Research Article *Gajah 53 (2021) 30-38*

Can the Oil Palm Industry and Elephant Conservation Be Reconciled? A Case Study in Kalabakan, Sabah

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Abstract. Bornean elephants are a central issue in oil palm development in Sabah. An initiative was launched to find solutions to reduce the conflict by forming a multistakeholder working group. The main issues identified were insufficient land-use planning due to the development of new oil palm areas and incorrect placement of electric fences. Satellite-collared elephant movement data was used to guide site-specific management options. The working group proved to be a crucial platform where collaborative actions were implemented, including re-allocating land and the strategic placement of fences. These efforts allowed the continuation of elephant movement through the landscape, as indicated by the tracking data.

Introduction

Sabah, a developing state, depends substantially on agricultural industry to drive its economy, in which oil palm cultivation is one of the main components. The oil palm industry has been a mainstay in generating employment and development in rural areas. However, development and growth is often at the cost of biodiversity as in conversion of forests to oil palm plantations (Koh & Wilcove 2008).

Bornean elephants (*Elephas maximus borneensis*) are a central issue in oil palm development in Sabah. The Bornean elephant is predominantly found in Sabah with an estimate of 2,040 individuals (Alfred *et al*. 2010) and a small population occurring in the Nunukan district in northern Kalimantan, bordering Sabah (Suyitno & Wulffraat 2012; Wulffraat & Greenwood 2017). Genetic analyses suggest that the Bornean elephants are genetically distinct from other populations and are indigenous to the island, which warrants high conservation importance (Fernando *et al*. 2003; Sharma *et al*. 2018). Sabah, lists elephants as a "Totally Protected Species" under Schedule 1 of Wildlife Conservation Enactment 1997 and the IUCN Red List, as 'endangered' (Williams *et al*. 2020). Despite being legally protected, laws are often not adequate to safeguard the species. The Bornean Elephant Action Plan for Sabah 2020–2029 states that the main threats to the species are habitat loss and habitat fragmentation, retaliatory killing due to Human-elephant conflict and more recently, deaths due to poaching for their tusks and possible unintentional chronic poisoning due to chemicals used in plantations (Sabah Wildlife Department 2020).

The death of 14 elephants in 2013 in the Gunung Rara forest reserve was so far the biggest conflict incident in Sabah (Othman *et al*. 2013). In 2018, 31 elephants were found dead due to various causes including complications from wounds inflicted by snares and gunshots, and disease (Sabah Wildlife Department 2020). The factors underlying human-elephant conflict in Sabah are multifaceted and records of oil palm plantations experiencing conflict date back to the early 1990s (Sale 1994). Conflict can be linked to the massive land conversion during that period, which resulted in major habitat loss and conversion of forests into agricultural land and settlements. Subsequently, oil palm plantations were developed adjacent to and in forest reserves, which left some reserves such as the Kinabatangan floodplain and Tabin Wildlife Reserve, severely fragmented. Land

Manuscript Editor: Prithiviraj Fernando

use plans in elephant range often failed to factor in the large land area elephants need to survive and their basic requirements, particularly access to freshwater and food. As the plantations were developed, large plantation companies that could afford electric fences constructed them along their boundaries, often without considering habitat and movement needs of elephants. This created movement bottlenecks, leading to artificially high elephant densities and conflict in some areas, often with local communities and oil palm smallholders at the receiving end (Estes *et al*. 2012; Othman *et al*. 2019).

In the 1970s, oil palm was planted in approximately 38,433 ha, which increased to 715,736 ha by 1997 (Fuad *et al*.1999). Most of the early plantations have now ended one productive cycle of 20–25 years and are replanting. During this period, human-elephant conflict incidences have steadily increased.

The Kalabakan landscape

The Kalabakan landscape is 2380 km^2 and located in the Tawau District, in south-eastern Sabah. It is connected to the main Central Forest Block, which has a land area of approximately 9200 km^2 and is the largest forest block in Sabah (Sabah Forestry Department 2017). Kalabakan is a dynamic multiple-use forest landscape that lies within the Government of Malaysia-UNDP project area and is a conflict hotspot (Othman *et al*. 2013). It comprises parts of totally protected forests and production forests, fragmented forests such as the Brantian-Tantulit virgin jungle and the Ulu Kalumpang Forest Reserve and oil palm plantations, industrial tree plantations and to a lesser extent, rubber estates. Landuse change is still occurring in the Kalabakan landscape, as shown by the land use in 2016 in Figure 1 (Sabah Forestry Department 2019).

