



**MANAGEMENT AND CONSERVATION PLAN FOR *DALBERGIA COCHINCHINENSIS*
AND *DALBERGIA OLIVERI* IN VIETNAM**

(Prepared by Center for Nature Conservation and Development)



Hà Nội, April 2022

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Cover illustration: Upper left photo – A *D. cochinchinensis* tree labeled for protection and management in Dak Uy Protected Area – taken in 2020.
Upper right photo – Seeds of *D. cochinchinensis* collected in Dak Uy Protected Area – taken in 2019.
Lower left photo – A *D. oliveri* tree labeled for protection and management in Cat Tien National Park – taken in 2019.
Lower right photo – A nursery with *D. oliveri* seedlings in Bu Gia Map national park – taken in 2020.
Photo credit: La Quang Trung/CCD.

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No. 5, Alley 56/119, Tu Lien Street, Tay Ho District, Ha Noi, Vietnam.
Tel: +84 (0) 246 682 0486
E-mail: info@ccd.org.vn

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On behalf of the project team.

Nguyen Manh Ha

Project Team Leader

ABBREVIATIONS

ANR	Assisted natural regeneration
CBD	Convention on Biological Diversity
CCD	Center for Nature Conservation and Development
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DARD	Department of Agriculture and Rural Development
DBH	Diameter at Breast Height (at 1.3 m from the ground level)
<i>D.</i>	<i>Dalbergia</i>
EIA	Environmental Investigation Agency
EN	Endangered
EU	European Union
FIPI	Forest Inventory Planning Institute
GPS	Global Positioning System
Ha	Hectare
HUS	Ha Noi University of Science – Vietnam National University
IEBR	Institute of Ecology and Biological Resources
IG	Institute of Geography
IUCN	International Union for Conservation of Nature
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resource and Environment
MOST	Ministry of Science and Technology
ND-CP	Decree of the government
PPC	Provincial People's Committee
QD-BNN-TCLN	Decision - MARD - VNFOREST
QD-TTg	Decision of Prime Minister
RIFI	Research Institute of Forest Industry
SRI	Silviculture Research Institute
SUF	Special-Use Forests, known as Protected Ares, are mainly used to conserve natural forest ecosystems, genetic resources of forest organisms, carry out scientific research, preserve historical - cultural relics, beliefs, and places of scenic beauty associated with ecotourism; and provide forest environmental services. SUFs include national parks; nature reserves; species and habitat conservation areas; landscape protection areas; and scientific research or experiment forests
VAFS	Vietnamese Academy of Forest Sciences
VAST	Vietnam Academy of Science and Technology
VNFOREST	Vietnam Administration of Forestry
VNMN	Vietnam National Museum of Nature
VU	Vulnerable

1. CONTEXT

1.1. Background

Vietnam is a tropical monsoon climate country, which has an average annual rainfall from 1,400 mm to 2,400 mm; average humidity from 80 to 85%; and average temperature of the coldest month from 10°C to 16°C in the north and from 20°C to 24°C in the south, and of the summer is from 25°C to 30°C (MONRE, 2019). According to the Decision 1558/QD-BNN-TCLN of the Vietnam Administration of Forestry dated 13 April 2021, the country has a total of 14,677,215 ha of forested area, of which, the watershed protection forests and protected areas account for more than 5.2 million ha, and the forest cover is about 42%.

Vietnam is one of the 25 highest levels of biodiversity countries in the world with about 20,000 species of plants, 3000 species of fish, more than 1000 species of birds, and over 300 species of mammals (Loc et al., 2018). Endemic plant species are about 10% (Loc et al., 2018). Orchidaceae, Fabaceae, Poaceae, Euphorbiaceae, Rubiaceae, Cyperaceae, Asteraceae, Lauraceae, Fagaceae, and Acanthaceae are the 10 largest families of vascular plants in Vietnam with the first largest family (Orchidaceae) comprising 1,212 species and the 10th largest one (Acanthaceae) consisting of 177 species (Loc et al., 2018).

However, Vietnam has been facing serious biodiversity loss due to deforestation and forest degradation as well as illegal hunting, logging, and trade in wild plants and animals. Amongst the illegal logging and trading plant species, *D. cochinchinensis* and *D. oliveri* are the most wanted rosewood species in trade for high-end furniture and decoration products, even though both species are listed in the Red Book of Vietnam, IUCN Red List of Threatened Species and Appendix II of CITES (EIA, 2017).

Rosewood is one of the most special wood groups because its timber is well-known for durability, corrosion resistance, and termite resistance, and has been used in construction and furniture for a century. Particularly, processed household and handicraft products from *D. cochinchinensis* and *D. oliveri* have high commercial value. Therefore, *D. cochinchinensis* and *D. oliveri* have been the most heavily exploited and traded species in Vietnam and many countries in the world. Whilst the wild populations are small and fragmented, lacking population protection, conservation, and restoration measures are posing these species at high risk of extinction in many places in Vietnam (Center for Nature Conservation and Development, 2021).

1.2. Distribution of *D. cochinchinensis* and *D. oliveri*

1.2.1. Global level

According to Nguyen et al. (2019a), *D. cochinchinensis* is mainly distributed in Cambodia, Laos, Thailand, and Vietnam.

D. oliveri distributes in Cambodia, Myanmar, Laos, Thailand, and Vietnam (Nguyen et al., 2019b).

1.2.2. National level

D. cochinchinensis mainly distributed in central provinces, some south-eastern provinces, and very few southwestern provinces. These provinces include Quang Tri (Cam Lo district)¹, Da Nang city, Quang Nam province (Hien and Phuoc Son districts), Kon Tum province (Dak Ha, Sa Thay, Ngoc Hoi and Kon Plong districts), Gia Lai province (Krong Pa, Chu Pah, Ia Pa, Ayun Pa, Mang Yang, Dak Doa, Ia Grai, K'Bang and Duc Co districts), Dak Lak province (Buon Don, Ea Sup, Ea Kar, Krong Nang and Krong Pong districts), Lam Dong province (Cat Tien, Bao Lam and Da Teh districts), Binh Thuan province (Ham Thuan Bac district), Dong Nai province (Dinh Quan, Trang Bom, Vinh Cuu, Tan Phu, and Thong Nhat districts), Tay Ninh province (Tan Bien district), and Kien Giang province (Phu Quoc district) (La et al., 2021; Nguyen et al.,

¹ This location was recently confirmed by CCD staff (Nguyen Manh Ha, personal communication, 27 January 2022).

