Regional Workshop

Distributions and biology of Asian tree species: Translating research results into conservation plans

Beijing, China 21st-23rd October 2019

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Background

Developing effective conservation and restoration strategies for Asia's thousands of tree species requires up-to-date knowledge on the species' distributions and the threats they are facing. The regional initiative *APFORGIS: Establishing an Information System for conserving native tree species and their genetic resources in Asia-Pacific* (2017-2019) was designed to help address these knowledge gaps.

Based on information gathered from more than 40 organisations and individuals, the initiative has developed regional distribution and threat maps for 65 pilot tree species, and conservation planning approaches that can be applied also to other species of importance. The maps will help decision-makers and conservation and restoration practitioners to:

- identify species richness hotspots for priority species, to optimise conservation efforts
- assess how well the current protected area networks conserve species' adaptive traits
- identify areas where species populations may be most threatened by climate change
- identify seed transfer zones and adequacy of existing seed sources for tree planting and forest restoration
- plan field studies on genetic diversity and provenance trials that are representative of the species' range and the variation in environmental conditions

APFORGIS was implemented from December 2017 to November 2019. It contributes to the Regional Strategy 2018-2022 of the Asia Pacific Forest Genetic Resources Programme APFORGEN (www.apforgen.org), and the Global Plan of Action on the World's Forest Genetic Resources (FAO 2014). It is implemented by Bioversity International and APFORGEN, and funded by the Government of the Federal Republic of Germany.

This report summarizes the discussions and results of the project's final workshop, held in Beijing, China, 21-23 October. The workshop brought together 28 experts from 14 countries and international organizations, to discuss the project's results and their use in conservation planning. The workshop was jointly organized by Bioversity International, Chinese Academy of Forestry and APFORGEN, and funded by the Government of Germany with contributions from the CGIAR Research Programme on Forests, Trees and Agroforestry.

The workshop was organized in conjunction with a regional workshop on the preparation of the second State of the World's Forest Genetic Resources report (23-24 October 2019), organized by the Food and Agriculture Organization of the United Nations, Bioversity International and Chinese Academy of Forestry.

Workshop presentations are available online at the project's shared folder.

Day 1: 21st October 2019

Welcome and introductions

Participants were welcomed to the workshop by Dr Michaela Haverkamp from the Federal Ministry of Food and Agriculture, Germany, and Prof. Zheng Yongqi, Chinese Academy of Forestry. Participants introduced themselves. Riina Jalonen of Bioversity International then introduced the workshop objectives:

- identify regional priorities and synergies for conserving the species and their genetic diversity
- agree on a shared definition for genetic conservation units, building on existing knowledge and approaches in Asian countries
- identify opportunities and action points for effectively communicating the project results into national conservation planning through policy-makers, conservation practitioners and funding partners

Presentation: Gap analysis of tree species conservation in Asia: results of species distribution modelling and threat mapping

Hannes Gaisberger, Bioversity International

The project compiled distribution data on 72 native Asian pilot species, and more than 50,000 occurrence records were received from more than 40 individuals and organisations. Data was sufficient to develop stable species distribution models for 65 species. To assess the threats of climate change on the species, five global circulation models and two climate change scenarios (RCP4.5 – slowly declining greenhouse gas emissions, and RCP8.5 – rising emissions) were used. Under the RCP4.5 scenario, the most affected species were *Alstonia scholaris* (minimum 20% of area loss by 2050, as predicted by all 5 models), *Hopea odorata* (15.2%), *Shorea macrophylla* (13.7%), *Shorea parvifolia* (12.6%) and *Scaphium macropodum* (11.2%). The most affected species under the RCP8.5 scenario were *Alstonia scholaris* (37.8%), *Hopea odorata* (30%), *Vatica mangachapoi* (26.8%), *Dipterocarpus alatus* (24.4%), and *Pometia pinnata* (23.1%). The results of the species distribution modeling also enable assessing whether species would gain new suitable habitat under climate change. The impact of land conversion on the species distributions was assessed using two datasets: the ESA land cover map 2015 and Tree plantations 2016 (Transparent World and Global Forest Watch). Species conservation status was assessed using the World Database on Protected Areas (WDPA, October 2018). The species most affected by land conversion were for *Azadirachta indica* (79.8% of potential distribution

converted), *Ailanthus excelsa* (75.2%), *Dalbergia sissoo* (73.9%), *Albizia lebbeck* (67.8%) and *Garcinia indica* (64.1%).