The plantations of Sabah Softwoods Berhad (SSB), an industrial tree plantation and oil palm plantation company, lie within the Kalabakan landscape. The plantations are in two blocks; Kalabakan in the west (19,100 ha) and Brumas in the east (41,500 ha). SSB has experienced elephant damage since 2004 despite using several measures to protect their crops such as crop protection patrols, trenches, using 'canon' blasts, translocation of problematic elephants and setting up electric-fences along their boundary.

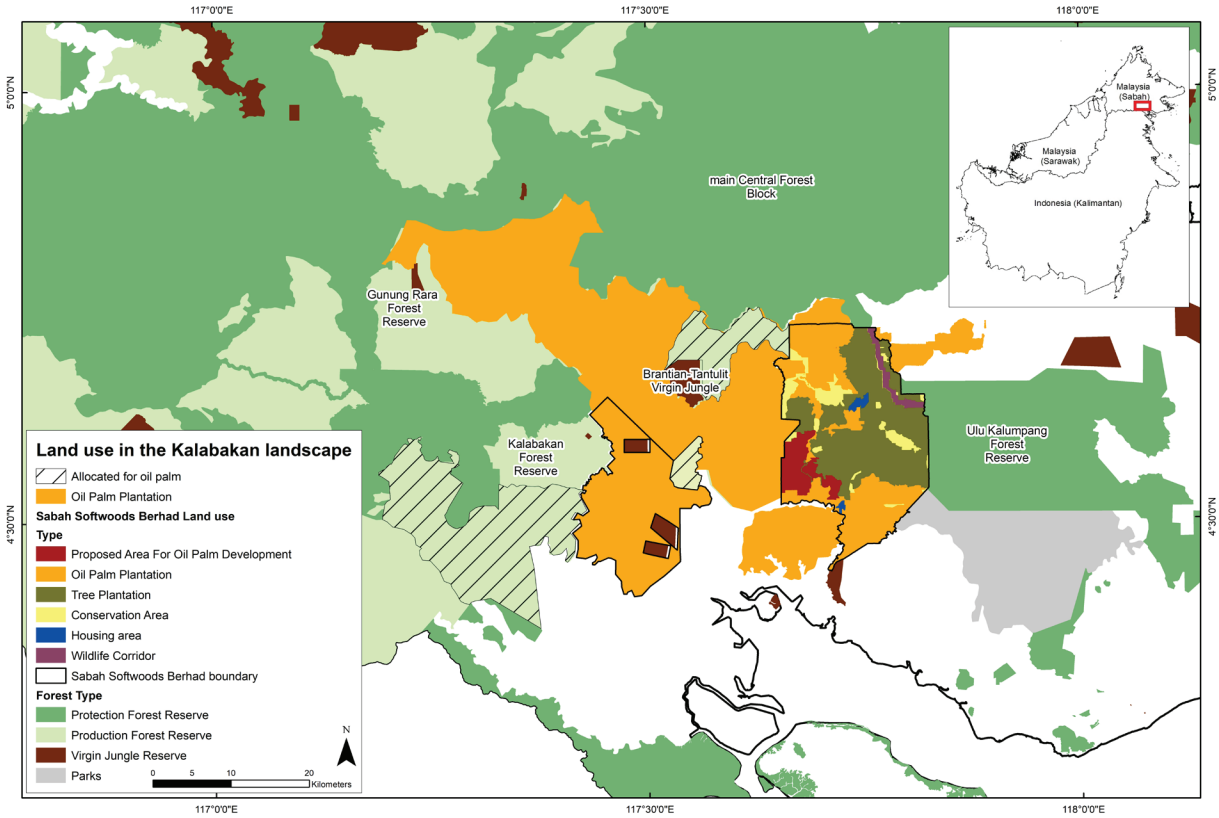

Figure 1. Land use in the Kalabakan landscape in 2016.