2019a) (see Appendix 2). *D. cochinchinensis* may have been extinct in some historical distribution locations such as Ben Cat and Thu Dau Mot towns of Binh Duong province and Thu Duc district of Ho Chi Minh city due to the urbanization (Nguyen et al., 2019a).

In protected areas, *D. cochinchinensis* is found in Dak Uy Special-Use Forests (SUF), Chu Mom Ray national park, Kon Plong watershed protection forests, Yok Don national park, Ea So nature reserve, Krong Nang watershed protection forests, Ia Rsai watershed protection forests, Nam Song Ba watershed protection forests, Kon Ka Kinh national park, Ia Grai watershed protection forests, Kon Chu Rang nature reserve, Duc Co watershed protection forests, Chu Mo watershed protection forests, Dong Nai nature reserve, Cat Tien national park, Tan Phu watershed protection forests, Ham Thuan – Da Mi watershed protection forests, and Phu Quoc national park (La et al., 2021) (see Appendix 3).

D. oliveri can be found in the following locations: Quang Tri province (Huong Hoa district), Da Nang city (Son Tra district), Kom Tum (Sa Thay, Ngoc Hoi, and Dak To districts), Gia Lai province (Krong Pa, Ia Grai, Duc Co and Chu Prong districts), Dak Lak province (Ea Kar, Krong Nang, Ea Sup, Buon Don and Lak districts), Dak Nong province (Dak Mil and Cu Jut districts), Lam Dong province (Lang Biang, Lac Duong, Da Teh and Di Linh districts), Dong Nai province (Vinh Cuu, Tan Phu, Thong Nhat, and Xuan Loc district), Phu Yen province, Khanh Hoa province, Ninh Thuan province (Thuan Nam and Ninh Son districts), Binh Thuan (Ham Thuan Bac district), Binh Phuoc province (Bu Dang and Bu Gia Map districts), Tay Ninh province and Ba Ria-Vung Tau provinces (Tan Thanh and Xuyen Moc districts) (La et al., 2021; Nguyen et al., 2019b) (see Appendix 2).

In protected areas, *D. oliveri* is found at Chu Mom Ray national park, Yok Don national park, Ea So nature reserve, Krong Nang watershed protection forests, Ia Rsai watershed protection forests, Nam Song Ba watershed protection forests, Ia Grai watershed protection forests, Duc Co watershed protection forests, Dong Nai nature reserve, Cat Tien national park, Ham Thuan – Da Mi watershed protection forests, Bu Gia Map national park, Dinh mountain, Binh Chau-Phuoc Buu national park (La, et al., 2021) (see Appendix 3).

1.3. Population status

1.3.1. Global population

a) *Dalbergia cochinchinensis*

In the world, *D. cochinchinensis* is mainly distributed in Cambodia, Laos and Thailand (Nguyen et al., 2019a). According to the IUCN Red List of Threatened Species, the conservation status of *D. cochinchinensis* is Vulnerable (Asian Regional Workshop (Conservation & Sustainable Management of Trees in Viet Nam), 1998). *D. cochinchinensis* is also listed in Appendix II of CITES.

In Cambodia, *D. cochinchinensis* was recorded in some provinces of Kampong Thom, Kampong Speu, Preah Vihear, Ratanakiri, Pursat, Siem Reap, Kratie, Koh Kong, Stung Treng, and Modulriki but their population size was unknown (UNEP-WCMC, 2018). The latest study indicated that the population density of above 5 cm DBH trees is 2.6 trees/ha in the Choam Ksant district of Preah Vihear province (Say, Chheang, Hort, et al., 2021; Say, Chheang, Kim, et al., 2021).

In Laos, *D. cochinchinensis* was reported to distribute in the southern provinces of Champasak, Attapeu and Sekong and the central provinces of Bolikhamsai and Khammouane (UNEP-WCMC, 2018). The population size is unknown and seems to be faded as field surveys in 2012 did not record mature individuals (UNEP-WCMC, 2018).

In Thailand, *D. cochinchinensis* was said to be in the Northeast and the stock was estimated to be between 80,000 – 100,000 trees (Rose, 2014).

b) Dalbergia oliveri

In the world, the species distributes in Cambodia, Myanmar, Laos, and Thailand (Nguyen et al., 2019b). According to the IUCN Red List of Threatened Species, the conservation status of *D. oliveri* is Endangered (Nghia, 1998). *D. oliveri* is in the CITES' Appendix.

In Cambodia, *D. oliveri* was reported to be sparsely distributed in the upper part of the country including Kratie, Preah Vihear, Kampong Thom, Ratanakiri, Stung Treng, Pursat and Siem Reap provinces (Say, Chheang, Hort, et al., 2021; Say, Chheang, Kim, et al., 2021). The population size is unknown but the latest surveys in the Choam Ksant district of Preah Vihear province showed that the population is low because the above 0.5 cm DBH tree density is only 0.8 plants/ha (Say, Chheang, Kim, et al., 2021).

In Laos, there is little information on the distribution of *D. oliveri*. The species was recorded in Khammouane, Bolikhamsai, Attapeu, Savannakhet, and Saravane (Salavan) provinces² and the population size in these places is not well known.

In Myanmar, *D. oliveri* populations are mainly found in the upper part of the country (Nyi, 2014). It was reported to have an estimated total of 4,000,000 trees of *D. oliveri* including more than two million trees in Sagaing, about 900,000 trees in Shan, 350,000 trees in Mandalay, 200,000 trees in Kachin, 100,000 trees in Chin, 80,000 trees in Magway, 50,000 trees in Bago, and more than 10,000 trees in Rakhine and Ayeyarwaddy (EIA, 2014; Nyi, 2014).

1.3.2. National population

a) Dalbergia cochinchinensis

According to the Vietnam Red Data Book, *D. cochinchinensis* is listed as endangered (MOST & VAST, 2007).

Based on population density from field surveys and calculated areas of the surveyed protected areas, it is estimated that there are about 8,000 trees of *D. cochinchinensis* with a DBH of above 6 cm (called timber trees) in Dak Uy SUF, and 8,000 – 10,000 trees in the Yok Don national park (Dinh et al., 2021). A population of *D. cochinchinensis* in the Kon Ka Kinh national park with the number of trees as many as those in the Dak Uy SUF was also reported, however, the number of large trees is few (Hoang Thanh Son, personal communication, August 31, 2020). Another population of *D. cochinchinensis* with about 1,000 trees in the Tan Phu watershed protection forest can provide seeds (Le Viet Dung, personal communication, October 10, 2019). Many other small populations of *D. cochinchinensis* were also reported to be sparsely distributed in different places such as the Chu Mom Ray national park, Watershed Protection Forests of Nam Song Ba and Ia Rsai, and plantations, especially in forest gardens, production forests, and/or crop fields of local villagers in the central provinces. Unfortunately, no detailed surveys were undertaken to document the number of timber trees (La et al., 2021; Nguyen et al., 2019a).

b) Dalbergia oliveri

D. oliveri is listed as endangered in the Red Data Book of Vietnam (MOST & VAST, 2007). Based on population density from field surveys and calculated areas of the surveyed protected areas, it is estimated that there are about 70,000 – 80,000 *D. oliveri* trees with a DBH of above 6 cm in the Bu Gia Map national park, 140,000 – 160,000 trees in the Cat Tien national park, and 50,000 – 60,000 trees in the Yok Don national park (Dinh et al., 2021).

