IUCN | National Committee of The Netherlands

BOOSTING BIODIVERSITY

A visual guide to promote biodiversity values in oil palm landscapes

A orangutan resting, moving from one forest to another, in an oil palm plantation in the Kinabatangan area, Malaysia. Contrary to common belief, (male) orangutans make use of oil palm plantations as they move from one forest to the other.

Photo credits: Marc Ancrenaz

Restored riparian areas in an oil palm plantation in West Sumatra, Indonessia. Old oil palms are left standing to provide shade for replanted seedlings of native species and prevent soil erosion.

Photo credits: Thijs Pasmans

A grasshopper living in undergrowth in an oil palm plantation in Sumatra, Indonesia. Allowing undergrowth to grow attracts beneficial arthropods that prey or lay eggs in pest species.

Photo credits: Jean Pierre Caliman

Colofon

Report by IUCN National Committee of The Netherlands (IUCN NL)

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Author: Thijs Pasmans

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Cover photo: ecological corridor through oil palm plantation in West Kalimantan, Indonesia. Photo credits: Tropenbos Indonesia.

Active replanting of native species improves biodiversity in the oil palm plantation in Colombia.

Examples of tree species are *Tabebuia rosea (Roble), Bombacopsis quinata (Ceiba Roja), Samanea Saman (Campano), Ceiba pentadra (Ceiba), Handroanthus chrysanthus (Cañahuete), Sterculia apetala (Camajón), Bactris guineensis (Corozo)* and *Aspidosperma polyneuron (Carreto).*

Photo credits: Gabriel Esteban Enríquez Castillo

Why oil palm and biodiversity?

In 2023 there were over 30 million hectares of oil palm plantations across the globe: almost 16 million hectares in Indonesia, over 5 million hectares in Malaysia, approximately 1 million in Thailand and around half a million in both Colombia and Nigeria and other tropical countries.

What does this mean for you? The loss of large areas of primary rainforest? Or the production of the world's most efficient vegetable oil on a relatively small portion of land? Both are true. IUCN (2018) showed us how many species are under threat because of oil palm expansion, but also the huge efficiency and potential of the crop: sustainable palm oil production is the best way to go.

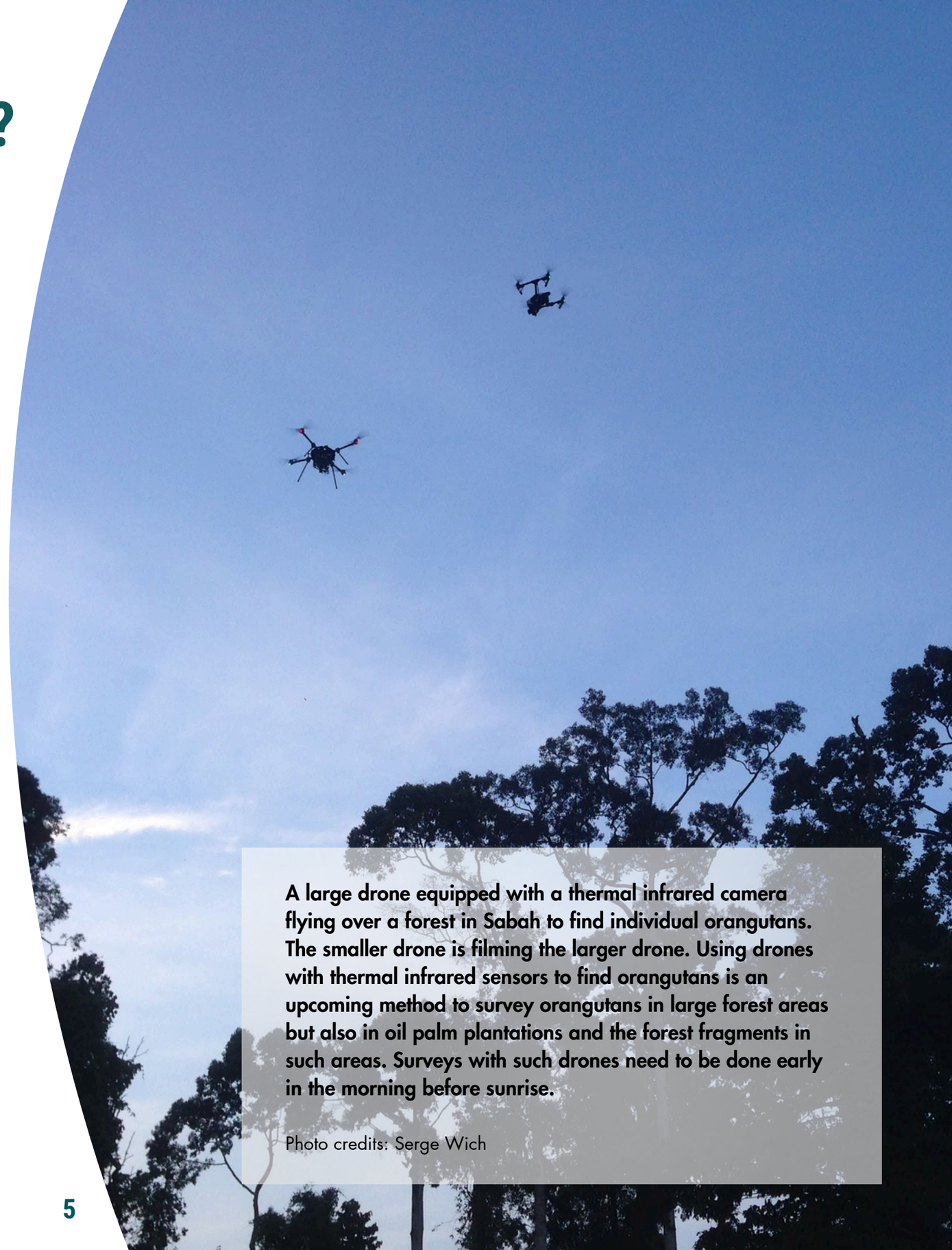
Fact is there are 30 million hectares of existing plantations that now can and should help increase biodiversity to achieve the goals of the agreements in the Global Biodiversity Framework.

This guide aims to show the potential of these existing plantations for biodiversity in fragmented landscapes. It should not be read as a blueprint, but as an atlas. Inspiring you to find new routes in your journey towards more biodiverse oil palm production.

By doing so we want to push the debate on sustainable palm oil to go beyond 'stopping further loss' only and move towards actively including biodiversity positive practices in what is already out there.

More biodiverse oil palm production:

- **Does not need to have a negative effect on yields**
- **Can even improve ecological functions that benefit oil palm production itself and reduce future risks and costs**
- **Is a crucial contribution of the sector to stop and revert the loss of biodiversity**



A large drone equipped with a thermal infrared camera flying over a forest in Sabah to find individual orangutans. The smaller drone is filming the larger drone. Using drones with thermal infrared sensors to find orangutans is an upcoming method to survey orangutans in large forest areas but also in oil palm plantations and the forest fragments in such areas. Surveys with such drones need to be done early in the morning before sunrise.

Photo credits: Serge Wich

What to think about oil palm?

Reality - as ever - is complex. Oil palm plantations have been a driver, but not the sole driver of biodiversity loss, peatland degradation and landscape fragmentation, and its impact has been locally specific.

Nevertheless, oil palm plantations do overlap with the world's most biodiversity-rich areas and expansion of plantations continues to open up new frontiers. This is a serious issue to address but not the focus of this guide.

Instead, we ask ourselves: what can we do to boost biodiversity in existing areas where the forest is already cut down, the landscape is already degraded, and species diversity has gone down severely? With a crop that stands over 25 years and a sector where forerunners have put efforts to protect biodiversity, oil palm should be in a good position to create more biodiverse plantations. Let us explore the options.

What diversity are we talking about?

Biodiveristy refers to the variety of life forms living on earth. It reflects the total diversity of genes, species, populations and ecosystems that we are all part of. The debate on biodiversity is often dominated by large-size species, but small termites, bacteria or fungi are as important for ecosystems as elephants or orangutans. Together these forms of biodiversity create the basis for ecological functioning of the world we live in. And must therefore be taken into account as a whole for effective biodiversity protection.

Photo credits: RSPO and Gabriel Esteban Enríquez Castillo

A *Koompassia malaccensis* tree (centre) standing in peatland area. Benefits of restoring peatland hydrology - rewetting - go beyond biodiversity conservation. Restored peat ecosystems also reduce carbon emissions, stop soil subsidence, protect against forest fire expansion and flooding, delay runoff of water and cool down the environment.

Photo credits: Wim Giesen

Red howler monkeys (Alouatta seniculus) are commonly found in oil palm landscapes in Colombia, where they use the plantations as a biological connection, to rest and feed, taking advantage of the fruits available in their habitat, including those of the oil palms. Their presence in these environments highlights the importance of conserving forests inside and outside plantations to protect their habitat as red howler monkeys play a key role in seed dispersal and ecological balance.