Collaboration between WWF and SSB

Since 2012, World Wide Fund for Nature (WWF) has engaged with SSB to find long-term solutions to address the conflict situation. As a result, in 2013 a 1067 ha (1.76%) of SSB land was set aside as a wildlife corridor to connect the fragmented Ulu Kalumpang Forest Reserve to the main Central Forest Block. This is the second largest area set aside by a plantation company for conservation in Sabah to date. The lost opportunity cost of setting aside this corridor – if planted with timber trees – would be RM 20 million for two rotations. The company also decided to restore the corridor with indigenous dipterocarps, pioneer species and fruit trees at their own expense. Furthermore, they agreed to strategically fence off their housing units and young oil palm trees (ages 8 years and below) based on WWF's recommendations (Fig. 2). Elephants were also allowed access to mature oil palm areas and tree plantation areas, since elephants caused minimal damages in them. Approximately 12,900 ha of young oil palm and 420 ha of housing units were fenced off by 2016, while 40 km of electric fences were removed from mature oil palm and tree plantation areas between 2015 and 2016.

Working group

As the main contributing factors of human-elephant conflict in the Kalabakan landscape was insufficient land-use planning and habitat fragmentation, a landscape-level approach and a platform for discussion was required to address the issue.

A multi-stakeholder working group for the Kalabakan landscape was set up in January 2016 with the purpose of minimizing human-elephant conflict through joint implementation of mitigation measures and to promote co-existence of plantations and elephants. It comprised the state forest and wildlife departments, Sabah Foundation, WWF as the facilitator, and eleven representatives of oil palm and tree plantation owners/licensees that were experiencing human-elephant conflict (SSB, Benta Wawasan Sendirian Berhad, Greenmax Sendirian Berhad, Samel Plantation Sendirian Berhad, Rinukut Plantation Sendirian Berhad, Usahawan Borneo Plantations Sendirian Berhad, Serijaya Industri Sendirian Berhad, FELDA Global Ventures Plantations Sdn Bhd, Yu Wang Plantation Sendirian Berhad, Golden Borneo Palm Sendirian Berhad and Hutan Kita Sendirian Berhad).

