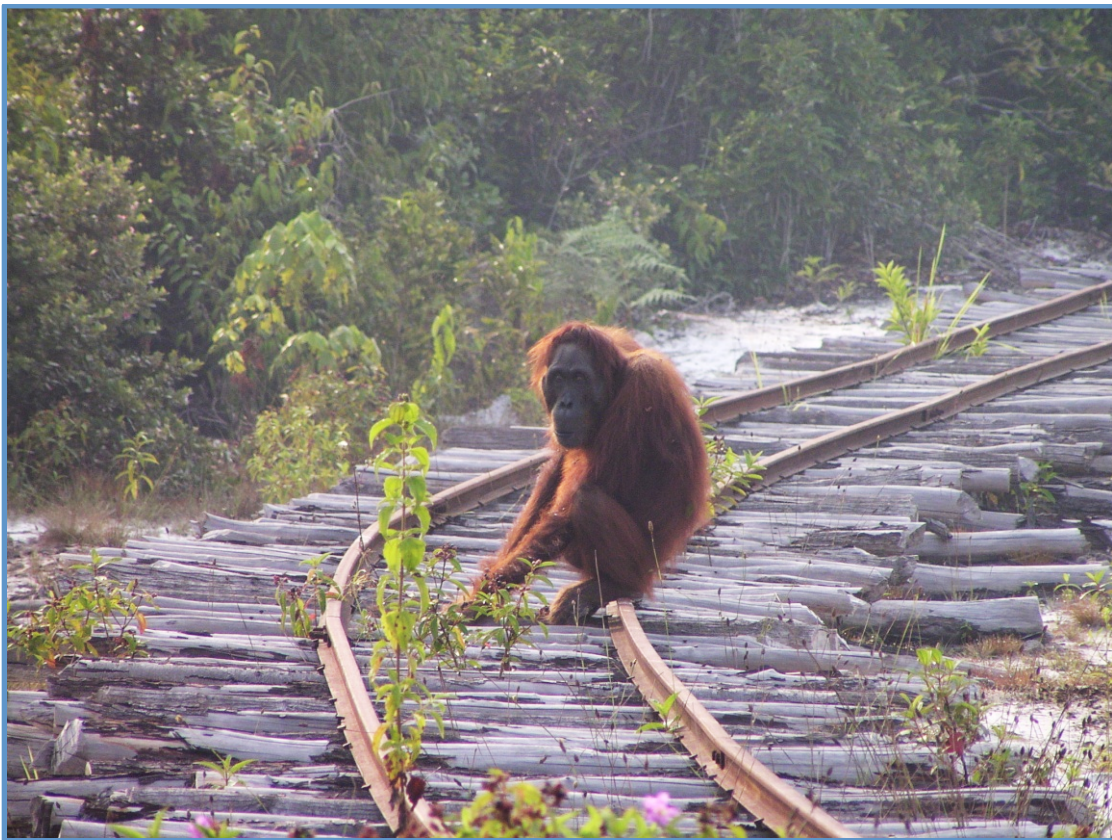


Extractive industries and orangutans



Erik Meijaard and Serge Wich



Summary

The extractive industries in Borneo and Sumatra overlap significantly with orangutan habitat. Concessions given out for timber extraction and mining especially coincide with orangutan habitat, with developments related to oil and gas exploration being less of a threat. Some 29% of orangutan habitat in Borneo is allocated to timber and 15% to mining. For Sumatra, these figures are respectively 4% and 9%.

No comprehensive studies have been conducted on the impact of mining on orangutans. Anecdotal information and our own observations suggest that where open-pit mining and orangutan habitat overlap, orangutans are either translocated or mostly ignored in the mine development process, with detrimental outcomes likely for the orangutans. This is primarily a concern in East Kalimantan Province where coal deposits significantly overlap with orangutan habitat, especially around the Kutai National Park, but also elsewhere in the province. Other threats exist in a number of bauxite deposits in West Kalimantan that also overlap extensively with orangutan habitat. To a much smaller extent such open-pit mining is occurring in Sumatra as well.

The impacts of timber extraction on orangutans have been studied in much more detail than those associated with mining. Orangutans generally cope relatively well with selective logging activities, although they may temporarily vacate an area with intense human disturbance. Depending on the level of damage done in the logging process, orangutans may recover to pre-logging densities if timber harvest amounts are low and residual forest damage limited. In many cases, however, such damage is significant and orangutan densities tend to be much lower. An additional problem is that potential timber revenues from heavily logged forests are low, creating incentives to convert them to mono-cultural plantations, such as oil palm or pulp and paper plantations, which almost exclusively have no carrying capacities for orangutans.

The costs to companies of improving their environmental management can be significant. In markets where companies can thrive by ignoring environmental legislation, there needs to be significant incentive to entice logging and mining operators to invest in orangutan-friendly forest management. Pressure from the public, shareholders, and investors can help when directed at those companies that do not practice sustainable management, although these are often smaller companies with limited exposure to international, environmentally sensitive markets.

We provide recommendations to companies aiming to bring their management practices in line with the goals of orangutan conservation, but we emphasize that the cost and benefits of such practices need to be considered. Minimizing costs and maximizing benefits might be the quickest way to get companies to commit to greener management under the presently depressed economic conditions.

Background

Orangutans (*Pongo* spp) are severely threatened by habitat loss and hunting (Rijksen & Meijaard 1999; Singleton *et al.* 2004; Wich *et al.* 2008) and all wild orangutan populations for which we have good data are in decline (Wich *et al.* 2008). The Sumatran orangutan (*P. abelii*) is currently listed by the IUCN as critically endangered and the Bornean species (*P. pygmaeus*) as endangered (IUCN 2012). Unless effective conservation measures are enacted quickly, most orangutan populations without adequate management face steep declines and even risk extinction in the next few decades (Singleton *et al.* 2004; Meijaard & Wich 2007). Even for orangutan populations in areas with legally recognized conservation status, habitat management and law enforcement need to be improved to prevent further population declines (Robertson & van Schaik 2001; van Schaik *et al.* 2001; Corlett 2007; Linkie *et al.* 2008; Gaveau *et al.* 2009).

The decline of orangutan populations can largely be explained by two factors: 1) unsustainable hunting and killing of orangutans; and 2) habitat loss and degradation (Meijaard *et al.* 2012). Historically, the former factor has played a bigger role in the orangutan's decline than the latter. During the Pleistocene orangutans occurred throughout South-East Asia, from Southern China in the north to Java in the south (Koeningswald 1982; Bacon & Long 2001), while today, their distribution is restricted to the islands of Sumatra and Borneo (Rijksen & Meijaard 1999; Singleton *et al.* 2004), or about 5% of their former distribution range. This decline can be attributed to a combination of human hunting and ecological changes that caused shifts in the occurrence of appropriate orangutan habitat (Jablonski *et al.* 2000). Much of this decline appears to have occurred over the last 15,000 years, apparently speeding up in the last few centuries (Goossens *et al.* 2006), and human hunting of orangutans is thought to have been a major source of population decline during that period (Meijaard *et al.* 2010). In more recent times, starting around the 1960s when large-scale deforestation in Sumatra and Borneo commenced, loss and degradation of suitable habitat been an increasingly significant threat to orangutans, with the conversion of logged-over forest lands into monoculture plantations particularly taking a major toll. Such habitat loss is often accompanied by killing of orangutans because of their (perceived) impact on agri- and silvi-cultural crops, although hunting in remote forests also remains a threat (Meijaard *et al.* 2011; Wich *et al.* 2012a).

The threats of habitat loss and hunting have now resulted in a much reduced and fragmented population of the two orangutan species. On Sumatra the distribution of orangutans is mainly restricted to the area north of the Toba Lake with a small part of the northern distribution extending west of the Toba Lake. South of the Toba lake orangutans can only be found in the two so-called Batang Toru forest blocks (Wich *et al.* 2008). Their total distribution is estimated to cover 8,641 km² of which the vast majority (78%) occurs in the Leuser Ecosystem (a 2.6 million ha conservation area) (Wich *et al.* 2011). Orangutan distribution can be divided into two major forest habitats: forest on drylands and forests on peats. Approximately 90% of orangutan distribution is covered by dryland forests but, due to the much higher orangutan densities in peat swamp forests (Husson *et al.* 2009), approximately 31% of the total estimate of 6,600 Sumatran orangutans are found in peat swamp forests (Wich *et al.* 2011). The distribution on Sumatra is very fragmented and only six populations are thought to be viable (Wich *et al.* 2008).

On Borneo the distribution is perhaps even more fragmented although there are several very large populations. The range consists of some 30 geographically distinct forest areas (separated from adjacent areas by rivers or cleared land more than 1 km wide) in which orangutans are expected to occur (Wich *et al.* 2008). In 2008, the population was estimated to at least 54,000, divided over three subspecies, with 44 populations containing more than 100 animals and several hundred smaller forest fragments containing unknown numbers of orangutans (Wich *et al.* 2008).

Brief history of extractive industries in Borneo and Sumatra

Definition: Extractive industries normally refer to the oil and mining industries (World Bank Group 2004). In this report we expand the context of extractive industries to include all major industries extracting resources from forest habitats of great apes: mining of minerals and other substances such as coal, oil and gas exploitation, but also commercial extraction of timber from forests. We do not include those forest products that are generally extracted at a smaller scale, e.g., non-timber forest products such as rattan and forest honey, or bushmeat. Because our focus is on the impact of these extractive industries on orangutans, we limit ourselves to the two islands where the orangutan species occur: Sumatra and Borneo.

The extractive industries have a long history in Sumatra and Borneo. Indian traders around 200 A.D. referred to Sumatra as the Island of Gold (Whitten *et al.* 1987). A well-established and extensive iron-smelting industry existed in the area of the Sarawak River delta around the 6th century B.C. (Cleary & Eaton 1992). Gold had been obtained from alluvial deposits in Kalimantan (Indonesian Borneo) since the 4th century B.C., and during the 18th century the Sambas area in western Kalimantan was the site of a gold rush (van Leeuwen 1994). In Central and South Kalimantan too there was significant trade in gold obtained by panning in the upper reaches of the region's large rivers (Schwaner 1853-1854; Maks 1861). Alluvial diamonds from South-East Borneo have been traded since the 7th century (Setijadji *et al.* 2010). The scale of this mining would have been comparatively small, and early trade from Borneo and Sumatra with the Asian mainland would have focused more on forest products such as betel-nut palm, bezoar, rhinoceros horn, camphor, tortoiseshell, pepper, civet, and beeswax rather than minerals (King 1993). Still, wherever significant mining deposits were found, this led to local environmental degradation, as well as sometimes significant social conflicts (see, for example, Enthoven 1903).

Royal Dutch Shell started to develop petroleum activities as early as 1885, while Caltex began developing giant fields in central Sumatra in the 1950s (Wunder 2003). Exploration of the large oil reserves of Brunei and western Sarawak (Malaysian Borneo) started in 1899, with Royal Dutch Shell starting operations in 1913 after discovering the Miri field in Sarawak, Malaysia. Commercial tin mining by Billiton Maatschappij started in 1850 and continued until 1958, when Indonesia nationalized Netherlands' properties and dissolved the tin company (Somers Heidhues 1991). Commercial coal mining in Indonesia similarly started early, but took much longer to develop. During the Dutch colonial period (1849–1945), coal was produced in small quantities from mines located on Kalimantan and Sumatra, with the coal being sold primarily to the shipping industry, which relied on coal to raise steam for purposes of powering ship engines. But the scale of the industry was minuscule compared with today (Lucarelli 2010).

People in Borneo and Sumatra have for thousands of years harvested trees for a variety of uses, but it is often assumed that this had relatively limited and only local impacts on forest stands. The occurrence of anthropogenic dark soils on Borneo (Sheil *et al.* 2012), and records of deforestation prior to the industrial timber revolution of the 1950 and 1960s (Knapen 2001) indicate, however, that forest clearing by indigenous communities did lead to relatively large scale deforestation, as indicated by the early clearing around the lower Kapuas in West Kalimantan (Enthoven 1903), the extensive grasslands maintained by clearing and fire in South Kalimantan (Nederlandsch-Indische Vereeniging tot Natuurbescherming 1939), and also the upland grasslands in northern Sumatra (Burton & Ward 1827; Hagen 1890; Schneider 1906). Still, compared to the scale of deforestation following industrial forest clearing these historic processes would have had limited impact on orangutan habitats, although such extractive processes could have been accompanied by hunting, which appears to have greatly affected orangutan populations (Meijaard *et al.* 2010), and is perhaps the reason that Sumatran orangutans had largely disappeared from the south of the island before the start of large-scale deforestation (Rijksen and Meijaard 1999). Industrial-scale clearing of Sumatra's and Borneo's forests occurred after these countries became independent from their previous colonial rulers, becoming one of the main sources of State income. For example, the value of timber exports in Sabah (Malaysian Borneo) rose from M\$420 million in 1971 to M\$2,250 million in 1982, providing over half of all State revenue (Cleary & Eaton 1992). Similar growth occurred in Sarawak (Kaur 1998), as well as in Kalimantan, where timber production increased from 1.16 million m³ in 1971 to 18 million m³ in 1978 (Avé & King 1986). This rapid expansion of the timber industry had a major impact on forest resources. In Indonesia, in 1967, the government of President Soeharto distributed over 60 million ha of timber concessions to private companies (Barr 2001), or about 31% of the entire country. By 1979, Indonesia was the world's largest producer of tropical logs, with an annual export value of US\$2.1 billion, corresponding to a world-market share of 41% (Wunder 2003).