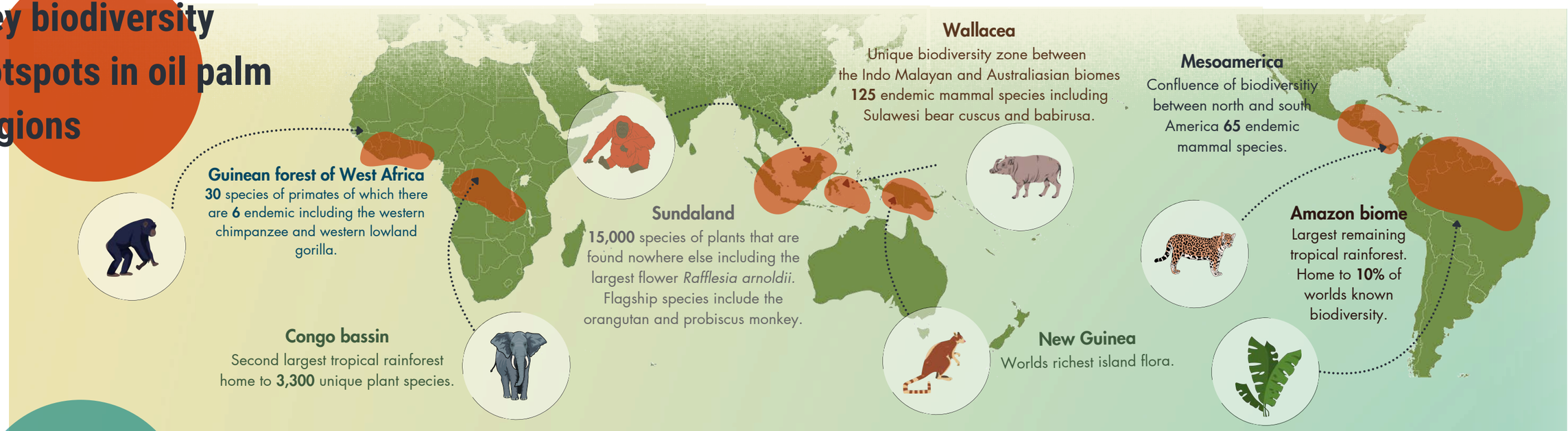
Photo credits: Gabriel Esteban Enríquez Castillo

Cassia reticulata **on an oil palm plantation in Guatemala. Nectariferous plant species attract beneficial insect species or predators of major oil palm pests, serving as a form of biological control and contributing to increased biodiversity within plantations.**

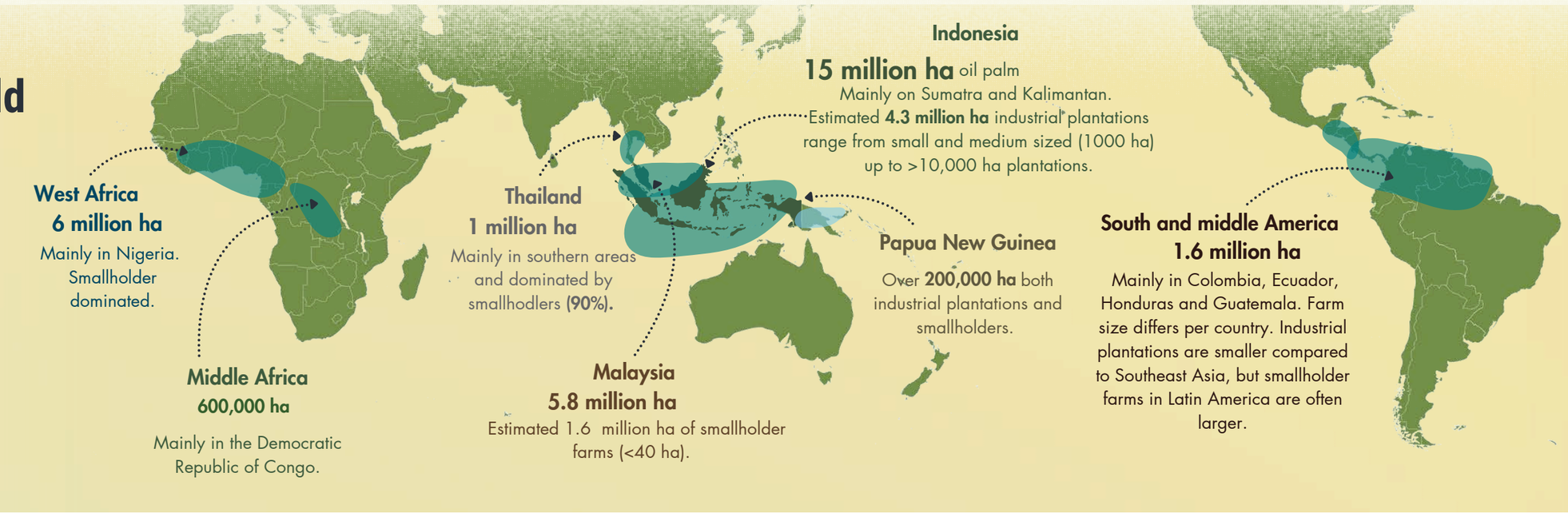
Photo credits: Adriana Zamora, GREPALMA, Guatemala

Oil palm and biodiversity: what is at stake?

Key biodiversity hotspots in oil palm regions



Oil palm plantations around the world



What happens after deforestation?

It should be no surprise that biodiversity in oil palm plantation landscapes is lower compared to that in natural forests. Off course impacts depend on plantation size and other landscape features, but the change from forest, even logged or degraded, to oil palm plantation is significant. Almost all animal species go down in number when forests are replaced by oil palm. Only a few fern epiphyte species, bees, and pest species such as rats, wild pigs and snakes, have been found to increase in oil palm plantations. Species that depend on forest only, will be absent from areas planted with oil palm and alien species are more prevalent in plantations compared to primary forest. Understanding what happens after deforestation is the starting point to restore as much ecological functions as possible.

Natural forest

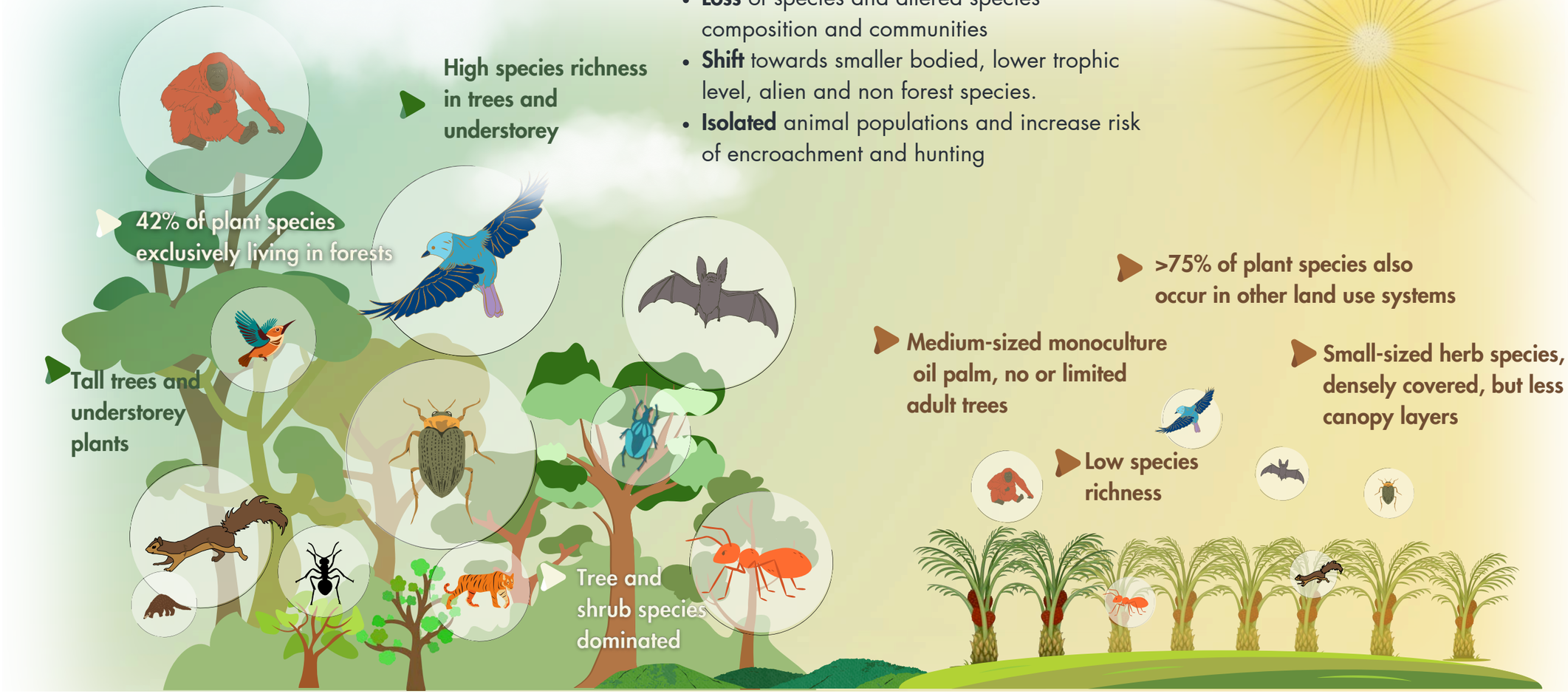
Cooling the landscape and retaining water