1.4. Threats

Both *D. cochinchinensis* and *D. oliveri* have been facing the main threats of illegal logging and trade, habitat loss, and forest fire (found in the Yok Don national park) for a long time causing the severe decline of mature individuals and fragmented populations. Currently, most of the *D. cochinchinensis* and *D. oliveri* trees that can yield heartwood are found in protected areas.

² Global Biodiversity Information Facility: https://www.gbif.org/occurrence/search?taxon_key=2968432

Given the fact that *D. cochinchinensis* and *D. oliveri* growth rates and natural reproduction by seeds are low; wild populations have significantly decreased in the past, and the main threats are continuous, the population trends of *D. cochinchinensis* and *D. oliveri* in Vietnam keep decreasing (Center for Nature Conservation and Development, 2021).

1.5. Constraints in management, protection, and recovery of *Dalbergia*

Although both *D. cochinchinensis* and *D. oliveri* were included in the list of protected species a long time ago (under the list of rare and precious forest plants and animals and the management and protection regime in the Decree No.18/1992/HDBT of the Council of Ministers dated 17 January 1992), stocktaking, harvest, utilization, and exportation of these species were documented.

According to Decree No. 06/2019/ND-CP and its revision, the Decree No. 84/2021/ND-CP, populations and distribution of *Dalbergia* and other endangered plant species listed in these decrees must be periodically studied and updated in all localities. However, there were no studies on the status of population, distribution, harvest and trade of *Dalbergia* species in Vietnam. There were only a few research activities on biological characteristics, seed germination and growth rate in the nursery, natural regeneration of some *Dalbergia* species at a small scale (Bui et al., 2018; Pham et al., 2013, 2011) and some studies on genetic and physiological research (Hien & Phong, 2012; Hung et al., 2020; Phong et al., 2011).

In addition, there was no conservation and management plan for these species developed and implemented in Vietnam to sustain their long-term survival and meet the sustainable harvest and use. This is a big gap in conserving the remnants of *D. cochinchinensis* and *D. oliveri* populations in particular, and endangered plant species in general.

As *D. cochinchinensis* and *D. oliveri* belong to the precious, rare timber group of high commercial value, it is necessary to have a long-term management and conservation plan to guide protection and management activities for wild populations more effectively, promote research and stocktaking programs to provide information for management and conservation purposes, provide orientations and guidance for restoration through assisted natural regeneration (ANR) and restocking in the previous distribution areas of *D. cochinchinensis*, *D. oliveri* and other rare timber species, and help orient the long-term sustainable harvest and use of this special timber group.

The plan will contribute to the implementation of national regulations and strategies on biodiversity and forestry. The development and implementation of this plan will also contribute to the compliance with international agreements such as the Convention on Biological Diversity and especially the implementation of Resolution Conf. 11.11 (Rev. CoP17) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on "Regulations of Trade in Plant", to which Vietnam is committed.

2. RATIONALE

2.1. Legal basis

The management and conservation plan for *D. cochinchinensis* and *D. oliveri* in Vietnam to 2035 is based on the following legal basis:

- International treaties and agreements to which Vietnam has joined and signed:
 - + Convention on Biological Diversity (CBD) to which Vietnam became the CBD's member in 1994.
 - + Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to which Vietnam has been a member since 1994. Specifically, the Resolution Conf. 11.11 (Rev. CoP17) on the regulation of trade in plants
 - + The Voluntary Partnership Agreement (VPA) between the EU and Vietnam on Forest Law Enforcement, Governance and Trade (FLEGT).
- National laws and regulations:
 - + Law on Biodiversity (2008).
 - + Law on Forestry (2017).
 - + Decree 102/2020/ND-CP of the government dated September 01, 2020, on stipulating the Vietnam Timber Legality Assurance System.
 - + Decree 84/2021/ND-CP of the government dated September 22, 2021, on amending the Decree 06/2019/ND-CP of the government on management of endangered, rare, and precious species of forest fauna and flora and observation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.
 - + Decree 64/2019/ND-CP of the government dated July 16, 2019, on amending Article 7 of the Decree 160/2013/ND-CP of the government on criteria to determine species and the regime of managing species under lists of endangered, precious, and rare species prioritized protection.
 - + Decree 06/2019/ND-CP of the government dated January 22, 2019, on the management of endangered, rare, and precious species of forest fauna and flora and observation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.
 - + Decree 160/2013/ND-CP of the government dated November 12, 2013, on criteria to determine species and the regime of managing species under lists of endangered, precious, and rare species prioritized protection.
 - + Decision 523/QD-TTg of prime minister dated April 1, 2021, on approving the Vietnam forestry development strategy for the period of 2021 - 2030 with a vision to 2050.
 - + Decision 218/QD-TTg of prime minister dated February 7, 2014, on approving the Strategy for the management of special-use forests, marine and mainland water conservation areas in Vietnam to 2020 with a vision to 2030.
 - + Decision 1250/QD-TTg of prime minister dated July 31, 2013, on approving the National strategy for biodiversity to 2020 with a vision to 2030.
 - + Decision 79/2007/QD-TTg of prime minister dated on May 31, 2007, on approving the National action plan on biodiversity to 2010 and orientation to 2020 to implement the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The above documents are an important legal framework for developing and promulgating a plan to manage and conserve *D. cochinchinensis* and *D. oliveri* in Vietnam until 2035. This plan will help to enhance the effectiveness of law enforcement on forest protection and protection of endangered plant species, improve the quality of conservation activities, and contribute to raising public awareness of conserving endangered wild plants and animals in Vietnam.

2.2. Scientific and practical basis

The group of *Dalbergia* species is one of the most endangered timber groups in Vietnam as a result of over-exploitation in a long time to meet market demand, especially in international trade. Over the last 20 years, international trade activities and demand for precious timbers in the genus *Dalbergia* have dramatically increased in the East Asian markets causing the looking for, over-exploitation, salvage of dead and fallen trees and roots, and illegal trade in all areas of their distribution not only in Vietnam and Southeast Asian countries but also in Africa and South America. Therefore, this group of timber species is considered to be at high risk of extinction as large trees and mother trees have been harvested almost everywhere to serve the trade and use demands.

