoods and other economic activities of the IPs are also adversely impacted by climate change (United Nations Permanent Forum on Indigenous Issues, 2008). Nevertheless, the IPs have lost their customary norms and values because of the changes in attitude. Which linked to an increase in the commercial exploitation of their resources including the sustainable traditional practices (Inamara & Thomas, 2017). An evidence from Levy and Patz (2015), the geographic factors could also influence the vulnerability of the IPs to the disadvantageous effects of climate change. Also, climate change reduces the ability of indigenous elders as seasoned hunters who are portrayed as deeply knowledgeable about the land because the environmental pattern has changed (Belfer et al., 2017).

#### **2.2.4 Vulnerability and Adaptive Capacity**

Regarding the IPCC Fourth Assessment Report in 2014, the vulnerability was defined as the readiness or preference to be adversely impacted by climate change that involved various concepts and elements including sensitivity or susceptibility and lack of capacity in coping range. Vulnerabilities are considered the critical potential in



influencing the impact of climate-related risk. The vulnerability to climate change is not just a propose of geography, or dependence on natural resources but also has social, economic, and political dimensions which influence how climate change affects different groups especially for the IPs (Reid et al., 2009). The function of exposure, sensitivity, and adaptive capacity to climate variables could be categorized as climate vulnerability (USAID, 2007).



**Figure 2.5** Climate change impacts diagram.

Source: IPCC (2014).

Figure 2.5 reveals the IPCC concept for climate change impacts. The natural and anthropogenic indicators of climate change address on vulnerability, hazards, and exposure as the risk that generates the impacts in next step. Moreover, the nature and magnitude of climate change for natural systems and human society can be identified by using climate impact, risks and vulnerability assessments. Climate risk and vulnerability reach considerably between different regions and groups of people depending on their local characteristic and development projects (Uitto et al., 2017). The socio-economic process and biophysical changing could define the impact of climate change and vice versa.

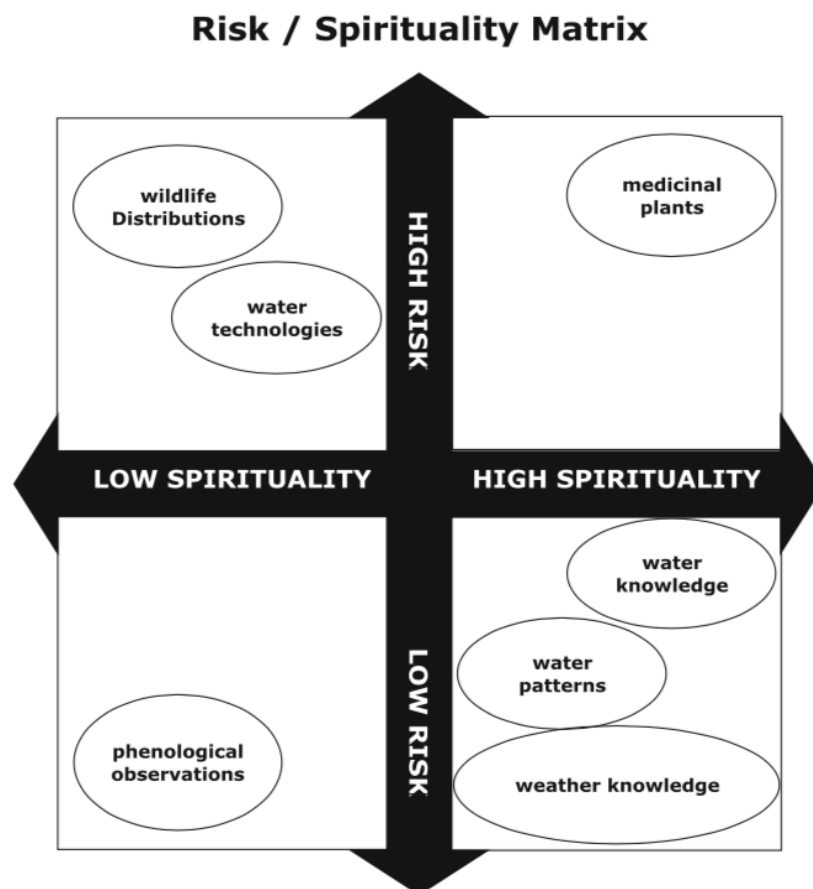
While, the adaptive capacity is the measurement of a system to operate its characteristics or behavior, to expand its coping range under existing climate variability, or future climate conditions (IPCC, 2014). The adaptive approaches are defined as acceptance of anthropogenic climate change impact and attempt to adapt to a new climatic environment or prevention of change and to maintain current systems under new climatic variations (Tanner-McAllister et al., 2017). For the IPs, the TEK's practices are such ways to do adaptive capacity as the ancient practices that gained from nature for years (Berkes, 1993). Moreover, the TEKs of the IPs could be increased by preventing them from being anything modern and cultural space expansion (Veland et al., 2013).

### **2.2.5 Traditional Ecological Knowledge**

Traditional Ecological Knowledges (TEKs) have been used to understand the as climate change issues for last decades. The TEKs refer to the knowledge base acquired by indigenous and local peoples over many hundreds of years through direct contact with the environment (Berkes, 1993). The TEKs are not only instrumentally valuables for climate science but also an observational knowledge collected over generations to persevere system of responsibilities in the way of thinking (Whyte, 2013a). According to Walshe and Nunn (2013), the TEKs are created by preliterate communities in response to various issues, most commonly those that stress or threaten a particular community or its livelihood. The TEKs are increasingly recognized as valuable study for adaptation to climate change which bringing scientists and the IPs together to collaborate and exchange knowledge with each other (Williams & Hardison, 2013).

The TEKs as content information could be passed from one person to another, as a traditional proses knowledge creating, as a way of observing and discussing, and also as making sense of new information in indigenous ways of knowing (Berkes, 2010). According to Fernandez-Llamazares et al. (2015), the TEKs are the key attempts to succeed the translation between local knowledge and scientific framings into a concept and its implications in the compelling arena of climate change adaptation. The TEKs had often been dealt with the various kinds of environmental uses and

problem in the past (Lejano et al., 2013). Remarkably, the TEKs can help to provide efficient, appropriate, and time-tested ways of responding to climate change for community development projects in a specific place (Pandey et al., 2018). The TEKs are critically important for revealing how societies respond and adapt to changing social-ecological conditions such as livelihood, educational levels and dependency on resources (Lauer & Aswani, 2010).



**Figure 2.6** Matrix illustrating hypothetical trade-offs between types of the TEKs  
Source: Williams and Hardison (2013).

Williams and Hardison (2013) reported that the approach of the TEKs had formed the risks and spiritual or beliefs in practice as shown in Figure 2.6. Risks include cultural values (moral hazard), material harms (misappropriation and overharvesting) and lack of benefit sharing. Cultural beliefs of the IPs are the various activities including social, economic, and environment components as a package of the TEKs.

According to Hiwasaki et al (2014), the TEKs embodied in folklore, rituals and ceremonies which prevent and mitigate climate-related hazards and engender and reinforce respect for the environment. Then customary laws are governed behavior and strengthen social cohesion that contribute to disaster prevention and mitigation. Also, local food, materials and structures used for mitigation and adaptation to hazards and climate change, and preparation for their impacts, and lastly observations of changes in the environment and celestial bodies is to predict climate-related hazards.

Armitage et al. (2011) mentioned that the practice of the TEKs are the critical points for observing, understanding, and making sense of environmental change of climate change as a baseline to build community resilience. However, the TEKs usually use to understand the concept of how traditional coping strategies translate into adaptation to long-term changes, what degree that they prevent as pro-active ways, and transformational responses to climate change (Pandey et al., 2018). Sometimes, the TEKs could have been influenced by the written literature rather than being solely the result of a long relationship between people and their environment (Burton & Riley, 2018). According to Lebel (2012) there are strengths and limitations of the TEKs for adaptation to climate change as shown in Table 2.3.

**Table 2.3** Strengths and limitations of the TEKs on climate change adaptation.

TEK	Strengths	Limitations
Awareness of change	<ul style="list-style-type: none"> <li>Monitoring of ecosystems has multiple benefits</li> <li>Able to articulate change in term that fit social context</li> <li>May be only source of information on past climate</li> </ul>	<ul style="list-style-type: none"> <li>Under a changed climate indicator may no longer works</li> <li>Difficult to track large-scale drivers and changes with local impacts</li> <li>May not be able to correctly explain causes of changes</li> </ul>
How to adapt	<ul style="list-style-type: none"> <li>Experience of analogous past problems and</li> </ul>	<ul style="list-style-type: none"> <li>Experience may be insufficient in a new climate</li> </ul>

	opportunities	
	<ul style="list-style-type: none"> <li>• Started with current practice, capacities, and sources of the resilience</li> </ul>	<ul style="list-style-type: none"> <li>• Successful adaptation may need techniques</li> </ul>
	<ul style="list-style-type: none"> <li>• Experience with diversification strategies to deal with uncertainty in ecological and social systems</li> </ul>	<ul style="list-style-type: none"> <li>• Local power relation may be hard to address</li> </ul>
Learning	<ul style="list-style-type: none"> <li>• Outcome of actions can be monitored and evaluated locally</li> <li>• Share skill in knowing what to observe and ways to respond</li> <li>• History of learning-by-doing with adaptive management responses</li> </ul>	<ul style="list-style-type: none"> <li>• Local source of information may be too limited for problem</li> <li>• Mistrust of non-local but valuable sources</li> <li>• Generation gap arising from new occupations and diverging interests</li> </ul>

Source: Label (2012).

In the Caribbean, the TEKs generates the new finding of farm fragmentation as a deliberate agronomic strategy to take benefits of different ecological niches and use the slope orientation in planting yams and staking them to maximize sunlight exposure (Beckford, 2017). In Accra, Sub Saharan African City, the IPs contributed their TEKs for weather monitoring system to predict extreme climatic events (Codjoe et al., 2013). For fisheries management, the TEKs could capture the knowledge for fish behavior and coral reef conservation that can be adapted for the use of modern technology (Gaspare et al., 2015). Generally, there are various understanding about the TEKs from academia and agency as shown in Table 2.4.

**Table 2.4** Summary of used terms for the TEKs.

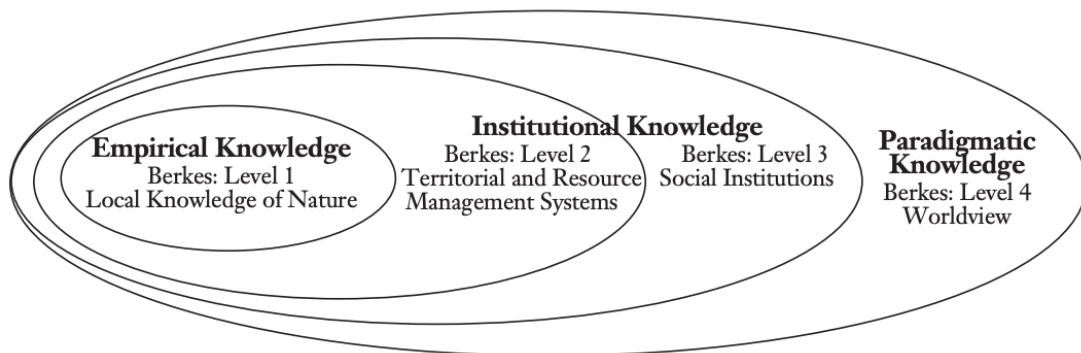
Terminology	Sources
Traditional ecological knowledge	Berkes (1993), IPCC (2014)
Traditional knowledge	Convention on the Biodiversity (CBD), International Council for Science (ICSU), International Work Group Indigenous Affairs (IWGIA), International Labour Organization (ILO)
Indigenous knowledge	United Nations, World Bank
Local or traditional knowledge	International Union for Conservation of Nature (IUCN)
Indigenous ecological knowledge	Lauer and Aswani (2010)
Local ecological knowledge	Berkes (1999)
Traditional management systems	Weymes (2004)
Local knowledge	Food and Agricultural Organization (FAO)
Local knowing	Antweiler (1998)

Institut Dayakologi and Aliansi Masyarakat Adat Nusantara (2011) stated that most of the IPs knowledge and wisdom are about their natural environment which born out of the relationship, persisting despite modern society's efforts in undermining themselves. The world is belatedly acknowledging the TEKs and wisdom of the IPs in sustainably managing the environment. The community participation and communication in climate change adaptation should be locally grounded and contextualized by using the TEKs (Walshe et al., 2018).

The United Nation Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007 proclaimed that the community-based adaptation could imply in the concept of

Free, Prior and Informed Consent, FPIC (FAO, 2018). The FPIC protects the right of the IPs in providing their right and consent to any development projects based on their TEKs that impacted to their traditional lands, and that consent should be freely given prior to implementation of projects and that they should be totally informed of the effects on people and their land tenures (Schroeder, 2010). The goal of the community-based adaptation in the TEKs management is the policy recommendation through bottom-up approaches (Ford et al., 2016). The policy and project development can improve the adaptive capacity of the IPs through inviting them in decision making at local and national adaptation initiatives (Nkomwa et al., 2014). Therefore, the IPs are able to engage in adaptation projects and knowledge exchanges leading many documented benefits, such as mobilizing the TEKs, solve large-scale problems that they cannot avoid, encourage the profoundly spiritual, and core to their identity (Williams & Hardison, 2013).

In 2012, Berkes stated that there is no universal definition of the TEKs, but three facets on which the TEKs might be defined. Firstly, the empirical, grounded, knowledge of species and environmental phenomena. Second, the practices that individuals carry out concerning their environment and livelihood activities. Lastly, the beliefs and values which shape how they interact with their environment. Many of researchers did not consider the TEKs as an essential point in climate change adaptation projects. The practices and experience motivate the TEKs by ancient as sustainable resource use, but sometimes they also damage the local ecosystem and undermine biodiversity (Lauer & Aswani, 2010). Berkes (2012) divides the TEK as a knowledge-practice-belief complex that can be analyzed on four interdependent levels which partly influence each other and none of them is in any way to be seen “superior” to the other as shown in Figure 2.7.



**Figure 2.7** Scheme of analytical levels in the TEKs.  
Source: Wilhelm (2005).

According to Huntington (2000), the validity and relevance of the reasons behind the various forms of the TEKs are still debatable because sometimes it would be wrong. Ajani et al. (2013) pointed out two significant problems identified as obstacles to integrating the TEKs into formal climate change mitigation and adaptation strategies. First is the recognizing the needs of specific TEKs into project development, and second is how to integrate the TEKs into science as extensive evidence. Therefore, the TEKs are widely treated as secular knowledge and brought into conformation with existing national and international laws (Williams & Hardison, 2013).

## 2.3 Policy Context for Indigenous Peoples and Climate Change

### 2.3.1 Sustainable Development Goal

Sustainable Development Goals (SDGs) are the world commitment agenda to transforming better future in 2030. The global target framework will measure the progress of implementation with 17 goals. Two targets that refer directly to the IPs, there are target 2.3 and target 4.5 (United Nations Indigenous Peoples' Partnership, 2017). There are several other relevant indicators to the IPs as well such as all of the targets in Goal 13 for climate change (Division for Social Policy and Development Indigenous People United Nations, 2017). The SDGs should be relevant to the IPs. Some of them have direct linkages to the commitments outlined in the UNDRIP. In more detail, there is the relation between the IPs, climate change and the SDG based on goals, targets, and indicators as shown in Table 2.5.



**Table 2.5** Sustainable Development Goals, Indigenous Peoples, and Climate Change.

Goals	Target
<p><b>Goal 2.</b> End hunger, achieve food security and improved nutrition and promote sustainable agriculture</p>	<p><b>Target 2.3</b></p> <p><i>By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists, and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.</i></p> <p><b>Indicator</b></p> <p>2.3.1</p> <p><i>Volume of production per labor unit by classes of farming/pastoral/forestry enterprise size</i></p> <p>2.3.2</p> <p><i>Average income of small-scale food producers, by sex and indigenous status</i></p>
<p><b>Goal 4.</b> Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all</p>	<p><b>Target 4.5</b></p> <p><i>By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations.</i></p> <p><b>Indicator</b></p> <p>4.5.1</p> <p><i>Parity indices (female/male, rural/urban, bottom/top wealth quintile, and others such as disability status, indigenous peoples and conflict-affected, as data become available) for all education indicators on this list that can be disaggregated</i></p>
<p><b>Goal 13.</b> Take urgent action to combat climate change and its impacts</p>	<p><b>Target 13.1</b></p> <p><i>Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.</i></p>

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**Indicator**

13.1.1

*Number of countries with national and local disaster risk reduction strategies*

13.1.2

*Number of deaths, missing persons and persons affected by disaster per 100,000 people*

**Target 13.2**

*Integrate climate change measures into national policies, strategies, and planning.*

**Indicator**

13.2.1

*Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)*

**Target 13.3**

*Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.*

**Indicator**

13.3.1

*Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary, and tertiary curricula*

13.3.2

*Number of countries that have communicated the strengthening of institutional, systemic, and individual*

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*capacity-building to implement adaptation, mitigation and technology transfer, and development actions*

**Target 13.a**

*Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible.*

**Indicator**

13.A.1

*Mobilized amount of United States dollars per year starting in 2020 accountable towards the \$100 billion commitment*

**Target 13.b**

*Promote mechanisms for raising capacity for effective climate change-related planning and management in the least developed countries and small island developing States, including focusing on women, youth, and local and marginalized communities.*

**Indicator**

13.B.1

*Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology, and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth, and local and marginalized communities*

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Source : Division for Social Policy and Development Indigenous People United Nations (2017).

Climate change as the primary factor drives the sustainable livelihood and right of the IPs. In achieving the SDGs for 2030, the IPs have a contribution to a global community to create sustainable life in the future. Looking globally for the SDGs baseline, the IPs have a connection with 5Ps namely People, Prosperity, Peace, Partnership, and Planet, with social and environmental issues that inter-correlated each other (United Nations Indigenous Peoples' Partnership, 2017).

The Indigenous Peoples Major Group (IPMG) stated that the rear visibility of the IPs in the current draft of the SDGs lies an essential part as national development processes as well as further marginalization in the Post 2015 Development Agenda (Galina & Roberto, 2012). According to the Department of Economic and Social Affairs United Nations (2015), the major group statements for the IPs had started since 2012 after the Rio+ 20 Conference on Sustainable Development which followed by many movements and organizations for the rights around the world. Since then, the IPs right has been aspirated at the local, national, and international forums. The recognizing process of the IPs in the SDGs related to the main jargon of the SDGs where “no one left behind”. The IPs as a part of the international citizen have the right to contribute the agenda 2030.

The United Nation General Assembly adopted prominent guiding principles and commitments in supporting the IPs and sustainable development arising from the Rio+20 Conference on Sustainable Development, and the 2014 High-Level Plenary Meeting of the General Assembly named as the World Conference on Indigenous Peoples, WCIP (United Nations Economic and Social Council, 2017). The United Nation outcome document of the Rio+20 was “The Future We Want” that paragraph 49 recognizes:

*“the importance of the participation of indigenous peoples in the achievement of sustainable development” and “the importance of the United Nations Declaration on the Rights of Indigenous Peoples in the context of global, regional, national and sub-national implementation of sustainable development strategies.”*

In Indonesia, the recognizing the SDGs and the IPs still have the significant gaps in project implementation level. The gap comes from the unclear responsibility for the IPs related for the SDGs. Unfortunately, there is no comprehensive national data that directly mentioned on the SDGs and the IPs in specific goals and targets. Most of the newest issues of the SDGs and the IPs are relating to the right, educational access, and infrastructure. Under the governmental responsibility of Indonesia, the recognition of the IPs is under several ministries such as Ministry of Social Affairs, Ministry of Maritime Affairs and Fisheries, Ministry of Environment and Forestry, Ministry of Home Affairs and some other related ministries. In Indonesia's SDGs Voluntary National Review 2017 stated that the major challenge for the SDGs is for ensuring the inclusive growth and shared prosperity for all citizen (Ministry of National Development Planning, 2017). Indeed, the proper actions and data for the IPs role in the SDGs still be in progress.

### **2.3.2 United Nations Framework Convention on Climate Change and Paris Agreement**

The IPs, knowledge, experiences, and livelihoods are commonly referred in the IPCC, Fifth Assessment Report, Working Group II (Ford et al., 2016). The IPs and local communities on the front lines of climate change will soon be able to share lessons learned and unique perspectives on reducing emissions, adapting and building resilience through a new platform created by the Paris Agreement (UNFCCC, 2017b). However, the seventh article of the Paris Agreement generated the establishment of a platform for the IPs to share the local knowledge worldwide (UNFCCC, 2015).

However, the opening up of discursive space for engagement with indigenous issues in the convention documented as over the last decade compares with the text of the Paris Agreement, indicates growing awareness and significant potential for change at the global level (Ford et al., 2016). In the Paris Agreement, it has been recognized the strengthen knowledge, technologies, practices, and efforts of the IPs in the context of addressing and responding to climate change (UNFCCC, 2015). In the following-up to the Paris Agreement, it will be critical that systems be put in place to bridge the

work on advancing the rights of the IPs who continue to play a central role in combatting climate change and protecting biodiversity and the global climate agenda (UNESCO, 2017). Furthermore, Decision 1/CP.21 of the Paris Agreement directly mentioned the right of the IPs and their TEKs in combating climate change in Preamble and Article 7.5 as presented in Table 2.6.

**Table 2.6** Key international the Indigenous Peoples recognized under the Paris Agreement.

Mentioned Point	Explanation
Preamble	<i>Acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the <b>rights of indigenous peoples</b>, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity.</i>
Article 7.5	<i>Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, <b>knowledge of indigenous peoples</b> and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.</i>

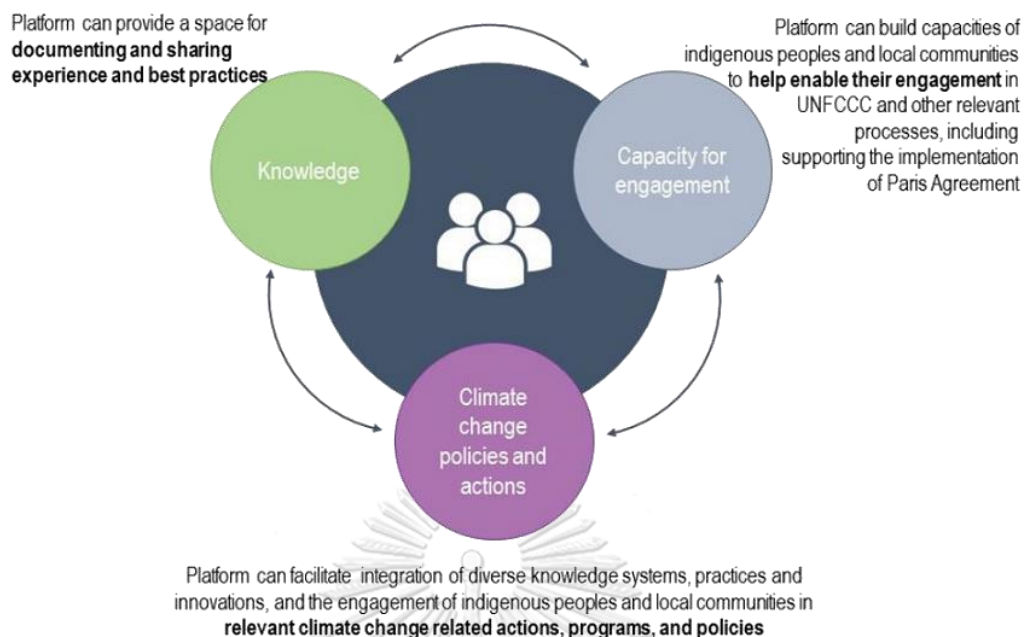
Source: UNFCCC (2015).

The TEKs were acknowledged in the Fourth Assessment Report of the IPCC as an invaluable basis for creating the adaptation and natural resource management strategies regarding environmental and other patterned change. The TEKs should be integrated into project development especially for climate change adaptation and mitigation. Furthermore, the outline of the IPCC's Working Group II contribution to the Fifth Assessment Report included the TEKs as a distinct topic within chapter 12

on human security as an element in decision making for project development related to climate change adaptation to ensure the security of the IPs (IPCC, 2014).

Additionally, the recognition of the IPs was reaffirmed at the IPCC's 32<sup>nd</sup> Session and consideration of the TEKs that containing as a conducting principle for the Cancun Adaptation Framework (CAF) adopted by Parties at the 2010 UNFCCC Conference in Cancun (UNFCCC, 2011). The CAF was a pivotal moment in the growing role of adaptation in the convention with mitigation as the priority (Ford et al., 2016). Also, the Conference of the Parties (COP) 11 of the UNFCCC in 2015 has discussed the Nairobi Work Program (NWP) in Decision 2/CP.11. The NWP is a mechanism under the convention to facilitate and develop the dissemination of knowledge information that would inform and build the adaptation policies and practices (UNFCCC, 2018). Both of the CAF and the NWP did not directly mention the IPs and climate change.

Furthermore, the COP 23 in 2017 held at Bonn, Germany which has conducted the multi-stakeholder dialogue and the submissions of functions of the platform of the IPs and climate change. The IPs should be included in the international platform to provide and to share the practices for the IPs around the world in combating climate change under the UNFCCC. This idea has initiated since COP 21 on Paris the Agreement. Then, in the 2018, one of the COP 24 outcomes also corresponded the launching preparation of the IPs platform. The official name of this platform is Local Communities and Indigenous Platform (LCIPP) which has three primary goals consisting of knowledge, capacity engagement, and appropriate climate change policy and action as shown in Figure 2.8.



**Figure 2.8** Three primary goals on climate change policy and action platform for Indigenous Peoples.

Source: UNFCCC (2017a).

The IPCC has stressed that people who are social, economically, culturally, politically, institutionally, or otherwise marginalized including the IPs. The IPs are especially vulnerable people to climate change and need to some adaptation and mitigation responses (IPCC, 2014). The International Labour Organization (ILO) also mentioned that the approach to the IPs empowerment is to promote social solutions to environmental problems and it is well positioned to address the threats posed by climate change (ILO, 2017). The ILO has committed to speak up about the IPs' right since 1967. Indeed, this initiation becomes the first international discussion about the IPs worldwide. In the present time, the right of IPs and the TEK is a strong issue in international forum because the IPs are the vulnerable group and often to be unrecognized in the development projects and policies. In the last worldwide agenda on the SDGs, the IPs also mentioned directly in several goals and targets. Table 2.7 presents the international instrument and framework for the IPs.



**Table 2.7** International agreements related to Indigenous Peoples and climate change.

No	Instrument and Framework	Year	Document Number	Description
1	ILO Indigenous and Tribal People Convention	1967	107	The previous ILO instrument on the issues. Though no longer open to ratification, it remains in force in 17 countries.
2	ILO Indigenous and Tribal People Convention	1989	169	The only international treaty on indigenous people that is open to ratification. It has been ratified by 22 countries so far.
3	United Nation Declaration on the Rights of Indigenous People (UNDRIP)	2007		The most recent expression of indigenous people's aspiration at the international level
4	2030 Agenda for Sustainable Development Goals (SDGs)	2015	Directly mentioned: Goal 2, Goal 4, Goal 13	Adopted in 2015 with a pledge to leave no one behind, it called on indigenous peoples to engage actively in its implementation, follow-up, and review.
5	Paris Agreement	2015	Preamble, Article 7.5	Outcome of the 2015 summit on climate change, at which states highlighted the importance of indigenous people' traditional knowledge in combating climate change.

Source: ILO (2017).

### 2.3.3 Reducing Emission from Deforestation and Forest Degradation: Climate Change and Indigenous Peoples in Indonesia

Reducing Emission from Deforestation and Forest Degradation (REDD) is one of the mitigation measures promoted for combating climate change especially in sustainable resources management and carbon stocks from the forest. The REDD+ means the countries efforts in tackling climate change impact, especially in developing countries. The implication of the REDD+ for the IPs is the recognition and exercise of the collective rights in maintaining natural resources with their local wisdom and knowledge (Eleonor et al., 2010). Ministry of Environment and Forestry Indonesia (2018) mentioned in its National Communication submitted to the UNFCCC in 2017

that the REDD+ activities in Indonesia have the potential to minimize the impact of climate change in reducing the national emission reduction up to 70 percent for land-based sectors. In 2010, the government of Norway and Indonesia signed a USD 1 billion performance agreement to cut down greenhouse gas emissions from forest degradation and deforestation, and further to support sustainable development (Ministry of Environment and Forestry Indonesia, 2018). Indeed, the REDD+ has a contribution to accelerate the policy and project development from governments, donors and multilateral organizations in combating climate change and indirectly conserves the IPs right as well (Institut Dayakologi & Aliansi Masyarakat Adat Nusantara, 2011).

In practice, the AMAN hosted the first agreement in Indonesia for the IPs and forest (The Indigenous Peoples' Alliance of the Archipelago, 2018). The AMAN held a national consultation of indigenous communities from August 5 to 8, 2009 on the REDD+. Then, it was followed by AMAN's national strategic meeting where the IPs in the mountains and forests, including the coasts and small islands, had affected and threatened from climate change (Lang, 2009). Through the REDD+, the IPs and forest community alliances in Indonesia are emerging in the climate change issues regime particularly in designing a mechanism on forest protection, but it remains indirect and weak in implementation (Schroeder, 2010).

Deforestation issues are more problematic for the IPs who are living in a forest. This group of the IPs who employ traditional land use is frequently accused of encroaching on the forest and illegal logging (Nugroho et al., 2017). In the case of indigenous sustainable forest management practices, they could not find the foods from the forest because their forest has been gone. It is difficult for them to do the new cultivation practices because they do not have any experience with it. Indeed, it is the reason for the REDD+ project do the prioritized intervention for the IPs who live in the forest (Eleonor et al., 2010).

The REDD+ project in Indonesia more focused on mitigation of land and forest conservation including biodiversity losses, forest people, and the TEKs for climate

change besides the adaptation. The projects of the REDD+ for adaptation in Indonesia has been started in the engaging community around the forest to work together and use the TEKs to keep the forest (Ministry of Environment and Forestry Indonesia, 2018). The REDD+ projects in Indonesia located in Sumatera island, Kalimantan island, and Sulawesi island that focused on monitoring the forest permits moratorium, one-map policy, law enforcement support, indigenous land mapping and forest fire prevention. In 2017, the Third National Communication (TNC) of Indonesia reported the strategy of the REDD+ and implementation status as shown in Table 2.8.

**Table 2.8** REDD+ strategy and the implementation status.

Pillar of REDD+ Strategy	Status of implementation	Achievements of Outputs
<b>Institutions and Process</b>		
1. REDD+ Institution	Implemented	<ul style="list-style-type: none"> <li>• Establishment of REDD+ Task Force in 2010, REDD+ Agency in 2013 and Directorate General of Climate Change Ministry of Environment and Forestry in 2015</li> <li>• REDD+ institution was established at 11 provinces (as a Working Group, Commission, or Task Force)</li> </ul>
2. Funding Instruments	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>• Fund for REDD+ in Indonesia was developed by REDD+ Agency</li> <li>• Government of Indonesia issued a Presidential Decree regulating Environmental Financing and is currently preparing a National Financing Institution</li> </ul>
3. MRV Institution	Implemented	<ul style="list-style-type: none"> <li>• National Registry System by Ministry of Environment and Forestry</li> </ul>
<b>Laws and Programs</b>		
1. Land rights	Operationalized/ Continuously	<ul style="list-style-type: none"> <li>• Land and Forest Governance Reform is established</li> </ul>

	progressing	<ul style="list-style-type: none"> <li>• Customary Right is given Recognition and Protection by the national government</li> <li>• Agrarian Reform is ongoing</li> <li>• Acceleration of Forest area through recognition of rights</li> <li>• Ministerial Decrees related to Indigenous Forests are issued at five provinces and six districts:</li> <li>• Sk.6737/menlhk-pskl/kum.1/12/2016;</li> <li>• SK.6738/menlhk-pskl/kum.1/12/2016;</li> <li>• SK.6739/menlhk-pskl/kum.1/12/2016;</li> <li>• SK.6740/menlhk-pskl/kum.1/12/2016;</li> <li>• SK.6743/menlhk-pskl/kum.1/12/2016;</li> <li>• SK.6744/menlhk-pskl/kum.1/12/2016;</li> <li>• SK.6744/menlhk-pskl/kum.1/12/2016</li> </ul>
2. Spatial planning	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>• One map policy is established</li> <li>• Cadastral baseline database is developed</li> <li>• Presidential Regulation No.9/2016 on Acceleration to One Map Policy Implementation is in place</li> </ul>
3. Review on law enforcement and corruption prevention	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>• Roadmap on Law Reform is established</li> <li>• Conflict Resolution is carried out in six National Parks</li> <li>• Permit of moratorium and conflict resolution is carried out through multi-door approach.</li> </ul>

4. Moratorium of concessions	Implemented	<ul style="list-style-type: none"> <li>Indonesian forest concession/license moratorium is implemented through Presidential Instruction No.8/2015 and Ministerial Decree No. SK.2312/Menhut-VII/IPSDH/2015, and is periodically reviewed</li> </ul>
5. Data and mapping	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>One map policy is established</li> <li>Cadastral baseline database is developed</li> </ul>
6. Harmonize the incentive systems	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>Some initiatives in result-based payment system related to emission reduction measures from deforestation and forest degradation by the local community at the district level were developed</li> <li>Engagement of the private sector is built, as one of the resources for REDD+ financing</li> </ul>
<b>Strategic Programs</b>		
1. Sustainable management of landscape	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>Memorandum of Understandings with local governments to develop sustainable management of landscape at subnational level are established</li> <li>Watershed management is implemented</li> <li>Forest Management Unit-based watershed are established</li> </ul>
2. Sustainable economic system in terms of resource utilization	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>Low-emission development strategies at the provincial level are developed, including Provincial Conservation Strategy</li> </ul>
3. Conservation and rehabilitation	Implemented	<ul style="list-style-type: none"> <li>Conflict resolution in national parks are implemented</li> <li>Prevention programmed of peat and forest fire are implemented</li> </ul>

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### Paradigm and work culture

1. Enhancement of forest management and land use

Operationalized/  
Continuously  
progressing

- Rehabilitation national movement is implemented, including replanting on burnt area, degraded land, and firebreaks
- Restoration programs are implemented, including those embedded in livelihood program.

2. Empowering local economy in accordance with sustainability principle

Implemented

- A robust and transparent National Forest Monitoring System is established
  - Improvement and data updating of activity from permanent sample plots at sub national level are on going
  - Web platform: REDD+ Registry System, SIGN SMART, Safeguards Information System/SIS REDD+ are developed
  - Forest Reference Emission Level REDD+ Indonesia is established
  - Acceleration of Forest Area through right recognition is carried out
  - Support for the development of Indicative Maps for Social Forestry
  - Strengthening capacity of local facilitators
  - Support to local communities in partnership mechanism with private sectors
  - Introduction of performance-based payments pilot activities (payment for ecosystem services) using community grants;
  - Submission of proposals on local community-based forest management (200,000 hectares)
-

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		<ul style="list-style-type: none"> <li>• Agreement on ‘payment for ecosystem services’ to private sectors between <i>Nagari Malalo</i> with PT. PLN and <i>Nagari Sungai Buluh</i> with PT. Angkasa Pura II are established</li> </ul>
3. National campaign for forest saving activities	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>• Several events and programs are carried out</li> </ul>
<b>Stakeholder involvement</b>		
1. Interactions with various groups (regional government, private sectors, non-governmental organization, indigenous/ local and international community)	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>• Capacity and local institutional building</li> <li>• Stakeholder engagement</li> <li>• Multi-stakeholder forum</li> <li>• Memorandum of Understandings with local government</li> <li>• Engagement of private sector is one of resources for REDD+ financing</li> <li>• Continuous engagement with 11 pilot provinces especially the 6 provinces under transition program</li> <li>• Cooperation with universities and research institution (Climate Change and Forestry Expert Network)</li> </ul>
2. Development of social and environmental safeguards	Implemented	<ul style="list-style-type: none"> <li>• Citizen journalism program</li> <li>• Principle, Criteria, Indicator, and Assessment Tools for a System for Providing Information on REDD+ Safeguards Implementation is developed and a Safeguard Information System REDD+ web platform is operational</li> </ul>
3. Fair benefit sharing	Operationalized/ Continuously progressing	<ul style="list-style-type: none"> <li>• Research and studies on the benefit sharing mechanism related to emission reduction measures from deforestation and forest degradation are developed, involving local</li> </ul>

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Source: Ministry of Environment and Forestry Indonesia (2018).

The discussions of the REDD+ in Indonesia related to the IPs who live in the land have raised many questions. The unclear scheme of the REDD+ in Indonesia has made many debates. Many people assumed that there are political forces beyond this project development. For the IPs and the REDD+, the AMAN is the only organization that responds to develop plan and strategy for the engagement of the IPs on the REDD+ activities. Since the changing of president and regulation to place the REDD+ under the Ministry of Forestry and Environment, the action of the REDD+ agenda is stalling (The Indigenous Peoples' Alliance of the Archipelago, 2018).

#### **2.4 Indonesia National Action Plan for Adaptation**

Indonesia as a Non-Annex I Party to the UNFCCC fulfills one of its commitment to implement the convention by presented its First National Communication in 1999, the Second National Communication in 2010, and the latest one is the Third National Communication in 2017 (Ministry of Environment and Forestry Indonesia, 2018). In 2015, Indonesia committed to reducing 29 percent GHG emissions by 2030 and up to 41 percent if adequate international support were formed available to the Government of Indonesia (Ministry of National Development Planning, 2014).

In 2014, Indonesia officially announced the national action plan for adaptation that called as *Rencana Aksi Nasional – Adaptasi Perubahan Iklim* (RAN-API). The RAN-API is the Indonesian national action plan document on adaptation to the impacts of climate change, which involves integrated coordination among all the stakeholders, from the government, civil society organizations, international cooperation agencies and other stakeholders (Ministry of National Development Planning, 2013). The RAN-API is under Indonesian Ministry of National Development Planning with some related some ministries and national agencies of Indonesia.