From forest to plantation

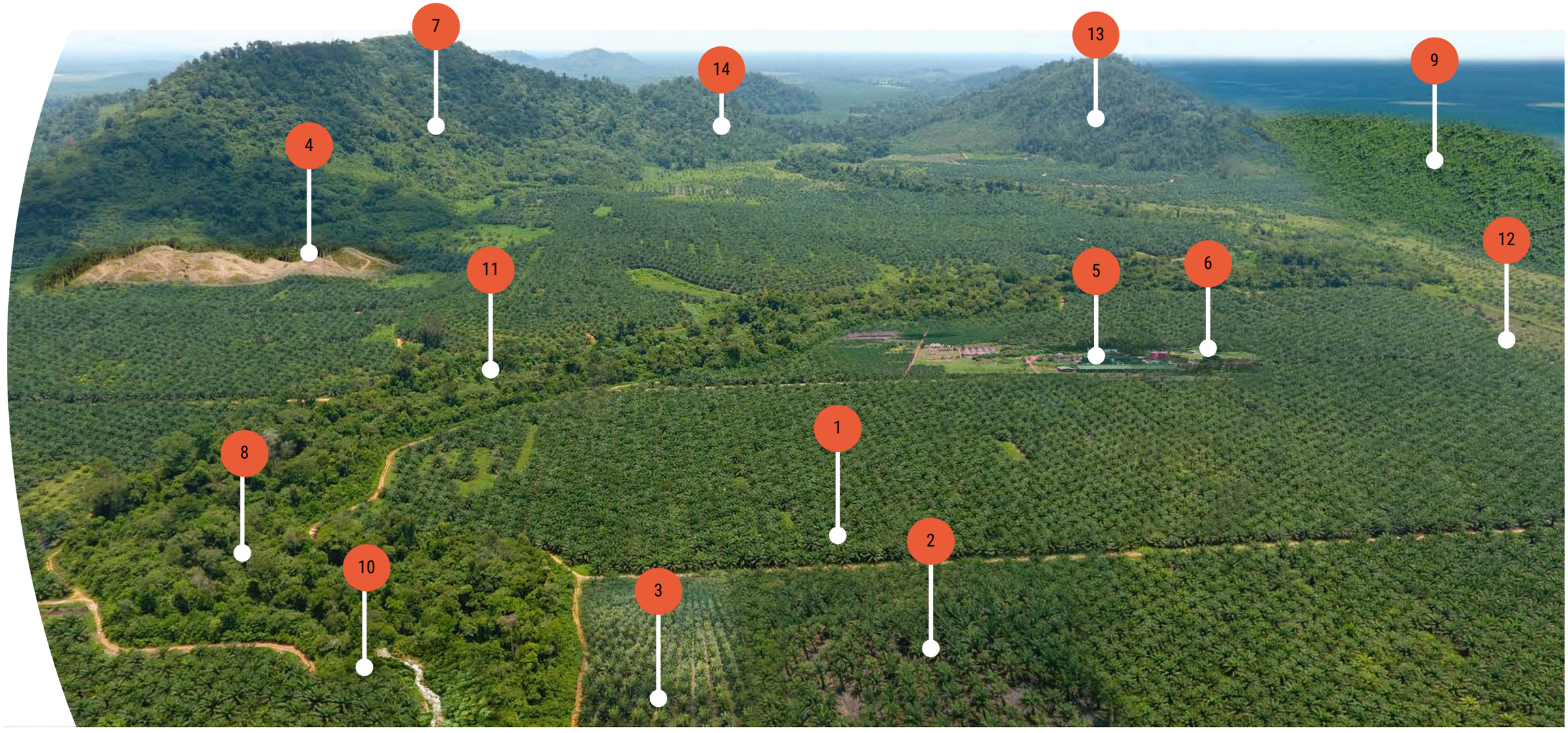
- **Disturbance** through removing native vegetation and application of herbicides
- More **extreme and less stable** environmental conditions
- **Loss** of species and altered species composition and communities
- **Shift** towards smaller bodied, lower trophic level, alien and non forest species.
- **Isolated** animal populations and increase risk of encroachment and hunting

Oil palm plantation

Leading to more dry and hot environments



Opportunities for biodiversity in the oil palm landscape



Plantations are not forest. However, well-managed oil palm plantations still hold opportunities for biodiversity. This cross-section introduces a fictious oil palm landscape and what can already be found there.

The oil palm matrix 1 is the core plantation area. It consists of rectangular, patch-like structures of planted rows of oil palms. Oil palms rotation cycles last for 25-30 years, allowing **epiphytes** and **understory vegetation** to provide habitat for arthropods, insects and other microorganisms, but also bats, small mammals and birds. The **older the age** 2 of a palm, the higher its ecologic value. Young plantations 3 have taller undergrowth, but less buffered microclimates and leaf litter depth. Re-clearing of planted areas will result in limited vegetation, higher temperatures and a lack of canopy cover. 4

Matrix areas can also be used to plant beneficial plants or for cattle grazing. Oil mills 5 process oil palm fruit bunches into palm oil. **Sedimentation ponds** 6 or water reservoirs next to the mill can provide wetland habitat for migratory birds.

Set-aside areas in oil palm plantations are often influenced by landscape topography: **steep slopes** 7 **, riparian areas** 8 **or peatland** 9 are more expensive or difficult to cultivate. These areas are therefore often avoided and prohibited for use by national guidelines, although planting up to riverbanks also occurs 10.

Set-aside areas are reservoirs of biodiversity within the fragmented landscape. Wildlife may also make use of plantation land for foraging or finding mates. It is not uncommon that palm oil companies to only cultivate 80% of their total area. Sustainability standards like the Roundtable on Sustainable Palm Oil (RSPO) or No Deforestation, No Peatland, No Exploitation (NDPE) commitments require companies to identify and protect **high conservation value** and **high carbon stock areas**.

Set-aside areas can also create connectivity with neighbouring forest via **ecological corridors** 11.

Within the same landscape **smallholders' plantations** 12 can be found adjacent to corporate plantations. Because of smaller sizes and individual management these plantations are more heterogenous and offer potential for more biodiversity, but could also risk less efficient use of chemicals and illegal hunting or more deforestation due toa lack off or delayed replanting. **Protected areas** 13, but also forests that are in production for **timber logging** 14 are reservoirs of biodiversity that are impacted by plantation activities, but may also make use of plantation land for foraging or finding mates.

Photo credits: Tropenbos Indonesia

A giant anteater crossing an oil palm plantation road while carrying youngster on its back in the Llanos Orientales region of Colombia. Giant anteaters continue to make use of landscapes dominated by oil palm plantations, despite having a specific diet. However, maintaining natural forest inside this landscape is crucial to provide habitat for resting.

Photo credits: Lain E. Pardo Vargas

Key actions for better biodiversity practices

The practices proposed in this guide are not meant to substitute effective forest conservation policies. Protecting the remaining natural forest from (agricultural) deforestation and stopping drainage of peatlands in the landscape should have our priority: plantations alone are unable to support viable populations and most ecological functions.

However, practices such as keeping epiphytes on oil palm trunks or ecological enrichment through setting aside small patches with native trees can facilitate animal movement and restore natural vegetation without having a significant impact on total palm oil yield. On a more positive note, biodiversity is a central link in providing ecosystem services that agriculture depends on such as soil fertility, nutrient and water cycles and reduced pest and disease invasions. These opportunities are missed out if we focus on protected areas only.

Better biodiveristy practices, however, can be in vain, or even work counterproductive, if we don't consider the role, perceptions and priorities of the people working and living in the landscape.

Mainstreaming biodiversity acceptance in oil palm plantations requires commitment from all levels, from top company management to harvesters and truck drivers working in the field. Cooperation with other people living and working in the landscape is even more important in topics that cross plantation boundaries such as creating riparian buffer zones or restoring peatland ecosystems. Support from (inter)national policies can reward and incentivize actions to create more biodiverse plantations.

Symbols to help you read actions

Watch out: carefull implementation required

Stop: consider operational challenges

Read: check out for more information

Learn: explore new ideas and insights

Drivers of biodiversity loss

- Habitat fragmentation
- Human disturbance
- Simplified vegetation
- Homogenation of the landscape
- Extremer environmental conditions
- Loss of forest-dependent species

1 **Facilitate animal movement** by connecting isolated populations via ecological corridors and allowing their movements by targeting other threats such as hunting, wildlife trafficking, forest fires or diseases.

2 **Enhance and restore natural vegetation** by keeping epiphytes, allow understorey, restore peatlands and riparian areas and enrich plantations with creating patches of native plant and tree species.

3 **Adapt oil palm replanting schemes** by exploring mixed-age standing, staggered replanting and permanent canopy cover throughout the oil palm matrix.

4 **Include staff and workers** by giving them tasks and rewards in biodiversity monitoring and protection.

5 **Try new monitoring techniques** that make monitoring and restoration activities easier.

6 **Scale up biodiveristy policies and targets in** voluntary standards for sustainable palm oil, national regulations and international agreements.