Moreover, this plant group contains species with a slow growth rate and long-time heartwood creation so they are almost not selected as plant species for main afforestation and restoration programs. Only in a few places, *D. cochinchinensis* and *D. oliveri* were piloted for plantation and forest enrichment in small areas for research or experimentation purposes.

In Vietnam, there is currently no conservation program for this group of species and no concentrated planting area to create an alternative supply source for the exploitation of these species from the wild. At present, *D. cochinchinensis* and *D. oliveri* have been exhaustedly exploited in their natural distribution areas and only a few small populations remain, which are being strictly protected in national parks and nature reserves. Even so, they are still facing risks of illegal logging and land-use conversion which cannot be restored.

The decline in tree numbers and natural populations of *D. cochinchinensis* and *D. oliveri* will affect the natural equilibrium and species diversity in the tropical forest ecosystems. Hence, it is necessary to develop a management and conservation plan to ensure that appropriate actions are taken to protect the remaining populations in the wild to preserve genetic resources and seedlings for natural recovery processes, gradually restore the populations and the balanced state of the natural ecosystem and create large enough planting areas to provide supply sources for the sustainable exploitation and use of these valuable timber species.

The Government has also issued many conservation action plans and programs for many wildlife species that are at high risk of extinction due to unsustainable exploitation. For example, the National program on tiger conservation for the period 2014 – 2022 (promulgated in 2013), the Emergency action plan to 2020 for elephant conservation in Vietnam (promulgated in 2012), and the Emergency action plan for primate conservation in Vietnam to 2025 with a vision to 2030 (issued in 2017). These plans have helped promote conservation actions more forcefully and effectively to protect endangered species and are bringing their populations to a safer threshold. Thus, the promulgation of a management and conservation plan for *D. cochinchinensis*, *D. oliveri*, and other endangered plants is absolutely necessary and practical. It is also a continuation of the Government's series of actions in enhancing the conservation of endangered species and the national biodiversity value, as well as to affirm Vietnam's determination to conserve biodiversity and prevent illegal exploitation and trade in wild fauna and flora to meet international commitments, such as CITES, CBD and other bilateral and multilateral agreements on the management of illegal wildlife trade that Vietnam has signed and is a member.

This plan will also be a tool to coordinate cooperation activities to conserve biodiversity, especially endangered plant species such as *Dalbergia* species, more effectively among government agencies, and national and international conservation organizations. The plan will

be an orientation for the research, conservation, and restoration activities of *Dalbergia* species. to achieve the highest efficiency in terms of implementation and resource use.

3. PLAN FOR MANAGEMENT AND CONSERVATION OF *D. COCHINCHINENSIS* AND *D. OLIVERI*

3.1. Points of view

a) *D. cochinchinensis*, *D. oliveri*, and other valuable timber tree species within the *Dalbergia* genus are part of biodiversity value and are national assets. Hence, the research, management, protection, conservation, and restoration of these tree species will benefit the whole society, including at all levels of organizations, communities, and individuals.

b) The management and conservation plan for *D. cochinchinensis* and *D. oliveri* in Vietnam to 2035 is in line with the National Strategy on Biodiversity to 2020 with a vision to 2030, the Strategy for management of the special-use forest system, marine protected areas, and inland water conservation areas of Vietnam to 2020 with a vision to 2030, and integrated into action plans of sectors and localities in forestry, biodiversity conservation, and environmental protection.

c) The wild populations of *D. cochinchinensis*, *D. oliveri* and other threatened *Dalbergia* species in Vietnam must be fully studied and thoroughly protected to provide a source of seeds for breeding and restoration programs.

d) The government and the forestry sector give priority to the establishment of seed collections for *D. cochinchinensis*, *D. oliveri*, and other rare and precious plants; and conduct propagation for plantation and restoration in their historical distribution areas.

e) The inclusion of *D. cochinchinensis*, *D. oliveri*, and other endangered plants in the list of indigenous plant species is a priority for the current and future reforestation and restoration programs in localities throughout the country.

f) The government encourages all kinds of support and investment from organizations and individuals for the research, enhancement of management efficiency, conservation, restoration, and plantation of *D. cochinchinensis*, *D. oliveri*, and other endangered plants in Vietnam. The government also encourages local communities to actively participate in the protection and rehabilitation of *D. cochinchinensis* and *D. oliveri* to provide long-term timber supply sources.

3.2. Goal

Improved long-term management and conservation of *D. cochinchinensis* and *D. oliveri* through effective protection and restoration of the existing wild populations and afforestation of *D. cochinchinensis* and *D. oliveri* for the colonization in the historical distribution areas.

3.3. Specific objectives

1. Important wild populations of *D. cochinchinensis* and *D. oliveri* identified for appropriate management and protection measures by 2025.
2. Key conservation areas, seed orchards for *D. cochinchinensis* and *D. oliveri*, and priority areas identified for afforestation and restoration in the period 2025 - 2035 by 2025.
3. *D. cochinchinensis* and *D. oliveri* included in the national and/or provincial list of native cultivars; standards and technical guidelines on the collection, propagation, reforestation and assisted natural regeneration for *D. cochinchinensis*, *D. oliveri*, and other *Dalbergia* species developed by 2025.
4. At least 10 hectares of *D. cochinchinensis* and *D. oliveri* planted; 100 ha of forests enriched by *D. cochinchinensis* and *D. oliveri*; 200 ha of natural forests with *D. cochinchinensis* and *D. oliveri* zoned and assisted for natural regeneration by 2030.

5. Research projects on restoration and monitoring of key populations of *D. cochinchinensis*, *D. oliveri*, and other *Dalbergia* species using modern technologies implemented by 2027.
6. Communication programs on the conservation of endangered, precious tree species implemented and maintained by 2025.
7. Population research and recovery of *D. cochinchinensis*, *D. oliveri*, and other rosewood species socialized by 2028.

3.4. Objectives, outputs, and activities

Objective 1. Important wild populations of *D. cochinchinensis* and *D. oliveri* identified for appropriate management and protection measures by 2025.

Output 1.1. All potential distribution areas of *D. cochinchinensis* and *D. oliveri* surveyed.

