

An Update on Human Elephant Conflict in Aceh, Indonesia

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Acronyms and Abbreviations

AES	: Asian Elephant Support	LIF	: Leuser International Foundation
ADB	: Asian Development Bank	NGO	: Non-govermental Organization
BPS	: Badan Pusat Statistik	RAN	: Rainforest Action Network
BKSDA	: Badan Konservasi Sumber Daya Alam	RSPO	: Roundtable on Sustainable Palm Oil
CRU	: Conservation Response Unit	RPJMA	: Rencana Pembangunan Jangka Menengah Aceh
DAS	: Daerah Aliran Sungai	RTM	: Rencana Tindakan Mendesak
DLHK	: Dinas Lingkungan Hidup dan Ke hutanana	PPP	: Public–private Partnership
FKGI	: Forum Konservasi Gajah Indonesia		
HEC	: Human-elephant Conflict		
ICUN	: International Union for Conservation of Nature		
KLHK	: Kementerian Lingkungan Hidup dan Kehutanan		
KSDAE	: Ditjen Konservasi Sumber Daya Alam Ekosistem		

■ Photo Below: Leuser Foundation Indonesia (2020).



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Executive Summary

Human-elephant conflicts are on the rise in Aceh, with the districts of Aceh Timur and Pidie being the most conflict-prone areas. Conflict events vary in form and severity, from crop-raiding to injury or death of people and elephants. The root cause of HEC is the drastic depletion of elephant habitat due to forest conversion, degradation, fragmentation, and agricultural area-elephant habitat interference. Much of Aceh's terrestrial biodiversity is concentrated within the lowland rainforest, while lowland forests are increasingly threatened by forest conversion, increasing contact between humans and elephants as many forest areas that are vital for elephants' habitat in Aceh have been cleared for human use - often for crop cultivation such as palm oil and rubber. Crop raiding and threats to humans by wild elephants are the most significant sources of conflict throughout Aceh, the

■ Photo Above: WWF Indonesia (2020).

two types of conflict accounting for 75% of all forms of HEC, with HEC also resulting in a negative impact on revenue crops and people's livelihood. To conserve elephant habitats, much more attention is needed to mitigate HEC. This report highlights aspects of HEC in Aceh including typology and root causes, and also provides practical recommendations on infrastructure and economic development that are elephant friendly. These are realistic solutions that can be adopted by the government to reduce HEC in the long term.



Introduction

The Sumatran elephant (*Elephas Maximus Sumatrana*) is a unique subspecies of the Asian elephant residing on the island of Sumatra in Indonesia. By Forum Konservasi Gajah Indonesia estimates in 2017, the Sumatran elephant population is between 1,694 – 2,038 individuals spread across seven provinces. It estimated the population had declined by 700 individuals between 2011–2017 (KLHK, 2020). Elephants are vital to the functioning of forests and ecosystems (Perera, 2009). When elephants move to search for food and water, they help spread seeds which are essential for maintaining the forest, causing tree branches, fruits, flowers, seeds, and leaves to fall to the ground as they move through the forest (Campos-Arceiz & Blake, 2011). The decline of large seed dispersers from the tropical forests can result in an impoverished ecosystem (Galettia, Bovendorpa, & Guevarab, 2015), with severe consequences for plant species

Photo Above: Leuser Foundation Indonesia (2020).

(Campos-Arceiz & Blake, 2012) and carbon storage (Bello et al., 2015). Elephant decline can also lead to adverse impacts on the whole complexity of the forest ecosystem (Qomariah, Rahmi, Said, & Wijaya, 2019).

In Aceh, elephant populations are faced with many threats including habitat loss, habitat fragmentation, and illegal killing. The loss of elephant habitat and increasing fragmentation has led to increased conflict with humans. This presents a major threat to elephant survival, with the number of Sumatran elephants in Aceh declining. An estimated around 539 elephants are spread across Aceh (Prabowo, 2019), and the decline in elephant population is linked to the loss of their primary habitat: lowland tropical forests. In 2011, the International Union for Conservation of Nature (IUCN) listed the Sumatran elephant as “critically endangered.”



Objective

The main objective of this study is to identify the root causes, ongoing trends, the typology, and the spatial patterns of human-elephant conflict (HEC) in Aceh. The secondary objective was to reference human-elephant conflict information against the economic and infrastructural planning process in Aceh, providing recommendations on nature-based solutions for infrastructure and economic development that are elephant friendly through public and private partnership (PPP) mechanisms and other alternative financing models.