Obstacles against biodiveristy gains

- Lack of resources
- No follow-up on monitoring assessments
- Mismatch in definitions, targets and criteria
- Lack of legal protection
- Misconceptions about wildlife ecology
- Perceived negative impact on yield

Boosting Biodiversity

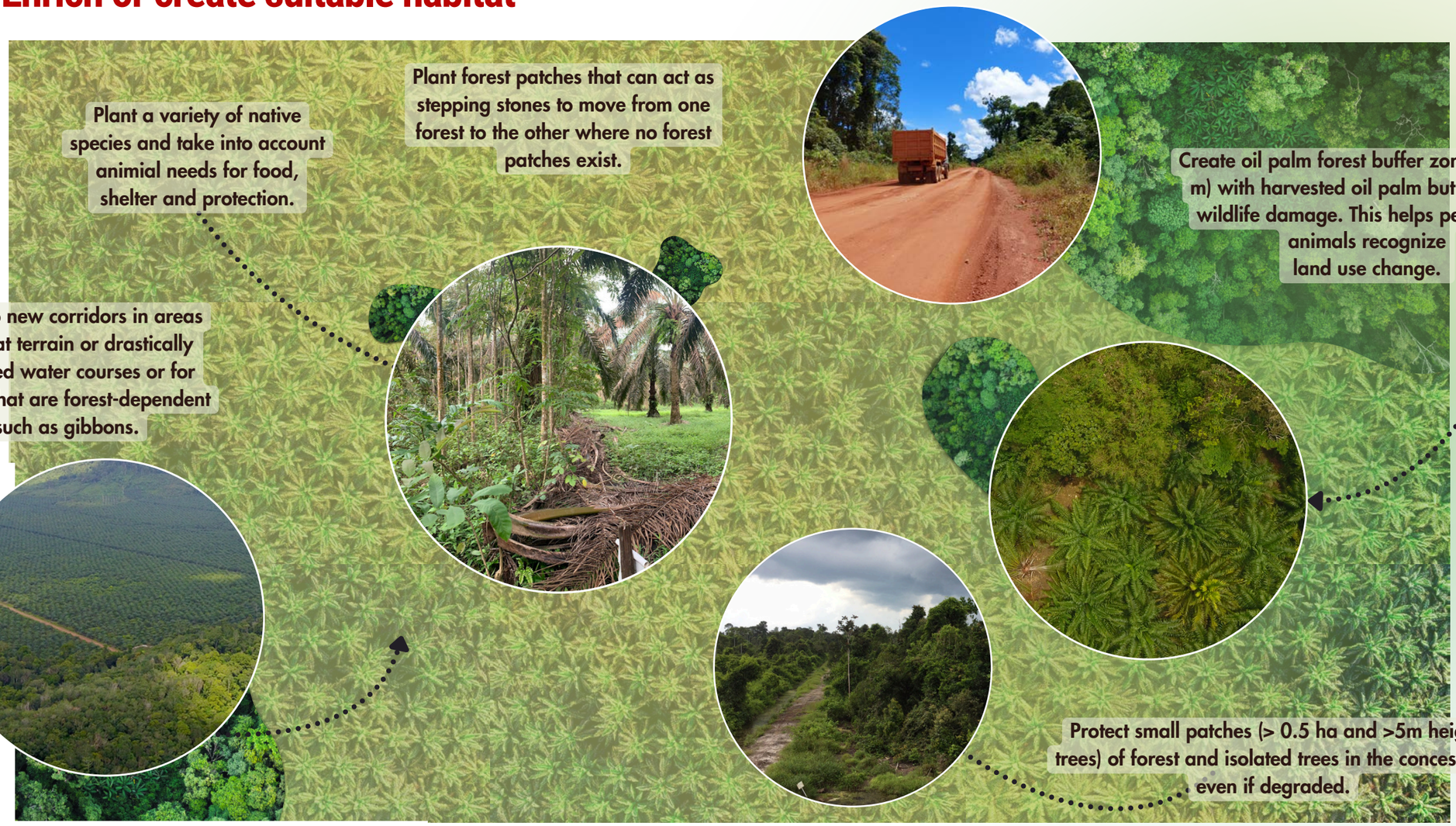
1. Facilitate better animal movement

There is an increasing change of view that wildlife can survive in disturbed and mosaic landscapes. Animals such as the orangutan, but also deer, elephants or sun bears, make use of oil palm plantations. Although oil palm plantations alone are not sufficient for wildlife survival, allowing animals to cross plantations is crucial for their continued existence. This means conservation strategies that can protect wildlife populations need a wider, landscape scale, perspective that includes plantations.

Minimize and prevent

- **human-wildlife conflict** by training and informing staff what to do when encountering certain wildlife;
- **road killings** by introducing speed bumps, arteficial canopy bridges - also across rivers - and signs;
- **feral dogs** who use oil palm plantations to enter forest;
- **human disturbanc**e such as illegal logging and poaching and promote 'no hunting' and 'zero snaring' policies;
- **accidental deaths** or poisoning by closing abandoned pits, unused wells and properly store and review use agricultural chemicals;
- **invasive leguminous vine** *Mucuna bracteate* or *Clidemia hirta* to expand into forest patches to prevent 'choking' of natural vegetation.

Enrich or create suitable habitat



DO NOT:
enrich in places where you do not want animals and avoid species that humans also want to harvest.

Photo credits: Tropenbos Indonesia, Gustavo Paterno and Thijs Pasmans.

Know animal behaviour

Understand animal movement: male orangutans can travel up to 10 km through oil palm plantations and navigate using rivers or high points while elephants make use of already establihed migration routes. These sites must get priority in protecting and setting up corridors.

Animals might be very elusive and difficult to record in mixed landscapes. This does not mean they are not there.

Take animal diets into account: orangutans tolerate some extraction of timber species, but depend on the presence of vine and lianes. Grasslands and pioneer species support grazers, and the presence of elephants is correlated with mineral deposits. These vegetation types can be promoted in areas where wildlife make use of.

Moving under mature oil palms is advantageous because animals can take cover from humans more easily.

Animals may or may not stay within the boundaries of the designated corridor. Successfull use depends on a clear goal of the corridor: passageway only or also additional habitat. It also depends on whether they feel safe, can easily enter and exit, serve movement of both individuals and herds, provides terresital and/or arboreal movement and is wide enough to prevent conflict between individuals.

Oram, F.,Best Management Practices for Coexistence with Orang utans in MixedForest/Oil PalmLandscapes (2023) Project Report of the PONGO Alliance – Kinabatangan Project, for Yayasan SimeDarby and The French Alliance for the Preservation of Forests, and in association with HUTAN.

Photo credits: Catherine Barton and Lain E. Pardo Vargas

Counter wildlife misconceptions

Male orangutans move through oil palm plantations to visit female orangutans who live in isolated patches of forest. In the Kinabatangan region of Sabah, Malaysia, signs of orangutans were found in every patch of forest surveyed within oil palm estates. This challenges popular believe that orangutans do not use oil palm plantations at all.

Take areas outside concession into account

Corridors are in vain if there is no forest to connect them to. This tiger was caught on camera trap in SIPEF Biodiversity Indonesia (SBI) project: a 12,672 ha degraded production forest issued by the Indonesian government as a 'Ecosystem Restoration Concession'(ERC) located next to a buffer zone for the Kerinci Sebelat National Park in Bengkulu Province, Indonesia.

Photo credits: Marc Ancrenaz and Sander Van den Ende

Edge of a 'tree island' established in an oil palm plantation. Tree islands can function as stepping stones to allow animal movement from one forest to the other. They also enhance biodiversity and ecosystem functioning, without decreasing yield at the plantation landscape scale.

Photo credits: Gustavo Paterno

2. Enhance natural vegetation

Understory vegetation increases soil fertility, water holding capacity and prevents soil erosion. Vegetation also attracts beneficial arthropods that prey or lay eggs in pest species. Practices to plant beneficial plants to attract these predators focus on creating planted strips along plantation roads or canals.

However, the potential of beneficial plants can be improved if naturally emerging understory is maintained and enriched throughout the oil palm matrix. This not only creates a more diverse network of natural enemies of pests, but also brings them closer to their prey and hosts throughout the oil palm matrix.

Some undergrowth such as *Mucuna* can become problematic in overgrowing others species.

Too many epiphtyes can stop loose fruits to reach the ground. Harvesters spot loose fruits as an indicator that the fruit bunch is ready for harvesting.

Install artificial bird perches to attract presence of predatory birds.

Leaving undergrowth and epiphytes has a positive effect on attracting insectivorous birds that can deliver natural pest control.

Do mechanical weeding instead of herbicide application to promote vegetation regrowth and diversity.

Missing palms create open spaces that can be used for planting beneficial plants.

Full stop of chemicals is not always feasable and manual weeding is labour-intensive and expansive, but field workers can be more selective when spraying and avoid spraying drains holding water.

Proper storage, training and health and safety equipement when using chemicals is also better for plantation worker.

Integrate use of 'attract and kill' devices using chemical signals and explore the use of pathogenic microbes. Chemical signals are insect specific and do not harm the environment.

Establish beneficial plant bed patches inside the oil palm matrix that offer resources such as shelter, nectar, pollen and alternative prey/hosts for predatory arthropods.

Photo credits: RSPO, MVO - The Netherlands Oils and Fats and Gabriel Esteban Enríquez Castillo

Artificial bird perches attract predatory birds that can enhance biological pest control, especially against rodents. Perches are vital as a heightened vantage punt for hunting, resting, preying, and roosting of predatory birds. *White-throated Kingfisher* (left and bottom right) and *Collared Kingfisher* (top right) prey on pups an juvenile rodents, potentially controlling rodents at pre-breeding stage. This complements presence of introduced barn owls who prey on adults and by night only.