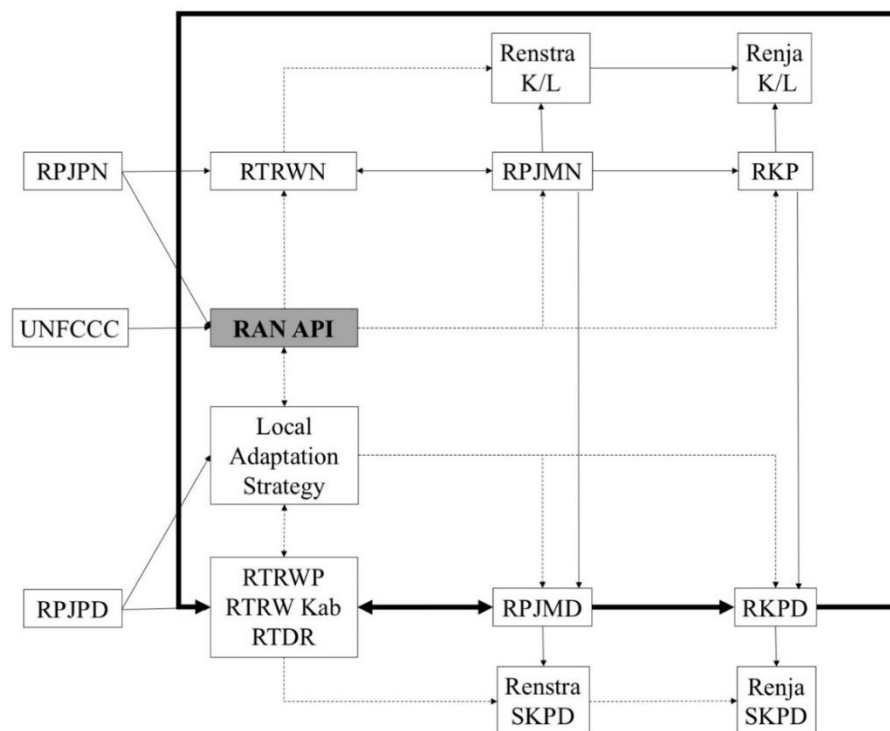


After designing the RAN-API, Indonesia is concerning on reducing the impact of climate change at local, regional, national, and international scales. This commitment is followed by the Paris Agreement as a driver to reduce the impact of climate change in all of the sectors. The roadmap of Indonesia initiatives for climate change in the last decade (2007-2019) is shows in Table 2.9.

**Table 2.9** Indonesia initiatives for climate change.

<b>Year</b>	<b>National Commitment</b>
2007	COP-13 in Bali as National Action Plan on Climate Change: Bali Roadmap and Bali Action Plan. Indonesia National Response to Climate Change (Yellow Book) between 2007 to 2009.
2009	Technology Needs Assessment (TNA). President Announced the Indonesian Mitigation Target, Reduce GHG by 26 percent (National efforts) and up to 41 percent (with supports) by 2020. Indonesia Climate Change Trust Fund (ICCTF).
2010	Indonesia Climate Change Sectoral Roadmap (ICCSR). Indonesian Second National Communication (SNC).
2011	Presidential Regulation No. 61 the Year 2011 on National Action Plan on GHG Emission Reduction (RAN-GRK). Presidential Regulation No. 71 the Year 2011 on National GHG Inventory.
2014	National Action Plan for Adaptation (RAN-API). Announced USD 250.000 Funding for Green Climate Fund. Ratify the Doha Amendment for 2 <sup>nd</sup> Commitment Period of the Kyoto Protocol.
2015	Contribute Actively in the Deliberations Leading Up to the Adoption of the Paris Agreement.
2016	Ratify the Paris Agreement. Submitted the first National Determined Contributions (NDCs), Reduce GHG by 29 percent (National efforts) and up to 41 percent (with supports) by 2030.
2017	Indonesia Third National Communication (TNC).
2019	Indonesia Low Carbon Development Initiative (LCDI).

The RAN-API is presumed to provide input to the future government work plan and the National Medium-Term Development Plan becoming more responsive to the impacts of climate change (Government of Indonesia, 2018b). The RAN-API is also a resource to develop the local strategy and action plan for climate change adaptation for local governments (Ministry of National Development Planning, 2013). Generally, the National Medium-Term Development Plan consists of three parts namely the National Development Agenda, the Sectoral Development Agenda, and the Regional Development Agenda with the *Nawa Cita* (the *Sanskrit* term for nine agenda priorities) explicitly accommodated in chapter six of the first part of the National Medium-Term Development Plan (UNDP, 2015). Figure 2.9 shows the position of the RAN-API in the National Development Framework.

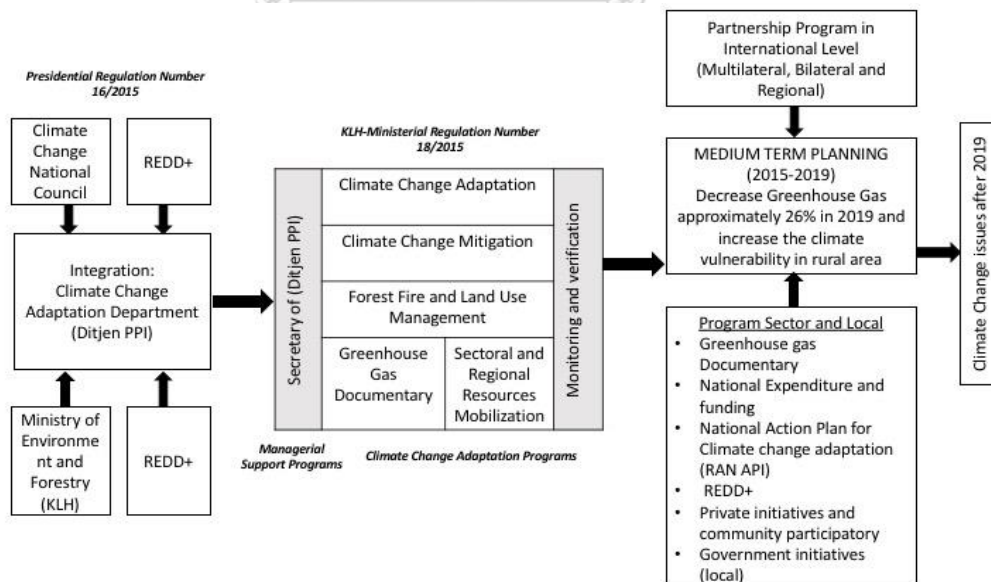


**Figure 2.9** The position of RAN-API in the national development framework.  
Source: Ministry of National Development Planning (2014).

RPJPN	: Long-Term National Development Planning
RPJPD	: Long-Term Regional National Development Planning
RTRWN	: National Spatial Planning
RTRWP	: Provincial Spatial Planning
RTRW Kab	: District Spatial Planning
RDTR	: Detailed Spatial Planning
Renstra K/L	: Line Ministries Strategic Plan

RPJMN	: Mid-Term National Development Planning
RPJMD	: Mid-Term Regional Development Planning
Renstra SKPD	: Local Government Agency's Strategic Planning
Renja K/L	: Line Ministry Work Plan
RKP	: Government Work Plan
RKPD	: Local Government Work Plan
Renja SKPD	: Local Government Agency's Work Plan

In the National Medium-Term Development Plan during the years 2015-2019, the Directorate General of Climate Change Control is mandated to produce low-carbon development and capacity building for adaptation to climate change (Ministry of National Development Planning, 2014). However, climate change control requires work areas targeted above the National Medium-Term Development Plan objectives and time dimensions (Ministry of National Development Planning, 2014). In the National Medium-Term Development Plan, the REDD+, and the RAN-API has been included in medium-term planning in 2015 to 2019 (Ministry of National Development Planning, 2013). The National Medium-Term Development Plan targets 2015 to 2019 tackling climate change post-2019 issues for climate change control are handled by five technical directorates and one secretariat of directorate general as shown in Figure 2.10.

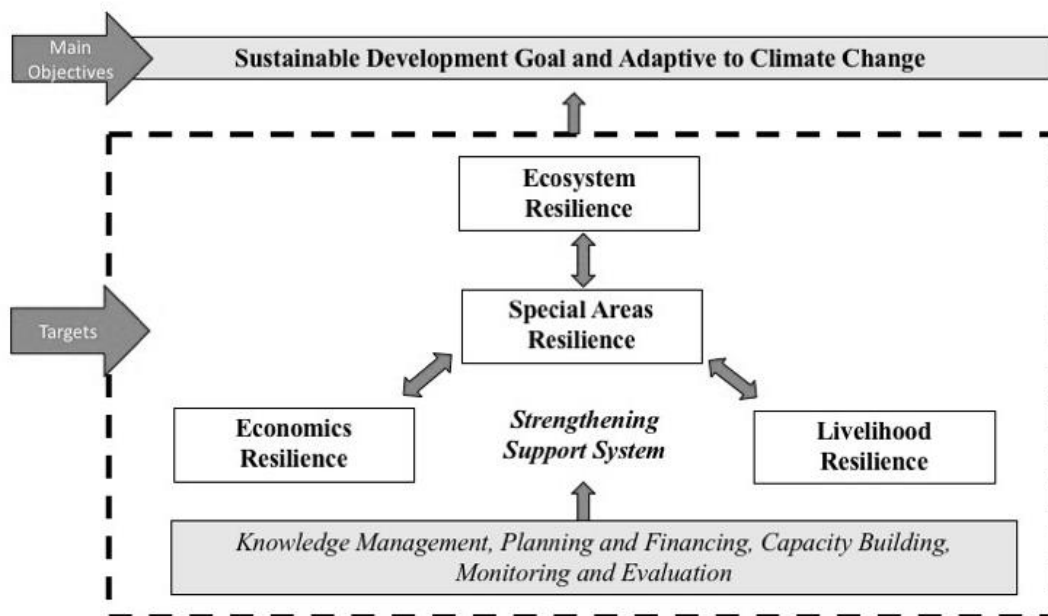


**Figure 2.10** National Medium-Term Development Plan of Indonesia for climate change.

Source: Ministry of National Development Planning (2014).

The National Long-Term Development Plan between 2005 to 2025 was drawn up as a continuation or previous stages of development planning under Article 4 of Act No. 25 the Year 2004 on National Development Planning (Ministry of National Development Planning, 2014). The National Long-Term Development Plan spans twenty years and is divided into four phases which each spanning of five years. In achieving the vision of sustainable development, the Government of Indonesia conducted that the long-term sustainability of development and predicted the challenges of climate change which affect the activities and community livelihood in the future (REDD, 2005).

The National Long-Term Development Plan mentioned three targets of sustainable development and adaptive to climate change as shown in Figure 2.11. These targets comprise of ecosystem resilience, livelihood resilience, and economic resilience (Ministry of National Development Planning, 2014). The community resilience in the IPs should be considered to take the best practices in climate change adaptation from their TEKs that they have gotten by generation from their ancient.



**Figure 2.11** Long-term planning of Indonesia for climate change.  
Source: Ministry of National Development Planning (2014).

Furthermore, Indonesia has declared the president decree for implementing the SDGs No. 59 the Year 2017. It consists of a guideline for several Ministries or Agencies in the preparation, implementation, monitoring and evaluation of national action plan for the SDGs (RAN-TPB) in accordance with their field of duty. Then, a guideline for Sub-national Government in the preparation, implementation, monitoring and evaluation of local action plan for the SDGs (RAD-TPB). However, this President Decree reference for Civil Society Organization (CSO), philanthropy, business actors, academia, and other stakeholders who will prepare the planning, implementation, and monitoring and evaluation of the SDGs.

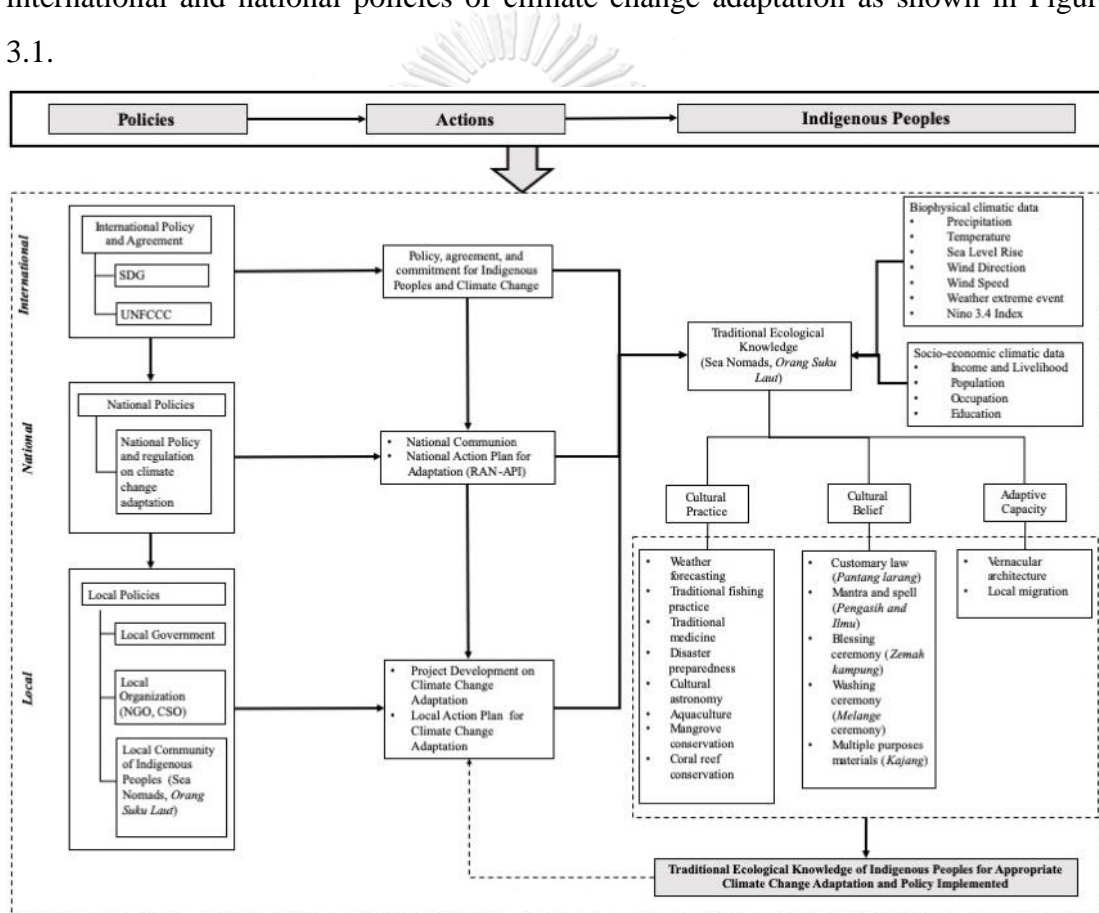


## CHAPTER III

### RESEARCH METHODOLOGY

#### 3.1 Conceptual Research Framework

The research aimed to study the Traditional Ecological Knowledge (TEKs) of the Indigenous Peoples (IPs) on climate change adaptation of the *Orang Suku Laut* (Sea Nomads), Lingga Regency, Riau Islands Province, Indonesia. The conceptual framework was designed in the context of the TEKs and the IPs relevant to international and national policies of climate change adaptation as shown in Figure 3.1.



**Figure 3.1** The conceptual research framework.

This research used both qualitative and quantitative research approaches for data collection and data analysis. The approaches include desk studies, field observation, in-depth interview using a questionnaire. Local stakeholders including the IPs, community leaders, local government officers, organizations, and agencies have been

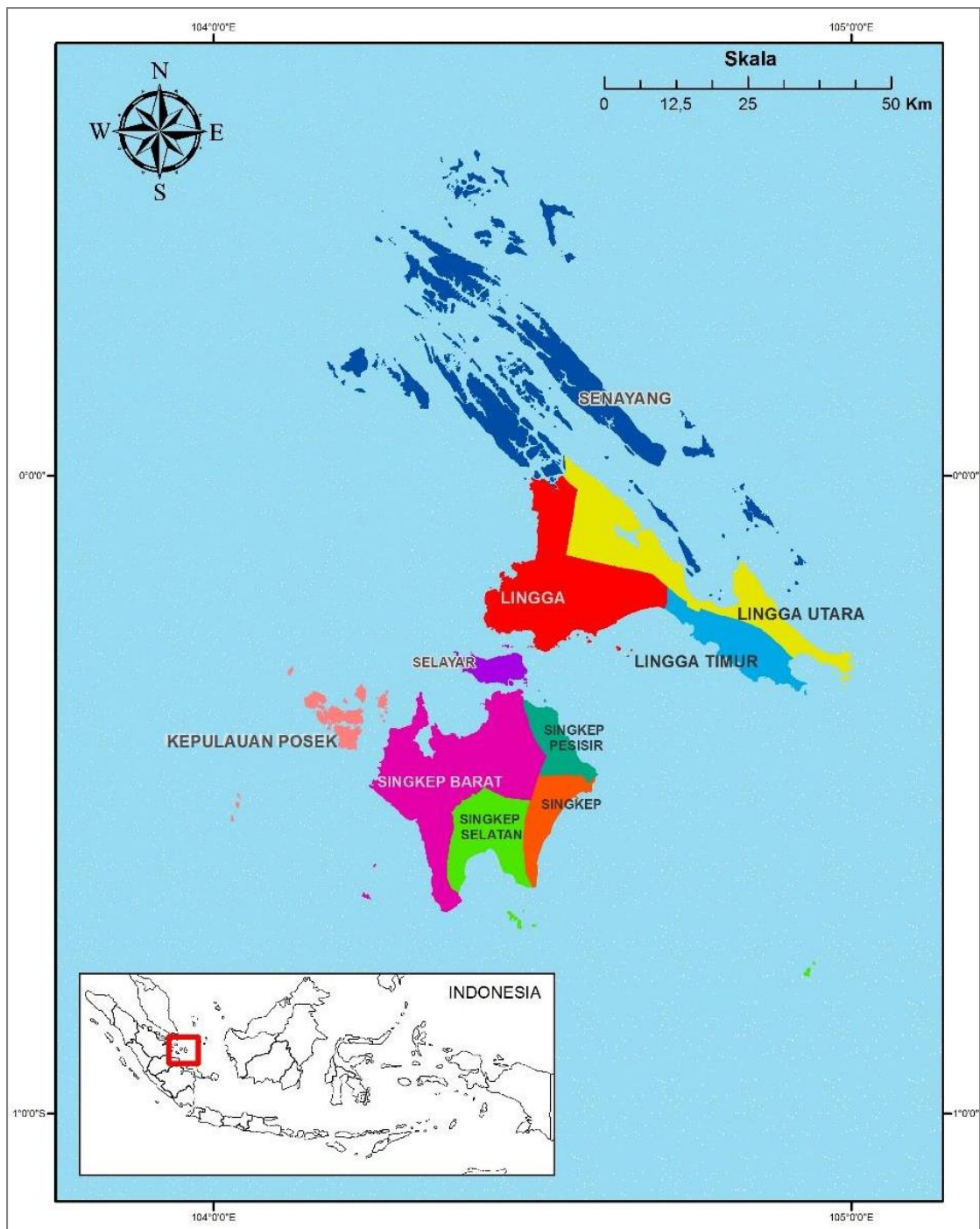
engaged in the study. The TEKs of the IPs were directly observed and collected primary and secondary data in the field.

### 3.2 Study Area

Geographically, the Lingga Regency is located between 0<sup>o</sup>20'N and 0<sup>o</sup>40'S, and between 104<sup>o</sup>-105<sup>o</sup>E. The Lingga Regency consist of two large islands that are Singkep Island and Lingga Island. The Lingga Regency have 10 Sub-regencies namely West Singkep, Posek Islands, Singkep, South Singkep, Coastal Singkep, Selayar, Lingga, North Lingga, East Lingga, and Senayang. The Map or Lingga Regency shows in the Figure 3.2.

Generally, the Lingga Regency has a tropical and wet climate with an average monthly rainfall variation of 264.98 millimeters in 2016. According to the Meteorology, Climatology and Geophysical Agency of Lingga Regency (2019), the Lingga Regency was classified as equatorial rainfall types. The rainy season occurs two times in a year March-April-May (MAM) and September-October-November (SON). However, the average temperature is 27.5 degree Celsius, while the humidity varies between 85 and 88 percent.

The Lingga Regency is located the highest disaster risk area in Riau Islands Province. In 2013, some villages especially Senayang sub-regency was a disaster hot spot village of Indonesia (Ministry of Social Affairs, 2018). The frequent disasters in the Lingga Regency, particularly in Senayang sub-regency are storm surge, high-tide periods, drought, and the tropical cyclone (Statistics Indonesia, 2017). The period of hazard is vary depending on climate variability in that area. The study focuses on the *Orang Suku Laut* who are scattering in the Lingga Regency, Riau Islands Province, Indonesia. There are 30 communities of the *Orang Suku Laut* living in five sub-regencies: Lingga, North Lingga, Senayang, Selayar, and West Singkep.



**Figure 3.2** The study area in the Lingga Regency.  
Source: Statistic Indonesia (2018).

### 3.3 Data Collection

Both qualitative and quantitative data collected were conducted at the *Orang Suku Laut*, Lingga Regency, Riau Islands Province Indonesia. The instruments of data collection were as follows.



### 3.3.1 Desk Study

Various literature sources were used as background information and practices of the *Orang Suku Laut* in the Lingga Regency. Desk study included the current review essentially journal articles and reports on academic findings, edited books, and book sections, and also reports of related projects. Various governmental documents and policy documents at the national and local levels were used and analyzed. The secondary data such as socio-economic and biophysical data have been reviewed as a baseline data using both qualitative and quantitative analysis, such data are presented in Table 3.1.

**Table 3.1** List of secondary data and their sources.

Institution	Level	Requested Data
Meteorology, Climatology, and Geophysical Agency	Regional	<ul style="list-style-type: none"> <li>• Daily rainfall data between 1987-2018</li> <li>• Daily average temperature data between 1987-2018</li> <li>• Daily maximum temperature data between 1987-2018</li> <li>• Daily minimum temperature data between 1987-2018</li> <li>• Daily wind speed data between 1987-2018</li> <li>• Daily wind direction data between 1987-2018</li> <li>• Extreme event data between 1987-2018</li> <li>• Nino 3.4 Index data between 1987-2018</li> </ul>
Regional Planning Department of Lingga Regency	Regional	Reports and documents related to the <i>Orang Suku Laut</i>
Social Office Department of Lingga Regency	Regional	Reports and documents related to the <i>Orang Suku Laut</i>
Marine and Fisheries Affairs Office of Lingga Regency	Regional	Reports and documents related to the <i>Orang Suku Laut</i>

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Environmental Department of Lingga Regency	Regional	Reports and documents related to the <i>Orang Suku Laut</i>
Statistical Department	Regional	Reports and documents related to the <i>Orang Suku Laut</i>
Regional Disaster Management Agency of Lingga Regency	Regional	Reports and documents related to the <i>Orang Suku Laut</i>

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### 3.3.2 Semi-structured Questionnaire Development

The semi-structured questionnaire was developed to collect primary data of the TEKs of the *Orang Suku Laut* on climate change adaptation. This set of questionnaire was used to in-depth interview selected respondents. The questionnaire consisted of four parts including general information, climate change knowledge, TEKs, and policy and development project implemented on climate change adaptation for the *Orang Suku Laut*.

### 3.3.3 Field Observation

A field visit was an important method to identify the overall basis of limitation and performance information in the field area of the *Orang Suku Laut*. The purpose of this instrument was to access data of the variability and change on climate change adaptation of the *Orang Suku Laut* for supporting the research findings toward improving and understanding of the study area circumstance.

### 3.3.4 In-depth Interview

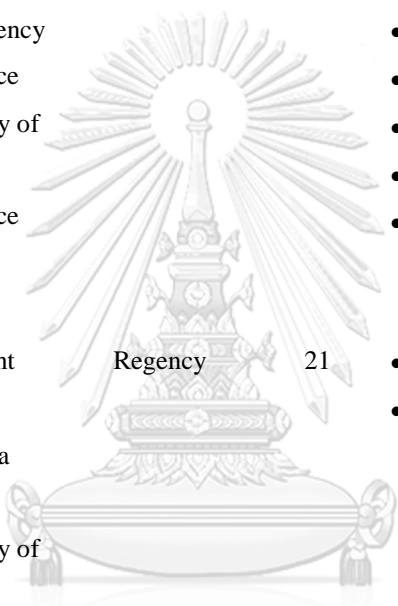
The in-depth interview was conducted to get comprehensive information of climate change adaptation and the TEKs of the IPs in the study area. The respondents of the study were selected using a purposive sampling method which is a non-probability form of sampling that aims to sample the cases or participants in a strategic way and relevant to the research questions that are being posed (Bryman, 2012). Additionally, this method is able to identify the typical case sampling by exemplifying a dimension

of interest. The in-depth interview was done using a set of questionnaire composed of general information of respondents, climate change knowledge, TEKs, and policy and development project implemented on climate change adaptation for the *Orang Suku Laut*. Respondents were the native of the *Orang Suku Laut* and related stakeholders. Table 3.2 presents respondents of the study.

**Table 3.2** Respondents of the study.

No	Respondents	Level	Number	Expected Outcome
1	Community Group Leaders (headmen)	Local	9	<ul style="list-style-type: none"> <li>• General information about their group</li> <li>• Community based adaptation</li> <li>• Traditional ecological knowledge</li> <li>• Seasonal calendar</li> <li>• Extreme Weather event</li> <li>• Socio-economic circumstance</li> <li>• Development projects</li> <li>• Human security</li> </ul>
2	The <i>Orang Suku Laut</i> community members (native people) <ul style="list-style-type: none"> <li>• Elder</li> <li>• Women</li> <li>• Youth</li> </ul>	Local	20	<ul style="list-style-type: none"> <li>• General information about their group</li> <li>• Community based adaptation</li> <li>• Traditional ecological knowledge</li> <li>• Seasonal calendar</li> <li>• Extreme Weather event</li> <li>• Socio-economic circumstance</li> <li>• Development projects</li> <li>• Human security</li> </ul>
3	Local administrator office <ul style="list-style-type: none"> <li>• Head of local administration office</li> <li>• General secretary of</li> </ul>	Local	5	<ul style="list-style-type: none"> <li>• General information about their communities</li> <li>• Community based adaptation</li> <li>• Traditional ecological knowledge</li> </ul>

	local administration office			<ul style="list-style-type: none"> <li>• Seasonal calendar</li> <li>• Extreme Weather event</li> <li>• Socio-economic circumstance</li> <li>• Development projects</li> <li>• Human security</li> <li>• Policy related to the <i>Orang Suku Laut</i></li> </ul>
4	Sub-regency government office	Sub-regency	3	<ul style="list-style-type: none"> <li>• General information about their communities</li> <li>• Community based adaptation</li> <li>• Extreme Weather event</li> <li>• Socio-economic circumstance</li> <li>• Development projects</li> <li>• Policy related to the <i>Orang Suku Laut</i></li> </ul>
5	Regency Government office	Regency	21	<ul style="list-style-type: none"> <li>• Development projects</li> <li>• Policy related to the <i>Orang Suku Laut</i></li> </ul>



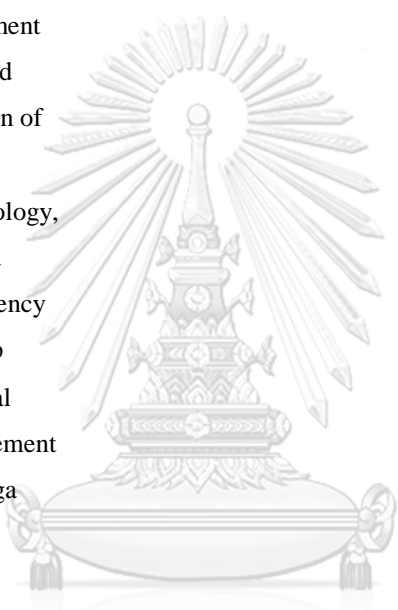
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Fisheries Affairs

Office of Lingga

Regency

- Head of Environmental Department of Lingga Regency
- Head of Department of Culture of Lingga Regency
- Head of Department of Population and Civil Registration of Lingga Regency
- Head of Meteorology, Climatology and Geophysical Agency of Dabo Singkep
- Head of Regional Disaster Management Agency of Lingga Regency
- People Representative Council of Indonesia for Lingga Regency



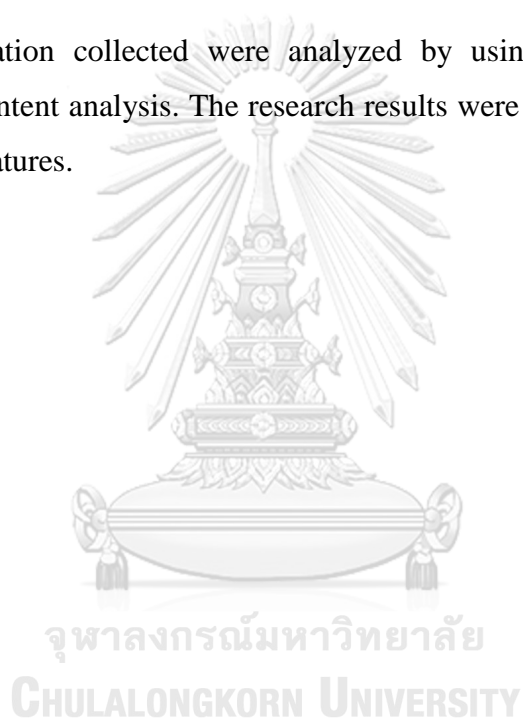
- |   |   |          |   |  |
|---|---|----------|---|--|
| 6 | Provincial Government office  | Province | 2 | <ul style="list-style-type: none"> <li>• Development projects</li> <li>• Policy related to the <i>Orang Suku Laut</i></li> </ul> |
|   | <ul style="list-style-type: none"> <li>• Cultural Value and Conservation Center of Riau Island Province</li> <li>• Marine and Fisheries Affairs Office of Riau Island Province</li> </ul> |          |   |  |
-

7	National Government	National	3	<ul style="list-style-type: none"> <li>• Development projects</li> <li>• Policy related to the <i>Orang Suku Laut</i></li> </ul>
	<ul style="list-style-type: none"> <li>• <i>Komunitas Adat Terpencil</i>, Ministry of Social Affairs of Indonesia</li> <li>• <i>Masyarakat Hukum Adat</i>, Ministry of Fisheries and Marine</li> <li>• Disaster mitigation and climate change adaptation, Ministry of Fisheries and Marine</li> <li>• National Action Plan for Climate Change Adaptation Secretary (RAN-API Secretariats)</li> </ul>			
8	Organization	Local	2	<ul style="list-style-type: none"> <li>• Development projects</li> <li>• Policy related to the <i>Orang Suku Laut</i></li> <li>• Problem and challenge of the <i>Orang Suku Laut</i></li> </ul>
	<ul style="list-style-type: none"> <li>• <i>Kajang Foundation</i> (NGO)</li> </ul>			
9	Private Sector	Local	1	<ul style="list-style-type: none"> <li>• Development projects</li> <li>• Policy related to the <i>Orang Suku Laut</i></li> <li>• Problem and challenge of the <i>Orang Suku Laut</i></li> </ul>
	<ul style="list-style-type: none"> <li>• <i>Koperasi Mangrove Lestari Lingga</i> (Private Sector)</li> </ul>			
10	Society	Local	7	<ul style="list-style-type: none"> <li>• General information for the <i>Orang Suku Laut</i></li> <li>• Policy related to the <i>Orang Suku Laut</i></li> <li>• Problem and challenge of the <i>Orang Suku Laut</i></li> </ul>
	<ul style="list-style-type: none"> <li>• Shop Owner</li> <li>• Teacher</li> <li>• Religious Leader</li> </ul>			

11	Experts and Academic	All levels	4	<ul style="list-style-type: none"> <li>• General information for the <i>Orang Suku Laut</i></li> <li>• Policy related to the <i>Orang Suku Laut</i></li> <li>• Problem and challenge of the <i>Orang Suku Laut</i></li> <li>• Traditional Ecological Knowledge</li> </ul>
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### 3.4 Data Analysis

Data and information collected were analyzed by using statistical analysis and descriptive and content analysis. The research results were in the forms of qualitative and quantitative natures.



## CHAPTER IV

### RESULTS AND DISCUSSIONS

#### 4.1 The Study Area

This research was conducted at the *Orang Suku Laut* in Lingga Regency, Riau Islands Province, Indonesia between November 2018 and January 2019. The observation and interview were done in 17 communities of the *Orang Suku Laut* in four sub-regencies namely Lingga, North Lingga, Senayang, and Selayar. The study area in the *Orang Suku Laut* was selected that based on the suggestion from the local administrative officers and study literature from previous researches. The primary data were collected by using the semi-structured questionnaire and the in-depth interview of the experts and local leaders in the selected communities.

##### 4.1.1 Lingga Regency

The Lingga Regency is one of the regencies passed by equator line in Indonesia which located between 0°20'N to 0°40'S and 103°30'E to 105°00'E. According to the Indonesian Constitution No. 31 the Year 2003 for the official establishment of the Lingga Regency in the Riau Islands Province, the total areas of the Lingga Regency are 211,772 square kilometers covering 2,118 square kilometers on the land (1 percent) and 209,654 square kilometers (99 percent) on the sea (Statistics Indonesia, 2018). 604 islands are inhabited and 571 islands are uninhabited. In 2017, the Lingga Regency administratively consists of 10 sub-regencies namely Singkep, Coastal Singkep, South Singkep, West Singkep, Lingga, East Lingga, North Lingga, Senayang, Selayar and Posek Islands. The Lingga Regency is bounded by Galang District, Batam City, and Natuna Sea in the north, Natuna Sea in the east, Bangka Sea and Berhala Strait in the south and Indragiri Sea (Riau Province) in the west.

The main city of the Lingga Regency is Daek, which is the center of the great government of the Lingga Sultanate in the 17<sup>th</sup> century. This caused the Lingga Regency known as *Bunda Tanah Melayu* or Malay Motherland. In general, the topography of the Lingga Regency is a hilly area with a fairly high slope 76.92



percent. The soil types in the Lingga Regency are red yellow podzolic, lithosol, and organosols with soil layers in a crumb and lumpy. Acid pluton, granite, and sedimentary rock are the types of rock in the Lingga Regency. The map of the Lingga Regency is shown in Figure 4.1.

According to the Medium-Term Development Plans (RPJMD) of the Lingga Regency during 2016-2021, there are the potential prone of tidal and coastal erosion in the following area.

- a. Tanjung Harapan Village - Dabo Lama - Batu Berdaun Village
- b. Berindat Village - Persing Village - Lanjut Village – Sedamai Village - Kote Village - Pelakak Village in Coastal Singkep Sub-regency
- c. Senayang Sub-regency
- d. North Lingga Sub-regency (Teregeh Village, Sasah Village, Tanjung Awak Village, and Sungai Nona Village).

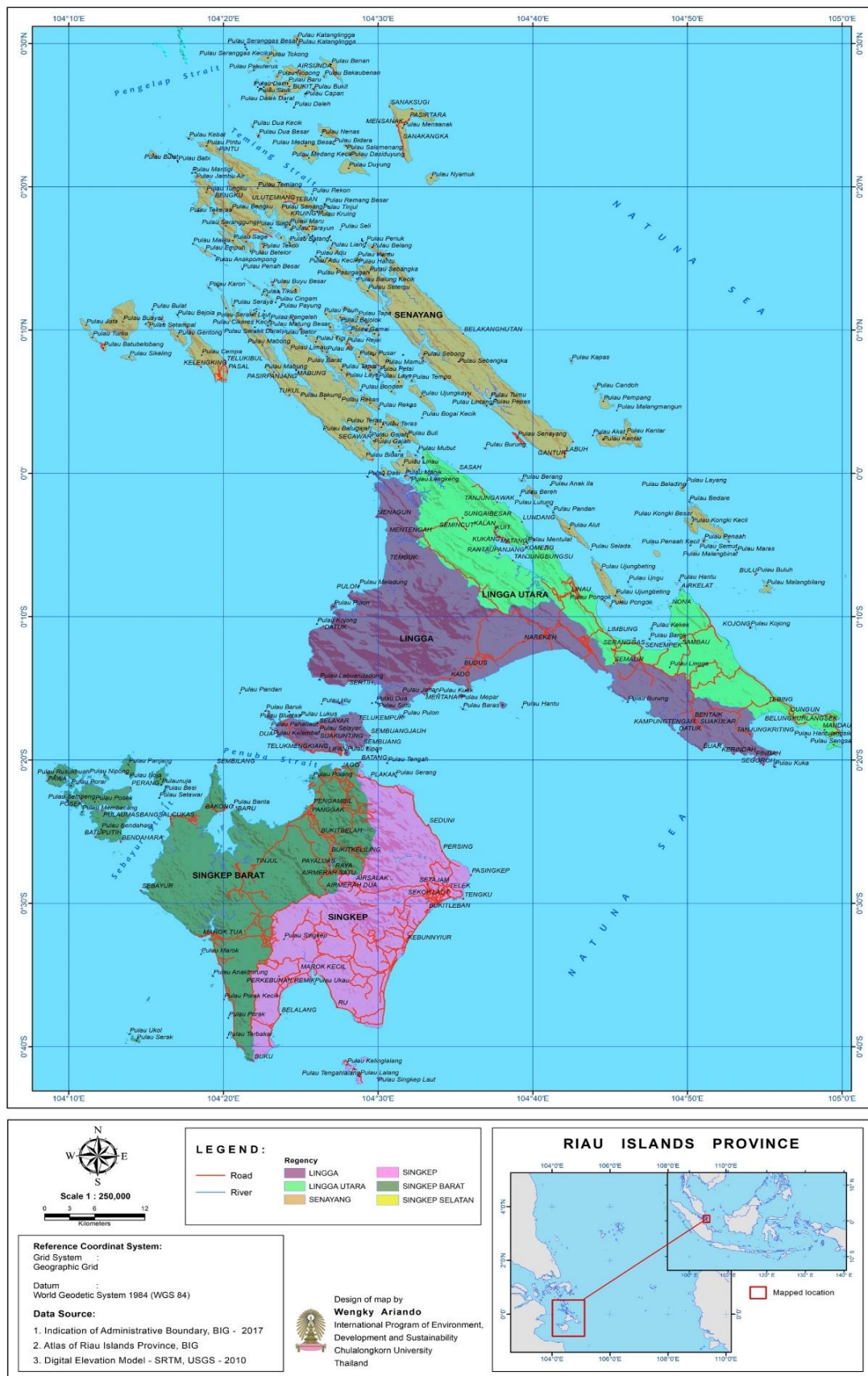


Figure 4.1 The Lingga regency map.

