

The Red List of Timber Trees

Ryan Hills, Megan Barstow and Malin Rivers



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October 2022

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BOTANIC GARDENS CONSERVATION INTERNATIONAL (BGCI) is the world's largest plant conservation network, comprising more than 500 botanic gardens in over 100 countries, and provides the secretariat to the IUCN/SSC Global Tree Specialist Group. BGCI was established in 1987 and is a registered charity with offices in the UK, US, China, Singapore and Kenya.



THE IUCN/SSC GLOBAL TREE SPECIALIST GROUP (GTSG) forms part of the Species Survival Commission's network of over 7,000 volunteers working to stop the loss of plants, animals and their habitats. SSC is the largest of the six Commissions of IUCN – The International Union for Conservation of Nature. It serves as the main source of advice to the Union and its members on the technical aspects of species conservation. The aims of the IUCN/SSC Global Tree Specialist Group are to promote and implement global red listing for trees and to act in an advisory capacity to the Global Trees Campaign.



Cedrela odorata (Azul, CC BY-NC)

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COVER PHOTOS

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(Alex Hudson)

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DESIGN

Seascape. www.seasapedesign.co.uk



Guibourtia coleosperma
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IUCN Red List Categories

- EX** Extinct
- EW** Extinct in the Wild
- CR** Critically Endangered
- EN** Endangered
- VU** Vulnerable
- NT** Near Threatened
- LC** Least Concern
- DD** Data Deficient
- NE** Not Evaluated

Acknowledgements

The completion of this report would not have been possible without the contribution of assessments and reviews from Global Tree Assessment partners, IUCN Species Survival Commission Global Tree Specialist Group members and others who have written and reviewed IUCN Red List assessments for timber tree species. We would like to thank all the assessors, reviewers and contributors who were involved with producing timber assessments for the IUCN Red List. A full list of names is provided in Appendix 1.

We are grateful to those who contributed to the case studies in this report. Also, all who provided photos are thanked and recognised in individual photo credits.

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Handroanthus impetiginosus (Eric Hough, CC BY-NC)

Contents

Foreword	6
Executive Summary	7
Background	8
Methods	11
Results	14
Threat status	14
Criteria used	16
Taxonomic analysis	16
Geographic analysis	18
Scale of timber use	20
Non-timber uses	20
Threats	21
<i>In situ</i> and <i>ex situ</i> conservation	23
Conclusions and Recommendations	28
Raise awareness	28
Address threats	28
Improve timber data management	29
Take species specific conservation action	30
Bibliography	32
Appendix 1 Assessors, Contributors and Reviewers of IUCN Red List assessments for timber tree species	34
Appendix 2 Number of species and threatened species per county	37

Appendix 3

IUCN Red List category for each species

Can be found at <https://www.bgci.org/resources/bgci-tools-and-resources/the-red-list-of-timbers/>

Case Studies

Protection and conservation of Ulin (<i>Eusideroxylon zwageri</i>) in Indonesia	10
Large-scale inventories and permanent plots: the evolution of the Okoumé population in the next 100 years in Gabon	13
The African ebony, <i>Diospyros</i> <i>crassiflora</i> Hiern	15
<i>Dalbergia</i> on CITES	17
Assessments for <i>Guibourtia</i> trees in Central Africa	22
Conservation nursery: A tool for <i>ex situ</i> conservation of tropical forest genetic resources in Indonesia	24
National initiative to update the malagasy timber classification system	27
World Forest ID	29
Integrated Conservation of four threatened timber species in the Brazilian Atlantic Forest	31

Foreword



Nothofagus alpina (Cristian Echeverría)

It is increasingly rare to hear anything truly positive about the world's timber species. Year after year, reports highlight increasing deforestation, growing trade volumes, and more and more species classified as threatened. Numerous studies have been conducted to document the exploitation of tree species for timber, pointing to specialty hardwoods used for musical instruments and high value furniture, to species used in large volumes for construction or other industrial use. Many factors have been identified that contribute to unsustainable harvest. These include, among others, poor management, outdated policies, lack of enforcement, and importantly, insufficient or non-existent data about the status of tree species.

Lack of data about the conservation status of timber species is an underlying theme that allows exploitation of timber species to continue in an unsustainable, unregulated and often illegal manner. Without sound inventories and species conservation assessments, forest managers are unable to design sound management schemes, or propose suitable conservation measures for individual species. In the absence of well-justified facts to demonstrate the decline in timber species, governments and producers, and indeed consumers, can continue with business as usual. Even though population declines have been documented for some species, trade volumes and consumer demand are increasing. The prevailing view is all too often - is this really a problem? As the argument goes, there is a lot of forest out there, and no solid evidence to say that action is needed right now.

Herein lies the value of *The Red List of Timber Trees*. For the first time, we have a baseline for 4,945 of the world's tree species that are valued for their timber. Compiled into a single document that presents data published on the IUCN Red List of Threatened Species, such as status, threats and recommendations for conservation action, combined with data on *in situ* and *ex situ* conservation, this publication can yield essential information that will be critical to inform conservation strategies. There is a real need to have this information at our fingertips, and an urgency to spread the word in a publication that is easy to use and full of relevant information.

The Red List of Timber Trees is an incredible achievement. Coordinated by Botanic Gardens Conservation International and the IUCN Species Survival Commission, it is the result of decades of research and contributions from hundreds of dedicated individuals. By documenting the extinction risk faced by timber tree species, and in particular the demand for timber, the ground is set for informed policies and legislation, targeted conservation efforts, and a conversation that goes beyond the usual inaction justified by a lack of information. With this publication, there is renewed hope that we can work together to conserve the world's tree species.

Nina Marshall

Senior Director of Monitoring, Evaluation and Outreach
Critical Ecosystem Partnership Fund (CEPF)

Executive summary



Baillonella toxisperma (Edouard Coenraets)

Timber is the most frequently recorded use amongst the world's nearly 60,000 tree species. Timber species support the livelihoods of people across the world and is a multi-billion dollar international industry with timber consumption predicted to continue to increase. Unsustainable levels of felling for timber can be a significant threat to species in the wild. However, despite their importance there has been a lack of information in terms of species-level threat status for timber trees. The production of *The Red List of Timber Trees* marks the first comprehensive global overview of the conservation status of the world's timber tree species.

In total, 4,945 timber tree species have conservation assessments submitted or published on the IUCN Red List of Threatened Species (version 2022-1). A high threat level was identified with a third of timber species threatened with extinction (1,664 species or 34%). Use of tree species for timber can be at various scales (subsistence, national and international) with most species being used at a subsistence or local level. Timber species are also widely distributed across the globe with centres of diversity in the tropics, particularly in Southeast Asia where there is also a high proportion of threatened species. There is also a large taxonomic representation with timber tree species occurring in 161 plant families and 1,243 genera.

Logging and wood harvesting is the most common threat to timber tree species affecting 59% of species. Many species are unsustainably harvested for timber in their natural populations, often illegally, causing significant

population declines. The next major threat identified is habitat loss from agricultural expansion. Other important threats to timber species include urbanisation, increased fire frequency, energy production and mining, climate change, invasive species and the construction of road and transport corridors. Most timber tree species are experiencing a decreasing population but there is generally a lack of quantitative information about many timber species with the population trend being unknown for almost a third of species.

An *ex situ* survey was carried out in this report and found that 46% of timber tree species are not held within an *ex situ* collection such as a botanic garden, arboreta or seed bank. Out of the 1,664 threatened species, 64% are not found in *ex situ* collections. Most of the species analysed in this report are found in at least one protected area. However, 15% of threatened species are not in protected areas and 27% of Critically Endangered species are not found in protected areas. Species without *ex situ* or *in situ* conservation should be priorities for conservation.

The Red List of Timber Trees aims to stimulate conservation action for this important group of species by identifying which species are under threat. We provide recommendations for conservation action including encouraging sustainable use and forest management. The results of this report and IUCN Red List assessments should be used to inform policy makers and guide conservation efforts to ensure that no species becomes extinct.

Background

National Reserve Nonguen Nothofagus forest
(Cristian Echeverría)

The importance of trees cannot be understated, being vital for both life on earth and contributing to ecosystem functioning. It is estimated that one-third of the world's population has a close dependence on forests and forest products (FAO, UNEP 2020). They provide a wide range of direct uses to humans with timber (as defined in Box 1) being the most frequently recorded use amongst the world's tree species (BGCI 2021). In many tropical countries, forest-adjacent people earn about one-quarter of their income from forests (FAO 2022).

Timber production is a multi-billion dollar international industry with wood products totalling about 2.3 per cent of the value of global exports and imports in 2020 (FAO 2022). Globally, timber production is increasing, with the world production of roundwood (at 3.91 billion m³ in 2020) increasing by 12 percent in the last two decades (FAO 2022). The value of the global timber trade has more than doubled over the past 20 years, reaching US\$153 billion in 2018 (Raza et al. 2020). Timber consumption continues to rise and is forecasted to triple over the next 30 years, driven by factors such as increasing urbanisation.

The *State of the World's Trees* report (BGCI 2021) revealed that at least 30% of tree species are threatened with extinction and timber harvest is the second major

Box 1: Timber Tree Definition

A timber tree is one felled for its wood for use in construction or production of wooden items such as flooring, furniture, musical instruments and carvings. Felled trees may be traded in the form of primary wood products such as roundwood or smaller, cut logs (sawnwood), or in the form of finished products such as veneer, boards, plywood or wooden objects (ITTO 2012)

threat to global tree species diversity (behind agriculture). High commercial demand drives unsustainable harvesting of timber tree species and illegal logging is prevalent in order to meet demand. In many tropical countries, illegal logging accounts for 50-90% of all timber harvested (Interpol 2019). Unsustainable logging of wild species contributes to the biodiversity crisis and the current unprecedented loss of the world's forests. This negatively affects the livelihoods of those dependent on these species, with low- and middle-income countries forest wealth per capita decreasing by eight percent in 1995–2018 due to a combination of population growth and the loss of forest area (FAO 2022).

