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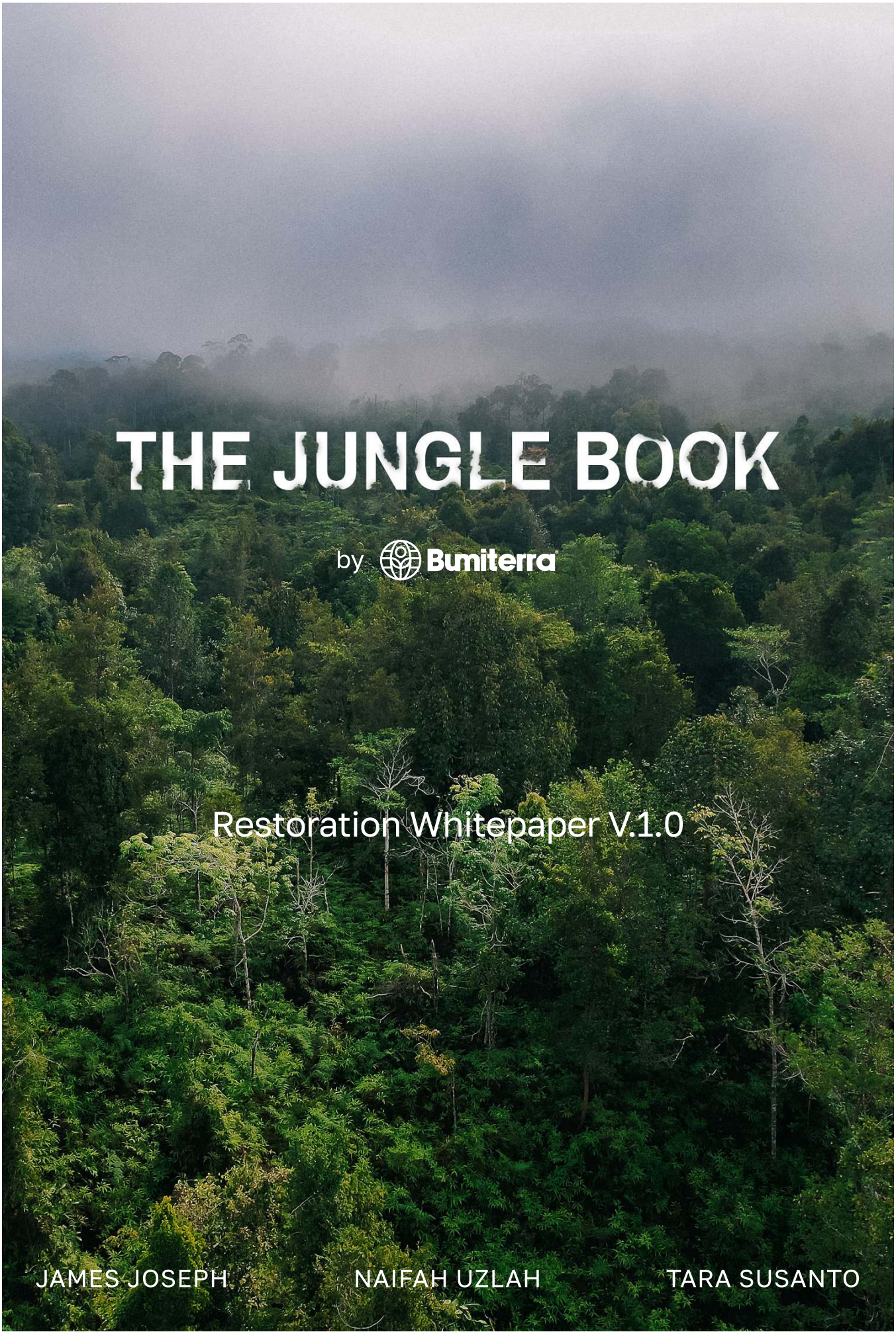

Restoration Whitepaper V.1.0

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Fore-word

The aim of this whitepaper is to provide a clean and effective solution for companies to reliably remove their carbon/greenhouse gas emissions, take care of natural ecosystems, regenerate biodiversity, and uplift marginalized communities.

Why are we taking the effort to provide this?

Simply, because we are not satisfied with the current state of the climate solutions offerings that exist currently. Climate solution tools in circulation now such as carbon credits/removals, RECs, Biodiversity Credits are all a work in progress and far from perfect. Climate change is the biggest existential threat to all life on earth, and so it only makes sense for us as humans to sharpen all our available tools and resources to fight this battle.

With that in mind, we are here to contribute and bring an energy of innovation and problem solving that can provide a tail wind to the climate solutions space.

Nature calls, we answer.

James Joseph & Tara Susanto

Co-Founders

Contents

Payback to Nature

Earth is the platform in which all businesses exists, and it's made of 3 pillars:

1. Atmosphere, the gasses surrounding us
2. Lithosphere, the solid matter we stand on
3. Hydrosphere, the water hydrating us

These 3 pillars create earth's endowment for us, or in other words, **nature's capital**.

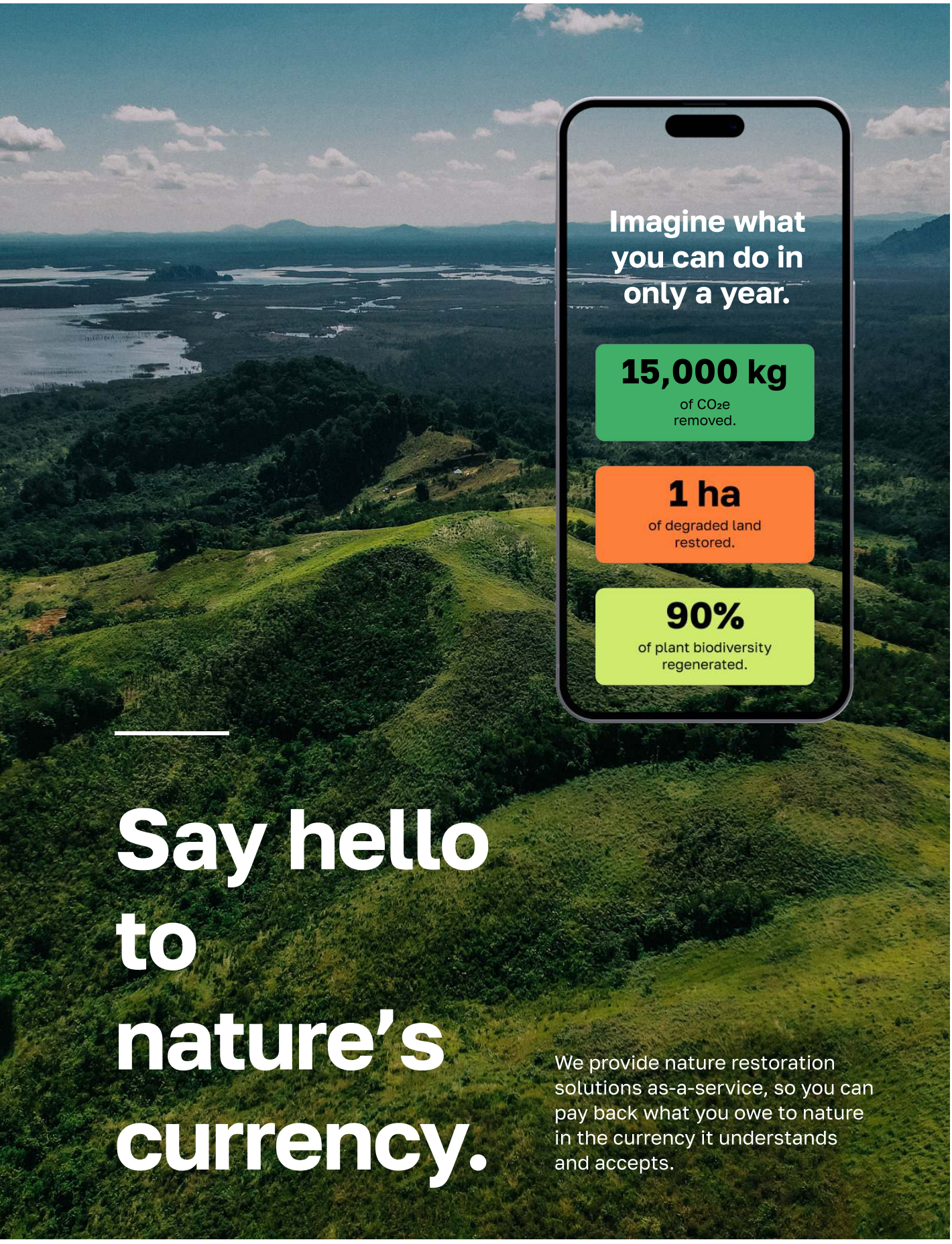
Our failure to account for the cost of nature's capital is the driving force of **climate change**.