#### 4.1.2 Socio-Economic Condition

According to Statistics Indonesia (2019), the occupation in the Lingga Regency consists of agriculture, forestry, fisheries sector (33.15 percent), social service (21.03 percent), and business sectors (15.40 percent). In general, the regional income from the Lingga Regency is supported by large trade, retail, restaurant, hotel, transportation, warehousing and communication, finance, real estate, rental and corporate services, and community, social and individual services sectors. Meanwhile, the human development index of the Lingga Regency is the lowest level in the Riau Island Province compared than other regencies. Also, in 2018 the Lingga Regency is categorized as the highest percentage of poor people in Riau Islands Province, reaching 13.55 percent of the total population.

Based on the population projection of the Statistical Bureau of the Lingga Regency in 2010-2035, the population of the Lingga Regency in 2017 is 89,330 people. When compared with 2016, the rate of population growth in 2017 experienced a slowdown, namely from 0.43 percent to 0.40 percent. The population density of the Lingga Regency in 2017 is estimated at 42.18 people per square kilometers. The composition of the population of the Lingga Regency in 2017 is dominated by the productive age consisting the age group of 15-64 years (65.11 percent). In 2017, the average of the highest level of education in the Lingga Regency is junior high school graduates (38.52 percent). Meanwhile, the dependency ratio of the Lingga Regency in 2017 was 53.58 percent. Regarding the sub-regencies which located for the *Orang Suku Laut*, there are the socio-economic conditions as shown in Table 4.1.

**Table 4.1** Socio-economic data of the Orang Suku Laut sub-regencies located.

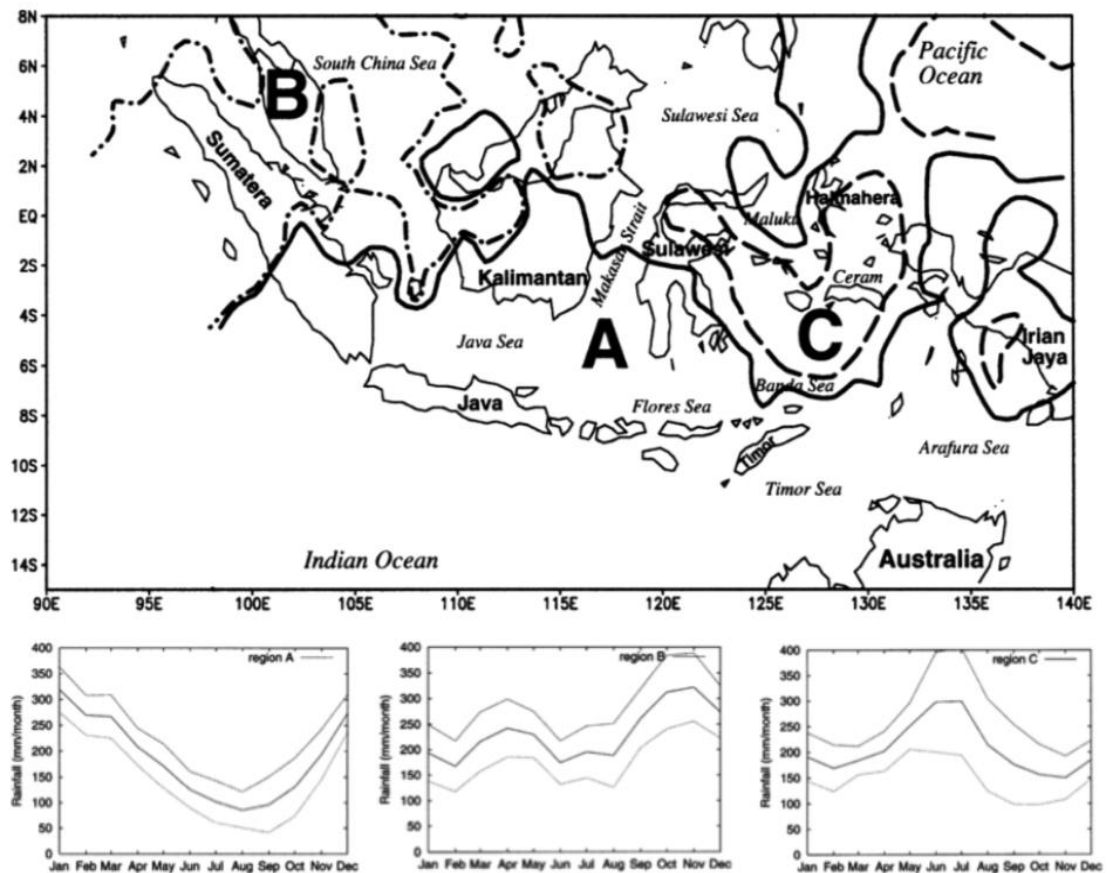
Indicator	Lingga	North Lingga	Senayang	Selayar	West Singkep	Total of Lingga Regency
Population (person)	10612	10048	19360	3288	12156	89330
The Orang Suku Laut population (person)	642	548	2133	440	168	3931

Land areas (square km)	383.45	283.21	396.00	84.86	337.10	211,772
Preposterous family (household)	674	842	1664	217	393	4783
Fisherman (person)	563	1338	3689	541	1032	8111
Fisheries production (ton/year)	2288	3597	6076	7374	3176	33973

Source: Statistic Indonesia (2018) and Interviewing the Head of Population and Civil Registration Lingga Regency Office.

#### 4.1.3 Climate information

Indonesia is an archipelago country passed by the equator and surrounded by Indian and Pacific Oceans. It is caused Indonesia as an intersection between meridional circulation (North-South) namely *Hadley Circulation* and zonal circulation (East-West) or *Walker Circulation*. These two circulations greatly influence climate variability in different province of Indonesia, particularly in provinces along the equatorial line (Meteorology Climatology and Geophysical Agency, 2019). According to Aldrian and Dwi Susanto (2003), the Lingga Regency, Riau Island Province is categorized as region B known as *equatorial rainfall pattern*, where the rainy season occurs two times in a year, March-April-May (MAM) and September-October-November (SON).



**Figure 4.2** Three main rainfall regions of Indonesia (A in solid line, B in short dashed line and C in long dashed line) and the annual cycles of rainfall (solid lines; dashed lines indicate one standard deviation above and below average).

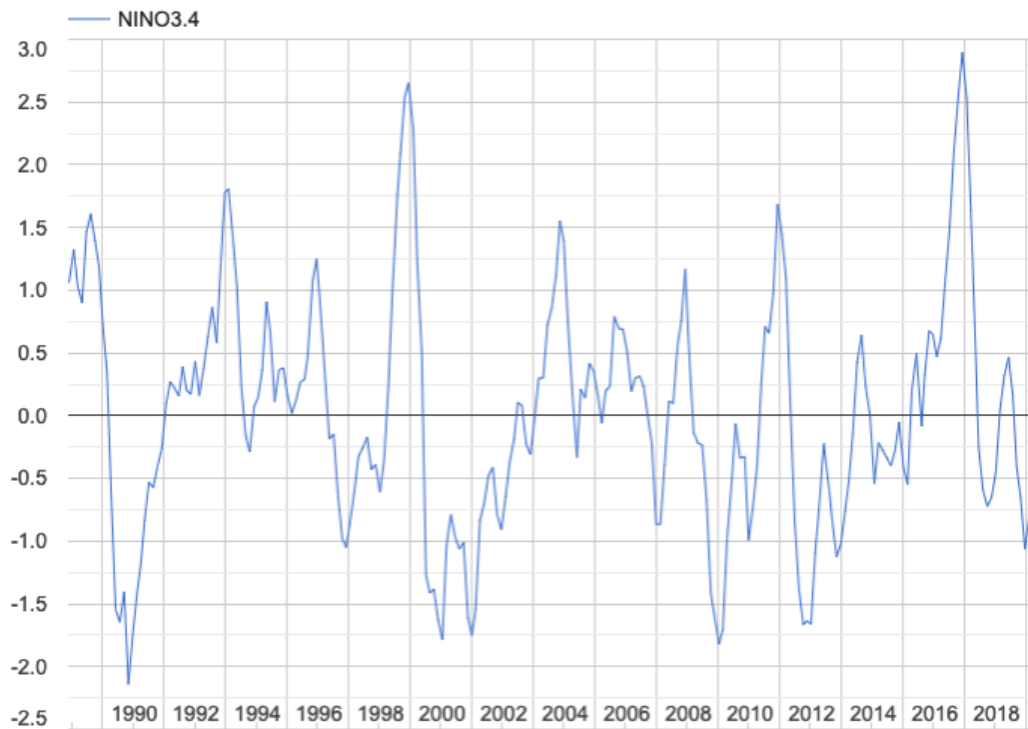
Source: Aldrian and Dwi Susanto (2003).

Figure 4.2 shows the rainfall pattern in Indonesia. It is divided into three regions. The monsoon rainfall pattern (region A) is characterized by the type of unimodal rainfall (one peak of the rainy season) where the dry season occurs in JJA and DJF is a wet season. Whereas six months are transition periods (three months transition from dry season to rainy season and three months transition from rainy season to dry season). Then, the equatorial rainfall patterns (region B) are characterized by the type of rainfall with a bimodal rainfall pattern (two peaks of rainy season) which usually occurs around March to October or when equinox occurs. Lastly, local rainfall patterns (region C) are characterized by patterns of patterns one rain peak, but the shape is opposite the type of monsoon rain.

Furthermore, the apparent motions of the sun from 23.5°N to 23.5°S impacts the Monsoon activities which also play a role in influencing climate variability (Meteorology Climatology and Geophysical Agency, 2019). The vary topographic forms and tropical cyclone disruptions also considered as influence factors on climate variability. IPCC (2014) stated that climate variability as results of climate change has influenced the intensity, spatial extent, duration, frequency, and timing of climate events and extreme weather. Therefore, Meteorology, Climatology and Geophysical Agency of Indonesia (BMKG) acknowledged *El-Nino* and *La-Nina* phenomenon influence the variability of rainfall in the Lingga Regency.

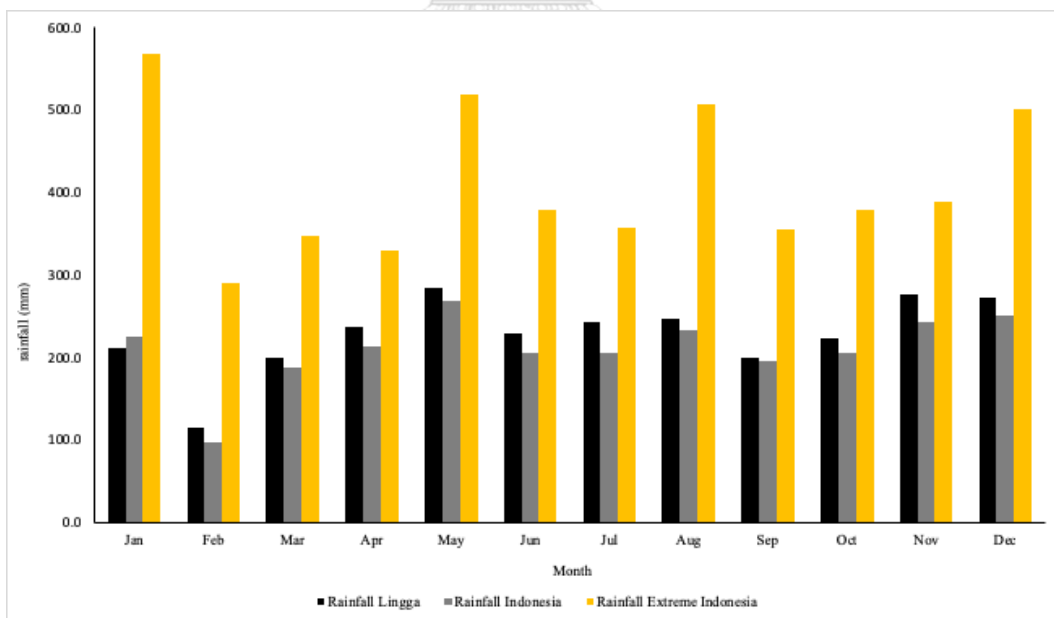
*El-Nino* and *La-Nina* are a result of climate variability (Larkin & Harrison, 2002). Recently, in 2018 *El-Nino* has occurred from September to October in Indonesia. This phenomenon will cause a decrease and increase in the amount of rainfall in some regions in Indonesia. The *El-Nino* effect is strong in areas patterned with region A, weak in region B and not clear in region C, whereas IOD (Indian Ocean Dipole) only has an apparent effect on the pattern of monsoon rain (Meteorology Climatology and Geophysical Agency, 2019). Also, the fluctuations of sea surface temperatures (SST) in the Pacific Ocean known generates *El-Nino* - Southern Oscillation (ENSO), IOD, and seasonal oscillation phase known as Madden-Julian Oscillation (MJO) that influence the variability of rainfall in Indonesia. According to Hendon and Salby (1994); Zhang (2005), MJO will cause variations in wind patterns, SST, clouds, and rainfall. The active phase of MJO at the same time as the northeast monsoon in the Riau Islands can cause an increase in rainfall of around 200 percent during December to August (Meteorology Climatology and Geophysical Agency, 2019).

The anomaly of the *Nino* 3.4 index in the period of 1987-2018 shows the fluctuated trend (Figure 4.3). In Indonesia, positive anomaly indicates that its year will have rainy season longer than the dry season and vice versa. Positive index of *Nino* 3.4 represents *La-Nina* and negative index for *El-Nino* which impact to hydrometeorological disasters and climate variability in Indonesia.



**Figure 4.3** Nino 3.4 index between 1987-2018.

Source: Meteorology Climatology and Geophysical Agency (2019).



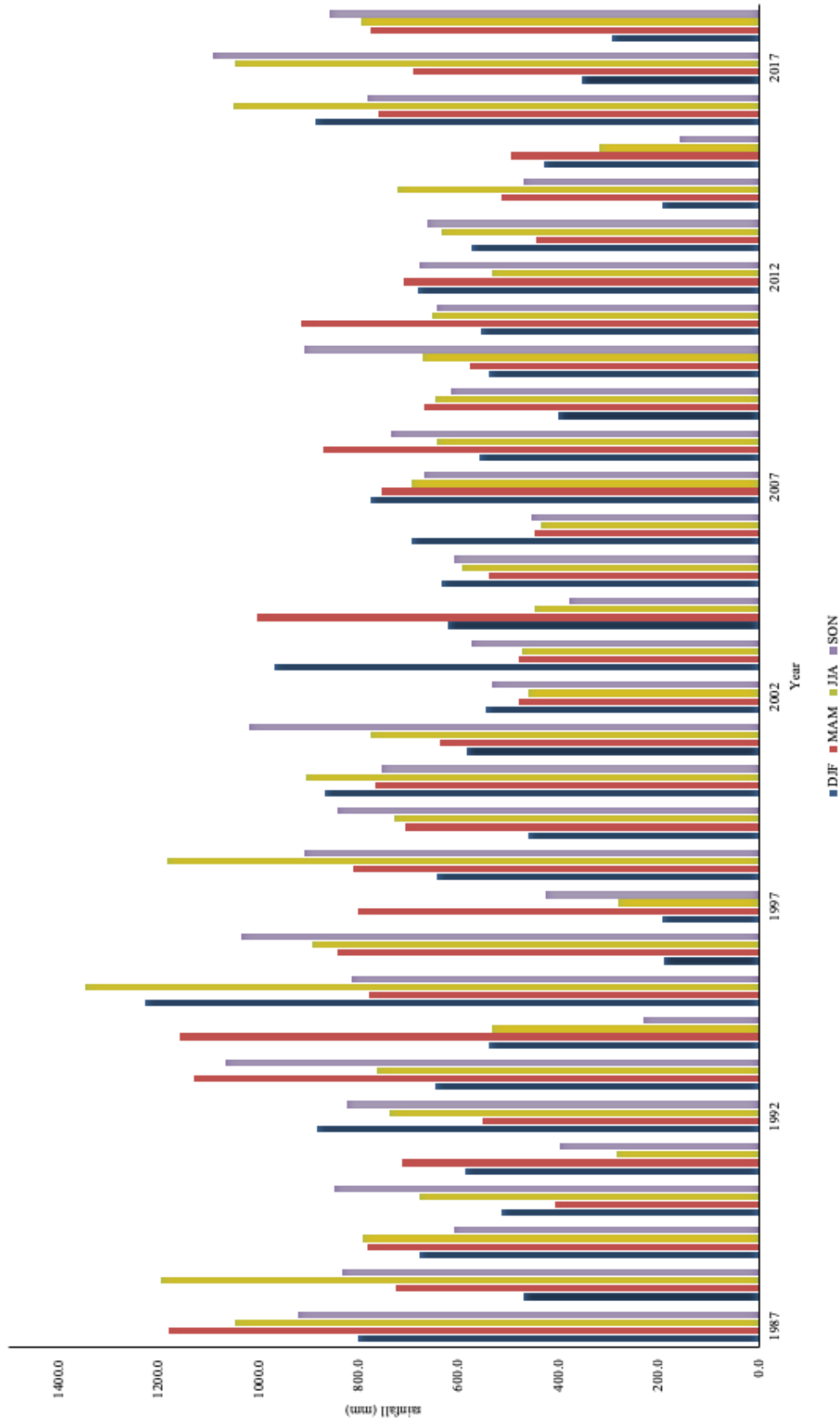
**Figure 4.4** The average monthly rainfall of the Lingga Regency in 1987 to 2018.

Source: Meteorology Climatology and Geophysical Agency (2019).

Figure 4.4 shows the average monthly rainfall pattern of the Lingga Regency during 1987 to 2018. The average rainfall data of Indonesia is lower than the average extreme rainfall pattern of Indonesia and the average rainfall data of Lingga Regency. Mostly, the highest rainfall occurs on MAM and SON or known as rainy season in the Lingga Regency. Then, normally DJF and JJA will be the dry season in the Lingga Regency.



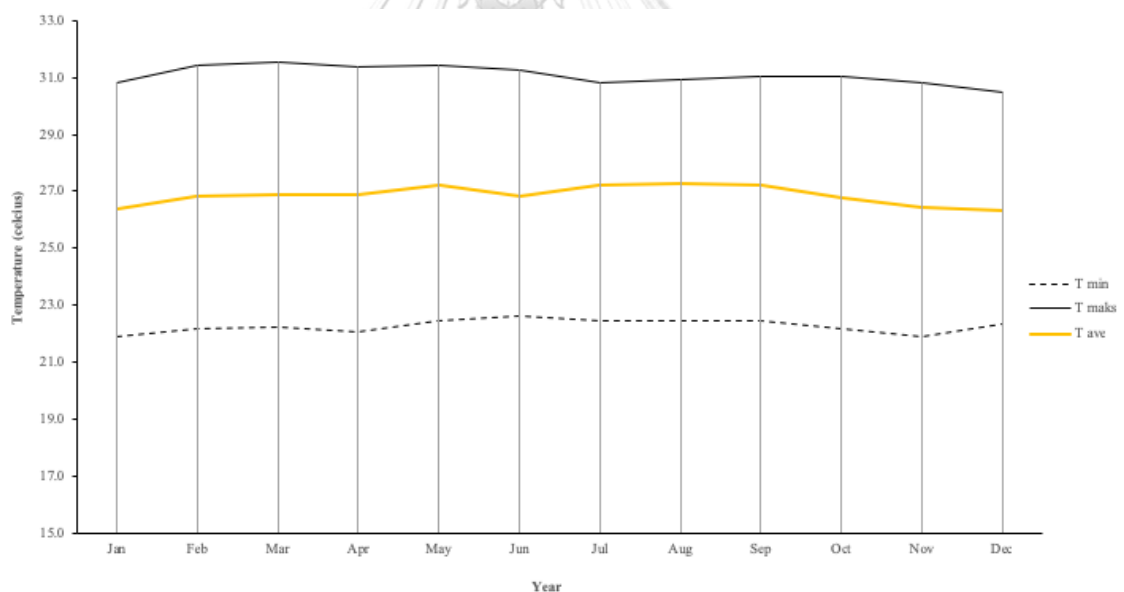




**Figure 4.5** Seasonal average rainfall of the Lingga regency in 1987 to 2018 (DJF, MAM, JJA, and SON). Source: Meteorology Climatology and Geophysical Agency (2019).

Figure 4.5 shows that the highest rainfall number happened in 1995 for JJA by 1349 millimeters and the lowest rainfall in 2015 for SON by 158 millimeters. Both of them showed that the extreme rainfall has occurred in the Lingga Regency. SON in 2015 was the worst case of drought in the Lingga Regency. According to Meteorology, Climatology and Geophysical Agency of Lingga Regency (2019), all of dams and rivers were totally dry in that time period. This event also recorded as the a bad impact of *El-Nino* phenomenon in Indonesia (Andrew et al., 2016).

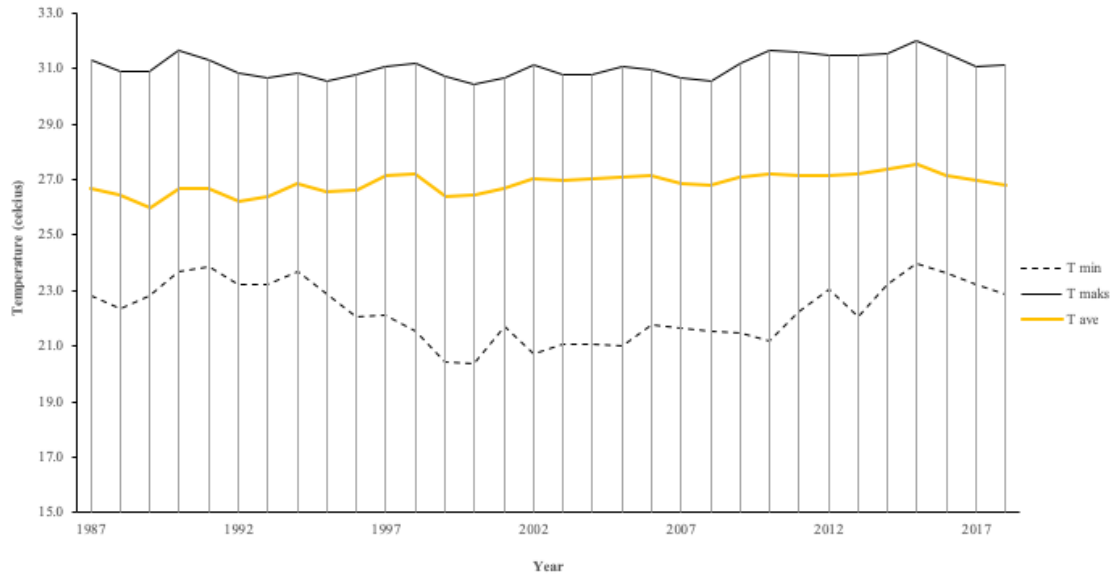
Meanwhile, the average temperature of the Lingga Regency during 1987 to 2018 is 26.9 degree Celsius. Figure 4.6 shows the highest average temperature is 27.3 degree Celsius in August and the lowest is 26.3 degree Celsius in December. The maximum temperature in March by 31.5 degree Celsius, and the minimum in January by 21.9 degree Celsius.



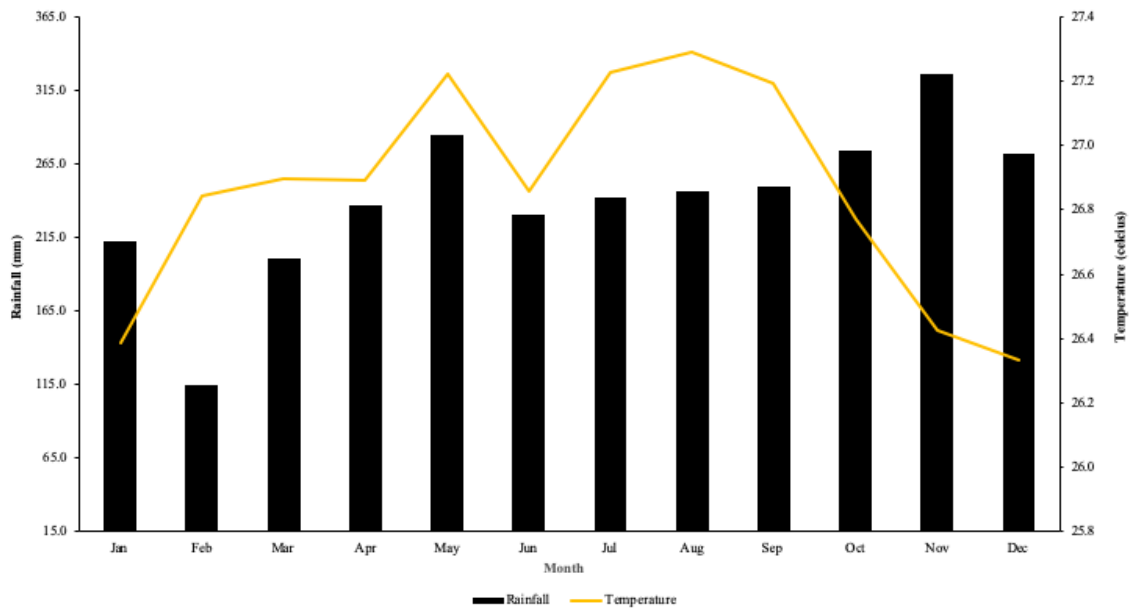
**Figure 4.6** Average monthly temperature of the Lingga Regency in 1987 to 2018. Source: Meteorology Climatology and Geophysical Agency (2019).

Figure 4.7 reveals the average monthly temperature of the Lingga Regency in 1987 to 2018. 2015 was observed as the extreme temperature. There were 24.0 degree Celsius for average temperature, 32.0 degree Celsius for maximum temperature, and 27.6 degree Celsius for minimum temperature. Therefore, the minimum temperature

during this period shows the year 2000 by 20.4 degree Celsius as the lowest temperature in the term of the average yearly minimum temperature.



**Figure 4.7** Average yearly temperature of the Lingga Regency in 1987 to 2018. Source: Meteorology Climatology and Geophysical Agency (2019).

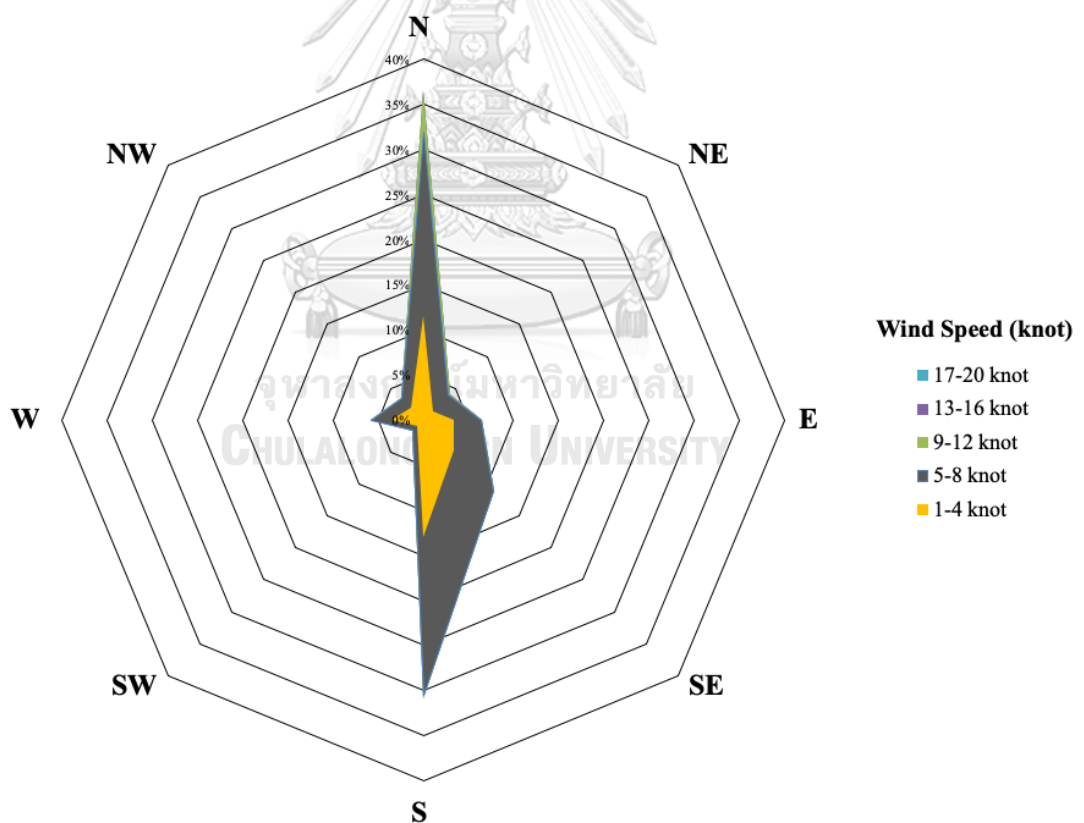


**Figure 4.8** Average monthly temperature and average rainfall of the Lingga Regency in 1987 to 2018.

Source: Meteorology Climatology and Geophysical Agency (2019).

Moreover, Figure 4.8 presents the average monthly temperature and average rainfall of the Lingga Regency in 1987 to 2018. The study found that there is no significant correlation between average monthly rainfall and temperature in the Lingga Regency. Aldrian and Dwi Susanto (2003) found that the rainfall in the Region B of Indonesia (Figure 4.2) does not have a good correlation with temperature by using the average monthly data after testing by advanced statistical methods.

Between 1987 to 2018, the direction of the wind in the Lingga Regency is dominated by Northern Wind and Southern Wind. Then, the wind speed points 5 (five) to 8 (eight) knot as presented in Figure 4.9. According to Meteorology, Climatology and Geophysical Agency of Lingga Regency (2019), the strong wind usually occurs in SON and DJF.



**Figure 4.9** Average wind speed and wind direction of Lingga Regency in 1987 to 2018.

Source: Meteorology Climatology and Geophysical Agency (2019).

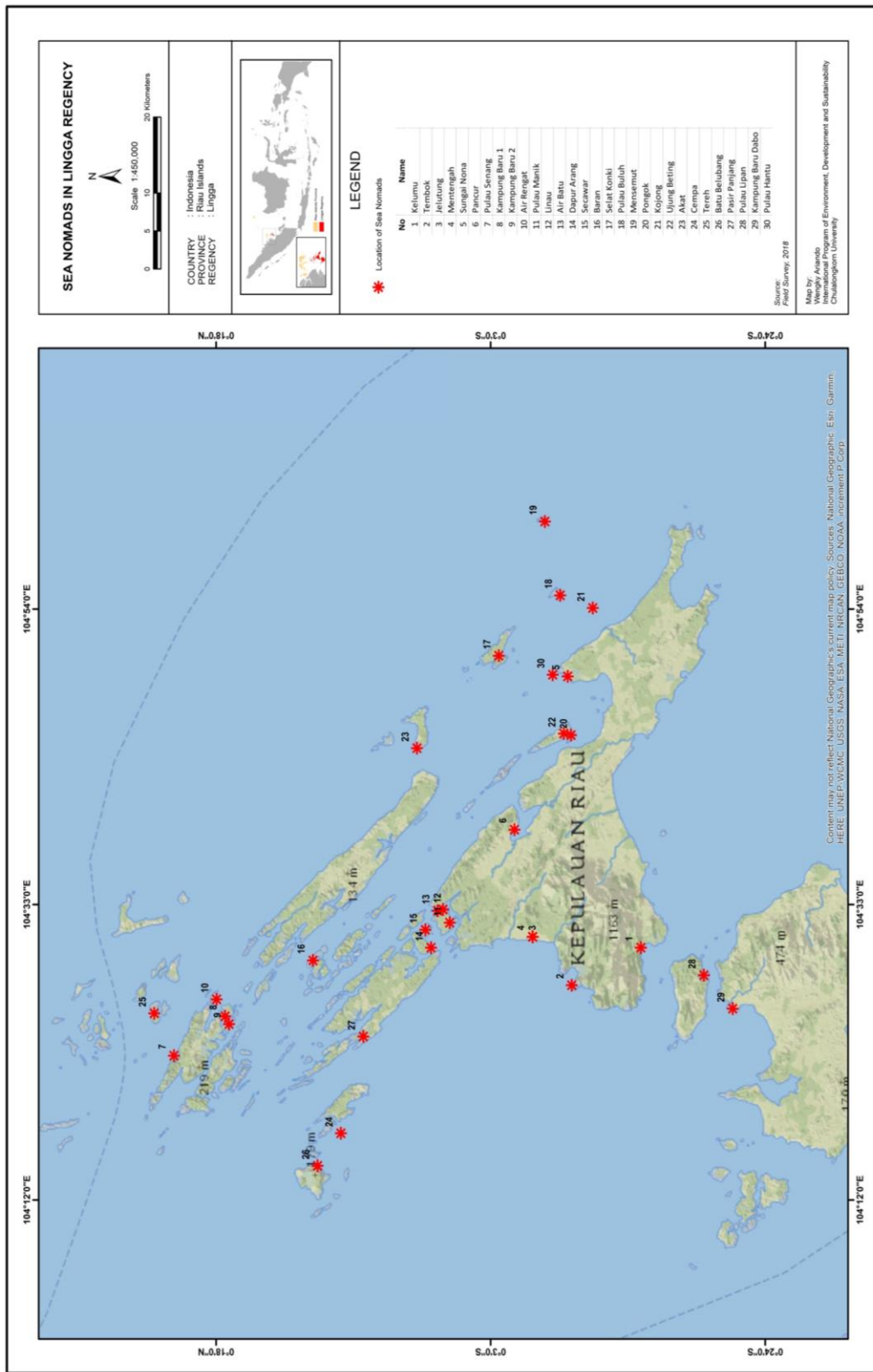
According to data from Meteorology, Climatology and Geophysical Agency of Lingga Regency (2019) and Statistics Indonesia (2018), climate condition in the Lingga Regency between 1987 to 2018 can be synopsized that the average temperature is 27.3 degree Celsius, average relative humidity 86 percent, average wind speed of 5 knots, average air pressure of 1010.50 millibars, the average amount of rainfall is 8 millimeters per day.

#### 4.1.4 The Orang Suku Laut of Lingga Regency

The *Orang Suku Laut* is the IPs of Malay Ethnic in the Lingga Regency, Riau Island Province, Indonesia. Various history information explained that the ancestor of *Orang Suku Laut* is the sea guard from the Islamic Kingdom namely *Kesultanan Lingga* or Sultanate of Lingga. Therefore, the *Orang Suku Laut* of the Lingga Regency is still living under the poverty line and categorized as illiteracy and innumeracy groups. Mostly, the *Orang Suku Laut* is working as a fisherman or labor of mangrove charcoal making corporation. Recently, they scattered around the Lingga Regency in 30 places (Figure 4.11) whereas some of them are still living as nomads in the sea by small boat named *Sampan Kajang* (Figure 4.10), some of the Lingga Regency pupils call the *Orang Suku Laut* as *Suku Sampan* or boat tribe that previous study by Chou (2003) mentioned it as well. According to interviewing respondent from Department of Population and Civil Registration Lingga Regency (2018), the total population of the *Orang Suku Laut* is 3931 people with 806 households which spreading in five sub-regencies namely Senayang, Lingga, North Lingga, Selayar, and West Singkep.



**Figure 4.10** Boat of the Orang Suku Laut.  
Source: Faisal (2018).



**Figure 4.11** The location of the Orang Suku Laut in the Lingga Regency.

The sea and coastal areas are the living spaces for the *Orang Suku Laut* for centuries. From birth, the *Orang Suku Laut* have been exposed to living on the sea. The *Orang Suku Laut* possess outstanding knowledge of climate variability, sea currents, and tides. They have the capacity to find the location of fertile fishing grounds and mangrove swamps. Their traditional astronomy knowledge is based on the position of the sun, moon, and stars by which to navigate their way through the Archipelago. The *Orang Suku Laut* believe that sea provides them all of their needs for diet. They supplement the diet with other maritime products such as shell-fish and crabs, fruits, and animals which collected and hunted from forests (Chou, 2003).

The *Orang Suku Laut* is paradoxically categorized as the lowest class in the community in the Lingga Regency. The Malay group (currently Lingga Regency citizen who are living in the land) named the *Orang Suku Laut* as ‘stupid people, smelly people who never bathe, people who do not have bathrooms, people who have black magic, and people who live and do everything in their boats’. It is supported by Chou (2003), the terms for calling of the *Orang Suku Laut* varied on hate speeches.

These paradigms are still existing until now even the kids of the Malay group notice it very well. The bullying for the *Orang Suku Laut* when meeting the Malay’s people from the land still happen presently. While the kids of the *Orang Suku Laut* go to the school, sometimes they get bullying from local and Malay group people. Moreover, the struggle for social development such as guaranteeing free and easy access to health care, medicines, and schools, constructing appropriate housing, providing clean water, sewerage, electricity, and adequate roads are the challenge of the IPs from dominant group in central areas (Hristov, 2009).

Since the 1990s, the government of the Lingga Regency initiated in relocating all groups of the *Orang Suku Laut* from the *Sampan Kajang* to the land by providing them the settlement. It is followed by time doing. The government forces them to stay in one place around an island or the place that they want to build the houses as long as it is located close to the mainland. According to the local government official that interview in this study, the relocation of the *Orang Suku Laut* aimed to decrease the

risk from hydrometeorological disasters and also help local government for public and registration data officially. The administrative identity of the *Orang Suku Laut* was registered to the nearest village around their settlement. Unfortunately, the government has built the settlement for the *Orang Suku Laut* but did not provide the primary facilities such as freshwater resources, bridges, toilets, electricity, and educational facility.