- Activity 1.1.1. Conduct scoping visits to all potential distribution areas of *D. cochinchinensis* and *D. oliveri* to verify the existence of *D. cochinchinensis* and *D. oliveri* and identify key areas for further surveys before 2025.
- Activity 1.1.2. Design and carry out field surveys to stocktake important wild populations by measuring all identified trees with DBH greater than 10 cm and recording potential mother trees for providing seeds, and collecting information on threats and conservation practices by 2025.
- Activity 1.1.3. Produce maps of all important populations of *D. cochinchinensis* and *D. oliveri* in the wild by 2026.
- Activity 1.1.4. Digitize collected data and maps, and develop a database for long-term management and monitoring by 2026.

Output 1.2. Management and monitoring programs for key populations of *D. cochinchinensis* and *D. oliveri* developed and implemented.

- Activity 1.2.1. Develop management and monitoring programs for key populations of *D. cochinchinensis* and *D. oliveri* by 2026.
- Activity 1.2.2. Label, get GPS coordinates of and map all trees of *D. cochinchinensis* and *D. oliveri* with DBH from 20 cm in key populations for long-term management and monitoring.
- Activity 1.2.3. Implement protection, management and monitoring measures for the labeled trees.

Objective 2. Key conservation areas, seed orchards for *D. cochinchinensis* and *D. oliveri*, and priority areas identified for afforestation and restoration in the period 2025 - 2035 by 2025.

Output 2.1: Criteria for establishing important areas and populations and conservation measures of *D. cochinchinensis* and *D. oliveri* in the wild developed.

- Activity 2.1.1. Develop a set of criteria for the establishment of important areas/populations of *D. cochinchinensis* and *D. oliveri* in the wild by 2024.
- Activity 2.1.2. Develop priority conservation and management activities and measures for the important areas and/or populations by 2024.

Output 2.2. At least 3 – 5 priority populations or conservation areas for each *D. cochinchinensis* and *D. oliveri* identified.

- Activity 2.2.1. Clearly identified in the field and on the map from 3 to 5 priority populations for each *D. cochinchinensis* and *D. oliveri* species by 2025.
- Activity 2.2.2. Develop conservation actions and management measures for each priority population in the 10-year period (2025-2035) by 2025.

- Activity 2.2.3. Implement conservation actions for each population and evaluate the implementation of actions by 2028.

Objective 3. *D. cochinchinensis* and *D. oliveri* included in the national and/or provincial list of native cultivars; standards and technical guidelines on the collection and propagation, reforestation and assisted natural regeneration for *D. cochinchinensis*, *D. oliveri*, and other *Dalbergia* species developed by 2025

Output 3.1. *D. cochinchinensis* and *D. oliveri* included in the national and/or provincial list of indigenous cultivars.

- Activity 3.1.1. Two rosewood species of *D. cochinchinensis* and *D. oliveri* are included in the list of native trees for indigenous afforestation programs and restocking in localities by 2025.
- Activity 3.1.2. Officially apply plantation of *D. cochinchinensis* and *D. oliveri* in natural forest restoration and enrichment programs in the southern provinces by 2028.
- Activity 3.1.3. Plant *D. cochinchinensis* and *D. oliveri* in the forests by both state and private sectors, communities and families by 2029.

Output 3.2. Standards and technical guidelines on the collection, propagation, reforestation and assisted natural regeneration for *D. cochinchinensis*, *D. oliveri*, and other *Dalbergia* species developed.

- Activity 3.2.1. Develop and promulgate standards, regulations, and technical guidance on the collection, selection and preservation of seeds for *D. cochinchinensis* and *D. oliveri* by 2027.
- Activity 3.2.2. Develop and promulgate standards and regulations on seedlings, density and silvicultural measures for afforestation and forest enrichment with *D. cochinchinensis* and *D. oliveri* by 2027.
- Activity 3.2.3. Develop technical guidelines for other *Dalbergia* species and precious and endangered tree species to promote propagation, restocking and restoration by 2029.

Objective 4. At least 10 hectares of *D. cochinchinensis* and *D. oliveri* planted; 100 ha of forests enriched by *D. cochinchinensis* and *D. oliveri*; 200 ha of natural forests with *D. cochinchinensis* and *D. oliveri* zoned and assisted for natural regeneration by 2030.

Output 4.1. Historical distribution areas identified for restocking and restoration of *D. cochinchinensis* and *D. oliveri*.

- Activity 4.1.1. Identify at least 200 ha for zoning and assisted natural regeneration in protected areas by 2025.
- Activity 4.1.2. Identify at least 100 ha for restocking to restore habitat, and enrich forests with priority given to historical distribution areas within watershed protection forests or protected areas by 2026.
- Activity 4.1.3. Identify at least 10 ha of production forests to pilot the planting of indigenous large trees with priority given to *D. cochinchinensis* and *D. oliveri* by 2026.

Output 4.2: Habitat restoration and restocking programs for *D. cochinchinensis* and *D. oliveri* in the historical distribution areas implemented.

- Activity 4.2.1. Conduct zoning for restocking and ANR for 200 ha of natural forests where *D. cochinchinensis* and *D. oliveri* are present by 2030.
- Activity 4.2.2. Enrich at least 100 ha of natural forest, including restocking of *D. cochinchinensis* and *D. oliveri* with a density from 100 to 200 trees per hectare in the identified historical distribution areas by 2028.

- Activity 4.2.3. Pilot group planting of at least 10 hectares of *D. cochinchinensis* and *D. oliveri* (inter-cropping or mixed inter-cropping with other native species) by 2030.

Objective 5. Research projects on restoration and monitoring of key populations of *D. cochinchinensis*, *D. oliveri*, and other *Dalbergia* species using modern technologies implemented by 2027

Output 5.1. Restoration ability of *D. cochinchinensis* and *D. oliveri* in natural forests, enrichment forests, and restocking areas studied and monitored.

- Activity 5.1.1. Implement one research program on regeneration, natural restoration, and interventional restoration (enrichment) ability for *D. cochinchinensis* and *D. oliveri* by 2025.
- Activity 5.1.2. Evaluate the effectiveness, growth rate, and development of models of ANR, natural restoration, forest enrichment and group and sparsely planting of *D. cochinchinensis* and *D. oliveri* by 2027.
- Activity 5.1.3. Introduce results and effective silvicultural measures of afforestation and rehabilitation in the historical distribution areas by 2030.

Output 5.2. Advanced technology in protecting and monitoring populations and assessing the ability of growing and regenerating *D. cochinchinensis* and *D. oliveri* applied.

- Activity 5.2.1. Develop and implement a key population protection program for *D. cochinchinensis* and *D. oliveri* in at least two priority conservation areas using digital and real-time monitoring technology by 2025.
- Activity 5.2.2. Implement effective protection programs for important populations in the Cat Tien National Park, Bu Gia Map National Park, Dak Uy Special-use Forest, etc, and mother trees that have been documented and located by 2027.