The harvesting of valuable tropical timbers for international trade has taken place for centuries. It is now more urgent than ever to determine which timber species are threatened with extinction in order to implement effective conservation measures, safeguarding these species and the livelihoods of those who are reliant on them.

Previously, there has been a lack of information on trees in terms of species-level threat status and despite the importance of timber tree species there has been a paucity of information available for them in regards to conservation status and extinction risk. Through the Global Tree Assessment (Box 2) and the *The Barometer of Life: Global Timbers Species* project there has been significant advancement in the publication of IUCN Red List assessments for trees and timber trees in the last five years. The IUCN Red List of Threatened Species (IUCN 2022) is widely recognized as the most authoritative system for assessing species extinction risk and carries weight in conservation planning and legislation, making it a powerful tool for taking conservation action (Rodrigues et al. 2006, Bennun et al. 2018).

Prior to the Global Tree Assessment there were fewer than 10,000 assessments for trees published on the IUCN Red List, and there had been no comprehensive assessment of timber trees. Over 1,000 timber tree species had assessments produced in 1998 in *The World List of Threatened Trees* (Oldfield et al. 1998), but since this time many timber species have remained unassessed or in need of an updated conservation assessment. A lack of timber assessment activity has occurred due to a lack of global initiatives. Furthermore, the scarcity of trade and exploitation information, particularly at a species level and the occurrence of undocumented and illegal trade makes categorisation difficult. The long life history and wide-spread nature of many timber species also can make application of the IUCN Red List Categories and Criteria (2012) more challenging.

The lack of conservation assessments of timber species has been a hindrance to effective tree conservation planning and policy implementation. The Global Tree Assessment sought to address this by prioritising timber assessments through a partnership between Botanic Gardens Conservation International (BGCI) and IUCN - *The Barometer of Life: Global Timbers Species* project. This project contributed over 1,500 IUCN Red List assessments for timber trees over five years (2016-2021). The assessments were completed using the best data available for timber species, combined with utilising the expertise the Global Tree Assessment has developed with a global network of over 60 partner organisations and more than 500 tree experts (BGCI 2021). Initially, a working list of 1,575 commercial timber species (Mark et al. 2014) was used to determine the priority species for *The Barometer of Life: Global Timbers*

Box 2: Global Tree Assessment



GTA
Global Tree
Assessment

The Global Tree Assessment (GTA) is assessing the conservation status of every known tree species.

Despite the importance of trees, many are threatened by over-exploitation and habitat destruction, as well as by pests, diseases, drought and their interaction with global climate change. In order to estimate the impact of such threats to trees there is an urgent need to conduct a complete assessment of the conservation status of the world's nearly 60,000 tree species – the Global Tree Assessment. The first phase of this initiative culminated in the *State of the World's Trees* report released in September 2021 (BGCI 2021), which showed that at least a third of tree species are threatened with extinction. The second phase of this initiative aims to have all tree assessments published on the IUCN Red List.

The GTA is led by BGCI and the IUCN SSC Global Tree Specialist Group. This initiative prioritises the tree species at greatest risk of extinction. The GTA provides information to ensure that conservation efforts are directed at the right species so that no tree species becomes extinct.

www.globaltreeassessment.org

Species project. However, many more species are used for timber on a local, national and regional level. All species with timber use recorded on the IUCN Red List were included in this *Red List of Timber Trees*.

The Red List of Timber Trees is the first comprehensive global overview of the conservation status of timber tree species. It provides a baseline for the number of threatened timber tree species. It analyses various aspects of data from IUCN Red List assessments including country-level distribution, direct threats, scale of timber use, secondary use and *in situ* and *ex situ* conservation. Recommendations are provided calling for conservation action for these important species.

Case Study: Protection and conservation of Ulin (*Eusideroxylon zwageri*) in Indonesia

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Ulin (*Eusideroxylon zwageri* Teijsm. & Binn.) is a valuable timber species distributed in Sumatra and Borneo. Due to its high-quality timber, the species is harvested from the wild. In Indonesia, the species was previously protected under government regulations. However, it has been excluded from the list of protected plant species based on the Regulation of the Minister of Environment and Forestry No. 106 issued in 2018. Since then, the species has featured more heavily in trade and is at risk from illegal harvesting, causing a decline in population size and distribution.

In Sumatra, Ulin is found in at least five protected areas (Sutan Thaha Syaefuddin Grand Forest Park, Durian Luncuk I Nature Reserve, Durian Luncuk II Nature Reserve, Gunung Kubing Protection Forest and Gunung Tajam Protection Forest), and in Kalimantan it can be found at the following protected areas: Sungai Wain Protection Forest, Kutai National Park, Gunung Lumut Protection Forest and Gunung Meratus Protection Forest. *Ex situ* collections of the species are present at Balikpapan, Baturraden, Bogor, Cibinong,



Ulin in Indonesia (Henti Hendalastuti Rachmat)



Ulin in Indonesia (Henti Hendalastuti Rachmat)

Kuningan and Purwodadi Botanic Gardens. To support the sustainable use of the species, the establishment of Ulin plantations is desirable. The idea, however, faces several challenges as the species has low mean annual volume increment (1.89 m³/ha/year) and will reach optimum timber production after the age of 150 years with a net benefit/cost ratio lower than one (Setiawan et al. 2019).

Ulin is listed as Vulnerable (VU) under criteria A1cd+2cd on the IUCN Red List. The species was last assessed in 1998 and therefore needs updating. The species is also assessed as VU under criteria A4cd in the National Plant Red List of Indonesia. In addition to the protection of the species in protected forests and *ex situ* collections, conservation strategies for the species should include community managed forests. Allowing local people to be actively involved in the conservation and livelihood benefits associated with this species.

References

Setiawan, B., Lahjie A.M., Yusuf, S., Ruslim, Y., 2019. Assessing the feasibility of forest plantation of native species: A case study of *Agathis dammara* and in Balikpapan, East Kalimantan, Indonesia. *Biodiversitas* 20(9), 2453-2461.

Methods

IUCN Red List assessment methodology

When assessing a species for the IUCN Red List, data were gathered on the distribution, habitat and ecology, population, use and trade, threats and conservation actions. Distribution maps were also produced using georeferenced herbarium records following the IUCN Red List mapping guidelines (IUCN Red List Technical Working Group 2018). All assessments in this report are completed to a global scale, taking into account the full native distribution of a species.

Assessors then evaluated this information against the IUCN Categories and Criteria. Species were assigned one of eight categories (Figure 1): Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), and Not Evaluated (NE).

Least Concern (LC) and Data Deficient (DD). In order to assess whether a species belongs to a threatened category (CR, EN, VU), the species were evaluated in relation to five criteria: A) Population reduction; B) Geographic range; c) Small population size and decline; D) Very small or restricted population; and e) Quantitative analysis. The criteria are based on a set of thresholds and subcriteria. If the thresholds were almost met, the species was assessed as Near Threatened (NT). Any species not meeting the thresholds were classified as Least Concern (LC) and those species with insufficient information to complete an assessment were assigned Data Deficient (DD). For full IUCN Red List methodology please see the IUCN guidelines (IUCN Standards and Petitions Subcommittee 2021). In this report, NT and LC are grouped as “Not threatened”.

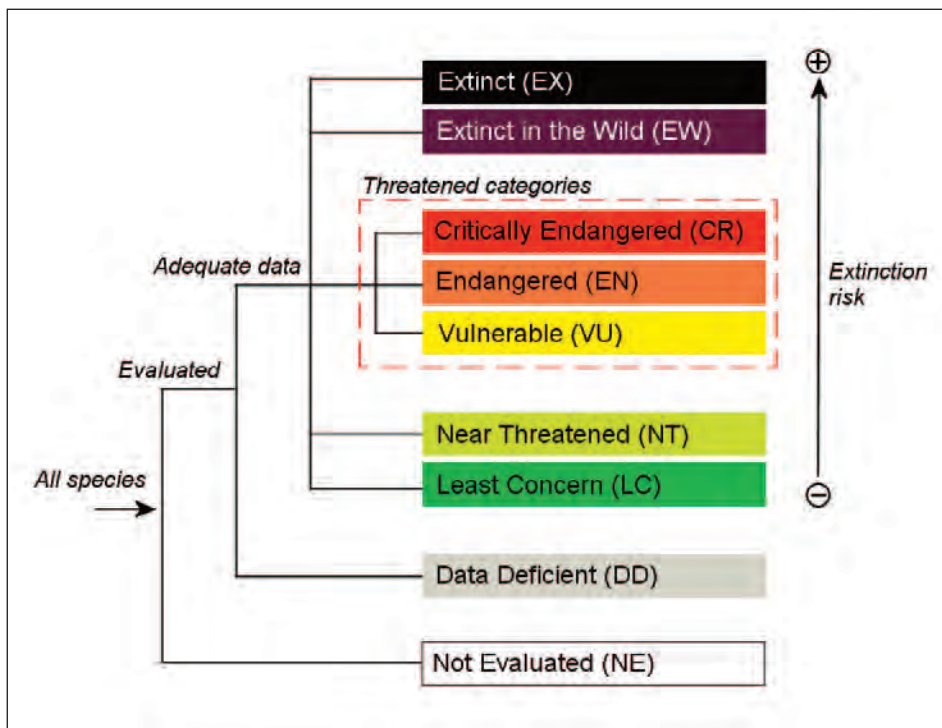


Figure 1. Structure of the IUCN Red List Categories, version 3.1 (IUCN)

Vateria indica (Anurag Dhyani)

Where appropriate a Reduction Analysis was carried out for assessing a species under criterion A. In this analysis, the removal of occurrence points where the species is no longer present enables the calculation of decline in extent of occurrence (EOO) or area of occupancy (AOO) for a species. The percentage decline calculated can be used as an indicator of extent of decline over the last three generations for a species enabling the use of criterion A. When the generation length is not known, a standard generation length of 50 years for large timber tree species, and 30 years for smaller timber tree species was used. If a literature review found that the species was particularly long-lived the generation length may be adjusted.