Geography of extractive industries and general environmental impacts

Oil and gas

Oil and gas exploration in northern Sumatra probably does not overlap with orangutan habitat, because it is primarily limited to the eastern coast of Aceh Province and separated from orangutan habitat by agricultural land (Figure 1). On Borneo, the majority of onshore oil and gas production occurs in north-western Sarawak and Brunei, in the Mahakam Delta, and in the Tarakan area (Figure 1). Neither the Sarawak/Brunei area nor the Tarakan area has orangutans, but the Mahakam production area does overlap with the orangutan populations occurring north of the Mahakam River. Most of the oil production in the Mahakam Delta, however, occurs offshore. The direct impact of these industries on orangutans might therefore be limited, and is supported by the finding that oil production in Indonesia appears to have had negligible direct impact on deforestation (Wunder 2003). The Indonesian oil and gas industries, however, have played a prime role in providing roads, bridges and other infrastructure, thus providing key support to economic development that enabled deforestation (Wunder 2003). Also, during the oil-boom periods of 1973–1981, Indonesia's significant revenues from oil and gas production were spent on physical and social infrastructure, agricultural investments and subsidies, strategic

investments and prestige projects, as well as public employment, administration, and the military, and thus might have indirectly boosted agricultural expansion and provided funding for developing the forestry industry.

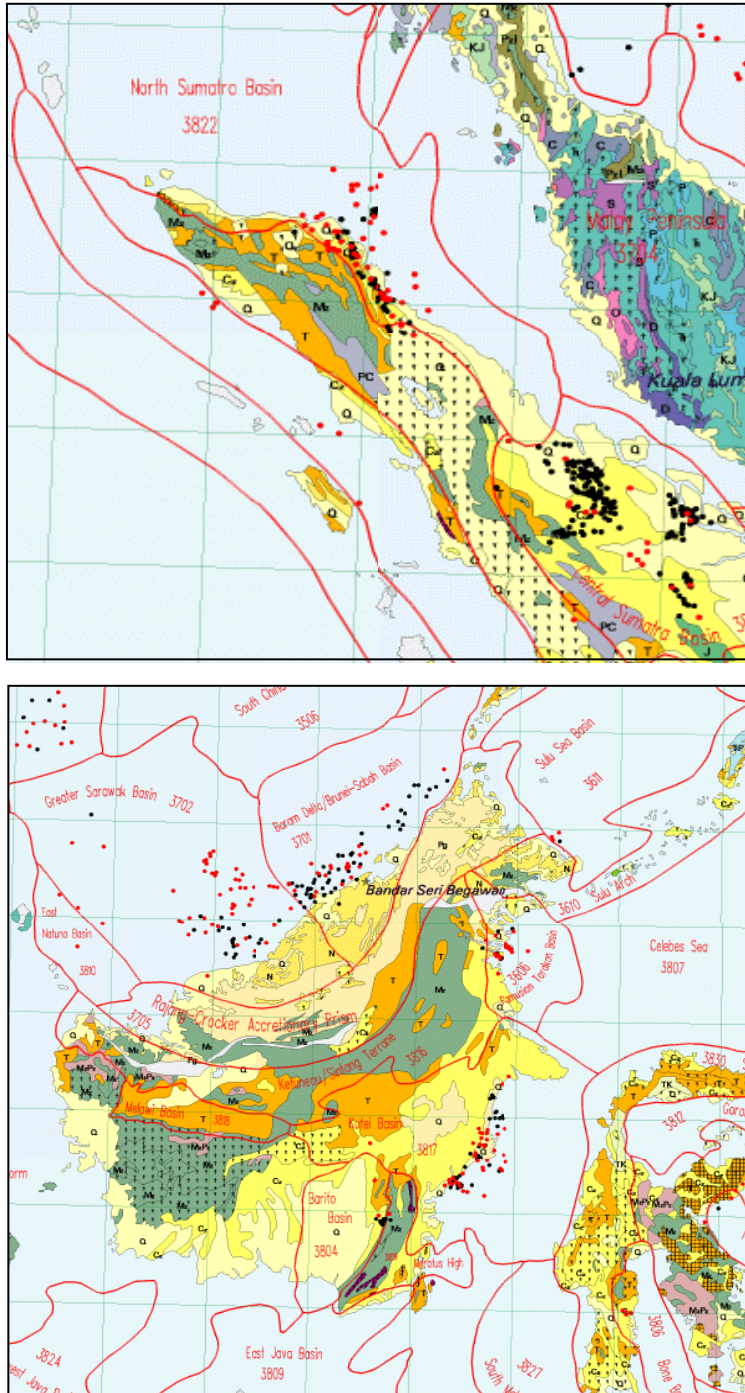


Figure 1. Geological maps of northern Sumatra (above) and Borneo (below) with the center points of oil and gas fields depicted by black and red dots respectively (Steinsouer *et al.* 1997) © US Geological Survey

Coal mining

Coal mining in Sumatra is primarily concentrated in the south-central part of the island ([see here for an overview](#)), but two large deposit areas exist in the north of the island that overlap with orangutan habitat (Figure 2). On Borneo, the situation is quite different and potentially more of a threat for orangutans. Coal is found in several large areas, including south-east Borneo, Pulau Sebuk and Pulau Laut, the large Kutai Basin, Berau, northern Central Kalimantan, where older, metallurgical coals are found, and the middle Kapuas area (Figure 3). Few public data exist about coal mining potential in Malaysian Borneo and Brunei, but the deposits there seem limited. A recently cancelled coal mining prospect in Sabah, however, does suggest that some viable coal deposits exist. The main area of overlap with orangutan habitat is in the large and shallow coal deposits of the Kutai and Berau Basins, while coal deposits and orangutan distribution also overlap in south Central Kalimantan and in the Kapuas valley in West Kalimantan.

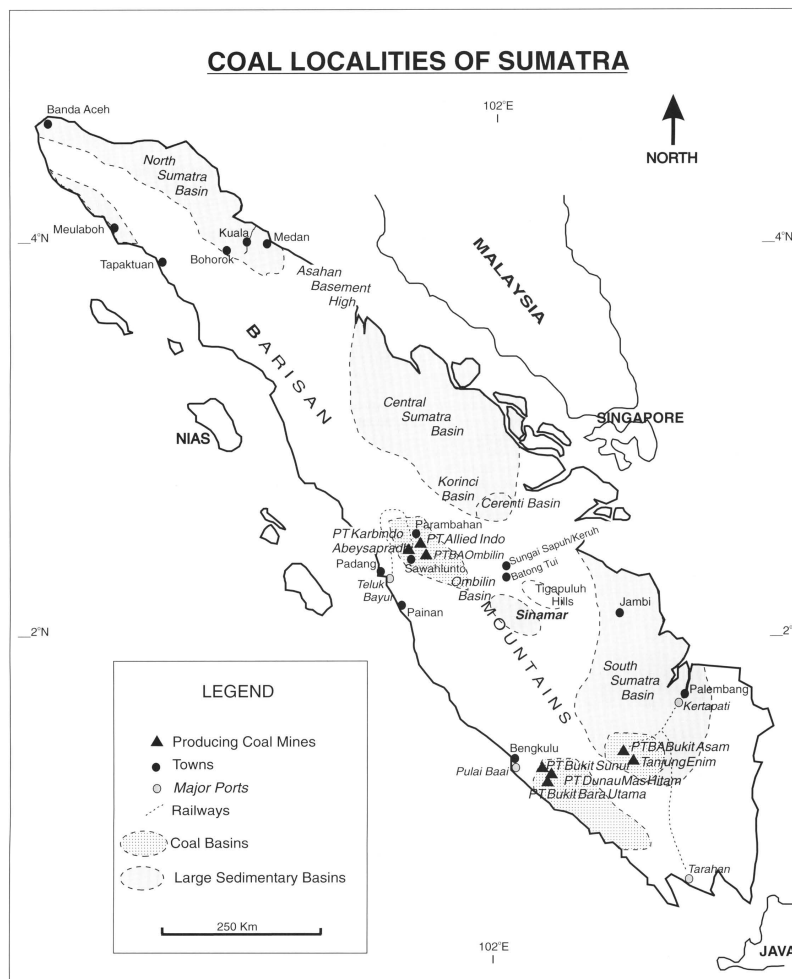


Figure 2. Coal basins of Sumatra (Thomas 2005) © Geological Society of London

The pioneer mining companies chose Kalimantan over Sumatra for a number of reasons. First, the Kalimantan resources were located within the provinces of South and East Kalimantan, with good access to navigable rivers or to coastal areas where ports could be built to load the coal onto sea vessels.

Another location advantage of Kalimantan was its shorter sailing distance to the lucrative export markets of North Asia — Japan, Korea, China and Taiwan — which would reduce the round trip journey by Panamax vessel by at least two days when compared with mines located on South Sumatra. Second, Kalimantan coals when compared with Sumatran coals had higher calorific values and lower sulphur and ash contents. For these reasons, companies applying for 1st Gen CCOW (Coal Contract of Work) all favored Kalimantan over Sumatra and within a few years Sumatra and PTBA were eclipsed by production coming from the Kalimantan mines of companies operating under 1st Gen CCOW (Lucarelli 2010).

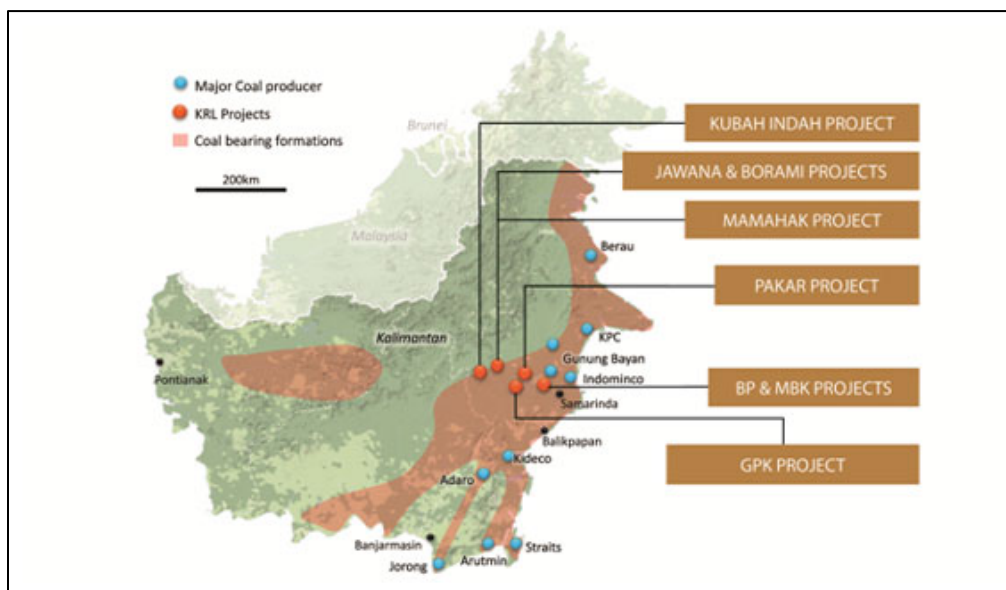


Figure 3. Kalimantan Project Location Map obtained from Kangaroo Resources, showing their concessions and approximate extent of coal mining deposits. © Kangaroo Resources Ltd <http://www.kangarooresources.com/>

Between 2002 and 2005, Indonesian investors either acquired majority ownership stakes or managerial control of Indonesia's four largest coal producers — KPC, Arutmin, Adaro, and Kideco — which in 2002 accounted for 57 percent of total coal production (Lucarelli 2010). Foreign ownership still continues on a minority basis, with new foreign owners coming mostly from either regional power companies (for example, Tata Power of India and Huadian of China) trying to secure access to Indonesian coal supply by taking partial equity stakes in Indonesian coal producers or from international investment banks and funds such as Goldman Sachs, Merrill Lynch, Saratoga Investments, and Farallon Capital Management (Lucarelli 2010). Ownership and investment relationships affect environmental performance. Most mining companies that hold an Indonesian Coal Contract of Work (CCoW) have a strong international outlook and observe best industry practices with respect to environmental protection and community responsibility (Lucarelli 2010). As an indication of the national importance of coal in Indonesia - although revenues from coal companies are said to amount to only about two to three percent of the National Budget - coal companies amount to 18 percent of the market capitalization of the Indonesian Stock Exchange. An analysis of Indonesia's billionaires in Forbes magazine shows that 30 percent made their fortunes, partly or completely, from coal (EITI 2012).

Especially in southern and eastern Kalimantan coals are mined in open-pit mines, often causing significant environmental damage (JATAM 2010). In 2008 and 2009 the South Kalimantan Environment Agency evaluated 40 out of 359 mining companies in the province, all of which violated the environmental management requirements (Barito Post 2010). The head of the Agency commented that if allowed to continue in this manner, South Kalimantan province would be awaiting a disaster within the coming fifteen years. The South Kalimantan Governor also commented on the cases, stating that companies not implementing the environmental management regulations properly would be closed, for it is better to lose government revenues than to sacrifice the environment and remaining forest (Barito Post 2010).

Water pollution is often the greatest concern for local communities, as many villages in Kalimantan are still very much dependent on rivers for bathing, washing, fishing and transport (Yasmi 2003). Some coal mining operations have caused water pollution to such an extent that locals can no longer use it for their daily needs (JATAM 2010), and it affects local fish breeding (Barito Post 2009). Elsewhere, farmers from Jembayan Dalam in the Kutai Kartanegara district, East Kalimantan blamed a coal mine for adulterating and polluting 120 ha of farming lands. Previously used for rice cultivation, the area had become a wastewater ditch. The remaining farming lands yield only a fraction of the rice yielded before the opening of the coal mine, and the rice is of bad quality. The pollution has forced the farmers to look for other sources of income.