However, the government of the Lingga Regency also asked them to change their belief becoming one of the official religions in Indonesia that consist of Islam, Protestantism, Catholicism, Hinduism, Buddhism, and Confucianism. It caused the degraded cultural beliefs and local knowledge of the *Orang Suku Laut*. The government officials and religious organizations also facilitated the *Orang Suku Laut* in teaching them the ritual and how to live as a religious community without traditional beliefs. According to Chou (2003), the efforts of local government to convert the *Orang Suku Laut* religion often sends Islamic representatives to the communities to evangelize.

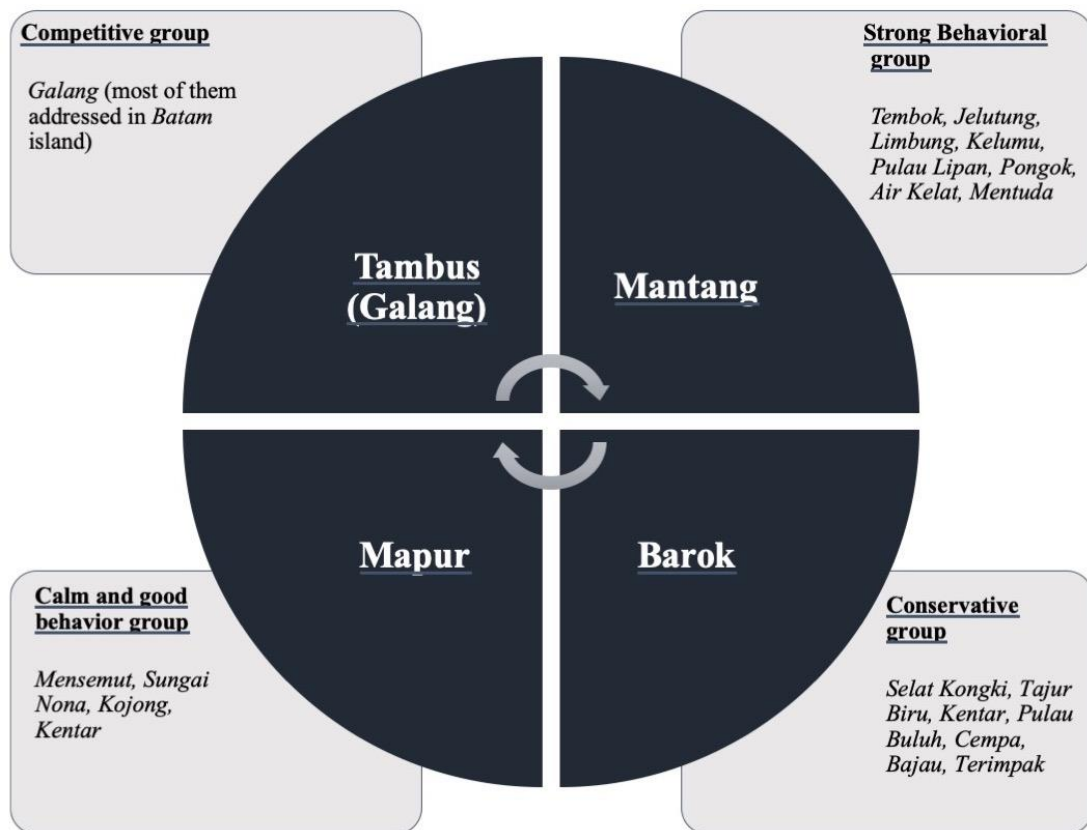
In the policy side, Indonesia declared the policy in recognizing the *Masyarakat Hukum Adat* or MHA through specific term for the ethnic group in the Minister's Decree of Ministry of Home Affairs Indonesia No. 52 the Year 2014 on the guidelines of rules and right protection for the MHA. Then, in Indonesian Act No. 1 the Year 2014 about management of coastal areas and small islands created the policy for zoning and coastal areas and small islands plans. There are five requirements for a group categorized as MHA following ancient history, customary areas, customary laws, assets and/or cultural properties, administrative and leadership system in the group. Surprisingly, that policy is not suitable with the *Orang Suku Laut*, caused they do not have the ancestor land and area when living as sea nomads for many years.

Furthermore, the beliefs of the *Orang Suku Laut* contradict the principles of Islam as propagated by the pure Malays, who often speak of dangerous and fearsome evil spirits in association with such observances (Chou, 2003). The *Orang Suku Laut* believed even before their adoption of any religion, they had always believed in the



existence of a higher God. They maintain that although they are presently encouraged to take up a religion. Despite, the *Orang Suku Laut* is still convicting that all religions lead to the same God. The *Orang Suku Laut* believe in the idea of a single unitary essence which was diffused throughout creation (Chou, 2003). Alternatively put, they think that beneath the apparent diversity of things is a cosmic unity which is God. Meanwhile, the multiplicity of spirits, whether good or evil, is merely so in appearance for the *Orang Suku Laut* as a cultural belief.

In the former time, the *Orang Suku Laut* in the Lingga Regency divided into four groups of clans (Figure 4.12) based on the origin of ancestors. It was also found by Lenhart (1997) that classified the *Orang Suku Laut* into Mantang, Barok, Mapur, and Galang. Chou (2003) also found that the clans or grouping was based on the history and territories of the *Orang Suku Laut* since *Malacca-Johor* and *Riau-Lingga* Sultanates with each assigned a different task in serving the ruler and ranked accordingly. Every clan attached themselves to the centers of power thrived and rose in political positions, but at the same time came under stricter control of the central power named *Sultan*. The clan has occupied into social status, behavior, and language by the times. Presently, these clans do not have the difference status, the homogenous of a significant number of the *Orang Suku Laut* have acculturated themselves exclusively. Moreover, the way of life of the *Orang Suku Laut* continues to fade, and the loss of language is a casualty in the cultural tumult the Sea Tribes are facing by times doing (Anderbeck, 2012).



**Figure 4.12** The origin ancestor group of the Orang Suku Laut in the Lingga Regency.

Nowadays, there are two categories of the *Orang Suku Laut* in the Lingga Regency. Firstly, nomadic groups, the groups who are living in the boat, used human power in rowing the boat or *Sampan Kajang*, and traditional practice for livelihood. The number of this group is very small. According to the local government officers in the Lingga Regency, no more than fifty householders are existing. Secondly, the semi-nomadic group and sedentary groups, as a group who are living in a temporary house provided by the government. The settlement group has several types based on social life and the ability to adapt themselves from globalization era.

#### **a) Nomadic Group**

The nomadic group sails follow the windy season. One group might consist of 6 to 20 boats *Sampan Kajang*. They do not use the machine for their boat, only rowing it with their hand alternately or using human power. It is challenging to find the position of this group because these groups are not staying in one place for long times. The

nomadic group of the *Orang Suku Laut* stays in a place not more than one week then they move to other places to go fishing. The nomadic group manages their need in very traditional ways and limited resources. In a boat might stay parents and their kids below ten years old. Their teenage kids will stay in a small boat or *Sampan Kecil* following *Sampan Kajang* of their parents. When the meal times the kids will come to their parent boat. Typically, one group only consist of a nuclear family. It is the reason the teamwork in each group very solid. They always go fishing together in a small group and help one another when any problem is happening. The existence of the TEKs of this group is robust. Even though they hold a religion (mostly Christian), they still do practice in cultural activities and mantra. This group also belong to one village whereas they have a settlement that was provided by the government, but they prefer to stay in the *Sampan Kajang* and to live as nomads. They know very well about the changing of climate and the way to adapt themselves for the weather changing.

#### **b) Sedentary Group**

Sedentary group is the group who have house or settlement and living around the coastal areas or mangrove forest including the group who are living semi-nomads. The sedentary groups are also grouped into three categories by social life, income, and mindset of the group members as shown in Figure 4.13 (including the population number) which details:

*Category 1:* Staying in the settlement, a traditional practice for livelihood and traditional way of thinking.

*Category 2:* Staying in the settlement, starting to adopt the technology, and mixed it with traditional knowledge (known as transition stages).

*Category 3:* Staying in the settlement, education literacy, and living with Information Communication Technology.

Mostly, the occupation of these groups is fisherman, but some of them have known how to aquaculture such as seagrass plantation and red grouper fishing farm. The kids of some of the sedentary groups also go to school. The *Orang Suku Laut* admitted

that they have the desire to become a Malay people. They always try to follow trends and how the Malay people do in their daily lives. Even, the young people from the *Orang Suku Laut* people stated that they were happier to wander than to live with their families in *Sampan Kajang* or settlement in the beach shore.



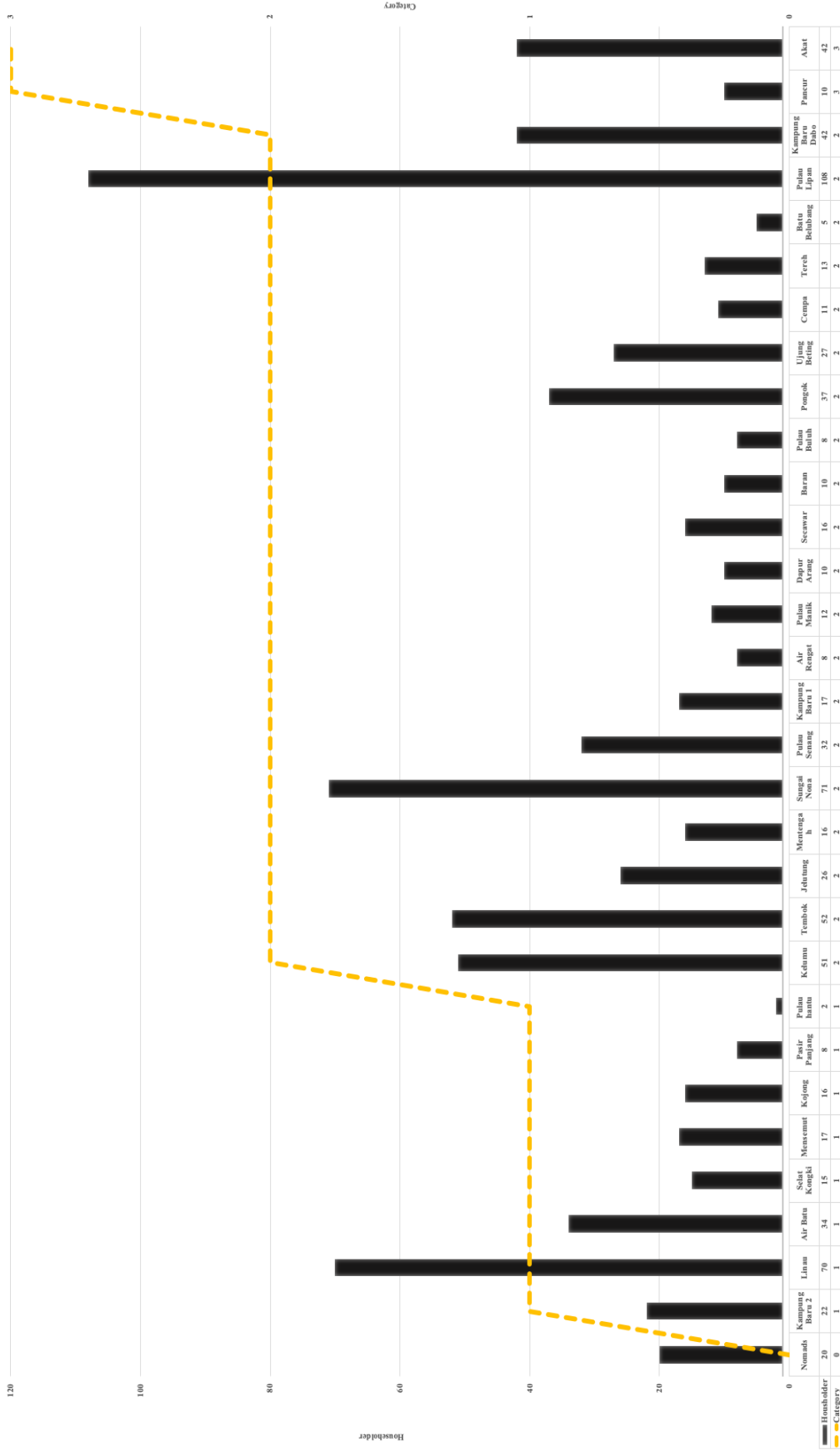
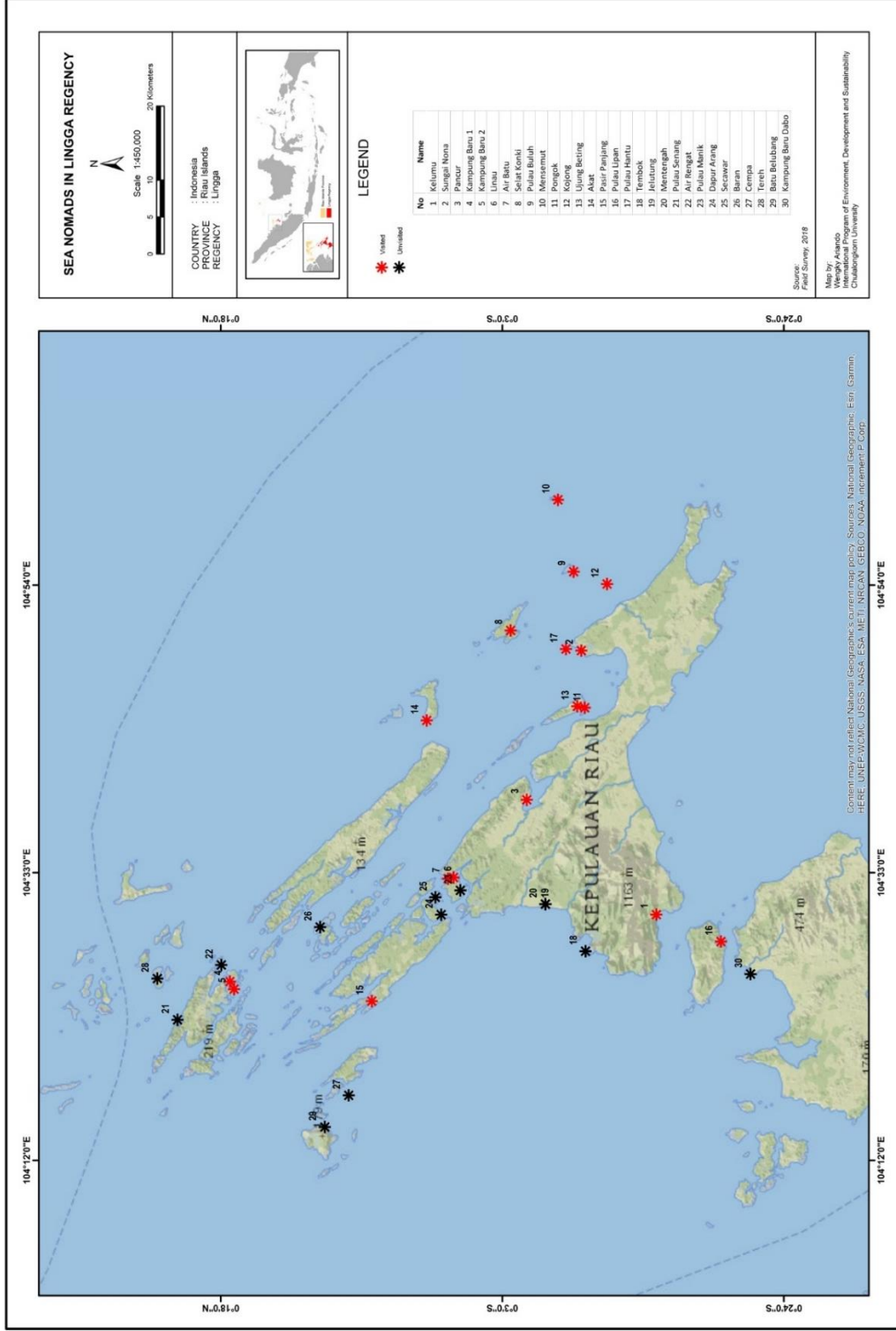


Figure 4.13 The category and population of the Orang Suku Laut in the Lingga Regency.



**Figure 4.14** Research location for selected area of the Orang Suku Laut in the Lingga Regency.

This research used the purposive sampling method through selected 18 groups to represent all the categories of the *Orang Suku Laut* including nomadic groups and settlement groups. There is one nomadic group was found in this research when they stopped in the *Pasir Panjang* Street at the location 00°07.56000' N, 104°23.16000' E. Therefore, there are 17 settlement group was visited in this research. The selected location of this research is shown in the map of Figure 4.14 and the details of each location as follows.

a) *Kelumu*

Location: 00°14.48686' S, 104°29.94805' E

*Kelumu* Village, Lingga Sub-Regency

51 householders

The *Orang Suku Laut Kelumu* is one of the oldest groups in the Lingga Regency. This group ancestor is the *Orang Suku Laut Mantang*. The *Kelumu* was categorized as class II. In the former time, this group lived in the ocean shore. Since 2014 this group is relocated to the land. The livelihood of this group was not only a fisherman but also labor for mangrove charcoal making corporation or *Dapur Arang*, and worker to cut the logs in the forest. The location of this group is close to the main village of local people. It makes that the *Kelumu* adopted the technology and globalization very fast. The religion of this group is Christian. Children in the *Kelumu* is going to school for primary school and junior high school. The implication the TEKs in this group is not showed. They only use local knowledge for fishing methods.

b) *Sungai Nona*

Location: 00°08.88618' S, 104°49.22694' E

*Limbang* Village, North Lingga Sub-Regency

71 householders

*Sungai Nona* means the river of ladies. This ancestor of this group is *Mapur*. The *Sungai Nona* is categorized as class II. The intonation of their language is very

slow and low tone compare than other groups. This group lives in the shore close to the island. Their skin color is also brighter than other groups. The livelihood of this group is fully based on fishing. This group implies their TEKs in traditional fishing methods, cultural ceremony, traditional medicine, weather forecasting, and some conservation methods. There is no educational facility in the group. Mostly the religion of this group is Islam.

c) *Pancur*

Location: 00°04.81830' S, 104°38.33286' E

*Pancur* Village, North Lingga Sub-Regency

10 householders

*Pancur* is one of the big ports in the Lingga Regency, this place used to be center of trading in the 1900s. Recently, it is difficult to find the original family of the *Orang Suku Laut* in this place. Mostly the *Orang Suku Laut Pancur* married with local people and Chinese Indonesian. These ten householders do not directly proof themselves as the *Orang Suku Laut*. Even, some of them do not know that their parents are the *Orang Suku Laut*. The livelihood of the *Orang Suku Laut* in *Pancur* has changed from fishing into trading. *Pancur* is categorized as class III because their civilization is on the top compared than other groups. Their religion is varying on Christian, Buddhist, Islam, and Catholic. The implementation of the TEKs in this community is not relaying anymore. Modernization and globalization have been occurring on them.

d) *Kampung Baru 1*

Location: 00°17.32170' N, 104°25.05978' E

*Tajur Biru* Village, *Senayang* Sub-Regency

17 householders

*Kampung Baru* means new village. The *Kampung Baru 1* is categorized as class II where they are closely living with technology, and their kids go to school in the *Tajur Biru* Village. The religion of this community is Christian, and they have



church in their place. Mostly men in this community works based on the season. When the northern season they will work as labor to cut the tree and mangrove for mangrove charcoal making corporation. In eastern season, men usually do fishing. When the western and southern season, men will collect the seashells, sea snails, sea grass and all kinds of non-fish marine biota. The TEKs of the *Kampung Baru 1* community is still practicing, but it is combined with technology. For example, in fishing methods, the *Kampung Baru 1* mostly community uses the boat with the machine for going to the sea or called as *Pompong* but they practice their TEKs on traditional fishing methods.

e) *Kampung Baru 2*

Location: 00°17.01534' N, 104°24.51588' E

*Tajur Biru* Village, *Senayang* Sub-Regency

22 householders

*Kampung Baru 2* is very close to the *Kampung Baru 1*, but the character of these two groups is very different. The *Kampung Baru 2* is less developed (category 2) than the *Kampung Baru 1* for social life (income, mindset, cleanliness, and group work). The TEKs of this community is not calculated as good practice. The livelihood of the *Kampung Baru 2* is working as fisherman and labor for mangrove charcoal making cooperation.

f) *Linau*

Location: 00°00.64800' N, 104°32.65800' E

*Tanjung Kelit* Village, *Senayang* Sub-Regency

70 householders

*Linau* and *Air Batu* are used to be one group in former time. They separated after the government project for settlement in 2008. The *Linau* and the *Air Batu* is the oldest *Mantang* group in the *Lingga* Regency. There is one primary school in the *Linau*. The *Linau* is categorized as class 1. As social and economic perspective, the *Linau* is less developed in income, mindset, and cleanliness. Their religion is

Christian and Islam. Mostly the young people from this community usually leave their group to get a new job in the land. It is quite challenging to find youth with age range 18 to 25 years old in this community. The young people will come back to their community when they are ready to get married. The TEK of this community was not used in daily activities, only for traditional medicine.

g) *Air Batu*

Location: 00°01.05894' N, 104°32.56800' E

*Tanjung Kelit* Village, *Senayang* Sub-Regency

34 householders

The circumstance of the *Orang Suku Laut Air Batu* group is similar to the *Linau* group. It is because *Air Batu* group just next to the *Linau* group and still in one big family. However, the householders of the *Air Batu* is less than the *Linau*. The social class is also in category 1.

h) *Selat Kongki*

Location: 00°03.61235' S, 104°50.69476' E

*Penaah* Village, *Senayang* Sub-Regency

15 householders

*Selat Kongki* means Street of *Kongki*. The group leader of this community is very talkative and corporative. He can explain the history and local knowledge of the *Orang Suku Laut* very well. The livelihood of this community is fully fisherman. The *Selat Kongki* is categorized as class I and the ancestor of this community is *Barok*. They have a perfect understanding of environmental management. The young people and kids have dominated the population of the *Orang Suku Laut Selat Kongki*. The kid goes to school to *Penaah* Village. Many kids in the *Selat Kongki* is adopted by local people to get the proper education in Daek, the main city of the *Lingga* Regency. The TEKs implemented in this community is traditional fishing methods, traditional medicine, weather forecasting, mangrove conservation, and environmental beliefs. Some mangrove island around the *Selat*

*Kongki* is set by the provincial government as limited production forest whereas only use for the *Orang Suku Laut Selat Kongki*. All of the *Orang Suku Laut Selat Kongki* community is Islam.

i) *Pulau Buluh*

Location: 00°08.31511' S, 104°54.98750' E

*Penaah* Village, *Senayang* Sub-Regency

8 householders

*Pulau Buluh* means Bamboo Island. This group is living close to local people on one island, but the *Orang Suku Laut Pulau Buluh* stay on different side of the island. In this island, there is primary school and primary health care. In the former time, the householder number is more than in the present. Presently, they moved to the *Sungai Nona* and the *Akat* following their prominent families there. The religion of *Orang Suku Laut Pulau Buluh* is Islam. They are categorized as class II. The TEKs has not been using anymore because of the acculturation with local people. Mostly the women of the *Orang Suku Laut Pulau Buluh* are living as a widow and living alone because their husbands passed away and their kids moved to other islands. The livelihood in this community is not only as fishing practice but also farming for vegetable and coconut.

j) *Mensemut*

Location: 00°07.14144' S, 105°00.23334' E

*Penaah* Village, *Senayang* Sub-Regency

17 householders

*Mensemut* is the tiny island in *Penaah* village. Sometime when the storm surge is coming in the northern season, there is no land anymore in this island because it is a sandy island. Moreover, the *Orang Suku Laut Mensemut* is living in the land. The *Orang Suku Laut Mensemut* always moves to *Pulau Hantu* every northern season (DJF). They build a temporary house in *Pulau Hantu* namely *Saphaw*. It is because they are worried if big storm surge and high-speed wind coming and it is

difficult to get bits of help from the nearest community around their island in the *Mensemut*. Besides, they do not want to relocate from the *Mensemut* island because the fishery production around this place is better than *Pulau Hantu*. Sometimes, when they stay in *Pulau Hantu*, they still do fishing to the *Mensemut* island. The *Orang Suku Laut Mensemut* is categorized as class I and the ancestor of this community is *Mapur*. There is one remote school with a stayed teacher in that community, but in the middle of 2018, this teacher never comes back to the *Mensemut* island. All of the community members are Islam. This community is lack of fresh water availability. They must go to the other islands to get fresh water without saline composing or otherwise they will drink rainwater.

k) *Pongok*

Location: 00°09.14112' S, 104°45.05862' E

*Penaah* Village, *Senayang* Sub-Regency

37 householders

*Pongok* is categorized as class II, and the ancestor group of this community is *Mantang*. This island used to be a wood processing industry in the 1990s. This community is well known about aquaculture especially red grouper fish farming. The youth of this community will go outside the community as a worker in the fish farm. There is no school on this island. The kids will go to school in *Ujung Beting* accompanied by their parents using *Pompong*. The livelihood in this community is coming from fishing. The TEKs of the *Orang Suku Laut Pongok* still exists especially for the traditional fishing method, weather pattern, and local beliefs for the environment. The religion of *Orang Suku Laut Pongok* is Christian.

l) *Kojong*

Location: 00°10.80785' S, 104°54.08860' E

*Penaah* Village, *Senayang* Sub-Regency

16 householders

*Kojong* is one of the *Orang Suku Laut* groups who is living in the land area of the island. Their house is not floating in the sea but literally located in the land. They moved to land in 2000 because their former house was broken by storm surge on the other side of this island. Then, the government forced them to move permanently in the land aiming to decrease the risk from hydrometeorology hazards. The *Orang Suku Laut Kojong* is categorized as class I and their ancestor of this community is *Mapur*. There is no educational infrastructure in this community. It means that the kids on this island are not going to school. Illiteracy in the *Orang Suku Laut Kojong* is very high compare than other groups of the *Orang Suku Laut* in the Lingga Regency. In this community, there are some freshwater resources where they do not have a serious problem with water scarcity in the dry season. The elders in this community can explain the TEK comprehensively. The religion of *Orang Suku Laut Kojong* is Islam.

m) *Ujung Beting*

Location: 00°08.58780' S, 104°45.16326' E

*Penaah* Village, *Senayang* Sub-Regency

27 householders

*Ujung Beting* is mixed blood group between the *Orang Suku Laut* and local people especially *Flores* ethnic. The religion of this community is Christian. There is one church and one Christian primary school in *Ujung Beting*. The *Orang Suku Laut Ujung Beting* is categorized as class II, and their ancestor group is similar with *Pongok* named as *Mantang*. They do not practice their TEKs. The education level in *Ujung Beting* is better than other *Orang Suku Laut* groups. Mostly, the kids in this community are going to school.

n) *Akat*

Location: 00°02.64040' N, 104°44.12810' E

*Laboh* Village, *Senayang* Sub-Regency

42 householders

The *Orang Suku Laut* in *Akat* is one of the groups who is implying modern technology to their livelihood and categorized as class I. Most of them are well-educated communities and not using the TEKs anymore. They send their kids to the school in the main island of sub-regency named *Senayang* Island. That is the reason the youth of this community is not staying with them. One of their kids gets a scholarship to study overseas. They live in the coastal area near the mangrove forest. Drinking water in this community is taken from the island behind their settlement. This community is well known about aquaculture, especially red grouper fish. The religion of *Orang Suku Laut Akat* is Islam.

o) *Pasir Panjang*

Location: 00°06.74575' N, 104°23.63419' E

*Pasir Panjang* Village, *Senayang* Sub-Regency

8 householders

*Pasir Panjang* means the long seashore, this group number is very small with one two sibling elders and others are their kids. The livelihood of the *Orang Suku Laut* in *Pasir Panjang* is not only relying on fishing but also as labor for mangrove charcoal making cooperation close to their island. Even some of them cut the forest for local people that requested to build stilt house or *Kelong*, fish farming offshore. They are living close to the land around the mangrove forest. The *Orang Suku Laut Pasir Panjang* is categorized as class I and the ancient group is mixed between *Barok* and *Mantang*. Some of them still sleep in the *Sampan Kajang* even though they have their own house. The TEK in this group can be found from traditional fishing methods, cultural beliefs, and conservation practices. The kids of this group go to school close to their house by rowing the small boat around 20 minutes. The religion of the *Orang Suku Laut Pasir Panjang* is Islam and Christian.

p) *Pulau Lipan*

Location: 00°19.29920' S, 104°27.98872' E

*Penuba* Village, *Selayar* Sub-Regency

108 householders

*Pulau Lipan* means Centipede Island. The *Orang Suku Laut Pulau Lipan* is the highest population of the *Orang Suku Laut* in the Lingga Regency. They are living as exclusive on one island. Generally, the *Orang Suku Laut* in the *Pulau Lipan* is categorized as class II, and their ancestor group is *Mantang*. Therefore, this community consist of three small groups but staying in one big island. Group I and group II are an Islamic group that is staying in the land. They do the agricultural practice beside fisheries practice, and their income and economic situation are quite good. They combine their TEKs with technologies. The group III is the conservative group of the *Orang Suku Laut Pulau Lipan*. Their religion belongs to Christian. Group III is living poorer than group I and group II. The TEKs of group III is using in every single activity. Generally, the *Orang Suku Laut Pulau Lipan* have a strong practice, belief, and cultural activities on climate change adaptation. Their TEKs are laying on traditional fishing methods, traditional medicine, weather forecasting, mangrove conservation, coral reef conservation, cultural astronomy, and environmental beliefs. There is one primary school on this island. The local government of the Lingga Regency often invite this group for art performance representing the culture of *Orang Suku Laut* of the Lingga Regency.

q) *Pulau Hantu*

Location: 00°07.73970' S, 104°49.34412' E

*Penaah* Village, *Senayang* Sub-Regency

2 householders permanent and 11 householder temporary nomads from *Mensemud*

*Pulau Hantu* means Ghost Island. The *Orang Suku Laut Pulau Hantu* is the nomadic community from the *Mensemud* Island. The inhabitants can be found on this island when the northern season (DJF). They bring all their stuff from the *Mensemud* to this island and build the temporary shelter or named as *Saphaw*. The water resource from this island is coming from rainwater. The community

livelihood when they are staying in this island is selling shells, sea snails, and other non-fish marine products.

#### 4.2 Respondents of the Study

Respondents of the study were selected by using the purposive sampling method in order to select stakeholder's involvement. This technique used as a non-probability form of sampling that aims to sample the cases or participants in a strategic way and relevant to the research questions and the objectiveness of the study (Bryman, 2012). The respondents consist of multilevel stakeholders including the native people of the *Orang Suku Laut*, governmental officers, non-governmental officers (NGOs), private sectors, academics and professional, and society. The interviewed *Orang Suku Laut* was headmen of the group (group leaders), elders, women, and youth. The interviewed governmental officer, NGOs officer, expert, and private sector were the ones who have experienced on the TEK of the *Orang Suku Laut* on climate change adaptation and related work with the *Orang Suku Laut* in the Lingga Regency, Riau Island Province, Indonesia. The number of respondents were 77 as shown in Table 4.2.

**Table 4.2** General information of the respondents.

Component	Respondent (N=77)	Percentage (%)
1. Gender	Male	27.27
	Female	72.73
2. Age (year)	18-30	12.99
	31-40	19.48
	41-50	32.47
	51-60	22.08
	Over 61	12.99
3. Educational Background	None	35.06
	Primary School	5.19
	High School	7.79
	Bachelor	38.96
	Magister	10.39



	Doctor	2.60
4. Occupation	Housewife	15.58
	Fisherman/Farmer	22.08
	Governmental Officer	49.35
	Social Worker	5.19
	Educator/Professional/Expert	6.49
	Other (student)	1.30
5. Position	Group Leader	11.69
	Community Leader	7.79
	Governmental Officer	35.06
	Council Member	2.60
	Women Leader	6.49
	Youth Leader	7.79
	NGO Officer	2.60
	Expert/Teacher/Professional	15.58
	Other (elder)	10.39

Table 4.2 presents general information of the respondents including gender, age, educational background, occupation, and position of career. The respondents composed of males of 27.21 percent and females of 72.73 percent. The majority ages of the respondents are between in the range of 41–50 of 32.47 percent and 51-60 of 22.08 percent. For the educational level, predominantly respondents graduated at the level of bachelor's degree (38.96 percent), none (35.06 percent) and postgraduate (12.99 percent). The main occupation of respondents are governmental officers (49.35 percent), fisherman/farmer (22.08 percent) and housewife (15.58 percent). Regarding position of respondents, 35.06 percent of respondents work for the government, 15.58 percent are expert/teacher/professional, and 11.69 percent are group leaders.

### 4.3 Climate Change Understanding

Climate change knowledge is the common indicator to figure out the understanding and adaptive capacity of a community. In 2014, the IPCC stated that the knowledge of climate change should be considered as a part of assessment of the vulnerable

community and risks (IPCC, 2014). The IPs' knowledge on climate change has contributed to the understanding of the vulnerabilities, concerns, adaptive capacities and longer-term aspirations (Nakashima et al., 2012). Furthermore, those kinds of knowledge would be used to adapt to climate change through their culture, local belief, and daily practice in many years.

Hiwasaki et al. (2014) reported that coastal and small island communities in Southeast Asia face daily threats from the impacts of climate change and climate-related hazards. The *Orang Suku Laut* as a vulnerable group who are living in the coastal, small island estate, and in the boat have different understanding and perception about climate change from stakeholder involvement, including headmen of the group, elder, women and youth. The understanding of the *Orang Suku Laut* for climate change would describe their ability to adapt to the changing of the climate. Technically, the *Orang Suku Laut* cannot explain in systematic ways of thinking, but in their practice, they know the environmental changing and its impact on them. Therefore, climate variability and climate change as the weather pattern changing in the short term and long term are the other indicators to explore the knowledge of the *Orang Suku Laut* about climate change. However, climate change impacts and adaptation would be used to assess the adaptive capacity to climate change through their TEKs.

Climate change knowledge of the respondent can be identified into two groups. The first group composed of all respondents including government, NGO, private sector, society, expert and academic. The second group was the 29 *Orang Suku Laut*' respondents who are living in the sea and land including headmen, elder, women, and youth.

#### **4.3.1 Climate Change Understanding of the Respondents**

The respondent knowledge is determined by the experience for climate change and its impact. The experiences and understanding to climate change in the community identify inherent characteristics that enable or constrain a community to respond, recover and adapt (Dolan & Walker, 2006). This research indicated the respondent' perspective and experience on climate change. A set of a semi-structured

questionnaire was used to interview to the selected stakeholders. The results of the study are shown in Table 4.3.

**Table 4.3** Climate change knowledge of the respondents.

Knowledge	Description	Percentage
Climate change	Environmental changing, frequency of extreme event increasing, natural resources declining	97.12
Current climate is changing	Frequency of extreme event increasing	98.28
Seasonal changes have impacted livelihood	Fishing and income	99.42
Experience(s) on climate change	• Unpredictable weather	96.15
	• Hotter Temperature	91.66
	• Sea Level Rise and Coastal Erosion	91.02
	• Increasing Extreme Weather Event	89.74
Current impact(s) of climate change in the community	• Livelihood	100
	• Health-Related Issues	100
	• Water-Related Issues	100
	• Frequent Natural Disasters	98.85
	• Agriculture/Fisheries Production	99.42

Table 4.3 denotes that all of the respondents well comprehended about climate change and its impacts. 97.12 percent of the respondents knew the meaning of climate change and 98.28 percent realized that the current climate is changing. The experience of the respondents to climate change varied on unpredictable weather of 96.15 percent, hotter temperature of 91.66 percent, sea level rising and coastal erosion of 91.02 percent, and extreme weather events of 89.74 percent. In terms of climate change impacts, they mentioned the impacts on health, water, agriculture and fisheries production, energy, natural disasters frequency, and livelihood.

The inadequate understanding and knowledge of climate change in the community determine their capacity in mitigation and adaptation efforts. The respondents revealed that climate change is their common issue. This circumstance reflects that climate change impacts at all levels. Its consequences have been realized by the communities including the IPs such as the *Orang Suku Laut* communities which have been affected on their environment and livelihood.

#### **4.3.2 Climate Change Understanding of the Orang Suku Laut**

The understanding of climate change is the first step in assessing community knowledge. This would associate with a learning concept of the ability to know and to respect on environment such as climate pattern changes. This would lead the *Orang Suku Laut* to use their TEKs to adapt to climate change impacts.

The respondents of the *Orang Suku Laut* were 29 and divided into four groups, namely headmen (31.03 percent), elder (27.59 percent), youth (24.14 percent), and women (17.24 percent). 62.07 percent of them were male and 37.93 percent were female. They were able to explain their understanding on climate change, climate variability, climate change impact, and climate change adaptation.

The study found that the *Orang Suku Laut* conceives climate change as an environmental changing and the natural resources declining. Huntington et al. (2004) stated that the TEKs of the IPs derives from the environmental changes by observing plant and animal distribution, abundance, performance, behavior of specific animals, and interactions between species and the environment. The *Orang Suku Laut* understood climate change as missing natural resources, increasing frequency of extreme weather events, increasing temperature, and decreasing of fishery productions and incomes, which are their direct impact. Granderson (2014) also stated that climate change presents an opportunity and challenge for communities and their livelihoods through authentic and tangible effects on rainfall, temperature, seasonal timing, and distribution of biodiversity and ecosystem services.

The experiences of the *Orang Suku Laut* on climate change are depended on their age. Generally, the elder, headmen, and women are having more experience than the young. The study found their experiences as follows.

The headmen of the group have a well understanding and knowledge on climate change. They described climate change as the environmental changing that impacted their livelihood, social life, and cultural beliefs. They believed climate change as a massive changing of the world during long periods and the impacts are increasing by the time. They have responsibilities to encourage their community to live closely with nature using the cultural beliefs and practices. They also presented their ability to conserve nature that is a part of their spirit to wisely kept.

The elder of the *Orang Suku Laut* are very independent. The study found that they are lived alone. They will visit their children when they do not have food and face some problems that they cannot solve it by themselves. The elder understood what climate change is, but they cannot explain it well because the aging problems and some of them are deaf. However, they still execute their traditional belief and practice through spells and mantra in managing environmental changes. They conceived climate change as a changing of environment and damaging their livelihood.