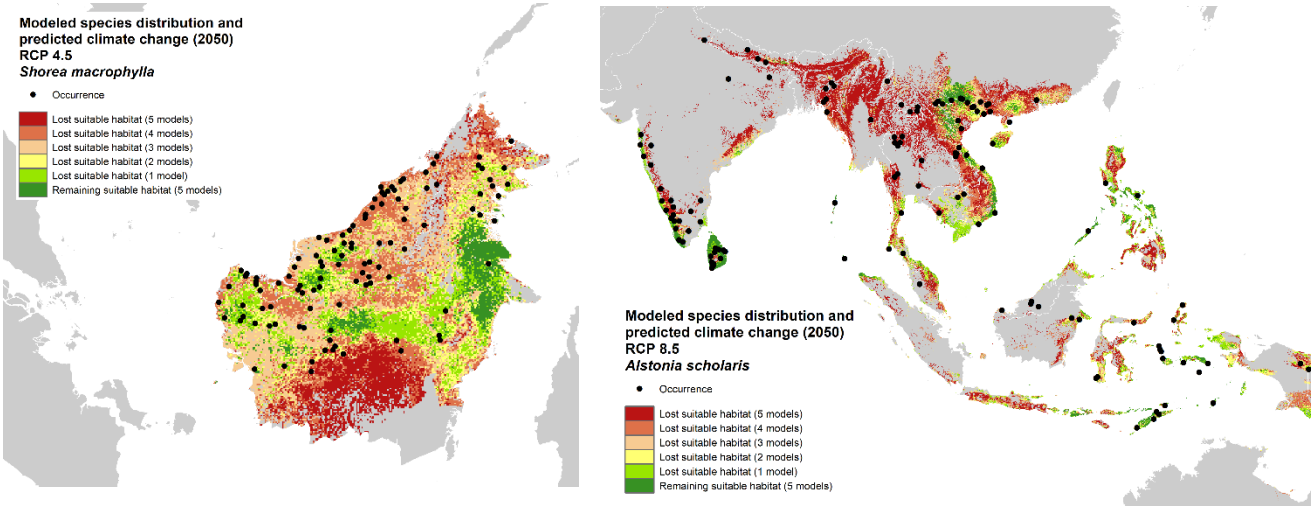

Figure 1. Impact of climate change by 2050 on the distribution of (a) *Shorea macrophylla* (RCP4.5, scenario of slowly declining greenhouse gas emissions), and (b) *Alstonia scholaris* (RCP8.5, scenario of rising emissions).

Discussion:

- Land conversion does not necessarily reflect species' threatened status: for example, *Azadirachta indica* is very widely planted. However, few natural populations of the species remain, compared to its original extent, which may indicate loss of genetic diversity that is different of that found in planted populations, and therefore conservation need.
- For habitat-specific species such as those found on peatlands and in mangroves, soil type is important in explaining species distribution. Soil type is already considered in the distribution models of APFORGIS.
- Under the RCP4.5 scenario, species richness may increase in many areas, although species composition changes. However, under the RCP 8.5 scenario that fits the current trend in atmospheric CO2 concentration, species diversity will reduce in most areas. Most species will either gain or lose due to climate change, not both. *Hopea ferrea* and *Myristica malabarica* will be the biggest gainers in terms of new suitable habitat, while many *Shorea* species will lose habitat. Forest types will also change with species composition.
- It is important to note that the predicted area gain will not necessarily realise, at least without human intervention. Connectivity, competition and migration potential will affect the species' ability to colonise new suitable habitats.

- Are widespread species more affected by climate change than those with narrow distribution? This varies between species, depending on the predicted impacts of climate change in each location.
- In average across all species, about 10% of the potential distribution area fall under protected areas. However, this varies largely between species, and also within species (by country or ecoregion)
- Why don't the maps show Indonesia as distribution area for teak? The models predict suitable habitat for teak in Indonesia, but the presented maps have been expert-corrected to exclude non-natural distribution area, for a better understanding of the impacts of different threats on the species genetic resources. Different versions of the maps will be prepared in future, including those that also show non-native distribution areas.
- There are models of predicted land use change till the future. These could be used in combination with the predicted climate change impacts, for a better understanding of future threats on the species.
- Socio-economic data can be used to assess conservation status. Relevant global datasets exist for example on human population density, shifting cultivation and accessibility. These indicators and thresholds with negative impacts on species vary widely between countries and contexts, and are probably best looked at a national or sub-national level. Bogor Agricultural University has an ongoing project in Jambi, Sumatra, looking at the impact of human dimension and migration on tree species.

Proposed guidelines for identifying genetic conservation units and seed sources for Asian tree species

Riina Jalonen, Bioversity International

Results of the species distribution modeling help to gain an overview of the species conservation status across its range, under current and future climates. Field studies and inventories are needed to confirm the distribution within protected areas. The proposed regional guidelines for genetic conservation units describe a process for such more detailed conservation assessment, building on the results of APFORGIS. The guidelines have the following objectives: (1) Enable a regional assessment of the conservation status of the species and their genetic resources using readily available information, (2) Enable the identification and recognition of sites that already serve, or have the potential to serve, as genetic conservation units, so that relevant measures can be taken to safeguard them, (3) Support the identification of priorities and collaboration opportunities for ecological and genetic research, (4) Raise awareness about the importance of conserving genetic diversity, by highlighting related gaps

and priorities that may differ from gaps and priorities identified solely at species or ecosystem level. The guidelines consist of four Tiers, from protected areas with confirmed species presence and confirmed sufficiently large populations of the target species, to forest areas with sufficiently large and sustainably managed populations and finally designated genetic conservation units.