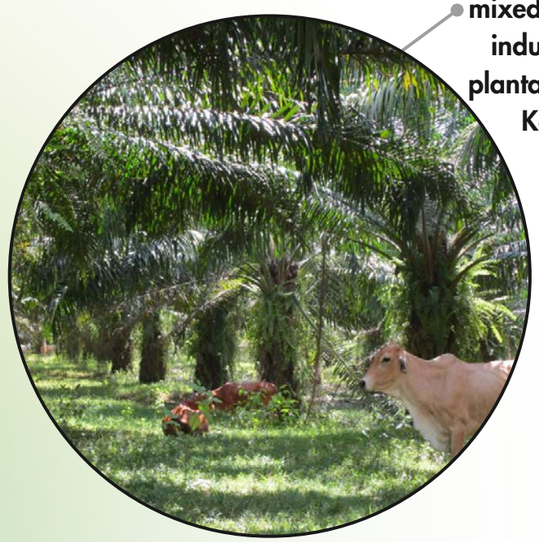
Photo credits: Badrul Azhar, Universiti Putra Malaysia (UPM)

Combining oil palm with other land use

Cattle grazing can complement manual weeding and preserves weeds root biomass that allows regrowth and has positive effects on soil biodiversity.

Bali cattle, a small, local breed that is often kept by smallholder oil palm farmers

Rotational grazing of mixed cattle breed on industrial oil palm plantation in southern Kalimantan.



Corn intercropped with young oil palms in Colombia can help reduce weeds and generate additional income in the early stagtes of the crop.

Cattle grazing must be well-planned with the soil's carrying capacity and avoided in young palms or close to riparian areas to prevent crop damage and destruction of river banks.

Vegetable intercropping between young oil palms in Jambi, Indonesia provides opportunity for farmers who are not actively involved in oil palm.

An oil palm and cocoa agroforestry system developed in Cameroon can achieve environmental and economic gains and is recommended by CIRAD guidelines.

MONITORING PLANT-INSECT INTERACTIONS IN OIL PALM AGROECOSYSTEMS – a report for the Ferrero-SAN program: Towards a Healthy & Biodiverse Oil Palm Production System

Photo credits: Maja Slingerland, Verina Ingram, Gabriel Esteban Enríquez Castillo and Thijs Pasmans

The leaf bases of oil palm trunks remain attached for approximately 20 years and create a 'flower pot like' base for epiphyte communities that can provide habitat for arthropods, insects and other microorganisms, but also bats and birds.

Photo credit: RSPO

Allowing more floral diversity and complexity in undergrowth creates habitat for insects and other 'hidden biodiversity' in oil palm plantations. Insects can benefit the oil palm by controlling pests, reduce herbivory, improve soil and pollinate palms. As insects depend on undergrowth, limiting the frequency of spraying herbicides or only targetting specific zones will boost their occurance and diversity.

Photo credits: Gabriel Esteban Enríquez Castillo and Jean Pierre Caliman

Use of herbices (front) versus mechanimcal weeding (back) in smallholder plantations, Jambi, Indonesia.

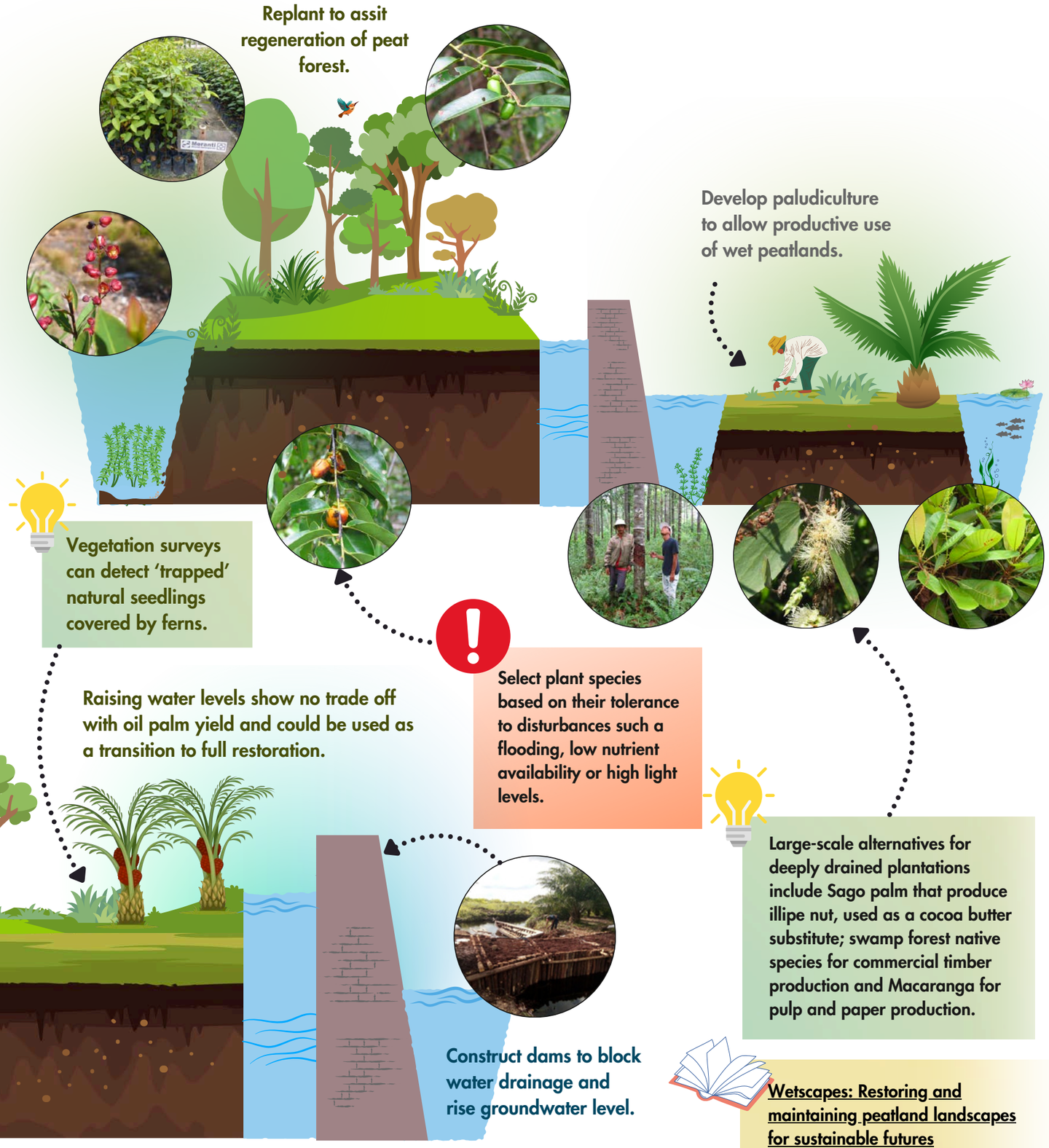
Photo credit Thijs Pasmans

Restore functioning of peat ecosystems

Peatlands are wetland ecosystems consisting of layers of partially decomposed plant material. Peat is best understood as a sponge: a self-regulating hydrological entity that stores and regulates water. Heavy draining and deforestation in peat has disrupted this sponge mechanism, resulting in the degradation of peat ecosystems and loss of its specific biodiversity.

Restoring peatlands is simple: peatlands need to be wet. But rewetting is not a straightforward practice. Draining or blocking water in one area will have consequences in another. This means that individual actions to rewet can work counterproductive if they are not well aligned with needs of other stakeholders.

Oil palm is grown on drained peat to allow better yields and farm access. Current policies focus on stopping further expansion on peat and maintaining proper water levels for existing plantations. RSPO also requires companies to asses phasing out oil palm from peat. In the meantime soil subsidence, risk of fire and flooding continues. Oil palm is one of the key stakeholders and can pick up an active role to move from optimal peatland management to restoring its ecosystem functions in the entire peat landscape.



Wetscapes: Restoring and maintaining peatland landscapes for sustainable futures

Photo credits: Wim Giesen and Suwignya Utama

Alstonia spatulata: plant able to live in both pioneer and secondary succession stages and tolerant to flooding.

Dyera Polyphylla: pioneer plant tolerant to light with predictable yearly fruiting.

In addition to being tolerant to disturbances, replanting species to restore peat should take into account usefull plant characteristics such as economic value, predictable yearly fruiting and seeds that attract animals.

Photo credits: Wim Giesen

Combretocarpus rotundatus: fast-growing pioneer and secondary plant that is tolerant to low nurietns, fire and light.

Melaleuca cajuputi: pioneer plant tolerant to fires and flooding that is fast-growing.

Biodiversity practices proposed in other chapters do not necessarily apply for peat. Drying out of peat modifies its ecosystem and biodiversity in remaining peat pockets will disappear. Rewetting is key to restore biodiversity in peat.

Restore riparian buffer zones

Riparian reserves are strips of natural vegetation located along rivers, streams and lakes, surrounded by areas of non-natural vegetation like oil palm plantations. The presence of natural vegetation next to waterways can provide many benefits within an oil palm plantation or for downstream water users. Riparian reserves help to filter out pollutants before they enter rivers. They can stabilise river banks, reduce downstream flooding and help maintain natural in-stream conditions for aquatic plants and animals. Riparian reserves can sequester carbon dioxide and provide habitats for a range of plant and animal species. On account of such environmental values, properly managed riparian reserves can generate significant benefits from the conservation of natural vegetation for oil palm companies.

