Rio de Janeiro Botanical Garden Research Institute - JBRJ

National Centre for Flora Conservation - CNCFlora

Project:

"Conservation assessment of Brazilian tree species towards the Global Tree Assessment"
(REPORT 3/2018)

Following the project "Conservation Assessment of Brazilian tree species towards the Global Tree Assessment" we present here its main result: "Submission of 800 global IUCN Red List assessments of Brazilian trees".

Rio de Janeiro

December 2018

Summary

Appendix 1 - List of assessed species.

Appendix 2 - List of taxonomic specialists by number of genera and species of the 800 endemic tree species evaluated.

Appendix 3 - Endemics trees species assessed - vol I -VI.

Appendix 4 - Species maps (zipped).

Appendix 5 - List of species reviewed for BGCI and Kew by CNCFlora BR-RLA.

CNCFlora-BP-RLA/IUCN Team

Financed by BGCI/GTA

Eduardo Fernandez – assessor/analyst Red List - BGCI/GTA (partial)
Fernanda Wimmer – analyst - BGCI/GTA
Gláucia Crispim Ferreira – analyst GIS - BGCI/GTA (partial)
Marta Moraes – assessor/analyst Red List - BGCI/GTA
Marcio Verdi – analyst Red List - BGCI/GTA (partial)
Mary Luz Venegas León – analyst Red List - BGCI/GTA
Patrícia da Rosa – project manager/evaluator Red List - BGCI/GTA (partial)
Gustavo Martinelli – head CNCFlora

Members of other CNCFlora projects

André Eppinghaus – analyst TI
Mario Gomes – analyst Red List and expert taxonomist
Raquel Negrão – analyst Red List
Júlio Perota – project manager CNCFlora

Facilitators/Compilers/volunteers

Anna Letícia Espíndola de Oliveira – environmental engineering student
Ana Karoline Ramos Alves – engineering student
Bernardo Cavalcanti – environmental engineering student
Sérgio Braga Neto – environmental engineering student
Igor Abreu Marinho – geography student
Otávio Candeias – Junior Scientific Initiation JBRJ/CNPq
Luan Silva Rabelo Gomes – Junior Scientific Initiation JBRJ/CNPq

Experts taxonomist = 116 (Appendix 2).

1 - Introduction

Since the Convention on Biological Diversity (CDB), many countries are working with a great effort to assess the risk of species extinction in this age of profound environmental changes driven by human activities. The Global Strategy for Plant Conservation (GSPC) defined clear targets to be achieved by countries to prevent mass extinctions until 2020 (GSPC-CDB). The first challenge faced has been to define the list of known species and to assess their risk of extinction.

This approach has especially helped megadiverse countries, with thousands of endemic species and several threats to be mitigated in the remaining time. In Brazil, one the most megadiverse country in terms of the number of endemic plant species, the Brazilian Flora 2020 project is using a system, aiming to achieve Target 1 established for 2020 by the GSPC-CBD (BFG, 2018, 2015; Flora do Brasil 2020 under construction, 2018). Also, the Brazilian Flora 2020 project is part of the Reflora Programme and is integrated with the Brazilian Red List.

Among 46,675 species recognized for Brazil's flora, at least 33,100 are native terrestrial plants, including 53% recognized as endemic (BFG, 2015; Flora do Brasil 2020 under construction, 2018). However, habitat loss and fragmentation, mining activities, infrastructure development, overexploitation of species of economic interest, invasive species, and climate change represent the main set of threats faced by biodiversity across different Brazilian ecosystems (Martinelli and Moraes, 2013). Since the creation in 2008 of the Brazilian National Center for Flora Conservation – CNCFlora, 15,5% (5,646 species) of the Brazilian native species has been assessed (Martinelli and Moraes, 2013; Martinelli et al., 2014, 2018; Martins et al., 2018). Only 2,113 species were recognized in Brazilian Oficial Red List of Threatened plant species (MMA, 2014).

According with the countries progress's Global Tree Assessment (2018), Brazil has more tree species in comparison with any country. There are 9,031 species (GTA:Country Progress, 2018), representing a huge biomass or fixed carbon, including almost 4,000 endemic tree species (Flora do Brasil 2020 under construction, 2018) as a source of genetic diversity. However, just 22% was assessed, which means that still remains 6,841 species. In

this context, the Global Tree Assessment (GTA) program is more than important especially for megadiverse countries, helping with the species prioritization for risk assessments to achieve GSPC targets on time.

Following the GSPC challenges, the content included in this report represents the summary of 800 Brazilian endemic trees assessments of selected species, carried out through the partnership established between CNCFlora/JBRJ and BGCI. It cames along species' associated documentation, needed to perform risk assessments as supportive information, and its distribution maps. Also, results are shown in highlights about the general conservation status of endemic tree species, main threats and process' bottlenecks.

2 - Methods

2.1 - Occurrence database/Workflow

A list of all native and endemic Brazilian tree species with 800 species of 62 families (**Appendix 1**) was compiled using data available at the Rio de Janeiro Botanic Gardens Research Institute webpage and Brazilian Flora 2020 (JBRJ, 2018), as explained in the first report. Information on geographic distribution, biomes and vegetation types were also consulted as well as vouchers, images and papers, articles and books.

The occurrence records were downloaded from GBIF, REFLORA and SpeciesLink. A data cleaning work was later proceeded and duplicates were eliminated from downstream analyses, as well as those records with no information. For the 800 species, a total of 40,098 occurrence records were uploaded to CNCFlora information system. This open platform can be accessed at http://cncflora.jbrj.gov.br/portal. The species profile area, occurrence map and assessments module were available to the CNCFlora team of analysts, assessors, facilitators/compilers, coordinators and botanical specialists, usually taxonomists associated with the validation stage.

We used the recommendation of IUCN (2001) for taxonomic validation. After, we excluded 129 species which were initially considered targets of the project (89 species were excluded by specialists regarding its level of endemism, 22 species had taxonomic problems, 14 had no documented arboreal habit, and three were already listed in the species evaluated by Kew or BGCI). Excluded species were replaced by species on the spare list or those indicated by botanical specialists themselves. The indication of species by botanical experts

has been considered favorable to the evaluation of risk assessments, since it makes them more involved and committed in the next steps of the proposed workflow, such as taxonomy and occurrences validation, which requires specialist's time, and also attest for the robustness of the names and validity of additional informations used for extinction risk estimations.

To produce the species risk assessment comprising the 800 targeted Brazilian endemic trees, we consulted 116 botanic family/genus experts, which carried out strict names validation in face of available data (**Appendix 2**). These botanical specialists who also monograph Brazilian Flora 2020 were involved in the occurrences validation for the present extinction risk assessment process. This procedure is in accordance with CNCFlora's workflow (**Box 1**, see Machado et al., 2018 for more details on this procedure).

