Environmental and Social Impact Assessment

and

Environmental and Social Management Plan

July 3,2024

CEPF Grant 115445

Missouri Botanical Garden

Rescue the Orphaned "Alliance for Zero Extinction" Tree Species of Madagascar

Ankarabola-Agnakatrika, Makay and Tsitongambarika, Madagascar

Grant Summary

1. **Missouri Botanical Garden**
2. **Rescue the Orphaned "Alliance for Zero Extinction" Tree Species of Madagascar**
3. **115445**
4. **US$ 170,860.44**
5. **July 2024-June 2026**
6. **Madagascar**
7. **Summary of the project**

The Red List of Trees of Madagascar, published in March 2021 by Botanic Gardens Conservation International (BGCI), provides the first comprehensive assessment of the conservation status of Madagascar's trees: Of the **2,904** trees assessed, **62%** are classified as threatened; meaning that 3 out of 5 trees endemic to Madagascar are threatened in their natural habitats. The Alliance for Zero Extinction, a multi-organization joint initiative, was established to identify, effectively conserve and safeguard the most important sites for preventing global species extinctions. AZE sites are a subsection of Key Biodiversity Areas (KBA). To obtain AZE designation, there are three principles which must be met: 1) Endangerment: An AZE site needs at least one Endangered (EN) or Critically Endangered (CR) species, as assessed on the IUCN Red List, 2) Irreplaceability: An AZE site should only be designated if it is the sole area where an EN or CR species occurs (contains >95% of the population), 3) Discreteness: The area must have a definable boundary. In other words, within this framework, species found within AZE sites are defined as species with the highest risk of extinction due to their known distribution being only a single location. In other words, AZE sites contains the last remaining population of a given species. From this previous assessment, 477 species endemic to Madagascar fit this AZE criteria and, **of which, 21% of these species only occur outside Key Biodiversity Areas (KBA) or Protected Areas (PA) and therefore not currently protected in any way. The focus of this project will be to save targeted orphaned AZE trees species from the risk of extinction, which are arguably the most at-risk of all endangered trees** (*See List of Target Orphaned AZE species.xlsx.)*. Orphaned here refers to species that are not currently protected in a secure reserve or protected area, and/or are species whose distribution, as currently known, does not include any managed areas and therefore at greater risk of extinction. Such AZE taxa are not only known from small-single site populations, but they are also usually highly exposed to human-induced extinction due to unsustainable landscape practices. Furthermore, many of these populations are also vulnerable to climate-driven habitat loss such as severe droughts, flooding, and wildfires since they occur at unmanaged locations. Species loss is imminent without intervention. Effective protection of these AZE tree species has never been more pressing. We estimate that many populations will be extinct within 5 years based on surrounding landscape practices at many of these sites; our team of field botanists have conducted botanical surveys across the country of Madagascar and within protection, we often observe the complete loss of populations after only a few years.

This project uses an active intervention approach to mitigate species extinction by relocating species from these unmanaged populations to nearby protected areas. **It is important to reiterate that while many species may be relocated to sites far away from their fragmented populations, these trees literally only occur at single sites which are completely unmanaged and have zero protection from**

their complete destruction. The approach to ensure they do not go extinct is a two-pronged approach for ensuring their survival but unfortunately does not include in situ conservation directly currently. **Plans for in situ conservation of these threatened trees will hopefully be an outcome of this project.**
The overall goal of the project is to ensure the survival of orphaned AZE tree species by the combination of two main approaches: ex-situ conservation by local seed banking, field gene banks, planting in gardens and arboretum and replanting actions in three KBA sites: ANKARABOLAVA-AGNAKATRIKA, MAKAY, AND TSITONGAMBARIKA

1. Prioritization of the orphaned AZE species.
As indicated above, 21% of the 477 species classified as AZE do not occur within any type of protected area. Unfortunately, we need prioritization of these species currently. Here, we focus on saving 74 species not yet represented in seeds banks within Madagascar managed by BGCI and Silo National des Graines Forestières (SNGF). Additionally, we will focus on species that were not targeted by a previous parallel project managed by MBG and funded through Franklinia Foundation entitled "Conserving orphaned threatened Malagasy tree species by integration into reforestation and restoration projects". In other words, the species prioritized for this project have not yet had any active interventions to date. The total species proposed for recovery are 74 species listed, with their localities in file Target Orphaned AZE species.

