RESEARCH PROGRAM ON Forests, Trees and Agroforestry

CGIAR

Food and Agriculture Organization of the United Nations

Asia-Pacific Forest Sector Outlook: Roadmaps for primary forests conservation and innovative forest technologies

Report of the inception workshop, held online on 30 July 2020

Table of contents

Disclaimer

FAO and CIFOR, lead center of the CGIAR research programme on Forests, Trees and Agroforestry (FTA), are developing two inter-related roadmaps for the Asia-Pacific region on: (i) primary forest conservation and (ii) innovative forest technologies. These roadmaps will be elaborated through an inclusive and participative process associating a wide range of key regional forest experts and decision-makers.

On July 30th, 2020, FAO and CIFOR co-organized an online inception workshop to: officially launch this process; agree on the global orientation of the work; and start collecting ideas and building a strong community to accompany the development of the roadmaps.

This non-edited document reflects the views expressed during this first meeting. It should thus be considered as work in progress. It does not necessarily reflect the views or policies of FAO or CIFOR.

In the coming months, FAO and CIFOR will prepare and co-publish two technical papers, one on each of the abovementioned topics, as well as two policy briefs for decision-makers, gathering the main findings and concrete recommendations emerging from this work.

Acknowledgements

This report has been prepared by Nathanael Pingault, Alexandre Meybeck and Vincent Gitz. It has been reviewed by Amos Amanubo, Illias Animon, Anne Branthomme, Stephen Elliott, Thomas Hofer, Rodney Keenan, Yves Laumonier, Yanxia Li, Rao Matta, Mike May, CTS Nair, Robert Nasi, Marco Piazza, Edmund Leo Rico, James Roshetko, Maria Paula Sarigumba, Vaeno Vigulu, Shengfu Wu, Makino Yamanoshita. Any remaining errors are the sole responsibility of the authors.

The organization of this inception workshop has been made possible thanks to the involvement of many colleagues in FAO, CIFOR and other partner organizations.

In particular, all the organizers must be acknowledged for their engagement ahead of the workshop: Illias Animon, Anne Branthomme, Vincent Gitz, Thomas Hofer, Yves Laumonier, Rao Matta, Alexandre Meybeck, Marco Piazza, Nathanael Pingault and James M. Roshetko.

Thanks also to the chairs of the breakout groups sessions for their availability and their strong leadership during the discussions: Amos Amanubo, Stephen Elliott, Baisone Inthirath, Rodney Keenan, Yanxia Li, Mike May, CTS Nair, Robert Nasi, Edmund Leo Rico, Maria Paula Sarigumba, Vaeno Vigulu, Shengfu Wu, Makino Yamanoshita.

The breakout groups' rapporteurs, which provided the written material that served as a basis for this workshop report, must be acknowledged for their excellent work: Illias Animon, Anne Branthomme, Vincent Gitz, Yves Laumonier, Rao Matta, Alexandre Meybeck, Marco Piazza, Nathanael Pingault and James M Roshetko.

Special thanks to the technical support team without which this online meeting would not have been possible: Gusdiyanto, VitoGama Kaparang, Kallaya Meechantra, Fabio Ricci, Dinny Saputri, Lucya Yamin.

Finally, many thanks to all of those who participated in this workshop for their very valuable input. They are warmly invited to continue to contribute actively to the development of the two roadmaps in the coming months.

Asia-Pacific Forest Sector Outlook: Roadmaps for primary forests conservation and innovative forest technologies

Inception workshop report

Summary

Following the recommendations of the 'Third Asia-Pacific Forest Sector Outlook Study' (FAO, 2019)[1], FAO and CIFOR, lead center of the CGIAR research programme on Forests, Trees and Agroforestry (FTA), are developing *two inter-related roadmaps for the Asia-Pacific region on: (i) primary forest conservation and (ii) innovative forest technologies*.

On **July 30th, 2020,** FAO and FTA co-organized an online inception workshop to officially launch the collective process of development of these roadmaps with three objectives in mind: (i) agree on the global direction of the studies on the two abovementioned topics; (ii) collect ideas and identify potential contributors; (iii) start building a strong community around these roadmaps to ensure a large participation to the process.

Workshop participants were representatives of all the key stakeholder groups (international organizations, governments, private sector, civil society, research and academia) and the majority of the countries in the region. During the workshop, participants demonstrated their high level of interest and enthusiasm for the two topics discussed. This raises high expectations regarding the outcomes of this collective process. Thomas HOFER, Senior Forestry Officer in FAO Regional office for Asia and the Pacific (FAO-RAP, Bangkok), Natural Resources Management (NRM) Group Leader and Secretary of the Asia Pacific Forest Commission (APFC), thus invited all participants to maintain their level of engagement in the coming months and contribute actively to the work ahead with innovative ideas, out-of-the-box thinking and a forward-looking perspective, in the spirit of the 'Third Asia-Pacific Forest Sector Outlook Study'.