Box 1 - Data analysis and extinction risk assessment are performed through the CNCFlora's system (http://cncflora.jbrj.gov.br) according to the following workflow:

- **Data preprocessing**: consolidation of the list of endemic tree species, taxonomic validation based on Brazilian Flora 2020, georeferencing of species occurrence records available in the databases: GBIF, Reflora, Jabot, SpeciesLink;

- **Data analysis**: collation and inclusion of several information for each taxa, such as distribution, ecology, use, threats and conservation actions;

- **Data validation**: confirmation by botanical specialist of taxonomic data and occurrence;

- **Risk assessment**: follows the system of categories and criteria of IUCN (2001, 2012, 2017). After the CNCFlora analyst evaluation, the botanical specialist makes comments about the criteria and categories assigned for the species. The map for each species is elaborated and finally the Red List is sent to Ministry of Environment.

2.2 - Method of pre-selection of species with wide distribution

From the total of eight hundred species, 161 species presented over 100 up to more

than 800 occurrence records, which could render them a possible not threatened category. To avoid overloading the specialists with records validation, in these cases, a questionnaire was prepared to be answered by the specialists, for each species.

The Questionnaire presented the following questions: According to botanical specialist, the species: 1 - Presents use (timber, fruits, landscaping, etc)? 2 - Occurs in Conservation Units? 3 - Shows recent records, between 2010-2018? 4 - Is it a widely distributed species? 5 - Does it have a habitat range? 6 - Does it have habitat specificity? 7 - Presents quantitative data on population size? 8 - In relation to the frequency of individuals in the population (rare/occasional/frequent)? 9 - Are known incident threats to the populations?

All the 161 questionnaires were answered by the botanical specialists, sometimes we had to access substitute ones to get the answer in the short term of 15 days stipulated. All responses were analyzed and compared with Brazilian Flora 2020 (JBRJ, 2018) data and herbarium records. Thus, 144 species were evaluated by the workflow of non-threatened species. The remaining 17 species were considered by specialists as rare, restricted or ornamental, and therefore records should be individually reviewed to evaluate the conservation status of the natural population, excluding cultivated specimens. Finally, 656 species followed the normal workflow of the CNCFlora (**Box 1**).

2.3 - Appendix 3 - Presentation of profiles and assessments

The six volumes of **Appendix 3** present the profiles of the 800 endemic tree species assessed by CNCFlora. Each volume is organized in alphabetical order of botanic families. The category and criteria, rationale, distribution map, data analysis, EOO polygon and valid points clustered, threats and conservation actions compiled from several sources are presented. Here, we only exhibit the bibliographic references used in the rationale, the ones used for the data analysis will be available in the species profile at CNCFlora's website or can be accessed by login CNCFlora's information system.

2.4 - GIS and species distribution maps

Since one criterion for determining extinction risk is the evaluation of geographic distribution of each species sub-populations, and species occurrence records could represent the area they inhabit, the records were converted into polygons, the sizes of which varied in

accordance with their precision. The precision attributed to each pair of coordinates was defined according to the accuracy of spatial information and the origin of same (for more information consult: http://cncflora.jbrj.gov.br/portal/static/pdf/documentos/Metodologia_mapas_cncflora.pdf). In this way 8 classes were delineated: 0 to 250m, 250 to 1000m, 1 to 5km, 5 to 10km, 10 to 50 km, 50 to 100 km, centroid of a protected area and centroid of a municipality. For records with no geographic coordinates, but only information on the protected area or municipality where the species had previously been collected, the spatial information was associated to the locality of the collection and its radius defined by the very limits of the protected area or municipality. Subsequently the polygons referring to each species were superimposed and grouped, creating species' distribution maps.

For the potentially non-threatened species, it was used the methodology that introduced automatically the latitude and longitude coordinate pair of the municipality centroid, when the original coordinate was not provided by the collector, through script developed in software R. The maps were performed by points in the ArcGIS 10.2.2 for Desktop program and saved in jpg at 300 dpi (**Appendix 4**). Two species does not contain maps, *Marlierea acuminatissima* (O.Berg) D.Legrand and *Plinia coronata* (Mattos) Mattos, this because after the records validation, only the type collection remained valid. Then, it was issued 798 maps.

Geospatial analyzes were used to generate data on number of species in Conservation Units, number of species threatened by phytogeographical domain, as well as the number of threatened species compared with the number of species assessed in each Brazilian state.

3 - Results

3.1 - Risk assessment of Brazilian endemic trees

The CNCFlora carried out complete global conservation assessments for 800 endemic tree species, taxonomically and geographically validated by botanical experts, following a workflow, as highlighted in Methods above and in previous reports.

These trees are distributed among 62 botanic families and represented c. 20% of the total amount of trees assigned as endemics by the Flora do Brasil 2020 em construção (2018) (**Appendix 1, 3** and **4**).

All taxa herein presented had its available biological, ecological and spatial data collated and analysed by CNCFlora Red List team. At least 1623 papers, articles, books, digital databases (e.g. GBIF, CRIA SpeciesLink, Reflora Virtual Herbarium, JABOT, among others) and accesses in available vegetation monitoring trends platforms (e.g. PRODES, SOS Mata Atlântica, LAPIG) were used and cited in species' extinction risk assessments, providing the baseline knowledge and further sound evidences in which risk assessments relies. These resources disclosed information regarding species' taxonomy, distribution, ecology, reproduction, economic value, uses, incident threats, stress vectors and also ongoing conservation actions, as well as needed ones.

Over 65% (519) of tree species are found in just 10 families (**Figure 1**). The most species rich family within this assemblage of endemic trees is Fabaceae-Leguminosae, with 168 species, followed by Myrtaceae (69 spp.) and Annonaceae (54 spp.). The fact that Fabaceae-Leguminosae is the most diverse tree family is not surprising, given that it is the third most diverse plant family world-wide and it is placed among the first three most diverse plant families in Brazil. Fabaceae-Leguminosae represents crucial architectural elements of most Neotropical forests in order to keep ecosystems' plant diversity and structure. Myrtaceae, as the second most assessed family in this report, may reflects the fact that the family is almost entirely woody, and it is characteristic of highly diverse subtropical and tropical zones of most forested areas laying within Brazilian borders. Additionally, it is among the most important food resources for both human and animals, particularly within the Atlantic Rainforest.

Figure 1: The 10 most represented plant families assessed in the present report

Following prominent families addressed here are Chrysobalanaceae (37 spp.), Malvaceae (34 spp.), Vochysiaceae (33 spp.), Lauraceae (32 spp.), Melastomataceae (32 spp.), Euphorbiaceae (31 spp.) e Rubiaceae (29 spp.). These numbers are a glimm derivative from botanic experts level of engagement throughout the process, particularly, during taxonomic and specimens validation stages.