In addition to aforementioned localized environmental impacts, coal mining has the potential to inflict serious damage on the national forest estate and conservation areas due to the legal framework that allows for the temporary use of such areas for coal mining. The government decision-makers work under the assumption that these areas will eventually return to the original condition through reclamation, once mining is over. In practice, however, the damage due to mining is often beyond repair.

The USGS Mineral Minebook for 2010 (Kuo 2012) provides insight about where orangutans might be threatened by developments related to coal mining in Kalimantan. Minerals Energy Commodities Holdings (MEC) of the United Arab Emirates expects a coal railway to start operating at the end of 2012 when its coal mine in East Kalimantan Province begins producing; the company plans to begin exporting 14 Mt of coal to Chinese and Indian power producers beginning in 2013. MEC has cooperation agreements in place to acquire the land for the US\$1 billion 140 km railway project and had arranged a US\$750 million loan to finance the railway (Kuo 2012). This railway cuts through the remaining orangutan habitats north of Kutai National Park, a generally fragmented and highly degraded landscape where many orangutan still survive. Other major operators in orangutan areas include Bayan Resources, whose operations span eight mining concessions in East Kalimantan and West Kalimantan Provinces (Kuo 2012), Bumi Resources, which operates the large mine north of Kutai National Park, and various other open pit mining projects, including those by Berau Coal, Essar Power Ltd. of India, and the Churchill Mining plc, whose feasibility study of its East Kutai thermal coal project in East Kalimantan Province indicated that a 30-Mt/yr open pit mining operation was proposed for an initial 25-year period (Kuo 2012).

Mineral mining

Indonesia is endowed with a wide range of key minerals. It is the world's second largest producer of tin and nickel and the fourth largest copper producer. The country also produces significant quantities of gold, bauxite, phosphates and iron sand, and has the potential for alluvial diamond production. The mining industry accounted for 10.8% of Indonesia's GDP in 2009, with minerals and related products contributing one-fifth of the country's total exports. Indonesia's mining industry looks set to post strong average annual double-digit growth of 11.2% in real terms over the forecast period to reach US\$149.8bn in 2015 (Fast Market Research 2011).

The mining industry is a potential threat to Sumatran orangutan habitat in a number of important areas, both directly by its own activities and indirectly by road access. This includes a major gold mine near the town of Batang Toru (Martabe area on Figure 4). As Figure 4 indicates there are mineral clusters for mainly gold and base metals in the area where orangutans occur. The Sumatran gold belt runs straight through orangutan habitat and north of the orangutan distribution exploration of these deposits occur such as in the Miwah cluster. Although within the orangutan distribution the gold clusters, except for the Martabe cluster, are not actively explored at the moment they could very well be in the near future.

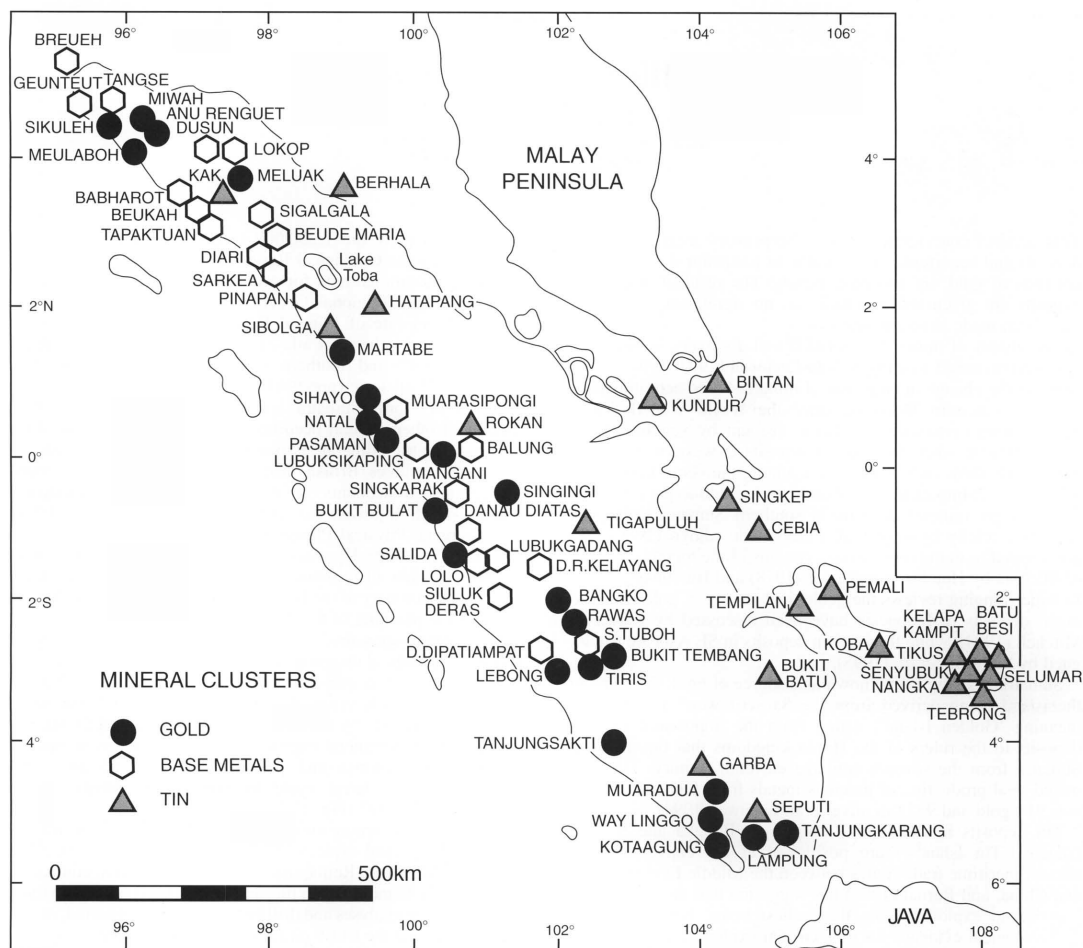


Figure 4. Locations of mineral clusters on Sumatra (Crow & van Leeuwen 2005). © Geological Society of London

Borneo's mineral mining potential is significant. The 'central Kalimantan gold belt', or the old geological Sundaic core of the island, has large numbers of mining prospects running from central Sabah, through western East Kalimantan, and along the central Bornean mountain chain into large parts of west Borneo (Figure 5). Potential overlap with orangutan habitat occurs in parts of Sabah, central East Kalimantan (although coal mining is a much larger threat), and the northern parts of Central Kalimantan. The potential impact seems greatest, however, in the central, western and northern parts of West Kalimantan, where significant bauxite, gold, lead, and other deposits overlap with key orangutan habitats.

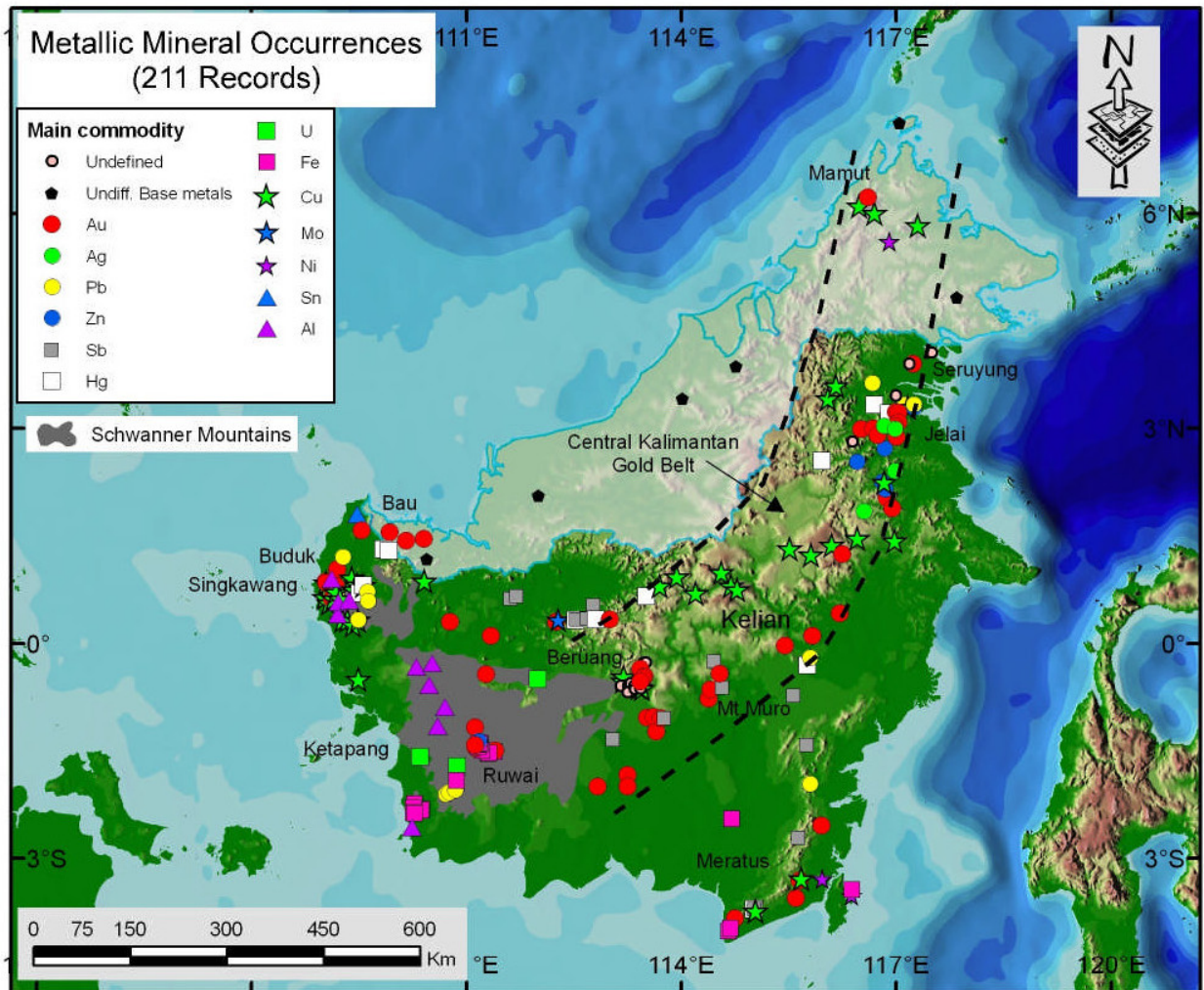


Figure 5. Compiled database on metallic mineral occurrences in Kalimantan (Setijadji *et al.* 2010)

As mentioned above, few public data exist about Sabah and Sarawak's mining prospects, although a study by Tse (2012) indicates that there are few major resources within orangutan habitat that are presently being developed.

Timber

Both Borneo and Sumatra had and still have vast timber resources. These islands are characterized by dipterocarp forests, which are highly productive in terms of harvestable timber volumes per area unit. Also, because of their high growth rates, rich commercial stocking, and a regeneration ecology well suited to canopy opening, these dipterocarp forests are also very suitable for sustainable management (Appanah 1998). Timber yields in these forests are considerably higher than in similar forest types in Africa and South America. In some Bornean forests as much as 70–130 m³ of timber/ha was harvested, while elsewhere on the island extraction rates between 54 and 104 m³/ha were reported (Meijaard *et al.* 2005). In Africa, timber yields are rarely >13 m³ of timber/ha with 2–3 trees harvested/ha, while yields are even lower in Amazonian forests (Davies *et al.* 2001). This generally means that damage from timber harvest in Borneo and Sumatra is more severe, often with up to 80% damage to the canopy (Johns 1989), and potentially large ecological impacts on orangutans in these forests (Husson *et al.* 2009; Ancrenaz *et al.* 2010; Hardus *et al.* 2012).

Selective timber extraction in itself should not be a major problem for orangutan populations, but over-harvest of timber significantly degrades their habitats and reduces population densities (Husson *et al.* 2009; Ancrenaz *et al.* 2010). If forests were allowed to recover, the longer-term impact of such unsustainable logging could be limited (e.g., Knop *et al.* 2004), but in many cases, degraded forests are considered to be a minimal economic value and more intensive land uses, such as plantations for pulp and paper or oil palm production are favored. This indicates that selective timber harvest itself is not necessarily a problem for orangutans, but that the scale and intensity of this process needs to be studied to understand the potential impact this has on orangutan populations (e.g., Hardus *et al.* 2012). An increasing number of timber companies in Sumatra and Borneo are committing to the implementation of proper sustainable forest management, but this is still a minority of the total number of timber concessions active, and at present timber harvest practices should be considered a threat in most places where they co-occur with orangutans. The exceptions, such as the Forest Stewardship Council (FSC)-certified Deramakot concession in Sabah, provide positive examples of how productive forest uses can be reconciled with long-term orangutan conservation goals (Mannan *et al.* 2003; Matsubayashi *et al.* 2011).

Methods

We conducted a literature review of publications that reported how the extractive industries on Sumatra and Borneo had affected orangutans. Publications were accessed in the scientific and grey literature, while we also searched local newspapers (in Indonesia only). We specifically looked for ecological studies about the impact of natural resource extraction on orangutan densities and behavior. This included recent spatial analyses of remaining orangutan habitat in Borneo and Sumatra. In addition, we reviewed legislation relevant to the natural resource sector, and how this could affect orangutan conservation.