Data for timber tree assessments was gathered from a variety of online sources including CITES Trade Database, International Tropical Timber Organization (ITTO) Lesser Used Species website, Plant Resources for Tropical Africa (PROTA), Plant Resources for Southeast Asia (PROSEA) and Global Biodiversity Information Facility (GBIF), as well as literature in taxonomic and country monographs. Where available, trade data were also sourced but more often evidence of forest loss (Google Earth or Global Forest Watch) was used to understand the scale of threats to species. For country endemic assessments, carried out by in country Global Tree Assessment partners, assessor's knowledge and herbarium records were also often used.

Experts were sought for all species assessed. Sometimes experts carried out the conservation assessment for a species (assessors), and sometimes they contributed



Sequoiadendron giganteum
(Ioannis Daglis - CC BY-NC-SA)



Cupressus cashmeriana (BGCI)

data for the conservation assessment to be carried out elsewhere (contributors). In accordance with IUCN Red List regulations, all assessments were reviewed by a specialist. A full list of assessors, contributors and reviewers in the timber project can be found in Appendix I.

Species List

This publication includes all species that have been published or submitted to the IUCN Red List and recorded as being used for timber. To compile a species list for this report, a list of tree species coded as being used for timber (IUCN Red List use code 9. Construction or structural materials and code 11. Other household goods) (IUCN 2020) was downloaded from the IUCN Red List website (IUCN version 2022-1). Species from a list of commercial timber trees (Mark et al. 2014) that have a published or submitted assessment were also included. This combined list was then compared to GlobalTreeSearch (BGCI 2022), a list of accepted tree species, to include only currently accepted species for analysis.

Case Study: Large-scale inventories and permanent plots: the evolution of the Okoumé population in the next 100 years in Gabon

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Université Libre de Bruxelles, Belgium
Missouri Botanic Garden, West and Central Africa Program

Okoumé (*Aucoumea klaineana* Pierre, Burseraceae) is the most harvested timber species in Central Africa. The species is mostly distributed in Gabon where it plays a key economic role. The species has been assessed as Vulnerable on the IUCN Red List of Threatened Species in 1998, but this assessment needed to be updated. To do so, the Red List criterion A3 was used to assess the projected population reduction (PPR) that will be met in the future (up to a maximum of 100 years) of the Okoumé population.

The PPR was estimated at three levels of forest allocations. First, we assumed that the Okoumé population in protected areas should remain constant ($PPR_{pa}=0$). Second, we assumed that the Okoumé habitat is subject to a constant annual deforestation rate ($0.17\% \cdot \text{year}^{-1}$) leading to $PPR_{npf} = 15.6\%$ in the non-permanent forest domain. Third, we simulated the evolution of the Okoumé population using an Usher matrix model to estimate the PPR of production forests (logging concessions, PPR_{pf}). The simulations were initialised using the density (number of trees/ha⁻¹) per diameter class (from 20 cm diameter) from forest management inventories of logging companies. The evolution of this initial population depended on several demographic (recruitment, mortality, and growth rate) and logging parameters (minimum cutting diameter, cutting and damage rate) that were adjusted using data of permanent tree plot monitoring.



Aucoumea klaineana (Jean Louis Doucet)

Using this method, we predicted the density of Okoumé in 100 years with one logging every 25 years, which corresponds to the average cutting cycle in Central Africa. PPR_{pf} was then calculated as the difference between initial and final number of trees. Finally, the three different PPR estimates were aggregated computing the average of PPR weighted by their specific areas. The global PPR result was found to be lower than 30% if the recruitment rate is high as today, suggesting the Okoumé population might not be threatened in Gabon according to the Red List criterion A3, as it falls outside the thresholds of a threatened category for Criterion A. Considering this, a reassessment of the species has been submitted for publication in 2023/24.

Results

Threat Status

In total, 4,945 timber (tree) species have been submitted or published on the IUCN Red List (2022-1). Globally, 63% are not threatened (assessed as Least Concern or Near Threatened). Just over a third (1,664 species or 34%) of timber species are threatened with extinction (assessed as Critically Endangered, Endangered or Vulnerable) (Figure 2). A further 155 species (3%) are assessed as Data Deficient, where there is insufficient information to estimate the extinction risk. Five species are assessed as Extinct or Extinct in the Wild – *Furcraea macdougallii* formerly known from Mexico, *Sophora toromiro* from Chile, and *Lachanodes arborea*, *Nesiota elliptica* and *Trochetiopsis melanoxydon* from Saint Helena.

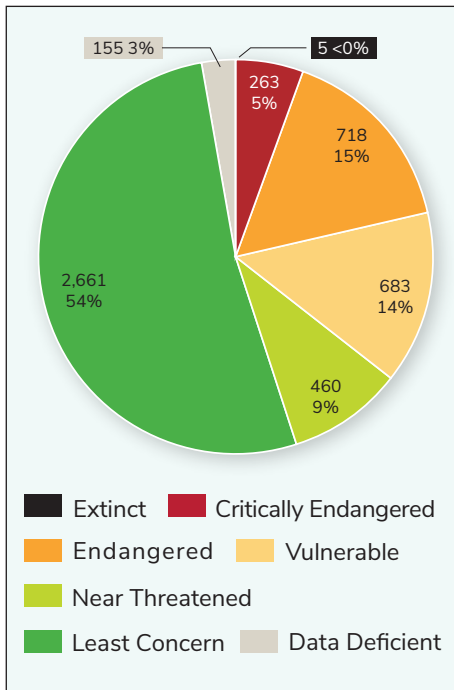


Figure 2. The number of timber species in each IUCN Red List Category

Almost a half of timber species (45%) have a documented decreasing population trend (Figure 3). About one fifth (22%) of species have a stable population trend and 51 species (1%) are recorded with an increasing population trend. The population trend for 1,566 species (32%) is unknown or not recorded highlighting the lack of population data for many timber species. Despite not being assessed as threatened (Critically Endangered, Endangered or Vulnerable), 822 Least Concern and Near Threatened species are experiencing a decreasing population.

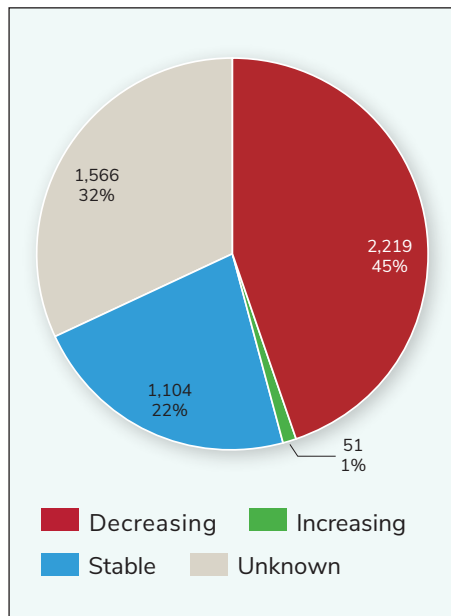


Figure 3. The population trend for timber species (excluding Extinct species)



Shorea rubra (CY Ling)

Case Study: The African ebony, *Diospyros crassiflora* Hiern

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Ebony producing timbers of the genus *Diospyros* in Asia, Madagascar and Africa have been the focus of overseas trade for centuries, and more recently have been considered of conservation concern. The African ebony, *D. crassiflora* Hiern, is one of the main species traded internationally as a source of ebony globally.

The species is native to the lowland moist rain forests of Equatorial Guinea, Cameroon, Gabon, Nigeria, and the Republic of Congo where it is widespread but never abundant. Although historically it has been exploited from all these countries, today Cameroon is the main source of exports. In Cameroon, the allowable harvest is determined by a government quota set annually. Despite sometimes being included in forest management plans and quantitative forest inventories for Forest Management Units, under current permits ebony is generally not permitted to be harvested from timber concessions. Some of the wood is used domestically for the crafting of small objects bought locally by tourists or directly exported abroad, but the bulk

is exported for musical instrument parts and to supply the Asian hongmu furniture market.

This said, during the last global Red List assessment of the species in 2017, the exploitation of the tree for wood was not considered to be the most significant threat. This is due to conservation actions and the relatively small size of the ebony market, with up to 3,000 tons of annual quota in Cameroon since 2005. The most severe long-term threat identified was the conversion of forests for agriculture. Because the expected total tree population decline due to habitat loss exceeds 30% over the next century, the assessment concluded that the species qualifies for listing as Vulnerable.

Despite successful monospecific cultivation and vegetative multiplication trials, few efforts at large scale plantations of *D. crassiflora* have been attempted. The responsibility for developing a sustainable model of harvesting is left to the initiative of the private sector. For example, in 2016, a U.S. guitar manufacturer, the Ministry of Environment, Nature Protection and Sustainable Development and a permitted ebony mill in Cameroon funded the Ebony Project. The project has led to the planting of more than 20,000 ebony trees and plans to plant an additional 30,000 by 2026. That project also conducts scientific research into the ecology of the species, focusing in particular on overlooked threats such as the widespread hunting of large mammals on which the species relies for the dispersal of its seeds.