Methods

This study analyses HEC incident data over six years (2015–2020) in Aceh, Indonesia. HEC incident records were acquired from the Aceh Natural Resource Conservation Agency (BKSDA Aceh). The dataset is based on HEC incidents reported from different locations throughout the province. Primary data was collected through a mix of open-ended and

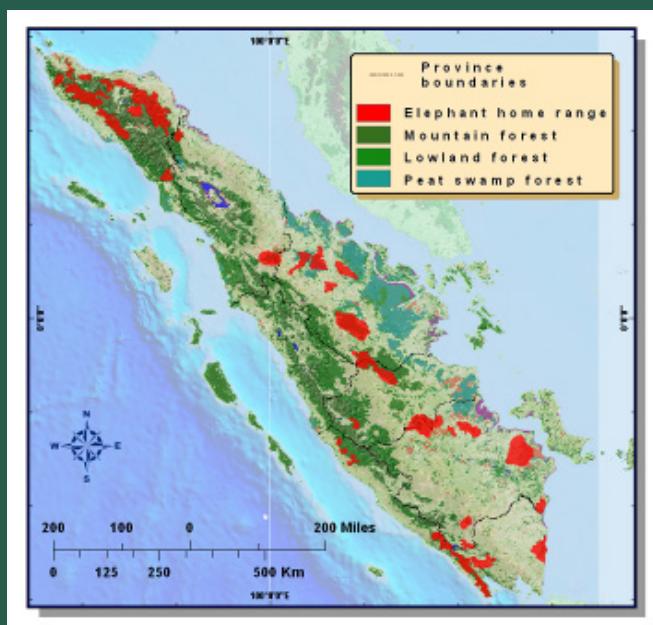
■ Photo Above: Irsan Mulyad, Antara Foto (2020).

closed-ended questions. The individual farmer was the basic unit of data collection and two districts within conflict-prone landscapes were selected as study localities. The study area was situated within different landscape type: Bener Meriah district, which is located at the Gayo highlands, and Pidie District at the lowlands, field study was focused on sub-districts Pinto Rime Gayo (Bener Meriah) and Mila (Pidie). Ten respondents from each sub-district were chosen for the interview to draw their experiences about conflicts with elephants and to examine their attitudes toward elephants and their habitat. A wide range of sources have been used as secondary data, including statistics and information collected by National Bureau of Statistic (BPS), national government departments (KSDAE, BKSDA) and local government department (DLHK, Dinas Pertanian).



Human–Elephant Conflict in Aceh

■ Photo Above: Leuser Foundation Indonesia (2020).



Picture 1. The map of elephant habitat in Sumatra Island, Indonesia

Note. *The map of elephant habitat from the Ministry of Environment and Forestry, Directorate General of Natural Resources and Ecosystem Conservation. 2020. <https://www.gajah.id/wp-content/uploads/2020/04/RTM-Gajah-Sumatera-2020-2023.pdf>*

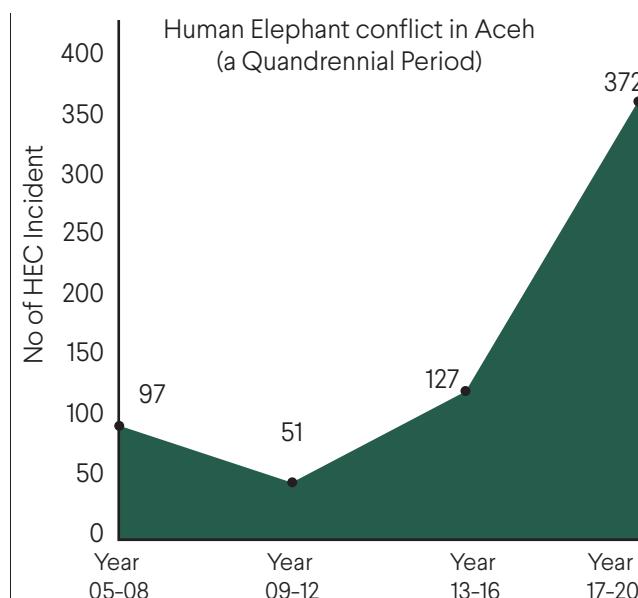
The number of Sumatran elephants in Aceh are declining and according BKSDA, 85% of the remaining elephants inhabit areas outside the conservation area. Thus, elephants are coming into conflict with humans because the elephants are usually located in areas with high quality and quantity of food, water, and cover (Lamarque, Anderson, Fergusson, Lagrange, & Osei, 2009). “The elephants prefer agricultural food crops to wild plants because they are palatable and nutritious with relatively little secondary defensive mechanisms” (Okello & D’Amour, 2008). This situation causes “interspecific competition with humans” and the elephant is difficult to control, considering the expensive and ineffective control techniques (Mamboleo, Doscher, & Paterson, 2017).

Elephant numbers have fallen significantly in the last two decades, largely due to habitat loss in Aceh forests. Conflict with humans, poaching, and habitat destruction continue to

threaten this species. The elephant population struggles to find sufficient food and water in the remaining habitat and, as a result, more elephants are seeking food in villages causing conflict with humans. The increasing number of HEC every year in Aceh contributed significantly to the decline of the elephant population from about 800 individuals in 2003 to 539 individuals by 2020 (BKSDA, 2020). This remaining elephant population is spread across the districts of Aceh Jaya, Aceh Barat, and Aceh Utara.