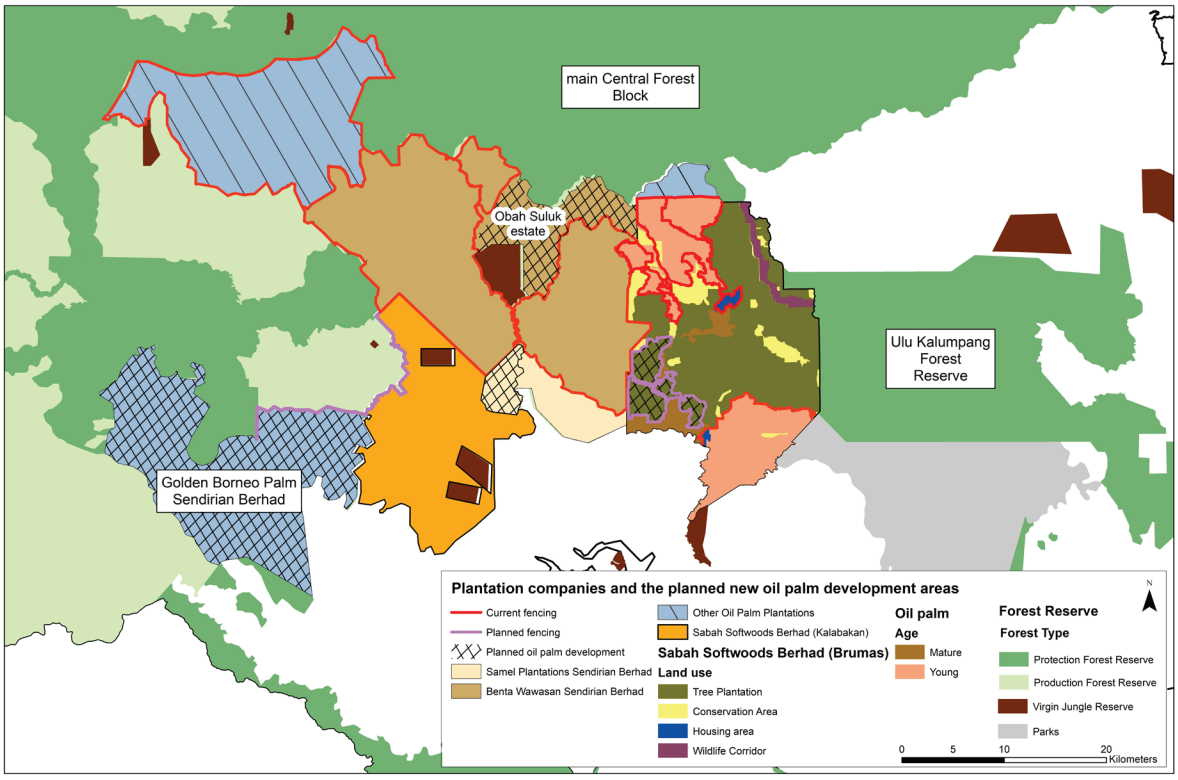

Figure 2. Different plantation company areas in the Kalabakan landscape and the location of the new oil palm development areas.

Through the working group deliberations, it was identified that the new oil palm development area (3200 ha) in SSB (Fig. 2) could become a potential conflict area. The area at the time was planted with fast-growing tree species *Albizia falcataria*, *Acacia mangium* and *Gmelina arborea* that had reached the harvesting stage. After harvest, the land was to be converted into oil palm. Once converted, the area had to be electric-fenced, to protect the young oil palm crops. The movement data from the collared elephants showed that they used the area. If it was fenced, it would restrict the movement of elephants from the neighbouring Samel Plantation Sendirian Berhad into SSB's tree plantation area.

Similarly, new oil palm development plans in Samel Plantation Sendirian Berhad and Benta Wawasan's Obah Suluk estate, were identified as potential conflict areas due to elephant presence there (Fig. 2). If these areas were planted with oil palm and fenced off, it would have further exacerbated the conflict.

Recognizing this issue, several site-specific mitigation options were identified by WWF to ensure that elephant movement could continue between the Ulu Kalumpang Forest Reserve and the larger Central Forest Block through SSB, Samel Plantation Sendirian Berhad and Benta Wawasan Sendirian Berhad.

The Golden Borneo Palm Sendirian Berhad was also identified as a potential conflict area, but because the land use to the south of it was dominated by oil palm with no remaining forests and because the company planned to install electric-fences along their boundary, no interventions were recommended at the time.

Information used for making decisions

The plantation maps, planting plans, land use and locations of electric fences for most plantations were obtained by WWF in 2016. The land use maps provided information on the location of the planted areas, unplantable areas, conservation areas and housing areas while the planting maps showed the year of planting of the palm trees within specific blocks in the plantation area. These maps were subsequently digitized using the ArcMap 10.1 (ESRI, Redlands, California) and areas that were undergoing oil palm development were identified. Information on elephant movements were obtained from four satellite-collared females belonging to four herds, collared between April 2014 to October 2016. These tracked herds represented approximately 90–100 elephants using the Kalabakan landscape.

Outcomes

As a result of the discussions held by the working group, it was decided to set aside connectivity areas for elephants that had the following criteria;

1. Low-lying terrain

A priori, elevations below 300 m were deemed suitable for elephants. Low-lying terrain was identified by determining the elevation of potential connectivity sites using a 30-m resolution Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM), which was obtained from the United States Geological Survey, Earth Explorer site (http://earthexplorer.usgs.gov/). The elevation data was extracted using the Spatial Analyst tool in ArcMap 10.1. and areas below 300 m were identified.

2. Riparian habitat in plantations

Where rivers flow through plantations into forests, it was decided to consider riparian borders as connectivity areas and to ensure that their access by elephants was not prevented by electric fences. The size of the riparian buffer/reserve in Sabah is related to the width of the river as stipulated by the Sabah Water Resources Enactment 1998 which states that rivers more than 3 m in width are required to provide a minimum of a 20 m vegetated zone on each riverbank. No land clearing or deforestation is allowed in riparian buffers.