2. Field missions for identification of targeted species populations, phenology assessment, and tissue/seed collections
Field surveys are needed to assess species' distribution data, identification of species' biology (habitat, phenology), and collecting of tissues for propagation for relocations. These approaches will optimize our relocation success (ensuring the greatest number of AZE species will be relocated). Thus, specific activities planned for these field missions are as follows:

a. The project focuses on AZE species whose distribution is highly localised geographically. They are recorded in concentration zones defined according to BGCI's AZE analysis, which assesses the risk of extinction using existing data points. However, locating these populations of interest depends largely on the analysis of existing distribution data, which sometimes concerns a single locality with low precision of geographical coordinates; therefore, more extensive searching will be required. In these cases, we will hire local community members to serve as local guides and inform on species localities and phenology. Assessing locations of tree populations will use the coordinates that were previously gathered for assessment from the Malagasy Plant Specialists Group. Coordinates for targeted tree species are found in the provided *List of Target Orphaned AZE species.xlsx.*

b. Collection of botanical material, including bio-ecogeograhic data. Upon successful location of the populations of interest, fresh plant material, including seeds will be made. Collection of fresh plant tissue (leaves, seeds, stems, roots) will be carried out in accord with the protocol used by the Laboratoire de Biotechnologie et d'Amélioration des Plantes. This protocol is designed to help maintain the freshness and viability of plant tissue per their expertise. Collections will involve permanent marking of mother trees used for informing future collections, especially important for seed collecting. Botanists of numerous organizations (Missouri Botanical Garden, University of

Antananarivo, Centre National d'Application de Recherche Pharmaceutiques) will oversee these activities with assistance from local communities for seed collecting. The integration of local communities is essential for subsequent seed collections: as locals to the site play the role of "eye in the forests" (being able to identify when a tree species sets flower and fruit if during a time that field mission did not take place). MBG has worked with numerous local communities implementing this approach in the past and it has proved extremely beneficial.
c. IUCN Red List re-assessments. Most of species targeted have only been assessed under criterion B of the IUCN Red List (data geographic distribution). Using the new data collected from field missions that conduct population surveys at localized sites, a reassessment may be necessary using population criteria (e.g. number of mature individuals). We plan to reassess up to 20 species within the Red List Madagascar Plant Specialists Group, including hosting one validation session.

3. Development of field gene banks.
Seeds collected will be first grown in a nursery-like setting and then grown and maintained long-term in botanical garden-like settings at numerous conservation sites: Ankarabola-Agnakatrika (MBG), Makay (Naturevolution) and Tsitongambarika (ASITY). Botanists from MBG are well-versed in the development and operation of field gene banks from previous projects supported by Franklinia Foundation. Additionally, our team has experience as coordinator of the Millennium Seed Bank Project (MSBP) in helping with seed collections and technical supervision of the operations. Depending on the ecological conditions of there seeds are collected will determine the sites for which seeds are dispatched. A portion of the seeds collected will also be used for ex situ collections (activity 4 below) and replanting projects (see activity 5 below).

4. Ex-situ collections
Orphaned AZE species will also be backed up into ex-situ conservation collections. Globally, botanical gardens and arboreta can play a substantial role in assisting the survival of orphaned AZE species. For that, seedlings and/or in vitro plants will be planted in botanical gardens and arboreta, within Madagascar, as identified below.

- Silo National des Graines Forestières, Madagascar.
- CNARP botanical garden, with a surface area of 3 ha, could accommodate these transplants.
- Tsimbazaza Botanical and Zoological Park.
- MBG has been in communication with officials in charge of the National Protected Area Network and a Ministry's project to re-create/re-launch the Malagasy arboretum at Ambatobe FOFIFA, which could serve as an additional potential site.
- While regulations may not permit this at this time, additional seed and/or tissue could be sent to Missouri Botanical Garden whose expert horticultural staff manage greenhouses that host numerous species, some that are now extinct in the wild and many that are highly threatened in the wild.