Discussion:

- Minimum population size for genetic conservation units depends on reproductive strategies (e.g. vegetative vs. sexual reproduction, mono- vs. dioecious species) and habitat-specificity. It is very important to verify if the species propagate vegetatively. In certain cases there might be up to 15 individuals in a relatively large area, but these are clones. To design effective species-specific conservation it is fundamental to know the habitat specificity of a species (e.g. *Myristica spp.* only occur in swamp).
- In India, there have been programmes on species genetic conservation, especially for medicinal species, where priority areas were identified for conservation. One common problem was not knowing whether a species is monoecious or dioecious. In some cases, male trees were not identified during the ground-truthing process, so there were some areas with up to 50 individuals, but only female trees and so the populations were not reproductive.
- Should each population be considered as a separate conservation unit? It depends: if the area is very large and there are several populations, then this might count only as one unit. In other cases there might be just one population on the target site, then that will also be a unit.
- For many species, there may not be sufficient populations left. For highly valuable and threatened species, it may be difficult to find populations larger than 10-15 trees, and it can't be expected that these be unrelated individuals. Nevertheless, to be useful, the guidelines on minimum population sizes should be formulated based on genetic theory and not to fit what is available. If sufficient populations are lacking, the guidelines can then be used to inform species restoration. The proposed Tier-wise approach is aimed at recognizing existing populations and conservation approaches and building on them in each country context. It would be important to plan management actions to increase the size of very small populations.
- Life-history traits can be used for grouping species, as has been done by Forest Research Institute Malaysia (FRIM). Their results are one of the few studies available on minimum viable populations for tropical Asian tree species. Currently, there is not enough information to formulate species-specific genetic conservation guidelines.
- For a review of species genetic diversity: How to compare different populations and studies? E.g. *Shorea parvifolia* is very well known to be in many clusters. Comparison

will be made between same markers with similar number of loci, and multiple populations will be included to better discern the differences.

- Protected areas need to be studied for genetic diversity, because species persistence there is not guaranteed either – e.g. highly valuable species can be exploited within protected areas, or climate change may change their suitability as species habitat.
- Populations studied for genetic diversity could be prioritized as genetic conservation units.
- Pan-European minimum requirements for genetic conservation of tree species are based on the idea of dynamic conservation, that can include both *in situ* and *ex situ* conservation sites. The regeneration potential is an important indicator of the conservation value of either type of site. Seed stands are available for many species, and the guidelines must, therefore, consider their genetic conservation value.
- In Germany, genetic conservation is the responsibility of individual states. Not all conservation units are listed in the pan-European information system, by state decision.
- Would genetic conservation units need to be approved by the government? E.g. in Indonesia the seed production areas need to be approved. Legal status for conservation units would be ideal, but it is not necessary.
- When applying the guidelines, different factors need to be considered: Species (e.g. species ecology), country context, finances and human resources. In Vietnam, the conservation of forest genetic resources is not mentioned in the law, therefore it is very difficult to implement this kind of initiatives.
- How do we convince governments to take action? What role can research and generation of knowledge play in this? First priority would be to identify gaps in current conservation approaches, so that governments can be better aware of what actions are needed for improving conservation.
- The guidelines are partly aligned with the OECD Forest Seed and Plant Scheme that provides international requirements for documenting of seed sources. Units at Tier 1-2 can potentially include seed sources and be used as such (as *source-identified* sources).
- The Tiered approach of the guideline can be useful: they help to flag areas that have not been studied, and help practitioners to recognize these important areas.

Regional conservation priorities for model species: Overview of the process

Participants split into the three sub-regional groups to discuss and identify conservation priorities for a subset of the species. The species had been selected by the participants to the project's validation workshop in March 2019 and included the following: *Alstonia scholaris*, *Anisoptera costata*, *Aquilaria crassna*, *Dipterocarpus alatus*, *Gonystylus bancanus*, *Hopea*

odorata, *Intsia bijuga*, *Phyllanthus emblica*, *Pterocarpus macrocarpus*, *Shorea macrophylla*, *Tectona grandis* and *Terminalia chebula*. The participants were provided with maps and