HEC has become more intense over the last decade in Aceh, when observing HEC incident over that period, HEC incidents were organized into four-year groupings arranged consecutively from the earliest to the most recent. The four-year intervals were applied to allow comparison of HEC incidents for temporal analysis. Figure 1 shows HEC incident data over 16 years (2005–2020). The inter-annual variations of HEC incidents in Aceh indicated that the period 2017–2020 had the highest number of incidents, while the lowest number of incidents was seen in the period 2009–2012. The loss of elephant habitat in recent years has led to increasing HEC often resulting in deaths

Figure 1. Human-elephant conflict in Aceh Province (in a quadrennial period)

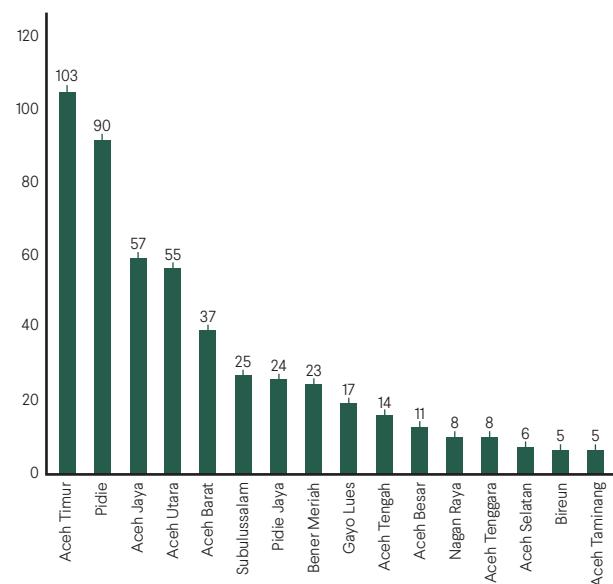


Note. The data of HEC incidents from BKSDA Aceh. 2021

of elephants – these critically endangered mammals being slaughtered as pests or caught in traps placed alongside the community plantations. In early 2021, for example, the carcass of a wild elephant was found dead in the plantation area of Blang Rakal village in Bener Meriah district. In 2020 alone, BKSDA recorded 106 cases of HEC in Aceh in which 11 cases resulted in the death of the elephant.

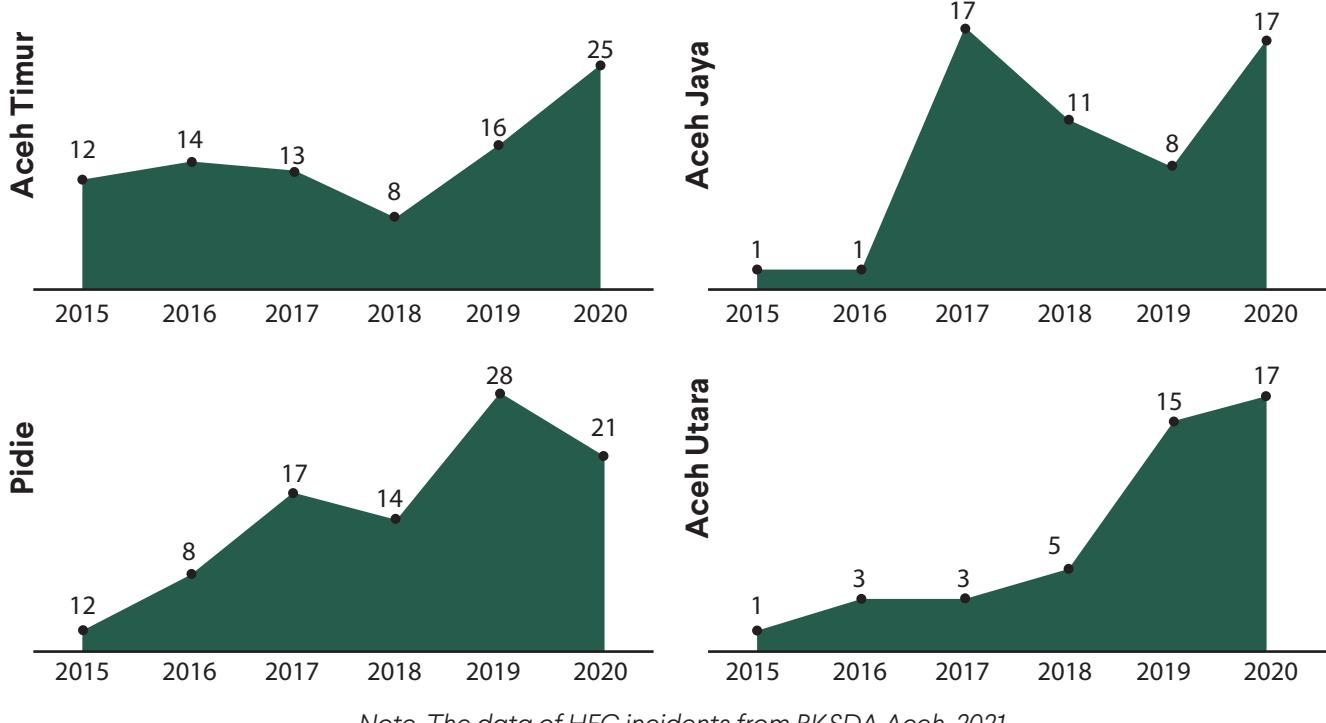
The temporal analysis of annual HEC incidents in the period 2015–2020 (Figure 2) shows that the highest number of HEC incidents had occurred in the districts of Aceh Timur, Pidie, Aceh Jaya, and Aceh Utara. The fewest incidents were observed in Bireuen and Aceh Tamiang. The total number of HEC incidents during the study period was recorded at 456 cases, with an annual incident average of 76 cases. However, HEC is on the rise, as can be seen from Figure 3.