However, women of the *Orang Suku Laut* have a responsibility not only as a housewife but also as an environmental nurturer through their TEKs. They are able to fish, shell collecting, and others. The study found that they still live in the boat and never leave their boat or *Sampan Kajang* for a period of time. Some of the women who already moved to the land and stayed in the house have the ability to make crafts from pandanus leaves and collect the seagrass for selling. Arunotai (2006) reported that the sea nomad women in Thailand are skillful in wild yams digging and pandanus leaves cutting than others. These kinds of specific skill can conserve nature as well.

The young people will be cultural and traditional practice successors of the *Orang Suku Laut*. Their TEKs quite limited due to cultural degradation. The youth role in the communities is also decreased by times. They prefer to move from their community to get a better life. The study found that the youth of the *Orang Suku Laut* like to migrate because they seek economic mobility, personal and familial security, and a freedom from cultural law and regulation. In terms of climate change, they were not able to adapt themselves to climate change and using their TEKs. Actually, youth is one of the vulnerable groups who are not protecting themselves from climate change. It is a crucial concern for most young people through believe, lifetime, social life due to global warming and climate change (Schreiner et al., 2005).

The headmen, women, and youth of the *Orang Suku Laut* fully agreed that the seasonal climate change impacts have already taken place in their livelihood. Their experiences on extreme weather events were valuable lessons to enhancing resilience and reducing vulnerability of climate-related adverse impacts. Therefore, a synopsis of the *Orang Suku Laut* on climate change knowledge is as follows.

#### **a) Extreme Events**

According to Meteorology, Climatology and Geophysical Agency (2019), the extreme events in the Lingga Regency particularly around the *Orang Suku Laut* communities were high rainfall intensity, drought, storm surge, high speed of the wind, and sometimes including a thunderstorm. The *Orang Suku Laut* believes the environmental changing because the number of extreme events has increased by the

time. They stated that number of extreme events has increased since the last decade in their communities. They found that the extreme events usually occur in the southern and northern monsoonal season which make the risk to their newborn babies, kids, and elders.

#### **b) Storm Surge**

The *Orang Suku Laut* knows a storm surge as *Badai Laut* occurring in the northern monsoonal season and unable to fishing. This storm surge leads to their income decreasing and socio-cultural affecting. As an example, in the *Orang Suku Laut Mensemut*, most of the community household will migrate to *Pulau Hantu* in the northern monsoonal season. The man will move earlier than women and children because the man must build a temporary house before moving. In that time period, women and kids will stay in the home without a man.

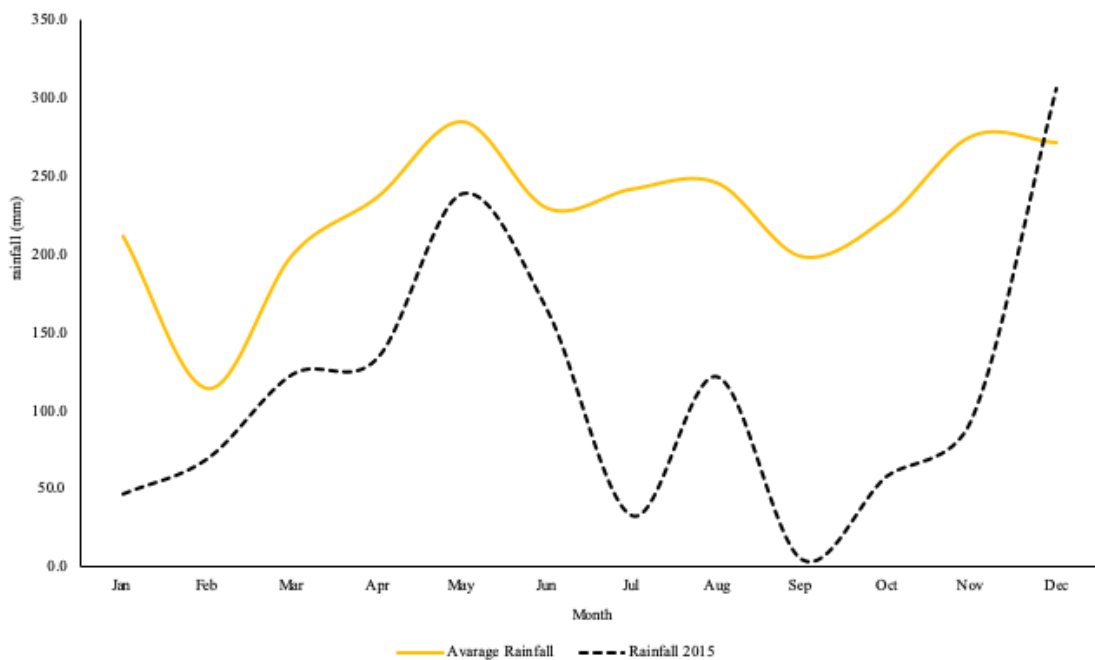
#### **c) Coastal Erosion and Sea Level Rise**

Although sea levels have been rising slowly for centuries, a global change driven increases in the rate of rising will result in increased exposure to coastlines and coastal systems around the world. The coastal erosion is one of the consequences of climate change taken place the *Orang Suku Laut*. The *Orang Suku Laut Mensemut* shared an experience that in the year 2000 around the northern monsoonal season, their island shrunk for four days which affected the coastal line and island are getting smaller until now.

#### **d) Drought**

Drought for the *Orang Suku Laut* is related to water availability for their daily life. They use freshwater for drinking and cooking. According to Meteorology, Climatology, and Geophysical Agency of Lingga Regency (2019), 2015 was the worst year of drought in the Lingga Regency. Dams and rivers in the Lingga Regency were dry in that time period. The *Orang Suku Laut* stated that they faced with water shortage. All of *Parigi* (shallow wells) were dry because no rain about three months in that year.

Figure 4.15 presents the average monthly rainfall between 1987 and 2018 compared to the monthly rainfall in 2015, a drought year at the Lingga Regency. The data reveals that the rainfall 2015 is lower than the average monthly rainfall between 1987 and 2018. The *Orang Suku Laut* also mentioned that the year 2015 was a long drought.

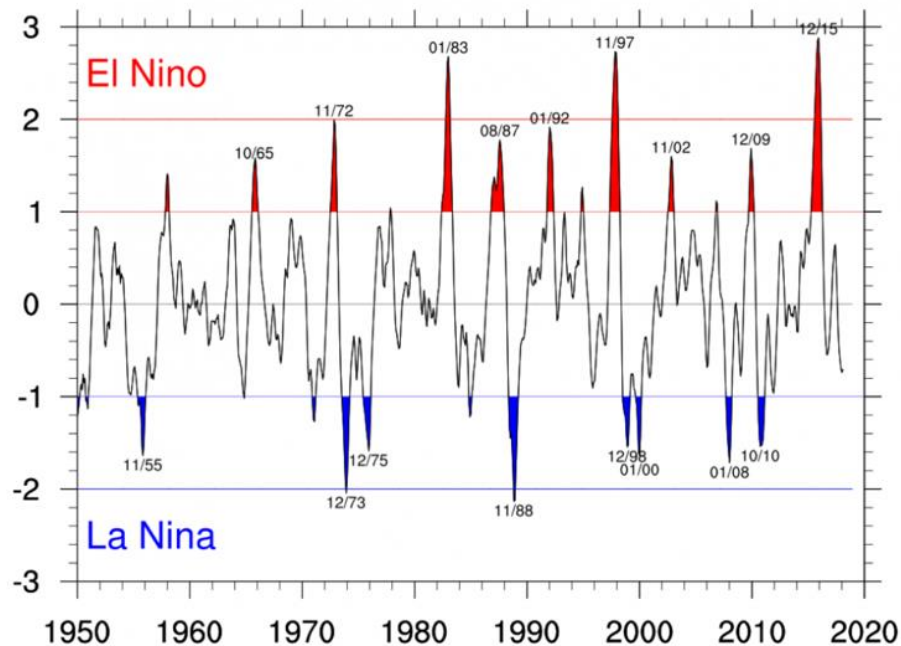


**Figure 4.15** Average monthly rainfall in 1987-2018 and rainfall 2015 of Lingga Regency.

Source: Meteorology, Climatology, and Geophysical Agency (2019).

Trenberth et al. (2019) reported that 2015 was a year of *El-Nino* taken place in the global communities. The impacts of the *El-Nino* 2015 were the forest fire and severe drought in several places in Indonesia. Figure 4.16, the *El-Nino* and *La-Nina* marked, Ocean Nino Index (ONI) January 1950 to February 2018, presents the maximum number of the *El-Nino* almost 3.

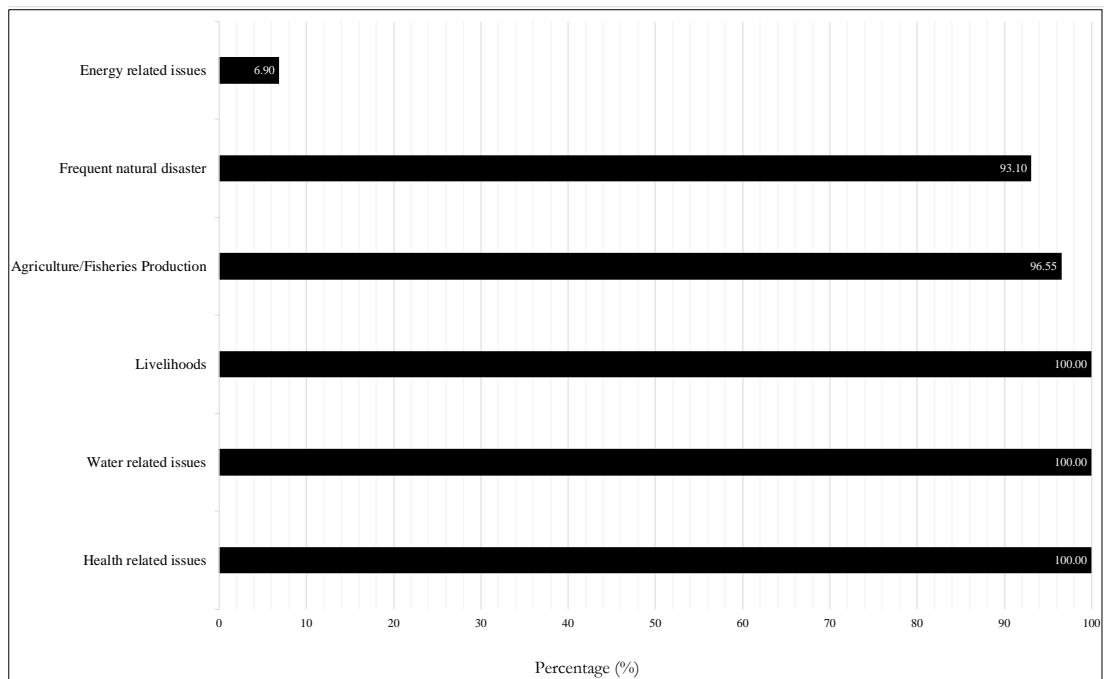




**Figure 4.16** El-Niño and La-Niña marked, ONI January 1950 to February 2018. Source: Trenberth et al. (2019).

### 4.3.3 Climate Change Impacts on the Orang Suku Laut

Climate change has profound impacts on the IPs which fully exacerbates their physical, biological, and social life (Tol, 2009; Williams & Hardison, 2013). The *Orang Suku Laut* communities struggle to survive by the threats and impacts of climate change. They notice the climate change impacts on their community through a close relationship with the environment and its resources generation by generation. The study indicated the impacts of climate change on the *Orang Suku Laut* including livelihoods, frequent natural disasters, energy related issues, agriculture or fisheries production, water-related issues, and health related issues as shown in Figure 4.17.



**Figure 4.17** The impact of climate change of the Orang Suku Laut.

The *Orang Suku Laut* perceives the impact of climate change that entirely influenced their livelihoods, including water-related issues, health-related issues, agriculture or fisheries production, and frequent natural disasters. Their livelihood is the worst affected by climate change. Mirza (2003) expressed that the livelihood could be related to the capital, social life, and investment which influenced by climate change. The *Orang Suku Laut* proclaimed that the increasing of the frequent hydrometeorological disasters impacted their fishing incomes and cultural practices by times.

Water and health-related issues definitely effect on the daily life of the *Orang Suku Laut*. The study found that the seasonal skin diseases in the *Orang Suku Laut* communities usually occurs in the dry season or well-known as northern season because of poor sanitation and freshwater availability. The energy-related is another climate change impact on the *Orang Suku Laut*. They consume energy only for lighting and boat fuel. Presently, they use fossil fuel to start a dynamo in generating electricity. There is averagely one dynamo machine provided by local government for the *Orang Suku Laut* group who are living in the house. However, for the *Orang Suku Laut* who are living in the boat as nomads, do not have an electricity use. They use a

kerosene lamp as an energy source and firewood for cooking. In the former time, when the *Orang Suku Laut* were sailing, they usually used wood with a long stem of *Mentango* or *Bintango* Plant (*Calophyllum inophyllum*) for lighting and cooking.

In terms of age, gender, and climate change impacts on the *Orang Suku Laut*, the study found that the elder would have more affected than others, because of their physical weakness. While, the young people have a high risk to climate change impacts due to their limited TEKs. Regarding gender, environment, and development perspective, men and women have different access to resources, including physical and social resources. The men have more ability to adapt the climate change than women because of norms and customary laws. Nelson et al. (2010) reported that climate change increases the natural hazard frequency and gender line, particularly for women risk because of culturally-specific gender norms. Additionally, the men are usually able to have a mantra or spell to protect themselves from the storm surges and some unpredictable weather changes compared to women.

#### **4.3.4 Climate Change Adaptation of the Orang Suku Laut**

The IPs have uniqueness practices in adapting to climate change. They can adjust the timing of activities and employ a variety of techniques which have developed over in many cases and centuries of surviving conditions for climate change adaptation (Berkes et al., 2000). The study found that the *Orang Suku Laut* always use their sense of initiative to make a resilience to natural disasters, extreme weather events, and other climate threats. The broader relationships between nature and society are important for them to shape the framing of any particular problem relating to a changing climate and the potential solutions proffered by their autonomous adaptation responses. On climate change adaptation practices of the *Orang Suku Laut* are part of the TEKs. For example, *saphaw*, water conservation, and storm surge observation for daily life.

##### **a) Saphaw**

The temporary settlement of the *Orang Suku Laut* is *Saphaw*. The *Saphaw* is the stilt house that built in a coastal, sea or a small island. The *Orang Suku Laut* always stays

in the *Saphaw* for one to three months, dismantles and rebuilds it in the new place. They build the *Saphaw* for fishing with their TEKs on vernacular architecture. The usages of *Saphaw* are to keep the drying fish, cooking equipment, and other important stuff. They go back to their *Saphaw* in the evening for sleeping, cooking, and keeping fish. Regarding climate change adaptation, the *Saphaw* is durable to disaster such as storm surge, sea level rise, and coastal erosion. The *Saphaw* material is easy to obtain and dismantle when the storm surge hit them. The materials used are from wood and leaf that the sunlight can penetrate making the low temperature inside of the house.

#### **b) Water Conservation**

The *Orang Suku Laut* always move to the place or island that have a shallow well when drought. They know the nearest place for finding water spring around their location. Prior to drought season is coming, they will conserve amount of water to cover at least one-month. The water is collected from freshwater source or rainwater and kept it into storages, 10 liter- plastic cans, and buckets. Their practice on water conservation has been used not only to maintain efficient water use in the dry season but also to share a such water in community. The contemporary water management activities including water allocation planning can be informed by the TEKs of the IPs (Woodward et al., 2012). In terms of climate change adaptation, the study found that water conservation practice has started when drought has taken place since the last two decades.

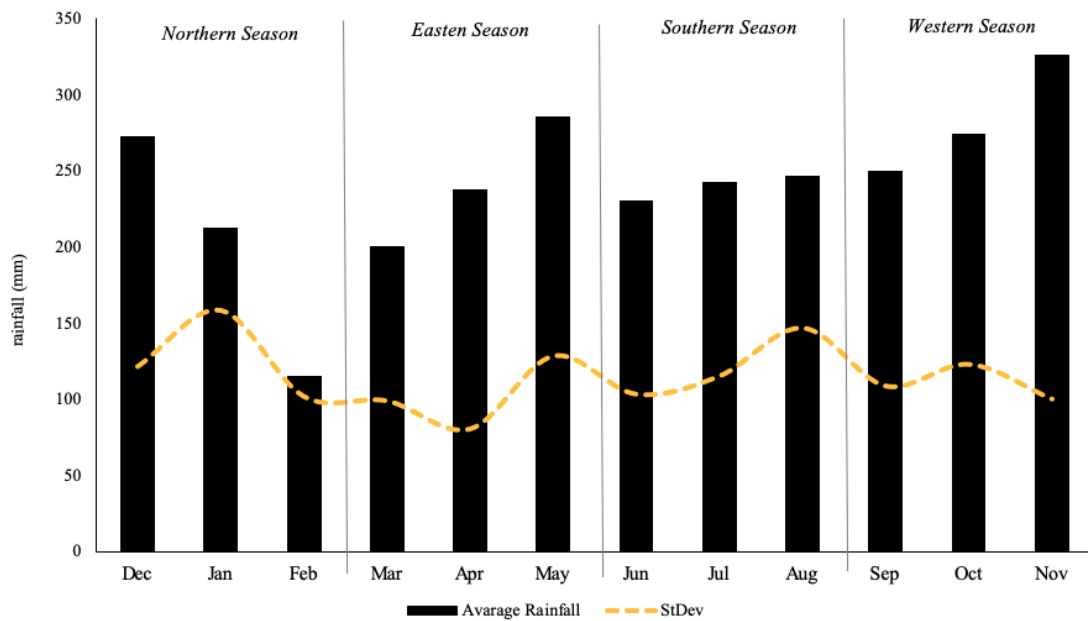
#### **c) Storm Surge Observation**

The *Orang Suku Laut* always move to the river in the big island or go inside the mangrove forest when storm surges occurred. They can predict at least an hour before the storm comes by observing the environmental signs such as animal behavior, cloud, wind direction, and sea current. They will return to their settlement or boat when the storm is over. The study found that they can estimate the wind speed and the strength the waves as well.

#### 4.3.5 Seasonal Calendar of the Orang Suku Laut

The *Orang Suku Laut* use their own calendar to fishing and socio-cultural activities. The seasonal calendar is very important for them. It deals with fishing activities including areas, equipment, practice, and season that would increase the risk due to storm surges, strong winds, and other hydrometeorological hazards. The study found that the *Orang Suku Laut* detects their calendar based on the monsoonal seasons. Aldrian and Dwi Susanto (2003) mentioned that wind direction, wind speed, and rainfall pattern had a strong influence during the monsoonal season in Indonesia. Regarding a seasonal wind, monsoon is based on the changing of rainfall. The monsoon circulation is predominately wind-driven, although in some locations it is modified by heat and fresh-water fluxes (Schott & McCreary Jr, 2001).

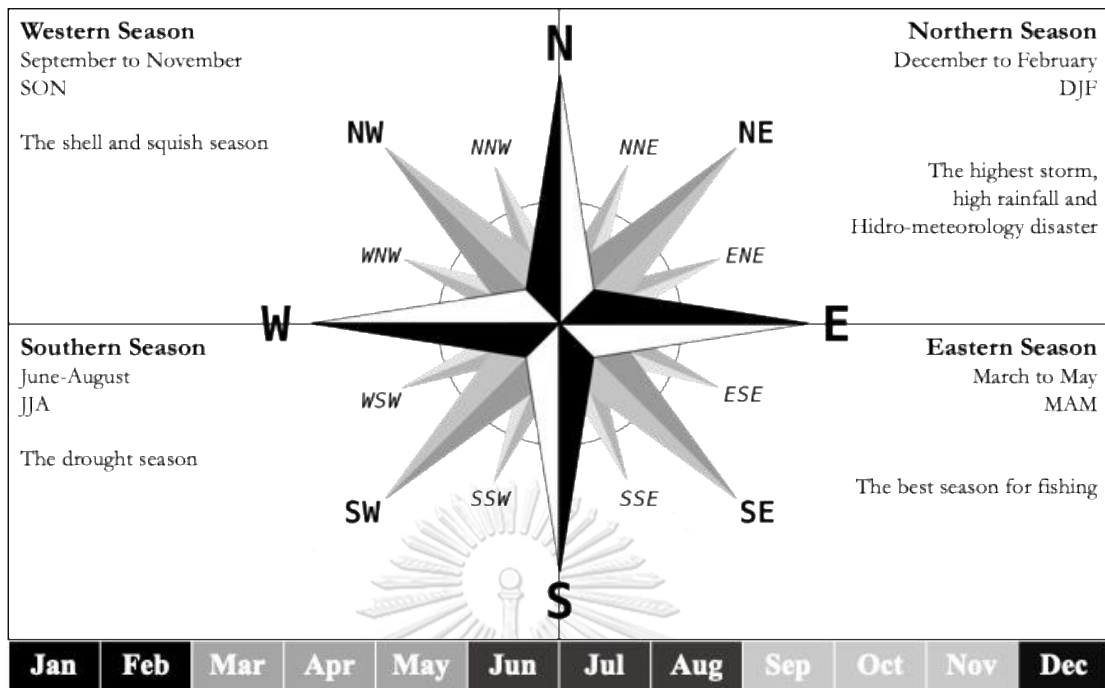
Figure 4.18 displays the average monthly rainfall and standard deviation of the Lingga Regency between 1987 and 2018 based on the seasonal calendar of the *Orang Suku Laut*. The rainy season period varies on the eastern season and the western season. February-March-April are in dry season in the Lingga Regency and the productive season for fishing. Then, April-May-June is the rainy season in the Lingga Regency. The standard deviation of rainfall is lower than the average data of monthly rainfall.



**Figure 4.18** Average monthly rainfall and standard deviation of the Lingga Regency between 1987 and 2018 based on seasonal calendar of the Orang Suku Laut.

Source: Meteorology, Climatology and Geophysical Agency (2019).

The study found that climate change causes the decreased validity of the seasonal calendar of the *Orang Suku Laut* for fishing. They noticed that their seasonal calendar has changed and unpredictable impacted by climate change. Therefore, the details of the seasonal calendar and activities of the *Orang Suku Laut* is presented in Figure 4.19.



**Figure 4.19** Seasonal calendar of the Orang Suku Laut.

#### a) Northern Season

The northern season occurs in December-January-February which the monsoonal wind blows from a northerly direction. The northern season is the most feared season of the *Orang Suku Laut* because storm surges, thunderstorms, strong waves, and extreme weather events usually take place. In the former time, they went to *Kuala Daek* or *Daek's* river during the northern season. However, they can do hunting, repairing, and making a new *Sampan Kajang*. This season is their holiday. They usually visit and socialize to their colleagues and enjoy the city center of the *Daek*, main city of the Lingga Regency in the former time. Nowadays, the northern season is only used for resting and repairing the fishing equipment.

#### b) Eastern Season

The eastern season occurs in March-April-May which the monsoonal wind blows from an easterly direction. This season is a high productivity of fishing. Predominantly, the *Orang Suku Laut* go fishing every day in the eastern season. They catch all kinds of fish and sea crabs during the day and the night. Hence, they have a good income from fishing. This season is a saving season of high fishing productivity.

According to recorded data from Meteorology, Climatology and Geophysical Agency (2019), the eastern season is the monsoonal season with a light intensity of rainfall. It is also known as the second rainy season in the Region B rainfall pattern (shown in Figure 4.2). The eastern season is also the period of rainwater collection for the *Orang Suku Laut* to prevent the water shortage in the southern season. They keep water storages and galloons. This season is well known to catching *Ikan Kerapu Merah* or Red Grouper Fish (*Epinephelus coioides*). If the weight of red grouper fish is less than 500 grams, the *Orang Suku Laut* take it aquaculture and sell it in the western season for their income.

#### c) Southern Season

The southern season occurs in June-July-August which the monsoonal wind blows from a southerly direction. The *Orang Suku Laut* knows this season as a dry season and they still do fishing. They collect shrimps, *Siput Gonggong* or sea snails (*Strombus canarium*), *Sereteh* (*Tegillarca granosa*), *Kerang Lokan* (*Geloina erosa*), *Ulat Bakau* or Shipworms (*Teredinidae sp*), *Ketam bangkang* or giant mud crabs (*Scylla serrata*) and *Siput Berong* (*Telescopium Telescopium*) in this time period. This season is also known as the fish spawning period. They reduce fishing because the fish size found is small. As a dry season, the *Orang Suku Laut* use water from the previous season if the drought is long.

#### d) Western Season

The western season occurs in September-October-November which the monsoonal wind blows from a westerly direction. According to the climate data from Meteorology, Climatology, and Geophysical Agency (2019), the western season is the main rainy season of the Lingga Regency with high rainfall. The western season is a period to catch several kinds of big fish, marine mammals, squid, and seashells by the *Orang Suku Laut*. They consume marine mammal such as manatees (*Dugong dugon*) which known as *Duyung*, green sea turtle (*Chelonia mydas*) and hawksbill sea turtle (*Eretmochelys imbricata*). The carapaces of hawksbill sea turtle and bones of manatees are used as jewelry including rings, bracelets, necklaces, and earrings. In the

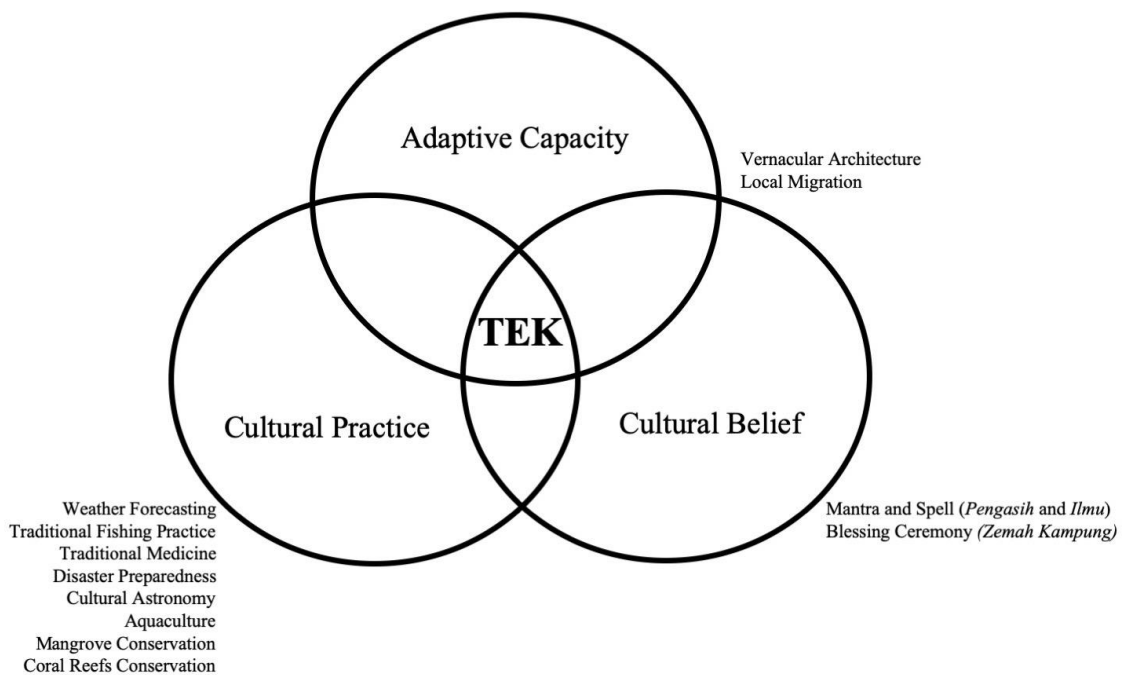


former time, the western season was the cultural ceremony of the *Orang Suku Laut* both wedding party and blessing ceremony.

#### **4.4 Traditional Ecological Knowledge (TEKs) of the Orang Suku Laut**

The TEKs, a foundation of knowledge, practice, and belief, have been evolving by adaptive processes and handed down through generations by cultural transmission, the relationship of living beings with one another and direct contact with the environment (Berkes, 2012). The TEKs are not only instrumentally valuables for climate science but also an observational knowledge collected over generations to persevere system of responsibilities in the way of thinking (Whyte, 2013a). Such knowledge enables communities to better face and responds to the impacts of climate change and climate-related hazards (Hiwasaki et al., 2014). According to Hong et al. (2018), the TEKs are not limited to botany knowledge, medicinal application, hunting, fishing, gathering, processing of material(s), caretaking such as burning, coppicing, thinning, astronomy, phenology, time, ecological markers, species markers, weather and climate knowledge. The TEKs in conserving and enhancing biodiversity may be best put to use as an integrated system of knowledge, practices, and beliefs (Gadgil et al., 1993).

The experiential knowledge of the TEKs can bestow important insights for the design of adaptation and mitigation strategies to cope with global environmental change (Gómez-Baggethun et al., 2013). For the *Orang Suku Laut*, the TEKs has an identity to combat climate change through friendly environmental practices. The study found that the TEKs of the *Orang Suku Laut* on climate change adaptation including cultural practices, cultural beliefs, and adaptive capacities at the percentage of 53.3, 33.3, and 13.4 respectively. The cultural practices, cultural beliefs and adaptive capacities of the TEKs in climate change adaptation are interconnected practices as shown in Figure 4.20.



**Figure 4.20** Traditional ecological knowledge (TEKs) of the Orang Suku Laut on climate change adaptation.

#### 4.4.1 Cultural Practices

Cultural practice is contingencies of human reinforcement capacity with sustain behavior as a process of the customary practice of different individuals over time (Glenn, 1989). Its practices can be introduced as dynamics and complex systems applied in conventional resource management (Berkes et al., 2000). In terms of climate change practices of the IPs are the connection on how they do their sustainable livelihood without harmful the environment. It can be the way in adapting to their natural and modified environments, and the hazards that arise from them over time such as the Tsunami (Becker et al., 2008). Generally, the worldwide IPs follow their traditional practices for the collection of natural resources and conservation action (Kala, 2017).

The Convention on Safeguarding Intangible Cultural Heritage, United Nations Educational, Scientific, and Cultural Organization (UNESCO) in 2003 has recognized the raising awareness on the importance of knowledge, cultural and social practices concerning to nature and environment. The cultural practices are predominantly used by *Orang Suku Laut* every day which are influenced by seasonal calendars of the

monsoonal season. The TEKs' practices on climate change would be a tool to reduce environmental hazards and hydrometeorological threats. The TEKs' practices related to climate change are weather forecasting, traditional fishing method, traditional medicine, disaster preparedness, cultural astronomy, aquaculture, mangrove conservation and coral reef conservation.

#### a) Weather Forecasting

The IPs have the ability to predict the weather by reading the sky, the clouds, and types of wind (Lefale, 2009). The weather forecasting is obtained from environmental biotic and abiotic indicators. The awareness of climate is often through bio-indicators such as the behavior of plants and animals that may be used to anticipate extreme weather (Lebel, 2012). According to Shoko and Shoko (2013), a future weather event can be predicted base on the behavior of living organisms by the IPs as well as the scientific terms. The *Orang Suku Laut* forecasts the season from the current weather directly from looking the sky around and feel the wind direction. Hence, the *Orang Suku Laut* is capable of predicting the weather for tomorrow by using the temperature in the night and see the dark sky in the evening.

The *Orang Suku Laut* use the own sign to see the points of the compass. The sun movement indicates the direction to the western part and eastern part. The direction to the northern part and southern part are signed by the landmark of the nearest islands or the coral reef location. These points of compass interpret as the necessary knowledge to forecast the weather condition. There are some weather forecasting knowledge of the *Orang Suku Laut* as shown in Table 4.4.

**Table 4.4** The TEKs of the Orang Suku Laut on weather forecasting.

Weather condition	Description
Strong wind	<ul style="list-style-type: none"> <li>• The big dark cloud (<i>cumulonimbus</i>) from any direction will generate strong wind and heavy rain</li> <li>• A wind from the northern part will bring clear weather</li> <li>• A wind from the southern part will bring heavy rain</li> <li>• Bayan or parrot bird (<i>Eclectus roratus</i>) will be noisy and swing</li> </ul>

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Rainfall	<ul style="list-style-type: none"> <li>• Few stars in the evening, within two days rain will come</li> <li>• North wind become south wind will expect rain</li> <li>• The fast moving of the cloud and it is lower altitude</li> <li>• Hear the sound of <i>Bubut</i> bird (<i>Centropus sinensis</i>)</li> <li>• The frog starts to make a noise</li> </ul>
Storm surge	<ul style="list-style-type: none"> <li>• Pass the dolphin in the sea, and if they follow sea current, the storm surge will come</li> <li>• Dark skies from the current season on that time</li> <li>• A sudden change of wind, ex: west to east or vice versa</li> </ul>
High tide	<ul style="list-style-type: none"> <li>• Sea current will go further the shore</li> <li>• Two hours before moonrise</li> <li>• Two hours before moonset</li> </ul>
Low tide	<ul style="list-style-type: none"> <li>• Sea current will be far from the shore</li> <li>• Moon is appearing</li> </ul>
Sunny	<ul style="list-style-type: none"> <li>• See an eagle fly nearby in the morning</li> <li>• Red sky in the evening, tomorrow will be a sunny day</li> </ul>

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Identifying the indigenous weather forecasting indicators and acquiring information will be useful to other people who are living under similar environmental conditions elsewhere. The observation for weather over time of the IPs generates knowledge about the climate from their place and the possibility of recognizing changes in climate (Lebel, 2012). The practice of the *Orang Suku Laut* creates knowledge in their small group to understand the weather pattern. The practice in weather forecasting sometimes cannot explain with western science because even not make sense for an outsider of the *Orang Suku Laut*. Green and Raygorodetsky (2010) stated the TEKs for weather forecasts and knowledge could guide the document for policy maker in developing the regional climate adaptation strategies.

Regarding climate change adaptation, the capability and practice of the *Orang Suku Laut* in forecasting the weather is the prevention for the extreme events occurring. For

instance, when the drought in the southern monsoonal season come, the *Orang Suku Laut* will keep much water from various sources using at least a month. The *Orang Suku Laut* could adapt themselves to the hydrometeorological hazards as a driver of climate variability. Nevertheless, this study found that the TEKs of the *Orang Suku Laut* is being eroded and becomes less accurate in seasonal weather forecasting. The changing of climate has governed the unpredictable weather and degraded their TEKs especially for the weather forecasting. The respondents of the study stated that they should combine indigenous knowledge and scientific weather data to obtain comprehensive information for predicting seasonal characteristics in their area.

#### b) Traditional Fishing Practice

The traditional fishing practice of the IPs is extensive, varied and eco-friendly compare than modern fishing technology (Prasad et al., 2013). Fisheries resource management as the TEKs in the traditional fishing practice acknowledged the selection of site, time, the efficiency of materials used, and availability of fish (Raju, et al., 2016). The traditional fishing practices of the *Orang Suku Laut* consist of seasonal changes, physiography of the water body, types of fish available, efficiency of the gear and characteristics of the material used. The *Orang Suku Laut* use the traditional fishing as part of practice in the TEKs. Mostly, its traditional fishing methods and fisheries management are still applicable at present in the *Orang Suku Laut* of the Lingga Regency as shown in Table 4.5.

**Table 4.5** The TEKs of the *Orang Suku Laut* on traditional fishing practice.

Activities	Description	Habitat
Spearfishing in low tide ( <i>Nyuluh</i> )	Spearfishing activities in the evening when the low tide (walking or rowing small boat) using <i>Serampang</i> . It does in the day or evening depends on the flux or reflux. In the evening, the <i>Orang Suku Laut</i> use the torch.	Shallow water Coral reef Rocky coast
Fish trap ( <i>Bubu</i> )	A traditional fish trap that uses a net or in the former time used woven bamboo.	Shallow water Deep sea

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	The <i>Orang Suku Laut</i> will put the bait into the <i>Bubu</i> , then put it into the seawater at least a day.	
Fish poison ( <i>Nuba</i> )	A traditional fish poison from natural ingredient. How to process it is by pounding the roots of the tuba plant ( <i>Derris eliptica</i> ) and then put it in water, usually placed on a slight stretch or around the mangrove forest.	Mangrove forest Shallow water
Squid fishing ( <i>Nyomek</i> )	Catching the squid using colorful fishing bait within the one side hooks named <i>somek</i> .	Shallow water Deep sea
Shrimp trap ( <i>Tekop</i> )	Shrimp trap using the woven bamboo or root. Put the <i>Tekop</i> in the shallow water, then using bare hands to catch the shrimp.	Shallow water Coral reef Rocky coast
Spearfishing ( <i>Serampang</i> )	Spearfishing activities using various gears consist of one gear, three gears, five gears, nine gears, and 12 (twelve) gears.	All kinds of water depths Coral reef Rocky coast
Longline fishing ( <i>Merawai</i> )	A fishing method use longline or <i>Rawai</i> a long main line anchored to the bottom to which shorter lines with baited hooks are fastened at intervals.	Deep sea
Fish aggregating ( <i>Rumpon</i> )	A fish aggregating device, made by kinds of leaves such as areca leaves and coconut leaves.	Shallow water Deep sea

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Furthermore, spearfishing is one of the traditional fishing practice that use the spear as a tool in the fisheries practices of the *Orang Suku Laut*. The *Orang Suku Laut* name spear as *Serampang* as present in Figure 4.21. The *Serampang* for spearfishing






has the odd gears number (1, 3, 5, 7 and 9), and unique number *Serampang dua belas* (12 gears). The stick of the *Serampang* uses bamboo or palm wood. Bamboo stick uses to make the handle of the *Serampang* gear 3, 5, 7, 9 and 12. The length bamboo stick of the *Serampang* follows the cultural belief which has seven or nine segments of bamboo or around there to five meters with five to seven centimeters diameter.