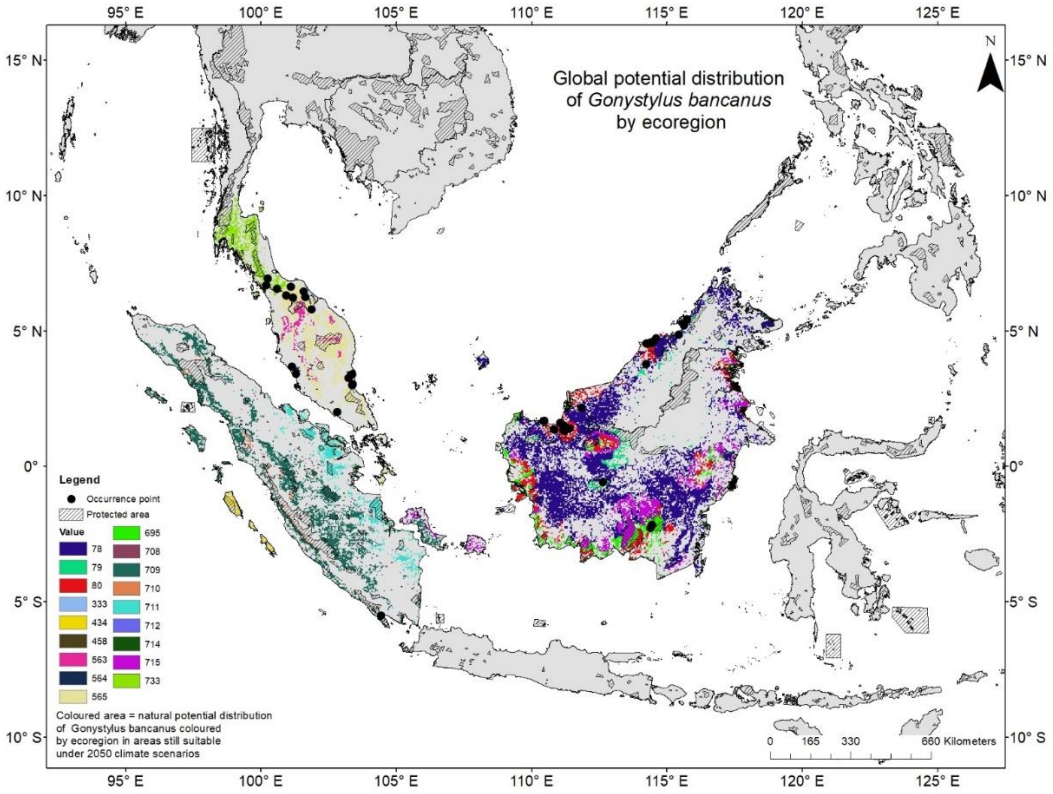

Figure 2. Example of ecoregion-wise distribution maps used in the group discussions to identify conservation priorities.

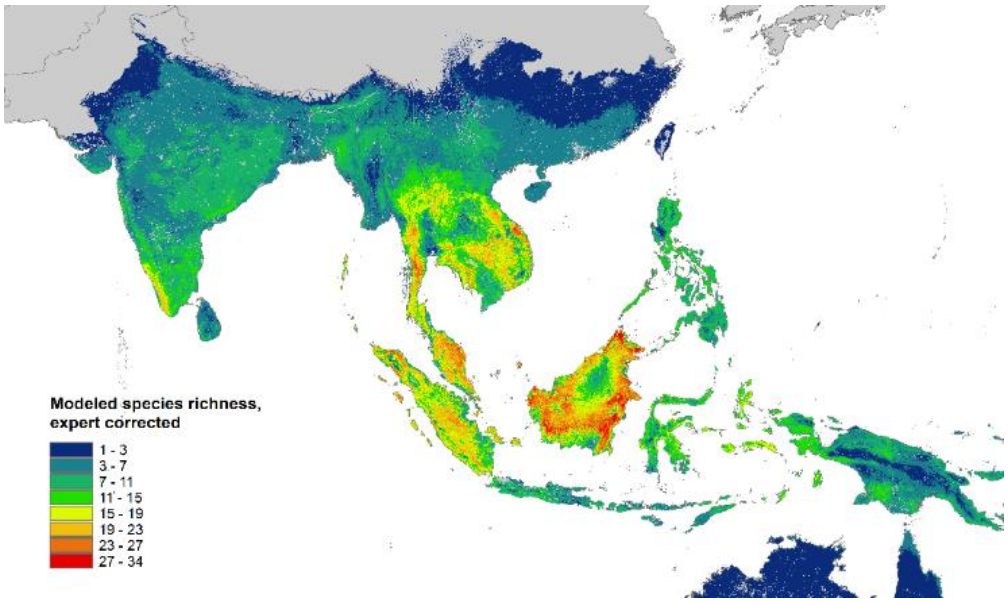

Figure 3: Species richness map of the project's 72 pilot species, for assessing synergies in conservation priority setting.

calculations of the conservation status of the species in each ecoregion within their distribution range (proportion of potential distribution protected, converted to other land uses, and threatened by climate change). Participants were asked to consider for each species: (1) Which ecoregions are top priority for conserving the species and why? (2) What actions can be taken in the ecoregion to help improve the species conservation? (3) What opportunities are there for collaboration between countries? The exercise served both to gauge regional conservation priorities for the pilot species, and to test and obtain feedback on how the project results can be used in conservation priority setting.

Figure 4: Conservation priority setting. Nur Sumedi (Indonesia), Nurul Farhanah bt Zakaria (Malaysia), Iskandar Siregar (Indonesia) and Enrique Tolentino jr. (Philippines) review maps and data. Photo: Tania Kanchanarak

Figure 5: *from left:* Species conservation in Indo-China: Wichan Eidathong (Thailand), MuMu Aung (Myanmar), Chaloun Bountihiphonh (Lao PDR) and Chhang Phourin (Cambodia). Photo: Jiuxin Lai / CAF.