***

During the first session, participants in the breakout groups discussed the main threats facing primary forest conservation, including: climate change and natural disasters; population and economic growth; overexploitation and illegal exploitation of forests; conflicting land uses; inconsistent policies across sectors and scales; corruption, weak governance, migration and conflicts. They identified many hotspots for primary forest conservation and suggested to develop, during this study, a list of criteria that could help describing and mapping the hotspots across the region and prioritize conservation efforts. Among possible criteria, participants mentioned the level of threats, as well as the (environmental, economic, social and cultural) richness and uniqueness of the ecosystem. Participants also discussed the minimal size that should be considered to define a primary/intact forest: should conservation policies and efforts prioritize the largest remaining fragments or consider all remaining primary forest patches regardless of their size?

Participants in the breakout groups also discussed the institutional changes required to prevent further deforestation, fragmentation and forest degradation. Was mentioned the need to adopt an integrated, cross-sectoral, multi-stakeholder governance, articulated at all scales and to consider the remnant primary forests within a broader landscape, considering the dynamics at stake in surrounding areas (whether other natural or planted forests, agricultural land, mining, industrial or urban areas)

1 FAO. 2019. Forest futures – Sustainable pathways for forests, landscapes and people in the Asia Pacific region. Asia-Pacific Forest Sector Outlook Study III. Bangkok. 352 pp. http://www.fao.org/3/ca4627en/ca4627en.pdf

that directly or indirectly impact forest status and trends. They noted the need to undertake an assessment of existing land and regulations related to primary forests in the region. They highlighted various institutional challenges for primary forest conservation including: the accurate monitoring of primary forest values; the sustainable funding of forest conservation; the importance of education and capacity building; the effective enforcement of existing laws and rules. They suggested that the study should: provide an assessment of the regulations in place and of their actual implementation; inform on existing good practices and successful national legislations; and, suggest innovative regulatory frameworks.

***

During the second session, devoted to innovative forest technologies, participants suggested that the study should embrace not only sustainable forest management, but also all forest industries and value chains. The study should distinguish incremental vs. transformative and disruptive innovations; technological vs. institutional innovations; and product vs. process technologies. Some participants suggested that the study should also cover the application of technologies outside the forest sector, directly or indirectly reducing the external pressures on forests, thus contributing to their conservation. Among the most promising innovative technologies for sustainable forest management, the following categories emerged from the breakout group discussions: ICTs and digital technologies; low-carbon technologies; biotechnologies; and emerging technologies for financing.

Participants in the breakout groups discussed the impacts of innovative technologies on people and the planet. Most participants shared the feeling that innovation benefits will outweigh the risks. However, the study should also consider the potential negative impacts of new technologies on local communities (access to natural resources, food security and livelihoods), on natural ecosystems and on biodiversity. Innovative technologies can provide new products and services and improve productivity thus generating further income and employment opportunities in the forest sector. Innovative technologies can also improve resource use efficiency, thus increasing profitability of the forest sector and contributing to the sustainable management of natural forest resources. The adoption and dissemination of innovative technologies will likely produce a shift in the labour market: generating new skilled job but destroying unskilled jobs and marginalizing traditional practices.

According to participants, one of the major challenges will be to “scale-down” innovative technologies and adapt them to various local contexts, so that they can also benefit traditional users, smallholders and local communities. Among the main barriers to uptake and upscale of technologies, participants also identified: (i) the lack of capacity (infrastructures and equipment, human capital and financial resources); and, (ii) restrictive policies and regulations lagging behind the rapid evolution of technologies and the rapid shifts in wood demand. Participants agreed that regional cooperation, investment, infrastructure development, education and capacity building will be key to overcome these barriers, support technology transfer and dissemination, and accompany the populations at risk of being marginalized by these technological advances. They highlighted the importance for the public and private sectors to work hand-in-hand to address these issues.

Participants pointed out that the current version of the scoping note focuses almost exclusively on the “what”, but does not really cover the “who” and the “how”. Rather than focusing on a list of innovative technologies, the study should describe the innovation process of dissemination of new technologies, the actors involved (without overlooking the gender dimension), and the related challenges in terms of financing, education and capacity building. Another important question in this study is the “why”: the study should not start by listing innovative forest technologies but by screening the needs to be addressed, highlighting the gaps, not yet covered by existing technologies, and identify emerging technologies or technologies imported from other sectors that could contribute to fill them. The study should not neglect traditional and indigenous knowledge which, matched where appropriate with “modern” technologies, could bring transformative changes in the forest sector.