Businesses account the cost for all types of capital, from:

1. **Human capital** in the wages we pay to our employees and team members
2. **Financial capital** in the interest we pay to our creditors
3. **Manufacturing capital** in the money we pay to the factories

However, **Nature's capital** seems to be nonexistent. It is time to account for nature's capital and go **nature positive**.

Bumiterra is a movement dedicated to help businesses account for nature's capital, and here is how we pay back to nature.



Say hello to nature's currency.

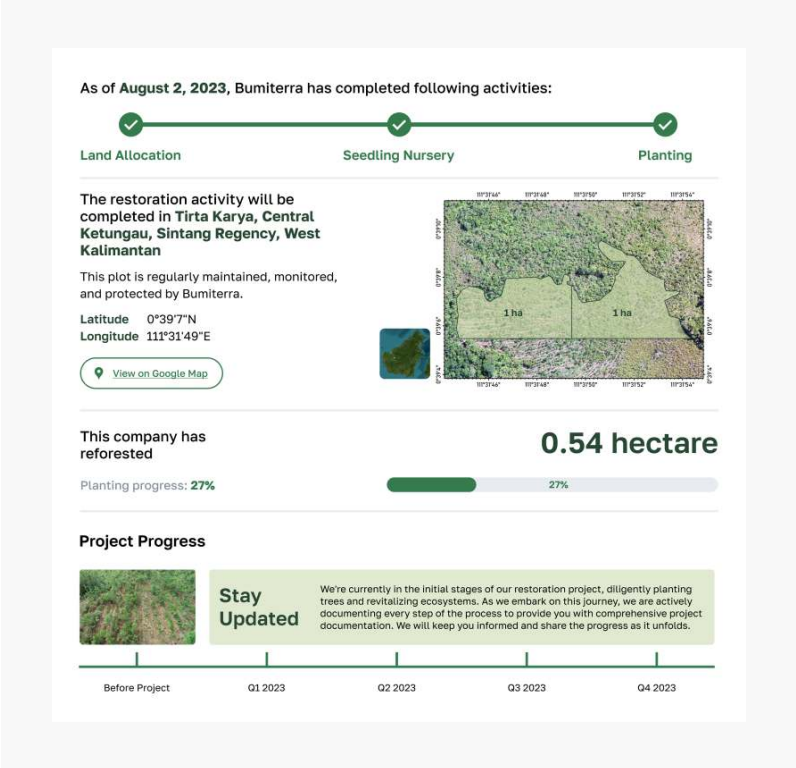
We provide nature restoration solutions as-a-service, so you can pay back what you owe to nature in the currency it understands and accepts.

FOR USD 400 A MONTH, YOU RESTORE 1 HECTARE OF DEGRADED RAINFOREST, AND MORE:

✓ Remove and store 15 tonnes of CO2 permanently in a year, on average
✓ Prevent slash and burn activities and avoid 42 tonnes of CO2e emissions per year
✓ Regenerate at least 20 different plant biodiversity
✓ Conserve at least 9 types of wildlife biodiversity
✓ Empower at least 1 family and provide their need for food
✓ Restore at least 1 family's legal land right status

WE PROVIDE:

1. **Restoration registry** that is open to the public on our website and updated every 2 weeks. Features of the tracker include HD aerial photograph of the allocated reforestation site, and progress timelines for nursery and planting activities. (Figure 1)
2. **Quarterly restoration reports**, to keep track of all the details and metrics of your restoration work. Such as carbon sequestered and wildlife occurrence. (Figure 2)



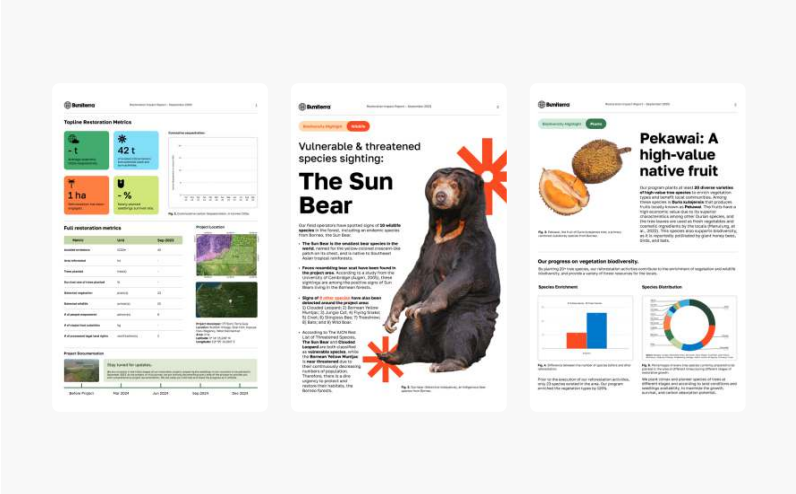


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Figure 1. Example of Bumiterra's restoration registry (Source: Bumiterra, 2023).

BOTTOM

Figure 2. Example of Bumiterra's restoration report (Source: Bumiterra, 2023).

How We Execute for You

Empowering local indigenous people is core to Bumiterra.

All our restoration activities are designed to be carried out by local communities on their own ancestral lands, 1 hectare at a time. We have an inclusive program that actively involves the local people, to remove the drivers of deforestation such as slash and burn agriculture, illegal logging, and mineral mining.

Bumiterra values the wisdom of local indigenous people and their interconnectedness with the natural environment. Our program implements a participatory approach where local communities are involved in every step of the process, from prospecting, planning, strategizing, to planting and monitoring.

I. WE FACILITATE, TRAIN, AND ENGAGE OUR LOCAL COMMUNITIES

The local community is the foundation of Bumiterra reforestation program. Each training plan is developed on the basis of not only what the program needs, but what the community will benefit from.

Identification of the appropriate target audience, skills to train, and training method is essential to create the most impact. The skills that we put a particular emphasis on are those related to seedling nursery, planting, land management and monitoring.

We closely teach and guide for as long as necessary. Once they are able to operate on their own without further guidance, we let them be and periodically monitor their progress and performance.

Our field operatives team closely guides and supervises our Mitra Penghijauan in every process of the reforestation program. (Source: Bumiterra, 2023).

II. WHAT DO THE LOCALS GET IN RETURN?

Our restoration partners or ‘mitra penghijauan’, will be incentivized to sustainably manage and restore their lands. By participating in Bumiterra’s program, our local partners will receive the following benefits:

Benefit	Frequency	Details
Upfront capital for Seedling Preparation	1 time	Provide capital to local partners to purchase the necessary tools to create a nursery and manpower for the seedling collection.
Upfront capital for Planting	1 time	Provide capital to local partners to purchase the necessary tools and manpower for planting.
Rent for every hectare restored	Monthly	Every hectare that they own and restore gets rewarded monthly rent.
Management & monitoring fees	Monthly	Payments for their constant care, oversight, and protection of restored land.
Rice Subsidy	Monthly	5kg of rice is provided for every family member of the restoration partner’s family.
Performance bonus	Monthly	Awarded when local partners are diligent in following SOPs and cooperative.

We value the end-to-end contributions of our local partners/mitra. This benefit provides them a sustainable source of income and a driver of productivity. Providing alternative employment for the local communities is also a way to minimize their dependence on emission-intensive industries, such as palm oil, coal, gold mining, and tobacco production to name a few.

Our field operatives team closely guides and supervises our Mitra Penghijauan in every process of the reforestation program. (Source: Bumiterra, 2023).

III. DEVELOPING COMMUNITY CAPACITY

With community at its core, our program is designed to also progressively grow the capacity of our local partners.

Referring to the Community Capacity Curve, particularly applied to the context of reforestation, we believe that the success of our reforestation activities is strongly linked with the capacity of the communities that are executing it. Therefore, our program takes into account the fulfillment of main assets for our local partners: (Figure 4)

1. **Financial assets**, by providing direct monthly payments and benefits for their participation;
2. **Human assets**, fulfilled through trainings and by ensuring that the benefits they receive are equal or exceed those from other sources;
3. **Natural assets**, by planting high-value species that could be harvested by the communities;
4. **Physical assets**, by training them to build natural nurseries and find high quality seedlings to be planted;
5. **Social assets**, fulfilled by working on the basis of a free, prior, and informed consent (FPIC), and by leveraging the social dynamics through the implementation of group leaderships;
6. **Cultural assets**, which could be achieved through recognition and utilization of their local indigenous knowledge; and
7. **Political assets**, by facilitating them to acquire the legal rights over their lands.