Fraxinus ornus (Ian Harvey-Brown)

Box 3: Least Concern Timbers

Timber species are frequently assessed as Least Concern as they are widespread and common, hence why they are readily and more frequently utilised for their wood. Some Least Concern species are able to regenerate well, occurring in secondary habitats and, overall for these species, the rate of decline from logging and other threats (habitat loss etc.) is not suspected to cause a population decline of over 20% across a three generation period. Despite these species being assessed as Least Concern, it is still important to consider that many of them will be experiencing population decline, and the rate of use will be uneven across the range of the species leading to them being threatened locally in some states, countries or regions. In assessments, we hope to identify where this might be the case for species and often advise that more information on the population and rate of harvest be gathered or monitored.

Criteria Used

The majority of threatened timber species are assessed using criterion B (67% - Table 1), indicating these species are threatened due to their restricted range. The next most frequent criteria used is criterion A (32%), species that are threatened by significant population declines. Only 6% of threatened species are assessed under criterion C (threatened by declines and small population numbers) and 4% are assessed under criterion D (small population size). Population, exploitation and trade information is lacking for many timber species but if this was available, it is likely that more species could be assessed using criteria that have population thresholds such as criterion A.

Criteria	Number of species	%
A	538	32
B	1,118	67
C	107	6
D	64	4

Table 1: The IUCN Red List Criteria used to assess threatened timber species.

Family	Number of species
Fabaceae	723
Dipterocarpaceae	332
Myrtaceae	239
Sapotaceae	217
Lauraceae	217
Pinaceae	171
Malvaceae	160
Fagaceae	151
Arecaceae	150
Magnoliaceae	111

Table 2. The ten largest families in terms of number of timber species

Taxonomic Analysis

There is a large taxonomic representation with the 4,945 timber tree species occurring in 161 plant families and 1,243 genera.

The family with the highest number of species is Fabaceae (Table 2), which contains the genus *Dalbergia* and *Pterocarpus* traded for their rosewood (see Case Study: *Dalbergia* on CITES). Rosewoods are one of the most trafficked wildlife products globally (UNODC 2016). Many rosewoods are under severe threat in the wild due to the demand for the coloured hardwood timber they produce, which is used in the production of traditional and high-class furniture.

Dipterocarpaceae is the second largest timber tree family and it includes important timbers of *Shorea*, *Hopea*, *Dipterocarpus* and *Vatica* (common names are meranti, giam, keruing, resak, balua). Dipterocarps have a high species diversity in Southeast Asia particularly in Borneo. These species are of ecological importance, for example, providing the lowland habitat for Orang-utan species, however risk from land use change for oil palm plantation and exploitation for timber are major threats to the species (Bartholomew et al. 2021).

Myrtaceae is the third largest timber tree family and contains the largest timber genus, *Syzygium*. Sapotaceae, Lauraceae, Pinaceae, Fagaceae, Malvaceae, Arecaceae (palms) and Magnoliaceae are the other largest timber families.

Case Study: Dalbergia on CITES

Emma Williams and Carly Cowell

Royal Botanic Gardens Kew, UK

Many timber species are listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to ensure sustainable trade of threatened species. Some timber species are listed individually, for example, *Aniba rosodora* (Brazilian Rosewood), or entire genera have been listed, for example, *Dalbergia*, due to the difficulties identifying individual species.

When CITES Scientific Authorities consider a CITES import or export permit for species listed under Appendix II, they need to follow a Non-Detriment Finding (NDF), confirming any trade of the species will not cause detrimental harm to the species survival in the wild. Whilst writing an NDF, Scientific Authorities research the species taxonomy, conservation status, species biology, harvest impacts, trade impacts and management measures, similar research to that needed for writing an IUCN Red List assessment.

Understanding the taxonomy and nomenclature of CITES listed timber species is essential for CITES implementation and for making NDFs. Many CITES nomenclature checklists have been published for herbaceous plants and bulbs but none for timber species, except for a guide on CITES and timbers (Groves and Rutherford 2015).

In 2017 the entire genus of *Dalbergia* was listed on CITES due to high volumes of trade affecting certain species and the challenge in distinguishing species apart when in trade as timber and sawn wood. However, a comprehensive list of accepted species was not available which made the implementation of CITES extremely difficult. The Royal Botanic Gardens Kew worked with a team of international *Dalbergia* experts to write the first CITES *Dalbergia* checklist (Cowell et al. 2022). The checklist includes a list of all accepted names of *Dalbergia* and synonyms, with plant profiles for all 275 accepted species including their common names in English, French and Spanish, IUCN Red List status, plant habit, representative



Dalbergia sissoo (Elavarasan M, CC BY-NC)

herbarium specimens, list of timber libraries with wood samples and country distribution.

Collaborating with plant nomenclature specialists and herbarium taxonomists, having access to digitised herbarium specimens at Kew and online, and Kew's botanical library was key to producing the CITES *Dalbergia* checklist. CITES Parties and border enforcement officials will have access to an accurate list of accepted *Dalbergia* species names and synonyms, helping them to keep track of trade and enforce CITES controls using the standard recognised list of species names. Checklists for other timber species are needed, especially with the addition of more timber species to the CITES appendices at CoP19 (2022).

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Geographic Analysis

Timber species are distributed across the globe. Except for Antarctica, timber species are found in every continent and are found in every biogeographic realm (Nearctic, Palearctic, Neotropics, Afrotropics, Indo-Malaya, Oceania and Australasia). The biodiversity hotspots for timbers are in the tropics (Figure 4a).

Indonesia has the greatest number of timber tree species in this study with 809 species (Table 3). Out of the 10 countries with the highest number of timber tree species the majority are in Asia (Indonesia, Malaysia, Philippines and China). Madagascar, Brazil, Mexico, Colombia, Papua New Guinea and the Democratic Republic of the Congo are other countries with high number of timber species (Table 3).

The countries with the highest number of threatened timber species are similar to the most species rich countries (Table 4, Figure 4b). The Philippines has the highest number of threatened timbers (309 species) followed by Madagascar with 285 species, then Malaysia (249 species) and Indonesia (215 species).



Toona sinensis (Daniel Atha)



Karomia gigas (Kirsty Shaw)

Country	Number of species
Indonesia	809
Malaysia	685
Madagascar	618
Philippines	585
Brazil	504
Mexico	482
Papua New Guinea	424
Colombia	422
China	377
Congo, The Democratic Republic of the	330

Table 3. The ten countries with the highest number of timber species

Country	Number of threatened species
Philippines	309
Madagascar	285
Malaysia	249
Indonesia	215
Mexico	122
Brunei Darussalam	97
Colombia	80
China	71
Papua New Guinea	71
Thailand	65

Table 4. The ten countries with the highest number of threatened timber species

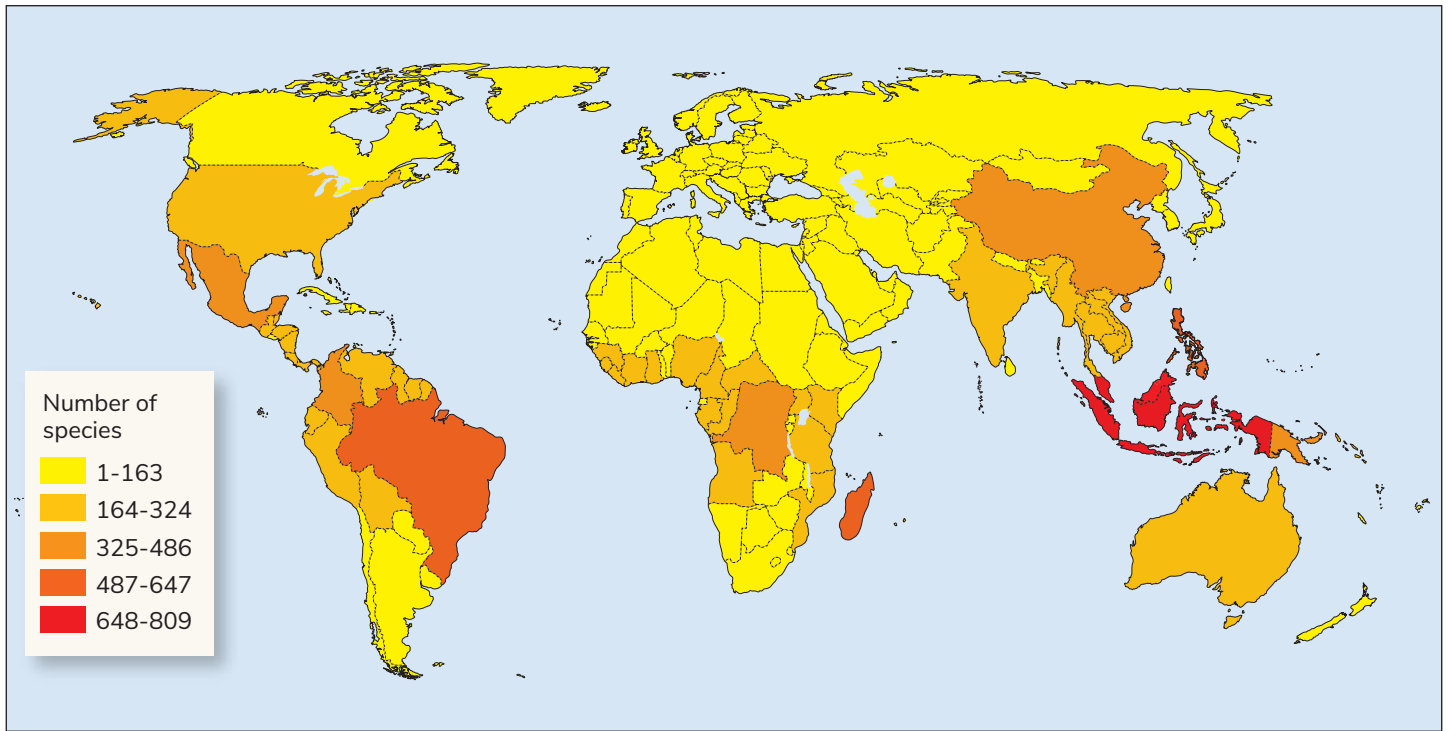


Figure 4a. Country timber species richness map showing the number of timber species in each country