Some participants found that the communication dimension is neglected in both scoping notes. Consumers have the power to orient the forest sector towards sustainability. It is fundamental that the

roadmaps contribute to raise consumer awareness on the two topics discussed during this workshop. A communication package should be developed.

***

Vincent GITZ, Director of the CGIAR research programme on Forests, Trees and Agroforestry (FTA), presented to the audience the next steps of the process. The two scoping notes will be revised, based on the comments received during the workshop. An open electronic consultation will then be launched on both topics: this consultation will be framed considering the suggestions received during the workshop. An essay competition will be organized for students and young professionals to gather their views on innovative forest technologies. Technical inputs will be gathered through direct interviews of key regional stakeholders and reviews of the existing literature. Additional technical workshops will be organized, as appropriate, at critical steps of the process of development of the roadmaps. The results of this work will be presented during a regional and multi-stakeholder validation workshop to be held possibly back-to-back to the XV World Forestry Congress (Seoul, Republic of Korea, 24-28 May 2021).

1 Introduction

The 'Third Asia-Pacific Forest Sector Outlook Study' (FAO, 2019)[2], launched in June 2019 at the Asia-Pacific Forestry Week in South Korea, highlighted two important areas of concern for the forest sector in the region. First, of the region's 723 million hectares of forest, only 19 percent (140 million hectares) is primary, which is much lower than the global average (32 percent), and this share is still declining. The conservation of primary forests[3] – i.e. forests largely unaffected by human activities -, and the sustainable management of other naturally regenerated forests are urgently needed to safeguard biodiversity, ecosystem services and the quality and health of the physical environment in the Asia Pacific region. Second, it is critical to improve our understanding of the opportunities and challenges for sustainable forest management associated with the application of innovative technologies in the forest sector, including Information and Communication Technologies (ICTs), processing technologies, and new wood-based products.

Following-up on this important outlook study, FAO and CIFOR, lead center of the CGIAR research programme on Forests, Trees and Agroforestry (FTA), collaborate to develop *two inter-related roadmaps for the Asia-Pacific region on: (i) primary forest conservation and (ii) innovative forest technologies*, including key recommendations (policy and concrete actions) informed by science. These roadmaps will be developed through a participative process involving key regional stakeholders and technical experts. This process will also include a substantial participation of students and young professionals.

On **July 30th, 2020,** FAO and FTA co-organized an online inception workshop to officially launch this process with three objectives in mind: (i) agree on the global direction of the studies on the two abovementioned topics; (ii) collect ideas and identify potential contributors; and (iii) start building a strong community around these roadmaps to ensure a large participation to the process.

This workshop was the occasion to: (i) present the regional context and the two abovementioned topics; (ii) present the participative process of development of the roadmaps; (iii) receive feedback on the two corresponding scoping notes circulated as background documents ahead of the workshop; and (iv) launch and organize the technical work on each topic.

During the workshop, participants have been invited to submit additional written contributions, through a Google form, including examples and case studies that they consider of interest for primary forest conservation or for innovative forest technologies, as well as the contact details of resource persons able to contribute to the development of the roadmaps.

This report[4] presents the information and ideas collected during this workshop and presents the next steps of the process. Section 2 describes the large and multi-stakeholder audience that attended the workshop. Section 3 reproduces the detailed agenda of the workshop. Section 4 reflects the opening plenary session. Sections 5 and 6 summarizes respectively the discussions on primary forest conservation and on innovative forest technologies. Section 7 reflects the wrap-up plenary session and presents the next steps. More detailed material is gathered in Appendixes 1 to 5.

---

[2] FAO. 2019. Forest futures – Sustainable pathways for forests, landscapes and people in the Asia Pacific region. Asia-Pacific Forest Sector Outlook Study III. Bangkok. 352 pp. http://www.fao.org/3/ca4627en/ca4627en.pdf

[3] "Naturally regenerated forests of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed" (*FRA 2020, Terms and definitions*)

[4] This report was prepared by Nathanael Pingault, Alexandre Meybeck and Vincent Gitz, CIFOR/FTA.

2 A large and multi-stakeholder audience for this workshop

Appendix 1 lists the 89 invitees that registered for or attended to the inception workshop. All these people will be kept informed of the development of the roadmaps.

These 89 participants, out of which 22 women, were coming from 29 different countries, including 23 countries of the Asia-Pacific region. They represented all the key regional stakeholder groups, including: 25 officials from national governments; 25 scientists from the CIFOR, ICRAF and other research and academic institutions; 23 representatives of international or intergovernmental organizations and international donors; 9 experts, either independent or working for private sector organizations; 7 people from civil society organizations.