3. Elephant presence

Elephant presence in the area was identified using satellite-collared movement data.

Site-specific mitigation measures

In order to allow elephant movement through the landscape, four site-specific measures were agreed upon by the working group (Fig. 3). These measures were to be implemented by the respective companies:

Sabah Softwoods Berhad

Due to the company's plan to convert a tree plantation area that had reached harvesting stage into oil palm, which could potentially exacerbate conflict, a potential connectivity site adjacent to Samel Plantation Sendirian Berhad was identified based on land use and planting plans. The site had low-lying terrain and a riparian area. It was decided to have the connectivity area as a "north-south" orientated strip, since it was the shortest distance (6.5 km) to connecting the tree plantations via the SSB conservation area (Fig. 2) and because the company's operational procedure was to start from the north in 2016 and end in the south in 2020. WWF's elephant tracking data from 2014 and 2015 indicated that elephants used the area.

Location of the corridor on the ground was made after field visits by a WWF and SSB team. During the visit, the topography and elevation of some points along the proposed connectivity site were assessed and a minimum width of 100 m in non-steep areas and 200 m width in steep areas was recommended. This was done taking into account the minimum reasonable width to facilitate elephant movement and the costs of setting aside the area. This information was shared in a follow-up discussion with the Sabah Wildlife Department and the company's senior management, to convince them to set aside the area. In April 2016, as a first case implementation of a joint solution, SSB agreed to set aside 80 ha of connectivity area, 6.8 km in length, with electric-fencing on the eastern side for newly planted crops (action point #1 in Fig. 3).

SSB also agreed to allow elephants to use their Umas-umas riparian area, which passes through the centre of connectivity area, by providing a 30 m buffer with electric fences on either side. This would enable the elephants to access the tree plantation area (Fig. 3). The river bisects the new oil palm development area, flowing northeast to southwest.