Maintaining some minimum activity in riparian restored area is a way to prevent local communities to come into these "non-used area" and start their own activities, generally at the expense of the restore area.

Do not block acces of animal movement by replanting too heavily.

Keep existing oil palms in place to prevent soil erosion and provide shade to seedlings.

Discuss restoration with local communities and other stakeholders to make agreements on use and maintenance along the entire river stream.

RSPO Manual on Best Management Practices (BMPs) for the Management and Rehabilitation of Riparian Reserves

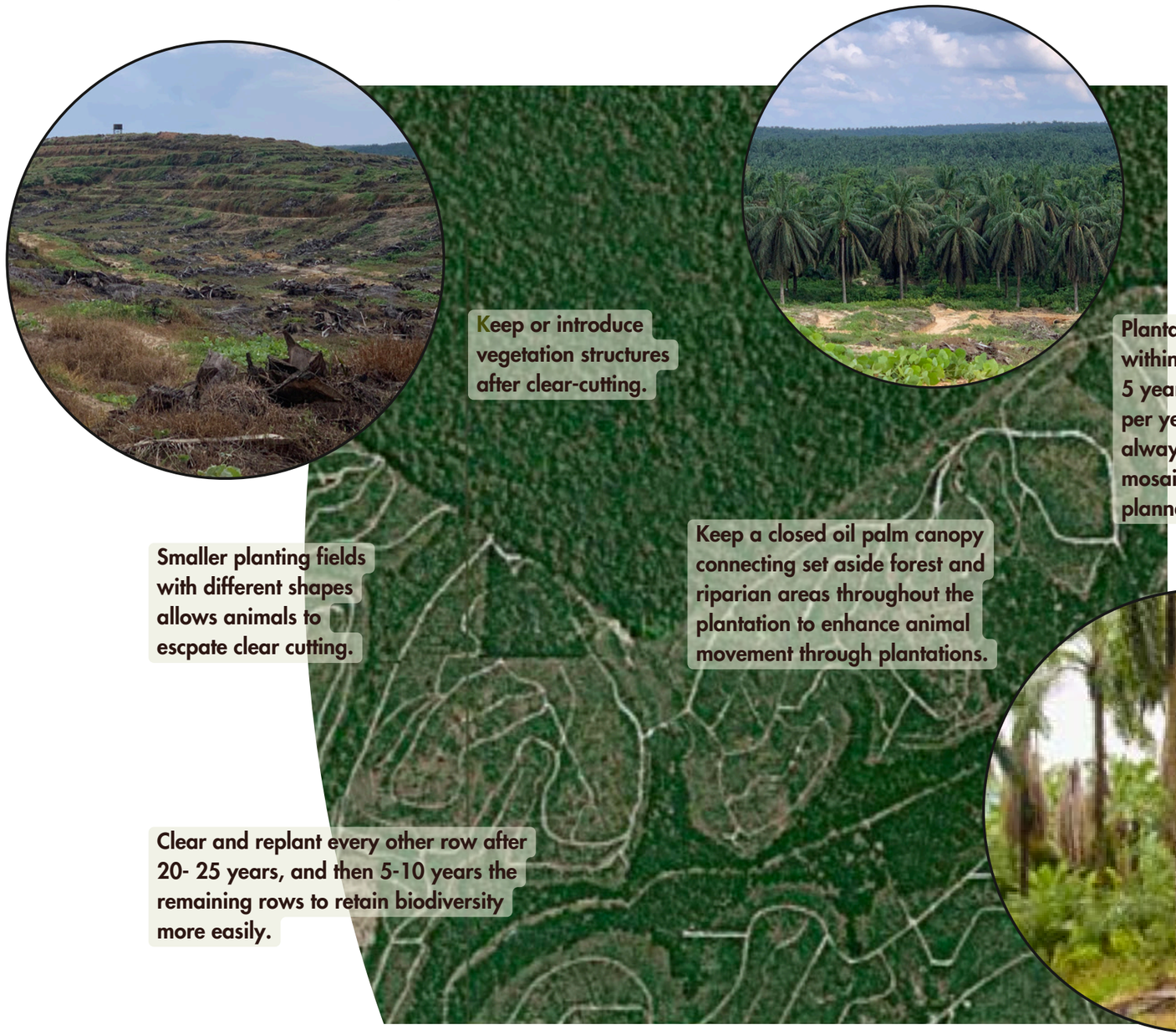
Photo credits: Catherine Barton, Thijs Pasmans and RSPO.

Riparian buffer zone in an oil palm plantation in Palmas del Machaquilá, Sayaxché, Petén Guatemala. The establishment and protection of riparian zones provide several advantages, including biological corridors, increased local biodiversity and conservation of native species and the protection of surface water bodies.

Photo credit: Jose Fares, GREPALMA, Guatemala

3. Create more heterogeneity in replanted plantations

Replanting aged oil palms is usually a clear-cut activity: oil palms are pulled down and recycled into organic matter while the ground is being prepared for new oil palm seedlings. The biodiversity and habitat complexity that has been built up for 25-30 years phases a 'second wave' of losses when these palms are being cut down. However, when well-planned, replanting can contribute to improved permeability, connectivity and reducing negative impact on habitat and microclimates in plantations.



Keep or introduce vegetation structures after clear-cutting.

Plantations are never replanted within a single year, but within 4-5 years or by approximatly 5 % per year. This means there is always opportunity for some mosaic distribution that can be planned to favor biodiversity.

Smaller planting fields with different shapes allows animals to escpate clear cutting.

Keep a closed oil palm canopy connecting set aside forest and riparian areas throughout the plantation to enhance animal movement through plantations.

Clear and replant every other row after 20- 25 years, and then 5-10 years the remaining rows to retain biodiversity more easily.

Small sized plantation landscapes such as those farmed by smallholders show lower disturbance because replanting is done on a smaller scale and not at the same time.

Undoubtly natural forest patches in plantations are more important for biodiversity. But their potential is limited if they are locked within an oil palm monoculture that lacks heterogeneity.

Phased replanting and underplanting of young oil palms might risk spreading of diseases such as *Ganoderma* as clear-cutting is also a sanitary practice. It also challenges plantation logistics and management practices.

Promoting landscape heterogeneity to improve the biodiversity benefits of certified palm oil production: Evidence from Peninsular Malaysia - ScienceDirect

Photo credits: Gustavo Paterno and Matthew Luskin

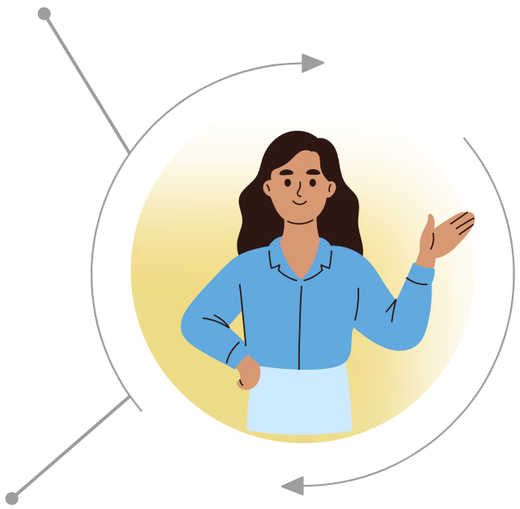
4.Include workers, communities and management

Companies that have good biodiversity management show that a well-communicated and supported biodiversity strategy is key to beingsuccessfull. This does not only mean training on better agricultural practices or information about what to do when encountering elephants. It also means giving staff a task or performance indicator linked to biodiversity – especially those outside the sustainability team – to change the way they work and perceive biodiversity.

> **We have thousands of people working in our plantations, and these people see wildlife every day. So why not ask them what they see?**
>
> https://www.anj-group.com/en/pendaki

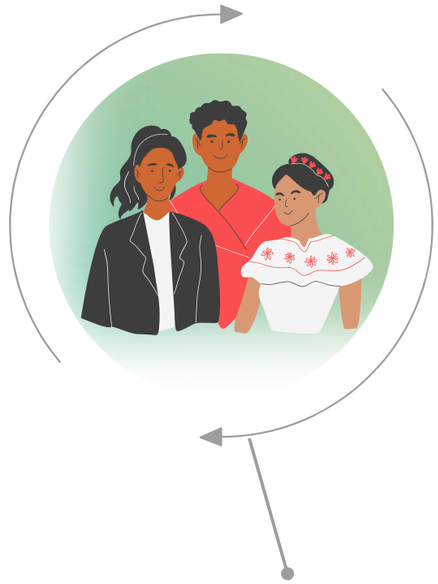
In preprint: A novel citizen science-based wildlife monitoring and management tool for oil palm plantations.
Nunik Maharani et al (2025).