This large and diversified audience shows the widely shared interest for the two topics discussed during this workshop and raises high expectations regarding the outcomes of the roadmaps. Thomas HOFER, on behalf of FAO and CIFOR, thus invited all participants to remain committed and to contribute actively to the work ahead in the coming months.

3 Agenda of the workshop

The inception workshop consisted of an online meeting of 4 hours[5]. The workshop combined plenary sessions with parallel sessions in smaller breakout groups (7 groups of about 8-10 persons for each topic) with the view to ensure both inclusiveness and active participation during the workshop.

Roadmaps for primary forests and innovative forest technologies in Asia-Pacific

Timing	Title	Speaker
13:00	Opening and welcome	Thomas HOFER (FAO)
13:05	Introduction: Innovations, technology and importance of primary forests	Robert NASI (CIFOR)
13:20	Introduction: Following up on the third Asia-Pacific outlook: Regional context and main areas of concern. Reasons and general objectives of this work.	Rao MATTA (FAO)
13:30	Presentation of the scoping note on primary forests and introduction of the following discussions	Yves LAUMONIER (CIFOR)
13:40	Discussion on the scoping note (organized in 7 parallel breakout groups then reporting to plenary)	
14:40	Break	
14:50	Report of breakout groups to plenary	
15:10	Presentation of the scoping note on innovative forest technologies and introduction of the following discussions	James ROSHETKO (ICRAF)
15:20	Discussion on the scoping note (organized in 7 parallel breakout groups then reporting to plenary)	
16:20	Report of breakout groups to plenary	
16:40	Wrap-up and next steps	Thomas HOFER (FAO) Vincent GITZ (CIFOR)

[5] Organized in the afternoon, 13h00-17h00, Bangkok time (UTC+7), to facilitate the involvement of participants from the different countries and time zones of the Asia-Pacific region.

4 Plenary session: introduction

4.1 Opening remarks

Vincent GITZ, director of the CGIAR research programme on Forests, Trees and Agroforestry (FTA) opened the workshop and welcomed the participants.

Thomas HOFER, Senior Forestry Officer in FAO Regional office for Asia and the Pacific (FAO-RAP, Bangkok), Natural Resources Management (NRM) Group Leader and Secretary of the Asia Pacific Forest Commission (APFC), then introduced the workshop. He recalled that the envisaged roadmaps for primary forests conservation and innovative forest technologies come as a follow-up of the 'Third Asia Pacific Forest Sector Outlook Study' (FAO, 2019), which highlighted these two topics as two major areas of concern for the forest sector in the region. These roadmaps, he said, will suggest practical recommendations, focusing primarily on policy and management aspects, to address these two concerns. The objective of this inception workshop is to associate broadly key partner organizations and regional stakeholders to this work. Thomas HOFER concluded his intervention by encouraging the participants to adopt a forward-looking perspective in the spirit of the Third Outlook Study, and to contribute to the development of the roadmaps with innovative ideas and out-of-the-box thinking.

Opening remarks (Thomas HOFER)

Distinguished Participants and Colleagues,

It gives me great pleasure to welcome you all, who without exception are some of the leading thinkers and practioners in the field of forestry in the region. I am indeed delighted to see that all of you are able to participate in this virtual Inception Workshop despite several restrictions posed by the COVID-19 crisis in our professional and personal lives. So let me, on behalf of my FAO colleagues, and also on behalf of CIFOR, our partner for this initiative, extend a warm welcome to you.

FAO has always placed special emphasis on promoting sustainable resource management which today is more important than ever. Of specific relevance today is the 'Third Asia-Pacific Forest Sector Outlook Study'. This was launched in June 2019 at the Asia-Pacific Forestry Week in South Korea, which I am sure, many of you are familiar with. Among many issues, the Outlook Study particularly highlighted two important areas of concern for the forest sector in the region.

First, primary forest: of the region's 723 million hectares of forest, only 19 percent (140 million hectares) is primary, which is much lower than the global average, which is 32 percent, and this share is declining. The conservation of primary forests – i.e. forests largely unaffected by human activities -, and the sustainable management of other naturally regenerated forests are urgently needed to safeguard biodiversity, ecosystem services and the quality and health of the physical environment in the Asia Pacific region.

Second, innovative technologies: it is critical to improve our understanding of the opportunities and challenges for sustainable forest management associated with the application of innovative technologies in the forest sector, including ICT technologies and new wood-based products.

Following-up on this important outlook study, FAO and CIFOR engaged in a collaboration to address these two concerns and develop roadmaps for primary forest conservation and innovative forest technologies in the Asia-Pacific region. These roadmaps will primarly focus **on policy and management** aspects related to improving the situation in both these areas.