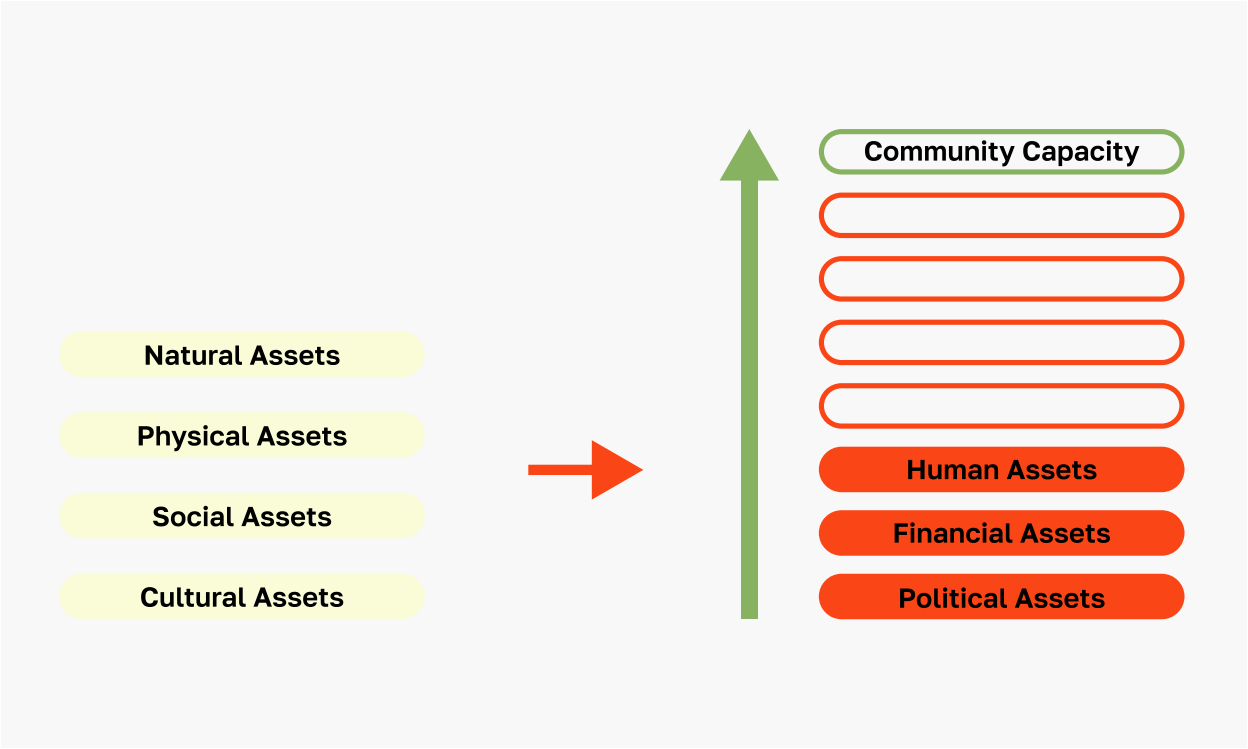

Figure 4. Illustrates how each asset that we provide and endow our local partners with increases the partner's capacity to reforest successfully (Source: Bumiterra, 2023, adapted from Herborn, J., et al., 2022).

IV. LAND TENURE & RIGHTS

We only work with plots of lands that meet these two criteria,

1. Each plot of land is directly owned and controlled by the local indigenous people. Ownership or control can be proven with:
   a. Surat Keterangan Tanah or **SKT**
   b. Surat Hak Milik or **SHM**
2. Legal status of the land has to be Areal Penggunaan Lain (**APL**)/Other Land Use.

To elaborate, the Indonesian jungle has 4 general types of legal status. If we refer to the hypothetical map below of West Kalimantan, National Parks are outlined in orange, Production Forests are outlined in yellow, Protected Forests are outlined in purple, and APL/Other Land Use is all the remaining land that is unclassified with a designated border and status. Bumiterra only focuses on APL, as it allows the clearest and most direct line of ownership and the most flexibility. (Figure 5)

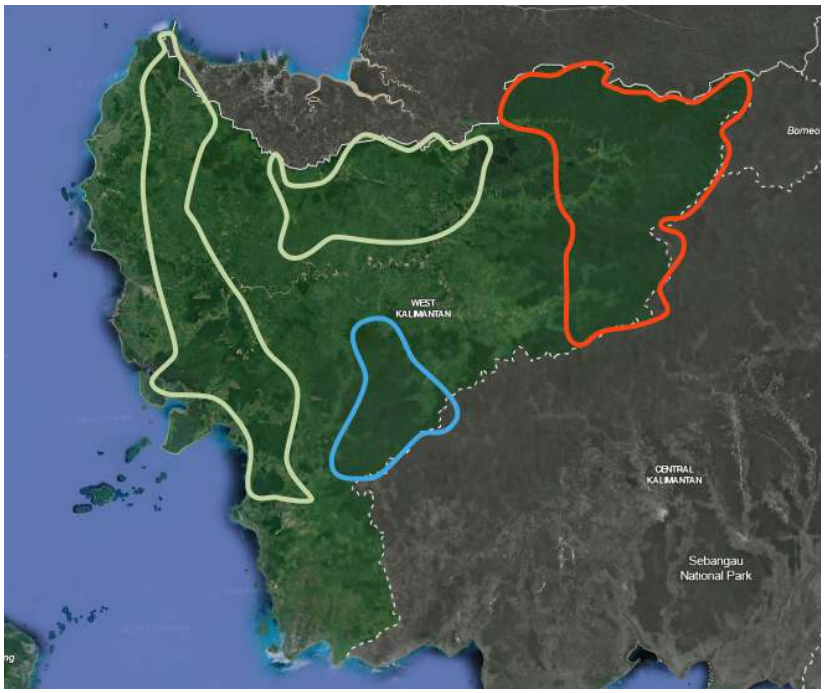

Figure 5. Hypothetical map of different legal status of forests in West Kalimantan (Souce:)

Forest Classification	Allowed Use Cases
National Park/ Nature and Wildlife Reserve (Taman Nasional/ Cagar Alam)	Strictly for activities such as biological studies, non-destructive tourism, and nature preservation sites. No form of destructive economic activities allowed. Protection and oversight of this class is very strict and tight.
Protected Forest (Hutan Lindung)	Forest that is protected by the government due to its importance in maintaining a healthy functioning ecosystem. Eg. Forest that protects the flooding of a certain river and land erosion. No form of destructive economic activities allowed.
Production Forest (Kawasan Hutan)	Forest concessions lent out to private companies for industrial purposes. Concession permits usually last 30-60 years, where the private holder is allowed to conduct economic activities, within certain bounds, during that time frame. Eg. Acacia plantations, logging.
Other Land Use (APL)	These are lands where there is no utilization constraint by the central government. As a result any type of activity can be conducted on such land. For example, roads, houses, plantations, or even malls can be built on these lands. The most important thing is that APL also tends to be where private landholders exist, as it is not technically owned by the government.

Community Reforestation Framework

The Bumiterra reforestation program follows an end-to-end process that is designed to empower and involve our local partners deeply. Our local partners are our superheroes and here are the steps. (Figure 6)

Figure 6. Summary of Bumiterra's community reforestation framework (Source: Bumiterra, 2023).

I. PROSPECTING

The first and most fundamental step in the Bumiterra reforestation program is gathering relevant information from the village head or other local stakeholders on the local community and their ancestral lands. Knowledge on the culture, personality, and behavior of potential local partners is required to develop a program that contributes to both removal of carbon and uplifting the livelihoods of the locals.

Factors that we look for to ensure that the community is a fit for Bumiterra:

1. **Healthy social dynamics**. Indicators include women participating in the labor force and little alcohol consumption.
2. **Physical health of the workforce.** An indicator of this is the absence of proper waste management and clean water supply.
3. **Terrain**. The terrain of the location has to have some form of adequate infrastructure for us to operate efficiently. Usually the existence of roads and cellular signals is the main indicator.
4. **Forest cover.** If the forest is still pristine and intact, there is not much Bumiterra can offer.
5. **Legality and land status.** Forest land must meet our criteria of land.