Figure 2. Human-elephant conflict intensity in Aceh, 2015–2020



Note. The data of HEC incidents from BKSDA Aceh. 2021

Figure 3. The trend of HEC in conflict-prone districts 2015 - 2020



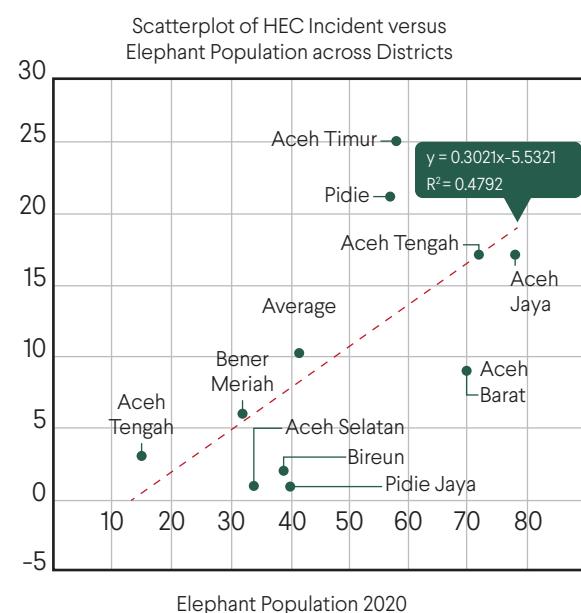
Note. The data of HEC incidents from BKSDA Aceh. 2021

To assess the relationship between the elephant population and HEC incidents in each district, the two variables are graphed in a scatterplot. For the elephant population and HEC incidents data in 2020, the scatterplot displays a positive relationship; districts with a higher elephant population tend to have a higher incidence of HEC. The relationship appears to be a straight line because it rises for higher elephant population values. As can be seen in Figure 4, values tend to rise together in Aceh Timur, Pidie, Aceh Utara, and Aceh Jaya, indicating a positive correlation.

To support the conservation of wild elephants and their habitat, and to create opportunities for local communities, it is important to focus on achieving positive outcomes for both elephants and people. To this end, BKSDA has established Conservation Response Units (CRU) in seven districts in Aceh: Aceh Utara, Aceh Timur, Pidie, Aceh Jaya, Aceh Barat, Aceh Selatan, Bener Meriah. The CRU utilize captive elephants, their mahouts, and local community representatives for direct and field-based conservation interventions. The CRU is

obligated to provide a technical response to handle HEC, the mahouts play important roles to understand the condition of the elephant and employ appropriate actions to prevent the elephants from entering community settlements.

Figure 4. The relationship between the elephant population and the HEC incidents



Note. The data of elephant population and HEC incidents from BKSDA Aceh. 2021

Typology of Human-Elephant Conflict

This study identified seven mutually exclusive types of HEC in the period 2015–2020 (Figure 5). In terms of direct damage, crop-raiding and elephant threat account for most HEC incidents in Aceh. Crop raiding – elephants damaging plant crops cultivated by farmers – by either feeding on or trampling them accounted for the highest number of incidents (46.7%), followed by elephant threat¹ (29.3%), property damage (8.5%), elephant death (8.1%), elephant injury (5.1%), human injury (1.8%), and human death (0.5%). The temporal analysis of annual HEC incidents indicated that the period 2017–2020 had the highest number of incidents of crop riding and elephant threat. Our field survey confirmed that the community settlement and the croplands at the forest edge had been prone to intensifying crop-raiding and elephant threats.

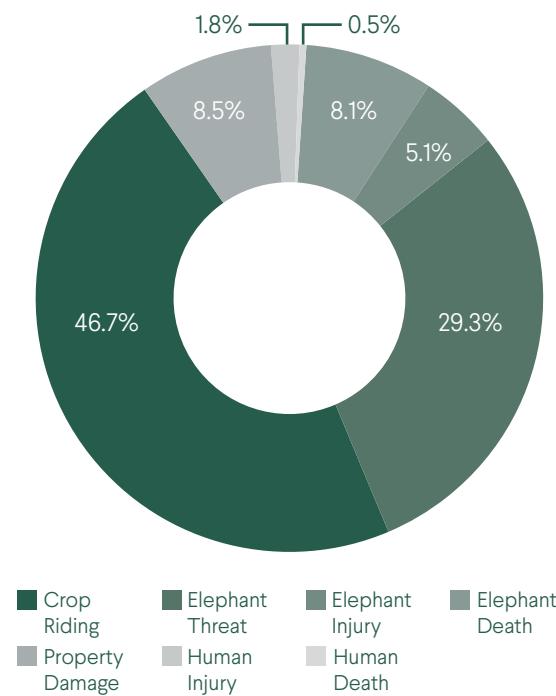
In relation to crop-raiding, the results of our field observations of farmers cultivating fields in areas close to the forest reserve boundary (<1 km) shows they come into conflict with elephants attracted by nutritious crops, with elephants destroying substantial amounts of harvest by crossing through the plantations and feeding on the crops. Losses caused by elephants to the farming community also include indirect costs such as the costs of elephant deterrent, guarding, or the maintenance of crop protection measures. Although most crop losses are small to medium-sized damage, wild elephant attacks can also cause very significant damage, including the complete destruction of a harvest.