Our results indicates that out of 800 Brazilian endemic tree species assessed so far, 41 were considered Critically Endangered (CR), while 150 were classified as Endangered (EN), and another 62 as Vulnerable (VU). In total, 253 trees are placed within a given threat category. Among the not threatened categories, 34 species were categorized as Near Threatened (NT), and further five were categorized as Near Threatened, almost Vulnerable, a category adapted for national use by CNCFlora; 147 species, or 18%, were classified as Data Deficient (DD), as there are insufficient information for a proper assessment of conservation status to be made. Considering the above, almost 32% of the considered species list are placed under threat categories, meaning they are facing high risk of extinction. Finally, 361 trees (45%) trees defined as Least Concern (LC), once there were no identifiable stress vectors directly affecting species' persistence, considering the whole distribution, in the near future (**Figure 2**). Also South Africa, a megadiverse country which completed the risk

assessments for all plant biodiversity, showed a bigger percentage of LC species (SANBI, 2018).
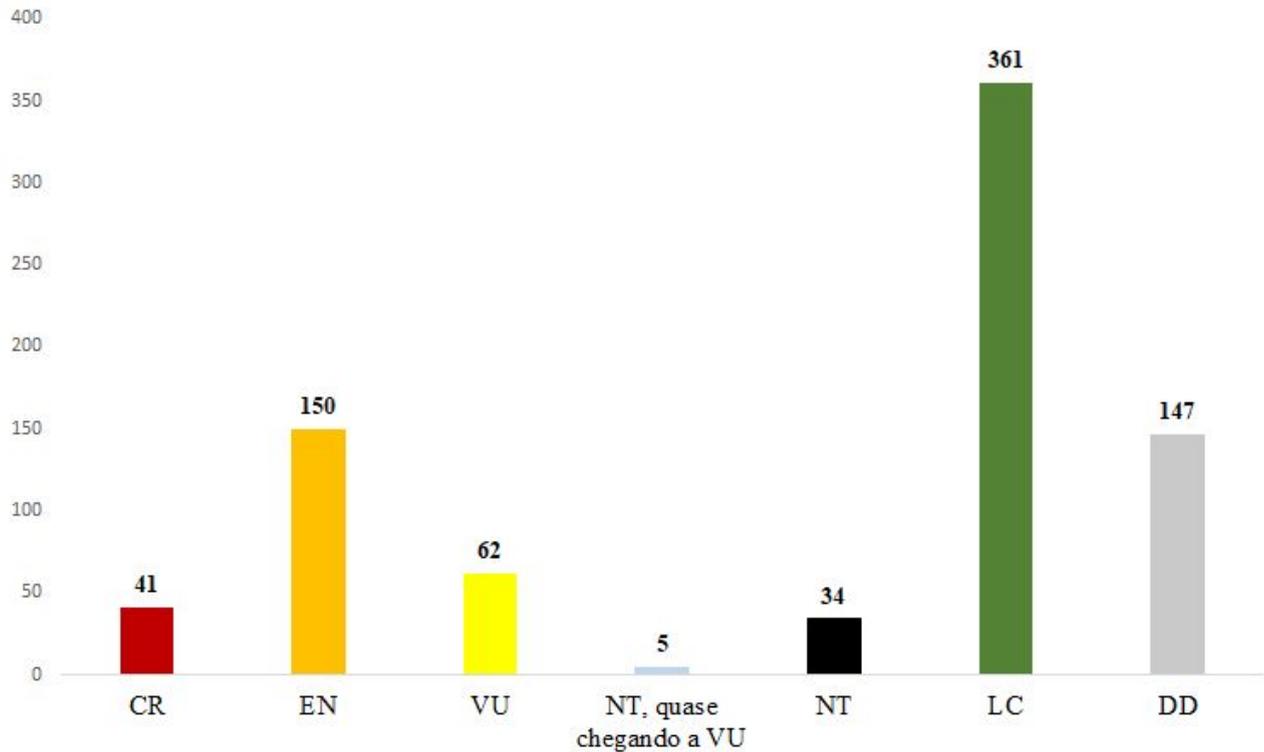

Figure 2: Conservation assessments of 800 Brazilian endemic trees and their respective IUCN category of risk: CR - Critically Endangered, EN - Endangered, VU - Vulnerable, NT, quase chegando a VU - Near Threatened almost reaching Vulnerable, NT - Near Threatened, LC - Least Concern and DD - Data Deficient. Figures above each column represent the total number of tree species assigned to each category.

Most species in this study were assessed applying Criterion B, which uses geographic range size and evidence of declining or fragmented populations (Gaston and Fuller, 2009). Criterion B is suitable for estimating conservation status even when data is limited and the distribution of a taxon is only known from a few georeferenced herbarium collections (Schatz, 2002). Considering Brazil, a country of continental proportions in South America, is expected Brazilian tree species (mostly from wet and dry forests) presenting a wide distribution considering the intrinsec adaptive and evolutionary processes (Prado and Gibbs, 1993; Pennington et al., 2000). Naturally it is reflected by higher percentages of LC species. For a few species, however, when appropriate data were available, criteria A, C or D were also applied. Specially tree species wide distributed but with use, mainly woody species were accessed by criteria A.

The present assemblage of assessments encompassess tree species distributed throughout all 26 Brazilian states and the Federal District (**Figure 3**), where the capital city of Brazil, Brasília, is located. Evaluated taxa in this report are spread among five out of six biomes present in the country - Amazon Rainforest, Atlantic Rainforest, the Central Brazilian Savanna, also known as Cerrado, Caatinga and Pantanal - with exception to the predominantly grassy, tree-scattered Pampa, which lies within the South Temperate Zone in the southernmost of Brazil's states, Rio Grande do Sul. As expected, many species occur in ecotones and transition zones between distinct vegetation types, and in some forests inside the Pampa a few occurrence records may be present.
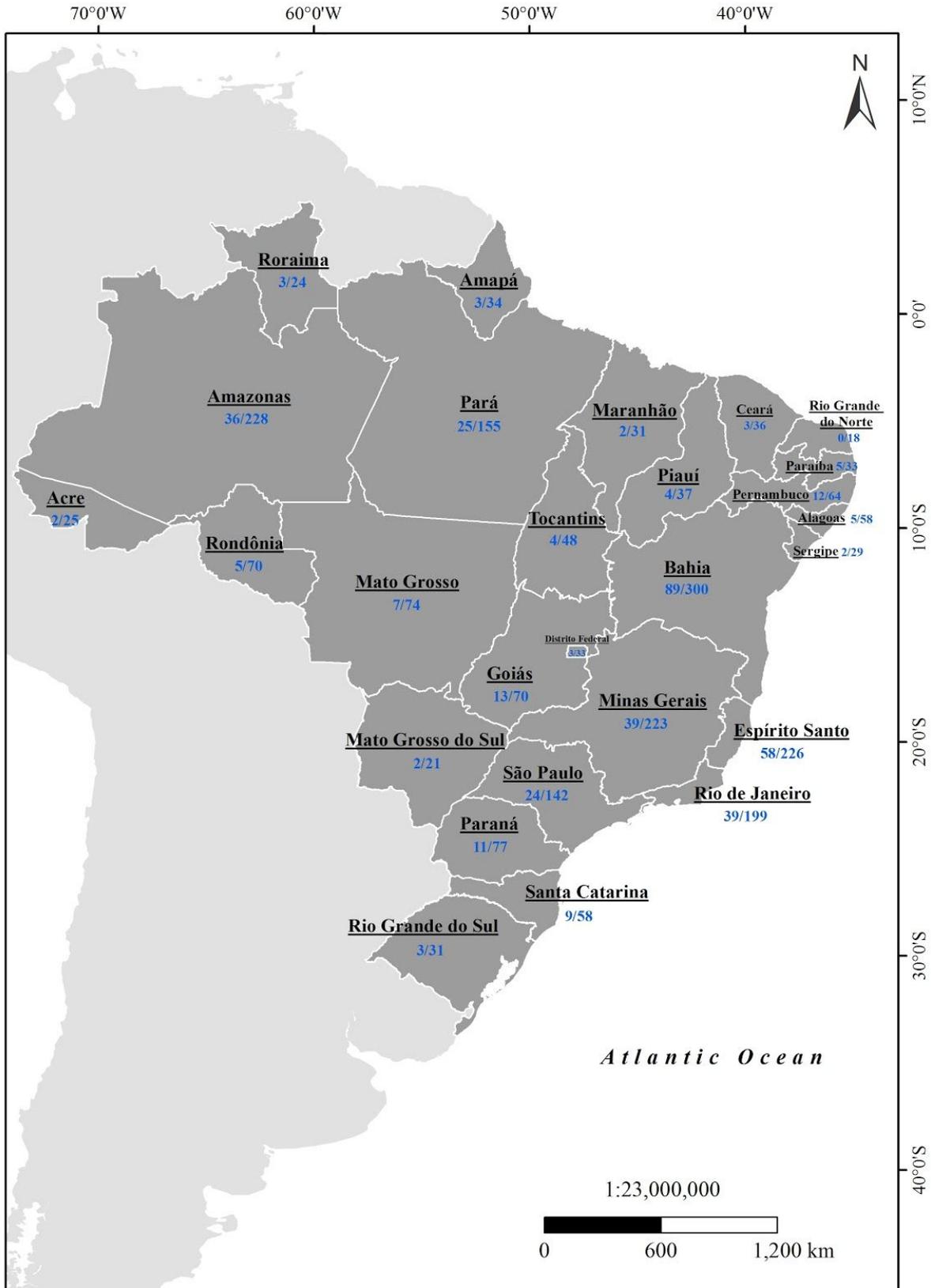
Figure 3: Number of threatened species followed by the number of species assessed with extinction risk assessment, respectively, across all states in Brazil