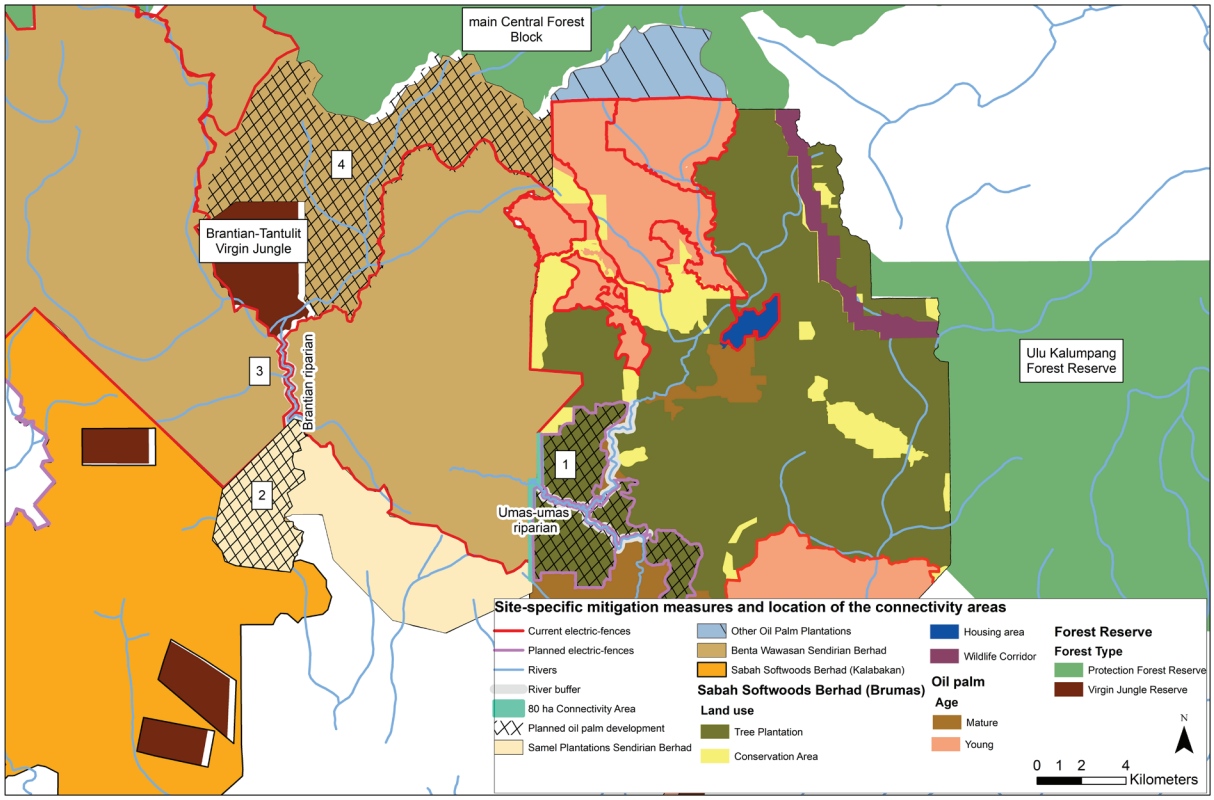

Figure 3. Site-specific mitigation measures and location of the connectivity areas. The numbers denote the locations of actions referred to in the text.

Samel Plantation Sendirian Berhad

The company agreed not to fence their boundary area adjacent to SSB and Benta Wawasan Sendirian Berhad (action point #2 in Fig. 3) and instead only to fence vulnerable areas (newly planted areas and housing settlements).

Benta Wawasan Sendirian Berhad

The company agreed to continue allowing the elephants to use their riparian area (Brantian river), without fencing off the whole plantation (action point #3 in Fig. 3). This enabled elephants to access the Brantian-Tantulit virgin jungle within their concession area and to move further north to the main Central Forest Block. The width of the riparian buffer that was set aside was 30 m on either side of the river, with electric fences installed at the edge of the buffer and for approximately 6 km. In addition, the company also agreed only to fence their vulnerable areas at the Obah Suluk Estate, when they begin operations. This would allow the elephants to use their unplantable areas, to access the main Central Forest Block (action point #4 in Fig. 3).

Of the four site-specific mitigation measures that were agreed upon, action points #1 and #3 were implemented by early 2017, by SSB and Benta Wawasan Sendirian Berhad, respectively. Some blocks of the new oil palm development area in Sabah Softwoods Berhad were planted in phases between 2017–2020, where areas planted with young palms were electric-fenced. Samel Plantation Sendirian Berhad decided not to install electric-fences for now due to licence issues, which meant that the elephants have continued to use their plantation (action point #2). Similarly, Benta Wawasan Sendirian Berhad's Obah Suluk Estate had also not begun operations, so no fences were installed (action point #4).

Movement patterns of collared elephants

The movement of two collared female elephants named 'Bang' and 'Sebatik' that were in separate groups, were monitored from December 2014 to December 2020. Figure 4 depicts the movement of Bang between January 2015 – December 2020 and Sebatik between October 2016 – December 2020. Their movement patterns show that they intensively used the tree plantation areas in SSB, presumably because of the abundant grass in them. However, the conservation areas, which are mainly water catchment areas and are steep, were avoided by the collared elephants. They also moved frequently in the "east-west" direction between SSB and Samel Plantation Sendirian Berhad. The elephants started to use a small part of the 80 ha connectivity area and the Umas-umas riparian corridor bisecting the new oil palm development area in mid-2017. By 2019–2020, the elephants started using more of these connectivity areas as the planting of oil palm progressed and the areas were fenced off. Their movement patterns also showed that they continued to move through Samel Plantation Sendirian Berhad and the Brantian riparian area to access the Brantian-Tantulit virgin jungle through Benta Wawasan Sendirian Berhad. The elephants then travelled northwards towards the main Central Forest Block and back again into SSB and Ulu Kalumpang Forest Reserve.

The movement of the collared elephants after the mitigation measures were implemented indicates that the efforts undertaken were effective. However, the landscape is still subject to land use conversion and therefore has to be continuously monitored over the long-term, to ensure future development does not disrupt elephant movement.