Communicate the importance of biodiversity throughtout the company



Involve staff in biodiversity monitoring

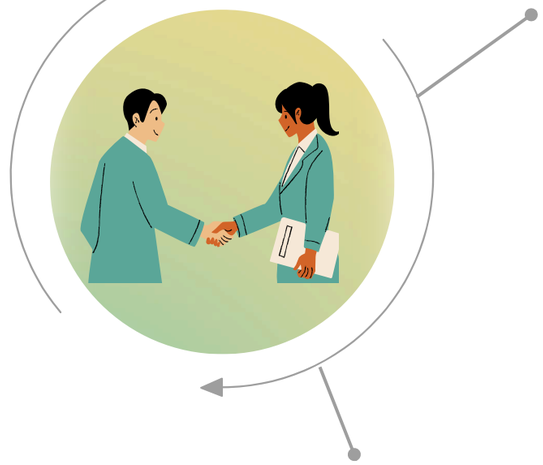
Including truck drivers, estate managers, security staff or harvesters in biodiveristy monitoring as part of their daily routine work. This can be done based on the principles of citizen science and focus on key (endangered) species that are easy for staff to identify. This will not only generate a lot of 'free' biodiversity data, but it will also foster a sense of biodiveristy ownership among plantation staff.



Role of communities

Awareness and socialization on biodiversity and conservation with surrounding communities reduces external threaths such as illegal logging, forest fire or hunting. Such activities can be organized with local organisations or governments. Hiring local people as rangers or forest guards can also increase environmental awareness among locals.

Include biodiversity targets as key performance indicators for staff



Get top management support

High-level support for biodiversity means that conservation practices can be pushed through from the top. This can help counter feelings that biodiversity will limit yields and can ensure long-term commitment and funding that is not dependent on the financial status of the plantation. The type of management that works depends on the local biodiveristy opportunities and threaths and does not need to be too prescriptive. Management has to focus on broader objectives such as maintaining forest cover or animal movement, which can be monitored remotely.

Participation of non-professional volunteers - also callled citizen science - expands the scale and scope of ecological monitoring. At oil palm company ANJ in Indonesia, citizen science informs the company how species such as orangutans make use of the landscapes and how plantation management could be adapted to maximize population viability.

Photo credits: Austindo Nusantara Jaya Tbk

5. Try new monitoring techniques

Monitoring every species throughout the plantation, its remaining patches of forest and neighbouring forest over a long period of time can be difficult to manage. As a result, initial assessments risk losing their potential as success of conservation efforts of certain species or in certain areas of the plantation are not well-recorded. In addition, new arrivals or occurrence of species outside identified High Conservation Value (HCV) areas or the value of a production forest nearby risk remaining out of scope. New monitoring techniques can overcome these issues and create more integrated biodiversity monitoring approaches.

Field conditions such as wind, sun and vegetation complexity can affect detectability of species. Other challenges include the cost of procuring drones, sensors and related materials, flight time, limited payload, and frequently changing regulation.

Focus on data that leads to better management outcomes, instead of pure biodiversity detection. Questions that can help could be:

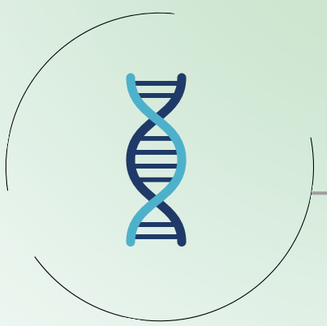
- **Where and which animals cross roads?**
- **What animals are targeted by hunting?**
- **Are there locations in the landscape that are of specific importance for wildlife?**
- **Are there invasive species that could pose a threath?**

Camera traps can provide valuable information landscape use of wildlife.

Drones can be used for surveying, observations, tracking and habitat research and monitoring.

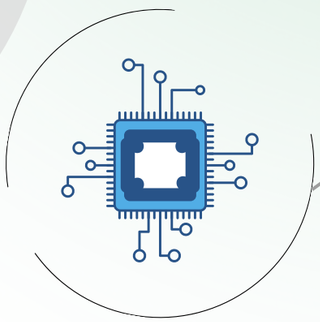
Biodiversity activities aided by new technologies:

- Animal counting and tracking: such as baseline counting to start restoration projects or following; high conservation species
- Plant health assesments;
- Environmental sampling: taking soil or water samples;
- Replanting native species: Seed dispersal and ferttilisation and pest management;
- Vegetation mapping.



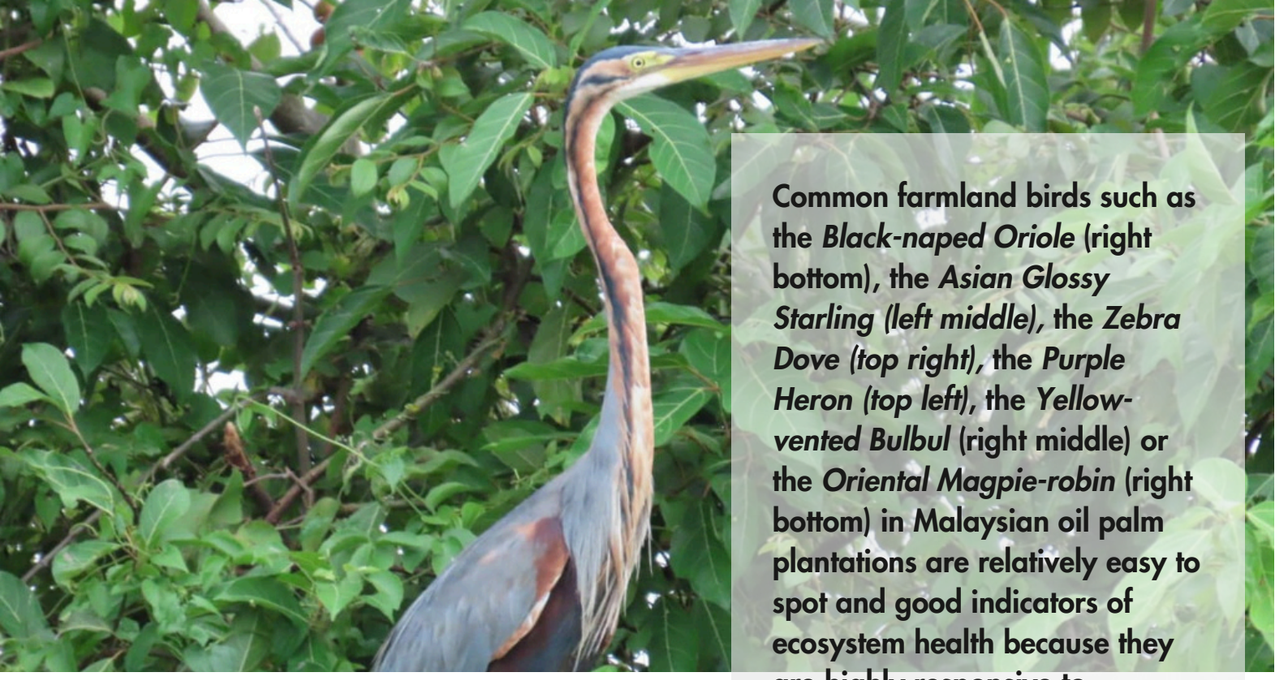
Environmental DNA, or eDNA: genetic material taken from environmental samples (soil, sediment, water, etc.) is being explored as an efficient, non-invasive and easy-to-standardize sampling approach.

Acoustic monitoring in ecosystems has potential to improve biodiversity monitoring at the landscape level.



Artificial intelligence overcomes issues around false positives and the analysis of the many images generated which is very time-consuming when done manually.

Photo credits: Serge Wich



Common farmland birds such as the *Black-naped Oriole* (right bottom), the *Asian Glossy Starling (left middle)*, the *Zebra Dove (top right)*, the *Purple Heron (top left)*, the *Yellow-vented Bulbul* (right middle) or the *Oriental Magpie-robin* (right bottom) in Malaysian oil palm plantations are relatively easy to spot and good indicators of ecosystem health because they are highly responsive to environmental degradation such as pesticides or habitat simplification.

Photo credits: Badrul Azhar, Universiti Putra Malaysia (UPM)

A team of Malaysian researchers from HUTAN flying a drone to survey orangutan nests. Drones offer the advantage of quick surveys of orangutan nests over relatively large areas and are much faster than ground surveys. At present, it takes considerable manual effort from human image analysts to go through all the videos obtained during these surveys to locate the nests. However, research is ongoing to use AI to semi-automate this and hence make drone surveys more efficient.

Photo credits: Serge Wich

Live images from a drone patroling ecological corridor on oil palm plantations in West Kalimantan. Drones are used by local Tropenbos Indonesia team to check illegal expansion of bauxiet mining into the corridor. Images taken monthly and stored to allow comparision and engagement with companies active in the region.

Photo credit Thijs Pasmans and Tropenbos Indonesia

A camera trap in Sabah. Camera traps can provide valuable information on the usage of oil-palm plantations by orangutans and other species. Generally the SD cards in the cameras are emptied out and then manually inspected. More recently there are options to upload such images to AI models that detect species automatically. The camera in this photo has a SIM card and uploads the images directly to an AI model through the mobile network and the user will get an email a few seconds later with the detection results. This allows for fast responses in oil-palm plantations to the presence of animals (e.g. elephants).

Photo credtis Serge Wich

Scale up biodiversity policies and targets

Oil palm is in a good position to boost biodiversity. There is, however, a matter of scale. RSPO has been benchmarked by IUCN NL as the highest standard for biodiversity, but its share of global production volume has remained constant on 19 to 20% since 2019. Similarly, the European Deforestation Regulation, (EUDR) unless applied by traders for their full practice, only has a direct impact on the palm oil produced for Europe, about 10%. Governing sustainable oil palm, including the practices in this guide, thus needs to take the quantitative aspect of scale and potential impact along as well. Nature-positive approaches such as the new targets of the Global Biodiversity Framework that include restoration of biodiversity alongside its protection are hopeful. As are (mandatory) national sustainability standards in oil palm production countries that can raise the floor for all growers or support for separate actions that can be implemented prior to or apart from any sustainability certification. The following actions can be taken by policymakers to implement the above biodiversity practices easier and more efficient.