Decision-support tools: demonstration of the online database for conservation priority setting

The project results will be published on a website to allow researchers and conservation practitioners in the region to benefit from those. The website will include a map interface that allows users to display and download the data layers of their choice, and a conservation priority setting tool that helps to identify most threatened ecoregions for each species. The overall objectives of the database are to: (1) Help practitioners, policy makers and donors identify spatial priorities for the conservation and restoration of tropical tree species and their genetic diversity, (2) Provide practical tools for species and seed source selection in restoration projects, (3) Raise awareness among users about the importance of genetic considerations in species conservation and restoration, and demonstrate how genetic information can be integrated in priority setting, and (4) Serve as a repository and sharing platform for data on tree species. Database will be available for registered users. Users can view maps and download data layers. If data contributor has agreed to share species occurrence data, users can also view

it. A webinar will be organised once the website is completed, to demonstrate the use of the database and the tools.

Discussion:

- The idea behind the online database is to make the project results more easily accessible and reusable by partners on a user-friendly platform. The existing maps were prepared using specific spatial analysis software that it not very accessible to non-specialists.
- A doodle poll will be sent to identify a suitable timing for the webinar. The webinar will also be recorded.
- Instead of giving access to individual users to access data, it would be better if institutions are officially asking for data (e.g. institutional registration).
- In some cases, partners need to reconfirm institutional endorsement for sharing the data on the website
- Data contributors will be recognised on the website for their contribution to the project, given that they give their permission to this. The General Data Protection Regulation of the EU will be followed in publishing information on the website.

Day 2: 22nd October 2019

In the morning of day 2, participants finalized the group discussions on the species conservation priorities for the 12 pilot species. Each group the provided a brief summary of the conservation priorities and feedback on the exercise.

Discussion:

South Asia (Bangladesh, India, Sri Lanka)

- Not all existing protected areas are displayed on the maps. The World Database of Protected Areas does have some gaps at national level.
- It is difficult to assess on the map the conservation priorities for species for which majority of the potential area has been converted to other land uses, and the remaining populations are in very small forest patches. More detailed maps are needed for such cases.
- There might still be problems of species identification for certain species: for example *Dipterocarpus alatus. Presence of Hopea odorata* on the Indian sub-continent is uncertain; it may only be present in the Nicobar island.

- *Dipterocarpus alatus* and *Hopea odorata* are important to conserve as they only occur in small pockets of land.
- *Alstonia scholaris* is medium priority, as it is well present in the protected areas.
- Teak is a very tricky species for genetic resources conservation, as it is often difficult to know which populations are planted and which natural. Markers to assess natural distribution are currently being developed to support identification of conservation priorities.
- *Terminalia chebula* mostly occur outside from the protected area. It is an important NTFP species. It should be conserved on Tier 4 sites within protected areas.
- No Tier 2 sites (sustainably managed genetic conservation units outside of protected areas) were identified for establishment in South Asia: managing the units would be problematic. More incentives are needed to protect the species, which involve policy decisions.

Indo-China (Cambodia, China, Lao PDR, Myanmar, Thailand, Vietnam)

- *Aquilaria* crassna, *Gonystylus bancanus* and *Terminalia chebula* are very important non-timber forest species, all other species in the region are timber species.
- There are problems in the identification of *Aquilaria crassna* in Thailand. *Aquilaria sp.* can cause confusion due to the taxonomy. If species identification is correct, then there are high priority areas for conservation close to urban area (Bangkok).
- Most natural distribution of *Tectona grandis* is in Northern Thailand, Myanmar and Laos. All these areas should be prioritized for conservation. There is good progress and work on the species with other stakeholders, and the species may therefore not be of high priority for follow up through APFORGEN.

Malesia (Indonesia, Malaysia, the Philippines)

- As *Alstonia schola*ris is Least Concern according to IUCN Red List assessment and widespread, this is a low priority species in the sub-region.
- *Gonystylus bancanus* is a high priority species as its natural habitat (peat swap) is threatened. Suggested conservation units at Tier 3 and 4 levels (need confirmation of species presence and their population size inside protected areas). There is a potential for collaboration between Indonesia and Malaysia to conserve the species.
- *Gonystylus bancanus , Anisoptera costata* and *Intsia bijuga* are highly threatened as the value of timber is high. Population outside protected areas are threatened.
- *Shorea macrophylla* is a protected species in Malaysia, and high priority in Indonesia because its low germination and slow growth make it vulnerable
- The sub-region should mostly already have Tier 3 and 4 conservation sites in place. Tier 2 sites should also be identified and established outside protected areas. Countries can

collaborate on genetic conservation studies, timber tracking, and seed source identification and development.

- In Indonesia, there are still logging concessions in natural forests, and these may include some important germplasm reserve areas (Tier 2), therefore collaboration with concession areas is very important for species conservation.

Follow-up plans: project ideas, publications, capacity needs

Participants were invited to propose topics for follow-up projects and activities building on the APFORGIS results. The following topics were identified and discussed in four break-out groups. After the group discussions, the groups provided a summary of their ideas at plenary. It was agreed that participants could sign up for follow-up discussions on topics of their interest by contacting the rapporteurs of each group.