Reduction in electric-fencing costs

Another example of benefits accruing from having the working group, occurred in 2017 when SSB (Kalabakan estate) and a neighbouring plantation, Golden Borneo Palm Sendirian Berhad decided to set up a joint electric-fence, connecting both their boundaries to prevent double-fencing between the estates (shown in Fig. 2). The areas to the south of these two plantations were surrounded by oil palm, with no remaining forests up to the southernmost extent of the Sabah boundary. This partnership was a win-win solution as they were able to share and reduce the costs of installing and maintaining electric fences in newly planted oil palm areas.

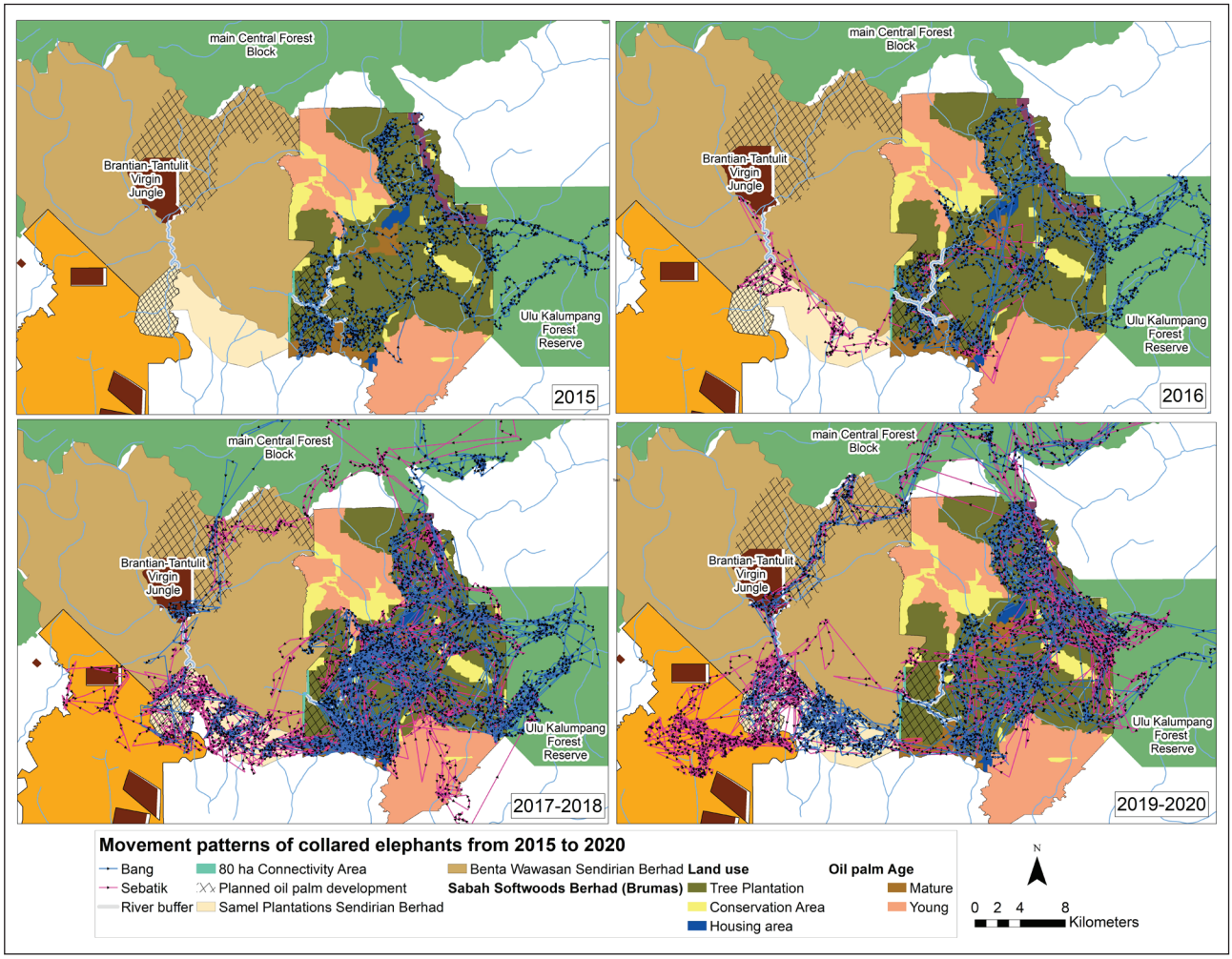

Figure 4. Movement patterns of two collared elephants Bang and Sebatik in two groups, before (2015 - Bang only), during (2016) and after (2017 onwards) the mitigation measures were implemented.