Insights from Pidie (the second most conflict-prone district) show that wild elephants damaged at least 245.8 hectares of crops in 2020. The damaged crops comprise banana, betel nut, palm oil, rubber, durian, cocoa, and rice. The most frequent crops being eaten by elephants are betel nut (59%) and banana

(29%), palm oil (5%), durian (5%), cocoa (2%). Banana and perennial trees in the area are very attractive crops to hungry wild elephants. The CRU leaders from Pidie reported that a group of 40 to 50 elephants from Aceh Besar usually cross the Simeuleuk border entering the Pidie area to search for food.

In Aceh Utara, most of the damage was reported in the sub-district of Cot Girek, nearly 30 hectares of banana, and other perennial trees in the area were eaten by wild elephants in 2020. The reports that elephants had damaged people's properties were relatively common in the surveyed areas. The most common type of property being damaged by wild elephants is the temporary shelters for farmers in the farmland. The destruction of farmer's huts can be traumatic for people although no physical injuries resulted from the events.

Figure 5. Types of Human-Elephant Conflict in Aceh, 2015–2020



Note. The data of HEC incidents from BKSDA Aceh. 2021

¹Elephant threats refer to the presence of elephants within community settlements that does not result to any of the other forms of HEC.

Elephant death, Human Death, and Injury

HEC is the leading cause of elephant death in Aceh with BKSDA data showing 57% of elephant deaths in Aceh can be attributed to conflict with humans, while 10% are due to illegal hunting, and the remaining 33% from natural causes. The most elephant deaths occur in Aceh Timur. The official figure shows as many as 46 elephants have died during the period 2015–2020. At least 12 elephants died in 2020 compared to three elephants in 2019. For the purpose of this study, we counted the elephants that died due to HEC and illegal poaching and exclude natural deaths. In addition to elephant deaths, HEC also resulted in death and injuries of humans. The official data reported at least two people had been killed and five people had been injured by elephants during the period of the study.

Root Causes of Human-Elephant Conflict

Forest Conversion, Degradation, and The Loss Of Elephant Habitat

As large mammals, elephants require larger home ranges and thus are more prone to suffer the effects of deforestation (Kinnaird, Sanderson, O'Brien, Wibisono, & Woolmer, 2003). According to Global Forest Watch, around 268,639 hectares of the forest have been lost in the last 20 years (2001–2020), mostly due to forest conversion and illegal logging. Aceh has lost most of the lowland forest containing the richest biodiversity and prime elephant habitat. Qomariah (2018) shows the deforestation rate in elephant habitat from 2001 to 2016 which indicated that Aceh Timur has the highest rate at 19.4 thousand hectares and Pidie about 2.2 thousand hectares. These conditions have led to the fragmentation of most elephant habitats and corridors. Increasing fragmentation of the habitat has led to increased HEC.

The conversion and degradation of forest areas is still ongoing although the Aceh government has issued a policy for the cessation of logging (logging moratorium) in 2007 which remains valid at the time of this study.² From 2001 to 2016, Aceh lost 216,818 hectares of primary forest cover. According to BKSDA about 77,463 hectares (35.7 percent) of vital elephant habitat (Qomariah, 2018). More recently, Aceh has lost 8,730 hectares of its primary forest in 2020, 10,200 hectares in 2019, 15,071 hectares in 2018, and 17,820 in 2017 (Global Forest Watch, 2021). The main reasons for the reduction in forest cover are illegal logging, shifting cultivation, and oil palm expansion. In relation to illegal logging, between 2019 and 2020, Aceh police arrested 95 perpetrators for allegedly committing illegal logging activities (Zulkarnain, 2020).

² Aceh has experienced a severe reduction in forest area, with the loss of more than 1.6 million hectares of the forest in the last 60 years (Baabud, Griffiths, Afifuddin, & Safriansyah, 2016).