Based on new survey information on orangutans and a compilation of concessions given out for mining and timber, we conducted spatial analyses to quantify how orangutan habitat could be affected if all planned mining activities were indeed implemented.

Results

Logging

Logging and orangutan distribution

A recent study (Wich *et al.* 2012b) showed that an estimated 29% of the current orangutan distribution in Borneo is found in natural forests exploited for timber, where logging is allowed but forest conversion is prohibited (Figure 6). A smaller proportion (21%) of orangutan distribution lies within protected areas where logging and conversion are prohibited. An almost equal percentage (19%) overlaps with undeveloped industrial oil palm concessions, and 6% overlaps with undeveloped industrial timber plantations. These concessions are still forested but are likely to be converted to plantations in the near future. Finally, an estimated 25% of the orangutan distribution range occurs outside of protected areas and outside of concessions, with 13% and 12% on “conversion forests”, and in “production forests”, respectively. “Conversion forests” include forested regions allocated explicitly for non-forest purposes.

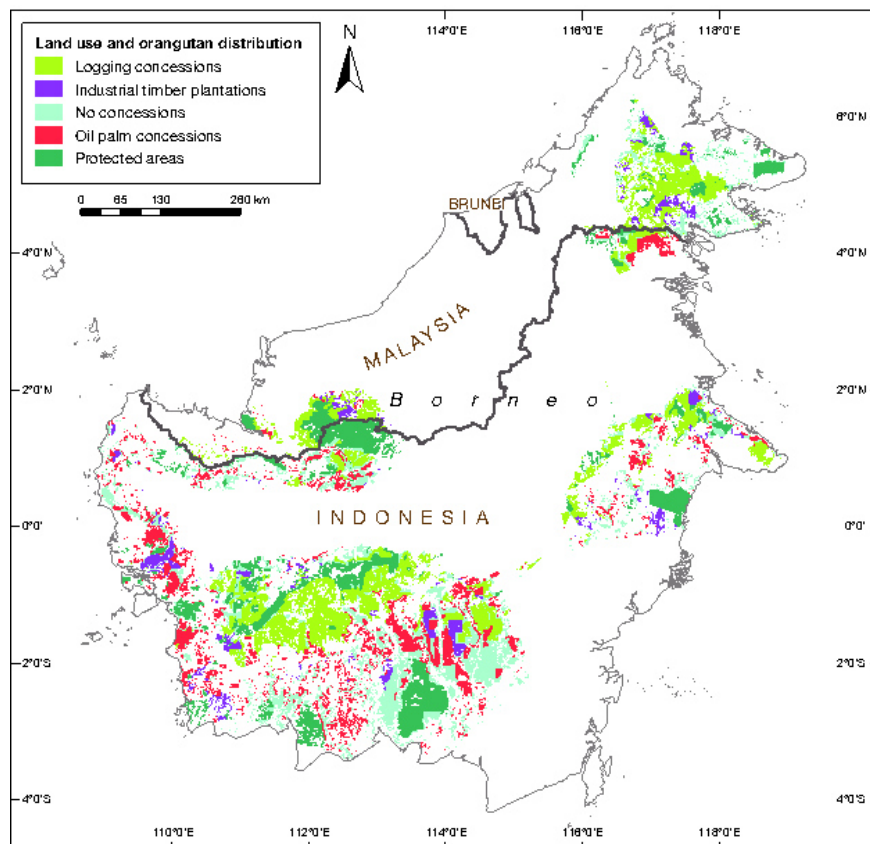


Figure 6. Orangutan habitat in Borneo and the land use to which it has been allocated. ITP = industrial tree concessions and IOPP = industrial oil palm concessions (Wich *et al.* 2012b)

On Sumatra almost equal percentages of the orangutan distribution are found within protected areas (43%) and outside protected areas and concessions (41%). The overlap of the orangutan distribution with logging concessions is much less than on Borneo with only 4% of the orangutan distribution being in logging concessions. The overlap with plantation concessions (almost exclusively oil palm plantations) is 3%, whereas 9% of the orangutan distribution is under mining concessions (Figure 7).

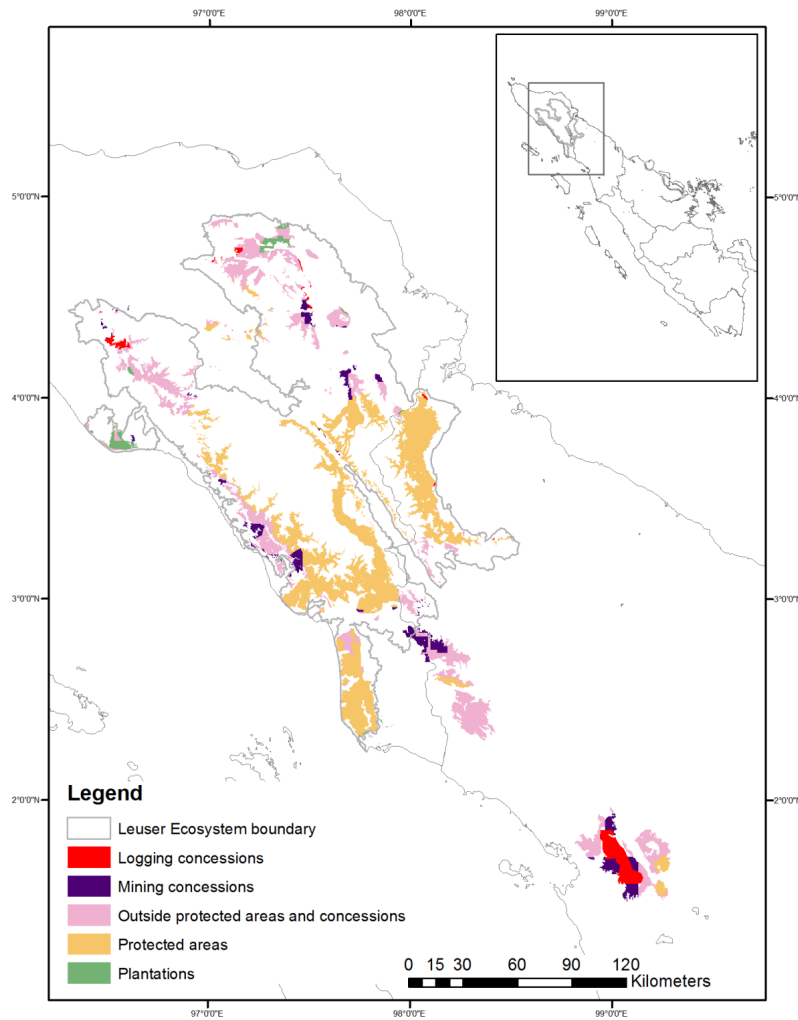


Figure 7. Orangutan habitat in Sumatra and land use allocation.

Note: Protected areas were defined as those areas that fall under management by the Ministry of Forestry and that are strictly protected. So they do not include the Leuser Ecosystem area outside of the Gunung Leuser National Park, in Aceh, which has been designated as a National Strategic Area. Including this area into the protected area category would increase the percentage of orangutans in protected areas, but would also create considerable overlap between the concessions and protected area category. Multiple boundaries of Gunung Leuser National Park exist and we decided to use that mentioned in SK. 276.

Logging, orangutan density and behavior

There is now sufficient evidence indicating that selectively logged natural forests can conserve orangutan populations on both Borneo and Sumatra (Mannan *et al.* 2003; Ancrenaz *et al.* 2005; Husson *et al.* 2009; Ancrenaz *et al.* 2010; Hardus *et al.* 2012). Several studies have indicated that orangutan populations can survive in logged areas, but that this is often accompanied with a decrease in their density that depends on logging intensity (Felton *et al.* 2003; Knop *et al.* 2004; Husson *et al.* 2009; Ancrenaz *et al.* 2010). Data compiled by Husson *et al.* (2009) show that, for Borneo, the higher the logging intensity the more the orangutan density decreases (Figure 8). Other long-term data from Borneo indicate that orangutan density can be stable with appropriate management (Ancrenaz *et al.* 2010).

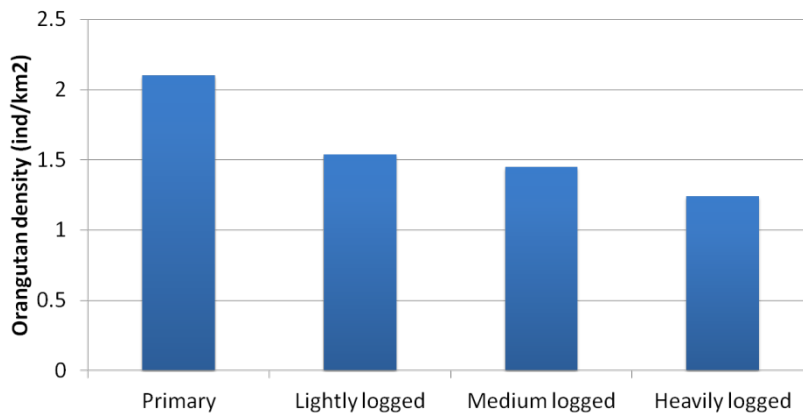


Figure 8. Orangutan densities for Borneo under different logging intensities. Based on Husson *et al.* (2009).

A recent large scale nest survey on Sumatra (Wich, unpubl. data) shows similar results to those of Borneo with primary forests transects having a mean number of nests/km that is higher than that of transects in forests that have been logged (primary forest #nests/km: 14.0 ± 12.8 , $N = 60$; logged forest #nests/km: 5.9 ± 5.0 , $N = 52$). This difference would be even larger if corrected for elevation because examining only transects in primary forests there is a slight decrease in density with elevation and the mean elevation of the transect in logged forests is 346m asl ± 371 , whereas that of transects in primary forests is 848m asl ± 381 . The transects in Sumatra had dissimilar logging intensities, and duration after logging differed as well, but these could not be quantified during the surveys. But in several cases the transects were in logging concessions where logging had ceased more than 20 years ago indicating that orangutans are likely to survive in such areas in the long term (Knop *et al.* 2004) mirroring earlier studies (Rijksen 1978; van Schaik *et al.* 1995; Rao & van Schaik 1997). Previous orangutan nest surveys by SW in the late 1990s came across some transects that were heavily logged and did not contain any orangutan nests, while adjacent primary forests still contained orangutans. It is difficult to be absolutely positive that orangutans had occurred earlier in the logged forests, but it is likely that they had which indicates that after heavy logging orangutans disappear from such areas. In those cases it is likely that some males might move away, but that females remain and in many cases likely die if food availability decreases to such a low level that it cannot support them anymore (van Schaik 2004).

Although there is now a reasonable amount of data on orangutan density after logging there are much less data on which behavioral changes occur during and after logging. On Sumatra one short-term (Rao and van Schaik 1997) and one long term study (Hardus *et al.* 2012) have studied the effects of logging on orangutan behavior in the Ketambe research area. These studies show that in terms of activity budget orangutans spend more time traveling and less time resting in logged than primary forest. Both studies also showed that there was more time spend feeding on fruits in the primary than logged forest and the Rao and van Schaik (1997) study also showed that there were more feeding bouts on leaves in the logged forest than in the primary forest. Both studies also showed a difference in locomotion styles between logged and unlogged that indicated that in logged forest more energetically expensive styles of locomotion are used. Such energetically more expensive locomotion in combination with less time spend on feeding fruits could potentially lead to negative energy balances in orangutans living in logged forest as has been indicated by Knott (1998) for the fruit scarce periods between masting periods in Gunung Palung (Borneo).

Although we do not know of other studies that were able to make such a direct comparison between behavior in logged and unlogged forest, an alternative is to do a cross-site comparison and assess whether there are large differences in activity budgets and diet between logged and unlogged sites. Activity patterns between the various sites (Figure 9) do not show a clear difference between logged and unlogged sites. Of course this is a rough comparison that does not take into consideration potential age-sex differences, sub-species variation, or impacts of whether the sites were in dryland forests or peat swamp areas or a mixture of these.

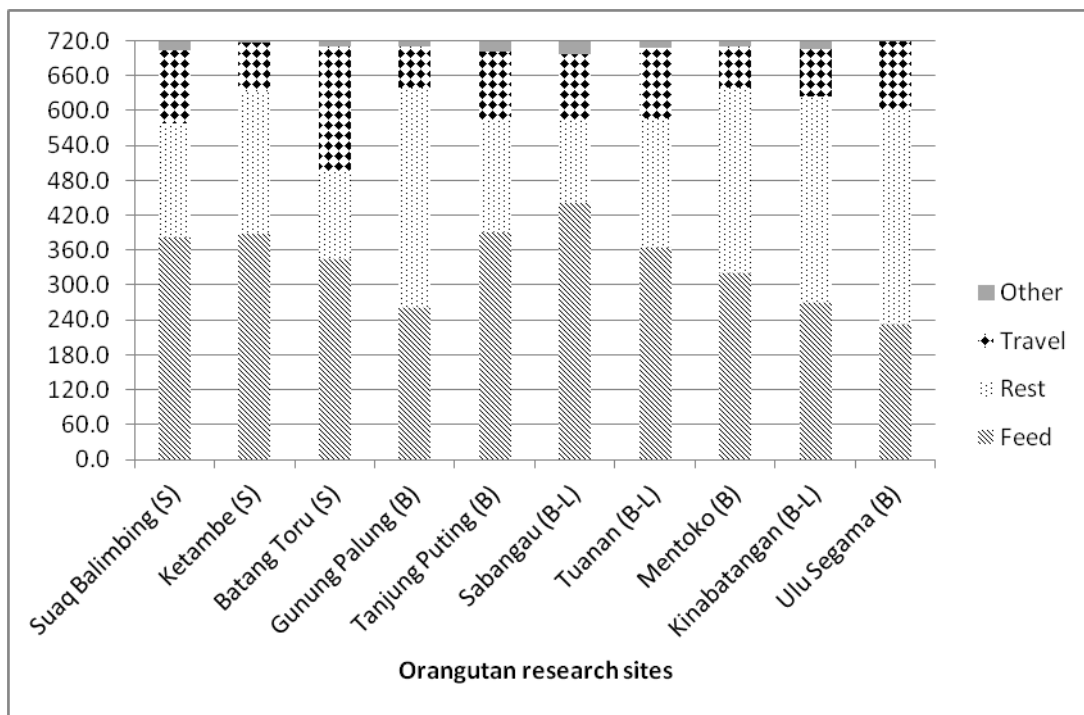


Figure 9. Orangutan activity budgets based on Morrogh-Bernard *et al.* 2009 and Wich *et al.* 2013. S = Sumatra; B = Borneo, L = logged.