Objective 6. Communication programs on the conservation of endangered, precious tree species implemented and maintained by 2025

Output 6.1. Awareness of local communities and public perception of forest protection and endangered, valuable tree conservation enhanced.

- Activity 6.1.1. Conduct Knowledge, Attitudes and Practices (KAP) surveys to understand the knowledge, attitudes and practices of local people regarding laws on forest protection, tree conservation, and illegal harvest and trade controls by 2023.
- Activity 6.1.2. Design awareness-raising programs on sustainable use, afforestation facilitation, restoration and prevention of illegal harvest and trade of *D. cochinchinensis*, *D. oliveri*, and endangered, valuable tree species by 2023.
- Activity 6.1.3. Develop communication messages, materials (leaflets, signages, and billboards) and products (T-shirts, caps, bags) based on designed programs by 2024.
- Activity 6.1.4. Select appropriate mass media for local communities and the public at different levels to implement and maintain the awareness-raising programs by 2025.
- Activity 6.1.5. Develop community-based models such as community conservation teams and community forest protection teams for the protection of *D. cochinchinensis*, *D. oliveri*, and endangered tree species at the local level.
- Activity 6.1.6. Mainstream raising awareness on the protection and restoration of *D. cochinchinensis*, *D. oliveri*, and endangered tree species into regular meetings and/or communication events of the forestry sector at provincial, district, and commune levels by 2025.

Objective 7. Population research and recovery of *D. cochinchinensis*, *D. oliveri*, and other rosewood species socialized by 2028.

Output 7.1. Policies on public-private partnership development and investment socialization encouragement in study and restoration of *D. cochinchinensis*, *D. oliveri*, and endangered tree species established.

- Activity 7.1.1. Develop a mechanism to encourage the private sector and individuals to participate in or fund programs on research and restoration of *D. cochinchinensis*, *D. oliveri*, and endangered tree species by 2025.
- Activity 7.1.2. Develop a seedling program from socialized sources to provide seedlings of *D. cochinchinensis* and *D. oliveri* free of charge for afforestation and rehabilitation programs by 2027.
- Activity 7.1.3. Support important conservation areas and main restoration areas to establish small- and medium-sized nurseries to provide seedlings of *D. cochinchinensis*, *D. oliveri* and endangered tree species for afforestation, forest enrichment and restoration by 2028.

4. TIMEFRAME, MONITORING, AND EVALUATION

4.1. Time frame

The conservation and management plan for *D. cochinchinensis* and *D. oliveri* in Vietnam will be implemented in the period from 2022 to 2035. All activities of the plan will be implemented simultaneously or separately to ensure that at least 80% of the objectives will be achieved within the time frame. It is planned as below:

- Urgent activities will be carried out from 2022 to 2027.
- Medium-term activities will be carried out from 2022 to 2030.
- Long-term activities to be carried out from 2022 to 2035.

Such time arrangement is to make sure that agencies, organizations, forest owners, and other stakeholders will have enough time to prepare, mobilize and allocate their resources for the implementation of the plan's activities as well as evaluation of the effectiveness of activities.

4.2. Monitoring

The conservation and management plan will be monitored during the implementation to enhance the efficiency and effectiveness of conservation objectives and goals by providing information and feedback to management agencies and forest owners to adjust the plan and develop significant solutions. The monitoring will consist of:

- Designing a monitoring system with concrete measurable indicators against objectives, activities, and time frame.
- Tracking the achievements and shortcomings by objectives, activities, and implementation progress.
- Mobilizing human and financial resources for the plan implementation.
- Analyzing the effectiveness and impacts of the plan implementation
- Identifying problems causing impacts on the implementation of the plan and necessary solutions for amendment.

4.3. Evaluation

From 2022 to 2035, the evaluation will focus on the main effectiveness and impacts of the plan, which will include: i) management and protection of important populations and key mother trees in the wild; ii) mitigation and elimination of illegal harvest, trade of timber trees, and seedlings in managed protected areas and watershed protection forests; iii) nurseries and seed orchards established to provide seedlings for restoration programs; and iv) pilot planting and forest restoration programs.

The evaluation will be based on the plan's objectives, activities, and time frame. The evaluation should be objectively conducted by an independent organization and/or agency including an international organization and non-governmental organization. The following suggested contents are the subject for evaluation:

- The performance of the plan's objectives and activities against the set timeframes. This includes protection of important populations and seedlings in key conservation areas, implementation of afforestation and restoration programs in the previous distribution areas, socialization and mobilization of the private sector's resources in efforts of research, propagation, and restoration of populations of *D. cochinchinensis* and *D. oliveri* in the historical distribution areas, and the inclusion of *D. cochinchinensis* and *D. oliveri* in the list of native tree species for planting in forest restoration programs.
- The plan's impacts on biodiversity conservation, reducing pressures on precious and rare tree species, changing livelihoods/incomes of local communities, engaging stakeholders in the timber trade chain of these two tree species and the contribution of

action taken towards biodiversity conservation goal, implementing international commitments, and contributing to the local socio-economic development.

- The level of coordination in the implementation of the plan between state management agencies, forest owners, and relevant organizations.
- The involvement and efforts of private and international sectors to manage, restore and promote sustainable use of these two species.

5. IMPLEMENTATION AGENCIES

Based on the objectives and the list of priority tasks of the "Management and conservation plan for *Dalbergia cochinchinensis* and *Dalbergia oliveri* in Vietnam", departments, and agencies under MARD, MONRE, and MOST in coordination with departments, and agencies of other ministries, sectors, and localities will develop detailed proposals with budget estimation to perform priority tasks and projects.

Depending on their functions and authority, all levels from ministries to localities will prepare and approve specific projects and tasks of the plan as a basis for determining and allocating budgets for implementation at their level, either ministry or locality.

Forest owners based on their rights and responsibilities propose priority tasks and projects to carry out activities to protect, conserve and restore populations of *D. cochinchinensis*, *D. oliveri* and other threatened plant species in their natural distribution areas, conservation areas, and priority restoration areas.