**Figure 4.21** Illustration of serampang of the Orang Suku Laut.

However, the *Serampang* gear 1 or known as *Ebol* use the palm wood as the handle. The *Ebol* ties to a rope along 100 meters and the stick around two meters. The fishing activities using the *Ebol* must do in the day around 12.00 to 15.00 local time. It is part of belief in the *Orang Suku Laut* communities. These gears of the *Serampang* will follow the size of the target, the most prominent target will catch using a smaller number of gears. Moreover, the *Serampang* also uses as a defense tool from sea robber and any threat. Table 4.7 presents the type of gears and target as the practice of the TEKs of the *Orang Suku Laut*.

**Table 4.6** Type of gears on traditional fishing practice of the Orang Suku Laut.

Number of gears	Illustration	Target	Target's Habitat
1 ( <i>ebol</i> )		Sea turtle Marine Mammal	Deep sea water
3 ( <i>Serampang mata tiga</i> )		Kinds of big fish Shark Dolphin	Deep sea water
5 ( <i>Serampang mata lima</i> )		Fish (less than 30 cm) Shrimp Crab Oyster	Coral reef Rocky coast
7 ( <i>Serampang mata tujuh</i> )		Difference kinds of small fish (presently there is no one using <i>Serampang gear 3, 9 and 12</i> )	Shallow water
9 ( <i>Serampang mata sembilan</i> )			



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12

(*Serampang  
dua belas*)



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Detail knowledge on fishing gears, crafts, and fishing practice is essential for the management of fishery resources. According to Bose et al. (2017), the information gathered on the traditional fishing techniques can help to devise modified fishing methods to enhance the capture as well as to reduce the operation period. Furthermore, the TEKs of the *Orang Suku Laut* for the traditional fishing practice is one of the best practices that is still doing every time. Instead, this practice also uses as the name of traditional dances of the *Orang Suku Laut*, like are *Serampang 12* dance and *Merawai* dance. Predominantly, all communities of the *Orang Suku Laut* in the Lingga Regency imply the traditional fishing practice as the best practice in the TEKs. Nowadays, the TEKs for traditional fishing practice is not only used for the *Orang Suku Laut* but also marine and fisheries scientists.

The traditional fishing practice is combined with the mantra as a cultural belief to get a better blessing from nature. Mathooko (2005) stated that spiritual rituals, religious practices, social taboos, and sacred animal totems guided the peoples on how and when to utilize the available natural resources including in traditional fishing activities. The mantra of the *Orang Suku Laut* always mention about the spirit of nature and kinds of biotic and abiotic things around their place. In the climate change adaptation term, the TEKs in traditional fishing can be an option to adapt themselves as practice with eco-friendly methods and conserve nature.

As a practice of the TEKs, the traditional fishing practice of the *Orang Suku Laut* has recognized of Ministry of Maritime Affairs and Fisheries of Indonesia as a traditional fisherman in the Act No. 7 the Year 2016 about the protection and empowerment of fisherman, fish farmers, and sea salt farmers. The TEKs should be put as traditional

fisherman practices including coral reef conservation, fishing activities, and climate change adaptation. However, the traditional fishermen are defined as fishers who carry out fishing in displacement which is a traditional fishery right that has been used for generations in accordance with local culture and wisdom. Afterward, the Act No. 27 the Year 2007 and followed by the Act No. 1 the Year 2014 about management of coastal areas and small islands created the policy for Coastal and Small Islands Zoning Plans or known as RZWP3K. The RZWP3K includes the IPs right to zone their own territorial boundaries. It aims to improve the quality of life for the IPs who are living around coastal areas.

### c) Traditional Medicine

The TEKs on plants and their application in treating different types of ill health has evolved from long-term interactions. The IPs have with their local environments (Isaac et al., 2018). Many kinds of plants around the *Orang Suku Laut* can be used as medicine. The medicinal plants remain an essential part of healing ceremonies conducted for patients or to celebrate essential events, such as weddings and naming ceremonies for the *Orang Suku Laut*. There are various medicines from biotic and abiotic resources used by the *Orang Suku Laut* such as postpartum, headache, stomachache, back pain, fever, and many things. Table 4.7 shows the variety of plants that used as medicines of the *Orang Suku Laut*.

**Table 4.7** The TEKs of the Orang Suku Laut on traditional medicine.

Type	Description	Processing
<i>Morinda citrifolia</i> (Noni plant)	Hypertension Postpartum Body health	Boil the fruit and drink the water boiled with the Noni fruit
<i>Rhizophora mucronate</i> (Bakau Melukap)	Stomachache	Mash the leaves and drink the extract
<i>Rhizophora apiculata</i> (Bakau Akit)	Bleeding	Mash the leaves and put on the bleeding part
<i>Psidium guajava</i>	Stomachache Diarrhea	Chew the leaf shoots directly

(Guava plant)

*Eurycoma longifolia* Internal disease Boil the roots with water then drink the extract  
(Pasak bumi root)

*Colocasia esculenta* Headache Mash the leaf shoots and drink the extract  
(Keledik)

*Lygodium japonicum* Fever Mash the root and drink the extract  
(Ribu)

*Caesalpinia sappan L.* Postpartum Mash the leaf and fruit than drink the extract  
(Ncang)

*Terminalia catappa* Postpartum Mush the stem skin and drink the extract  
(Ketapang)

*Patok Udang* Postpartum Mash the leaves and drink the extract

*Heritiera littoralis Dryand* Postpartum Mash the leaves and drink the extract  
(Dungun Laut)

*Piper nigrum* (Black paper) Postpartum Mash the fruit and drink the extract

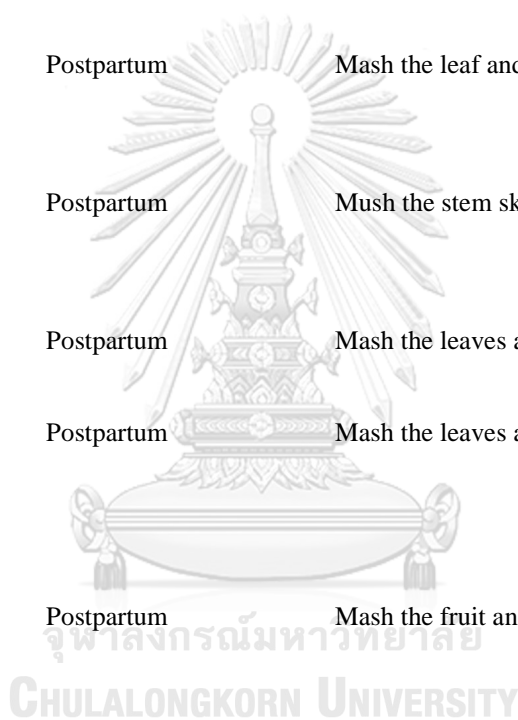
*Lange plant* Body aches Mash the leaf and put into baht water than bathing with that mixed water

*Phragmites karka* Dengue fever Mash the leaves and drink the extract  
(Pelumpung)

*Lumnitzera littorea* Bad breath Chew the flower directly  
(Bakau Sesap)

*Cocos nucifera* Smallpox Drink the coconut water directly  
(Coconut water)

*Holothuria scabra* (Sea Body health Dry the sea cucumber meat then eat it with lime juice



cucumber)	Massage oil	Extract the sea cucumber meat until it becomes an oil
<i>Euplexaura sp.</i> ( <i>Akar karang</i> )	Backpain	Boil the <i>Akar Karang</i> and drink the water
<i>Myrmecodia sp.</i> ( <i>Sarang semut</i> )	Pain in the chest and lungs	Boil tuber of the <i>Sarang Semut</i> and drink the water

The degradation of folk cultures and the disappearance of the IPs pose not only a problem for the future practice of ethnomedicine but also the protection of biotic communities which serve as sources of indigenous medicine. The ethnomedicine and ethnopharmacology from the IPs point to the development of modern medicine. For the *Orang Suku Laut*, the most important traditional medicine for them is kinds of medicine for postpartum. It is caused the maternal mortality, and child mortality was the big problem of the *Orang Suku Laut* since many years ago.

Meanwhile, during the pregnancy period, the woman does not allow to come to the land or ground floor. The *Orang Suku Laut* believe land as for burial site (Chou, 2016). Women must give birth in *Sampan Kajang* or their stilt house as long as not directly touch the land. A piece of cloth, a mat or a piece of paper must therefore necessarily be laid on these surfaces before she can safely sit down. During the giving birth, there is a midwife or known as *Mak Dukun* for their group will help to push the child out from the mother's belly. The husband will accompany his wife during the giving birth process. *Mak Dukun* will deliver some spell and touch the belly of that pregnant women. Then, after the baby born out, the *Orang Suku Laut* will bathe the baby with sea water. It aims to make babies stronger in the future and be a brave sea fighter. In the postpartum periods, the mother will consume the medicine until 40 days.

Loss of the TEKs for traditional medicine has an impact also on the development of modern medicine (Anyinam, 1995). The continued adherence of the *Orang Suku Laut* could be traditional cultural principles and values of ethnomedical systems that contribute to the preservation and conservation of several biotic communities.

Regarding climate change adaptation, the practice of traditional medicine as part of practice in the TEKs can conserve nature with traditional ways without generates environmental hazards. The materials and the processing method used are the best practice in the TEKs as a capacity to adapt climate change.

#### **d) Disaster Preparedness**

The TEKs are a key to encompass the resilience of coastal and small island communities to impacts of climate change, particularly hydro-meteorological hazards. It is important to recognize the TEKs for disaster risk reduction and climate change adaptation (Hiwasaki et al., 2014). The *Orang Suku Laut* usually deal with climate disasters such as storm surge, strong wind or depression, thunderstorm, coastal erosion, and drought. The *Orang Suku Laut* have their own belief and practice to notice the hydro-meteorological hazards in traditional ways. They can alert when the storm is coming and make the center point when the disaster is happening and water conservation before facing severe drought.

In the practice of the TEKs, disaster preparedness and reduction are critical to human security and livelihood. The autonomous adaptation of the *Orang Suku Laut* can practice themselves to be aware of the unnormal changing of the sky, sea current and sea wave. As a homogenous community, the *Orang Suku Laut* have a community-based adaptation in their group to reduce the disaster risk. Indeed, the incorporation of the TEKs in disaster awareness represents the recognition of incredible depth and insight into indigenous environmental knowledge and co-management as a best practice in climate change adaptation (Becker et al., 2008). Table 4.8 presents the disaster preparedness of the *Orang Suku Laut*.

**Table 4.8** The TEKs of the Orang Suku Laut on disaster preparedness.

Disaster	Action
Storm surge	<ul style="list-style-type: none"> <li>• Build stilt house based on the numerous wind direction coming, make sure the main door follows the side of wind coming (mostly facing to the east)</li> <li>• Do not cut mangrove forest or trees around the house, protect from the storm</li> <li>• Go the contrary part of wind direction</li> <li>• Go to the small river or mangrove forest</li> </ul>
Strong wind	<ul style="list-style-type: none"> <li>• Tie the rope twice to the paddle when in the sea and follow with a mantra</li> <li>• Wear clothes that make it easy to swim if at any time the boat will sink</li> <li>• Gather all of family member and shelter under the Kajang when in the middle of the sea</li> <li>• Wind from the north part will bring clear weather, Wind from the south will bring heavy rain</li> <li>• Go the contrary part of wind direction</li> <li>• Go to the small river or mangrove forest</li> </ul>
Drought	<ul style="list-style-type: none"> <li>• Find the water into the nearest island</li> <li>• Save water into some storages before drought coming (water conservation practices)</li> </ul>
Coastal Erosion	<ul style="list-style-type: none"> <li>• Plant the Jerampong or Tapak Kude plant (<i>Ipomoea pescaprae</i>) in the coastal line</li> <li>• Plant mangrove in the coastal line</li> <li>• Do not make a settlement in the land</li> </ul>

Meanwhile, the practice of the *Orang Suku Laut* in the disaster preparedness and reduction in coping climate change adaptation should be recognized as best practice. Despite this considerable potential, the study found that the limited information and lacks documentation of the *Orang Suku Laut* in the disaster preparedness and reduction. This practice is not found in all generational classes of the *Orang Suku Laut* particularly for young people. If it is contextualized to particular communities,

this knowledge cannot be scientifically validated. Sometimes, when the big storm surge is coming, the *Orang Suku Laut* could not prevent it using their TEKs. It is affected the *Orang Suku Laut* such as damage the houses and livelihood. The respondent concluded that both the TEKs and the disaster risk reduction practitioners could benefit from the *Orang Suku Laut*.

### e) Cultural Astronomy

Identifying the position of the stars to give the sign for times, direction, tidal period, and seasons are the way of the *Orang Suku Laut* in observing nature. The *Orang Suku Laut* identify sun, moon, and stars to direct them for the changing of nature. Every IPs in the worldwide imply the cultural astronomy or known as indigenous astronomical knowledge in daily activities. Indigenous astronomical knowledge integrates many aspects of the TEKs, including seasonal calendars, navigation, food economics, law, ceremony, and social structure (Nakata et al., 2014). It is supported by Carlson et al. (1999) that the cultural astronomy of the IPs reflects the social role of astronomically regulated rituals, agricultural shifted time and fishing seasons. The TEKs of the *Orang Suku Laut* on cultural astronomy shows in Table 4.9.

**Table 4.9** The TEKs of the *Orang Suku Laut* on cultural astronomy.

Element	Behavioral Sign	Forecast
Sun	<ul style="list-style-type: none"> <li>• Hot temperature in the night</li> <li>• Red sunset</li> <li>• The dark cloud around sunset</li> </ul>	<ul style="list-style-type: none"> <li>• Rain will come tomorrow</li> <li>• Sunny will come tomorrow</li> <li>• Rain and storm will come in the late evening</li> </ul>
Moon	<ul style="list-style-type: none"> <li>• <i>Bulan Timbul</i> or Full moon (day15)</li> <li>• First-day moon appearing</li> <li>• Bright moonlight (day 10-20)</li> <li>• Moonrise (first two</li> </ul>	<ul style="list-style-type: none"> <li>• Do not go fishing in the evening</li> <li>• Storm surge will occur for two to six hours after appearing</li> <li>• Calm current and decrease the fish catch</li> <li>• High tide</li> </ul>

	hours)		
	• Moon in the sky	• Low tide	
	• Moonset (last two hours)	• High tide	
	• <i>Bintang 7</i> (7 star close to the moon	• A storm will come soon	
Stars	• Few stars appearing	• Rain will come tomorrow	
	• Plenty of stars appearing	• Sunny will come tomorrow	
	• <i>Bintang 7</i> (7 star) in the northern season	• Sign the time, if appearing, the time is 9 pm, and the wind will come	
	• <i>Bintang Jong</i> (boat star) in the southern season	• Calm sea current	
	• <i>Bintang Barat</i> (west star) in the southern season	• Sign the time, if appearing, the time is around 6 pm to 9 pm	
	• <i>Bintang Talak</i> ( <i>talak</i> star)	• Sign the time, if appearing, the time is around 10 pm to 4 am	
	• <i>Bintang Penyapu</i> (sweeper star) in the eastern season	• Sign the time, if appearing, the time is around 6 pm to 6 am	

A cultural understanding of climate transforms the way the contemporary idea of climate change that should be envisaged, not primarily as a physical process which must be stopped, but as the latest stage in the cultural evolution of the idea of climate (Hulme, 2015). However, the climate has a cultural history which is interwoven with its physical history, cultural astronomy, and forms the substrate out of which contemporary beliefs, claims and disputes about climate change emerge today. The cultural history in climate change as extensive knowledge and practice in the TEKs has generated the adaptability for many years. Regarding cultural astronomy as an observation of the moon, sun, and star relate to the cultural history of climate change in the IPs. In the *Orang Suku Laut* communities, the physical history of climate



change is well explained by their ancestor through the cultural astronomy. The TEKs in the cultural astronomy is used as guidance to increase the capacity to the changing of climate. The existence of cultural astronomy is eroded by times being because the successor does not seem interested in this practice.

#### f) Aquaculture

Aquaculture refers to a practice of farming of aquatic organisms, including finfish and shellfish, by individuals, groups or corporations using interventions like are feed, medications, controlled breeding, containment that enhance production to get a profit (Sapkota et al., 2008). The practice of the IPs in aquaculture indicates sustainable practice because the traditional method used. In advance, sustainable aquaculture development creates environmentally sustainable and protects the quality of the environment for society (Frankic & Hershner, 2003). Although, Diana (2009) stated that the TEKs in aquaculture can generate both positive and negative impact for the ecosystem.

In realization of this fact, the *Orang Suku Laut* will not take marine biota when they are breeding or spawning period. As an example, for seashell and sea snail breeding period, the *Orang Suku Laut* will catch fish in order to take the seashell or sea snail on that time. The *Orang Suku Laut* do not know how to control breeding of the marine biota. Their practice on aquaculture only relies on feeding. They use the method fixed net cage in doing the practice of aquaculture. The simple cage is made from mangrove stakes and rope net. Their aquaculture practice consists of some species such as fish, crab, and sea turtle as presented in Table 4.10.

**Table 4.10** The TEKs of the Orang Suku Laut on aquaculture.

Species	Action
Red groupers fish ( <i>Epinephelus coioides</i> )	Make the net pool under their stilt house, feeding until the weight of fish more than one kilogram
Sea turtle <ul style="list-style-type: none"> <li>• Green sea turtle</li> </ul>	Make the fixed net cage under their stilt house, feeding until the weight more than 50 kilograms

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(*Chelonia mydas*)

- Hawksbill sea turtle

(*Eretmochelys*

*imbricata*)

*Bangkang* crab

(*Scylla serrata*)

Make the net pool under their stilt house, feeding until the weight of fish more than one kilogram

*Gonggong* snail

(*Strombus canarium*)

Make the net pool under their stilt house, feeding until the length around 80 millimeters

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The practice of the TEKs on aquaculture can be an action in adapting climate change. The traditional ways without harm the environment is the best practice to cope with the changing of climate especially for livelihood impacts. Diana (2009) stated, aquaculture has some impacts on biodiversity and conservation such as cultured seafood can reduce pressure on overexploited wild stocks, aquaculture often boosts natural production and species diversity. For social impacts, employment in aquaculture may replace more destructive resource uses and increase incomes for the *Orang Suku Laut*.

#### **g) Mangrove Conservation**

The TEK and forest biodiversity conservation are linked through various socially shared aspects, such as values and norms, spiritual beliefs and perceptions of ecosystem functions and benefits as well as operational conditions, including livelihood strategies and economic constraints (Joa et al., 2018). In coastal zones, potential declines in mangrove forest habitat resulting from sea level rise, changes in sediment and pollutant loading from the river, and lake basins combined with land reclamation for agriculture or overexploitation could also impact on fisheries by reducing or degrading critical coastal habitats (Badjeck et al., 2010). The aims of mangrove conservation for the *Orang Suku Laut* is because their livelihood cannot be separated anymore from mangroves as the natural resources closest to them. Even they do not know the academic term of conservation, but they practice it every day.

The *Orang Suku Laut* can classify the kinds of Mangrove, how they grow and how to cut utilize them without giving damage to the environment. Three kinds of Mangrove namely *Akit* (*Rhizophora apiculate*), *Tumuh* or *melukap* (*Rhizophora mucronate*) and *Tengah* or *Nadai* (*Bruguiera cylindrica*). The uses of these mangroves are as a source of food, medicine, firewood, boards and shelter from storms. The mangrove stake also uses to make the cage for the aquaculture.

There are some reasons for the *Orang Suku Laut* to conserve the mangrove. Firstly, mangrove for the *Orang Suku Laut* is playing ground for kids. In the former time, when the parent of *Orang Suku Laut* parked the *Sampan Kajang* around mangrove forest, it is a sign for playing time of the kids and gathering each other for the adult. Children can play and gather wild plant fruits in the mangrove forest. Second, the mangrove forest is a garden for traditional medicine. The *Orang Suku Laut* can identify some kinds of mangrove for medicine like *Akit* (*Rhizophora apiculate*) for stomachache and *Melukap* (*Rhizophora mucronate*) to stop the bleeding. Next, mangrove can be food provider because it is the place to find the shell, sea snail, shipworm, crab and several kinds of fish. Lastly, mangrove has economic value that can generate income such as for charcoal making from mangrove stem and stakes for making a house or boat.

If referred to in the Law of the Republic of Indonesia No. 32 the Year 2009 about the Protection and Management of the Environment, the forms of local wisdom of the *Orang Suku Laut* in utilizing the natural resources management for mangrove ecosystem have conservation practices of natural resources. Also, this law ensures the sustainable use of mangroves while maintaining and improving the quality of values and diversity. Indeed, those kinds of practices are defined as TEKs on climate change adaptation. It is the important point of the TEKs and the land use practices of forest resource users who rely on this form of knowledge play a crucial role for biodiversity conservation in managed forests (Joa et al., 2018). Chow (2018) also support with the previous research that mangroves provide services that would help reduce damages of climate change, by sequestering carbon, enhancing coastline stability, and protecting coastal settlements from storm surges and prevent the impact of sea level rise.

#### **h) Coral Reef Conservation**

Coral reef for the *Orang Suku Laut* is not only for livelihood but also as community spirit. The *Orang Suku Laut* believe that coral is the playing ground, breeding area for fish, and some colorful coral reef was assumed as the incarnation of the sea god. Whereas the *Orang Suku Laut* believes the location that has much fish showed by greenish sea water, there is a splash of water from the sea surface in the form of fish movement and good coral reef condition. The coral reefs are highly vulnerable to climate change induced stresses that have led to substantial coral mortality over large spatial scales (Cinner et al., 2012). The practice of the *Orang Suku Laut* for coral reefs conservation is categorized as the TEKs on climate change adaptation. McClanahan et al. (2008) express the adaptive capacity in coral reef conservation is the ability of the IPs as households to anticipate and respond to changes in coral reef ecosystems and fisheries, and to minimize, cope with, and recover from the consequences. This statement has proved by result finding in the *Orang Suku Laut* Communities.

The *Orang Suku Laut* conserve the coral reef from the overfishing activities. They will notice the growth of coral reef and condition around their community. The *Orang Suku Laut* can map the area of fishing ground and various kinds of coral reefs that called *Gosong*. The TEKs of the *Orang Suku Laut* for coral reef conservation support the adaptation to climate change. As a vulnerable group who live in the coastal area, the *Orang Suku Laut* have a high risk to the sea level rise, storm surge, and other climate change impacts. Meanwhile, it has the potential to lead to declines in marine fish production and compromise the livelihoods of fisheries-dependent communities (Cinner et al., 2012).

During 2004 to 2009, the Government Indonesia, World Bank, and Asian Development Bank established a continued project namely Coral Reef Rehabilitation and Management Program (COREMAP) Phase II in the Lingga Regency. The objective of this project in to develop increased control of communities (through zoning, monitoring, enforcement) regarding access to coral reefs and conservation areas, resulting in more sustainable fisheries and improved quality of the coastal

resources. Some location of this project is around the village of the *Orang Suku Laut* such as *Selat Kongki*, *Kojong*, *Mensemut*, *Pulau Buluh*, and *Pongok*. The *Orang Suku Laut* were involved to COREMAP Phase II through their TEKs particularly in zoning and monitoring. Since in 2018 the government of Indonesia undertakes partnerships with World Bank to continue the COREMAP Phase II to COREMAP-CTI or Coral Triangle Initiative. The COREMAP-CTI explicitly acknowledge the IPs on the planning process that called as Indigenous Peoples Planning Framework (IPPF). The IPPF prepares for ensuring consultation, giving the IPs a consent in participating and an opportunity to benefit from the program (Government of Indonesia, 2018a).

#### 4.4.2 Cultural Beliefs

Cultural belief is spiritual or religious dimensions (beliefs) that do not make sense to science or fall outside the realm of science (Berkes, 2012). In the belief of the *Orang Suku Laut*, nature means their mother of God. This spirit and belief have brought the *Orang Suku Laut* in adopting it as a culture by many generations. Cultural beliefs of the *Orang Suku Laut* are dynamic and reflexive to the spirit of the environmental changing for example customary law (*Pantang Larang*), mantra and spell (*Pengasih* and *Ilmu*), blessing ceremony (*Zemah Kampung*), washing ceremony (*Melange Ceremony*), and multiple purposed materials (*Kajang*).

##### a) Customary Law (*Pantang Larang*)

*Pantang Larang* means abstinence forbids or customary law. The *Pantang Larang* is a form of language or instruction that is used by a group of ancestors such as an oral regulation that must be accepted by society as a dogma in daily life. The *Pantang Larang* can be in the form of an action based on beliefs or punishment for bad attitudes. Its revenge is in the form of supernatural power. These restrictions have been trusted by the community as a culture passed down from generation to generation and even became traditional binding law. The *Orang Suku Laut* uses *Pantang Larang* as a cultural belief to protect the environment and social life. However, the *Pantang Larang* as cultural heritage is the basic law and regulation of the *Orang Suku Laut* as interconnected between practices and cultural beliefs. This

research found some terms of the *Pantang Larang* of the *Orang Suku Laut* as the TEKs as shown in Table 4.11.

**Table 4.11** The TEKs of the *Orang Suku Laut* on customary law

Customary Law	Revenge
Directly kill fish or marine biota when sailing in the sea.	The catch will decrease because no sea god will be mad.
Leave a little food when eating for other creatures like feeding fish around your place.	You will not find fish when do fishing.
Do not kill any creatures when you are pregnant.	Your baby will be died before giving birth
Do not be against parents and headmen advice.	You will be a <i>Busut</i> (anthill) and get <i>Dulat</i> (hell).
Do not go the sea after <i>Zemah Kampung</i> ceremony within three days.	You will suffer and be unlucky when fishing.
Do not damage the coral reef.	Your village will get a natural disaster because there is an incarnation of the sea god.
Do not make settlement on the land or cut the trees.	You will get sick because land is only for burying.
Do not throw away garbage into the sea.	You will suffer and be unlucky when fishing.

According to the *Orang Suku Laut*, the destruction of nature not only destroys, natural and economic resources but also impact the source of various cultural activities and social life. Hence, the *Orang Suku Laut* uses their *Pantang Larang* to conserve the nature with their customary law. Hiwasaki, Luna, Syamsidik, and Marçal (2014) defines the role of customary laws in climate change is as a govern behavior, rituals engender and reinforce respect for the environment, strengthen social cohesion, and

thus help communities to better face and respond to the impacts of climate change and climate-related hazards through their TEKs. Furthermore, the *Pantang Larang* as the TEKs has a role in protecting the environment which directly impacts to climate change. As climate change adaptation practice, the *Pantang Larang* should be included to develop a comprehensive program for the *Orang Suku Laut*.

#### **b) Mantra and Spell (Pengasih and Ilmu)**

The *Pengasih* is a cultural belief that studies the personal appeal or group to attract others in protecting nature and living together as a peaceful society. The *Orang Suku Laut* use their *Pengasih* for every single activity in their livelihood such as in fishing activities, cutting trees, weather changes, medicine, and even for martial arts or self-protection. The *Pengasih* for the *Orang Suku Laut* includes the cultural belief in understanding and controlling winds, sea currents and tides for flux and reflux by studying the position of the sun, the moon and the stars. They know how to navigate their way offshore and knowledgeable about, rich fishing grounds, mangrove swamps, and danger zones in contrast to areas for refuge. This research investigated two *Pengasih* that related to the TEKs for climate change adaptation named *Pengasih* for fishing and rain. The *Pengasih* for fishing uses prior to *Orang Suku Laut* goes to the sea. Then, the *Pengasih* for rain delivers when the sign for rain will come.

The *Ilmu* is magic, knowledge, and science of the *Orang Suku Laut* as stated by Chou (1997) in the previous research. Many people from the outside group visit the *Orang Suku Laut* to get the magic stuff and witchcraft. Regarding TEKs for climate change adaptation, the *Orang Suku Laut* cast the *Ilmu* over their material technology for fishing. It endows their fishing gear with supernatural power or even entails taking care of, feeding, protecting, raising, maintaining and guarding the things or spirits. According to the headmen and elder respondents of the *Orang Suku Laut*, their *Ilmu* can reduce the rain intensity, moving the storm, changing weather pattern and weather forecasting.

This kind of belief still exists in the *Orang Suku Laut* communities, especially for elders. Presently, many of the young generations do not have the capability to use

both the *Pengasih* and the *Ilmu*. Some of them informed that the elders and headmen do not teach it to them properly. Confirming the headmen and elders, they said that the young people are not interested in the *Pengasih* and *Ilmu* because it is against their current religion which might be Islam, Protestantism, Catholicism, Hinduism, or Buddhism. Additionally, young people presumed that the *Pengasih* and the *Ilmu* is outdated and uninteresting.

### c) Blessing Ceremony (*Zemah Kampung*)

*Zemah Kampung* also known as *Semah Kampung*, is a cultural belief for wishing the good things from the sea god. According to Gottlieb (2004), myths and laws for the human term can be a driver to respect and socialize themselves to nature which support the finding about cultural belief in the *Zemah Kampung*. As a terminology, *zema* mean cleaning up and blessing, then *kampung* means village. The *Zemah Kampung* is the tradition of Malay in the former time, not only in the *Orang Suku Laut* communities. The *Zemah Kampung* is ceremonies and propitiations often connected with basically pre-Islamic beliefs of paganist character particularly in connection with the seasons, fishing and new activities.

The activities of the *Zemah Kampung* is the ceremony to float the miniature of a boat (*Jong*), doll, three colored rice: black yellow and green, candle, cigarettes, money, plat, and cup from the glass and daily goods into the sea. The *Orang Suku Laut* does not allow to catch fish or do fishing activities for three days after this ceremony. If someone breaks the rule, he must pay the penalty from the headmen of the community. Practically, the *Zemah Kampung* needs good expenditure and donation from the local community and various benefactors that related to their daily activities. The *Orang Suku Laut* will come to visit that benefactors to get money, rice, and other basic needs for the *Zemah Kampung* Ceremony.

The relation of cultural belief in term of the *Zemah Kampung* and climate change adaptation is not from the way their belief the jinn or ghost, but the belief that the need to normalize the fishing activities after the ceremony. It can be timing for destabilizing the natural resources as respect to nature. Despite a myth, it should be



the way of the *Orang Suku Laut* to adapt themselves for the natural changing. Williams and Hardison (2013) stated that there is a relation to the trade-offs between types of the TEKs with differing levels of spiritual significance and risks related to sharing. However, there are some other regions in Indonesia have this kind of cultural belief and practice such as in Aceh Province named as *Kenduri Laut* (sea party) and *Sasi* (sufficiency in the natural resources management) in the Maluku Province.

#### **d) Washing Ceremony (Melange Ceremony)**

*Melange* ceremony is eventually ceremony of the *Orang Suku Laut* in washing their boat and fishing equipment before going to the sea. The boat and fishing equipment will be washed using extracted leaves of *Delima* (*Punica granatum*), *Lange* and *Limau* (*Mauritius papeda*). The *Orang Suku Laut* believe that the *Melange* ceremony will give blessing and increase their income. They must do the *Melange* Ceremony every 15 days when the fully moon is appearing. The first day after the *Melange* ceremony, the *Orang Suku Laut* will splash water three times to the left and right side and then put the spearfishing or the *Serampang* in front of the boat. It is a cultural belief that hereditary from the ancestor.

As a cultural belief, the *Melange* Ceremony is very close to traditional fishing practice. It is a social process that requires increased attention to the meaning of climate change, including the opportunities created, and the ways it can influence the community and identity of the *Orang Suku Laut*. According to Adger et al. (2012), cultural dimensions highlighted here are rare and only partially included in common assessments of climate change impacts and adaptation. The *Melange* Ceremony as an intangible aspect of culture can lead the behavior of the *Orang Suku Laut* to conserve the environment. It is supported by research from Kim (2011), climate change can give both impacts to the intangible aspect of culture and brace the adaptive capacity of the human for changing many dimensions of their activities.

#### **e) Multiple Purposes Materials (Kajang)**

*Kajang* is the multifunction purposes materials of the *Orang Suku Laut*. It is made from *Mengkuang* leaves or pandanus leaves (*Pandanus tectorius*). The practice in

making the *Kajang* of the *Orang Suku Laut* is part of the TEKs where every stuff should be combined with the *Kajang*. It can be a sail, roof, house wall, mat, cooking tool, drying storage, box, bag, and hat. The ancestor of the *Orang Suku Laut* divided *Kajang* into two types namely *Kajang Bilis* and *Kajang Layar*. *Kajang Bilis* is *Kajang* for drying the *Bilis* or Anchovy Fish (*Engraulidae sp*), and *Kajang Layar* is *Kajang* for sailing. The differences in them are frame and size. The *Kajang Bilis* is longer than the *Kajang Layar* but does not have a frame like a mat. The *Kajang Layar* has a frame from rattan stems.

The TEKs in the *Kajang* spirit can be a practice to climate change adaptation because of the way to making craft or stuff from the *Kajang* including the belief to protect nature and respect to the environment as a livelihood. Therefore, Lugo-Morin et al. (2019) argued that human could create things based on the needs through their systems of beliefs and values that have determined the sustainability of the resources they use from their environment. Regarding sustainability, *Kajang* practice can be an alternative practice to achieve a sustainable life because using organic and not harm the environment as the today world problem in solid waste and marine debris.

#### 4.4.3 Adaptive Capacities

Adaptive capacity is the attributes of a system to adjust its characteristics or behavior, to expand its coping range under existing climate variability, or future climate conditions (IPCC, 2014). Adaptive capacity is also denoted as the ability of a system to adjust, modify or change its characteristics or actions to moderate the potential damage, take advantage of opportunities or cope with the consequences of shock or stress (Brooks & Adger, 2004). According to Jones et al. (2010), adaptive capacity has close links between development and adaptation that but it remains limited at the local level.

In this research, the TEKs as adaptive capacity will be used correctly for climate change adaptation. The adaptive capacity of the *Orang Suku Laut* refers to the ability or potential of living and unliving things to respond to climate change and its impact. The adaptive capacities include preventative strategies, which involve making

decisions to minimize or avoid an event, and strategies to facilitate recovery. In the perspective of the IPs, adaptive capacities create a successful story to lead the climate change policy and development in adaptation term. Then, it will develop the new ecosystems as a critical determinant of successful adaptation in the face of an uncertain future climate. However, this study found that the outstanding adaptive capacity of the *Orang Suku Laut* is a vernacular architecture and local migration.

#### a) Vernacular Architecture

Architecture is considered as a mirror of a civilization that is shaped up by needs, society, technology, culture, and climate (Ozay, 2005). The vernacular buildings are a unique interaction between the human mind and experience gathered by observing natural phenomena like climate change (Motealleh et al, 2018). The vernacular architecture as the TEKs of the *Orang Suku Laut* consists of stilt house (*Saphaw*) and a rowing boat (*Sampan Kajang*).

The *Saphaw* is the stilt house that builds in coastal line, in the sea or the small island as shown in Figure 4.22. The reason why the *Orang Suku Laut* stays in the *Saphaw* or the *Sampan Kajang* is that they cannot sleep if they do not hear the waves and sea current sound. This stilt house is durable to disaster. The materials used are from wood and leaf that the sunlight can penetrate making the low temperature inside of the house. The *Saphaw* is built at least three *depa* above the sea bed and one *depa* stick in the sand. The aims of building the *Saphaw* for the *Orang Suku Laut* is to prevent the sea level rise and tide season. The *Orang Suku Laut* is well known about the water depth increasing and that impacts.



**Figure 4.22** Illustration of saphaw of the Orang Suku Laut.  
Source: Faisal (2018).

During 2008 to 2009, the government through the program from Isolated and Vulnerable Community (KAT), Indonesian Ministry of Social Affairs changed the *Saphaw* of the *Orang Suku Laut* into permanent stilt house with the asbestos roof, wooden wall and floor as shown in Figure 4.23. The *Orang Suku Laut* is forced to live on land that contrary to their TEKs. The government did not consider the social impact and cultural degradation of the *Orang Suku Laut* when conducting this program. The *Orang Suku Laut* informed that the house is not strong enough and against the customary law or *Pantang Larang* of the ancestors. Additionally, this program has influenced the livelihood and the TEKs of the *Orang Suku Laut* because they must stay in the one place and cannot do the nomadic activities.



**Figure 4.23** Illustration of house that provided by government for the *Orang Suku Laut*.

Source: Faisal (2018).

Another adaptive capacity of the vernacular architecture is the *Sampan Kajang*. It is made by *Mentango* wood (*Calophyllum inophyllum*) and *Mengkuang* leaves (*Pandanus tectorius*) as illustrated in Figure 4.24. The size of *Sampan Kajang* should follow the odd number starting with five *depa* (1 *depa* equals to 1.8 meters) based on the cultural belief of the ancestor of the *Orang Suku Laut*. Therefore, the *Sampan Kajang* is the rowing boat of the *Orang Suku Laut* from many generations. The traditional boat is used without harming the environment like a modern boat with fossil fuels. They believe that the *Sampan Kajang* is the heritage of their ancestor. As the adaptive capacity to climate change, this TEKs can help to reduce the greenhouse gas into the atmosphere. The way the *Orang Suku Laut* adapt climate change through the *Sampan Kajang* is friendly environmental practice.



**Figure 4.24** Illustration of sampan kajang of the Orang Suku Laut.  
Source: Faisal (2018).

Regarding climate change adaptation, the capacity to adapt through the TEKs in vernacular architecture is coming from the designs were based on inter-generational knowledge, landscape, and the environment with materials locally available in nature. Both of the *Sampan Kajang* and the *Saphaw* use the eco-friendly design which not harming the environment. The *Saphaw* is built higher the sea level that aims to adopt the sea level rising and tidal period.

#### **b) Local Migration**

Environmental factors extend the local migration for the *Orang Suku Laut*. The migration of the *Orang Suku Laut* is the temporary migration from one island to another island when the northern monsoonal season is coming. According to Makondo and Thomas (2018), this seasonal or circular migration pattern can be considered as a traditional positive adaptation strategy for seasonal climate variabilities. The traditional climatic knowledge in the high-risk area from the IPs is important to adapt themselves in migrating or relocating to new areas due to droughts, rising tides, floods, pestilence, and political strife (Reedy et al., 2013).