Again, comparing diet data across sites (Table 1) does not indicate clear differences between logged and unlogged sites. Again caution should be taken when comparing mean and range data without making careful controls for the above-mentioned confounding variables. But at least both the activity and diet data show that orangutans in these logged areas seem to be very comparable to the patterns we see in orangutans in primary forests.

Table 1. Orangutan diets in logged and unlogged forests

Site and Range	Fruits	Flowers	Leaves	Bark	Invertebrates	Other
Suaq Balimbing (S)						
mean	66.2	-	15.5	1.1	13.4	3.8 (inc. fl)
low fruit - high fruit	62.7 - 69.6	-	18.3 - 12.7	0.8 - 1.4	14.6 - 12.2	3.6 - 4.1
Ketambe (S)						
mean	67.5	3.5	16.4	2.7	8.8	1.3
monthly range	57.5 - 71.5	-	10.6 - 20.1	2.2 - 3.3	5.7 - 11.7	-
Batang Toru (S)						
mean	73.7	5.3	6.8	2.9	2.9	8.4
Sabangau (B-L)						
mean	73.8	9.0	5.1	1.5	8.6	2.0
monthly range	24.4 - 91.9	0.0 - 60.2	0.3 - 17.4	0.0 - 9.1	0.7 - 28.0	0.1 - 4.9
Tuanan (B-L)						
mean	68.6	5.9	17.2	1.0	6.3	0.6
monthly range	26.3 - 88.0	0.0 - 5.1	4.5 - 49.5	0.0 - 5.9	0.3 - 24.1	0.0 - 2.5
Tanjung Puting (B)						
mean	60.9	3.9	14.7	11.4	4.3	4.0
monthly range	16.4 - 96.1	0.0 - 41.1	0.0 - 39.6	0.0 - 47.2	0.0 - 27.2	0.0 - 21
Gunung Palung (B)						
mean	70.0	5.1	13.4	4.9	3.7	2.9
monthly range	25.8 - 99.0	0.0 - 49.6	0.1 - 41.1	0.0 - 30.9	0.0 - 14.0	0.0 - 9.2
Kinabatangan (B-L)						
mean	68.0	1.3	22.9	6.7	1.2	-
Mentoko (B)						
mean	53.8	-	29.0	14.2	0.8	2.2 (inc. fl)
monthly range	25.7 - 89.0	-	5.3 - 55.6	0.0 - 66.6	0.0 - 11.1	0.0 - 2.5
Ulu Segama (B)						
mean	51.5	-	35.6 (inc. fl)	11.2	2.1	-
monthly range	10.0 - 90.0	-	8.3 - 75.0	0.0 - 36.7	0.0 - 8.3	-

Note: Mean values and ranges are presented. For Suaq Balimbing monthly ranges were not available, but low and high fruit availability values were available so these are reported. Values obtained from Morrogh-Bernard et al. (2009). For Batang Toru the 'other' category contains pith and stem. Due to the preliminary nature of the Batang Toru monthly ranges are also not yet known for Batang Toru. For some food items data was not available from some sites. S = Sumatra, B = Borneo, L = logged. Based on Morrogh-Bernard et al. (2009), and Wich et al. (2013).

It is worth mentioning here that the sites that were indicated as being unlogged in the cross-site comparison and had the data collected when they were still primary, there now is or recently was logging at each of these sites. As a result Ketambe, Suaq Balimbing, Gunung Palung, Mentoko and Ulu Segama are now all sites with various logging intensities. In the coming years we can thus expect more behavioral data to come out of these sites that allow for pre- and post-logging comparisons.

Overall it thus seems that a moderate amount of logging does lead to a decrease in density that will probably slowly become smaller as the forests have time to regenerate and orangutan densities increase again. In addition, a moderate amount of logging seems to have no large effects on activity budgets and diet once logging has ceased. Both these findings argue for an important potential role of logging concessions in orangutan conservation as long as they are well managed and logging is moderate. At the end of this document we will provide some recommendations as to what we consider moderate logging or logging that has a reduced impact on orangutans. It is thus important to assess how well logging concessions are protected against encroachment and whether they are using logging regimes that fall within the range that would allow orangutans to survive.

Logging concessions appear to be as effective as protected areas in reducing rates of smallholder encroachment (Gaveau *et al.* 2012). We are now slowly seeing a change in perception among forestry concession holders, conservation workers, and governments with increased understanding that logging concessions are an important component of maintaining forest habitats while promoting economic development (Putz *et al.* 2012). The quality of management, for example as indicated by timber extraction rates, damage to residual stands, and hunting control is very important. Concessions where timber is not harvested through reduced impact logging practices, however, tend to have far lower orangutan densities (Ancrenaz *et al.* 2005; Ancrenaz *et al.* 2010). Certification, for example through the principles and criteria of the Forest Stewardship Council (FSC), could guarantee such management, but take up of certification remains low in Asian forests because often the costs outweigh the benefits (Dennis *et al.* 2008). There is progress though, with the Sabah State Government having made the commitment to certify all remaining natural and planted forests under FSC by 2015. These positive observations come with an important caveat. Logging concessions are officially selected for sustainable, selective logging, and should remain forested permanently. However, several logging concessions that have been depleted of commercial timber stock following overexploitation in the past decades have been reclassified for industrial tree plantations in Indonesia and Malaysia and even for oil palm development (in the case of Sabah) (Obidzinski & Chaudhury 2009; Faeh 2011; Wicke *et al.* 2011). Thus, compared to protected areas, logging concessions are more vulnerable to changes in land use status that might encourage deforestation. With most Bornean orangutans surviving in selectively logged natural forests, the future of the species will largely depend on commitment from governments and companies to reduce deforestation and forest degradation rates in this land use type and maintain these production forests for sustainable timber harvest in the long-term.

Mining

Mining and orangutan distribution

Mining concessions overlap with orangutan habitat in both Kalimantan and Sumatra (Figure 7 and Figure 10). No official mine concession information in Sarawak and Sabah could be obtained for this study, but on the basis of the presence of coal and mineral deposits, the threat of mining to orangutans in these Malaysian states appears limited. Mining concessions in Borneo overlap with other concessions thus for this report we examined the extent of the orangutan distribution that is shared with mining concessions. The results of this analyses show that 15% of the orangutan distribution overlaps with mining

concessions. For Sumatra the same analysis showed that 9% of the orangutan distribution overlaps with mining concessions.

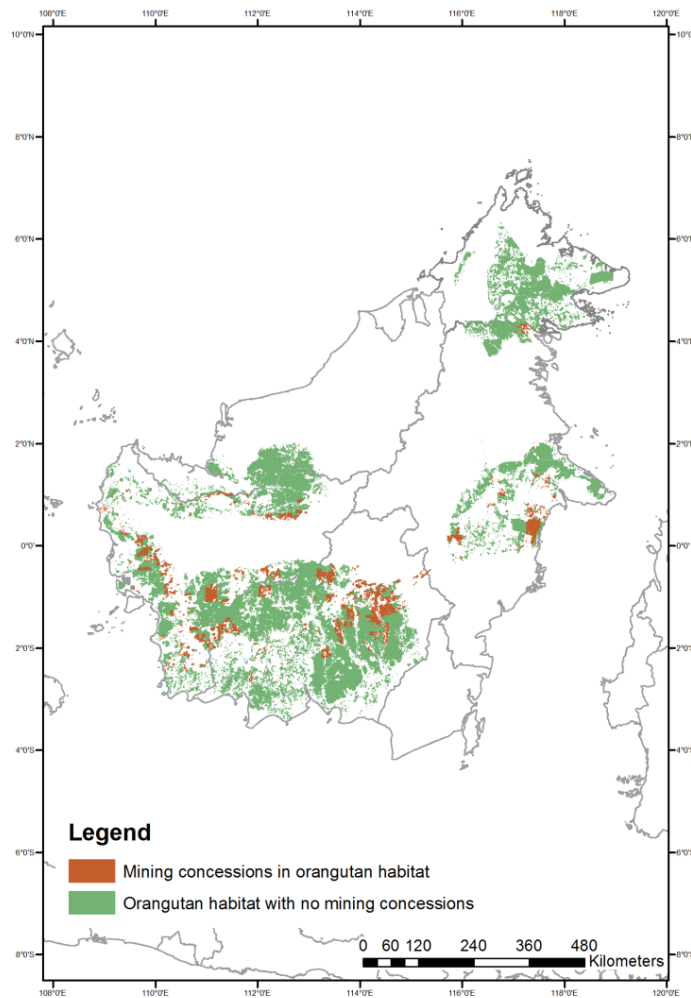


Figure 10. Mining concessions in Kalimantan (no data available for Malaysian Borneo) in relation to orangutan habitat.

Mining concessions often cover large areas that may include either prime orangutan habitat such as natural forest or more marginal habitat such as degraded forest and agricultural mosaics. The impact of mining on orangutans and their habitat can be both direct and indirect. The establishment of mine sites, roads and associated infrastructure has a direct impact on orangutans and other biodiversity whereas the building of new roads in previously inaccessible areas can cause indirect impacts by attracting people to these areas, which can in turn lead to forest degradation and hunting. This was recently shown in Madagascar, where prospecting activities undertaken by Rio Tinto since the 1990s, including road construction, encouraged conversion of the remaining forest in their concession area (Virah-Sawmy & Ebeling 2010).

To our knowledge, no scientific publications in the peer-reviewed literature exist which report on the impacts of mining on orangutans. At least one company, however, reports its own findings with regard to forest and orangutan management. Kalimantan Prima Coal reported in its 2010 sustainability report (KPC 2010) that “fauna monitoring in 2010 was done to inventorize the orangutan as a protected endangered species by using the nest inventory method. This activity was done with the PPHT Unmul (Mulawarman University) Samarinda team in organizing the program of Best Management Practices for the conservation of orangutan in the mining reclamation area. The conclusion of this activity is that the orangutan uses the vegetation resources in the mining reclamation area as its source of food and trees as nest, this is shown by the many nests and scratches in the tree trunks in the reclamation area.” Also, the company relocates orangutan found in their mining locations to a safer location, with the assistance of the local Natural Resource Conservation Institute and BOSF (Balikpapan Orangutan Survival Foundation) (KPC 2010). No findings were reported about total population estimates and population trends in the concession area, or the success rate of the translocations.

Kalimantan Prima Coal appears to be an exception in Kalimantan, with at least some public statements referring to their management with regard to orangutans. Other large companies operating in orangutan habitat such as Indominco Mandiri mine, owned by PT Indo Tambang Raya and Thailand Banpu group, just south of Kutai National Park and once an orangutan stronghold, does not mention orangutans on its website or any other public documents, but does highlight the [Gold Level - Environmental Management Award and other awards](#) they received. One mining case has been particularly controversial in recent years. The UK-based Churchill Mining, PLC, is involved in mine development on the western fringes of Kutai National Park. Following local protests and an apparent incursion into the national park, its local subsidiary PT Ridlatama Group had its project license revoked in 2011. The presence of orangutans and potential impact on the national were key aspects of NGO protests.

Typically, an exploration lease covers a much larger area than the area that will ultimately be mined. Following a set timeline, the original lease area is relinquished back to the government and can be re-issued as a new mining lease to another company. In reality, mining companies, therefore, only have management rights over a relatively small area (typically a few thousand hectares), which is known as the borrow-use area. These borrow-use areas, especially those on state forestland, are usually much smaller than the operational areas of pulp and paper and oil palm plantations or timber concessions. It is thus important to understand that many of the mining concessions that overlap with orangutan habitat may not actually be mined. Mining concession boundaries are therefore not a good indicator for the potential impact mining activities will have on orangutans for the following reasons: 1) Many exploration license area will have low economic potential and will not be developed; 2) only a section of an exploration lease area will ultimately be used for mining.

The establishment of open cast mines and access roads generally results in the clear cutting of much of the vegetation. This leaves little habitat for orangutans to survive in, or opportunity to manage successfully any orangutans that do survive in such areas. In many cases, the only option has been to translocate orangutans from these cleared areas to nearby forest areas with the help of government agencies and orangutan welfare organizations (e.g., KPC 2010). However, translocation can create

ecological problems (such as the introduction of diseases, and orangutan numbers that exceed the carrying capacity of the area) and only offers a partial solution to the problem of keeping orangutans out of operational areas. Kalimantan Prima Coal in Kalimantan has worked with ecologists to identify ways to enhance its reclaimed mine sites with local tree species and species that provide food for orangutans. Some of these older rehabilitated sites now provide habitat for orangutans (KPC 2010). The key now is to ensure these areas are linked through habitat corridors to the wider forested landscape so the orangutans can move away from operational areas without becoming cut off or isolated from suitable habitat.