Gathering information and support from village stakeholders and local communities are necessary to ensure the success of our reforestation program, starting with area survey and prospecting. (Source: Bumiterra, 2023).

II. PROGRAM INTRODUCTION

First, socialization to the village head or local stakeholders is conducted with an objective of acquiring the support from the local governmental office. This support is important in ensuring that the program abides to local norms and regulations, strengthening the permanence of the reforestation efforts and its future benefits.

Second, direct engagement with the local community members is also necessary to gain their willingness to participate. Two types of direct engagement are carried out in the program.

1. **Socialization Events.** Similar to a focus group discussion or a public forum, Bumiterra hosts socialization events to allow for free and open discussion with the participants, as well as demonstrating the seedling nursery activity;
2. **Door-to-door Socializations** are conducted to local community members that have shown interest in the program and are within close proximity with our existing Mitra.

These direct methods serve as platforms to align our perspective with the locals', as well as motivating them to reforest their degraded lands through monthly benefits which will be described in the subsequent section.

Before embarking every community member on our program, we conduct direct socialization to obtain a free, prior, and informed consent (Source: Bumiterra, 2023).

III. PROGRAM PREPARATION

To ensure effective program execution in partnership with the locals, several preparations are required.

Ground surveys are necessary to select suitable reforestation locations and understand the drivers of deforestation. (Source: Bumiterra, 2023).

1. **Participatory mapping**
    a. Drone mapping, to identify the borders and create a clear birds eye view image of the locals' land.
    b. After the drone image has been captured, we then show the owner of the land, the head of the village, and the surrounding neighbors of the land, to ensure that there is no overlapping or trespassing of other people's territory.
2. **Terrain and land cover survey**
    a. Documentation of objects in and near the lands, such as water resources, ideal nursery sites, road access, and planting strategy. All this data is necessary for us to formulate a reforestation strategy together with the locals.
3. **Local partner selection,** based on:
    a. Land cover, whether or not it fits into Bumiterra's eligibility criteria.
    b. Accessibility and feasibility of their land. This is determined by multiple factors such as access to roads, water, and infrastructure
    c. Health and psychological factors
    d. Willingness to 'rent' out their lands
4. **Contract and partnership agreement.** This step is completed with the signing of partnership contracts between Bumiterra and each local partner, consisting of accurate survey-based information on each partner's lands and potential reforestation sites.

IV. PROGRAM EXECUTION

The actual execution of the reforestation from nursery preparation to planting is done by our local partners, with our close supervision, guidance, and oversight. The activities include:

1. **Planning,** which consists of:
   a. **Determination of nursery location**. Location of the nursery should be accessible to bodies of water, have decent canopy cover, and nearby the reforestation site.
   b. **Determination of tree species collected**, based on 3 factors. (Figure 7)
      i. Plant biodiversity, at least 20
      ii. At Least 50% climax species to generate large carbon sequestration trees
      iii. Non wood economic value tree species. All this means is that we incorporate trees that provide economic value without having to cut down the wood, such as durian.

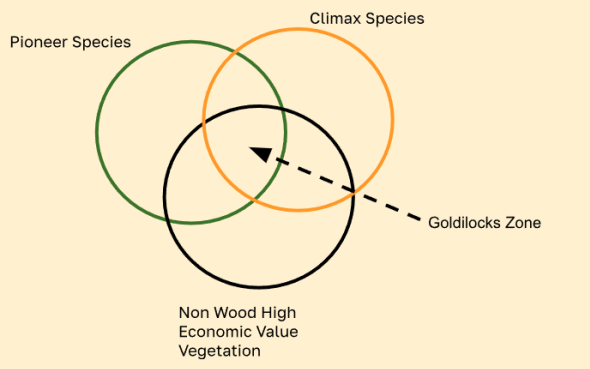

Figure 7. Types of tree species planted in Bumiterra's reforestation program (Source: Bumiterra, 2023).

   c. **Project monitoring schedule.** This step requires planning between our local partners and Bumiterra team to determine what monitoring intensity is feasible given their current conditions

Our field operatives team closely guides and supervises our Mitra Penghijauan in every process of the reforestation program. (Source: Bumiterra, 2023).

2. **Implementation,** executed by our local partners and includes:
   a. **Collection and nursery of the seedlings**
   b. **Monitoring of the nursery seedlings**
   c. **Planting the seedlings**

Each activity follows the reforestation standard and receives training from Bumiterra.

Bumiterra leverages the social dynamics of our local partners/mitra to optimize program execution and monitoring. We refer to the approach of leadership capacity building developed by the Grameen Bank as our method to empower the local people. Each group of local partners will be led by a key person that holds a high social status in the community, is well-respected by all in the group, and could be relied on for the monitoring & reporting process.

Monitoring and documenting changes from the nursery and planted trees are conducted routinely by our field operatives team. (Source: Bumiterra, 2023).

V. REFORESTATION MONITORING

Finally, the Bumiterra reforestation program also includes a rigorous monitoring plan. Education on monitoring techniques and procedures are provided for the local partners, who are required to report their progress on a weekly and monthly basis. Below are the frequency of the monitoring process:

Patrol
once per week

Weeding
once per month

Enrichment
once per month

Fertilization
once per month

Restoration with Bumiterra directly contributes to both emissions removal, ecosystem regeneration, and improving the livelihoods of local indigenous people.

Reforestation Standard

Figure 8. Summary of Bumiterra's reforestation standards (Source: Bumiterra, 2023).

I. SEEDLING & NURSERY

This process is prepared in 4 simple steps:

Figure 9. Summary of the seedling and nursery process (Source: Bumiterra, 2023).

1. **Nursery establishment**, which requires the field team to complete the following tasks: (Figure 9)
   a. **Nursery location,** based factors such as sunlight exposure, ease of access, and accessibility of fresh water to name a few. Depending on these factors, necessary adjustments for the construction will be made.
   b. **Nursery Preparation.** Clean, organize and prepare the nursery location. This step ensures that all the weeds and hindrances to the location are removed.
   c. **Nursery construction.** Each Nursery construction will be different depending on the initial condition of the location.
   d. **Worker Shed.** Build a worker shed to store all the materials and equipment safely.
2. **Poly-bag preparation**, simply a process where our local partners fill poly-bags and be placed inside the nursery. Each poly-bag is filled with a mix of dense clay, parse soil, and some form of organic fertilizer. (Figure 9)
3. **Seedling collection**, the collection of the seedlings to be planted inside the poly-bags. The local partners are responsible for getting at least 20 different tree species to fulfill Bumiterra's biodiversity threshold. (Figure 9)
4. **Nursery Operations & Monitoring** requires the local partners to: (Figure 9)
   a. Water the seedlings everyday
   b. Protect the nursery from all threats
   c. Clear each seedling from weeds
   d. Fertilize and enrich the seedlings
   e. Monitor and track the data daily

II. PLANTING PROCEDURE

Seedlings have to be prepared and acclimatized for planting in the open degraded field.

After roughly 3 months inside the care and comfort of the nursery, which has a gentle and stable microclimate, the seedlings are brought out into the open sun to acclimatize for a few days to ensure that it is strong enough to be planted.

The seedlings that manage to survive and grow leaves within the acclimatization period will be cleared for planting.

1. **Prepare the planting grid**.
   Determination of planting grid requires the distance between each tree, and the distance between each tree is determined by our reforestation scientist. This distance is based on multiple factors, but all is designed to achieve optimum biomass growth. (Figure 8)
2. **Prepare the planting lanes**.
   After the planting grid has been determined, the locals will start clearing the weeds, shrubs, and grasses in straight lines to create access to the planting hole. (Figure 8)
3. **Seedlings planting**. (Figure 8)
   a. Dig a hole with 40 cm depth and 40 cm diameter at the east side of stick poles
   b. Put topsoil separately from subsurface soil
   c. Squeeze the polybag until the soil is compact
   d. Separate the seedlings and soil by holding the base of roots
   e. Remove the polybag and save it for next nursery
   f. Plant seedlings in the center of the planting hole
   g. Cover the remaining gap with nearby soil (topsoil first)
   h. Compact the soil by hand pressing or stomping
4. **Marking**: Mark and tag each planted seedling/tree with a stick pole and record it. Stick poles are used to track each and every tree that is planted. (Figure 10)