5.1. Responsibilities

5.1.1. Ministry of Agriculture and Rural Development (MARD)

VNFOREST is a standing agency and is responsible for leading and coordinating with other agencies of MONRE, MOST, PPCs, the cities under the Central Government, and national and international organizations to develop detailed activities according to the framework of goals and objectives of the "Management and conservation plan for *D. cochinchinensis* and *D. oliveri* in Vietnam". VNFOREST will:

- Direct and guide localities to implement the plan for the management and conservation of *D. cochinchinensis*, *D. oliveri*, and other *Dalbergia* species in the whole country until 2035.
- Coordinate with the MONRE in developing priority programs and projects on conservation and restoration of *D. cochinchinensis*, *D. oliveri*, and other rare tree species to send them to the MOST to develop detailed programs for research and pilot on population conservation and restoration.
- Annually check, monitor, and evaluate the implementation of the management and conservation plan, and periodically report to the Minister of MARD on the results of the plan implementation.
- Provide advice to include the contents of the plan in periodic meetings of the Steering Committee of Forestry Program for discussion, constraints, and problem solving during the plan implementation.
- Annually report to the Minister of MARD on the results of the implementation of the plan. Organize every 5-year preliminary workshops by 2027 and 2032 to review the implementation of the plan, and a closing conference by 2035 to review the implementation of the whole plan.
- Direct management boards of protected areas and watershed protection forests, and forest owners in places where *D. cochinchinensis* and *D. oliveri* are distributed or identified as seed orchards and/or seedling supply sources to actively develop and implement protection, monitoring, and restoration activities within their respective management areas.

5.1.2. Ministry of Natural Resource and Environment (MONRE)

MONRE has responsibilities of:

- Review information and including *D. cochinchinensis*, *D. oliveri*, and other endangered plant species on the list of endangered, precious, and rare tree species prioritized for protection.

- Allocate financial resources from national biodiversity conservation programs and environmental protection resources to implement monitoring, conservation, and restoration projects for *D. cochinchinensis*, *D. oliveri*, and rare tree species.
- Cooperate with MARD in developing priority programs and projects on conservation and restoration of *D. cochinchinensis*, *D. oliveri*, and rare tree species, and send them to the MOST to develop detailed programs for research and pilot population conservation and restoration.
- Participate in the appraisal of projects and proposals related to the implementation of the plan and advise on the allocation of funding for the implementation of the plan, including priority projects.

5.1.3. Ministry of Science and Technology (MOST)

MOST is responsible for the following:

- Direct proposals of scientific programs and tasks on research, monitoring, propagation, and restoration of *D. cochinchinensis*, *D. oliveri*, and rare tree species.
- Approve and allocate funds to carry out tasks, projects, and proposals on research, monitoring, conservation, and restoration in priority conservation areas and historical distribution areas.

5.1.4. Cities of central government and provinces

To develop programs and projects on the conservation and restoration of *D. cochinchinensis*, *D. oliveri*, and rare tree species in the provinces.

Assign DARDs and cities that have naturally distributed *D. cochinchinensis* and *D. oliveri* to:

- Develop a stocktaking plan, a plan of forest protection, conservation and development, including zoning for natural regeneration, restocking, and pure or mixed planting of *D. cochinchinensis* and *D. oliveri* in the planned areas for restocking or new planting.
- Advise People's Committees at all levels to allocate funds from the local budget to implement the plan.
- Advise the PPCs to guide the departments, sectors, and local organizations to coordinate with the management boards of protected areas and watershed protection forests to effectively implement the plan.
- Advise the PPCs to have a plan to attract and encourage the people, the public, and businesses and local organizations to sponsor, or contribute to forest plantation and restoration programs of *D. cochinchinensis*, *D. oliveri*, and other rare tree species in their locations.
- Check and supervise forest protection and development, including the implementation of the management and conservation plan for *D. cochinchinensis*, *D. oliveri*. Annually report to MARD and PPCs on the results of the plan implementation.

5.1.5. Forest owners

- Management boards of protected areas, watershed protection forests, and other forest owners directly carry out stocktaking of their managed areas and areas with mature trees, and actively develop plans for management and restoration of *D. cochinchinensis*, *D. oliveri*, and rare tree species.
- Based on the objectives and prioritized actions of the plan, forest owners will develop projects on the investigation, research, and restoration of *D. cochinchinensis*, *D. oliveri*, and rare tree species, and send them to MARD, MONRE, and MOST to apply for funding.

- Develop a schedule for management, protection, and resource allocation for *D. cochinchinensis*, *D. oliveri*.
- Mainstream conservation and restoration of *D. cochinchinensis*, *D. oliveri*, and rare tree species into the annual plan of forest owners.

5.2. Budget for implementation and priority projects

5.2.1. Allocation of resources

The budget for implementation of this plan will be mobilized from the state budget, private sector, and international funding sources. This budget is balanced and allocated from the state budget according to the current state budget regulations and other legitimate mobilized funding sources such as support from non-public science and technology organizations, non-profit organizations, and the private sector, and contributions from domestic and foreign individuals, etc.).

MARD integrates the budget for the implementation of the plan into the annual recurrent cost estimate and sends it to the Ministry of Finance for summarization and submission to the competent authorities for consideration and approval in accordance with the laws on the State budget.

MARD coordinates with MONRE to propose at least 01 target program for research and conservation of *Dalbergia* species and other endangered plant species and send it to the MOST to develop a 10-year research-conservation program in the period of 2025 – 2035.

The People's Committees of the provinces and cities under the central government ensure to allocate funding from the local budget, use revenues from forest environmental services and other legal revenues, and private sector at their localities to implement this plan and priority projects and actions.

5.2.2. Priority projects

The followings are the six proposed priority projects which are recommended for approval in principle under the "Management and conservation plan for *Dalbergia cochinchinensis* and *Dalbergia oliveri* in Vietnam " (see Appendix 1).

5.3. Environmental efficiency

The management and conservation plan for *D. cochinchinensis* and *D. oliveri* in Vietnam will be implemented in the period from 2022 to 2035 to ensure the survival of the remaining populations, and the recovery of precious timber species, which are the speciality of Vietnam and the Indochina region. Once protected, populations of these tree species will contribute to the stability of habitats for other wild plants and animals, protection of water sources, better resilience to climate change, and the creation of important ecosystem service values that both communities and countries would benefit from.

The increase of forest areas through wild population protection, conservation, restoration, restocking and new planting will enable environmental and rehabilitation opportunities for wild plants and animals in places where *D. cochinchinensis* and *D. oliveri* are present. As a result, this will contribute to the protection of local and national forests, and cultural and biodiversity values.

Conservation and restoration activities of *D. cochinchinensis*, *D. oliveri*, other endangered plants, and forest habitats/landscapes will contribute to environmental protection, nature conservation, natural disaster reduction, mitigation of climate change impacts, and disease prevention.

5.4. Socio-economic efficiency

The implementation of the management and conservation plan for *D. cochinchinensis* and *D. oliveri* will create more jobs to attract local people and communities to actively participate in the conservation and restoration of rare and precious plants in particular and nature conservation in general. In the long term, the protection, maintenance, and restoration of high valuable populations of *D. cochinchinensis* and *D. oliveri* will generate income for the people involved and improve their family livelihoods, enhance gender equality and contribute to economic and cultural development for local communities in the implementation areas.