As displayed in **Figure 4**, the majority of species assessed occurs within the boundaries of the Atlantic Rainforest biome (46%), followed by the Amazon Rainforest (32%), the Central Brazilian Savanna (14%), Caatinga (8%) and finally, Pantanal (less than 1%). Although most species were recorded from a single biome, many occurs in more than one and some generalist plants can even occupy multiple domains and forest ecosystems.
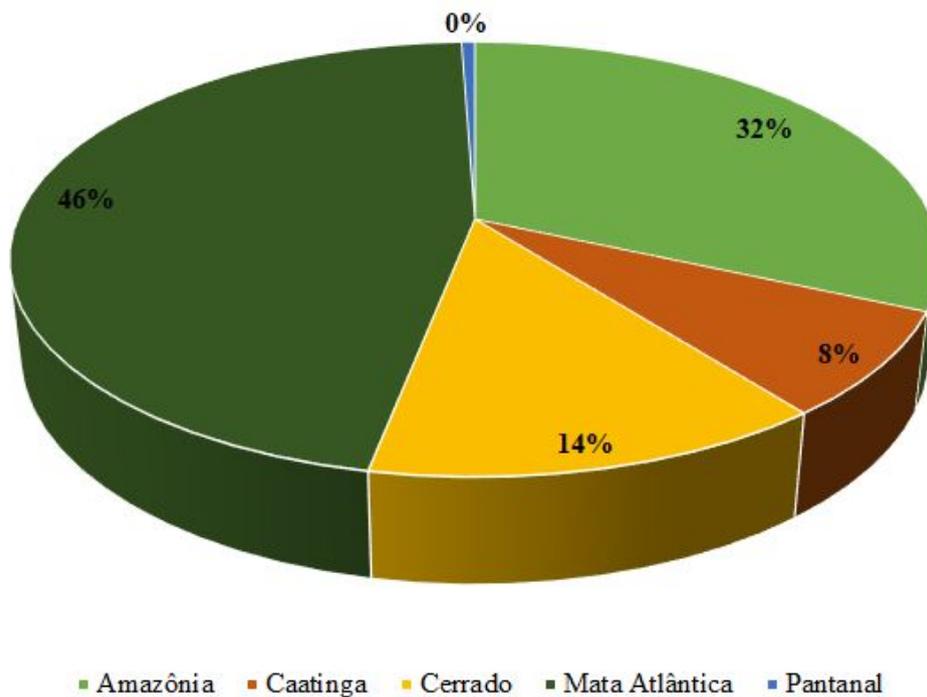

Figure 4: Proportion of endemic trees assessed per biomes.

Below (**Figure 5**) it is illustrated the number of threatened plant species followed by the number of species with extinction risk assessment conducted so far across all biomes in Brazil. The Atlantic Rainforest houses more threatened species in absolute values than any other biomes, with 173 tree species placed among threatened categories. The Amazon houses 56 threatened trees while the Cerrado presents additional 38 tree species threatened with extinction.
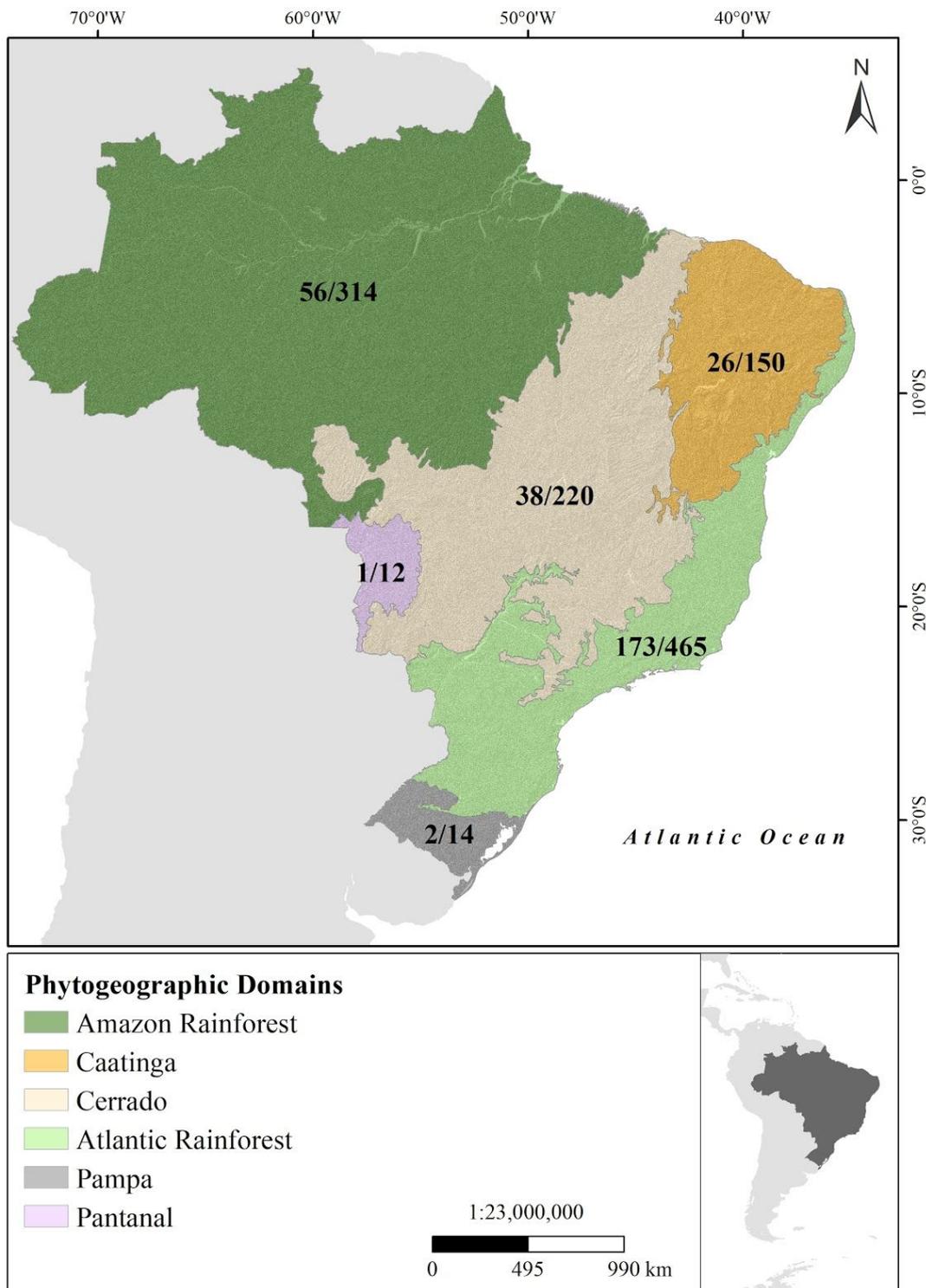
Figure 5: Number of threatened plant species followed by the number of species with extinction risk assessment, respectively, across all biomes in Brazil (according to official data of Brazilian biomes provided by Ministry of the Environment - http://mapas.mma.gov.br/i3geo/datadownload.htm).