Give protective status to areas already set aside on plantation lands.

Ecological corridors in the Ketapang district of West Kalimantan, Indonesia for example have received the official status of 'Kawasan Ekosistem Esensial (KEE)' - Essential Ecosystem Area - giving it legal protection on land that is designated as agriculture.

This area that received the KEE status contains forest areas that have been assessed as HCV areas as part of RSPO certification. However, a simpler approach to identify and protect, for example by focussing on the actual presence of forest above a certain threshold – like the FAO definition – would also be useful to include companies that do not have sustainability certification or to be taken up by national standards for sustainable palm oil.

Integrate organic or agroforestry practices into regulations and standards for sustainable palm oil.

Oil palm yields are increasingly vulnerable to pest and disease invasions, droughts, fires and flooding. These extreme circumstances have direct impact on plant physiological properties. Oil palm yields are also becoming more vulnerable because of its limited geographical area of production, narrow diversity genetic diversity, low rate of mechanisation and stagnation in oil palm yield growth.

Including organic, agroforestry or regenerative oil palm practices into other sustainability standards can stimulate biodiversity in oil palm and help restore ecological functions such as climate resilience, soil fertility, nutrient and water cycles and reduced pest and disease invasions.

Prioritize research on replanting practices that improve biodiversity - and follow this up in criteria for sustainability standards.

Supply for future demand will increasingly be produced via replanting of existing plantations. However, research on the replanting management and its impact is not well explored in existing literature.

Better replanting practices offers a chance to redesign plantations: not only to limit biodiversity loss through clear cutting of existing oil palms, but also to make oil palm better to facilitate animal movement, climate resilience and biological pest control. This is especially relevant for large scale plantations that lack heterogeneity. Good practices should be taken up by standards such as RSPO and national standards for sustainable palm oil.

Target riparian and peatland areas in plantation landscapes as biodiversity restoration areas under the CBD.

Riverbanks are officially protected by national law in Malaysia and Indonesia. However, widths are limited and encroachment up to river banks is not always implemented. Expansion on peatland is prohibited by private commitments, voluntary standards or national moratoria, but existing plantations on peatland are still open for production and replanting.

Convention on Biological Diversity (CBD) Target 2 on the restoration of 30% degraded terrestrial ecosystem areas could create policy vehicles to restore these areas. Major oil palm growing countries Indonesia and Malaysia have ratified the CBD framework.

Other CBD targets relevant for oil palm could be:

- Target 1 on biodiversity inclusive spatial planning – to allow animal movement through plantations;
- Target 10 to ensure that areas under agriculture are managed sustainable – to enhance natural vegetation in the oil palm matrix;
- Target 14 on the full integration of biodiversity into policies – to stop removing of epiphytes and reduce use of chemicals.

Support supply chains and markets for paludiculture products such as reed, illipe nuts or sago palm.

Rewetting peatlands is urgent, but can be politically complex. Peatlands with oil palm, or other agricultural or forest commodities, have been drained for production purposes. With a growing demand for food and biomass products, rewetting to create new nature is not always possible. Instead, we need land use options that move away from the environmentally damaging use of drained peatlands.

Paludicultures aims to produce on peat while stopping further subsidence and greenhouse gas emissions. In Southeast Asia, but also in other peat regions, there are plant species that can be usefull growing wood, medicinal uses, food (such as fruits, nuts, and oils) or other uses such as latex, fuels, and dyes. This requires abandoing the common practice of draining water as quickly as possible, requires new legislation and incentives in the form of subsidies and the set up of a new supply chain including logistics, breeding of plant species and market acceptance.

Change policies that focus on wildlife translocation to wildlife co-existence.

For many companies, government officials or NGO's, wildlife such as orangutans and elephants are still an abnormality in plantation landscapes. This assumption has caused policies to focus on removing 'lost' animals and locate them to forest areas 'far away'.

However, finding new adequate habitat for these animals is increasingly difficult. For species such as orangutans translocation goes against new insight on their ecology and social behaviour and disrupts orangutan communities. The Sabah Action Plans 2021 - 2029 amended the policy above from one of routine translocation of orangutans away from human-use areas to one that advocates coexistence.

Other IUCN and IUCN NL papers on oil palm

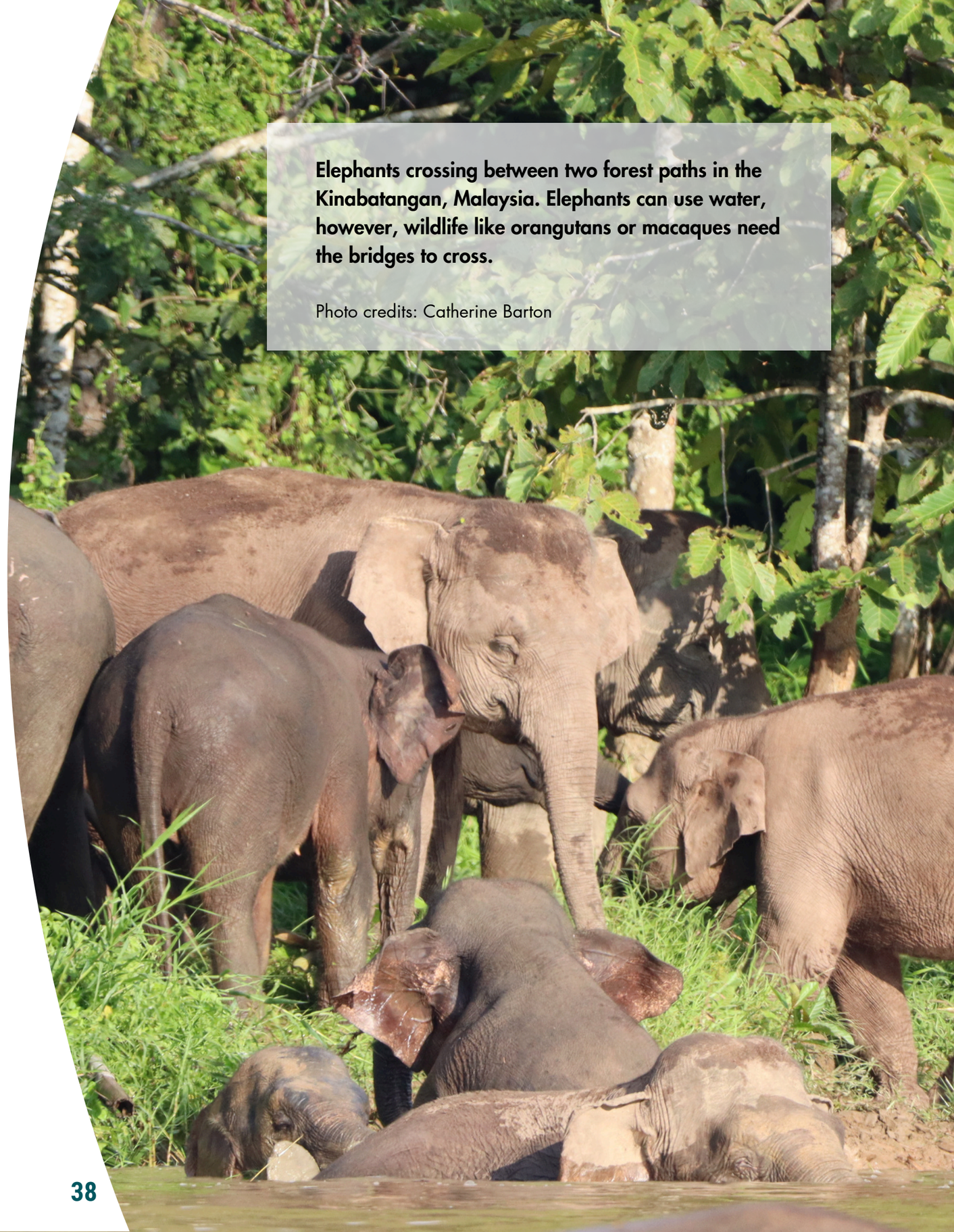
IUCN NL promotes sustainable production and consumption of palm oil to stop further biodiversity loss and restore ecological functions in the landscape. We believe that policies and practices that offer such solutions deserve more attention and support.

IUCN NL is part of a network of global IUCN constituencies. Other IUCN and IUCN NL related papers you might find interesting are listed on this page.

IUCN-NL 2021: "Sustainable palm oil in practice: recommendations for improving the assurance of RSPO"

IUCN 2024: "There is no good or bad oil crop. There are only good and bad practices."

IUCN 2018: "Saying 'no' to palm oil would likely displace, not halt biodiversity loss"



Elephants crossing between two forest paths in the Kinabatangan, Malaysia. Elephants can use water, however, wildlife like orangutans or macaques need the bridges to cross.

Photo credits: Catherine Barton

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Two Oriental pided hornbills in the Kinabatangan, Malaysia.
Photo credits: Catherine Barton

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