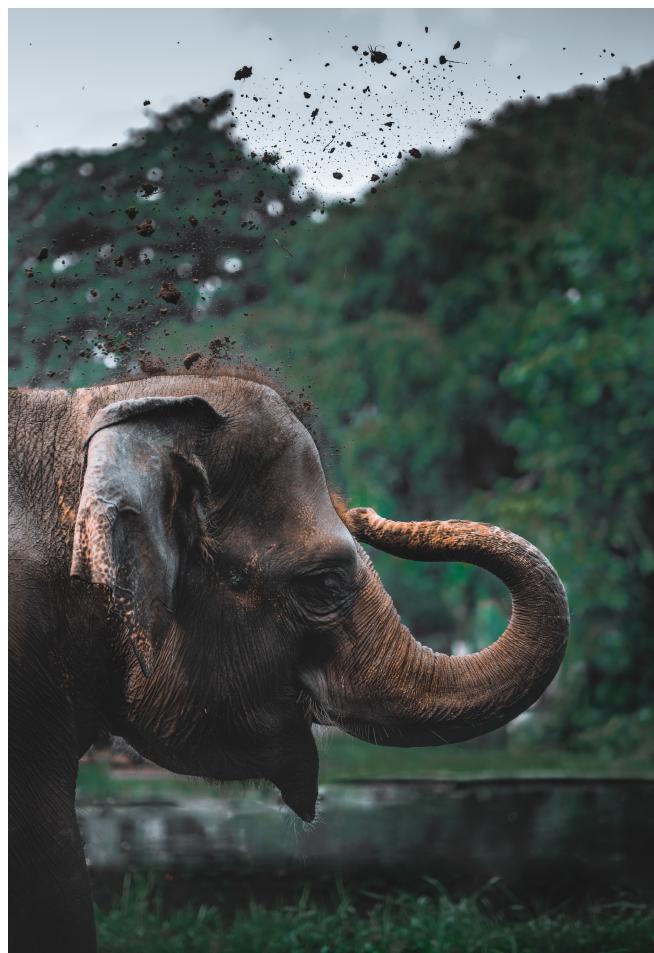


Photo Above: Iswanto Arif, Unsplash (2020).

Agricultural Area – Elephant Habitat Interface

Aceh is well known for its lowland and highland agrarian landscapes. While the lowland forests are increasingly threatened by forest conversion, it has led to fragmentation of elephant habitats and changes in land use, which in turn has increased contact between humans and elephants. Many forest areas that are vital for elephant habitat have been converted into another purpose such as crop cultivation – like palm oil and rubber – which has expanded into areas that were previously occupied by the elephants.

Aceh Timur – the most conflict-prone district – is one of the largest crops producing areas in Aceh, the total estate crop areas devoted to palm oil, coconut, and rubber in this region is estimated to be 82.1 thousand hectares in which 16.3 thousand hectares (about 32 percent) of the crop area is occupied by oil palm plantations (Table 1). The encroachment of oil palm plantation in elephant habitats in recent years has contributed to intense HEC in Aceh Timur and Aceh Jaya. A study on palm oil expansion in Aceh Timur by the Rainforest Action Network (RAN) that looks at nine firms identified “conflict palm oil culprits,”

six of which are expanding into the remaining lowland forests (Rogers, 2015). With their natural habitat now dominated by palm oil plantations, elephants are increasingly traveling to the villages and through the fields closer to the forest edge where farmers plant crops.

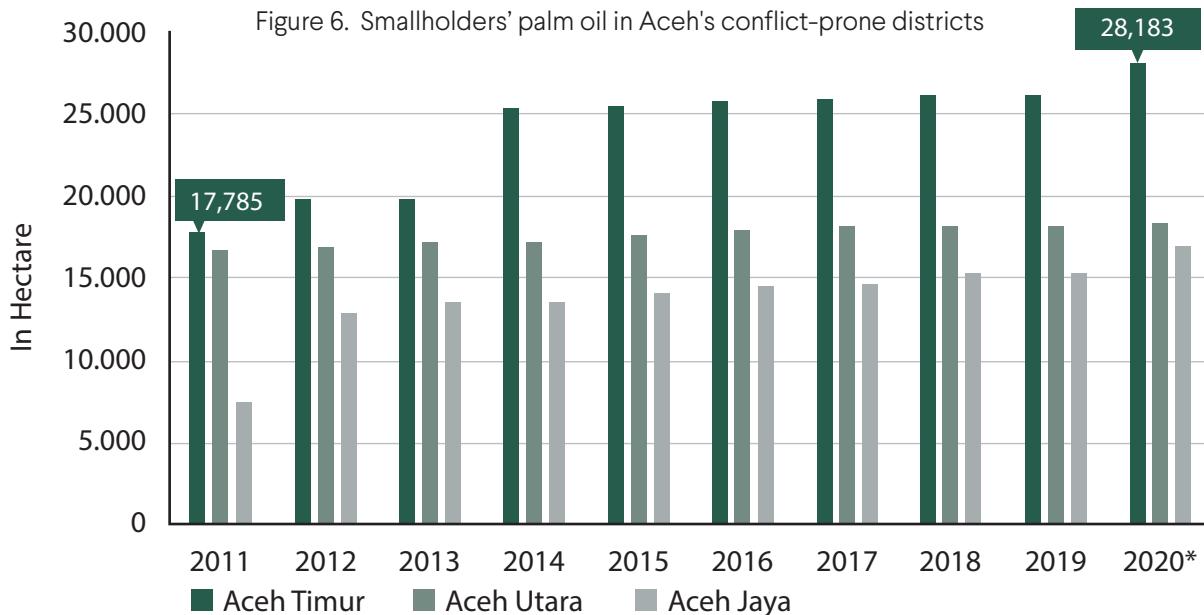


Photo Above: <https://fin.co.id/2019/07/01/investigasi-gajah-sumatera-mati/> (2019).

Table 1. Crop areas in the most prone districts to HEC (2019).