Following the Habitats Classification Scheme (Version 3.1) prompt by IUCN, species considered in the present report were predominantly present in forest (83%), followed by species which occurs in savanna-like vegetation types (14%) with tree density varying across the landscape, usually associated with the Cerrado Hotspot. The remaining species (3%) were mostly documented occuring in shrubland, grasslands and wetlands and even in deeply human-modified ecosystems, such as pastureland and heavily degraded former forests (**Figure 6**).
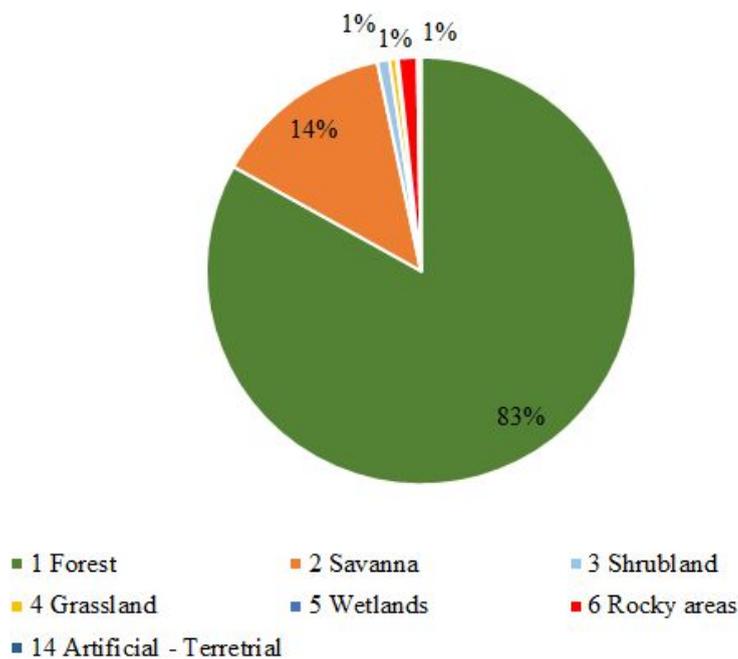

Figure 6: Proportion of endemic trees assessed according to the Habitats Classification Scheme IUCN (Version 3.1).

A total of 3,135 incident threats have been uploaded to our system and then later associated with species' occurrences and geographic scope. The most widespread threat for these endemic tree species are certainly activities related with Agriculture & Aquaculture (1104 insertions; **Figure 7**), such as livestock farming and ranching (405 insertions), the establishment of annual and perennial non-timber crops (242 insertions), wood and pulp plantations (97 insertions), and activities from the agro-industry farming industry (21 insertions).

Biological resource use, mostly due to logging and wood harvesting activities, is responsible for 665 (22%) incident threats. This is of particular importance for timber trees, as

they are often regarded as valuable forest resources and are frequently explored legally and illegally in many areas and, unfortunately, even inside protected areas.

Residential and commercial development also poses great threats towards tree species conservation in Brazil, and represents 478 incident threats, manly due to housing and urban areas expansion (98 insertions), what rapidly converts considerable tracts of natural ecosystems into bare ground, and also the establishment and expansion of tourism and recreation areas.

Energy production and mining are responsible together for 269 (11%) of inserted threats, frequently degrading habitats until they virtually disappears or sometimes severely polluting surrounding ecosystems, water streams and even entire river basins, directly affecting biodiversity persistence.

Transportation and service corridors also directly impacts ecosystems stability by fragmenting them and opening ways towards impenetrable areas of natural ecosystems. For the 800 endemic trees highlighted in this report, 205 (11%) incident threats related to this activities. Natural system modification, such as fire, fire suppression and increased fire regimes, and the construction of large dams represents major threats to tree species biodiversity, as they profoundly modifies ecosystems and promote tree mortality in most of the cases. Here we estimated 367 (12%) incident threats insertions for the considered trees.
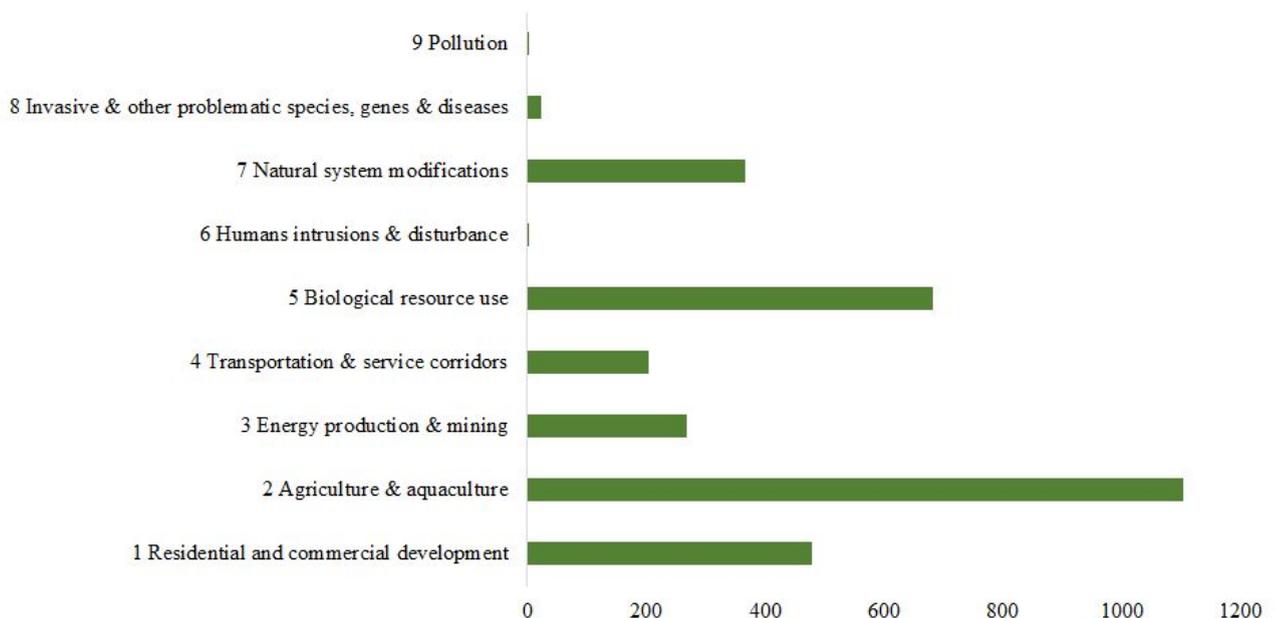