5. Replanting at three sites: Ankarabolava-Agnakatrika , Makay and Tsitongambarika. Two approaches to replanting will be conducted based on initial seed germination trials at the nurseries. Both approaches will be carried out in two different bioclimates: humid, sub-humid, and sub-arid to accommodate the wide geograhic and ecological areas where AZE tree species are found.

a. propagation in nurseries. The three conservation sites (Ankarabola-Agnakatrika (MBG), Makay (Naturevolution) and Tsitongambarika (ASITY)) have experienced nursery teams for seed germination and propagation. Mini local community nurseries will be also developed- this is budgeted in the project. After one year of seedling growth (see project workplan), tree saplings will be planted into existing restoration plots pre-validated for each site. Monitoring seedlings of each orphaned AZE species in each tree-planting project to determine species-specific survival and growth will be part of the routine.
b. Direct seeding at restoration sites. Trees established by direct seeding generally have better root development and grow faster than young trees grown in nurseries (Tunjai, 2011). Literature recommends that the plant species to be selected are those of Fabaceae and Ficus species. Other species with thick integumentary, large seeds and spherical seeds, such as Lauraceae, will be considered. Collected seeds will be stored until sowing at the restoration sites at local optimum planting times for best germination (rainy period). Manipulation of field conditions to maximise germination will also be used as needed (application of compost, mulching).

6. Micropropagation by in vitro culture for problematic or precarious species
We plan to produce vitroplants for 6 species in need through The Laboratoire de Biotechnologie et Amelioration des Plantes. We estimate the various stages of micropropagation (cultivation to the production of seedlings ready for transplantation) can be carried out during this period. Materials and consumables will be acquired by the project, and a laboratory team under the direction of Pr Noro Rakotoarisoa will be responsible for this production. Plant material will be collected during field missions as indicated above.

7. Outreach and Stakeholder Engagement.
ASITY has been directing the national coordination of the AZE initiative in Madagascar. In collaboration with ASITY, we will highlight to various stakeholders the AZE category which indicates the most threatened plant trees and AZE sites needed for comprehensive protection. We propose hosting a national workshop in Antananarivo to share project ‘s findings and AZE initiatives. Participants from all regions will be solicited to participate. This workshop’s goal is to also initiate a process for the development of a National Strategy for the conservation of orphaned AZE plant species, for which Madagascar is among the countries with highest concentration globally.
Our project workplan is outlined in the provided file entitled "Workplan_CEPF_FRKL_2024_OrphanedAZESpecies".

8. <u>Document Prepared on June 28, 2024</u>

9. <u>Legal and regulatory framework</u>:

Madagascar ratified the Nagoya Protocol in 2014. This governs all use of genetic resources on national territory in the field of Research and Development. One step in the access modality is the research authorisation for wild flora genetic resources A systematic request for a research authorisation presented by a public National Research institution, which is for the Missouri Botanical Garden, the Botanical and Zoological Park which is our long-standing partner.

Research authorisations are issued by the Department of Protected Areas, Renewable Natural Resources and Ecosystems (DAPRNE) of the Ministry in charge of the Environment and Biodiversity.

In order to collect seeds of native trees in protected areas of Madagascar, a permit is needed from the national authorities. The regulation is the same for endangered and non-endangered, as defined by the IUCN Redlist, trees. Missouri Botanical Garden has permits to conduct such work that need to be renewed every six months.

The law regulating the exploitation of forest products, including seeds of tree seeds, is decree n° 98-782 of August 18 1998. Scans of permits issued by the Minister of Environment and Sustainable Development, will be included in reports to CEPF.

10. **Status of area to be impacted:**

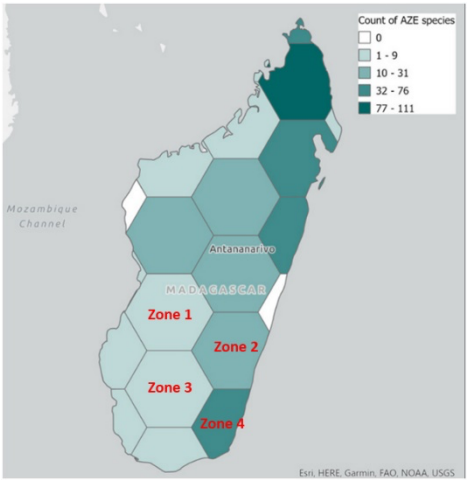
The proposed project covers large geographic regions of Madagascar: Southern, South-West and Western Madagascar (see attached map of zones). The societies in these parts of Madagascar are pastoralist, although the cattle population has declined considerably over the past decade and as a result village and rural societies have experienced severe eco-political crises, insecurity, and lack of income opportunities. This has led to massive migration to the Menabe region of the North-west.