Conserving regionally important and threatened tree species
Participants: Chaloun Bountihiphon, Nguyen Quoc Dung, Chhang Phourin, Iskandar Siregar, Suchitra Changtragoon (Rapporteur), Wichan Eiadthong, Nguyen Hoang Nghia, MuMu Aung

- Focus species: *Aquilaria* spp.
- The project could serve for CITES implementation, support law enforcement and on-the-ground conservation
- Activities will consist of field visits, at least 2 workshops, review of existing studies in each country, and a joint publication
- DNA samples could be analysed in Thailand and Malaysia.
- India has some *Aquilaria sps. (Aquilaria agallocha*) and they would like to participate in the activities. The country also has the facilities and means for genetic studies.

Restoring endemic tree species
Participants: as above

- Endemic species include rare species which occur in limited and specific areas in each country. A close look is needed in each country to identify distribution.
- Activities will include species distribution modelling and ground truthing, followed by genetic diversity studies, seed source establishment, and growing in potential areas for repopulation. Possible economic value of the species can also be studied.
- Interested countries: China, Laos, Vietnam, Thailand, Cambodia, Malaysia, and Lao PDR
- Each country will review available national resources first, as the study is on endemic species.

Figure 6: Ideas for follow-up projects: *Above:* Forest and landscape restoration: Enrique Tolentino jr. (Philippines), Greuk Pakkad (Thailand), Jarkko Koskela (FAO), Yu Zhang (China), Vilma Bodos (Malaysia), Vivi Yuskianti (Indonesia) and Barbara Vinceti (Bioversity). *Below:* Socio-economic considerations in genetic conservation: Nur Sumedi (Indonesia) and Md. Baktiar Nur Siddiqui (Bangladesh). Photos: Riina Jalonen / Bioversity Int.

Socio-economic aspects in forest genetic resources conservation

Md Baktiar Nur Siddiqui (Rapporteur), Nur Sumedi

- Forestry activities in Bangladesh have focused on planting fast growing species such as Acacia that are easy to plant and are not threatened by grazing.
- Focus is now shifting towards social forestry. The challenge is how to conserve native tree species.
- In Indonesia, community forestry has a long tradition, especially in Java. Key products and species include honey, *Albizia* spp., mahogany, *Toona sureni* and Tengkawang (illipe nuts). Seedling production can be done by community members, for supply for smallholder plantations

Forest and landscape restoration

Participants: Enrique Tolentino jr. (Rapporteur), Greuk Pakkad, Yu Zhing, Vilma Bodos, Vivi Yuskianti; Jarkko Koskela and Barbara Vinceti

- Proposal title: Scaling-up the Framework Species method by enhancing forest genetic diversity in forest restoration of natural forest for climate change adaptation and increased forest ecosystem services
- Massive forest degradation/forest decline; climate change; loss of ecosystems goods and services motivate restoration
- Framework species method has been extensively developed by FORRU Thailand (platform to guide the project); species screening from phenology to nursery, plantings,
- Activities: inventory of local species, demonstration plots comparing performance traditional approach vs Framework species method, evaluation of seed sources and genetic diversity; capability building
- Second proposal / project idea: “DIVERSITY FOR RESTORATION” Tool in Asia-Pacific Region

Establishing a regional information system on forest genetic resources

Participants: Ping Huang, Zheng Yongqi, Panduka Weerasinghe, Rekha Warrier, Hannes Gaisberger (Rapporteur)

- Apply similar methodology as APFORGIS for endemic species.
- Train countries under the APFORGIS umbrella for widespread species, to build the capacity within the countries, e.g. spatial modelling knowledge. This will also help apply same methodology for each species for comparability.
- China has the ambition to establish a similar database, for 1000 species.
- The main challenge is the problem of data sharing.
- External funding is needed. Each country can be followed up with for new proposals. For example, the IKI proposals funded by the Government of Germany

- Should build few case studies on different species; which models to use etc.

Communicating the results to policy-makers and practitioners

Participants were asked to identify in their countries stakeholders who should be communicated to about the results of the APFORGIS project. They wrote their ideas on cards and discussed then in table groups to identify key messages for each stakeholder group. Identified stakeholder groups included ministries, forestry departments, universities, research institutions and private sector (Figure 7).

Discussion:

- Bangladesh: Immediate conservation of threatened habitats should be started. Research must be initiated on other species not yet included on APFORGIS list. It is important to award and motivate local people not to destroy habitats in wildlife sanctuaries and generate income opportunities. This should be done with sanctuary management committees, working side by side with the Forestry Department. Private sector is not prominent in the forestry sector, but some forest areas destroyed by companies and they could be asked to compensate.
- In Indonesia, one priority is watershed management. There isn't an integrated database about tree species in Indonesia. We must focus on species of economic and social value and empower people by developing community-based tree seed sourcing. Farmers can enhance their livelihoods by planting trees in agroforestry or mixed plantations. Seed sources give high financial benefit and can be operationalised by farmer groups. There are also forest concessions by private companies and plantation forest industry, and big companies could be approached for funding through corporate social responsibility programs.
- Messages for policy makers: (1) Laws are needed to conserve and protect vulnerable/adaptable species from climate change/land conversion (national, local), (2) Need to revise protocols for species-specific seed collection sources of vulnerable species, (3) Budget is needed for prioritizing sites for conservation and vulnerable/adaptable species, (4) Law or policy is needed on the mechanisms or guidelines on how private entities (e.g. logging companies) implement forest restoration programs in production forests (e.g. seed sources, suitability, etc.), (5) Law or policy is needed on designating land uses for conservation areas outside protected areas, especially those identified as vulnerable/adaptable climate change and land conversion (e.g. local level only)
- Messages for practitioners: tools exist to identify vulnerable/adaptable species to climate change/ land conversion and their locations;