Figure 7: Categories of major incident threats documented upon 800 Brazilian endemic trees

Data about the known uses of each species were gathered from a wide range of literature sources, specimens labels and information provided directly by experts or locals whom plant usage knowledge regarding a particular plant species is undebatable. Out of the 800 species, 655 do present any documented use, which by no means mean they are not used at all; 145 with documented uses, which 94 possesses one use type, 51 with more than one use, 41 with two uses, seven with tree uses, on with four uses and two with five uses.

By far, the most assigned use category for the foci trees are related with selective logging and use of timber for overall constructions, particularly for housegoods and structural materials and as fuel and food (**Figure 8**). It is worth to mention a few examples, such as species from the genus *Peltogyne* spp. (Fabaceae-Leguminosae), widely used for its ornamental and very hard and of good quality wood, and *Theobroma grandiflorum* (Willd. ex Spreng.) K.Schum. (Malvaceae), vernacularly known as Cupuaçu and widely used as food and medicine across the Amazon basin.

- 1. Food - human
- 2. Food - animal
- 3. Medicine - human and veterinary
- 6. Other chemicals
- 7. Fuel
- 8. Fibre
- 9. Construction/structural materials
- 10. Wearing apparel, accessories
- 11. Other household goods
- 12. Handicrafts, jewellery, decorations, curios, etc.
- 13. Pets/display animals, horticulture
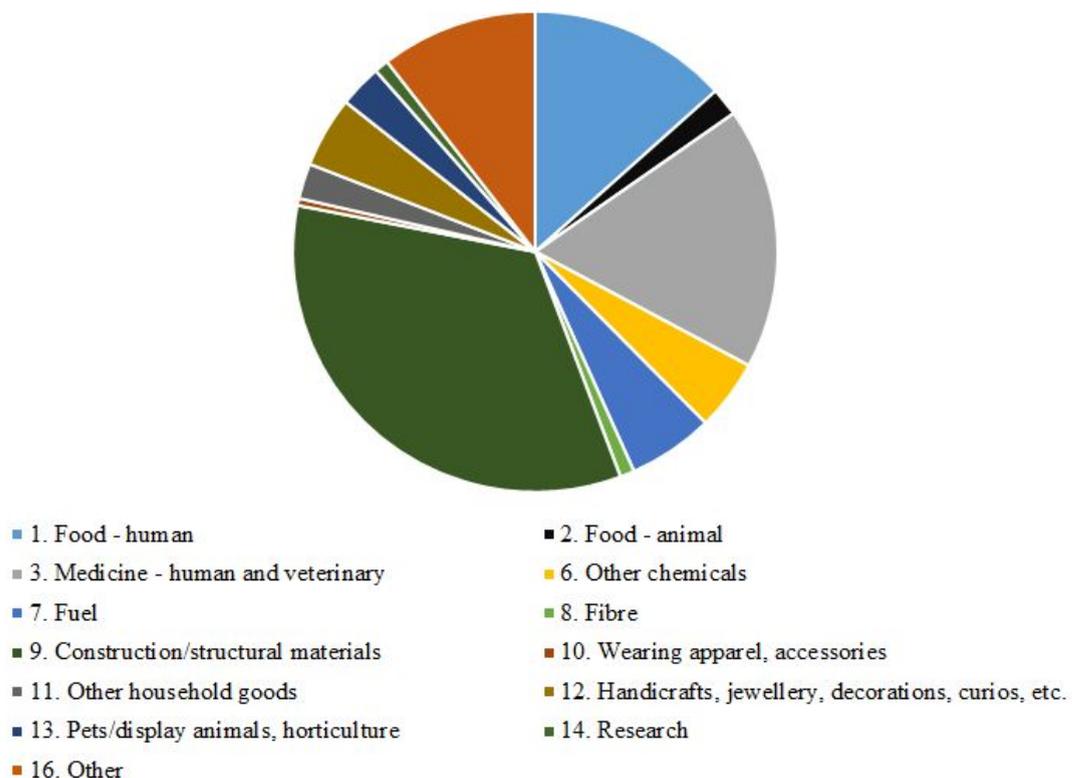- 14. Research
- 16. Other

Figure 8: Main uses attributed to the 800 endemic trees.