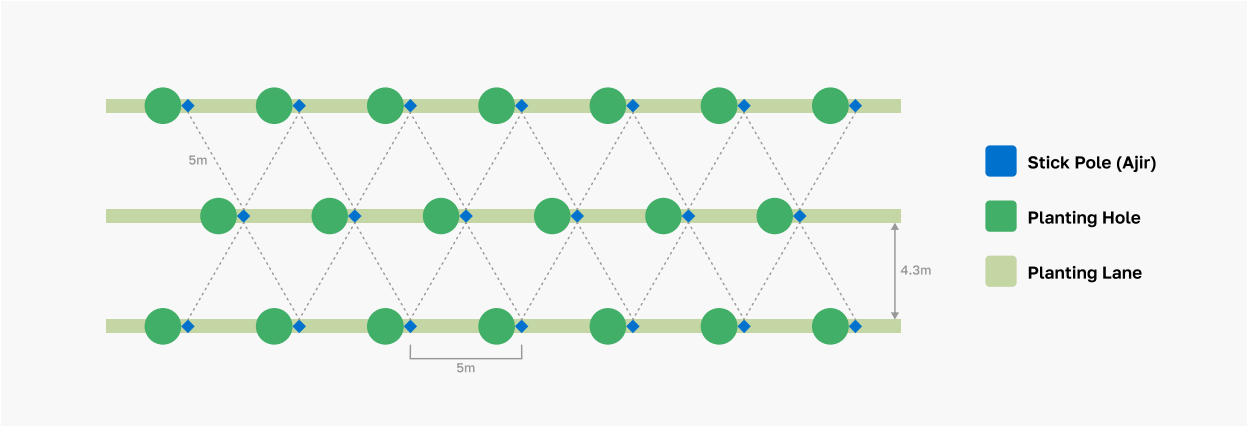

Figure 10. Planting structure on the field (Source: Bumiterra, 2023).

Not all kinds of species can be planted simultaneously. When a forest is degraded, it is usually missing a habitat/ ecosystem that allows for healthy biomass growth. Since the land is open without any vegetation or canopy cover, it is usually very hot and dry.

There are 2 general categories of trees: **pioneer** and **climax** species. Pioneer species are the trees that pave the path and create a micro habitat for all other vegetation to flourish. Pioneer species grow fast and can grow in all kinds of conditions, even conditions that have very degraded soil, but are usually unable to grow big. Climax species on the other hand require a much richer environment to flourish and are much slower to grow. Climax species trees grow to be big and mighty carbon sequestration machines that last for hundreds of years.
Hence we have to reforest in the proper sequence based on two scenarios: (Figure 11)

1. If the forest is already **naturally regenerating** with evidence of pioneer species, then Bumiterra proceeds to only planting climax species.
2. If the land is **completely clear** with little to no vegetation, then Bumiterra proceeds to plant pioneer species first, and then proceed to planting climax species after the necessary conditions have been established by the pioneer species.

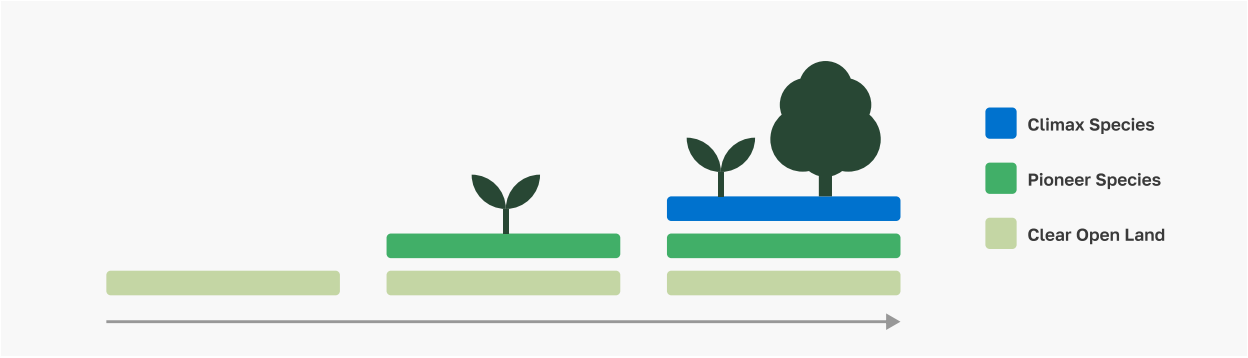

Figure 11. Planting sequences depending on initial land cover type (Source: Bumiterra, 2023).

III. MAINTENANCE & MONITORING OF REFORESTATION SITE

1. **Frequency of monitoring**: (Figure 9)

Patrol
once per week

Weeding
once per month

Enrichment
once per month

Fertilization
once per month

2. **Weeding** (Figure 9). Removing the weeds from all the planted seedlings.
3. **Enrichment** (Figure 9). Replacing dead seedlings with fresh ones, and record it.
4. **Fertilizing** (Figure 9). Bring fertilizer as needed to add nutrition to the planting.

Methodology

I. ELIGIBILITY

The area must be under the non-forests land cover type based on the definitions of the High Carbon Stock (HCS) Approach Toolkit, using primary data from the field. These include: (Figure 12)

1. **Scrubs**, which are lands that have less than 20% canopy cover and an estimated carbon stock of 15 to 35 tonnes per hectare. (Bumiterra is currently focusing our program on this type of lands)
2. **Cleared** or **Open Lands**, which have 0% canopy cover and an estimated carbon stock below 15 tonnes per hectare. (Bumiterra is open to explore restoration activities in these areas, but additional actions are required to replenish the soil before conducting tree planting)

Land Cover Type	Canopy Cover	Estimated Biomass Ct/ha	Description
Forest	>30%	>35	Closed to open canopy natural forest ranging from high density, low density, and highly disturbed forest or forest areas regenerating to their original structure. Dominated by trees with diameter >10 cm, mostly climax species with high frequency of pioneer species.
Scrubs	<20%	15-35	Land areas that were once forest but have been cleared in the recent past. Dominated by low scrub with limited canopy cover and includes areas of tall grass and fern with scattered pioneer species. Occasional patches of older trees may be found.
Open Land	0%	0-15	Recently cleared land with mostly grass or crops. Few woody plants.

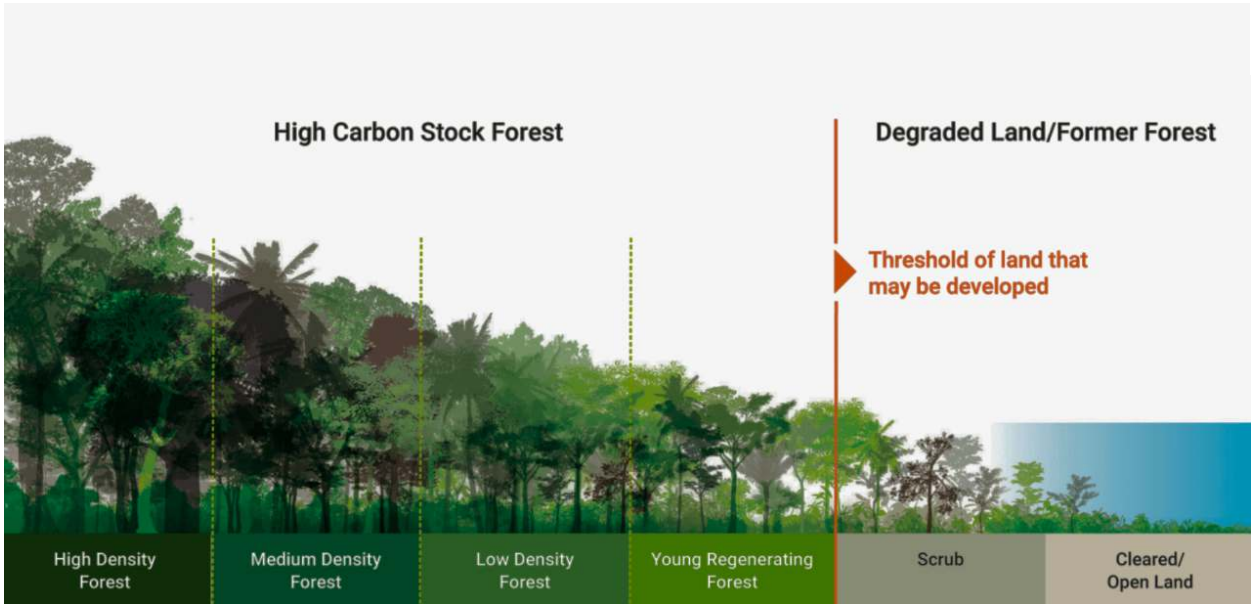

Figure 12. Classifications of forests and other land cover types. (Source: High Carbon Stock Approach. The HCS Approach Toolkit, Rosoman, G., Sheun, S.S., Opal, C., Anderson, P., and Trapshah, R., (eds). Singapore: HCS Approach Steering Group, 2017).