- Project results must be shared with all Conservators of Forests of all states and t he Director General of Forests at the Ministry. They must be encouraged to document available genetic resources of the species in the different states so they know what they are in the possession of. APFORGIS results show how tools are available for scientifically managing forests, and this should be included in the 5-10 year working plans and procedures on forest management. Climate modelling should form part of all planning processes, so that stakeholders know what to plant and where. Species recovery programs for rare, endemic and threatened species should be initiated. Awareness of forest genetic resources conservation must be created from grassroot level.
- In the Mekong region, forests are fragmented, without conservation, and effective use of forest genetic resources is not possible. National and subnational collaboration in conservation is important
- We need to inform policy makers, gain resources, develop guidelines; this needs more time before targeting practitioners with practical material
- Target also international, regional organisations and NGOs who work on conservation, and who can potentially make use of the results directly; they can help extend and implement these at national levels

Figure 7: Word cloud of stakeholders whom APFORGIS results should be communicated to.

- Focus on the unique messages of this project, how protected areas are failing under climate change, forest genetic resources are being lost and not available for restoration. Policy-makers need to plan how to be able to conserve genetic resources in landscapes, under climate scenarios.
- In the private sector, there are companies that are drivers of change, and companies who have obligation to restore natural resources due to their business. These are good targets for funding. Forest and landscape restoration is carried out mostly by the government; where private sector is required to contribute to restoration, they may pay deposit or fees to the government for this. Planting and seed companies could be approached to emphasise the need for site-specific planting material. In Thailand, company taxes can be waived for those companies that contribute to environmental conservation.
- Shell has a big campaign to plant trees when people buy petrol, to offset emissions
- If we really want to scale up FLR, forest genetic resources are the key foundation without which restoration can't be done. Also, without genetic resources, we can't adapt to climate change.

Closing and vote of thanks

On behalf of the project team, Riina Jalonen thanked all participants for their active participation at the workshop, and the local organizing team at the Chinese Academy of Forestry and Bioversity International's Beijing Office. She heartfully thanked the Federal Ministry for Food and Agriculture of the Government of Germany for funding the project and providing their support to implementing the project's activities. Lastly, she thanked all data contributors and other project participants whose inputs helped to make the project a success. Zhang Zongwen, Regional Coordinator for East and Southeast Asia, Bioversity International, thanked participants on behalf of the local organizing committee, and expressed the growing importance of regional collaboration and networks in agricultural and forest biodiversity conservation, sustainable use and capacity strengthening.

Day 3: 23rd March 2019

Field trip

The Beijing Botanic Gardens hosted a visit to the Gardens for the workshop participants on the morning of 23 March. After the Botanic Gardens, the participants visited the State Key

Laboratory of Tree Genetics and Breeding, and the Research Institute of Forestry at the Chinese Academy of Forestry. Professor Zheng Yongqi of gave the participants an introduction to the Academy and the research of the institute.

Figure 8: Entrance to the Beijing Botanic Gardens. Photo: Jiuxin Lai / CAF

Figure 9: Enormous trunk of the living fossil tree *Metasequoia* sp. at the Botanic Garden. Photo: Tania Kanchanarak