Southern Madagascar also stands out for it's complex socio-economic dynamics, making it the most vulnerable region of Madagascar. Its dry, arid climate, profound lack of infrastructure and basic services, insecurity, and limited economic opportunities contribute to a poverty rate of over 90% of the population. Three regions in particular in the southern part of the country (Atsimo Andrefana, Androy and Anosy) account for more than 20% of the island's total population; characterised by a relatively high proportion of young people; people aged 20 and under makeup 62.5% of the population. Also in these regions, at least ⅔ children live in extreme poverty. And associated with this is dire malnutrition, directly correlated with the lack of education level of the head of household. See more statistics outlined by UNICEF: https://www.unicef.org/esa/media/8456/file/UNICEF-Madagascar-Summary-Note-Child-Poverty-(MODA)-Study-2020-EN.pdf

Giving this growing population and need for resources, there is fierce competition for access resulting in irreversible damage to any remaining forests. Land is transferred from forest for short-term maize production via slash and burn. Most people previously had dual economic and social activities, combining livestock farming with a variety of complementary agricultural products. Now throughout the area of the project there is declining cattle and goat farming and traditional rice growing can only support self-consumption. Famine here occurs with regularity.

Intervention approaches that combine conservation objectives with social-economic impacts are essential. To ensure a high probability of success for the project, we need to secure the strong commitment and sustained support from the local people, whom

we call the "eyes of the forest". These community members are thoroughly trained as seed collectors and work directly with the project managers. The recruited seed collectors receive training on phenology monitoring and collection protocols of high-quality seed samples with fair compensation for this work. Moreover, the project will provide income for local communities who are hired to participate in the tree planting projects at the KBAs.Our field missions to search for targeted species also engage local assistance as paid field guides. This local community participatory approach that MBG fosters is becoming more and more established and we are now witnessing an emergence of dynamic young leaders.



11. **Baseline data**:.

The target species selected from the AZE species are:

Abrahamia ellipticarpa
Amyrea lancifolia
Aristogeitonia uapacifolia
Aspidostemon capuronii
Aspidostemon parvifolius
Baudouinia capuronii
Beguea australis
Capurodendron delphinense
Cedrelopsis gracilis
Croton bracteatus
Cryptocarya alseodaphnifolia
Cryptocarya capuronii
Dichaetanthera grandifolia
Diospyros beberonnii
Diospyros falyi
Diospyros mimusops
Diospyros silicea
Dombeya acuminatissima
Dombeya apikyensis
Dombeya halapo
Dombeya humbertiana

Dombeya mananarensis
Dombeya mandenensis
Dombeya megaphyllopsis
Dombeya pauciflora
Dombeya rienanensis
Dombeya roseiflora
Dombeya sakamaliensis
Dombeya seyrigiana
Drypetes birkinshawii
Eugenia ardyceae
Eugenia arenicola
Eugenia guajavoides
Eugenia louisae
Eugenia roseopetiolata
Eugenia stictophylla
Flagenium petrikense
Grewia monantha
Hafotra superba
Hibiscus benedicti
Homalium brachyrhachis
Homalium randrianasoloi
Huberantha pendula
Humbertiella sakamaliensis
Hyperacanthus madagascariensis
Ivodea mahaboensis
Ivodea razakamalalae
Ixora trimera
Ludia ikongoensis
Mauloutchia annickiae
Meineckia websteri
Memecylon fianarantse
Memecylon isaloense
Mendoravia dumaziana
Moringa hildebrandtii
Noronhia armandiana
Ormocarpopsis itremoensis
Pandanus barbellatus
Payera madagascariensis
Peponidium ihosyense
Pouzolzia mandrarensis
Premna decaryi
Psorospermum cornifolium
Sarcolaena delphinensis
Schizolaena charlotteae
Terminalia cephalota
Turraea andriamiarisoana
Vernonia ampandrandavensis

Viguieranthus unifoliolatus
Vitex lastellei
Vitex vondrozensis
Xyloolaena humbertii
Xylopia humbertii
Zanthoxylum subspicatum

12. **Anticipated impacts and risks:**.