The local migration of the *Orang Suku Laut* follow the seasonal changes especially the changes of the monsoonal pattern. They will be able to move to a safe place when the northern monsoonal season is coming. The northern monsoonal season for the *Orang Suku Laut* is feared season that generate many hydrometeorological disasters. When storm surge is coming, the *Orang Suku Laut* will migrate to the nearest safety island or go inside the mangrove forest or row into a small river in the big island. They will try to move from the boat to the island. They can predict at least an hour before the storm is coming by investigating the environmental change. The *Orang*

*Suku Laut* will come back to their settlement or boat when the storm is over. As an example, the *Orang Suku Laut Pulau Mensemut* migrate every northern monsoonal season to *Pulau Hantu*. They will come back to *Pulau Mensemut* at the end of the northern monsoonal season. In *Pulau Hantu*, they will build the new *Saphaw* and dismantle it when they move back to *Pulau Mensemut*.

The study found that the *Orang Suku Laut* used to migrate overseas to Malaysia and Singapore in the last two decades. They rowed their *Kajang* for two to three weeks. The preparation of this migration is at least in the middle of the western monsoonal season. Some of the *Orang Suku Laut* respondents informed that they brought their selling goods then sold it during staying there such as fish, sea turtles, and sharks. Some other groups of the *Orang Suku Laut* usually locally migrate to *Cempa* island to hunt the wild boars during the northern season and stay there for some weeks.

The relation between local migration as the TEKs and climate change adaptation is caused by environmental changing. Local migration is one of the ways of the IPs like the *Orang Suku Laut* as a capacity to adapt climate change. The increasing impact of climate variability is likely to increase migration that impacted to livelihood, and social life (Gautam, 2017). Then, issues such as values, ethics, risk, knowledge and culture construct societal limits to climate change adaptation (Makondo & Thomas, 2018).

#### **4.5 Policy and Development Projects on Climate Change Adaptation Related to the Orang Suku Laut**

The study obtained policy and development projects information from the respondents including government officials at local, regional and national level. Other stakeholders such as non-governmental organization, private sector, society, and academic also provided information on climate change adaptation policy and its development projects that are related to the *Orang Suku Laut*.

Government plays important role in the social welfare of the communities related policy and development project. The study found that the government officials were

interviewed to gather information about the policy and development project related to climate change adaptation and the *Orang Suku Laut*. The result revealed that government as policymakers in all levels would take consideration for the TEKs regarding their autonomous adaptation of the IPs mainly who are living nomads in the sea. Additionally, Indonesian Climate Change Adaptation Action Plan or RAN-API is also contemplating the integration of the TEKs of the IPs into national action plans on climate change adaptation and policy framework. The RAN-API needs many shreds of evidence from research in developing a plan which acknowledges the TEKs and best practices of the IPs on climate change adaptation. The details of the information of respondents presents in Table 4.12.

**Table 4.12** Projects and policies of multilevel government for the Orang Suku Laut and climate change adaptation.

Level	Related Policy and Development Project
Local	<ul style="list-style-type: none"> <li>• Village Fund, fiscal policy to enhance and develop the rural economy based on the signature of Indonesian President, Joko Widodo to emphasize his priorities on marginalized and less developed regions</li> </ul>
Regency	<ul style="list-style-type: none"> <li>• Settlement, Unlivable House Program (RTLH), provides the new house for poor people with unlivable houses for communities</li> <li>• Family Hope Program (PKH), a top-down social program central government as an effort to accelerate poverty reduction through provides cash for poor people periodically</li> <li>• RAN-GRK, Indonesian National Action Plan to Reduce Greenhouse Gas Emissions, the policy guideline and action plan for climate change mitigation</li> <li>• Disaster Information</li> <li>• Wave Breaker and infrastructures</li> <li>• Climate Information</li> <li>• Provide seed for agriculture</li> <li>• Fisherman Insurance</li> </ul>
Province	---No direct action---

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National	<ul style="list-style-type: none"> <li>• Isolated and Vulnerable Community (KAT) program from Ministry of Social Affairs</li> <li>• National Action Plan for Climate Change Adaptation (RAN-API), a mainstream national guideline for climate change adaptation</li> <li>• Constitutional Adat Territory from Ministry of Marine and Fisheries Affairs, the acknowledgment of the IPs knowledge related to coastal and small island management</li> </ul>
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Regarding climate change adaptation, the KAT considers three bottom lines of sustainable livelihood concept which are social, economy and environment. However, in practice in the field, the local government drives that program for the infrastructural program. Presently, there is no specific program from the KAT to climate change adaptation. As a finding in this research, the KAT will consider the climate change adaptation for the IPs in the next agenda. The KAT stated that they need to collaborate with several departments and ministries to execute an action plan for climate change adaptation and the IPs.

Moreover, the RAN-API is a resource to develop the local strategy and action plan for climate change adaptation for local governments which endeavors to take attention for sectors and aspects of development. The RAN-API is a cross-cutting thematic plan that is definite in preparing a more climate change resilient development plan including climate proof and resilient development at the national level (Ministry of National Development Planning, 2013). Despite being impacted by climate change, the national development goals through the RAN-API can still be achieved as long as there are several types of resilience in the economic, social and environment. As mainstream action plan for climate change adaptation, the RAN-API targets, strategies and cluster of action plans are presented by five areas namely economic resilience (food security and energy security), livelihood resilience (health, settlement, and infrastructure), ecosystem resilience, special area resilience (urban area and small island area) and supporting system.



The study has investigated the policy about climate change and IPs based on the RAN-API guideline. There is a target in the special area resilience for small island area that could be dealt with the *Orang Suku Laut* which aims to attain resilience in the priority areas that are vulnerable to the impact of climate change. The closest sub-objectives of the action plan regarding the *Orang Suku Laut* is the capacity increasing of communities or community-based adaptation and integration of adaptation measures to climate change in the plan for managing coastal areas and small island areas. Unfortunately, this plan is too broad and not specific for the IPs or specifically for sea nomads like the *Orang Suku Laut*.

This research found the gap between plan and action of the RAN-API. The mainstream action plan of the RAN-API in the national level is not well communicated in the province, regency, local and grassroots level. All of the respondents of this research do not know about the RAN-API even the government officials in the province and regency level. Additionally, the respondents from the Environmental Department and the Regional Planning Department in the Lingga Regency were more familiar with Indonesian National Action Plan to Reduce Greenhouse Gas Emissions (RAN-GRK) than RAN-API.

The RAN-API stated that the limited relevant research about climate change adaptation and the IPs in Indonesia is an obstacle to provide an appropriate action plan. This problem is wisely mentioned in every action plan such as increased research and quality of the information in related issues to climate change adaptation. It is caused the weak background to come out with the policy about climate change adaptation and the IPs by the RAN-API. It is supported by previous research by Ariando (2018), the RAN-API has limited data to figure out the TEKs of the IPs, and they do not put the TEKs as a priority on climate change adaptation. The information from the respondents in this research found that the RAN-API is doing a consideration to put the TEKs in national climate change adaptation plan for Indonesia.

Furthermore, under the Indonesian Ministry of Maritime and Fisheries, there is a sub-directorate for disaster mitigation and climate change adaptation. Its task is for the preparation and implementation of policies, preparation of norms, standards, procedures, provision of technical guidance, supervision, and evaluation, and reporting in the field of disaster mitigation and climate change adaptation in the coastal area and small island estates. This department looks close with the *Orang Suku Laut* and the TEKs. However, they do not put the priority for the IPs yet. They prioritized the high-risk location along the coastal area and small island estates for climate change by providing the infrastructures.

The Indonesian Ministry of Maritime and Fisheries has another sub-directorate that works on the IPs or *Masyarakat Hukum Adat*, MHA in the coastal area and small island estate. This department has investigated indigenous knowledge from nine locations of the coastal IPs in Indonesia. They also declared the acknowledgment for those groups through local government negotiation. According to an informant from this department, the big challenge to figure out the local knowledge is the official acknowledgment as positive law to recognize the IPs and their rights. Prior to putting the IPs as part of the mainstream development plan, a positive law must be a driver.

Furthermore, the information from NGO, private sector, society and academic on climate change policy and development project disclosed that there is no climate change adaptation project for the *Orang Suku Laut* presently. The study found that relevant project to climate change adaptation and its impact was only a disaster relief conducted by the local NGO. Such project focused on rehabilitation after onwards natural disaster.

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Conclusions

The objective of this research is to study the traditional ecological knowledge (TEKs) of indigenous peoples (IPs) on climate change adaptation of the *Orang Suku Laut* (Sea Nomads), Lingga Regency, Riau Islands Province, Indonesia for appropriate climate change adaptation policy implemented at their communities. The communities of the *Orang Suku Laut* in the Lingga Regency were the study area. Data collection was obtained from the desk study as a secondary data, a field observation and an in-depth interview for a primary data by using a set of semi-structured questionnaires. This questionnaire consisted of four parts, namely general information of the respondent, climate change knowledge, the TEKs of the *Orang Suku Laut*, and policy and development project implemented for climate change adaptation in the *Orang Suku Laut* communities. The method used for selecting respondents for the in-depth interview was the purposive sampling, a non-probability form of sampling which aims to sample the cases or participants in a strategic way and relevant to the research questions that are being posed (Bryman, 2012). Data collected was analyzed using the statistical and descriptive and content analysis.

The respondents consisted of 77 including the native people of the *Orang Suku Laut*, governmental officers, non-governmental officers (NGOs), private sectors, academics and professional, and society. The interviewed *Orang Suku Laut* was headmen of the group, elders, women, and youth who are living in the land and staying in the boat. All of them well comprehended on climate change and its impacts. 97.12 percent of the respondents knew the meaning of climate change and 98.28 percent has realized that the current climate has changed. Their experiences on climate change varied on unpredictable weather of 96.15 percent, hotter temperature of 91.66 percent, sea level rising and coastal erosion of 91.02 percent, and extreme weather events of 89.74 percent. In terms of climate change impacts, the respondents mentioned the impacts on health, water, agriculture and fisheries production, energy, natural disasters

frequency, and livelihood. The headmen, women, and youth of the *Orang Suku Laut* fully agreed that the seasonal climate change impacts have already taken place on their livelihood. Their experiences on extreme weather events, storm surges, coastal erosion and sea level rise, and drought were lessons learnt to enhancing their resilience and reducing vulnerability of climate change impacts. The climate change adaptation of the *Orang Suku Laut* is derived from their TEKs. The study also found that climate change causes the decreased validity of the seasonal calendar of the *Orang Suku Laut* for fishing. The TEKs on weather forecasting sometime could not be relevant as a reference for the monsoonal season that impacted the significant losses for them.

The TEKs is adequate interconnected activities to combat climate change through friendly environmental practices. The TEKs of the *Orang Suku Laut* on climate change adaptation included cultural practices, cultural beliefs, and adaptive capacities at the percentage of 53.3, 33.3, and 13.4 respectively. The TEKs on cultural practices are weather forecasting, traditional fishing practice, traditional medicine, disaster preparedness, cultural astronomy, aquaculture, mangrove conservation, and coral reef conservation. Meanwhile, the cultural belief of the *Orang Suku Laut* consist of customary law (*Pantang Larang*), mantra and spell (*Pengasih* and *Ilmu*), blessing ceremony (*Zemah Kampung*), washing ceremony (*Melange Ceremony*), and multiple purposes materials (*Kajang*). For adaptive capacities, vernacular architecture and local migration are their TEKs.

A suitable climate change adaptation policy implemented for the *Orang Suku Laut* should considered the important roles of the TEKs. Indonesian Climate Change Adaptation Action Plan or RAN-API contemplates the integration of the TEKs of the IPs into national action plans on climate change adaptation and policy framework. The RAN-API needs many shreds of evidence from research in developing a plan which acknowledges the TEKs and best practices of the IPs on climate change adaptation. Regarding development project on climate change adaptation, the study found that there is no relevant project from respondents including the government and related stakeholders for the *Orang Suku Laut* in all levels.

## 5.2 Recommendations

The study would highly recommend the involvement of the *Orang Suku Laut* through the Free, Prior, and Informed Consent (FPIC) participation in the multilevel strategic plans on climate change adaptation in a clear direction. The FPIC as collective rights fundamentally entails the exercise of choices by the IPs, as rights-bearers and legal persons about their economic, social and cultural development (FAO, 2018). The FPIC cannot be enfeebled to consultation of individual constituents about their wishes, but instead must enable and guarantee of the IPs in their collective decision-making through legitimate customary and agreed processes in the community. While the TEKs, the IPs should be encouraged in the participation process for any project and policy implemented in their community and right. Regarding the study findings would be related.

Their TEKs and climate change in terms of water resources management, the *Orang Suku Laut* need the proper water resources in their location and nearest island. It will help them to face the long dry season and increase their quality of life and health. The integrated of technology and the TEKs is another recommendation to increase the adaptive capacity of the *Orang Suku Laut*. Such as early warning system for hydrometeorological hazards and natural disaster dissemination technology should be considered as combined technology for them. In addition, the relevant policies would support the livelihood of the *Orang Suku Laut* as proposed in Table 5.1.

The TEKs of the IPs should be incorporated in a national climate change adaptation policy. Therefore, further research would be strongly conducted on such issues.

**Table 5.1** Relevant policies to climate change adaptation of the Orang Suku Laut

Relevant Policy	Action Plans
1. Ethnic Identity and Culture	<p>1.1 Promote and support the <i>Orang Suku Laut</i> ethnic identity and culture as part of a culturally diverse national culture.</p> <p>1.2 Promote social recognition and understanding on living together in a situation of cultural diversity and pluralism by learning about the <i>Orang Suku Laut</i> cultural identity.</p> <p>1.3 Protect the local knowledge as part of cultural practice and belief.</p>
2. Resource Management	<p>2.1 Strengthen the regulation for Illegal, Unreported and Unregulated (IUU) fishing in the area of the <i>Orang Suku Laut</i>.</p> <p>2.2 Support the biodiversity of coral reef, flora, and fauna based on their Traditional Ecological Knowledge.</p> <p>2.3 Protect the area for mangrove conservation for the Livelihood of the <i>Orang Suku Laut</i>, Determination for productive forest area.</p> <p>2.4 Consider the area of the <i>Orang Suku Laut</i> as national park and marine protected area in order to conserve the biodiversity and the Traditional Ecological Knowledge, also preserve the tourism are that benefited the economic values.</p> <p>2.5 Conduct the Traditional Ecological Knowledge of the <i>Orang Suku Laut</i> as best practice in the climate change adaptation including cultural practices, cultural beliefs, and adaptive capacities.</p> <p>2.6 Review the regulation for using the private ownership on natural resources.</p> <p>2.7 Provide the infrastructure for proper well and sanitation</p> <p>2.8 Provide the renewable energy such as solar panel for each community</p>
3. Citizenship Rights	<p>3.1 The recognition of the <i>Orang Suku Laut</i> as sea nomad group including in the definition of</p>

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Indigenous Peoples of Indonesia (*Masyarakat Hukum Adat*) in accordance the Minister's Decree of Ministry of Home Affairs Indonesia Number 52 the Year (42) 2014 and Indonesian Act Number 1 the Year 2014.

3.2 Encourage the right of *Orang Suku Laut* in the development plans and policy through FPIC participation.

4. Transfer of Cultural Heritage
- 4.1 Support the establishment of community cultural centers by combining and harmonizing with the traditional lifestyle and ensures that these cultural centers are their real life.
- 4.2 Allocate budget to establish community cultural centers and the network of the *Orang Suku Laut*.
- 4.3 Raise the community awareness on their cultural heritage via television series, advertisement, workshop, and public seminar.
5. Education
- 5.1 Encourage the communities in involvement in educational program which is linked to their lifestyle, culture, and their right.
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## REFERENCES

- Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2012). Cultural Dimensions of Climate Change Impacts and Adaptation. *Nature Climate Change*, 3(2), 112-117. doi:10.1038/nclimate1666
- Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulmea, M. (2003). Adaptation to Climate Change in the Developing World. *Progress in Development Studies*, 3(3), 17. doi:10.1191/1464993403ps060oa
- Adger, W. N., & Vincent, K. (2005). Uncertainty in Adaptive Capacity. *Comptes Rendus Geoscience*, 337(4), 399-410. doi:10.1016/j.crte.2004.11.004
- Ajani, E. N., Mgbenka, R. N., & Okeke, M. N. (2013). Use of Indigenous Knowledge as A Strategy for Climate Change Adaptation among Farmers in sub-Saharan Africa- Implications for Policy. *Asian Journal of Agricultural Extension, Economics, and Sociology*, 2(1), 18. doi:10.9734/AJAEES/2013/1856
- Aldrian, E., & Dwi Susanto, R. (2003). Identification of Three Dominant Rainfall Regions within Indonesia and Their Relationship to Sea Surface Temperature. *International Journal of Climatology*, 23(12), 1435-1452. doi:10.1002/joc.950
- Alexander, C., Bynum, N., Johnson, E., King, U., Mustonen, T., Neofotis, P., . . . Weeks, B. (2011). Linking Indigenous and Scientific Knowledge of Climate Change. *BioScience*, 61(6), 477-484. doi:10.1525/bio.2011.61.6.10
- Anderbeck, K. (2012). The Malayic-speaking Orang Laut Dialects and Directions for Research. *Wacana*, 14(2), 265-312. doi:10.17510/wjhi.v14i2.64
- Andrew D., K., Geert Jan van, O., & David J., K. (2016). Climate Change and El-Nino Increase Likelihood of Indonesian Heat and Drought. *American Meteorological Society*, 97(12), 5. Retrieved from <https://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-16-0164.1>. doi:10.1175/BAMS-D-16-0164.1
- Antweiler, C. (1998). Local Knowledge and Local Knowing: An Anthropological Analysis of Contested "Cultural Products" in the Context of Development. *Anthropos*, 469-494. Retrieved from <https://www.jstor.org/stable/40464844>.
- Anyinam, C. (1995). Ecology and Ethnomedicine: Exploring Links Between Current Environmental Crisis and Indigenous Medical Practices. *Social Science and Medicine*, 40(3), 321-329. doi:10.1016/0277-9536(94)E0098-D
- Ariando, W. (2013). *Climate Variability and Tourism in Aia Manih Beach, Padang City, West Sumatera, Indonesia*. (Bachelor), Bogor Agricultural University, Bogor. Retrieved from <http://repository.ipb.ac.id/handle/123456789/64698> (64698)
- Ariando, W. (2018). *A Review of Climate Change Adaptation Policy for Indigenous Peoples In Indonesia*. Paper presented at the ASEAN/Asian Academic Society International Conference Proceeding Series, Chiang Rai, Thailand.
- Armitage, D., Berkes, F., Dale, A., Kocho-Schellenberg, E., & Patton, E. (2011). Co-management and the Co-production of Knowledge: Learning to Adapt in Canada's Arctic. *Global Environmental Change*, 21(3), 995-1004. doi:10.1016/j.gloenvcha.2011.04.006
- Arunotai, N. (2006). Moken Traditional Knowledge: An Unrecognised form of Natural Resources Management and Conservation. *International Social*



- Science Journal*, 58(187), 139-150. doi:10.1111/j.1468-2451.2006.00599.x
- Badjeck, M. C., Allison, E. H., Halls, A. S., & Dulvy, N. K. (2010). Impacts of Climate Variability and Change on Fishery-based Livelihoods. *Marine Policy*, 34(3), 375-383. doi:10.1016/j.marpol.2009.08.007
- Banholzer, S., Kossin, J., & Donner, S. (2014). The Impact of Climate Change on Natural Disasters. In *Reducing Disaster: Early Warning Systems For Climate Change* (pp. 21-49).
- Bardsley, D. K., & Wiseman, N. D. (2012). Climate Change Vulnerability and Social Development for Remote Indigenous Communities of South Australia. *Global Environmental Change*, 22(3), 713-723. doi:10.1016/j.gloenvcha.2012.04.003
- Becker, J., Johnston, D., Lazrus, H., Crawford, G., & Nelson, D. (2008). Use of Traditional Knowledge in Emergency Management for Tsunami Hazard. *Disaster Prevention and Management: An International Journal*, 17(4), 488-502. doi:10.1108/09653560810901737
- Beckford, C. (2017). Climate Change Resiliency in Caribbean SIDS: Building Greater Synergies Between Science and Local and Traditional Knowledge. *Journal of Environmental Studies and Sciences*, 8(1), 42-50. doi:10.1007/s13412-017-0440-y
- Belfer, E., Ford, J. D., & Maillet, M. (2017). Representation of Indigenous Peoples in Climate Change Reporting. *Climatic Change*, 145(1-2), 57-70. doi:10.1007/s10584-017-2076-z
- Berkes, F. (1993). *Traditional Ecological Knowledge: Concepts and Cases*. In J. T. Inglis (Ed.), *Traditional Ecological Knowledge in Perspective* (pp. 45). Retrieved from <http://library.umac.mo/ebooks/b10756577a.pdf>
- Berkes, F. (2010). Indigenous Ways of Knowing and the Study of Environmental Change. *Journal of the Royal Society of New Zealand*, 39(4), 151-156. doi:10.1080/03014220909510568
- Berkes, F. (2012). *Sacred Ecology* (3 ed., pp. 355).
- Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of Traditional Ecological Knowledge as Adaptive Management. *Ecological Applications*, 10(5), 1251-1262. doi:10.1890/1051-0761(2000)010[1251:ROTEKA]2.0.CO;2
- Berkes, F., & Jolly, D. (2001). Adapting to Climate Change- Social-Ecological Resilience in A Canadian Western Arctic Community. *Conservation Ecology*, 5(2), 15. Retrieved from <https://www.ecologyandsociety.org/vol5/iss2/art18/>. doi:10.5751/ES-00342-050218
- Bose, A. K., Bose, R., & Gupta, S. (2017). 'Kunche Jal' Fishing: A Low Cost Indigenous Fishery in Ganga River Basin. *International Journal of Fisheries and Aquatic Studies*, 5(4), 87-90. doi:10.13140/RG.2.2.27483.87845
- Brooks, N., & Adger, W. N. (2004). Assessing and Enhancing Adaptive Capacity. In *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures* (pp. 165-181).
- Bryman, A. (2012). *Social Research Methods* [Fourth](pp. 809).
- Burton, R. J. F., & Riley, M. (2018). Traditional Ecological Knowledge from the internet? The Case of Hay Meadows in Europe. *Land Use Policy*, 70, 334-346. doi:10.1016/j.landusepol.2017.10.014
- Carlson, J. B., Dearborn, D. S. P., & McCluskey, S. C. R., Clive L.N. (1999).

- Astronomy in Culture. *Archaeoastronomy*, 14(1), 3-21. Retrieved from [https://s3.amazonaws.com/academia.edu.documents/34348891/Carlson\\_et\\_al\\_1999\\_Astronomy\\_in\\_Culture\\_ARCH\\_XIV\\_1.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1553107470&Signature=2xM55vzAE63ZzsZYqxAxj7PgEIE%3D&response-content-disposition=inline%3B%20filename%3DAstronomy\\_in\\_Culture\\_ARCHAEO\\_ASTRONOMY\\_Th.pdf](https://s3.amazonaws.com/academia.edu.documents/34348891/Carlson_et_al_1999_Astronomy_in_Culture_ARCH_XIV_1.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1553107470&Signature=2xM55vzAE63ZzsZYqxAxj7PgEIE%3D&response-content-disposition=inline%3B%20filename%3DAstronomy_in_Culture_ARCHAEO_ASTRONOMY_Th.pdf).
- Carpenter, S. R., & Brock, W. A. (2008). Adaptive Capacity and Traps. *Ecology and Society*, 13(2), 16. Retrieved from <http://www.ecologyandsociety.org/vol13/iss2/art40/>. doi:10.3410/f.1161950.622391
- Chisanga, K., Mvula, B. A., & Habibu, T. (2017). The Role of Indigenous Knowledge in Climate Adaptation: Experiences with Farmer Perceptions from Climate Change Project in Sedumbwe Agricultural Camp of Southern Zambia. *International Journal of Scientific and Research Publications*, 7(9), 7.
- Chou, C. (1997). Contesting the Tenure of Territoriality: the Orang Suku Laut. *Bijdragen tot de Taal-, Land- en Volkenkunde*, 153(4), 605-629.
- Chou, C. (2003). *Indonesian Sea Nomads Money Magic and Fear of the Orang Suku Laut* [2](pp. 167).
- Chou, C. (2006). Research Trends on Southeast Asian Sea Nomads. 7. Retrieved from <https://kyotoreview.org/book-review/research-trends-on-southeast-asian-sea-nomads/>
- Chou, C. (2009). *The Orang Suku Laut of Riau, Indonesia: The Inalienable Gift of Territory*(pp. 192). doi:10.4324/9780203644232
- Chou, C. (2016). The Water World of the Orang Suku Laut in Southeast Asia. *TRaNS: Trans -Regional and -National Studies of Southeast Asia*, 4(02), 265-282. doi:10.1017/trn.2016.9
- Chow, J. (2018). Mangrove Management for Climate Change Adaptation and Sustainable Development in Coastal Zones. *Journal of Sustainable Forestry*, 37(2), 139-156. doi:10.1080/10549811.2017.1339615
- Cinner, J. E., McClanahan, T. R., Graham, N. A. J., Daw, T. M., Maina, J., Stead, S. M., . . . Bodin, Ö. (2012). Vulnerability of Coastal Communities to Key Impacts of Climate Change on Coral Reef Fisheries. *Global Environmental Change*, 22(1), 12-20. doi:10.1016/j.gloenvcha.2011.09.018
- Clifford, K. R., & Travis, W. R. (2018). Knowing Climate as A Social-Ecological-Atmospheric Construct. *Global Environmental Change*, 49, 1-9. doi:10.1016/j.gloenvcha.2017.12.007
- Codjoe, S. N. A., Owusu, G., & Burkett, V. (2013). Perception, Experience, and Indigenous Knowledge of Climate Change and Variability: the Case of Accra, A Sub-Saharan African City. *Regional Environmental Change*, 14(1), 369-383. doi:10.1007/s10113-013-0500-0
- Crane, T. A., Roncoli, C., & Hoogenboom, G. (2011). Adaptation to Climate Change and Climate Variability: the Importance of Understanding Agriculture as Performance. *NJAS - Wageningen Journal of Life Sciences*, 57(3-4), 179-185. doi:10.1016/j.njas.2010.11.002
- Departement of Social and Economic Affairs United Nations. (2018). Protecting the

- Rights and Well-being of Indigenous Peoples. Retrieved from <https://www.un.org/development/desa/undesavoiced/feature/2018/04#39109>
- Department of Economic and Social Affairs United Nations. (2015). Indigenous Peoples. Retrieved from <https://sustainabledevelopment.un.org/majorgroups/indigenouspeoples>
- Diana, J. S. (2009). Aquaculture Production and Biodiversity Conservation. *BioScience*, 59(1), 27-38. doi:10.1525/bio.2009.59.1.7
- Dinse, K. (2011). Climate Variability and Climate Change What is the difference? , 2. Retrieved from [https://eos.ucsb.edu/EOS\\_Linked\\_Documents/michu/michug11017.pdf](https://eos.ucsb.edu/EOS_Linked_Documents/michu/michug11017.pdf)
- Division for Social Policy and Development Indigenous People United Nations. (2017). Indigenous Peoples and the 2030 Agenda. Retrieved from <https://www.un.org/development/desa/indigenouspeoples/focus-areas/post-2015-agenda/the-sustainable-development-goals-sdgs-and-indigenous.html>
- Division for Social Policy and Development Indigenous People United Nations. (2018). Indigenous Peoples at the United Nations. Retrieved from <https://www.un.org/development/desa/indigenouspeoples/about-us.html>
- Dolan, A. H., & Walker, I. J. (2006). Understanding Vulnerability of Coastal Communities to Climate Change Related Risks. *Journal of Coastal Research*, 3(39), 1316-1323. Retrieved from <https://www.jstor.org/stable/25742967>.
- Drew, J. A. (2005). Use of Traditional Ecological Knowledge in Marine Conservation. *Conservation Biology*, 19(4), 1286-1293. doi:10.1111/j.1523-1739.2005.00158.x
- Dudu, H., & Çakmak, E. H. (2017). Climate Change and Agriculture: An Integrated Approach to Evaluate Economy-wide Effects for Turkey. *Climate and Development*, 1-14. doi:10.1080/17565529.2017.1372259
- Egeru, A. (2012). Role of Indigenous Knowledge in Climate Change Adaptation: A Case Study of the Teso Sub-Region Eastern Uganda. *Indian Journal of Traditional Knowledge*, 11(2), 8. Retrieved from <http://nopr.niscair.res.in/bitstream/123456789/13849/1/IJTK%2011%282%29%20217-224.pdf>.
- Eleonor, B.-S., Joan, C., Raymond, d. C., Christian, E., & Helen, T. (2010). *What is REDD? A Guide for Indigenous Communities* [2nd Edition](pp. 120). Retrieved from <http://www.tebtebba.org/index.php/all-resources/category/84-redd-and-ad-and-indigenous-peoples?download=413:red-d-a-guide-for-indigenous-peoples>
- Epule, T. E., Ford, J. D., Lwasa, S., & Lepage, L. (2017). Climate Change Adaptation in the Sahel. *Environmental Science and Policy*, 75, 121-137. doi:10.1016/j.envsci.2017.05.018
- Faisal, G. (2018). The Transformation of Settlement in Vernacular Duano Tribes, Eastern Coastal Line of Sumatera. [Transformasi Hunian Vernakular Suku Duanu, Pesisir Timur Sumatera ]. *Jurnal BAPPEDA*, 4(1), 43-50.
- FAO. (2018). Food Agricultural Organization - Indigenous People: Free, Prior and Informed Consent (FPIC). Retrieved from <http://www.fao.org/indigenous-peoples/our-pillars/fpic/en/>
- Fernandez-Llamazares, A., Mendez-Lopez, M. E., Diaz-Reviriego, I., McBride, M.

- F., Pyhala, A., Rosell-Mele, A., & Reyes-Garcia, V. (2015). Links Between Media Communication and Local Perceptions of Climate Change in an Indigenous Society. *Climate Change*, *131*(2), 307-320. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/26166919>. doi:10.1007/s10584-015-1381-7
- Ford, J. D., Cameron, L., Rubis, J., Maillet, M., Nakashima, D., Willox, A. C., & Pearce, T. (2016). Including Indigenous Knowledge and Experience in IPCC Assessment Reports. *Nature Climate Change*, *6*(4), 349-353. doi:10.1038/nclimate2954
- Ford, J. D., Maillet, M., Pouliot, V., Meredith, T., & Cavanaugh, A. (2016). Adaptation and Indigenous peoples in the United Nations Framework Convention on Climate Change. *Climatic Change*, *139*(3-4), 429-443. doi:10.1007/s10584-016-1820-0
- Ford, J. D., Stephenson, E., Cunsolo Willox, A., Edge, V., Farahbakhsh, K., Furgal, C., . . . Sherman, M. (2016). Community-based Adaptation Research in the Canadian Arctic. *Wiley Interdisciplinary Reviews: Climate Change*, *7*(2), 175-191. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/27668014>. doi:10.1002/wcc.376
- Ford, J. D., Vanderbilt, W., & Berrang-Ford, L. (2012). Authorship in IPCC AR5 and Its Implications for Content: Climate Change and Indigenous Populations in WGII. *Climate Change*, *113*(2), 201-213. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/26005230>. doi:10.1007/s10584-011-0350-z
- Frankic, A., & Hershner, C. (2003). Sustainable Aquaculture: Developing the Promise of Aquaculture. *Aquaculture International*, *11*(6), 517-530. doi:10.1023/B:AQUI.0000013264.38692.91
- Gadgil, M., Berkes, F., & Folke, C. (1993). Indigenous Knowledge for Biodiversity Conservation. *Ambio*, *22*(2/3), 151-156. Retrieved from <https://www.jstor.org/stable/pdf/4314060.pdf?refreqid=excelsior%3Aa9d6305fb6e14df978d6525ccfda1c23>.
- Galina, & Roberto. (2012). Indigenous Peoples Major Group Policy Brief on Sustainable Development Goals And Post-2015 Development Agenda: A Working Draft. Retrieved from <https://sustainabledevelopment.un.org/content/documents/6797IPMG%20Policy%20Brief%20Working%20Draft%202015.pdf>
- Galvin, K. A., Thornton, P. K., Boone, R. B., & Sunderland, J. (2004). Climate Variability and Impacts on East African Livestock Herders: the Maasai of Ngorongoro Conservation Area, Tanzania. *African Journal of Range and Forage Science*, *21*(3), 183-189. doi:10.2989/10220110409485850
- Gaspare, L., Bryceson, I., & Kulindwa, K. (2015). Complementarity of Fishers' Traditional Ecological Knowledge and Conventional Science: Contributions to the Management of Groupers (Epinephelinae) Fisheries around Mafia Island, Tanzania. *Ocean and Coastal Management*, *114*, 88-101. doi:10.1016/j.ocecoaman.2015.06.011
- Gautam, Y. (2017). Seasonal Migration and Livelihood Resilience in the Face of Climate Change in Nepal. *Mountain Research and Development*, *37*(4), 436-445. doi:10.1659/mrd-journal-d-17-00035.1



- Glenn, S. S. (1989). Verbal Behavior and Cultural Practices. *Behavior Analysis and Social Action*, 7(1-2), 10-15. doi:10.1007/BF03406102
- Gómez-Baggethun, E., Corbera, E., & Reyes-García, V. (2013). Traditional Ecological Knowledge and Global Environmental Change: Research findings and Policy Implications. *Ecology and Society*, 18(4), 1-8. doi:10.5751/es-06288-180472
- Gottlieb, R. S. (2004). *This Sacred Earth: Religion, Nature, Environment*. In R. S. Gottlieb. (Ed.), *Introduction: Religion in An Age of Environmental Crisis* (2nd ed.).
- Government of Indonesia. (2018a). *Coral Reef Rehabilitation and Management Program-Coral Triangle Initiative*. Retrieved from Indonesia: [http://oceanografi.lipi.go.id/haspen/DRAFT%20COREMAP%20CTI%20ESSF\\_ICCTF-LIPI.pdf](http://oceanografi.lipi.go.id/haspen/DRAFT%20COREMAP%20CTI%20ESSF_ICCTF-LIPI.pdf)
- Government of Indonesia. (2018b). *The Indonesian Act No.79 the Year 2017 about The Action Plan of Government for Year 2018*. Jakarta: Ministry of State Secretary Retrieved from <https://www.bappenas.go.id/files/rkp/LAMPIRAN%20PERPRES%20RKP%20TAHUN%202018.pdf>
- Granderson, A. A. (2014). Making Sense of Climate Change Risks and Responses at the Community Level: A Cultural-political Lens. *Climate Risk Management*, 3, 55-64. doi:10.1016/j.crm.2014.05.003
- Green, D., & Raygorodetsky, G. (2010). Indigenous Knowledge of A Changing Climate. *Climatic Change*, 100(2), 239-242. doi:10.1007/s10584-010-9804-y
- Hans, V. S., & Antonio, N. (1999). *Analysis of Climate Variablity* [second]. In H. v. Storch & A. Navarra (Eds.), *Applications of Statistical Techniques* (pp. 346). doi:10.1007/978-3-662-03744-7 (Springer-Verlag Berlin Heidelberg New York).
- Hasselmann, K. (1976). Stochastic Climate Models Part 1 Theory. *Tellus*, 28(6), 473-485. doi:10.3402/tellusa.v28i6.11316
- Hendon, H. H., & Salby, M. L. (1994). The Life Cycle of the Madden-Julian Oscillation. *American Meteorological Society*, 51(15), 13. Retrieved from <https://journals.ametsoc.org/doi/pdf/10.1175/1520-0469%281994%29051%3C2225%3ATLCOTM%3E2.0.CO%3B2>. doi:10.1175/1520-0469(1994)051<2225:TLCOTM>2.0.CO;2
- Herawati, T. N. (2017). *Indigenous Peoples Planning Framework*. Retrieved from <http://documents.worldbank.org/curated/en/551271482216295666/Indigenous-peoples-planning-framework>
- Hidayah, Z. (2015). *The Encyclopedia of Ethnic Groups in Indonesia* (II ed.). Jakarta: Yayasan Pustaka Obor Indonesia
- Hiwasaki, L., Luna, E., Syamsidik, & Marçal, J. A. (2014). Local and Indigenous Knowledge on Climate-related Hazards of Coastal and Small Island Communities in Southeast Asia. *Climatic Change*, 128(1-2), 35-56. doi:10.1007/s10584-014-1288-8
- Hiwasaki, L., Luna, E., Syamsidik, & Shaw, R. (2014). Process for Integrating Local and Indigenous Knowledge with Science for Hydro-meteorological Disaster Risk Reduction and Climate Change Adaptation in Coastal and Small Island

- Communities. *International Journal of Disaster Risk Reduction*, 10, 15-27. doi:10.1016/j.ijdr.2014.07.007
- Hong, S.-K., Won, Y.-T., Lee, G.-A., Han, E.-S., Cho, M.-R., Park, H.-Y., . . . Chisholm Hatfield, S. (2018). Interdisciplinary Convergence Research Design on Island Biocultural Diversity - Case Study in Wando-gun (County) Island Region, South Korea. *Journal of Marine and Island Cultures*, 7(1). doi:10.21463/jmic.2018.07.1.02
- Hristov, J. (2009). Social Class and Ethnicity/Race in the Dynamics of Indigenous Peasant Movements. *Latin American Perspectives*, 36(4), 41-63. doi:10.1177/0094582x09338595
- Hulme, M. (2015). Climate and Its Changes: A Cultural Appraisal. *Geo: Geography and Environment*, 2(1), 1-11. doi:10.1002/geo2.5
- Huntington, H., Callaghan, T., Fox, S., & Krupnik, I. (2004). Matching Traditional and Scientific Observations to Detect Environmental Change: A Discussion on Arctic Terrestrial Ecosystems. *Ambio*(13), 18-23. Retrieved from <http://www.jstor.org/stable/25094583>.
- Huntington, H. P. (2000). Using Traditional Ecological Knowledge in Science Methods and Applications. *Ecological Applications*, 10(5), 5. doi:10.1890/1051-0761(2000)010[1270:UTEKIS]2.0.CO;2
- ILO. (2017). *Indigenous Peoples and Climate Change from Victims to Change Agents through Decent Work* [1](pp. 56). Retrieved from [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---gender/documents/publication/wcms\\_551189.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---gender/documents/publication/wcms_551189.pdf)
- Inamara, A., & Thomas, V. (2017). Pacific Climate Change Adaptation: The Use of Participatory Media to Promote Indigenous Knowledge. *Pacific Journalism Review*, 23(1), 20. doi:10.24135/pjr.v23i1.210
- Institut Dayakologi, & Aliansi Masyarakat Adat Nusantara. (2011). The Dayak Jalai Peoples and Their Concept of Dahas In Ketapang District, West Kalimantan, Indonesia: A Case Study In F. Lakon, P. Unjing, V. Andi, E. Ngiuk, & S. Alloy (Eds.), *Climate change, Indigenous Peoples and REDD+*. (pp. 69). Indonesia.
- International Work Group for Indigenous Affairs, I. (2017). *The Indigenous World 2017*. In K. B. J. Hansen, Käthe; Jacquelin, Pamela Leiva (Ed.), *International Work Group for Indigenous Affairs* (pp. 652). Retrieved from <https://www.iwgia.org/images/documents/indigenous-world/indigenous-world-2017.pdf>
- IPCC, I. P. o. C. C. (2007). *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* In R. K. Pachauri & A. Reisinger (Eds.), (pp. 104).
- IPCC, I. P. o. C. C. (2014). *Summary for Policy Makers, In: Climate Change 2014: Impact, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. In C. B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, & a. L. L. W. e. P.R. Mastrandrea (Eds.), (pp. 1-32).