In Brazil, the National Protected Areas System (SNUC) is the legal tool which defines and regulates protected area categories at federal, state, and municipal levels, dividing them into two types: strictly protected, with biodiversity conservation as the principal objective, and sustainable use areas, allowing for varying forms of use or extraction, with biodiversity protection as a secondary objective (MMA, 2000). Protected areas are definitely among the most comprehensive *in situ* conservation strategies. However, lack in spatial planning and profound knowledge gaps across the country represents major bottlenecks in order to effectively protect species within protected areas boundaries, and therefore, prevent biodiversity losses. As evidenced below (**Figure 9**), the national protected areas systems overlaps consistently with occurence points of endemic trees. For instance, 307 tree species which are considered by the present work as threatened have occurrence records either in protected areas of strict protection or inside the limits of protected areas with sustainable use.
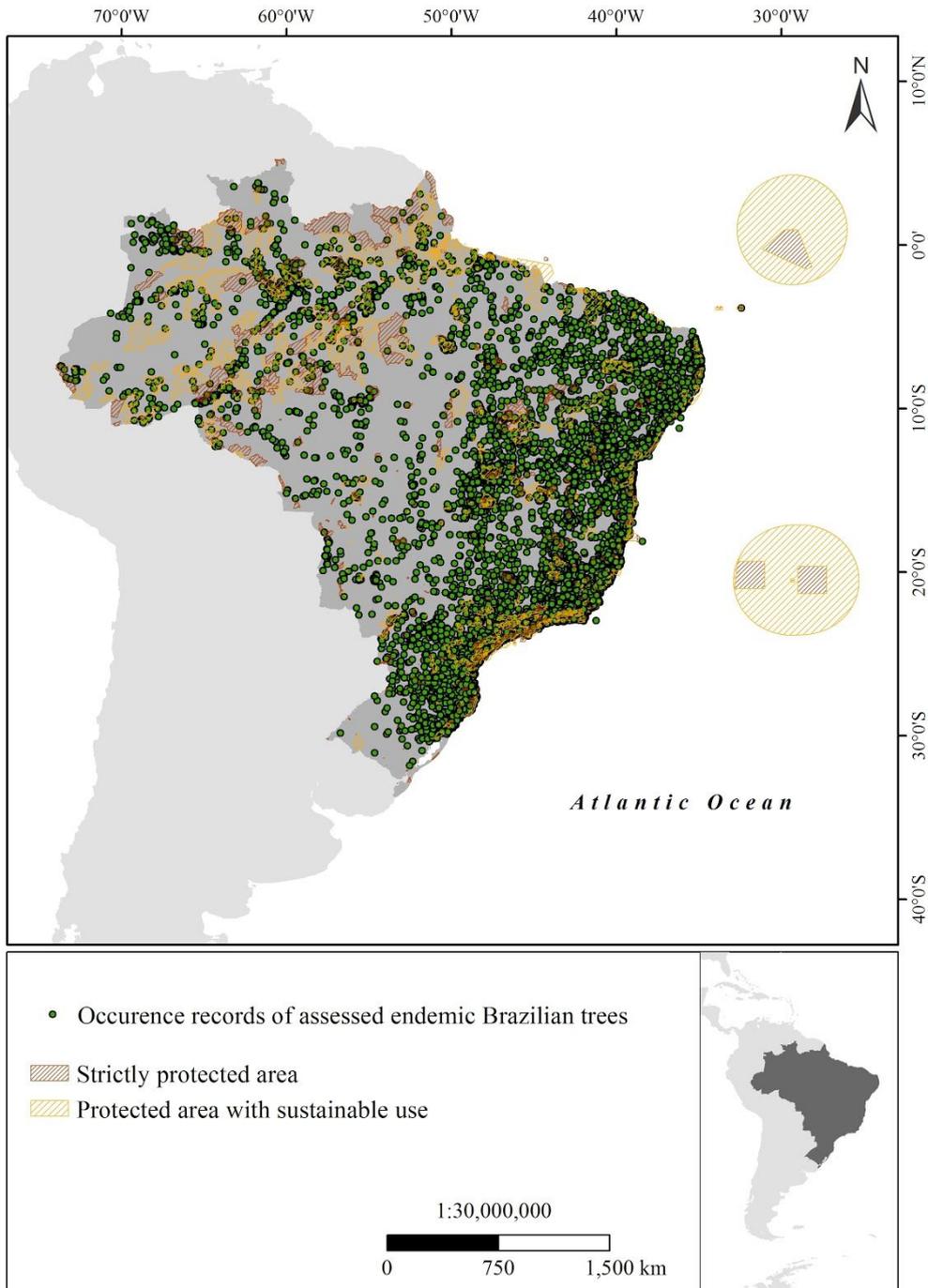
Figure 9: Occurrence records of 800 assessed endemics Brazilian trees in protected area (Protected areas shapefile available from Ministry of the Environment - http://mapas.mma.gov.br/i3geo/datadownload.htm; state/national boundary shapefile provided by IBGE - Brazilian Institute of Geography and Statistics).

3.2 - Review of 102 assessment of Brazilian endemic trees for BGCI and Kew

Following preliminary agreements, CNCFlora also reviewed 102 extinction risk assessments as the Brazilian Red List Authority, as recognized by IUCN. From the beginning of the project until the present, the outcomes of this joint initiative are shown in **Appendix 5**.

4 - Conclusions

Brazil's status as a megadiverse country confers a major global responsibility towards nature protection. As trees do not represent single phylogenetic grouping mostly because they span evolutionary distinct lineages across the plant kingdom (see Groover, 2005), it is challenging to draw any concrete conclusions and plausible comparisons from the present report.

However, this report is the first of its kind to exclusively evaluate the extinction risk of Brazilian endemic trees. It adds 800 global extinction risk assessments to the ever-growing list of tree species which GTA-BGCI and partners are targeting to complete their full global extinction risk assessments by 2020.

A major step in biodiversity conservation lean upon widening our understanding of incident threats and the extinction risk many species may face. Threats to native tree species are not homogenous across a country like Brazil, and analyses of multiple factors are required as the country is gifted with a large range of habitats, social settings, numerous issues and stakeholders to consider before direct action can be made. When ecosystems and specific tree species are faced with human-induced threats, it is essential to identify the reasons why societies resort to unsustainable exploitation. Without tackling the drivers of decline of a tree species, it is likely that it will face further problems in the future. The drivers for the threats, as well as uses of plant resources demanded by traders from both national and international markets and also by local communities, will direct influence which approach or combination of different methods would be most successful in conserving the area's target trees and fully restoring their habitats in the mid-long term.

Data availability is an important factor in achieving precision and robustness in extinction risk assessments initiatives, and it was no different while CNCFlora/JBRJ

developed this work. Brazil have an electronic online flora developed in response to the Global Strategy for Plant Conservation Target 1, "An online flora of all known plants (Sharrock, Oldfield, & Wilson, 2014)", and open access to the vast network of botanists and plant experts builded to complete Target 1 on time was a fundamental tool in this process. Mapping species is also an important step in assessing their conservation status, and also an activity essential to ensure effective conservation practices and management of tree diversity in Brazil. Understanding species' spatiality is a paramount tool to summarize the overall state of knowledge of a given plant and for mapping out strategies and stakeholders aiming to address ongoing biodiversity loss.

Knowledge on Brazilian plant biodiversity improved substantially during the last decade, and we believe that it is only through a good understanding of our biodiversity that we will be able to ensure adequate practices and sustainable development in the country, which will result in concrete preservation and sustainable development.

Brazil still facing an unbalanced challenge against poverty, as it pushes communities towards unsustainable levels of harvesting and encourage conversion of forest to agriculture and the overexploitation of timber resources for income generation. Although widely acknowledged, the importance of engaging local communities from the outset of a new conservation endeavour is still often overlooked and will be an essential bottleneck to be overcome. Brazilian environmental law and its applicability should also be strengthen, as the country's natural aptitude is to explore its natural resources in many irresponsible and unsustainable ways.

Momentum was created, and it is primordial to expand resources designated to foster the achievement of internationally agreed targets and therefore slow down the pace of biodiversity losses which Brazil, as many other megadiverse countries across the globe, are already experiencing.

5 - Final considerations

This project developed in the Global Tree Assessment program background represented strong support for Brazilian Red listing. Firstly, the project supported species' prioritization process, defined a new set of species for assessment and gave a good direction in the national scale on the GSPC scope. Second, the advances in the publication and

maintenance of digital databases were important for the realization of the current project, supporting nomenclature and distribution information updates for the set of assessed species. Also the financial support was decisive to keep a minimum of human resources working exclusively in the project, amid investment cuts in science and environmental policy applied by the Brazilian government (Fernandes et al., 2017). From this support, CNCFlora/JBRJ was able to evaluate the 800 species of endemic trees in Brazil in time, in addition to reviewing 102 assessments issued by assessments groups such as BGCI and research groups such as Myrtaceae from Kew.