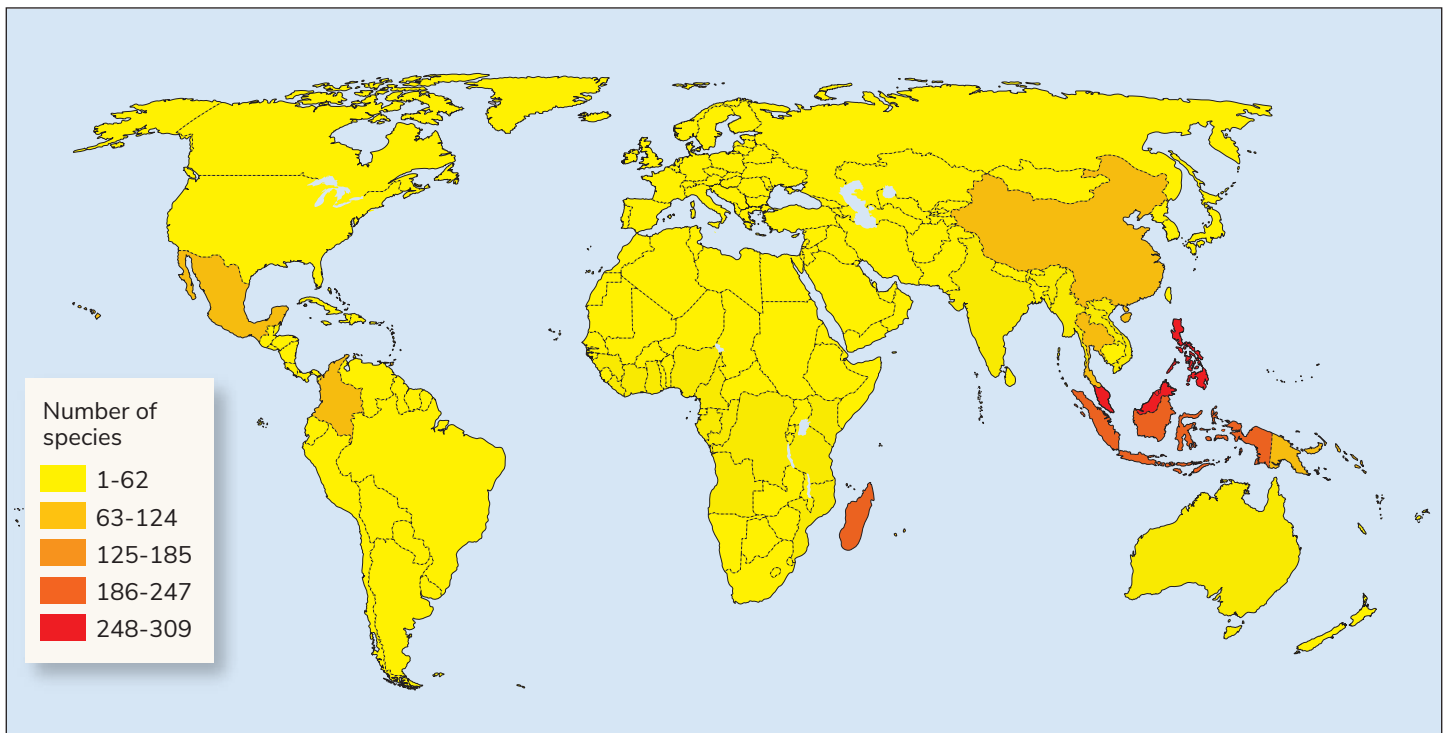


Figure 4b. Country timber species richness map showing the number of threatened timber species in each country

Scale of timber use

The scale of timber use (subsistence, national, international) was recorded for 70% of timber species (3,480 species). The same species can have multiple scales of use recorded against its name. Out of those with recorded information, 18% (636 species) are traded as timber on international markets and almost a half (48% or 1,675 species) are traded nationally. It was found that 89% (3,102 species) are used for timber at a subsistence or local level. Many of these species are of vital importance to local communities and livelihoods.



Milicia regia logged in village forest
(Xander van der Burgt)

Non-timber uses

All species in this report are recorded as being used for timber. Figure 5 shows that many of these species are multi-use, with a variety of recorded uses other than timber. These include food, medicine, horticulture, fuelwood and fibre. The most common non-timber use for species in this report is fuelwood, followed by medicine and food. The variety of uses of timber tree species highlights the additional importance of these species to humans and their value for conservation.

Shorea leprosula (Henti Hendalastuti Rachmat)

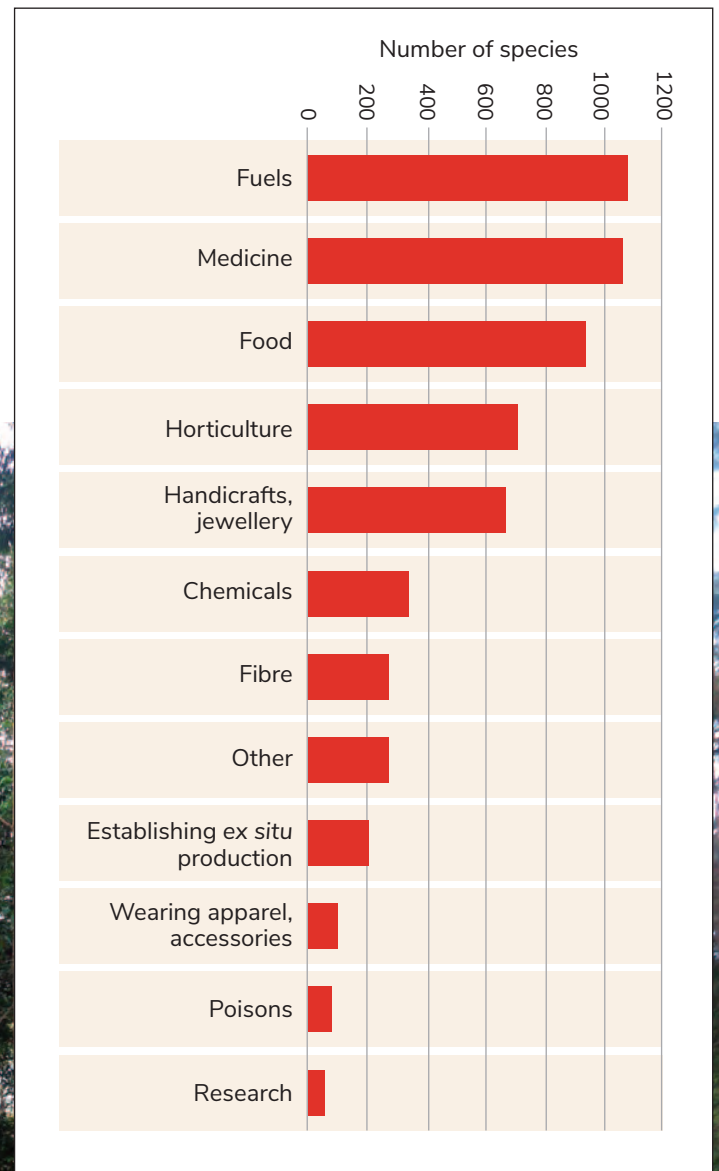


Figure 5: Other known uses of timber species and the number of species recorded for each use

Threats

Logging and wood harvesting is the most common threat to timber tree species affecting 59% (2,896 species) (Figure 6). Many species are unsustainably harvested for timber in their natural populations causing significant population declines. Timber species are often common and widespread but are now under threat due to overexploitation for timber with demand continuing to increase. Additionally, logging can have more impact on a forest beyond just the removal of trees, with machinery damaging the ecosystem which can impact regeneration of timber tree species and the thinning of forest making them more susceptible to further threats from fire, pests and diseases and land use change.

Habitat loss and deforestation via a number of human processes is threatening species across the world. Agriculture is the most commonly recorded driver of habitat loss. This can come in the form of clearing habitat for non-timber crops (affecting 2,401 species) or wood and pulp plantations (781 species) and livestock farming and ranching (772 species) (Figure 6). Other important contributors to habitat loss include urban development and settlement expansion, energy production (for example from oil drilling) and mining and the construction of road and transport corridors.

Felling (Jean Louis Doucet)

Climate change is an emerging threat to timber species with habitat shifting and alteration as well as an increase in droughts, temperature extremes, storms and flooding being cited as impacts. This impacts 295 species (Figure 6). This could have some influence on other threats such as increasing fire and invasive or problematic species.