Today's online inception workshop is organized mainly to officially launch the initiative and to present the process of development of the roadmaps and associate key partner organizations and regional stakeholders to this work. We also want to flesh out with you some basic questions which will guide the implementation of the work on these two thematic areas.

The enthusiasm we received for this gathering suggests that we are on the right track. To ensure inclusiveness, this inception workshop has participants from governments, intergovernmental organizations, private sector, civil society, academia and research institutions. I'm particularly pleased to note the presence of several field foresters and policy makers– and I am confident that you will help us focus our efforts on what is really needed on the ground.

Let me also take the opportunity to thank all my colleagues for organizing this virtual workshop- a first of its kind. I trust that your deliberations over the next four hours will help shed light on important issues related to primary forests and innovative technologies in general, and in particular strengthen our efforts in advancing sustainable forest management in the region. In the spirit of the Outlook Study, which is forward-looking, we encourage you to contribute with innovative ideas and outside the box thinking to the discussions during this workshop.

I wish all of us the best of luck with the workshop.

4.2 Innovations, technology and importance of primary forests (CIFOR)

Robert NASI, Director General of CIFOR, highlighted in a short presentation entitled "*Innovations, technology and importance of primary forests"* the importance of preserving primary forests, and of innovations in forestry to sustainably produce for the bio-economy, as well as the links existing between these two topics.

He underlined our changing perception of the forest sector: traditionally seen as quite conservative, it can also be transformed by innovation. He distinguished incremental, vs. transformative and disruptive innovations; and technological innovations vs. institutional changes. He gave examples of recent or emerging technologies that have the potential to transform or even disrupt the forest sector.

He then recalled the extreme importance of preserving primary forests, threatened by climate change and human activities (agriculture, mining, infrastructure), because of the multiple ecosystem services they provide (e.g. in terms of biodiversity, carbon stock, quality and health of the physical environment). He reaffirmed that all the remaining primary forests should be protected in their large diversity, regardless of their size or importance. Bold actions, like the permanent ban imposed in Indonesia, as well as disruptive technologies and actions should be promoted to reach this objective.

Intervention (Robert NASI)

Innovation…

The forestry sector, especially in the tropics, is not widely seen as one of the most innovative sectors. One might even say it is seen as rather conservative and opaque by many. This must however change and is indeed changing.

Innovation can be incremental, transformative or disruptive. Incremental innovation occurs when a business (company or sector wide) – having reached a productivity or expansion plateau – is adding attribute to existing products, develop more efficient processes or expand into new markets. Transformative innovation leads to new products or novel entire value chains or new ways of doing business, creating new socio-economic trade-offs. Innovation becomes disruptive when a transformative innovation is so radical that it displaces existing established actors or well-known technologies.

Innovation is not only about technologies, it is also about new organizational structures, institutions and forms of governance.

Incremental innovation is relatively easy to plan and forecast, often the result of improved processes or market knowledge (e.g. flat-screen TVs); it is generally a linear process with relatively quick turnover of "new" products (e.g. yearly new smartphone models that are only marginally different to the previous generation). Transformative or disruptive innovations are not easily predictable and are often the result of a "crazy" idea matching a not yet known demand (e.g. the smartphone itself); it is

never linear, progresses by leaps and bounds and ultimate outcomes are not really known in advance.

Incremental innovation is generally coming from within the sector and in tropical forestry, we can cite reduced impact logging, high-carbon stock or high-conservation values, breeding and GMOs. Some innovations, already widespread in the temperate forestry world, like precision forestry, cross-laminated-timber, etc., have still to make their way into tropical forestry operations. Transformative innovation, on the other side, is often coming from a very different sector and takes more time and efforts to be tailored for specific uses in or adopted by other sectors. It also requires the congruence of several conditions: versatility of the innovation (can it be used outside of the realm it was initially created for), existence of technology or enabling environment that can be used to expand the use of the innovation, according to the strong – yet unknown – demand for the products of this innovation. The latter being the condition for transformative to become disruptive.

So, what are the current new technologies, operation models or concepts that have the potential to transform or disrupt the tropical forestry sector? On-going examples of potentially disruptive innovations in the forestry sector are more numerous than generally thought for our perceived conservative sector. Bio-technology advances used in tailoring trees in plantations (e.g. reducing amount of lignin in wood to improve pulp yield or increasing it to produce biomass for energy; cellulosic derived sugars for bio-plastics or bio-fuels). Using drones equipped with advanced sensors (e.g. LIDAR) for management surveys or fire detection or illegal logging reporting has huge potential in saving costs and protecting resource.

Rethinking forest, plantation and tree product ownership with a greater involvement of individuals and communities (rather than following a classic industry concession ownership) could provide significant expansion potential of tree cover into private or community land as well as increased diversification and better livelihoods for the rural dwellers.