The above text suggests that large-scale mining is of most concern to orangutans, but a World Bank study in 2000 suggested that artisanal and small-scale mining might actually be more harmful to the environment (McMahon *et al.* 2000). Artisanal and small-scale gold, and to a lesser extent coal, mining resulted in immediate and visible environmental degradation with potential long-term damage, especially from mercury contamination (Bose-O'Reilly *et al.* 2010). The study estimated the annual equivalent of rehabilitation cost over ten years using a 12% discount rate for artisanal mining in Indonesia at US\$177 million, which was some 20 to 30 times higher than the cost of medium and large-scale coal mining. We acknowledge that this study refers to data nearly 15 years old and cannot judge how relevant these remain in the present. Still, some 1,304 coal mining licenses have been given out in East Kalimantan alone (Prasetya 2012). These are mostly small concessions which were given out by local district heads prior to 2009, when this practice was officially stopped, but altogether mining concessions cover 31 380 km² or some 15% of the province and are a considerable threat to the orangutans in the West Kutai, Kutai Kartenegara, East Kutai, and Berau Districts.

One potentially very damaging mining industry, which is often in the hands of artisanal miners, is the exploitation for zircon. Tanjung Puting National Park in Central Kalimantan has particularly been affected by zircon mining, which turns forests into sterile wasteland and is even more damaging to forests and orangutans than oil palm (Nelson 2011). Zircon production has recently declined since the economic crisis reduced demand, with Central Kalimantan Province reporting a decline from 78,890 tons in 2007 to only 6,224 tons in 2010 (<http://kaltengmining.com/Produksi%20Zircon.htm>), although others blame this decline on the political stalemate that exist between the national and provincial government regarding Central Kalimantan's spatial plan (<http://vanlockhart.blogspot.com/2012/04/pasir-zircon-zrsio4.html>). The underlying future demand for zircon is forecast to be strong. Growth is expected to be 4.5% pa between 2011 and 2015, provided zircon is not supply-constrained, and particularly driven by the growing economies of China and India. We were unable to obtain data on where economic concentrations of zircon exist on Borneo or Sumatra and therefore cannot judge its potential to affect large areas of orangutan habitat.

Mining laws and their implications for orangutan habitat

Indonesia's forestland is categorized as (1) Conservation Forest including National Parks; (2) Protection Forest; and (3) Production Forest. All mining activities are forbidden in Conservation Forest. The Forestry Law no. 41/1999 strictly prohibits open pit mining in Protection Forest, but the development of underground mines is still permitted under this law. Presidential Decree no. 41/2004 and Ministry of Forestry Regulation no 14/2006 give legal exemption to 13 companies, because their mining concessions

within Protection Forest were awarded before the regulation came into force. Among these are two coal-mining companies, namely PT Indominco Mandiri with an area of 25,121 ha in East Kalimantan, and PT Interex Sacra Raya, which owns 15,650 ha of coal mining concessions in East and South Kalimantan. As mentioned above, the former company operates in orangutan habitat.

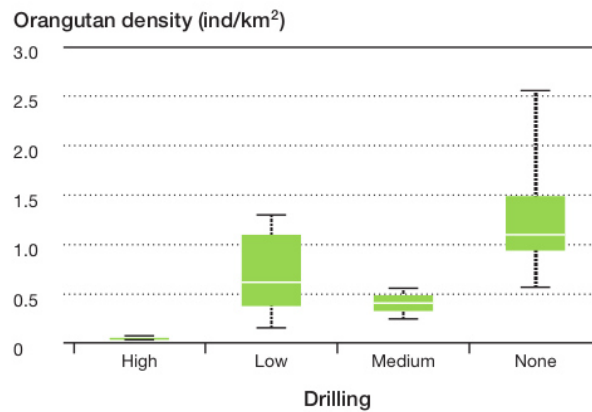
Investors can apply for a Forestland Borrow and Use Permit (PPKH) for the development of mining activities in Production Forest. This permit provides the right to use the designated forest area for non-forestry development interests, without changing the status and designation of the land as being forest (Ministry of Forestry Regulation no. 43/2008). Depending on whether the total forest area in the province concerned is more or less than 30% of the total land area, either Non-Tax State Revenue (*Penerimaan Negara Bukan Pajak* - PNBP) is paid or the company compensates by reforesting another area of land. Moreover, Forest Resource Provision (*Provisi Sumber Daya Hutan* - PSDH) and a reforestation fund (*Dana Reboisasi* - DR) are to be paid. Mining within forestland without the obligatory Forestland Borrow and Use Permit is considered illegal under the Forestry Law. However, the Ministry of Forestry does not have the authority to revoke licenses in case of non-compliance.

According to the Forestland Borrow and Use Permit, the land should be returned in the same state as in which it was received. Ministerial Decree 43/2008 suggests this can be achieved through reclamation with planting of forest species in 4m x 4m spacing, and in the third year after planting 80% of the plants should be in a healthy state. However, the issuance of permits for Protected Forest and the rudimentary state of reclamation plans and their implementation, challenge the credibility of large tracts of land indeed being returned in their original forested state (McMahon *et al.* 2000).

Mining, orangutan density and behavior

Because mining concessions are often large and exploration occurs over large areas it is important to assess the impact of the mining exploration phase on orangutan density and behavior. Unfortunately there are hardly any data on the potential impact of the exploration phase on orangutans. The only dataset that we are aware of is from south-west Sumatra. Here the impact of drilling activity during the exploration phase on orangutans was assessed in the Batang Toru area. Standard line transects were conducted in this area and the orangutan density was determined for each of these. Drilling intensity for each transect was determined by assigning a drilling intensity category to each transect (ranging from none to high based on the drill holes per area). These results show that there is a significant negative effect of drilling intensity on orangutan density (ANOVA $F = 3.8$, $DF = 3$, $P = 0.035$, $N = 18$, Figure 11). A post-hoc Tukey test shows that the significance is due to the pairwise significant effect between the no-drilling and high drilling categories ($P_{adj} = 0.026$). Thus high intensity drilling negatively impacts orangutan density, whereas low and medium exploration does not significantly decrease orangutan density. The latter could be an effect of the relatively small sample size in this study. It is important to note here that exploration in this area was conducted by sending small teams of people into the forest and make a small gap in order for a helicopter to bring in the drilling equipment with a long line with a net attached. This means that in this case there were no access roads in the forest and physical damage to the forest was very limited. As a result it is most likely that orangutans in this area shifted within their home range during the drilling phase and that there were no actual long-term decreases in orangutan

density. This hypothesis could not be tested though because recently the exploitation phase has started here and a large part of the forest in this area has disappeared.



Adapted from S. Wich and M. Geurts in PT Newmont Horas Nauli (2003). Courtesy of S. Wich.

Figure 11. Boxplot showing the orangutan density (ind/km²) for three categories of drilling intensity where this occurred and one for areas without drilling

Even though mine site rehabilitation is important and mandated by Indonesian and Malaysian laws, its value for biodiversity conservation in general and orangutan conservation in particular remains largely unstudied. Elsewhere, the effectiveness of forest rehabilitation in mining areas has been studied extensively, especially in various parts of Australia (e.g., Gardner & Bell 2007; Majer *et al.* 2007; Gould 2011; Cristescu *et al.* 2012). The consensus in these studies indicates that species diversity and abundance of various groups of species (e.g., plants and birds) can recover, although rarely to pre-mining conditions, and that the recovery of native species, such as orangutan, is especially problematic.

Mining companies can actively mitigate their direct and indirect impacts by establishing and implementing best practices for biodiversity management at all stages of mine development – from exploration, construction and mine operation (rehabilitation and re-vegetation) to closure and decommissioning. Adoption of best management practices for biodiversity (including orangutans) can present opportunities for positive biodiversity outcomes both at the immediate mine site level and in the wider landscape through external engagement with local government, conservation scientists, NGOs, local communities and other relevant stakeholders.

Positive impacts of extractive industries on orangutans

The general view among environmentalists and conservation groups about the impact of mining on species such as orangutans and their habitats is that this can only be negative. Some companies, however, are making significant efforts towards developing environmental practices that benefit orangutans or at least not negatively impact the orangutan's chance of survival. Examples are timber concessions certified under the Forest Stewardship Council principles and criteria, with the Deramakot concession in Sabah being a prime example of reconciling commercial timber exploitation with maintaining viable orangutan populations (Ancrenaz *et al.* 2005; Lagan *et al.* 2007). Such efforts are

attracting other business, such as commercial banks, who use the iconic image value of orangutans in their own corporate social responsibility (Chiew 2008). There are few other examples though of company-initiated habitat protection and management that resulted in an increase of orangutans. Such examples might exist among the increasing number of companies that are certified for their sustainable forest management (Meijaard *et al.* 2012), but their impacts on orangutans has not been quantified. Some companies report orangutan densities in their concession, such as the FSC-certified timber operator Sari Bumi Kusuma (see [here](#)), but not population trends that can be related to management interventions.

In East and Central Kalimantan, a range of oil and mining companies have provided assistance to orangutan rehabilitation programs, primarily in the form of direct financial sponsoring or in-kind assistance (e.g., the use of helicopters to transport orangutans). This includes companies such as TOTAL and Chevron that have helped the Wanariset rehabilitation center in the past and BHP Billiton and PT Indo Muro Kencana working with the Nyaru Menteng rehabilitation center (see, for example, <http://redapes.org/press-release-bos-nyaru-menteng-to-release-8-orangutans/>).

Another form of impact is biodiversity offsets that mostly oil and mining companies are funding to compensate for their local impacts on wildlife habitat. Bumi Resources' Kalimantan Prima Coal (KPC) project, for example, is providing financial support to the Wehea protection forest, several hundred kilometers west of their KPC concession (see [here](#)). In that regard, Indonesia's 'ecosystem restoration' license is of interest. This allows license-holders to restore previously logged forest concessions and develop carbon or REDD credits, and could form the basis for future biodiversity offset projects (Madsen *et al.* 2010).

Discussion

Our analysis suggests that there are no simple conclusions to be drawn about the impact of extractive industries on orangutans. The severity of impact varies significantly depending on the type of industry (oil and gas having the least impact), quality of management, type of forest in which a company operates, and a range of other factors.

With 29 and 4% of the orangutan habitat in Borneo and Sumatra respectively being inside natural forest timber concessions, the management of these forests will have a significant impact on the future of orangutans there. Studies indicate that well managed natural forest concessions appear to be compatible with maintaining viable orangutan populations, but truly sustainable forest management, (i.e., no long-term major changes in species composition, standing biomass, and forest structure) is practiced by only a small minority. Timber companies that take their environmental responsibilities seriously are increasing, as indicated by increased certification through Indonesian timber certification (Lembaga Ekolabel Indonesia, LEI) and through FSC. It remains unclear whether these commitments will indeed translate into reduced forest loss in timber concessions that contain wild orangutans.

A specific problem associated with unsustainable timber extraction is that it leaves natural forest concession with limited economic potential to generate revenues. The often-chosen next step is to

convert these natural forests stands into more intensively managed plantations of one or a few tree species. Even though such plantations provide some habitat for orangutans, carrying capacity appears to be far lower than natural forests, while human-orangutan conflicts and crop damage add further pressure on orangutans. The Sabah Government appears to be the most visionary in that respect. It has indicated its long-term commitment to maintain 50% of its state as natural forest, and ensure FSC certification of all its remaining natural forest concessions. It appears to accept that it will take several decades of minimal revenues from timber extraction until their forests have recovered to a productivity level that again allows timber extraction. The Indonesian government has made similar commitments, at least for Kalimantan, by promising to retain at least 45% of the land area as forest, but it is important to note that the definition of forest in this context remains to be clarified and it is unclear whether this forest would also cover timber plantation. The mechanisms to do so, however, remain unclear, and insufficient engagement between different government departments is not particularly facilitating for developing optimal trade-offs between economic, social, and environmental goals.

Impacts of the mining industry on forests occur at quite a different scale compared to the forestry industry. Severe impacts of open pit mining are to be expected in large parts of East Kalimantan, and more localized in Central and West Kalimantan. Still, these actual mine scars are expected to be relatively small in area, compared to the overall area used for commercial timber extraction or plantation development. The extent to which individual mining companies can reduce their impact from haul roads, exploration drilling, and concentrations of large numbers of employees once mines become operational, will determine their overall impact on orangutan habitat and illegal hunting and snaring. Corporate commitment to good forest management is required to minimize such impacts. This might be easier said than done, however. Whereas the timber industry in Borneo and Sumatra has a long history of trying to implement sustainable forest management and reduced impact logging, though not always with much impact on reducing forest loss and degradation, the mining industry appears to be less well regulated with regard to environmental management. There are some examples of good mine management and post-mining rehabilitation efforts, with PT KEM in East Kalimantan being a well-known example (Boer 2009), but the majority of mines appear mostly to ignore environmental prescriptions. A clear example of this is a mining road recently built by a bauxite company through the middle of a deep peat swamp forest, earmarked for conservation and containing several hundred orangutans (EM, pers. obs.). The company did not conduct the legally required environmental impact assessment nor did they get permission to build the road (Figure 12). Based on our experience this appears to be rule rather than exception. There is therefore an urgent need to work with the mining sector in Indonesia and Malaysia to develop and enforce operational practices that benefit orangutan conservation. The key to achieving this would be to ensure that those companies choosing to ignore regulations are fined and those with good management are rewarded by the markets or government. In addition, more research is needed to assess the impact of both the exploration and exploitation phase of mining operations on orangutans so that guidelines can be crafted that are based on solid research. Such research should encompass studies on orangutan density during the course of exploration and exploitation, impact on orangutan behavioral ecology, and hunting of orangutans.