II. BASELINE SCENARIO

Climate

The baseline scenario is defined as the condition of a control plot that receives no intervention from our reforestation activities, which will be the natural regeneration of the degraded or deforested land.

Bumiterra sets these criteria for determining the control plot:

1. **Location.** The area must be located within 2 km radius around the project area where reforestation activities will take place
2. **Similarity.** It must be ensured that the area has similar conditions and characteristics. A minimum total similarity rate of 80% must be reached based on the assessment of a few criteria:

Assessment	Description
Soil	The control plot must possess the same type(s) and condition(s) of soil, e.g. organic, burnt, as the reforestation plot.
Vegetation	Majority, if not all, of the types of vegetation and species of trees in the control plot must be the same as in the reforestation plot, e.g. shrubs, degraded forest. This in turn shows the similarity of the ecosystems.
Driver(s) of deforestation	The control plot must have experienced the same causes of deforestation and land conversion in the past.

   The assessment must use primary data collected through observation, calculation of number of trees, and understanding of local knowledge.
3. Regeneration and the change of condition in the plot must be examined every 3 months by using the sequential sampling method, which is a statistical procedure in which the sample size is not fixed in advance. The data obtained from these observations include:
   - "Yes" or "no" responses to the criteria mentioned above; and
   - Numerical measurements of tree species and growth.

Bumiterra quantifies the control plot by:

1. **Collecting ground truth above ground biomass data**. We do this by sampling data on tree height, diameter at breast height (DBH), and tree species and plugging it into the allometric equations for quantifying above ground biomass. Below are the details on how we do the data sampling:
   a. **Sample Plot**. A square sample plot in the size of 25 x 25 meters is set up within the control plot, and the coordinates are recorded using a GPS;
   b. **Sub Sample Plots**. Within the main sample plot, smaller sub-plots are created to conduct the estimation of younger trees. Each tree growth phase will be measured in a different subplot size:
      i. Pancang (height above 1.5 m and diameter up to 10 cm): sub-plot in the size of 5 x 5 m
      ii. Tiang (diameter between 10 cm to 20 cm): sub-plot in the size of 10 x 10 m
      iii. Pohon (diameter above 20 cm): main plot in the size of 25 x 25 m
   c. For each tree within the sample plot, **basic information is measured and recorded**, including the height, diameter at breast height (DBH), tree species, as well as the geographical coordinates which are recorded using GPS.

Figure 13. Different sizes of sample plot for each tree growth phase (Source: Bumiterra, 2023).

2. Bumiterra is also combining the manual quantification with remote sensing analysis in the project area. Our remote sensing procedure is in partnership with **Coolant Technologies**. A summary of the process is as follows:
   a. **Depth Analysis.** Conduct a sweeping vertical pan of the project area with the drone, clearly showing the edges of the area. This allows detailed spatial perception by only using images. (Figure 14)

Figure 14. Sample map of drone vertical sweeping (Source: Coolant, 2023).

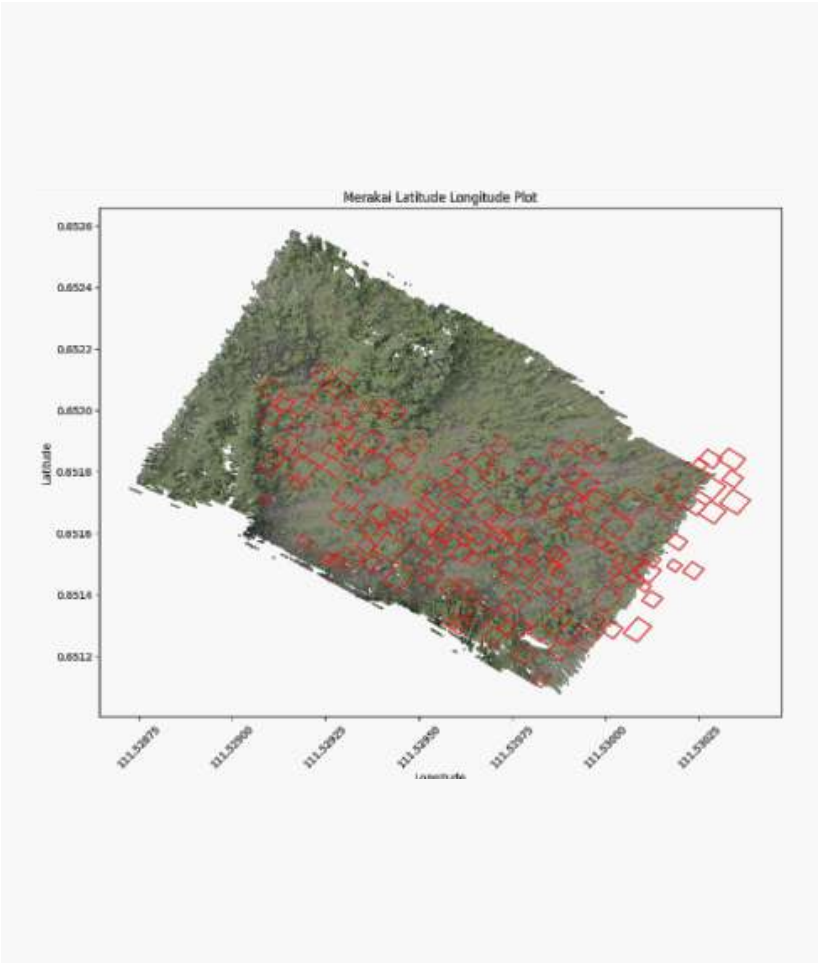

Figure 15. Sample 3D model from drone horizontal survey (Source: Coolant, 2023).

b. **Generate accurate spatial models** by, conducting a horizontal survey using the drone and recording the input, allowing the creation of a 3D model of the forest cover. (Figure 15)
c. **Coolant** processes the footage into biomass estimation using an unsupervised machine learning clustering algorithm. (Figure 16)

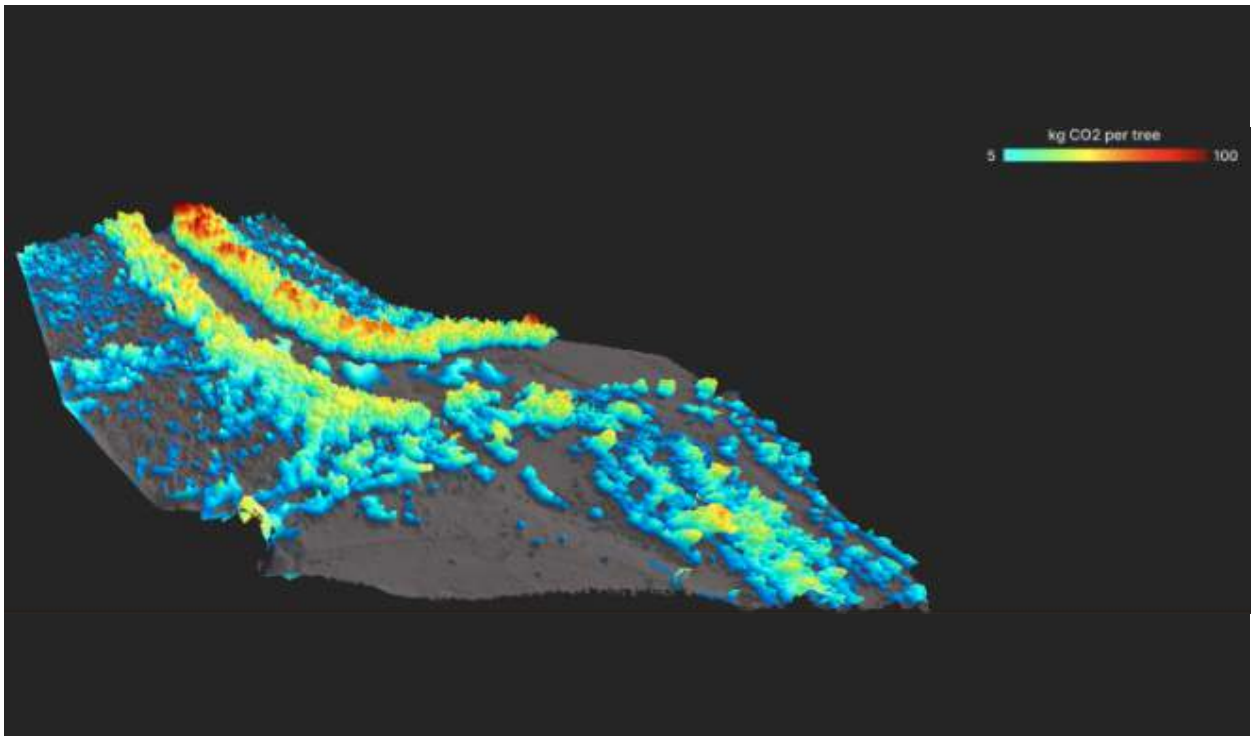

Figure 16. Sample biomass estimation result of unsupervised machine learning clustering algorithm (Source: Coolant, 2023).