The previous examples are already in use in some places but need a wider adoption in the tropical forestry sectors.

Other innovations have probably an even higher potential for transformation and disruption but are yet to be applied in any meaningful scale in our tropical forestry sector. These often require the existence of a given “technology” and an associated “platform”. We will simply highlight two examples that we believe will change the future of our sector and of society at large. Digitalization: drones equipped with new sensors combined with more and more accessible and accurate satellite data supported by increasingly affordable data storage, distributed calculation capacities and virtual reality will change completely the way we manage forests or plantations at all scales. Blockchain and other fintech[6] developments supported by mobile applications although created for a very different purpose have immense potential in securing land rights, transactions and increasing transparency in any forestry-based operations.

Let’s remind us however that for this to happen, we will need forests, plantations and trees managed by well-trained women and men who can make a decent living by sustainably managing the resource. That brings us to the second point of the talk: preserving primary forests (and yes many of the innovations above could be applied to the task).

Primary forests

Primary forests are those forests largely unaffected by human activities, and they are therefore extremely important for biodiversity conservation and other reasons. The ecosystem carbon stock of primary tropical forests is estimated at 141–159 Pg C (billion tonnes of carbon) about 49–53 percent of all tropical forest carbon. They also harbor the largest biodiversity of any terrestrial ecosystems.

[6] Financial technologies

Of the region's 723 million hectares of forest, of which only 19 percent (140 million hectares) is primary, which is much lower than the global average (32 percent). The conservation of primary forests in the region and the sustainable management of other natural forests is therefore urgently needed to safeguard biodiversity, ecosystem services and the quality and health of the physical environment.

These remaining primary forests are of very diverse nature and extent and linked together by one single imperative: they must be protected. There should not be any industrial extractive activities allowed in the remnant primary forests. No primary forest should be considered too small or not important enough to be protected.

Some are probably doomed to extinction because of climate change, especially the tropical montane cloud forests in many of the Pacific Islands unless we implement some disruptive technologies and actions. Others are destroyed by direct human activities (agriculture, mining, infrastructure) and here we are totally responsible and should take the right decisions based on long-term sustainability and not short-term financial profit. Here the decision is not a technologically difficult one, it is a political one.

Initiatives likes the one put in place by Indonesia putting a permanent ban on industrial activities or concessions in primary forests are to be promoted and used as an example for other countries

4.3 Following up on the Third Asia Pacific Forest Sector Outlook Study (FAO)

In his presentation, building on the main findings of the Outlook Study, Rao MATTA (FAO-RAP, Bangkok) introduced the two topics to be discussed during the workshop.

He first recalled that the primary forest area now represents only 19 percent of total forest area in the Asia-Pacific region, much lower than the global average (32 percent) and is still declining in most countries, particularly in Indonesia and Papua New Guinea. Among the drivers of this decline, elaborated in more detail in the Outlook Study, he mentioned: climate change, economic growth, infrastructure development, deforestation, logging, systemic governance failures, especially in regulating logging concessions and shifting cultivation. He underlined the vital importance of primary forest conservation through improved governance and policies; monitoring and awareness raising; innovative technology and finance; networking and partnerships.

He then listed examples of innovative technologies and underlined their uneven adoption across the region and their huge, yet largely untapped, transformative potential for the forest sector. He highlighted the enabling environment needed to support innovation: conducive policies and laws, strategic partnerships, investment in R&D, technology transfer, communication and infrastructures. He recalled that potential negative impacts of innovative technologies should also be considered, in particular their impacts on employment.

In conclusion, he reminded the roadmaps' objectives: improving our knowledge and understanding of the two areas of concern; increasing awareness and action at various levels; enhancing partnerships and collaboration. He informed the participants that a technical paper, informed by science, will be prepared on each topic, as well as a policy brief to trigger policy and concrete action. He finally announced the expected outputs of this inception workshop: sharing a common understanding on the general direction of the study; identifying experts and organizations willing to further contribute to the study; building a strong and broad community that will accompany the development of the roadmaps.

All the presentations (.ppt) made during this workshop are listed at the end of the document (**Appendix 5**).

Vincent GITZ concluded the set of opening remarks by presenting this inception workshop as the first step of a very important process and inviting all the participants to engage in the participative development of the roadmaps and help the CIFOR/FTA and FAO working team reaching other experts, not present in the workshop, but interested to make valuable contributions.

5 Primary forest conservation

5.1 Plenary session: presentation of the scoping note (CIFOR)

Yves LAUMONIER, Senior Scientist in CIRAD, seconded to CIFOR, presented the objectives of the primary forest study, the method to be followed and the questions that will structure the breakout group discussions (see **Section 5.3**). His full presentation (.ppt) is included in **Appendix 5**.