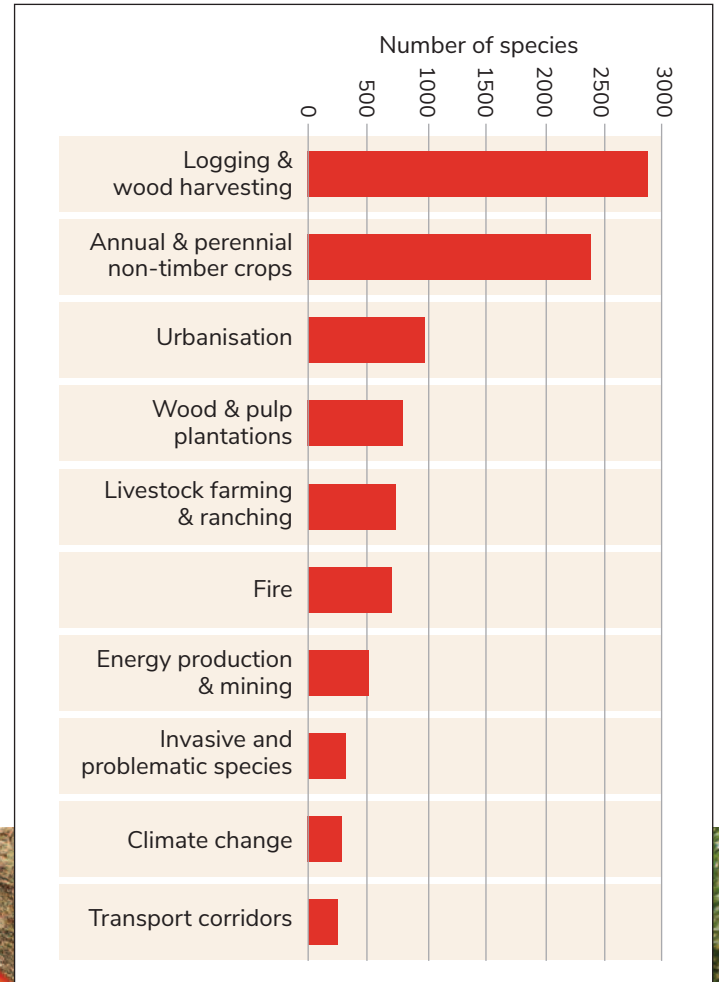


Figure 6. The ten most common threats recorded for timber species and the number of species recorded for each threat



Case Study: Assessments for Guibourtia trees in Central Africa

Megan Barstow
BGCI

Guibourtia demeusei, *G. pellegriniana* and *G. tessmannii* were assessed and published on the IUCN Red List for the first time in March 2021. These trees were listed in CITES Appendix II in 2017 and they are assessed on the IUCN Red List as Endangered (*G. pellegriniana* and *G. tessmannii*) and Near Threatened (*G. demeusei*). All three species produce a desirable rosewood timber commonly traded under the name Kévazingo or Bubinga. *Guibourtia pellegriniana* and *G. tessmannii* are distinct species but morphologically very similar and considered to produce a higher quality timber than *G. demeusei*. The two species are less common and widespread than *G. demeusei* in the wild and are suspected to have experienced a population decline of at least 50% within the last century. The rate of legal and illegal harvest of *G. pellegriniana* and *G. tessmannii* has increased since the mid 1980's, being driven by the high global demand for rosewood timber. *Guibourtia* are relevantly recent victims of this trade, and their harvest has risen as a result of declining global abundance and restriction of trade of other species of rosewood producing trees (such as species of *Dalbergia* and *Pterocarpus*). Although not as threatened as the other two species of *Guibourtia*, *G. demeusei* is now being more frequently harvested and occurring in international trade in larger volumes and consequently is assessed as Near Threatened. Conservation efforts need to be put in place now to prevent *G. demeusei* facing the same fate as *G. pellegriniana* and *G. tessmannii* and becoming more threatened by the illegal wildlife trade.



Guibourtia coleosperma (Peter Erb, CC BY-NC)

FSC certified logged forest, Cameroon
(JY De Vleeschouwer)



Ex situ and in situ conservation

Ex situ survey

An ex situ surveys allows us to assess the coverage of timber tree species within botanic gardens, arboreta and seed banks. Ex situ collections provide a vital back up to protect species from extinction. Using BGCI's PlantSearch database (2022), we analysed the presence of timber species in ex situ collections across the world. For this ex situ survey to inform conservation action, cultivar and hybrid records were excluded. Intraspecific records were also excluded. PlantSearch may not account for all timber tree species in ex situ collections, as some may be hosted in plantations and private collections not captured in this data set, however it is the best indicator of conservation collections available for timber trees.

Fifty-four percent of timber species (2,664 species) in this study are found in ex situ collections (Figure 7) with the majority of these being Least Concern species (1,785 species). Out of the 1,664 threatened species (CR, EN, VU), 64% are not found in an ex situ collection (Figure 7). Seventy-five percent of the 263



Juglans nigra (Paul Smith)

Critically Endangered species are not within an ex situ collection (Figure 7) and these should be priorities for targeting ex situ collection efforts.



Nursery of Pallisco, an FSC certified logging company in Cameroon (Jean Louis Doucet)



Gonystylus bancanus (Ismail Parlan)

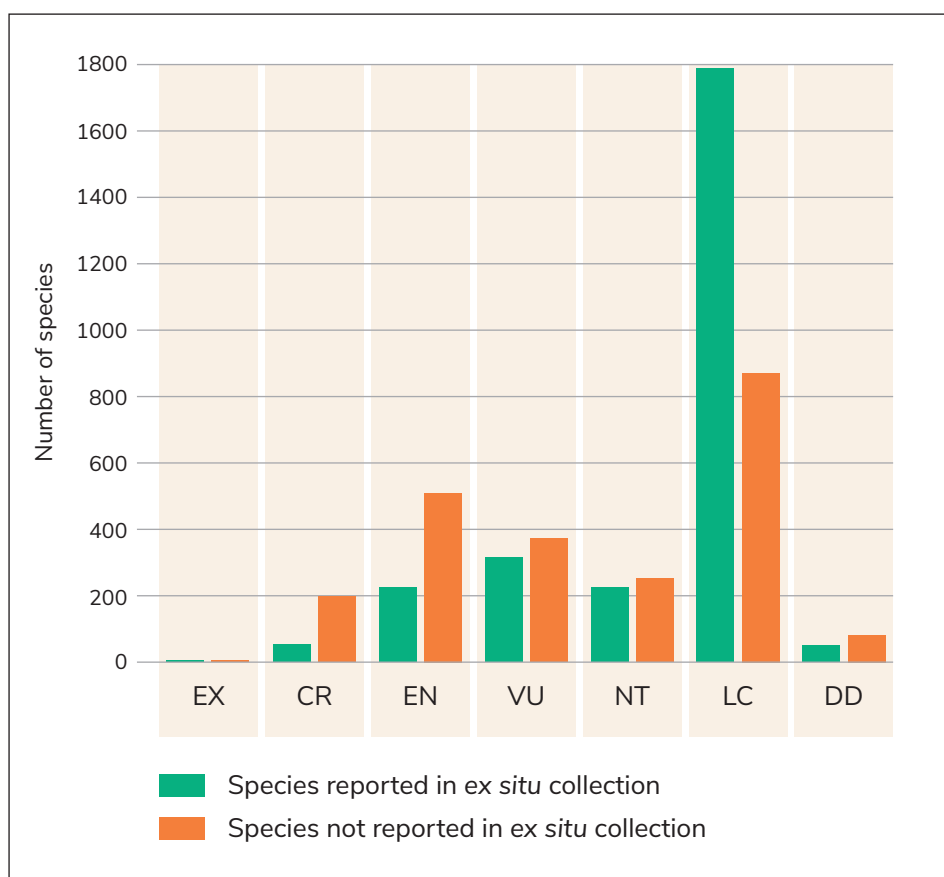


Figure 7. Presence and absence of timber species in ex situ collections per IUCN Red List Category

Case Study: Conservation nursery: A tool for *ex situ* conservation of tropical forest genetic resources in Indonesia

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A conservation nursery is one with the priority of conserving germplasm in a living collection of threatened, endemic, commercially valuable, and multi-purpose tree species. In Indonesia, conservation nurseries aim to provide and increase understanding of the use of Indonesian native tree species in various ecological restoration and protection activities. One such nursery is located in Bogor, West Java, Indonesia under the management of Ministry of Environment and Forestry. It has established itself as a 'centre of excellence' as a seedling source of Indonesian native trees. The nursery propagates around 5,000 planting stocks each year, most of which are publicly and freely available under special terms and conditions for various applicants. It has also transformed into multifunctional place for study, research, and internships for various stakeholders and produced a number of resources and publications (Rachmat et al. 2020, Susilowati et al. 2019, Siregar et al. 2019, Rachmat et al. 2018a).



Image 1 (Henti Hendalastuti Rachmat)



Image 2 (Henti Hendalastuti Rachmat)

The overall goal of the nursery is to collect forest tree genetic resources as widely as possible by collecting genetic material from Indonesian forests. Exploration is conducted (Image 1) to collect both generative and vegetative materials (i.e. seed, wildings) then sowed (Image 2), acclimatized (Image 3), and nursed (e.g. watering, weeding, fertilizing, and soil change) frequently in green houses and within the conservation nursery (Image 4) (Rachmat et al. 2015, Subiakto and Rachmat 2015, Subiakto et al. 2016, Rachmat et al. 2018a, Fambayun et al. 2019, Fambayun et al. 2020).

Case Study continued

Several species which are very low in collection numbers with no generative organ are prioritised to be multiplied by means of available technology of mass propagation of KOFFCO cutting technique (Rachmat et al. 2018ab). At present, the conservation nursery has more than 150,000 individuals consisting of 33 families, 71 genus, and 169 species. Around half of them are species from nine genera of dipterocarps, a major tropical timber, originated from fifteen provinces in Indonesia. Of the total collection, 66 of 169 species (39%) are assessed as Threatened on the IUCN Red List. Hence, the collection, conservation and artificial propagation of these trees within tropical forest trees play a vital role and support in *ex situ* conservation efforts and management of native tree genetic resources.

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Above: Image 3 and below Image 4
(Henti Hendalastuti Rachmat)

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In situ conservation

A protected area is ‘a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values’ (Dudley and Stolton 2008). Protected areas include national parks, wilderness areas, community conserved areas, nature reserves. To determine if a species is represented in a protected area, spatial data were downloaded from the IUCN Red List (IUCN 2022). This was combined with the World Database on Protected Areas (UNEP-WCMC and IUCN 2022) in ArcGIS to count which species occurred in protected areas. For species where no spatial data were available, the protected area information in the IUCN Red List assessment was used.