3. **This quantification process is repeated every 3 months**. A thorough assessment must be carried out to ensure that the control plot is representative of the natural condition of the project area if no reforestation intervention were to happen there. This helps to ensure a factual and conservative quantification of carbon removal. (Figure 17)

Figure 17. Quantification methods of the climate baseline scenario (Source: Bumiterra, 2023).

The following figure is an example of an allocation of a control plot for the reforestation site where the project activity will be carried out. (Figure 18)

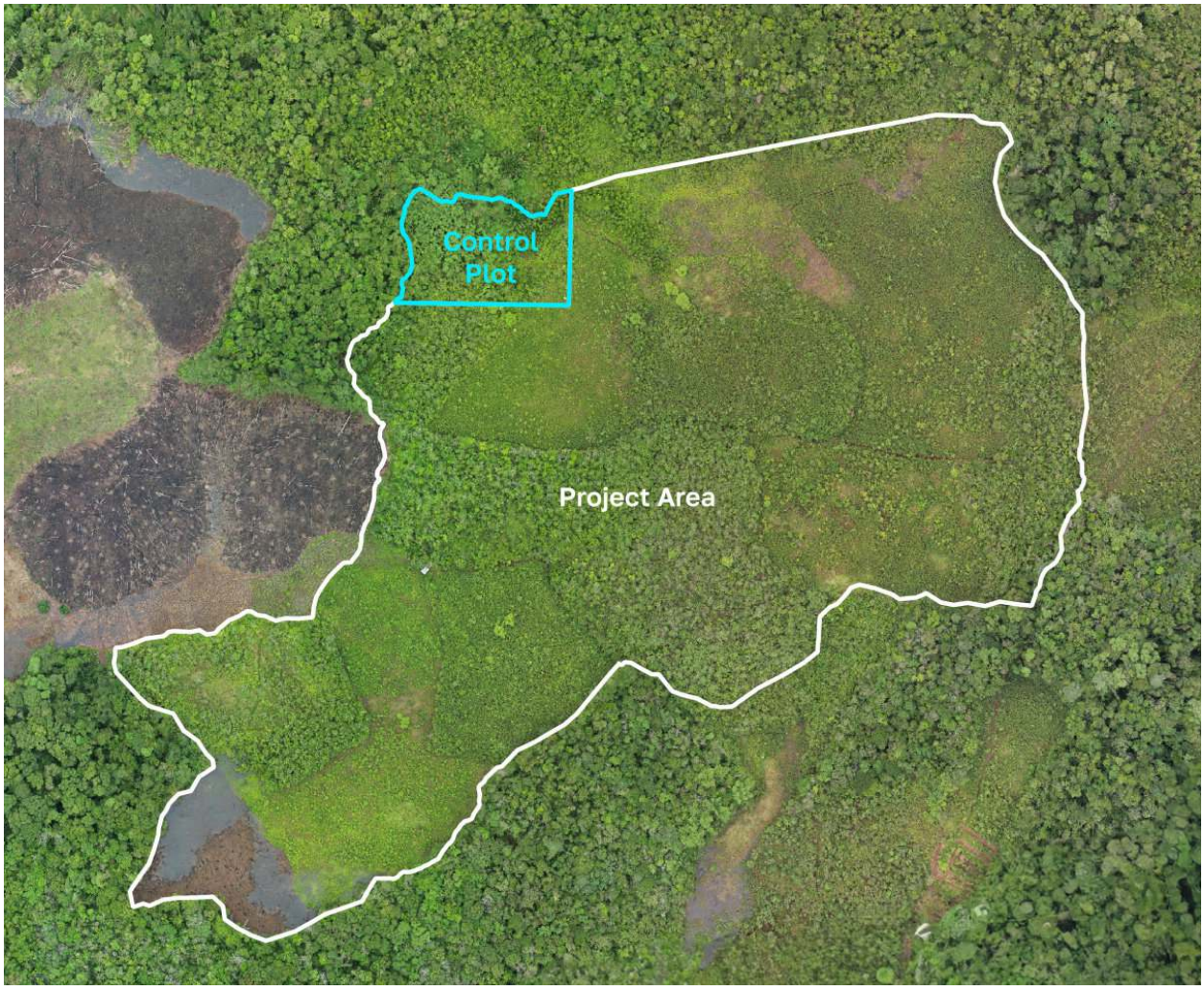

Figure 18. Example of reforestation site and the control plot (Source: Bumiterra, 2023).

Biodiversity

Biodiversity in the project area is measured by the species richness, which is the number of species found in an ecological community. In the context of this program, the ecological community boundary is the reforestation plots and the areas surrounding it, amounting to 10,000 hectares of areas with similar ecological characteristics.

We implement a very rigorous primary data collection process where the on field operatives track and record the exact numbers and locations of flora and fauna species found in the project area.

1. **For wildlife biodiversity**, the baseline scenario is determined by how many wildlife species exist within the project area in the beginning of the project. To gather accurate information on the wildlife sightings, we utilize two sources of evidence:
    a. **Trail camera traps**, which are set up in areas that animals use frequently, including natural trails and water reserves, as well as areas with physical signs of wildlife, such as its feces and nests. By placing cameras in these areas, we could capture images of wildlife as part of the data to measure the species richness.
    b. **Physical signs of wildlife occurrence**. All sightings of wildlife found throughout the program, such as footprints, nests, and feces, are also observed by the on field operatives team. The type of physical signs and its locations are recorded.
2. **For flora biodiversity**, the number of tree species that have initially existed in each reforestation site before reforestation activities take place will reflect the baseline scenario. We measure this number by conducting a transect survey, and list and observe all present species. The sample plot that exists within the reforestation site is the same plot used for measuring above ground biomass. (Figure 19)

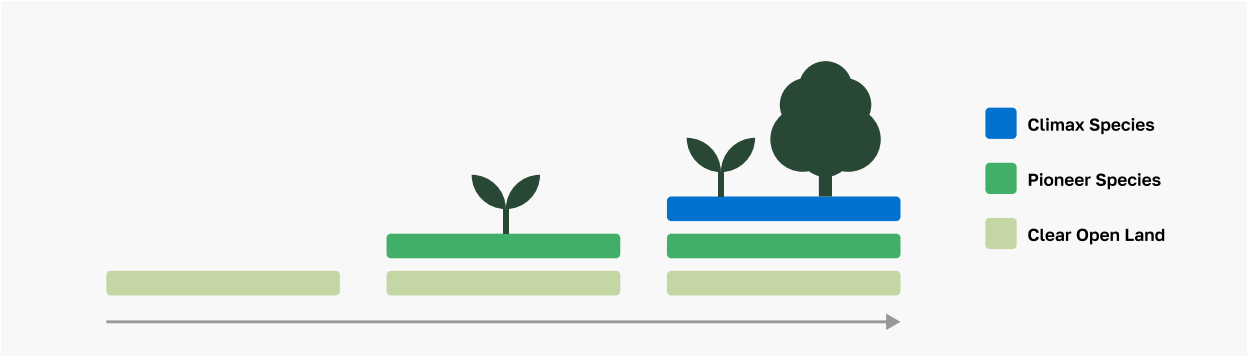

Figure 19. Example access path of the transect survey (Source: Bumiterra, 2023).

Community

To assess the impact of reforestation activities on the local community, the baseline condition of the community must first be identified based on the following factors:

1. **Monthly income**, measured by the source and amount of income they currently earn every month in Rupiah (Rp); and
2. **Legal recognition of land ownership**, which is identified by the type of land rights certificate owned by the community for the lands they manage.

All the factors above are examined in the project area before the program takes place, by conducting interview surveys with Mitra Penghijauan.