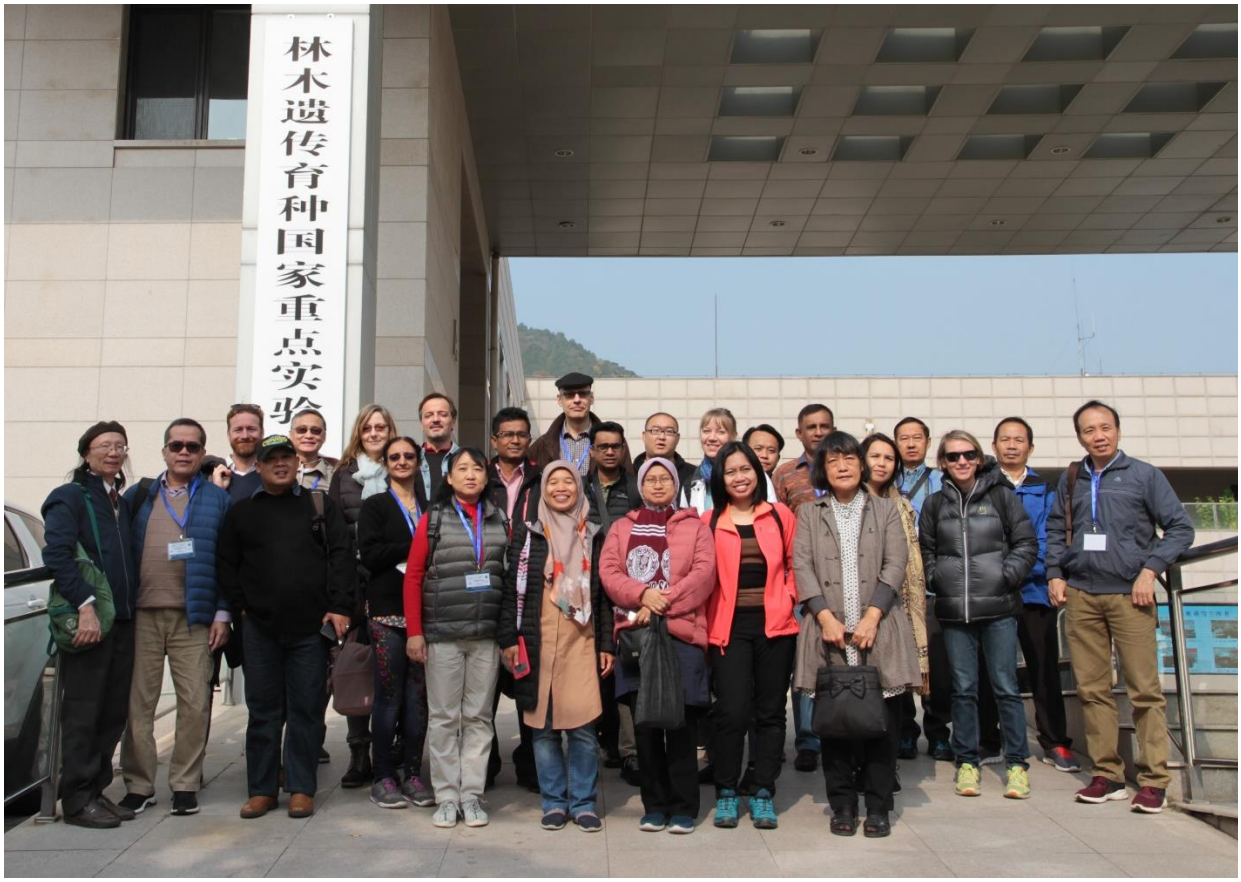

Figure 10: *Above and below:* Visiting the National Key Laboratory of Tree Genetics and Breeding. Photos: Jiuxin Lai / CAF

Figure 11: Experimental facilities of the National Key Laboratory. Photo: Tania Kanchanarak

Figure 12: Zheng Yongqi (left) welcomes participants to the Research Institute of Forestry, Chinese Academy of Forestry. Photo: Riina Jalonen / Bioversity Int.

Annex 1: Workshop programme

Distributions and biology of Asian tree species: Translating research results into conservation plans Regional workshop

21-23 October 2019
Si Ji Yu Yuan Hotel, Beijing, China

Programme

Day 1 – 21 October 2019

Time	Session
9.00-9.40	Welcome and introductions
9.40-10.30	Gap analysis of tree species conservation in Asia: results of species distribution modelling and threat mapping *Hannes Gaisberger, Bioversity International*
10.30-11.00	*Tea break*
11.00-11.30	Gap analysis of tree species conservation in Asia: results of species distribution modelling and threat mapping
	Plenary Discussion
11.30-12.30	Proposed guidelines for identifying genetic conservation units and seed sources for Asian tree species
	Riina Jalonen and Tania Kanchanarak, Bioversity International
12.30-13.30	*Lunch*
13.30-15.00	Regional conservation priorities for model species: *Group discussion (subregion)*
15.00-15.30	*Tea break*
15.30-16.30	Regional conservation priorities for model species: *Group discussion (subregion)*
16.30-17.00	Decision-support tools: demonstration of the online database for conservation priority setting

Day 2 – 22 October 2019

8.30-8.45	Recap of the first day
8.45-10.00	Regional conservation priorities for model species: synthesis *Group and plenary discussion*
10.00-10.30	Follow-up plans: project ideas, publications, capacity needs
10.30-11.00	*Tea break*
11.00-12.30	Follow-up plans: project ideas, publications, capacity needs *Group discussion*
12.30-13.30	*Lunch*
13.30-14.00	Follow-up plans: *Reporting back*
14.00-15.00	Communicating the results to policy-makers and practitioners: *Group and plenary discussion*
15.00-15.30	*Tea break*
15.30-16.15	Communicating the results to policy-makers and practitioners: *Plenary discussion*
16.15-17.00	APFORGIS Project wrap up and reflection
19.00	*Workshop dinner*

Day 3 – 23 October 2019

7.30-11.00	Excursion: Beijing Botanical Garden
11.00-12.00	Visit to Research Institute of Forestry, Chinese Academy of Forestry
12.30-13.30	Lunch
13.30	Departures

Annex 2: List of participants

Participants

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