The plan once implemented will also help resolve conflicts or inadequacies in the management and protection of biodiversity, especially valuable timber species. As a result, people will understand the economic value, and long-term use value of these tree species, and therefore, they will actively participate in protecting and restoring these species and forests to contribute to the promotion of green development and the sustainable development process of Vietnam.

Conservation and restoration of *Dalbergia* populations and other precious timber species and natural forest ecosystems are preservation and development of natural values and traditional national culture for future generations and sustainable development of the country.

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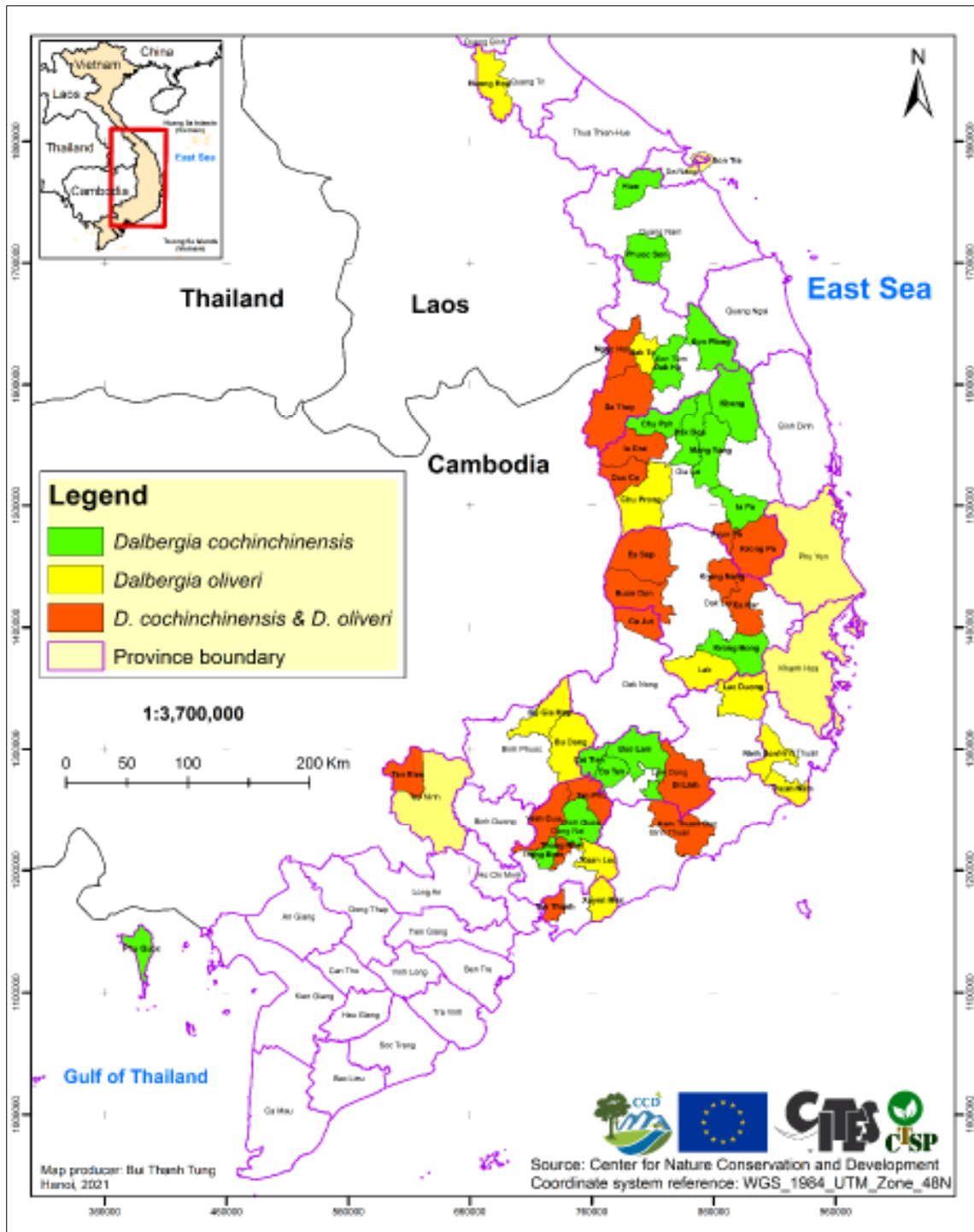
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Appendix 1. List of priority projects/programs.

No.	Priority projects/programs	Time	Leading agency	Coordination agencies
1	Conduct a comprehensive survey of wild populations of <i>D. cochinchinensis</i> and <i>D. oliveri</i> in Vietnam to plan priority conservation and restoration areas	2022 – 2025	MARD	MONRE, MOST, PPC, and national and international conservation organizations.
2	Conduct studies and research on the classification and distribution of other <i>Dalbergia</i> species in Vietnam for setting up management and conservation purposes.	2022 – 2025	MOST	MONRE, MARD, PPC, and national and international conservation organizations.
3	Develop processes and regulations on seed forests/orchards, seed and plantation, and forest restoration with <i>D. cochinchinensis</i> and <i>D. oliveri</i> .	2023 – 2027	MARD and PPCs	MONRE, MOST, PPCs, national and international conservation organizations, and forest owners.
4	Research and pilot planting of street trees and shade trees with <i>D. cochinchinensis</i> , <i>D. oliveri</i> , and other precious and rare tree species in urban and residential areas.	2022 – 2030	MARD and PPCs	Local authorities, Department of Environmental Crime Prevention Police, Department of Agriculture and Rural Development, Department of Traffic and Public Works.
5	Projects for planting <i>D. cochinchinensis</i> and <i>D. oliveri</i> in the southern provinces.	2025 – 2035	MARD and PPCs	Forest owners, management boards of national parks, and nature reserves.
6	Community communication and awareness-raising program on the conservation of rare and precious tree species.	2023 – 2030	MARD and PPCs	Management boards of national parks and nature reserves, forest owners, national and international conservation organizations.

Appendix 2. Distribution map of *D. cochinchinensis* and *D. oliveri* by districts.



Note: The confirmation of the existence of *D. cochinchinensis* in Cam Nghia and Cam Chinh communes of Cam Lo district of Quang Tri province in 2022 has not been updated into this map because the map was produced in 2021.

Appendix 3. Distribution map of *D. cochinchinensis* and *D. oliveri* by protected areas.