Sixty-five percent of timber species are found in at least one protected area. Sixteen percent are not recorded in protected areas and for 20% of timbers it is not known whether they occur in protected areas. Out of the 1,664 threatened timber species, 250 or 15% are not in protected areas and for 17% it is unknown (Figure 8). Twenty-seven percent (70 species) of the 263 Critically Endangered species are not found in protected areas and for 20% (52 species) the protected area status is not known (Figure 8).

Some species may be included in forest or wildlife management plans which offer sustainable use or limited use of the species or habitat, although this is not a formally designated protected area it may offer the species some protection. Future efforts should work towards gathering information on these protective measures for timber trees.



Fraxinus excelsior (Ian Harvey-Brown)



Swietenia humilis (CC BY-NC)

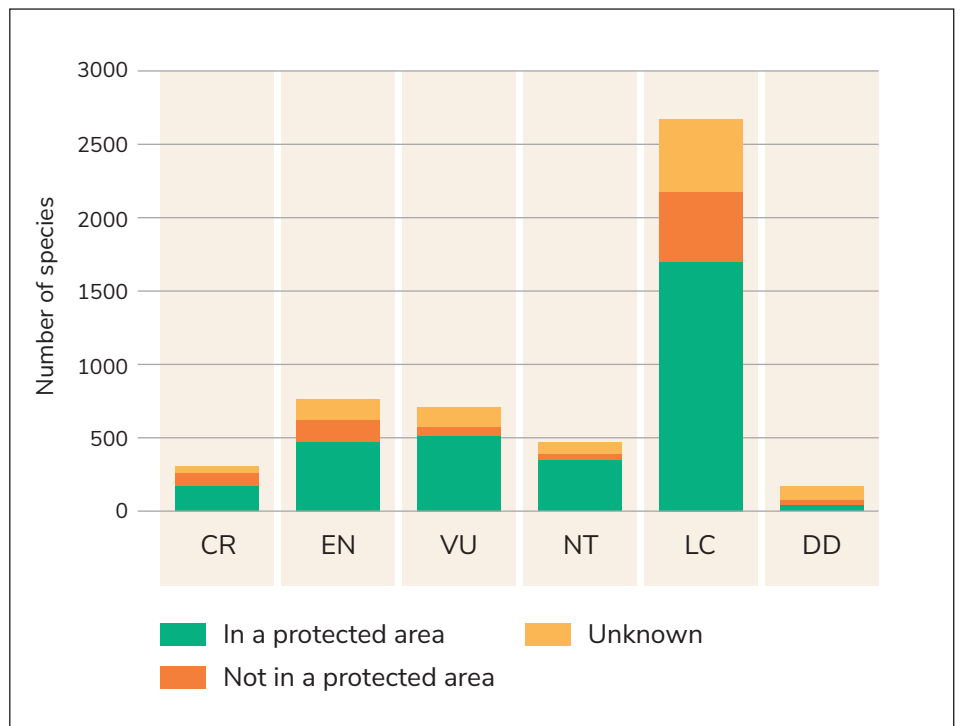


Figure 8. Presence and absence of timber species in protected areas per IUCN Red List Category

Case Study: National initiative to update the malagasy timber classification system

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The administrative classification scheme for Malagasy timber species currently in use was established in 1943. The scheme has become outdated and not adapted to reflect the current context of the state of Malagasy timbers. The categories within the scheme are no longer in agreement with the availability of timber species in the wild, several species listed in the categories are no longer on the market, and several species found on the market are not mentioned in the categories. Consequently, there is a need to update the categories.

Efforts to do this were initiated by the Ministry of Environment and Sustainable Development to improve the sustainable management of forest resources. This initiative follows the adoption of two decrees concerning timber exploitation standards and forest resource management standards in

Madagascar. This update is also necessary in order to fully utilise the various benefits offered by the international conventions and treaties that Madagascar has ratified. These include ITTA and CITES, the country is also a member of ITTO and has joined the FLEGT process (Forest law enforcement, governance and trade).

The new categorisation will allow each timber species to be valued according to its intrinsic properties. It will include species that are abundant on the current market and species that are interesting to promote. It will especially include those that are abundant in forests with interesting wood properties, but are not known to consumers, in order to constitute substitute species for those that are most exploited and to reduce the pressure on heavily exploited species. It will therefore allow the regulation of timber exploitation in Madagascar. It will be a working tool to enable better management, use and earning of Malagasy wood species in order to offer a wider range of products for local and international markets.



Squared timber, Moramanga, Madagascar (Andriambelo R. Razafimahatratra)

Conclusions and Recommendations

Pericopsis elata (Jean Louis Doucet)

The completion of the *The Red List of Timber Trees* has provided a baseline for understanding the global status of timber tree species. It has identified a high threat level among this group of tree species with 34% threatened with extinction. Exploitation for timber has been identified as the primary threat to timber species followed by habitat loss from agriculture.

With a high number of timber species identified as threatened in this report, conservation action is urgently needed to prevent their extinction. This report is evidence for the greater need of protection for timbers and improved enforcement of timber legislation at many levels, to save tree species. These actions can be supported at several levels and can be approached in a number of different ways depending on the focal species, timber trade issue, local community needs and aspects of the global supply chain.

Raise awareness

- Raise awareness of threatened timbers at all levels from consumers to governments. For example:
 - Make consumers more conscious of timber issues, particularly where the demand for threatened timber species is high but consumer awareness is low. This includes the encouragement of greater scrutiny of timber products on the market and more support for sustainably sourced timber e.g. Forest Stewardship Council.
 - Publicise information to governments to guide law, policy and governance decisions.

- Wider multi-level stakeholder engagement in decision-making regarding the wild timber supply chain, to ensure all relevant voices are heard and realistic goals are set.

Address threats

- Exploitation for timber is the most commonly recorded threat facing timber species. Sustainable timber practise is therefore necessary. Some possibilities for improving sustainable use include
 - Wider adoption of Reduced Impact Logging (RIL) and High Conservation Value Areas (HCVA) forest management programmes.
 - Deployment of more resources to fund the enforcement of timber legislation that is already in place.
 - Expanded use of international legislation such as CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and EU FLEGT (European Union's Forest Law Enforcement, Governance and Trade programme for timbers).
- Many timber species face multiple threats in addition to logging, including habitat loss from agriculture, urbanisation and mining, and climate change. These issues also need to be addressed to ensure the survival of threatened timber species and trees overall.

Improve timber data management

There is a lack of population data available for many timber species. Where species were assessed, decline information was based on forest loss statistics, or qualitative descriptions of species loss. The lack of population and trade data is a hindrance for pursuing conservation actions for timber species, as actions cannot be targeted to the greatest conservation need for the species. Improved data management and collection could rectify this. Some possible actions include:

- Improve transparency and availability of national and international timber trade data so it is available beyond governments and those working in the timber industry (e.g. for the public, conservation practitioners etc.). One example of this is World Forest ID as described in the adjacent case study.
- Implement methods of collecting data at a species level (instead of under a common name, or genus level).
- Improve funding to carry out and publish Non-Detriment Findings for CITES- listed timber species, with information on levels of timber stocks, production levels and permissible levels of trade.



Shorea flemmichii (Wilma Bodos)

Case Study: World Forest ID



Victor Deklerck

Royal Botanic Gardens Kew, UK

World Forest ID (www.worldforestid.org) is a non-profit organisation building the world's largest georeferenced library of tree and forest risk commodity samples. The Royal Botanic Gardens, Kew is the main curation centre for World Forest ID samples. Next to the physical sample collection, World Forest ID is creating an analytical database, currently based on wood anatomical analysis and mass spectrometry, which can be used to verify a product's identity and origin. As this reference library is still developing, World Forest ID needs to prioritise the tree species that are most at risk of entering the supply chain illegally and face high rates of deforestation. Collections are made by taking wood samples of prioritised species and World Forest ID is also in contact with international law enforcement officials to prioritise country and species collections. As such, World Forest ID began a database, called the Global Priority Wood Species List, to collect and organise species most at risk for illegal logging, unsustainable deforestation, and high rates of trade globally. Priority species must meet one or more of the following criteria to be added to the list: 1) illegal logging risk, 2) highly traded internationally, or 3) threatened by unsustainable harvesting. The following information is collected for each priority species: scientific name, common name, country of interest, country where the species is threatened, countries of natural distribution, countries with commercial plantation(s), CITES listing, IUCN Red List category, alternate scientific name(s), internationally traded (yes/no/banned), likely product form traded, and import countries. The IUCN Red List category is an important parameter to determine the importance of adding a tree species to the priority list. The priority list is curated by the World Resources Institute.

Take species specific conservation action

The majority of timber species are found within at least one protected area but this does not guarantee safety of these species. A variety of methods can be used to protect and conserve timber species including propagation, reinforcement planting and expanding ex situ and in situ conservation actions already in place. Examples of multi species action are given in the Case Study: Integrated Conservation of four threatened timber species in the Brazilian Atlantic Forest.

Some possible recommendations include:

- Introduce timber species into ecological restoration practises as appropriate for community and environmental benefits.
- Ensure that effective conservation occurs within protected areas and that the 15% of threatened species and 27% of Critically Endangered species not found within protected areas are prioritised to be encompassed into protected sites.
- Use the ex situ survey to prioritise species for collection efforts that are threatened and not within an ex situ collection.
- Involve local communities and indigenous leaders in species specific conservation action.
- Encourage governments to update protected species lists, and expand current timber trade legislation to include more threatened but unprotected species to halt the extraction of nationally or globally threatened species.