Figure 12. Mining road built through a deep peat protected forest area in West Kalimantan (photo by Erik Meijaard)

We conclude that despite some positive trends towards better environmental management in the extractive industries sector in Borneo and Sumatra, the future for orangutans in their concessions still looks precarious. The key question is whether increased corporate social responsibility is putting enough pressure on companies to change meaningfully the way they operate in forest landscapes. The high costs of complying to various stringent sustainability standards is a barrier to many companies, especially if some of the competition gets away with ignoring most environmental rules (Meijaard & Sheil in press). The financial benefits of good management are often intangible and could include: 1) increased equity investor confidence and loyalty and better access to capital; 2) higher share value; 3) improved relations with NGOs; 4) improved access to land, both at the initial stages of project development and for ongoing exploration to extend the lifetime of existing projects; 5) shorter and less contentious permit-cycles as a result of better relationships with regulatory agencies; 6) improved community relations; and 7) enhanced employee relations (Dennis *et al.* 2010a). The problem is that such potential benefits may only materialize in ideal situations. For example, in contexts where law enforcement is lax and other factors such as corruption play an important role in business deals, permitting and land access procedures may actually be quicker if official rules are not followed. Also, short-term community relationships can often be markedly improved by transferring a significant amount of cash, rather than trying to build long-term sustainable collaborative agreements. It seems obvious that many businesses are thus weighing the costs and benefits of good environmental management, and it appears that most still decide that business-as-usual is just fine. Larger companies that seek international trade relationships or financing from Europe and North America, or are otherwise internationally exposed to investors, are sensitive to market pressures. These are usually the companies with high environmental standards and practices.

One positive development in this regard, at least where it concerns the mining industry, is the establishment of the Extractive Industries Transparency Initiative - Indonesia (EITI) chapter. The EITI Indonesia Secretariat was formally established through a pair of regulations signed by the Coordinating Minister for Economic Affairs on 4 April 2012 (EITI 2012). One of the objectives of EITI is that all companies in the extractive industries sector formally declare their revenues. Interestingly in the latest half year report of EITI, most oil and gas and mineral mining operations reported their revenues, whereas a third of coal companies (almost all in Kalimantan) did not, which might be a tell-tale sign for the way the coal industry operates (EITI 2012). Further improvements in EITI reporting may assist the government of Indonesia's target to reduce corruption in its mining sector.

In the appendix we provide detailed recommendations for the extractive industries, based on work conducted by the USAID-funded Orangutan Conservation Services Program (Dennis *et al.* 2010a, b).

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Appendix. Specific recommendations for responsible management of orangutans in the extractive industry sector (after Dennis *et al.* 2010a, b)

The overall objectives are improved prospects for orangutan survival in mining concessions and enhanced business value for companies. Companies should seek to minimize their impact on orangutans in their sphere of influence. This can be achieved through careful planning and application of best management practices (BMPs), improving and increasing orangutan habitat set-asides within concessions and offsets outside their concessions, and participation in conservation efforts in the greater landscape in collaboration with other local, regional and national actors.

Positive and negative impacts on orangutans in the long term will depend on how well a company:

- Understands the ecological and behavioral requirements of orangutans, especially for shelter, space, food, and both social structure and space.
- Recognizes the potential threats to orangutans from operational practices during exploration, construction and mining.
- Identifies and manages potential biodiversity risks and opportunities during project development, implementation and closure.

Ideally, operations should be planned to avoid disturbance of orangutan habitat, including corridors that are used to connect areas of natural forest within the concession. However, these practical and technical considerations may result in the realization that disturbance is recognized but unavoidable. For example, a concession may have a few orangutans remaining in patches of vegetation that are too small and are unconnected to other patches of habitat suitable for orangutans. In these situations, orangutans will not survive within the concession. This may lead to the conclusion that the least favored conservation solution to conserve them may have to be applied, namely to have them translocated to another area. Responsible companies may then consider purchasing suitable land for these orangutans near their concessions as a conservation offset and translocating the surviving orangutans to this offset area. In this way, companies will help ensure that overall numbers of orangutan are not diminished in their general area of operations.

Corporate Commitments

COMMITMENT #1: CORPORATE COMMITMENT TO PROTECT ORANGUTANS

A company requires support at all levels to achieve best management practices that ensure the long-term survival of orangutans in its concession. To assist with this, it should:

1.1. Commit to the goals and objectives of the government regulations, legislation and objectives with regard to orangutan conservation.

Scope: Government legal frameworks, such as the Orangutan Action Plan in Indonesia, are the basis for activities to conserve orangutans. These require all companies with a stake in the management of orangutans to support actions for the conservation and management of orangutans and their habitats.

Actions recommended:

A company should commit to the goals and objectives of national orangutan commitments and any government policies that follow from that. The company should incorporate its commitment to the government goals into its policy, procedures, and operational management plans by taking the following actions:

- Develop and implement an orangutan-sensitive conservation management plan within its concession.
- Develop standard operating procedures for the protection of orangutans and their habitats (including habitat management, rescue activities, conflict mitigation, and community involvement).
- Contribute to community education and development activities that are conducive to conservation of orangutans in the vicinity of orangutan habitats.
- Build and maintain corridors between fragmented patches of orangutan habitats within and adjacent to its concession, where possible.
- Develop a monitoring and evaluation system to assess performance of implementation of its conservation management plan
- Ensure operations minimize negative impact on orangutans and their habitats.
- Collaborate with other stakeholders to conserve orangutans at the landscape level.

1.2 Make a publicly available policy statement for the protection of orangutans

Scope: A company should demonstrate full transparency in its implementation of its orangutan-sensitive conservation management plan by publicly demonstrating that it is adhering to the principles of orangutan best management practices.

Actions recommended:

- Commitment to minimize impacts on orangutans in the landscape.
- Commitment to adhere to national and internationally binding regulations.
- Commitment to make public its data and information on orangutans, and on its monitoring and operational actions to conserve orangutans.
- Commitment to respect customary indigenous rights and legal requirements.
- Commitment to engage with communities and stakeholders in a fair and transparent manner.
- Commitment to identify and consider all threats to orangutans that may result from the company's strategic management decisions.

1.3 Ensure that orangutans are sensitively managed within the concession

Scope: A company should consult with experts, NGOs and other stakeholder groups to work towards maintaining the presence of orangutans within its concession.

Actions recommended:

- Implement silvicultural and other types of habitat management approaches and techniques to minimize impact of these activities on areas used by orangutans.

- Protect key ecological resources for orangutans in both conservation set-asides and habitat corridors.
- Work to prevent hunting of orangutans by company employees, contractors and others.

1.4 Report on orangutan status and management in concessions to international standards

Scope: A company should employ transparent and timely reporting to demonstrate to stakeholders and the environmental community that biodiversity within the scope of its management area is monitored and evaluated. A company should include information on orangutans in its environmental reports where its operations are located in orangutan sensitive areas. While adherence to these standards is voluntary, compliance with these standards enhances a company's external transparency and responsibility in managing its impacts on orangutans, and serves as an internal guide on its performance against stated corporate orangutan policy. Reporting to these guidelines is in addition to any formal government environmental reporting requirements. For example, all mining companies that adhere to the International Council for Mining and Metals (ICMM) Sustainable Development Framework resolve to follow the Global Reporting Initiative (GRI) standards on sustainability reporting.

Actions recommended:

A company should comply with internationally accepted standards for biodiversity reporting, namely:

- Collect all information on its concession relevant to the development of BMPs.
- Document and describe significant threats to biodiversity within its concession. Gather and make publicly available information on locations where orangutans occur, using GPS if possible. This should include relative abundance estimates, and their key ecological resources and nest sites. Information on habitat types should be divided between natural, created and enhanced, and artificial (new habitats), by area and known orangutan presence.
- Detail strategies, current actions, and future plans for managing threats to biodiversity and orangutans.

COMMITMENT #2: COMPLIANCE WITH LAWS AND REGULATIONS

A company should demonstrate compliance with laws (both statutory and customary), regulations, international treaties and agreements to which Indonesia is a signatory. To demonstrate this, a company should:

2.1 Respect national and local laws and administrative requirements related to biodiversity protection

Scope: A company should comply with relevant laws and regulations of Indonesia that have implications for orangutans and their habitats. In addition, a company should be aware of any provincial or district laws and regulations that apply in the location of its operations. A company should also ensure that all required permits are obtained and updated. The national laws of Indonesia and Malaysia that are relevant include, but are not limited to, the following:

Actions recommended:

- Be familiar with and make available a document summarizing central government, provincial and district laws and regulations relevant to orangutans and their habitats, and possible implications of these on planning and operational decisions, and on the conduct of employees and contractors.
- Conduct a communication program to ensure that senior management is in a position to consider these legal issues and comply with the law when making decisions.
- Conduct a communication program for employees and contractors that ensures that their actions when dealing with orangutans and their habitat comply with the law.
- Develop a documented system to identify, track, close out and report on issues relating to potential legal non-compliance by the company, employees and contractors.
- Ensure all permits that relate to activities that may impact orangutan habitat are maintained in a permits register.
- Publicize legal requirements and obligations to all employees and contractors on an annual basis as part of work reviews.
- Develop procedures for compliance assessments and demonstrate internal enforcement and penalties in the event of identified breaches of law.
- Instigate an internal reward and punishment system for employees and contractors to promote compliance.

2.2. Comply with the provisions of all binding international agreements that relate to orangutan protection

Scope: A company should not only be in compliance with national laws and regulations but also meet the intent of international agreements and conventions to which Indonesia is a signatory. The international agreements that relate to the protection of orangutans are as follows:

- Convention on Biodiversity (ratified through Act No. 5 of 1994).
- Kinshasa Declaration of Great Apes.
- CITES.
- Tropical Timber 83.
- Tropical Timber 94.
- Ramsar Convention.

Actions recommended:

A company should disseminate requirements within these conventions and international agreements to all employees and contractors where relevant, and should demonstrate incorporation of these provisions within operational planning and management, namely:

- Be familiar with and make available a document summarizing international conventions relevant to orangutans and their habitats and possible implications of these on planning and operational decisions, and on the conduct of employees.

- Ensure that all employees and contractors are aware of and understand the legal and administrative obligations with respect to relevant international agreements to which Indonesia is a signatory.
- Conduct a communication program to ensure that senior management is in a position to consider these issues when making decisions.
- Conduct a communication program to employees that ensures that their actions when dealing with orangutans and their habitat comply with these conventions.

2.3 Ensure that habitat of orangutans is protected from illegal and unauthorized activities

Scope: A company should protect its orangutan habitat from unauthorized harvesting and other activities in the concession. It should strive to have sufficient security and protection systems and capacity to support compliance with its orangutan-sensitive conservation management plan. Conservation set-aside areas should be delineated from operations at the planning stage due to the presence of rare, threatened or endangered plant or animal species.

Actions recommended:

- Identify and assess threats and practical interventions to reduce or eliminate threats.
- Standardize approaches for demarcation of conservation set-asides and notify local stakeholders of these boundaries.
- Consider the establishment of forest patrols by local community members and forest police across the concession. This is to identify and combat encroachment, fire risk, illegal activities and other issues.
- Ensure a system exists for monitoring, documenting and reporting to appropriate authorities any instances of illegal harvesting, settlement, occupation or other unauthorized activities.

2.4 Clearly document local communities' long-term legal or customary ownership and use rights to the land, where these rights exist

Scope: A company should show commitment to long-term ownership and use rights of local communities to the land and forest resources inside or bordering concessions. The land user rights should be clearly defined, documented, and respected.

Actions recommended:

- Document evidence of legal, long-term rights to manage lands and to utilize forest resources over any part of the concession.
- These rights should be agreed to by local communities with evidence of this consent.
- To ensure cooperation of local communities and secondary stakeholders is maintained, a mechanism should be employed to resolve a dispute which also documents the nature of the dispute and its resolution, particularly as it relates to orangutans and their habitat.

2.5 Respect local communities' legal or customary ownership and use rights while protecting orangutans

Scope: A company should respect the rights of local communities with legal or customary ownership or use rights to maintain control over these aspects in concessions to the extent required for them to protect these rights and meet their economic and cultural needs. Where possible, a company should engage these communities in forest management and protection of orangutans.

Actions recommended:

- Identify and support sustainable use of resources by local communities and take steps to ensure that customary and other rights are upheld.
- Recognize and support these user rights, which should be clearly identified and demarcated using participatory approaches, and recorded.
- Support formalization of user rights through a local decree.
- Give free, prior and informed consent to use rights of local communities or affected parties.
- Where appropriate, include participation of local communities or parties with legal or customary tenure or use rights in the management planning of concession forests.
- Create mechanisms for resolving disputes over land use claims and use rights that respectfully involve disputants so as to reduce the risk of conflicts endangering orangutans.