III. ADDITIONALITY

Climate

Bumiterra only claims the increase of performance in terms of carbon stock growth due to project activity. The process of estimating **additionality** of the reforestation site is as follows:

1. **Collecting ground truth above ground biomass data on the reforestation site.** We do this by sampling data on tree height, diameter at breast height (DBH), and tree species and plugging it into the allometric equations for quantifying above ground biomass. This is the same process as determining the baseline, the difference here is that the sample will be done on the actual reforestation site.
2. **Bumiterra also incorporates remote sensing analysis in the project area**. Our remote sensing procedure is in partnership with Coolant Technologies. A summary of the process is as follows:
   - Conduct a sweeping vertical pan of the project area with the drone, clearly showing the edges of the area. This allows detailed spatial perception by only using images.
   - Conduct a horizontal survey using the drone and recording the input, allowing the creation of a 3D model of the forest cover.
   - Coolant, processes the footage into biomass estimation using an unsupervised machine learning clustering algorithm.

Figure 20. Comparison between growth rates in the reforestation plot (additionality) and control plot (baseline scenario) (Source: Bumiterra, 2023).

3. **Quantification is conducted every 3 months**. To assess the increase of performance in carbon sequestered for both the project area and the control plot. The increase of performance in the project area becomes the project scenario, while that of the control plot is the baseline scenario.
4. **Additional amount of carbon removals** is the comparison between the project and baseline scenario, in terms of the amount of carbon stock growth. (Figure 20)

To prevent baseline manipulation, and since boundaries of the control plot are marked and known, the program must not:

1. Conduct any activity or make any management effort on the area; and
2. Intentionally make changes in how the area of control plot is treated during the program execution. Any change of condition on the plot must be caused by natural and other factors external to the program.

Biodiversity

Additionality in the context of biodiversity is determined by estimating the increase in the number of species found in the project area, both for wildlife and flora. This is achieved by conducting constant observations and recapitulating the findings every 3 months. (Figure 20)

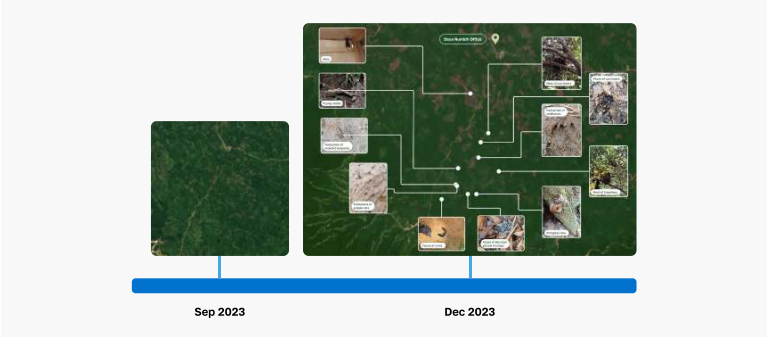

Figure 20. Illustration of how we keep track of wildlife occurrence and sighting, and how it changes over time.

1. **For wildlife biodiversity**, additionality is the increase of wildlife species that are witnessed throughout the ecosystem region. The measurement is conducted through the same process of estimating the baseline level, which is by recording sightings of wildlife using trail camera traps and by observed physical evidence. The data is gathered and compared with the baseline scenario every 3 months;
2. **For flora biodiversity**, additionality is determined by estimating the increase in the number of tree species on the reforestation plot after planting activities are conducted. The same process of estimating the baseline flora biodiversity is repeated every 3 months, which is by conducting a transect survey and recording each species found along the path.

We only claim additionality when an increase of biodiversity impact reaches a number of species above the existing levels in that area.

Community

Based on the factors initially assessed for the community baseline, the program claims additionality in terms of community when the following changes occur over each period of 3-month observation:

1. **Increase in the amount of income**, provided by Bumiterra and received by the community as the result of their reforestation activities every month, measured in Rupiah; and
2. **Change of legal status for their lands**, which is a one-time improvement when the program succeeds in securing the legal land rights for the community. When this factor has been achieved, only the above points would be relevant for estimating additionality for the community.

IV. LEAKAGE

Activity-shifting leakage from non-forest activities, such as slash and burn agriculture and other types of land conversion, is the main form of leakage that needs to be prevented in this reforestation area.

1. **Alternative Income**. Bumiterra's primary approach is to provide an alternative business model that directly creates additional socio-economic benefits for our Mitra. We do this by meeting their needs through rice subsidies and a stable source of income. By providing economic benefits that are comparable to benefits from non-forest alternatives, the likelihood of activity-shifting leakage will be low. In addition, strengthening the capacity of the community increases the success of the program.
2. **Observing Community Dynamics**. In addition to providing socio-economic benefits, an internal monitoring approach could be taken to look out for selected indicators of leakage, emphasizing on the key indicators that drive the demand for land use changes. These key indicators include the decrease in food supply and the sudden or urgent need for additional income, based on the understanding that most land conversion activity surrounding the project area is driven by economic needs. When these indicators are detected to be occurring, patrol teams will be assigned to investigate and the result will be evaluated to prevent the leakage or reduce its significance.

BOTTOM

Passing down its indigenous tradition, the local community goes farming as one of the ways to meet their daily needs. When these meets are not met, it poses a risk to the success of the reforestation program. (Source: Bumiterra, 2023).

TOP

Most of the local community earn their income as daily laborers, which has a risk of instability. The Bumiterra reforestation program provides an alternative source of economic benefits to help meet their needs. (Source: Bumiterra, 2023).

V. SAFEGUARDS

Ensuring the permanence of the program requires active prevention of deforestation drivers, in addition to the prevention of leakages.

1. **Work Safety**
   Without proper safety management, the execution of our activities might negatively affect the result and permanence of the program. Bumiterra trains our Mitra and has set a standard operating procedure for managing safety threats from humans and animals, particularly to address the risks of fires. Activities include avoiding the burning of wastes in and near the forests, consistent patrolling, and mapping of hotspots, among others.
2. **Waste Management**
   Poorly managed wastes from the project area could pose a threat and disturbance to the program. Leaving wastes piled and unmanaged in the forest, especially plastic wastes from the seedling pots, increases the risk of polluting the soil and disturbing the execution of reforestation activities. Therefore, all of our Mitra are trained to provide waste bins, sort their wastes according to its category, and manage their wastes appropriately.

LEFT

To ensure safety for our team, local community, and wildlife around the project area, Bumiterra has developed several Standard Operating Procedures for its activities. (Source: Bumiterra, 2023).

RIGHT

Our reforestation program aims to produce as little waste as possible and manage all wastes accordingly, such as by substituting plastic-based tools if possible. (Source: Bumiterra, 2023).

TOP LEFT

Each of our reforestation partners is facilitated by Bumiterra to obtain and document their legal rights over their ancestral lands (Source: Bumiterra, 2023).

TOP RIGHT

Our reforestation partners and Bumiterra team on the field. All of our Mitra are involved in the program after a thorough and direct engagement process. (Source: Bumiterra, 2023).

BOTTOM

Durio kutejensis, locally known as Pekawai, a primary rainforest substorey species from Borneo with high-value fruits. (Source: Sipayung, 2012).

3. **Verified Legal Land rights**
   Legal rights of the project area helps prevent ownership conflicts and thus ensures permanence of the program. As mentioned in the previous section, only areas classified as Areal Penggunaan Lain (APL) or Other Land Uses managed by the village or the local communities are eligible for the program. Legal certifications, such as Surat Keterangan Tanah (SKT) or Surat Hak Milik (SHM) must be obtained prior to the execution of the program.
4. **Free, Prior, and Informed Consent (FPIC)**
   The consent and agreement from the communities are the basis of our program. A series of socialization and direct engagement with community members must be conducted before developing the program in a potential project area. In addition, we provide our Mitra with the privilege to cancel their contract after their four-months trial period ends, allowing them to terminate their participation in the program if they're willing. Bumiterra is determined to ensure that every participation of the locals is based on the FPIC approach.
5. **High Value Species Planting**
   To optimize the benefits of the program by providing food sources and avoiding land conversion for crops, the species planted in the program are high-value species that will give direct benefits to our Mitra. By committing to reforest their degraded lands with Bumiterra, the local communities can harvest the fruits from their trees as a long-term benefit, giving them options to personally consume or to sell their harvests.

Conclusion

Paying back to nature is a difficult task. There are many factors to be considered so that activities are truly additional, permanent, and safe.

If paying back to nature is a job to be done, we believe Bumiterra's restoration plan does the job well. A subscription plan for everyday people and businesses to continuously restore, enrich, and protect the earth, is precisely the currency that nature understands.

It is our genuine hope that this whitepaper will contribute to the global efforts of preserving biodiversity and climate action.

Let us all account for the cost of nature's capital.

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