The Red List of Timbers provides evidence for the continued support of Sustainable Development Goal 15, which includes five targets calling to reduce pressure on terrestrial ecosystems and better manage timber resources. It also supports the Sustainable Development Goal target 12.2 for the sustainable management and use of natural resources.

We hope that this report will catalyse conservation action for an important group of species that are useful for people across the globe.



Upuna borneensis (CY Ling)



Gonystylus bancanus (Ismail Parlan)

Case Study: Integrated Conservation of four threatened timber species in the Brazilian Atlantic Forest

Noelia Alvarez de Román¹ and Tânia Rabello²
BGCI¹, Jardim Botânico Araribá²

Since 2019 Jardim Botânico Araribá, located near the city of Amparo, São Paulo, has carried out the integrated conservation of four threatened Atlantic Forest native tree species in collaboration with BGCI and supported by Fondation Franklinia.

The target species are *Cedrela fissilis*, *Chloroleucon tortum*, *Paubrasilia echinata* and *Zeyheria tuberculosa*. These native tree species have been intensely exploited over the years due to their wood quality and as such are assessed as threatened or Near Threatened.



Nursery of threatened tree seedlings ready to plant (Guaraci Diniz Jr)



Restoration planting of threatened trees in a Private Reserve of Natural Patrimony. (Guaraci Diniz Jr)



Conservation of four threatened tree species in the Brazilian Atlantic Forest (Guaraci Diniz Jr)

The iconic tree that gave its name to Brazil, the brazilwood or 'Pau-Brasil' (*Paubrasilia echinata*), is endemic to Brazil and assessed as Endangered because of the rampant exploitation that started more than 500 years ago. To avoid the extinction of this tree species, the Jardim Botânico Araribá is implementing integrated conservation actions such as the collection of propagules, the development of best-practice propagation protocols, the generation of a stock of genetically diverse seedlings in *ex situ* conservation collections and the *in situ* recovery of populations in the wild.

The project has planted more than 1,600 seedlings for the four tree species in nine Private Reserve of Natural Patrimony (RPPN) areas in the state of São Paulo. According to Brazilian legislation, these areas cannot be deforested, even if they were sold to new owners. These seedlings will serve as future mother plants for seed production to propagate the four target species. Another important component of the project is the development of propagation protocols for the four species. These include the best timing for seed collection, germination techniques to break dormancy, growing on and after care requirements.

Finally, community outreach workshops, attended by more than 1,200 school pupils from Amparo, highlighted the importance of these threatened species encouraging the local community to take an active role in conserving their fragile local habitat.

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Guibourtia coleosperma (Dewald du Plessis, CC BY-NC)



Acer sieboldianum (Philippe de Spoelberch)

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Appendix 1

Assessors, Contributors and Reviewers of IUCN Red List assessments for timber tree species

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Appendix 2

Number of species and threatened species per country

Country	Number of species	Number of threatened species
Afghanistan	34	2
Åland Islands	1	0
Albania	73	0
Algeria	49	3
American Samoa	29	2
Andorra	26	0
Angola	223	12
Anguilla	21	2
Antigua and Barbuda	34	2
Argentina	106	15
Armenia	48	1
Aruba	4	0
Australia	217	10
Austria	56	0
Azerbaijan	55	2
Bahamas	37	4
Bahrain	1	0
Bangladesh	119	12
Barbados	32	2
Belarus	29	0
Belgium	38	0
Belize	164	20
Benin	139	6
Bermuda	7	3
Bhutan	77	2
Bolivia, Plurinational State of	283	28
Bonaire, Sint Eustatius and Saba	28	3
Bosnia and Herzegovina	57	0
Botswana	56	0
Brazil	504	63
British Indian Ocean Territory	7	0
Brunei Darussalam	313	97
Bulgaria	69	1
Burkina Faso	87	6
Burundi	78	1
Cambodia	163	23
Cameroon	307	56
Canada	99	7
Cape Verde	6	0
Cayman Islands	31	3

Country	Number of species	Number of threatened species
Central African Republic	183	13
Chad	62	3
Chile	38	11
China	377	71
Christmas Island	13	0
Cocos (Keeling) Islands	8	0
Colombia	422	80
Comoros	39	3
Congo	227	32
Congo, The Democratic Republic of the	330	50
Cook Islands	18	0
Costa Rica	225	32
Côte d'Ivoire	233	35
Croatia	65	0
Cuba	87	10
Curaçao	15	1
Cyprus	19	1
Czechia	48	0
Denmark	27	0
Disputed Territory	2	0
Djibouti	19	1
Dominica	46	4
Dominican Republic	82	12
Ecuador	257	38
Egypt	22	1
El Salvador	133	27
Equatorial Guinea	149	13
Eritrea	41	2
Estonia	27	0
Eswatini	74	2
Ethiopia	92	5
Faroe Islands	2	0
Fiji	85	11
Finland	22	0
France	72	1
French Guiana	186	12
French Polynesia	17	1
French Southern Territories	3	0
Gabon	238	41

Country	Number of species	Number of threatened species
Gambia	61	3
Georgia	57	2
Germany	50	0
Ghana	213	29
Gibraltar	7	0
Greece	77	2
Greenland	2	0
Grenada	39	4
Guadeloupe	52	3
Guam	21	1
Guatemala	236	47
Guernsey	1	0
Guinea	180	21
Guinea-Bissau	86	7
Guyana	212	14
Haiti	95	28
Honduras	225	35
Hong Kong SAR, China	41	3
Hungary	49	0
Iceland	3	0
India	308	51
Indonesia	809	215
Iran, Islamic Republic of	56	4
Iraq	13	0
Ireland	24	0
Isle of Man	2	0
Israel	24	0
Italy	70	0
Jamaica	64	7
Japan	115	7
Jersey	1	0
Jordan	12	0
Kazakhstan	24	0
Kenya	188	22
Kiribati	14	0
Korea, Democratic People's Republic of	46	1
Korea, Republic of	56	2
Kyrgyzstan	18	0
Lao People's Democratic Republic	166	35
Latvia	27	0
Lebanon	26	1
Lesotho	9	1
Liberia	194	37
Libya	15	0
Liechtenstein	24	0
Lithuania	26	0
Luxembourg	27	0
Macao	1	0
Madagascar	618	285
Malawi	128	4

Country	Number of species	Number of threatened species
Malaysia	685	249
Maldives	17	0
Mali	70	4
Malta	14	0
Marshall Islands	12	0
Martinique	44	3
Mauritania	18	0
Mauritius	14	1
Mayotte	30	2
Mexico	482	122
Micronesia, Federated States of	33	2
Moldova	27	0
Monaco	8	0
Mongolia	23	0
Montenegro	61	0
Montserrat	35	3
Morocco	50	3
Mozambique	184	6
Myanmar	253	43
Namibia	56	0
Nauru	12	0
Nepal	100	3
Netherlands	31	0
New Caledonia	51	7
New Zealand	24	0
Nicaragua	196	18
Niger	37	3
Nigeria	265	33
Niue	22	2
Norfolk Island	3	0
North Macedonia	64	1
Northern Mariana Islands	25	1
Norway	26	0
Oman	14	1
Pakistan	69	4
Palau	36	2
Palestine, State of	13	0
Panama	207	23
Papua New Guinea	424	71
Paraguay	97	8
Peru	286	35
Philippines	585	309
Pitcairn	8	0
Poland	43	0
Portugal	57	2
Puerto Rico	58	6
Qatar	3	0
Réunion	10	0
Romania	57	0
Russian Federation	95	1
Rwanda	71	2

Country	Number of species	Number of threatened species
Saint Barthélemy	16	2
Saint Helena, Ascension and Tristan da Cunha	7	4
Saint Kitts and Nevis	29	2
Saint Lucia	49	5
Saint Martin	25	2
Saint Pierre and Miquelon	5	0
Saint Vincent and the Grenadines	45	2
Samoa	36	3
San Marino	2	0
Sao Tomé and Príncipe	44	2
Saudi Arabia	22	0
Senegal	103	6
Serbia	59	0
Seychelles	26	0
Sierra Leone	186	33
Singapore	157	28
Sint Maarten	10	1
Slovakia	43	0
Slovenia	59	0
Solomon Islands	146	16
Somalia	59	3
South Africa	118	4
South Africa	1	0
South Sudan	109	5
Spain	77	1
Sri Lanka	90	8
Sudan	66	5
Suriname	182	11
Svalbard and Jan Mayen	2	0
Sweden	30	0
Switzerland	49	0
Syrian Arab Republic	33	1

Country	Number of species	Number of threatened species
Taiwan, Province of China	79	11
Tajikistan	20	0
Tanzania, United Republic of	247	30
Thailand	316	65
Timor-Leste	85	3
Togo	116	5
Tokelau	7	0
Tonga	47	2
Trinidad and Tobago	76	4
Tunisia	29	0
Turkey	82	3
Turkmenistan	16	0
Turks and Caicos Islands	19	1
Tuvalu	17	0
Uganda	175	12
Ukraine	55	1
United Arab Emirates	3	0
United Kingdom	35	0
United States	252	41
United States Minor Outlying Islands	6	0
Uruguay	21	1
Uzbekistan	17	0
Vanuatu	64	5
Venezuela, Bolivarian Republic of	311	34
Viet Nam	290	58
Virgin Islands, British	33	3
Virgin Islands, U.S.	31	3
Wallis and Futuna	20	0
Western Sahara	4	0
Yemen	30	1
Zambia	138	3
Zimbabwe	133	3

Appendix 3

IUCN Red List category for each species

Can be found at <https://www.bgci.org/resources/bgci-tools-and-resources/the-red-list-of-timbers/>



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