In order to reach the project objective, it was necessary to over-effort the members of the CNCFlora team and the displacement of professionals from other projects and the selection of volunteers. Even so, in the last two months more work hours (arriving at 12 hours a day) were required to reach the goal. This has led to delays in other tasks of other projects, agreed and developed by CNCFlora.

5.1 - Challenges

- To evaluate the extinction risk of 9,000 trees which occurs in Brazil;
- Improve the quality of data available through collection records and its associated information;
- Improve the use of Rapid Assessment techniques in order to prioritize species to be assessed and scale up;
- Increase engagement of specialists.

5.2 - Perspectives

- Review 694 potential LC species until 12/01/2019;
- Submit full global conservation assessments to IUCN at the 2nd opening window in April 2019;
- Organize and make public the data through JBRJ and GTA data portals;
- Submit for publication the work's main outcomes in a peer-review journal until April, 2019;
- To continue assessing the extinction risk of Brazilian trees in the ongoing partnership set with BGCI and GTA program.

6 - References

BFG - The Brazil Flora Group, 2015. Growing knowledge: an overview of seed plant diversity in Brazil. Rodriguésia 66: 1085-1113.

BFG, 2018. Brazilian Flora 2020: Innovation and collaboration to meet Target 1 of the Global Strategy for Plant Conservation (GSPC). Rodriguésia 69, 1513–1527.

Fernandes GW et al., 2017. Dismantling Brazil's science threatens global biodiversity heritage. Perspectives in Ecology and Conservation 15: 239–243. doi:10.1016/j.pecon.2017.07.004

Flora do Brasil 2020 under construction, 2018. Jardim Botânico do Rio de Janeiro. http://floradobrasil.jbrj.gov.br/. (accessed 20 July 2018).

Gaston and Fuller, 2009 K.J. Gaston, R.A. Fuller The sizes of species' geographic ranges J. Appl. Ecol., 46 (2009), pp. 1-9

GBIF, 2017. GBIF Backbone Taxonomy. Glob. Biodivers. Inf. Facil. http//www. gbif. org/. (accessed 15 March 2018).

Groover, A.T. 2005. What genes make a tree a tree? Trends in Plant Science 10: 210–214.

Global Tree Assessment: Country Progress, 2018. http://www.globaltreeassessment.org/countryprogress/ (accessed 18 December 2018).

IUCN, 2017. The IUCN Red List of Threatened Species. Version 2016-3. www.iucnredlist.org. (accessed 27 July 2017).

IUCN, 2012. IUCN – CMP Unified Classification of Direct Threats: Version 3.2. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. http://www.iucnredlist.org/. (accessed 03 October 2017).

IUCN, 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. http://www.iucnredlist.org/. (accessed 03 October 2017).

JABOT, 2018. Banco de Dados da Flora Brasileira (Jabot, Jardim Botânico do Rio de Janeiro) http://jabot.brj.gov.br. (accessed 20 July 2018).

LAPIG, 2018. Laboratório de Processamento de Imagens e Geoprocessamento. http://maps.lapig.iesa.ufg.br/lapig.html. (accessed 27 July 2018).

Machado, N., Negrão, R., Martins, E., Loyola, R., Amaro, R., Moraes, M., Rosa, P. da, Baez, C., Moraes, L., Costa, M.L., Wimmer, F., Margon, H., Dalcin, E., Martinelli, G., 2018. Espécies ameaçadas da flora endêmica do estado do Rio de Janeiro, in: Martinelli, G., Martins, E., Moraes, M., Loyola, R., Amaro, R., 2018. Livro Vermelho da Flora Endêmica do Estado do Rio de Janeiro. Jardim Botânico do Rio de Janeiro, Secretaria do Estado do Ambiente. Andrea Jakobsson Estúdio, Rio de Janeiro, pp. 42-96.

Martinelli G. & Moraes M.A., 2013. Red Book of Brazilian Flora. Rio de Janeiro Botanical Garden Research Institute, Rio de Janeiro. 1100p.

Martinelli G., Messina T., Filho L.S., 2014. Red Book of Brazilian Flora: Cerrado Rare Plants. Andrea Jakobsson studio, Rio de Janeiro Botanical Garden Research Institute, Rio de Janeiro. 320p.

Martinelli G., Martins E., Moraes M., Loyola R., Amaro R., 2018. Red Book of the Endemic Flora of the state of Rio de Janeiro. Andrea Jakobsson studio, Rio de Janeiro Botanical Garden Research Institute, Rio de Janeiro. 456p.

Martins, E., Martinelli, G., Loyola, R., 2018. Brazilian efforts towards achieving a comprehensive extinction risk assessment for its known flora. Rodriguésia, 69(4), 1529-1537. https://dx.doi.org/10.1590/2175-7860201869403

MMA., 2014. Portaria nº 443, de 17 de dezembro de 2014. Available at <http://www.mma.gov.br/biodiversidade/especies-ameacadas-de-extincao/atualizacao-das-listas-de-especies-ameacadas (accessed 18 December 2018).

MMA, 2000. SNUC - Sistema Nacional de Unidades de Conservacao). MMA, SNUC, Bras´ılia (in Portuguese). Available from http://www.mma.gov.br/port/sbf/dap/ doc/snuc.pdf

Pennington RT, Prado DA, Pendry C. 2000. Neotropical seasonally dry forests and Pleistocene vegetation changes. J. Biogeogr. 27:261–73

Prado, D.E., Gibbs. P. 1993. Patterns of species distributions in the dry seasonal forests of South America.

PRODES/INPE, 2018. Incremento anual de área desmatada na Amazônia Legal Brasileira para os últimos 5 anos. INPE/OBT/DPI/TerraBrasilis. http://www.obt.inpe.br/prodes/dashboard/prodes-increase.html (accessed 3 July 2018).

Reflora - Herbário Virtual. http://reflora.jbrj.gov.br/reflora/herbarioVirtual/. (accessed 24 July 2018).

SANBI - South Africa National Biodiversity Institute. 2018. Red List of South African Plants - Red List Statistics. http://redlist.sanbi.org/stats.php (accessed 20 December 2018).

Schatz, G.E. 2002. Taxonomy and herbaria in service of plant conservation: lessons from Madagascar's endemic families. Annals of the Missouri Botanical Garden 89: 145-152.

Sharrock, S., Oldfield, S., & Wilson, O. 2014. Plant Conservation Report 2014: A review of progress in implementation of the Global Strategy for Plant Conservation 2011–2020. In

Secretariat of the Convention on Biological Diversity, Montréal, Canada and Botanic Gardens Conservation International, Richmond, UK. Technical Series Vol. 81, p. 56.

SOS MATA ATLÂNTICA, INPE, 2011. Atlas dos Remanescentes Florestais da Mata Atlântica, Período 2008-2010, São Paulo.

SpeciesLink (Centro de Referência em Informação Ambiental – Cria), 2018. http://splink.cria.org.br/. (accessed 27 July 2017).