Districts	Palm Oil (ha)	Coconut (ha)v	Rubber (ha)	Total Crop Area (ha)
Aceh Timur	26,307	6,980	22,521	82,115
Pidie	100	8,636	140	8,976
Aceh Jaya	15,664	5,189	14,033	50,220
Aceh Utara	18,185	14,993	8,779	60,142
Total Aceh	240,368	102,951	123,124	466,443

Note. The data for crop area from Regional Office of Agricultural and Plantation of Aceh. 2021



Note. The data for smallholder palm oil planted area from Regional Statistic Office of Aceh (BPS). 2020

* Based on authors' estimation

The Roundtable on Sustainable Palm Oil (RSPO) and its stakeholders promote the use of sustainable palm oil that mandates palm oil growers comply with applicable laws and regulations and to conserve natural resources and biodiversity. However, RSPO does not prohibit its members from converting forests to palm oil plantations (AES, 2021). In addition, poor farming practices by the smallholder oil palm sector is a growing source of forest loss (Ha, 2019). As biodiversity-rich forests are cut down and replaced by palm oil trees, the elephants lose their sources of food, water, and shelter. Figure 6 shows the large increase of palm oil smallholders in Aceh Timur, Aceh Utara, and Aceh Jaya. In Aceh Timur, smallholder oil palm³ accounted for 28.1 thousand hectares in 2020, which has increased 37 percent over a decade.

Although a very small area (8,976 hectares) is devoted to estate crops in Pidie, this region is known as the largest cocoa-producing area, and farmers are planting other crops, such as durian, betel nut, banana, and langsat at the forest edge, which are very palatable to elephants. The natural protected forest in Pidie is increasingly critical due to encroachment, conversion into agricultural and illegal mining

activities. Continuous illegal logging, and mining activities were reported within the forest areas of this district (DLHK Aceh, 2020; Kasia et al., 2011; Mardhiah, Supriatno, & Djufri, 2016).



■ Photo Above: Capturing The Human Heart, Unsplash (2017).

³ Smallholders oil palm refers to oil palm growers who cultivate palm in an area not exceeding 25 hectares.



Elephant Poaching and Law Enforcement

About 10 percent of elephant deaths in Aceh are attributed to poaching. During the study period, on average, at least two Sumatran elephants were illegally killed each year for their tusks. The demand for elephant tusk from black markets has fueled this rampant poaching epidemic. Trapping, snaring, and poison have been used by the poachers to kill elephants. The cable, wire, or rope are set to trap animals around the neck, torso, or leg. According to the investigators at the Aceh Police Special Criminal Investigation Directorate, in 2019, they handled nine cases with 17 suspects. In 2020, there were seven cases of wildlife poaching with four suspects (Wuragil, 2021).

Photo Above: Leuser Foundation Indonesia (2020).

Large Scale Development Projects in Aceh

Large-scale development projects contribute significantly to the loss of Aceh's forests. Aceh's rain forests are targeted for the development of road, hydropower plants, and geothermal power plans. Currently, the development of 470 km of highway with an investment valued at IDR 55.76 trillion is in progress and is expected to be completed in December 2025. Aceh has planned to construct hundreds more kilometers of road, and the planned road construction will pass through highly sensitive areas of the ecosystem. Environmental NGOs have voiced their concern over the potential negative environmental impacts related to the proposed road network projects and power plant development, especially in the Leuser Ecosystem.



Road development is a catalyst for the loss of natural ecosystems (Asian Development Bank, 2019). The roads may have a negative impact on wildlife by directly and indirectly providing access for habitat destruction and increasing wildlife mortality (Clements et al., 2014; Laurance, Goosem, & Laurance, 2009). The roads through the rainforest may cause habitat fragmentation, facilitating access to the previously unexploited forest (Jay, 2015). A larger scale road network – such as a four-lane highway – cause a significant barrier effect for elephants, reducing landscape permeability and connectivity that block their movement from one side of the road to the other (Beyer et al., 2016; van Strien & Grêt-Regamey, 2016; Wadey et al., 2017).

Furthermore, several hydropower generation projects are being planned by the Aceh I government to meet the increasing demand for

electricity, such as 88 MW in Peusangan 1 and 2, 45 MW in Kumbih 3, 20 MW in Krueng Isep, and 16 MW Jaboi Wind Power Plant in Sabang (RPJMA, 2019). Even though they are deemed crucial for economic development and support vital human activities, the development of dam and hydropower plants will have a negative cost on large forest areas.

■ Photo Above: Leuser Foundation Indonesia (2020).

Recommendations

Based on the above findings and analysis, the following recommendations have been developed to identify appropriate measures that will result in positive outcomes for both the community and the elephant (and wider fauna) population in Aceh:

- 1) Focus on habitat protection. Assuming the recent trend in HEC, conflict is likely to rise again in the coming years. As such, elephant habitats must be protected through multi-stakeholder habitat management, and further forest encroachment in elephant habitats must be prevented. Provincial land-use planning for infrastructure development needs to consider elephant habitat requirements and the ecological value of standing forest. Regulating and enforcing land-use change are key to preventing HEC and reducing elephant population decline.
- 2) Seek balance between economic growth and more sustainable use of natural resources. By adopting and implementing “green infrastructure and natural infrastructure approaches”⁴ and protective measures available to minimize negative impacts of large-scale infrastructure development on wildlife and biodiversity, economic losses due to HEC can also be mitigated. “A green infrastructure approach considers conservation values and actions

related to land development, growth management, and built infrastructure planning, thus differing from conventional approaches to open space planning” (Benedict & McMahon, 2002).