COMMITMENT #3: MANAGEMENT PLANNING AND MONITORING OF ORANGUTANS

A company should ensure that orangutans within the concession are sensitively managed. This requires development of an orangutan-sensitive conservation management plan, implementation and monitoring of the Plan. This Plan should be integrated and part of the overall environmental management plan. This will ensure that the long-term objectives of management, and the means of achieving them, will be clearly stated and monitored. To this end, a company should:

3.1 Ensure that a comprehensive conservation management plan for orangutans is developed that is in line with best management practices

Scope: The basis for a good extractive industry operation is a well-planned and comprehensive conservation management plan that addresses the need to maintain, enhance and protect conservation set-aside areas and general biodiversity values. The general guidelines for best practice in environmental management systems are covered by ISO 14001. A company's orangutan conservation management plan would be considered satisfactory if corporate policy and objectives on orangutan protection are incorporated into environmental policy and management systems that strive for this standard. The conservation management plan needs to be appropriate to the scope and scale of operations and should clearly explain the long-term objectives of management, and the means of achieving them. One of the long-term objectives should be the protection of orangutans and their habitat in the area surrounding the concession.

Actions recommended:

A conservation management plan should be developed that includes but is not limited to the following:

- The aim, goals and objectives of the Plan should be clearly described in relation to conservation of orangutans.
- The Plan should include a clear description of the forest areas to be managed, environmental issues, land use patterns, ownership status, socio-economic conditions and a profile of adjacent lands.
- The long-term silvicultural and other management systems should be clearly described and justified in relation to requirements of any resident orangutans.
- The Plan should clearly show how rare, threatened and endangered species and/or their habitat are to be identified and protected. It should include all measures planned for protection of orangutans in a concession, and identify habitat corridors to facilitate movement of orangutans around the edge (if possible) of a concession and to and from the greater landscape.
- The Plan should have a full complement of maps. These maps need to describe the forest resources including forest types, watercourses and drains, compartments/blocks, roads, log landings and processing sites, protected areas, unique biological or cultural resources, and other planned management activities. They should also clearly map the distribution of orangutans in the concession and the immediate adjacent forest, food sources, key ecological resources such as old fruiting trees and mineral licks, and identification of biological corridors.
- The Plan needs to cover all environmental safeguards that will be used to ensure the integrity of the forest concession and orangutans in the concession. These safeguards need to be based on environmental assessments (AMDAL), with clear references as to how adverse impacts on the orangutans will be mitigated through management prescriptions. Special attention should be paid to measures undertaken to reduce human-wildlife conflict.
- The Plan needs to have a robust monitoring plan for all aspects of management, including orangutans. Where appropriate, all monitoring results specifically relating to orangutans should be reported back to the government so that its databases can be kept up-to-date, and to allow the government to assess progress in the Orangutan Action Plan.
- There should be detailed emergency response procedures for issues concerning orangutan encroachments, conflicts, disease and other possible incidents. A hazard/incident reporting system should be established that documents issues, actions, follow-up and closeout of orangutan matters.
- The Plan needs to include a full budget for all operations and planning. The budget needs to include a sufficient allocation to cover the cost of operations to conserve orangutans.
- The Plan should be linked to a database system for storing information on orangutans. Preferably, this should be a map-based system to enable comparisons of locations of orangutans so that their movements within the concession can be mapped. It is important that the results of monitoring orangutans are incorporated into the implementation and revision of the Plan. Non-confidential elements of the Plan should be made public.

The Plan should detail rehabilitation of orangutan habitat both inside the concession and in surrounding areas, which should be undertaken where possible. Other ecological and operational measures should include:

- Retention of large trees for nesting and fruit in areas surrounding planted parts of a concession.
- Closure of canal systems in rehabilitation sites and canals that bisect conservation areas.
- Monitoring of permanent sample plots for edge impacts within conservation set-asides.
- Monitoring of community access.
- Monitoring of rehabilitation planting through Permanent Sample Plots.
- Monitoring of external boundaries of conservation areas, and of boundaries adjoining harvesting locations.
- Expansion of riparian habitats to a minimum of 500m either side of river banks (mineral soil sites) in locations inhabited by orangutans, and linking them to conservation set-asides and adjacent forest outside the concession.

When planning for rehabilitation, additional actions for land preparation may have to be conducted due to compaction or degradation as a result of infrastructure development. Due to the time delay in fruiting from seedling stock, the use of cutting stock is recommended, where feasible. Many orangutan food tree species, however, are non-commercial and may not be available. Monitoring should be instigated to support management objectives. This will be particularly important when trees are producing fruit to prevent conflict between humans and orangutans over harvest of such fruit.

Selection of species for rehabilitation of important orangutan habitat should be based on ecological characteristics (e.g. known orangutan food source, food source for other species, fast growing, native to area, and soil type). Generally, rehabilitation planting should use mixed tree species spaced at intervals of approximately 2 to 5 meters. However, in some instances planting of trees unpalatable to orangutans may be required as a barrier to deflect orangutans from moving deeper into a plantation. This may also include plantings of trees that are particularly favored as nesting sites by orangutans. All available open areas should be investigated for rehabilitation, including but not limited to:

- Roadsides of access and operational roads.
- Drainage system edges.
- Post-operational log landing sites, sites used for vehicle turning, etc.

3.2 Identify a point person or team to take the lead in coordinating activities related to management of orangutans

Scope: A company should elect one person or a team to take responsibility for the management of all orangutan conservation activities. This person or team needs to be placed within the management structure and should have sufficient authority to influence crucial management decisions.

Actions recommended:

- Clearly assign roles and responsibilities for information dissemination and the implementation of management prescriptions to conserve orangutans.
- Develop job descriptions that state roles and responsibilities for internal and external communications.

- Ensure that the person or team responsible for orangutan management has access to all key information regarding concession planning, and is involved in management decisions regarding activities or plans that potentially affect orangutans.

3.3 Create and conduct a training and education program for all employees and contractors on the importance of conservation of orangutans

Scope: A company should ensure that responsibility for conservation of orangutans and their habitat is the collective responsibility of management and all employees and contractors. To achieve this there is a need to disseminate this notion through direct education. The company should conduct awareness raising and educational actions with employees and contractors on the importance of orangutan conservation and management. These approaches should include but not be limited to information on legal status and penalties within employment contract and contract agreements for identified breaches of contract; the natural history of the orangutan and its ecological requirements; company policy on the conservation of orangutans and wider biodiversity; and HR policy and disciplinary processes and procedures in place for operational requirements to mitigate risks to orangutans from operational workers.

Actions recommended:

- Identify training needs to ensure the competencies of employees and contractors with responsibilities related to orangutans.
- Prepare and periodically conduct training for responsible employees and contractors, including community relations staff.
- Identify and train, in collaboration with qualified wildlife management personnel, specific personnel who have the responsibility to deal with emergency responses to orangutan issues. Orangutan issues, actions and responsibilities should also be included in the induction for employees, contractors and visitors.
- Develop information and brochures for use by all employees, contractors and visitors identifying the company's responsibilities, strategies and actions with regard to orangutan conservation. All employees and contractors should have a copy of such standard operational procedures (for details, see 3.5) and be instructed in the use of these procedures.

3.4 Ensure that all monitoring and evaluation is incorporated into a long-term adaptive conservation management plan

Scope: A company should demonstrate the operation of management review systems to ensure that lessons from past actions and experiences, or external factors such as new scientific knowledge on orangutans, are incorporated into updated conservation management plans for orangutans.

Actions recommended:

- Establish a mechanism to regularly review the company's orangutan policy and management systems so that they may be adapted to any changes in perceptions or circumstances.
- Develop a program and procedure for periodic audits of the orangutan management systems. This would be incorporated into the certification process of companies complying with ISO

14001. Companies not certified to this standard can follow self-assessment guidelines based on ISO principles.

- Seek new information from all stakeholders, including security agencies, local communities, local government agencies and the scientific community, to ensure that revised conservation management plans incorporate the best technical practices and experiences.
- Carry out a periodic review of the Plan, its objectives, systems and results, to ensure its appropriateness and effectiveness in orangutan conservation, both on site and within the greater landscape.
- Identify any changes required to policies and procedures in light of any changed circumstances in technical or scientific issues in the conservation of orangutans, changes in orangutan viability at the landscape level, and any other legal, business or financial considerations.
- Update policies and procedures to accommodate the findings of such a review so as to ensure continual improvement in approaches to conserve orangutans, and enhance corporate environmental responsibility.
- Incorporate any results of this review into the planning and operational management of the concession, including review of closure plans and actions.
- Document and communicate to employees any changes to the conservation management plan and operational procedures.

3.5 Develop standard operating procedures, work instructions and guidelines to support implementation of the conservation management plan for orangutans

Scope: A company should develop a clear and concise set of Standard Operating Procedures (SOPs) for individual activities in line with the principles and guidelines of its management. It should, at a minimum, ensure that SOPs are developed to encompass all operational actions that have a potential impact on orangutans and their habitat. This is required because generic company principles and guidelines are not in themselves sufficient to ensure that all operational activities are carried out consistently and in the manner required by the company.

Actions recommended:

- SOPs for operational activities that include dissemination of information to operational planners.
- SOPs for standardized pre-operational assessment process (pre-land disturbance/land clearing), and post-operational assessment process (monitoring).
- SOP for land disturbance and clearing to minimize forest damage during land clearing, road construction, and all other mechanical disturbances; and to protect water resources.
- SOP for routine biodiversity monitoring.
- SOP for managing and maintaining voluntary conservation set-aside areas within the concession and water resources, including guidance on retaining groves or individual large trees for nesting or fruiting.
- SOP for establishing and operating forest patrols in the concession.
- SOP for conducting environmental inductions for all employees, contractors and casual staff.

- SOPs for community engagement and communication protocols, especially with regard to recognizing conflicts between communities and orangutans, and having standard practices to deal with these conflicts.
- SOPs for the issuance of information, and verification of information to operational planners, field staff and teams tasked with impacting operational activities.
- SOPs for rehabilitation and restoration of degraded areas.
- SOPs about what to do when orangutan encounters or incidents occur during land clearing, felling, road building or other activities. These should include recommendations for staff behavior to prevent harm to orangutans such as no unnecessary disturbance, no feeding, no felling of trees with orangutans in them, etc.
- SOPs for land swaps.

3.6 Communicate to local communities the importance of orangutan conservation and ways to mitigate threats to the species

Scope: A company should be proactive in its communications with communities that have settled within its concession and/or access biodiversity areas, corridors, or controlled habitats. It needs to work with communities to identify consensus-based mitigation or conflict resolution. The Orangutan Action Plan clearly shows in section C1 that the inclusion of communities and their institutions and customary laws is paramount for the protection of orangutans.

Actions recommended:

- Review the community development program to ensure that orangutan education and awareness activities are included, and that programs are included to take pressure off orangutans and their habitats through alternative livelihoods and economic activities.
- Prepare a documented process within the company's community development department to identify and engage with communities on orangutan matters, which should include a register of meetings, issues, agreements, actions and follow-up.
- Develop systems for rapid reporting of conflicts between orangutans and people, and have management SOPs in place to mitigate these conflicts and prevent harm to orangutans and people's agricultural crops and gardens.
- Identify community benefits from conservation of orangutans.
- Provide education to communities on how to mitigate perceived risks from orangutans.

3.7 Collaborate with conservation scientists and seek technical advice from them when required

Scope: A company should engage with conservation scientists and groups, or seek technical expertise from recognized academic institutions, qualified consultants, or government departments when decisions regarding interventions to conserve orangutans go beyond the company's scope of understanding or technical capabilities.

Actions recommended:

- Obtain technical support for surveying orangutans, and store survey results in a Geographic Information System (GIS).
- Develop partnerships to annually review survey data and assess impacts of conservation actions.
- Develop partnerships for review of management planning proposals and gain additional input into that process.
- Facilitate studies of orangutan ecology in mining concessions by allowing local and international researchers to work in the concession, and use the resulting information to identify key features used by orangutans (old, large fruiting trees, mineral licks, specific nesting sites, etc.).
- If the local orangutans' home range extends into neighboring concessions, collaborate with the management of these concessions and with orangutan specialists to develop greater landscape-level management plans to assist conserve such orangutans (see below).

COMMITMENT #4: LANDSCAPE-LEVEL COLLABORATIVE MANAGEMENT

A company should collaborate with other stakeholders to achieve improved planning and implementation of conservation management for orangutans in the greater landscape. To do so, it is encouraged to:

4.1 Participate in a landscape-level collaborative management group to rationalize land-use conflicts, including for orangutans and their habitat

Scope: A company is encouraged to support landscape collaborative management groups in accordance with Ministry of Forestry regulations, by allocating sufficient staff and financial resources to contribute to the following:

Actions recommended:

- Assist in land-use planning for the greater landscape.
- Contribute to demarcation of concession boundaries.
- With other stakeholders, assist in preparation of risk assessments and an orangutan conservation management plan for the landscape.
- Ensure that the company's on-site orangutan management plan supports conservation management of the landscape.
- Where possible, support research and science concerning orangutans in the greater landscape.
- Share data, information and reports on orangutan management with other partners.
- Collaborate with law enforcement agencies.
- Where possible, build capacity of partners to fulfill their responsibilities.
- Encourage and participate in the resolution of land disputes between conflicting interests of other stakeholders in the greater landscape.
- Where possible, explore land swaps as an alternative to natural forest conversion or conversion of degraded forest with orangutan.
- With other stakeholders, support public awareness programs for conservation of orangutans in the area.
- With other stakeholders, support district, provincial and national level planning to help improve biodiversity values in the greater landscape.