The study will build on the FAO (2018)[7] definitions of forest, natural forest and primary forest[8]. Within this broad definition, the study will highlight the huge diversity of primary forest ecosystems in the regions, as well as their multiple ecosystem functions. Yves LAUMONIER also raised the question of the minimal relevant size, allowing the proper functioning of all the natural processes, that should be considered to define a remaining forest fragment as intact primary forest.

The study will describe the status, trends and outlook of primary forests in the region. Primary forest area, already relatively low in the region, is still declining. Primary forests degradation and fragmentation, he said, further weaken ecosystem resilience. Reversing this trend, he affirmed, must be a priority for the region in the next decade to ensure our survival, notably in the face of climate change. The study will finally draw a broad picture of forest governance at different scales, covering a range of issues - from land tenure security, access to natural resources, to participation of local communities in decision making – and formulate key recommendations for primary forest conservation.

This study will mobilize FAO and FTA experience, expertise and knowledge. It will be developed through a participative process involving a wide range of key regional stakeholders and technical experts, paying a specific attention to the contribution of youth. This initial inception workshop will be followed by more technical workshops at critical stage of the process. A validation workshop will be organized at the end of the process possibly back-to-back to the XV World Forestry Congress, to be held in Seoul, Republic of Korea, 24-28 May 2021.

5.2 Breakout groups: organization of the discussions

At the end of the plenary participants broke out in 7 smaller groups to allow more interactive and fruitful discussions. Registered participants to the workshop were pre-affected to the different groups before the workshop in order to ensure a certain level of diversity and representativity within each group and to save time for substantial discussions during the workshop itself.

Each breakout group was given one hour to answer collectively a set of predefined questions (see **Section 5.3**), under the leadership of a chair-person, with the support of a rapporteur, both of whom have been selected and briefed ahead of the meeting.

The discussions in each group were summarized by each rapporteur in a common template and reported by each chair to plenary. **Appendix 2** gathers the reports of the seven breakout groups on primary forest conservation, including for each group:

- its composition,
- the guiding questions discussed by the group (a sub-set of the 4 questions presented in **Section 5.3**),
- the main points emerging from the discussions on each question,
- a summary for the chair's report to plenary.

[7] **FAO.** 2018. *Terms and definitions. FRA 2020.* Global Forest Resources Assessment 2020. Forest Resources Assessment Working Paper 188. Rome. http://www.fao.org/3/I8661EN/i8661en.pdf

[8] Primary forests are "naturally regenerated forests of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed" (FAO, 2018).

5.3 Break out groups: guiding questions

Four questions were proposed to structure the breakout group discussions:

Q1. According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?

Q2. According to you, what are the "hotspots" for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?

Q3. Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

These questions were circulated to all invitees a few days before the workshop to leave them enough time to get prepared for informed discussions, and to allow those unable to attend the workshop to provide written comments.

To enable more in-depth discussions, each group focused on a sub-set of questions as indicated in the table below (see also **Appendix 2**):

	Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**	**Group 6**	**Group 7**
Q1	X	X	X	X			X
Q2		X	X	X	X	X	
Q3	X	X			X	X	X
Q4	X	X	X	X	X	X	

5.4 Breakout groups: reports to plenary

The chairs of all breakout groups were invited to report to plenary the most salient points emerging from the discussions. These points are summarized below, organized around the four guiding questions presented in the previous section. For more details on the breakout groups discussions see **Appendix 2.**

Q1. According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?

The breakout groups discussed the natural and human drivers of forest degradation as well as the multiple ecosystem services that forests provide to the communities. Among the main challenges / threats facing primary forest conservation, they mentioned:

- Climate change and natural disasters: wildfires, droughts, storms, volcanic eruptions, invasive species and pest outbreaks.
- Population and economic growth, which increase pressure on natural forests.
- Overharvesting of wood (including for firewood or charcoal).
- Illegal logging and illegal activities (hunting and poaching) in forests.
- Conflicting land uses. Agriculture expansion (shifting cultivation, conversion to monoculture plantations, cattle grazing). Industrial and infrastructure development (e.g. dams, roads), mining, urbanization.
- Waste and inefficient use of wood and other natural resources.
- Pollution.
- Conflicting mandates, incoherence of policies across sectors (environment, agriculture, economic development) and across scales (at national, sub-national and local levels).
- Corruption. Weak governance and weak law enforcement, in particular regarding land access and tenure rights.

- Covid-19 reverse migration: due to the pandemic, people go back to their villages, increasing the pressure on natural forests.
- War and conflicts.

Q2. According to you, what are the "hotspots" for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?