- 3) Consider public-private partnership (PPP) as the first step towards multi-stakeholder management of elephant habitat. PPPs can serve as a diversified funding strategy, and can cover all types of collaboration to deliver policies, services, and infrastructure projects – from design and planning, financing, and construction to operating services (Partington, 2012). Experience shows that PPPs in nature conservation can improve services through professional management and marketing, reduce the demand for public subsidies, and mobilize capital for investment in park infrastructure and biodiversity (Saporiti, 2006).
- 4) Promote landscape connectivity such as adopting good practices including elephant underpass at busy motorways to facilitate elephant movement across the highway, thus helping isolated elephant populations cross safely. Such measures will reduce the mortality of wildlife due to wildlife-vehicle collisions, which also affects public safety, particularly when large herbivores and carnivores are involved (Bennett, 2017).



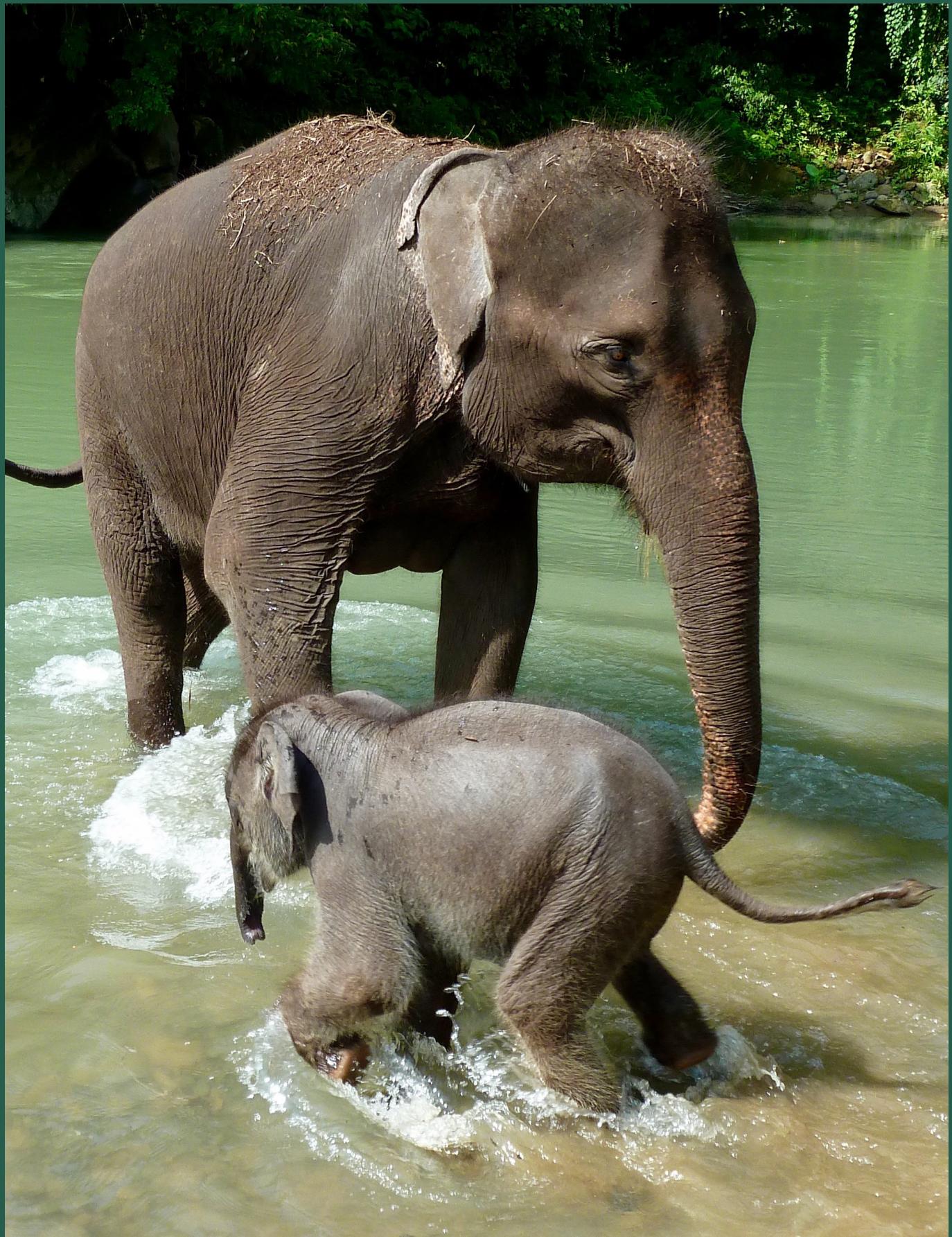
➤ **Animal-friendly viaduct.** Located on Highway BR-374 in Brazil, the bridge built over an intact drainage promotes passage by wildlife (photo by M. Hiijser).



Picture 2. The elephant-friendly passage structure

Note. This picture is taken from *Green Infrastructure Design for Transport Projects* Asian Development Bank. 2019.

⁴ “Nature-based Solutions (NbS) use ecosystems and the services they provide to address societal challenges such as climate change, food security, or natural disasters. IUCN defines NbS as: “Actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.” (Cohen-Shacham, Janzen, & Maginnis, 2016)



■ Photo Above: Leuser Foundation Indonesia (2020).

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