- Isaac, G., Finn, S., Joe, J. R., Hoover, E., Gone, J. P., Lefthand-Begay, C., & Hill, S. (2018). Native American Perspectives on Health and Traditional Ecological Knowledge. *Environmental Health Perspectives*, 126(12), 125002. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/30675814>. doi:10.1289/EHP1944
- Joa, B., Winkel, G., & Primmer, E. (2018). The Unknown Known: A Review of Local Ecological Knowledge in Relation to Forest Biodiversity Conservation. *Land Use Policy*, 79, 520-530. doi:10.1016/j.landusepol.2018.09.001
- Jones, L., Ludi, E., & Simon, L. (2010). Towards A Characterisation of Adaptive Capacity: A Framework for Analysing Adaptive Capacity at the Local Level. *Overseas Development Institute*. Retrieved from <https://oxfamlibrary.openrepository.com/bitstream/handle/10546/595168/bn-local-adaptive-capacity-011210.en.pdf?sequence=1>.
- Kala, C. P. (2017). Conservation of Nature and Natural Resources through Spirituality. *Applied Ecology and Environmental Sciences*, 5(2), 24-34. doi:10.12691/aees-5-2-1
- Keraf, S. (2010). *Environmental Ethics*. Jakarta: Kompas Media Nusantara.
- Kim, H.-E. (2011). Changing Climate, Changing Culture: Adding the Climate Change Dimension to the Protection of Intangible Cultural Heritage. *International Journal of Cultural Property*, 18(03), 259-290. doi:10.1017/s094073911100021x
- Lang, C. (2009). Indonesia: Sinar Resmi Declaration on Climate Change and REDD. Retrieved from <http://www.redd-monitor.org/2009/08/31/indonesia-sinar-resmi-declaration-on-climate-change-and-redd/>
- Larkin, N. K., & Harrison, D. E. (2002). ENSO Warm (El Niño) and Cold (La Niña) Event Life Cycles: Ocean Surface Anomaly Patterns, Their Symmetries, Asymmetries, and Implications. *Journal of Climate*, 15, 1118–1140. Retrieved from <https://journals.ametsoc.org/doi/pdf/10.1175/1520-0442%282002%29015%3C1118%3AEWENOA%3E2.0.CO%3B2>. doi:10.1175/1520-0442(2002)015<1118:EWENOA>2.0.CO;2
- Lauer, M., & Aswani, S. (2010). Indigenous Knowledge and Long-Term Ecological change: Detection, Interpretation, and Responses to Changing Ecological Conditions in Pacific Island Communities. *Environmental Management*, 45(5), 985-997. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/20336296>. doi:10.1007/s00267-010-9471-9
- Lebel, L. (2012). Local Knowledge and Adaptation to Climate Change in Natural Resource-based Societies of the Asia-Pacific. *Mitigation and Adaptation Strategies for Global Change*, 18(7), 1057-1076. doi:10.1007/s11027-012-9407-1
- Lefale, P. F. (2009). Ua 'afa le Aso Stormy Weather Today: Traditional Ecological Knowledge of Weather and Climate. The Samoa Experience. *Climatic Change*, 100(2), 317-335. doi:10.1007/s10584-009-9722-z
- Lejano, R. P., Tavares-Reager, J., & Berkes, F. (2013). Climate and Narrative: Environmental Knowledge in Everyday Life. *Environmental Science and Policy*, 31, 61-70. doi:10.1016/j.envsci.2013.02.009
- Lenhart, L. (1997). Orang Suku Laut Ethnicity and Acculturation. *Bijdragen tot de*

- Taal-, Land- en Volkenkunde*, 153(4), 577-604. doi:10.1163/22134379-90003916
- Levy, B. S., & Patz, J. A. (2015). Climate Change, Human Rights, and Social Justice. *Annals of Global Health*, 81(3), 310-322. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/26615065>. doi:10.1016/j.aogh.2015.08.008
- Lugo-Morin, D. R., Garcia-Sanchez, E., & Cruz-Vazquez, R. I. (2019). Beliefs, Values, and Traditions: Re-thinking Sustainable Development Using the Hñähñu Example. *Development in Practice*, 29(1), 95-102. doi:10.1080/09614524.2018.1516197
- Macchi, M., Gurung, A. M., & Hoermann, B. (2014). Community Perceptions and Responses to Climate Variability and Change in the Himalayas. *Climate and Development*, 7(5), 414-425. doi:10.1080/17565529.2014.966046
- Makondo, C. C., & Thomas, D. S. G. (2018). Climate Change Adaptation: Linking Indigenous Knowledge with Western Science for Effective Adaptation. *Environmental Science and Policy*, 88, 83-91. doi:10.1016/j.envsci.2018.06.014
- Mathooko, J. M. (2005). Application of Traditional Ecological Knowledge in the Management and Sustainability of Fisheries in East Africa- A Long-neglected Strategy? *Hydrobiologia*, 537(1-3), 1-6. doi:10.1007/s10750-004-2788-8
- McClanahan, T. R., Cinner, J. E., Maina, J., Graham, N. A. J., Daw, T. M., Stead, S. M., . . . Polunin, N. V. C. (2008). Conservation Action in A Changing Climate. *Conservation Letters*, 1(1), 53-59. doi:10.1111/j.1755-263X.2008.00008.x
- Meteorology Climatology and Geophysical Agency. (2019). Weather Analysis and Climate in Januari 2019. *Buletin Meteorologi*, 062, 25. Retrieved from <http://hangnadim.kepri.bmkg.go.id/buletin.html>
- Ministry of Environment and Forestry Indonesia. (2018). *Third National Communication of Indonesia Year 2017 Under UNFCCC* [1]. In N. Masripatin (Ed.), (3 ed., Vol. 3, pp. 270). Retrieved from [https://unfccc.int/sites/default/files/resource/8360571\\_Indonesia-NC3-2-Third%20National%20Communication%20-%20Indonesia%20-%20editorial%20refinement%2013022018.pdf](https://unfccc.int/sites/default/files/resource/8360571_Indonesia-NC3-2-Third%20National%20Communication%20-%20Indonesia%20-%20editorial%20refinement%2013022018.pdf)
- Ministry of Home Affairs of Indonesia Act No.52 the Year 2014 about the Recognition of Masyarakat Hukum Adat § 1 (2014).
- Ministry of National Development Planning. (2013). *National Action Plan For Climate Change Adaptation (RAN-API) Synthesis Report*(pp. 35). Retrieved from [https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/programme-info/RAN-API\\_Synthesis\\_Report\\_2013.pdf](https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/programme-info/RAN-API_Synthesis_Report_2013.pdf)
- Ministry of National Development Planning. (2014). *National Action Plan For Climate Change Adaptation (RAN-API)*(pp. 204). Retrieved from <http://sekretariat-ranapi.org/storage/app/media/RAN-API.pdf>
- Ministry of National Development Planning. (2017). *Indonesia's SDGs Voluntary National Review*. New York: National Development Planning Agency of The Republic of Indonesia Retrieved from <https://sustainabledevelopment.un.org/content/documents/25469INDONESIA>



[VNR PPT.pdf](#)

- Ministry of Social Affairs. (2018). Isolated and Vulnerable Community (KAT). Retrieved from <https://www.kemosos.go.id/content/kat>
- Mirza, M. (2003). Climate Change and Extreme Weather Events: Can Developing Countries Adapt? *Climate Policy*, 3(3), 233-248. doi:10.1016/s1469-3062(03)00052-4
- Motealleh, P., Zolfaghari, M., & Parsaee, M. (2018). Investigating Climate Responsive Solutions in Vernacular Architecture of Bushehr City. *HBRC Journal*, 14(2), 215-223. doi:10.1016/j.hbrj.2016.08.001
- Nakashima, D. J., Galloway McLean, K., Thulstrup, H. D., Ramos Castalino, A., & Rubis, J. T. (2012). *Weathering Uncertainty: Traditional Knowledge for Climate Change Assessment and Adaptation*. In D. McDonald (Ed.), (pp. 122).
- Nakata, M., Hamacher, D., Warren, J., Byrne, A., Pagnucco, M., Harley, R., . . . Bolt, R. (2014). Using Modern Technologies to Capture and Share Indigenous Astronomical Knowledge. *Australian Academic & Research Libraries*, 45(2), 101-110. doi:10.1080/00048623.2014.917786
- Nay, J. J., Abkowitz, M., Chu, E., Gallagher, D., & Wright, H. (2014). A Review of Decision-support Models for Adaptation to Climate Change in the Context of Development. *Climate and Development*, 6(4), 357-367. doi:10.1080/17565529.2014.912196
- Negi, V. S., Maikhuri, R. K., Pharswan, D., Thakur, S., & Dhyani, P. P. (2017). Climate Change Impact in the Western Himalaya: People's Perception and Adaptive Strategies. *Journal of Mountain Science*, 14(2), 403-416. doi:10.1007/s11629-015-3814-1
- Nelson, V., Meadows, K., Cannon, T., Morton, J., & Martin, A. (2010). Uncertain Predictions, Invisible Impacts, and the Need to Mainstream Gender in Climate Change Adaptations. *Gender and Development*, 10(2), 51-59. doi:10.1080/13552070215911
- Nizami, A., & Ali, J. (2017). Climate Change and Women's Place-based Vulnerabilities: A Case Study from Pakistani Highlands. *Climate and Development*, 9(7), 662-670. doi:10.1080/17565529.2017.1318742
- Nkomwa, E. C., Joshua, M. K., Ngongondo, C., Monjerezi, M., & Chipungu, F. (2014). Assessing Indigenous Knowledge Systems and Climate Change Adaptation Strategies in Agriculture: A Case Study of Chagaka Village, Chikhwawa, Southern Malawi. *Physics and Chemistry of the Earth, Parts A/B/C*, 67-69, 164-172. doi:10.1016/j.pce.2013.10.002
- Nugroho, H. Y. S. H., Van der Veen, A., Skidmore, A. K., & Hussin, Y. A. (2017). Expansion of Traditional Land-use and Deforestation: A Case Study of An Adat Forest in the Kandilo Subwatershed, East Kalimantan, Indonesia. *Journal of Forestry Research*, 29(2), 495-513. doi:10.1007/s11676-017-0449-9
- Nyong, A., Adesina, F., & Osman Elasha, B. (2007). The Value of Indigenous Knowledge in Climate Change Mitigation and Adaptation Strategies in the African Sahel. *Mitigation and Adaptation Strategies for Global Change*, 12(5), 787-797. doi:10.1007/s11027-007-9099-0
- Opare, S. (2016). Adaptation to Climate Change Impacts: Coping Strategies of An

- Indigenous Community in Ghana to Declining Water Supply. *Climate and Development*, 10(1), 73-83. doi:10.1080/17565529.2016.1184610
- Ozay, N. (2005). A Comparative Study of Climatically Responsive House Design at Various Periods of Northern Cyprus Architecture. *Building and Environment*, 40(6), 841-852. doi:10.1016/j.buildenv.2004.08.024
- Palframan, A. (2014). "In Common Nature": An Ethnography of Climate Adaptation in the Lesotho Highlands. *Local Environment*, 20(12), 1531-1546. doi:10.1080/13549839.2014.911268
- Pandey, R., Kumar, P., Archie, K. M., Gupta, A. K., Joshi, P. K., Valente, D., & Petrosillo, I. (2018). Climate Change Adaptation in the Western-Himalayas: Household Level Perspectives on Impacts and Barriers. *Ecological Indicators*, 84, 27-37. doi:10.1016/j.ecolind.2017.08.021
- Petheram, L., Zander, K. K., Campbell, B. M., High, C., & Stacey, N. (2010). 'Strange Changes': Indigenous Perspectives of Climate Change and Adaptation in NE Arnhem Land (Australia). *Global Environmental Change*, 20(4), 681-692. doi:10.1016/j.gloenvcha.2010.05.002
- Prasad, L., Jalaj, R., Pandey, S., & Kumar, A. (2013). Few Indigenous Traditional Fishing Method of Faizabad District of Eastern Uttar Pradesh, India. *Indian Journal of Traditional Knowledge*, 12(1), 116-122. Retrieved from <https://pdfs.semanticscholar.org/f6cc/0e360430045ef29b6738a2659c2b351ca8fc.pdf>.
- Raju, C. S., Rao, J. C. S., Rao, K. G., & Simhachalam, G. (2016). Fishing Methods, Use of Indigenous Knowledge, and Traditional Practices in Fisheries Management of Lake Kolleru. *Journal of Entomology and Zoology Studies*, 4(5), 37-44. doi:10.5829/idosi.wjz.2016.173.182
- REDD. (2005). National Long-Term Development Plan 2005-2025 (Indonesia). Retrieved from <https://theredddesk.org/countries/plans/national-long-term-development-plan-2005-2025-indonesia>
- Reedy, D., Savo, V., & McClatchey, W. (2013). Traditional Climatic Knowledge: Orchardists' Perceptions of and Adaptation to Climate Change in the Campania Region (Southern Italy). *Plant Biosystems - An International Journal Dealing with all Aspects of Plant Biology*, 148(4), 699-712. doi:10.1080/11263504.2013.793753
- Reid, A., Alam, M., Berger, R., Cannon, T., Huq, S., & Milligan, A. (2009). Community Based Adaptation to Climate Change: An Overview. In *Participatory Learning and Action Focuses on Community-based Adaptation to Climate Change (CBA)* (pp. 23). Retrieved from <http://pubs.iied.org/pdfs/G02608.pdf>
- Richard W., K., & Barbara G., B. (1992). Extreme Events in A Changing Climate: Variability Is More Important than Averages. *Climatic Change*, 21(3), 289-302. doi:10.1007/BF00139728
- Runhaar, H. A. C., Uittenbroek, C. J., Van Rijswick, H. F. M. W., Mees, H. L. P., Driessen, P. P. J., & Gilissen, H. K. (2015). Prepared for Climate Change? A Method for the Ex-ante Assessment of Formal Responsibilities for Climate Adaptation in Specific Sectors. *Regional Environmental Change*, 16(5), 1389-1400. doi:10.1007/s10113-015-0866-2
- Salick, J., & Ross, N. (2009). Traditional Peoples and Climate Change. *Global*

- Environmental Change*, 19(2), 137-139. doi:10.1016/j.gloenvcha.2009.01.004
- Sánchez-Cortés, M. S., & Chavero, E. L. (2010). Indigenous Perception of Changes in Climate Variability and Its Relationship with Agriculture in A Zoque Community of Chiapas, Mexico. *Climatic Change*, 107(3-4), 363-389. doi:10.1007/s10584-010-9972-9
- Sanders, D. E. (1999). Indigenous Peoples Issues of Definition Copy. *International Journal of Cultural Property*, 8(1), 9. doi:doi.org/10.1017/S0940739199770591
- Sapkota, A., Sapkota, A. R., Kucharski, M., Burke, J., McKenzie, S., Walker, P., & Lawrence, R. (2008). Aquaculture Practices and Potential Human Health Risks: Current Knowledge and Future Priorities. *Environment International*, 34(8), 1215-1226. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/18565584>. doi:10.1016/j.envint.2008.04.009
- Sather, C. (2006). Sea Nomads and Rainforest Hunter-Gatherers: Foraging Adaptations in the Indo-Malaysian Archipelago In P. Bellwood, J. J. Fox, & D. Tryon (Eds.), *The Austronesians: Historical and Comparative Perspectives* (pp. 245-276). Canberra: Australian National University E-Press.
- Schott, F. A., & McCreary Jr, J. P. (2001). The Monsoon Circulation of the Indian Ocean. *Progress in Oceanography*, 51, 1-123. Retrieved from [https://ac.els-cdn.com/S0079661101000830/1-s2.0-S0079661101000830-main.pdf?\\_tid=6cce7cdf-773e-4eb2-b67d-4a6940403a15&acdnat=1552769056\\_b5ba6d276bcfba51606bfa6ef8cbd872](https://ac.els-cdn.com/S0079661101000830/1-s2.0-S0079661101000830-main.pdf?_tid=6cce7cdf-773e-4eb2-b67d-4a6940403a15&acdnat=1552769056_b5ba6d276bcfba51606bfa6ef8cbd872).
- Schreiner, C., Henriksen, E. K., & Kirkeby Hansen, P. J. (2005). Climate Education: Empowering Today's Youth to Meet Tomorrow's Challenges. *Studies in Science Education*, 41(1), 3-49. doi:10.1080/03057260508560213
- Schroeder, H. (2010). Agency in International Climate Negotiations: the Case of Indigenous Peoples and Avoided Deforestation. *International Environmental Agreements: Politics, Law and Economics*, 10(4), 317-332. doi:10.1007/s10784-010-9138-2
- Shoko, K., & Shoko, N. (2013). Indigenous Weather Forecasting Systems: A Case Study of the Abiotic Weather Forecasting Indicators for Wards 12 and 13 in Mberengwa District Zimbabwe. *Asian Social Science*, 9(5). doi:10.5539/ass.v9n5p285
- Sinha, M. K. (2015). Another Impact of Land Use Change. Retrieved from <http://www.waterandmegacities.org/another-impact-of-land-use-change/>
- Sorensen, C. J., Borbor-Cordova, M. J., Calvellido-Hynes, E., Diaz, A., Lemery, J., & Stewart-Ibarra, A. M. (2017). Climate Variability, Vulnerability, and Natural Disasters: A Case Study of Zika Virus in Manabi, Ecuador Following the 2016 Earthquake. *GeoHealth*, 1(8), 298-304. doi:10.1002/2017gh000104
- Stacey, N., Steenbergen, D. J., Clifton, J., & Acciaioli, G. (2018). Understanding Social Wellbeing and Values of Small-Scale Fisheries amongst the Sama-Bajau of Archipelagic Southeast Asia. In *Social Wellbeing and the Values of Small-scale Fisheries* (pp. 97-123).
- Statistics Indonesia. (2018). *Statistical Data of Lingga regency* [1101002.2104](pp. 44). Retrieved from <https://linggakab.bps.go.id/publication/2018/10/18/d199fa8d6f1d32ea5881046>

- <4/statistik-daerah-kabupaten-lingga-2018.html>
- Statistics Indonesia, B. (2017). *Statistical Data of Senayang Year 2017* [1102001.2104050]. In B. P. S. K. Lingga (Ed.), (Vol. 1, pp. 125). (21040.1706).
- Tanner-McAllister, S. L., Rhodes, J., & Hockings, M. (2017). Managing for Climate Change on Protected Areas: An Adaptive Management Decision Making Framework. *Journal of Environmental Management*, 204(Pt 1), 510-518. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/28934674>. doi:10.1016/j.jenvman.2017.09.038
- Tauli-Corpuz, V., Enkiwe-Abayao, L., Magata, H., & Tugendhat, H. (2009). Asia Summit on Climate Change and Indigenous Peoples [Press release]. Retrieved from <http://www.tebtebba.org/index.php/all-resources/category/57-asia-summit-on-indigenous-peoples-and-climate-change?download=197:asia-summit-programme>
- The Indigenous Peoples' Alliance of the Archipelago, A. (2018). Aliansi Masyarakat Adat Nusantara. Retrieved from <http://www.aman.or.id/>
- Thornton, P. K., Ericksen, P. J., Herrero, M., & Challinor, A. J. (2014). Climate Variability and Vulnerability to Climate Change: A Review. *Global Change Biology*, 20(11), 3313-3328. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/24668802>. doi:10.1111/gcb.12581
- Tol, R. S. (2009). The Economic Effects of Climate Change. *Journal of Economic Perspectives*, 23(2), 29-51. doi:10.1257/jep.23.2.29
- Trenberth, Kevin, & National Center for Atmospheric Research Staff (Eds). (2019). The Climate Data Guide: Nino SST Indices (Nino 1+2, 3, 3.4, 4; ONI and TNI). *ONI: Jan 1950 - Feb 2018 with "moderate" and "strong" El Nino and La Nina marked*. Retrieved from <https://climatedataguide.ucar.edu/climate-data/nino-sst-indices-nino-12-3-34-4-oni-and-tni>
- Uitto, J. I., Puri, J., & Van den Berg, R. D. (2017). Evaluating Climate Change Action for Sustainable Development: Introduction. In *Evaluating Climate Change Action for Sustainable Development* (pp. 1-12).
- UNDP. (2015). *Converging Development Agendas- Nawa Cita, RPJM and SDGs*(pp. 12). Retrieved from <http://www.id.undp.org/content/dam/indonesia/2015/doc/publication/ConvFin-al-En.pdf>
- UNESCO. (2003). *Convention for the Safeguarding of the Intangible Cultural Heritage Sixth session of the Intergovernmental Committee for the Safeguarding of the Intangible Cultural Heritage* (pp. 1-14). Retrieved from <https://ich.unesco.org/doc/src/15164-EN.pdf>
- UNESCO. (2017). UNESCO Strategy for Action on Climate Change. 38 C/Resolution 21 and 201 EX/Decision 5.I.B. Retrieved from <http://unesdoc.unesco.org/images/0025/002592/259255e.pdf>
- UNFCCC. (2007). *Climate Change Impact, Vulnerabilities and Adaptation in Developing Countries*. In UNFCCC (Ed.), (pp. 68). Retrieved from <https://unfccc.int/resource/docs/publications/impacts.pdf>
- UNFCCC. (2011). Fact Sheet Climate Change Science: the Status of Climate Change Science Today In U. N. F. C. o. C. Change (Ed.), *Februari 2011* (pp. 7):



- United Nations Framework Convention on Climate Change.
- UNFCCC. (2015). Adaptation of Paris Agreement. *Durban Platform for Enhanced Action (decision 1/CP.17) Adoption of A Protocol, Another Legal Instrument, or An Agreed Outcome with Legal Force Under the Convention Applicable to All Parties*. FCCC/CP/2015/L.9/Rev.1. Retrieved from <https://unfccc.int/resource/docs/2015/cop21/eng/109r01.pdf>
- UNFCCC. (2017a). COP23: Address the Local Communities and Indigenous Peoples Platform. Retrieved from [http://www4.unfccc.int/sites/NWP/News/Pages/IPP-PreCOP23\\_Article.aspx](http://www4.unfccc.int/sites/NWP/News/Pages/IPP-PreCOP23_Article.aspx)
- UNFCCC. (2017b). Multi-stakeholder Dialogue on the Operationalization of the Local Communities and Indigenous Peoples Platform. Retrieved from [http://unfccc.int/meetings/unfccc\\_calendar/items/10151.php](http://unfccc.int/meetings/unfccc_calendar/items/10151.php)
- UNFCCC. (2018). Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change (NWP). Retrieved from [http://unfccc.int/adaptation/workstreams/nairobi\\_work\\_programme/items/9201.php](http://unfccc.int/adaptation/workstreams/nairobi_work_programme/items/9201.php)
- United Nations. (2012). *The Future We Want: Outcome Document of the United Nations Conference on Sustainable Development Rio+ 20*. Retrieved from Rio de Janeiro, Brazil: <https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf>
- United Nations. (2013). *Indigenous Peoples and the United Nations Human Rights System* [2]. In U. Nations (Ed.), (Vol. 9, pp. 50). Retrieved from <http://www.ohchr.org/Documents/Publications/fs9Rev.2.pdf>
- United Nations Economic and Social Council. (2017). *Tenth Anniversary of the United Nations Declaration on the Rights of Indigenous Peoples Measures Taken to Implement the Declaration*. Paper presented at the Permanent Forum on Indigenous Issues. <https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2016/08/Tenth-Anniversary-of-the-United-Nations-Declaration-on-the-Rights-of-Indigenous-Peoples.pdf>
- United Nations Indigenous Peoples' Partnership. (2017). *The UN Indigenous Peoples' Partnership (UNIPP) Delivering as One at the Country Level to Advance Indigenous Peoples' Rights Concept Note for Phase II 2017-2022* (pp. 22). Retrieved from [http://www.ilo.org/wcmsp5/groups/public/---ed\\_protect/---protrav/---ilo\\_aids/documents/publication/wcms\\_616831.pdf](http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/publication/wcms_616831.pdf)
- United Nations Permanent Forum on Indigenous Issues. (2008). Climate Change, Bio-cultural Diversity and Livelihoods: the Stewardship Role of Indigenous Peoples and New Challenges. Retrieved from [http://www.un.org/en/events/indigenoustday/pdf/Backgrounder\\_ClimateChange\\_FINAL.pdf](http://www.un.org/en/events/indigenoustday/pdf/Backgrounder_ClimateChange_FINAL.pdf)
- Urry, J. (2015). Climate Change and Society. In J. Michie & C. L. Cooper (Eds.), *Why the social science matter* (pp. 207). doi:10.1057/9781137269928
- USAID. (2007). *Adapting to Climate Variability and Change* In G. Anderson (Ed.), *A Guidance Manual for Development Planning* (pp. 31). Retrieved from [https://www.adaptationcommunity.net/?wpfb\\_dl=35](https://www.adaptationcommunity.net/?wpfb_dl=35)
- Veland, S., Howitt, R., Dominey-Howes, D., Thomalla, F., & Houston, D. (2013).

- Procedural Vulnerability: Understanding Environmental Change in A Remote Indigenous Community. *Global Environmental Change*, 23(1), 314-326. doi:10.1016/j.gloenvcha.2012.10.009
- Walshe, R. A., Chang Seng, D., Bumpus, A., & Auffray, J. (2018). Perceptions of Adaptation, Resilience and Climate Knowledge in the Pacific. *International Journal of Climate Change Strategies and Management*, 10(2). doi:10.1108/ijccsm-03-2017-0060
- Walshe, R. A., & Nunn, P. D. (2013). Integration of Indigenous Knowledge and Disaster Risk Reduction: A Case Study from Baie Martelli, Pentecost Island, Vanuatu. *International Journal of Disaster Risk Science*, 3(4), 185-194. doi:10.1007/s13753-012-0019-x
- Warman, K. (2014). The Regulation Map on Recognition of the Rights of Masyarakat Hukum Adat. 48. Retrieved from [http://procurement-notices.undp.org/view\\_file.cfm?doc\\_id=39284](http://procurement-notices.undp.org/view_file.cfm?doc_id=39284)
- Weymes, E. (2004). A Challenge to Traditional Management Theory. *Foresight*, 6(6), 338-348. doi:10.1108/14636680410569911
- Whyte, K. P. (2013a). Justice Forward: Tribes, Climate Adaptation and Responsibility. *Climatic Change*, 120(3), 517-530. doi:10.1007/s10584-013-0743-2
- Whyte, K. P. (2013b). On the Role of Traditional Ecological Knowledge as A Collaborative Concept: A Philosophical Study. *Ecological Processes*, 2(7), 12. doi:10.1186/2192-1709-2-7
- Wilhelm, J. (2005). Traditional Ecological Knowledge in the Beliefs of Japanese Fishing Villages: With Special Reference to Yoriiso (Miyagi) and the Sanriku Region. *Japanese Religions*, 30(1/2), 21-53.
- Williams, T., & Hardison, P. (2013). Culture, Law, Risk and Governance: Contexts of Traditional Knowledge in Climate Change Adaptation. *Climatic Change*, 120(3), 531-544. doi:10.1007/s10584-013-0850-0
- WMO. (2018). What Is the Climate Variability? FAQ. Retrieved from <http://www.wmo.int/pages/prog/wcp/ccl/faqs.php>
- Woodward, E., Jackson, S., Finn, M., & McTaggart, P. M. (2012). Utilising Indigenous Seasonal Knowledge to Understand Aquatic Resource Use and Inform Water Resource Management in Northern Australia. *Ecological Management and Restoration*, 13(1), 58-64. doi:10.1111/j.1442-8903.2011.00622.x
- World Bank. (2011). Vulnerability, Risk Reduction, and Adaptation to Climate Change. (April 2011), 12. Retrieved from [http://sdwebx.worldbank.org/climateportalb/doc/GFDRRCountryProfiles/wb\\_gfdr climate change country profile for IDN.pdf](http://sdwebx.worldbank.org/climateportalb/doc/GFDRRCountryProfiles/wb_gfdr climate change country profile for IDN.pdf)
- Xu, Z., Tang, Y., Connor, T., Li, D., Li, Y., & Liu, J. (2017). Climate Variability and Trends at A National Scale. *Scientific Reports*, 7(1), 3258. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/28607387>. doi:10.1038/s41598-017-03297-5
- Zhang, C. (2005). Madden-Julian Oscillation. *Reviews of Geophysics*, 43(2). doi:10.1029/2004rg000158



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## APPENDIXES

### Appendix 1. Research Questionnaire



No. ....

### Research Questionnaire

Traditional Ecological Knowledge of Indigenous Peoples on Climate Change Adaptation: A Case Study of Sea Nomads “*Orang Suku Laut*”, Lingga Regency, Riau Islands Province, Indonesia.

On

Explanation:

1. This questionnaire is subjected to a thesis research of Mr. Wengki Ariando, a master student in the Environment, Development and Sustainability Program, Graduate School of Chulalongkorn University, Bangkok, Thailand.
2. The purpose of this questionnaire is to collect data related to the research titled “Traditional Ecological Knowledge of Indigenous Peoples on Climate Change Adaptation: A Case Study of Sea Nomads “*Orang Suku Laut*”, Lingga Regency, Riau Islands Province, Indonesia”.
3. The questionnaire consists of 4 sections including:
  - Section 1. General information of respondent 5 questions.
  - Section 2. Climate change knowledge of respondent 10 questions.
  - Section 3. Traditional ecological knowledge of the *Orang Suku Laut* 7 questions.
  - Section 4. Policy and development project on climate change adaptation for the *Orang Suku Laut* 4 questions.

All information will be exclusively used for the research purpose.

To conduct this research, I would kindly request you a permission to taking note and recording during the interview.



## Section 1. General Information

Explanation: Please mark your response with an 'X' in the blank space.

### 1. Gender

(.....) Male

(.....) Female

### 2. Age

(.....) 18 – 30 years

(.....) 31 – 40 years

(.....) 41 – 50 years

(.....) 51 – 60 years

(.....) over 61 years

### 3. Educational level

(.....) None

(.....) Primary school

(.....) Secondary School

(.....) High School

(.....) Other (please specify) .....

(.....) Diploma

(.....) Bachelor's degree

(.....) Master's degree

(.....) Doctoral Degree

### 4. Current occupation

(.....) Housewife

(.....) Fisherman/Farmer

(.....) Local government officer

(.....) Social worker

(.....) Educator/Professional/Expert

(.....) Other (please specify)

.....

### 5. Position in the community

(.....) Group Leader

(.....) Community Leader

(.....) Local Government Officer

(.....) Council Members

(.....) Women Leader

(.....) Youth Leader

(.....) NGO Officer

(.....) Expert/Teacher/Professional

(.....) Other (please specify) .....

**Section 2. Climate Change Knowledge**

1. Do you know what climate change is?

(.....) Yes (*please specify*)

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.....  
.....  
.....

(.....) No

(.....) N/A

2. Do you think that the current climate is changing? and how does it look like?

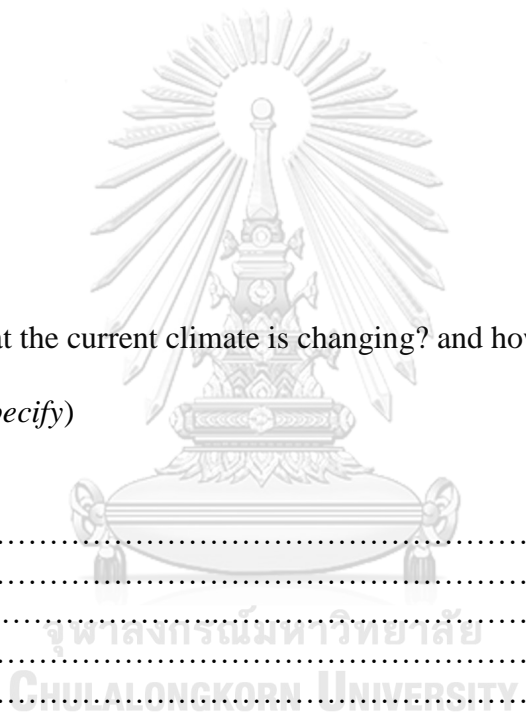
(.....) Yes (*please specify*)

.....  
.....  
.....  
.....

(.....) No

(.....) N/A

3. What is/are your experience(s) on climate change during the last decade, last 20 years or over than 20 years?



Rainfall

.....  
.....  
.....  
.....  
.....

Temperature

.....  
.....  
.....  
.....

Sea level rising



.....  
.....  
.....  
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Extreme event (ex: storm, drought, flood)

.....  
.....  
.....  
.....  
.....

Other (please specify)

.....  
.....  
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.....

4. What were the extreme weather events taking place in your area during the last decades? and how often?

(.....) Storm surge

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.....  
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(.....) Flooding

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.....

(.....) Drought

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.....



(.....) Depression or tropical cyclone

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(.....) Other (please specify)

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.....  
.....  
.....

5. Do you think that the seasonal changes have already impacted on your livelihood? and how?

(.....) Yes (please specify)

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.....  
.....  
.....

(.....) No

(.....) N/A

6. What was the most adverse impact of climate change on you? when did it take place and how long?

.....  
 .....  
 .....  
 .....  
 .....

7. What is/are the current impact(s) of climate change in your community? (*you may choose more than one*)

- (.....) None
- (.....) Health related issues
- (.....) Water related issues
- (.....) Agricultural/ fisheries productions
- (.....) Energy related issues
- (.....) Frequent natural disasters
- (.....) Livelihoods (capitals: social, human, natural, physical, financial)
- (.....) Other (please specify) .....

8. How do you adapt your life to climate change?

.....  
 .....  
 .....  
 .....  
 .....



9. What is/are the challenge(s) of your community in adapting to climate change?

.....  
 .....  
 .....  
 .....  
 .....

10. How do you set the seasonal calendar in your daily life?

.....  
 .....  
 .....

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.....

**Section 3. Traditional Ecological Knowledge of the *Orang Suku Laut***

1. What is/are the general traditional ecological knowledge(s) practicing in your community?

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2. What is/are the traditional ecological knowledge(s) on climate change in your community based on your beliefs?

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3. What is/are the traditional ecological knowledge(s) on climate change in your community based on your cultural practice?

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4. What is/are the traditional ecological knowledge(s) on climate change in your community based on your best practice?

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5. What is/are the traditional ecological knowledge(s) on climate change in your community based on your adaptive capacity?

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.....

6. How do you use your traditional ecological knowledge for climate change adaptation in your daily life, environment, and economy?

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.....

7. What is/are the challenge(s) of your community in using the traditional ecological knowledge for climate change adaptation?

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.....



**Section 4. Policy and Development Project on Climate Change Adaptation for the Orang Suku Laut**

1. Do you have any climate change adaptation project implemented for the *Orang Suku Laut*?

(.....) Yes (*please specify*)

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.....  
.....  
.....  
.....

(.....) No (*go to answer question 3*)

(.....) N/A (*go to answer question 3*)

2. How do you prioritize such an appropriate project for the *Orang Suku Laut*?

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.....  
.....  
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.....  
.....

3. Do you use the RAN-API guideline or other climate change adaptation policies for any project implemented in the *Orang Suku Laut* communities?

(.....) Yes (*please specify*)

.....  
.....  
.....  
.....  
.....

(.....) No











(.....) N/A

4. What is/are the challenge(s) of project development related to climate change adaptation policy for the *Orang Suku Laut*?

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.....  
.....  
.....  
.....  
.....



**Appendix 2. Photos of the study area.**

	
<p>Stilt house in the land</p>	<p>Stilt house in the coastal area</p>
	
<p>Temporary house in the migration periods</p>	<p>Saphaw</p>
	
<p>Orang Suku Laut who are living in the boat</p>	<p>Headman of the Orang Suku Laut</p>
	
<p>Elder of the Orang Suku Laut</p>	<p>Women of the Orang Suku Laut</p>
	
<p>Youth of the Orang Suku Laut</p>	<p>Kids of the Orang Suku Laut</p>





A family who is living in the boat



A family who is living in the house



Sampan Kajang (1)



Sampan Kajang (2)



A group of man of the Orang Suku Laut



Respondent interviewed (1)



Respondent interviewed (2)



Respondent interviewed (3)



Shell Collecting



Evening atmosphere

**VITA**

<b>NAME</b>	Wengki Ariando
<b>DATE OF BIRTH</b>	10 September 1991
<b>PLACE OF BIRTH</b>	Tiku
<b>HOME ADDRESS</b>	Ujung Pasa Tiku, Kecamatan Tanjung Mutiara, Kabupaten Agam, Sumatera Barat, Indonesia 26473
<b>AWARD RECEIVED</b>	Awardee ASEAN Scholarship from Chulalongkorn University



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