Working group function

During the working group meetings, it was realized that there was no single solution to reduce conflict that was applicable in all situations. The core business of plantation companies is to maximize revenue from their crops, and in order to gain their active participation in conservation, emphasis has to be placed on ways that they can benefit from supporting conservation. The buy-in from the working group was obtained by highlighting the importance of cooperation to find options to mitigate conflict. Through the implementation of the actions determined, the elephants were able to move through the plantation areas and access the main Central Forest Block as well as the fragmented Brantian-Tantulit Virgin Jungle and Ulu Kalumpang Forest. It is also important to note that the plantation owners and licensees agreed not only to allow the elephants to move through the identified connectivity areas, but also to allow elephants to use some parts of their plantations. These results indicate that elephants and plantations can coexist through proper land use planning and cooperation between plantation owners and conservation agencies.

Importance of connectivity in plantation landscapes

It is estimated that almost 70% of Asian elephants occur outside protected areas (Ning *et al*. 2016). Food preferred by elephants is more abundant in plantations and open habitats and they also provide elephants with easy access to food (English *et al*. 2014; Evans *et al*. 2018; Wadey *et al*. 2018). Therefore, it is imperative that connectivity be preserved to facilitate the movements of elephants through plantation landscapes into forested habitats, which may likely reduce conflict as well as encourage gene flow (Goossens *et al*. 2016).

SSB's efforts to establish and restore the 1067 ha wildlife corridor as well as setting aside the 80 ha connectivity area is a huge step forward for the plantation industry, as it indicates their commitment towards conservation. Some 60–70 elephants are now known to be present throughout the year in SSB lands, moving through the plantation with some degree of habituation towards people. In light of this, further initiatives have been taken to increase the plantation workers' safety through awareness programs with WWF.

The efforts by SSB in the Kalabakan landscape and a few others in landscapes such as the Kinabatangan floodplain (Othman *et al*. 2019) mark the beginning of a paradigm shift within the industry, where private companies are starting to play a role in conservation. These measures are crucial as the intensity of conflict increases and especially when the protection of forests alone is not enough to guarantee the species' long-term survival and address human-elephant conflict. These model plantations demonstrate that people and elephants can coexist in a shared landscape, using shared resources if proper mitigation measures are put in place.

Conclusion

While human-elephant conflict can be reduced and coexistence is achievable, we emphasize that mitigation can only reduce conflict and not eliminate it, as long as development continues in elephant habitat. The best for elephants and the oil palm industry is for people to be more tolerant and accepting of sharing land with elephants. We can see more plantations such as SSB step up and champion conservation, despite having to bear some costs by keeping elephants in their land. This is a significant success story for the industry and for the conservation of elephants in Sabah, although much more needs to be done. A strategy of evidence-based identification of solutions, collective decision-making and cooperative implementation among land managers, presents a new model of conservation practice for human-elephant conflict reduction in Asian elephant landscapes.

Acknowledgements

We thank the Sabah Wildlife Department, Wildlife Rescue Unit, Sabah Forestry Department, and Sabah Foundation for their support. Dr. K. Yoganand's guidance and technical inputs on the implementation of this study is gratefully appreciated. The authors thank their colleagues; John Japil, Vicculter Denius, Engelbert Dausip, Elbatius Sikul, Frederic Kusam and Max Donysius for their contributions. A special thanks to Dr. Glyn Davies, Dr. Mark Rayan and Mr. Kunna Segar for their inputs, which helped improve this manuscript. We also gratefully thank the reviewer whose constructive comments enhanced the manuscript. Lastly, the authors are appreciative to the members of the Human-Elephant Conflict Working Group for their active participation and cooperation in implementing the mitigation options. This project received financial support from the Malaysian Wildlife Conservation Foundation, WWF-Netherlands and WWF-AREAS.

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