Project implementation implies:

- Collecting seeds and vegetal materiel from endangered tree species, with risks:
    - to impact natural regeneration
    - to damage trees to collect seeds
- Setting up nurseries for reproduction of these species prior to reintroduction, with risk:
    - to establish a new nursery on a place where natural habitat occurs
    - to use pesticides that could contaminate natural habitats.

As nurseries are already established within other projects, and no pesticide is used, there are no risks associated with nurseries.

Precautionary measures should be taken to prevent any impact on the wild population of endangered species. The project will balance the seed collections with the harm to the populations from which collections will be made. Various scenario of seeds collections will be simulated with the Seed Collecting Specialist.

Measures should also be taken to ensure safety of staff and employees of the project during the implementation (First aid provided, powerful gear for communication, climbing gears etc.).

13. **Mitigation measures**:

For collection of seeds from endangered species:

- Each mature endangered species tree is labeled or has a unique identifier (ID). All phenological and ecological data for each tree are stored in a database, including information on the seeds collected. Seeds are collected from healthy specimens from large populations, distributed across different types of habitats.
- Fruit or seed collection activities are accompanied by an information), making it possible to trace the origin of the seeds, the date of collection, the location and the quantity collected. Seeds are stored separately for each tree, to preserve quality and genetic diversity.
- Rational collection is also put in place to ensure the natural regeneration of species and the maintenance of their population in their natural habitat. For a fertile tree, the quantity of seeds collected does not exceed 60% of its total production, unless the plant and/or its habitat is strongly threatened by fire or logging.

- All precautionary measures are taken not to damage the trees – collection of seeds will mostly happen with seeds fallen on the ground.
- The collection will take place on parcels of public land, with all authorizations from the protected area management.

14. **Actions to ensure health and safety**:

For safety measures:

Project staff will train the collectors; collection of seeds will mostly happen with seeds fallen on the ground. Precautionary measures will be taken to avoid any incidents with people climbing trees. Either people will be prohibited from climbing trees. Or they will be allowed to climb trees provided certain safety measures are complied with https://treeclimbing.com/climbing/the-tree-you-climb/choosing-a-safe-tree will be applied with training from our botanists
The project will acquire two sets of basic kit for Beginning Climbers that will include Helmets, ropes and harnesses.

15. **Monitoring and evaluation**:

Collection of seeds will be monitored, as described under the mitigation measures. Data will be centralized with project team at MBG office.
In the unlikely event of an incident, information will be shared with CEPF team as soon as possible.
The implementation of the ESMP will be reported regularly as part of reporting to CEPF.

16. **Timeline and resources:**

The precautionary measures will be taken all along project, as necessary.
The only financial implication lies in the climbing material cited under section 14.

17. **Permission of the landowner**:

Two types of permission are required to implement the project at local level:
1. the first is a favourable opinion from the site managers. This document must accompany the application for a research permit. This is a kind of endorsement of the project by the sites concerned.
2. the second is the courtesy visit to the traditional authorities, which reinforces permission from sites managers.

18. **Participatory preparation**:

In developing the concept of this project, we consulted with Botanical Gardens Conservation International (BGCI), a former project partner for the Global Tree Campaign, which enabled Madagascar to complete the assessment of the risk of extinction of Madagascar's tree flora. Input data used for developing this proposal came from BGCI's project funded by the Franklinia Foundation entitled "Developing a methodology to identify Alliance of Zero Extinction (AZE) tree species on a global

scale". Through that project, there have been 3,320 tree species identified globally as potential AZE trigger species, but Madagascar, by far, has the greatest number of species of concern with 486 species documented as AZE: https://www.bgci.org/our-work/projects-and-case-studies/developing-an-aze-methodology/.
In regards to activities outlined in this proposal: we have been approached by officials in charge of the Malagasy National Protected Area Network and the Ministry to discuss revival of the Malagasy arboretum at Ambatobe FOFIFA, which could serve as an additional potential field gene bank site.

We have also consulted with the IUCN SSC Madagascar Plant Specialists Group for the Red Listing assessment of 20 species given the demographic information gathered through this project, and will work with that group to prioritize species targeted for evaluations.

20. **Disclosure**:

The impact assessment will be part of the document available on the CEPF web, and will be communicated through presentation to local stakeholders, at same time as presentation of the Grievance mechanism, explicated in the main proposal..