In the breakout groups, participants identified many hotspots for primary forest conservation in the Asia-Pacific region (not mentioned here by order of importance). They defined these hotspots either in terms of geographical area (e.g. Vietnam, Thailand, Myanmar, Indonesia, Malaysia, Borneo, Papua New Guinea, Solomon Islands, Vanuatu, the Maldives, the lower Mekong region, the Yunnan, etc.) or in terms of forest ecosystems or functions (e.g. New Zealand rainforest, cloud forests, montane forest including Himalayan forests, peatlands, coastal forests including mangrove forests in India, erodible lands, important water catchment areas, habitat for wildlife and endangered species). Participants expressed particular concerns for the situation in Indonesia and Papua New Guinea where primary forest area have declined sharply over the past decades.

The Asia-Pacific region is huge and contains multiple and very diverse hotspots; making it hard, if not impossible, to draw an exhaustive list of these hotspots. However, a more accurate knowledge of these hotspots could help develop efficient conservation strategies and prioritize conservation efforts. It is also important to anticipate the emergence of new hotspots in the future to start acting for conservation before it is too late. Hence, participants suggested to develop during this study a list of criteria that could help describing and mapping the hotspots of the whole region. Among possible criteria, participants mentioned the following ones:

- *Size.* Participants raised the question of the minimal size that should be considered to define a primary or intact forest. For some participants, conservation efforts should prioritize the larger patches where natural processes still work properly. For some participants, all remnant primary forests are worth considering and even the smallest patches should be protected. Fragmentation should be considered, but also connectivity between fragments (e.g. "ecological corridors" that perform a range of ecosystem functions).
- *Level of threats* and pressure (last frontier effect) as well as rapidity of change.
- *Ecosystem environmental value:* richness and uniqueness of the ecosystem (considering eco-floristic zoning[9]), biodiversity (including endangered species), endemism, ecological functions (e.g. carbon storage or watershed protection).
- *Ecosystem social, economic and cultural values,* considering that different stakeholders, with different views, traditions and interest, will value differently the same ecosystem.

Q3. Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?

The breakout groups discussed the transformations and institutional changes required to prevent further deforestation, fragmentation and forest degradation.

Participants mentioned the need to adopt a holistic, integrated, cross-sectoral and multi-stakeholder perspective. Primary forest conservation is a complex issue: addressing it supposes a fundamental change in human behaviour, as well as the collective engagement of all stakeholders (from governments, private sector and civil society) to work together at all scales. Remnant primary forest fragments should be considered within a broader landscape. Primary forest conservation should engage high-level political decision-makers, not only from the forest sector, but also from sectors outside forestry, in particular agriculture, mining, infrastructures and urban development, because of their direct impacts on deforestation, fragmentation and forest degradation. Similarly, primary forest

[9] See for instance the work of FAO and UNESCO on eco-floristic zoning.

conservation strategies should consider the dynamics at stake in other natural forests and in planted forests. For instance, harnessing the potential of planted forests as a primary source of wood would reduce the pressure on the remaining natural and primary forests and would provide an alternative to illegal logging.

Participants insisted on the importance of education, information, and communication. Training and capacity building will enable forest stakeholders, particularly small-scale actors and local communities, to exercise their rights, access to technologies and markets, and improve their livelihood. A better understanding and consideration of the perspectives of young people is needed, since they will become tomorrow's leaders, responsible for sustainable forest management.

Participants considered that a lot of policies and regulations already exist. The biggest institutional challenges lie in sustainable financing in the medium- and long-terms, and in effective enforcement and implementation of existing laws and rules.

The discussions highlighted that respecting customary rights of indigenous peoples and local communities and considering indigenous and traditional knowledge can be instrumental for primary forest conservation. Participation of indigenous peoples and local communities in decision-making must be encouraged. Land access and tenure rights must be clarified, strengthened and enforced to protect the rights of the most vulnerable forest-dependent people and communities. Legal protection of primary forests and appropriate land planning mechanisms[10] must be effectively enforced to support forest conservation, considering the rights and needs of local populations and indigenous peoples. Legal instruments, such as logging bans in primary forests, should be considered and promoted.

Most primary forest values are not marketed, nor even recognized. Participants considered various policy tools recognizing the different values of primary forests to incentivise conservation actions, such as: payments for ecosystem services, forest bathing or ecotourism promotion. Reducing waste and improving resource use efficiency would provide a better economic return for forest-dependent people. This would increase the value of and reduce the pressure on remaining natural forests, thus contributing to their conservation and sustainable management.

The failure to accurately monitor the value of primary forests is seen as one of, if not the biggest threat to their conservation. Participants underlined the need to monitor and map more accurately the current extent and status of primary forest in the region, to better inform primary forest conservation strategies and programmes.[11] In that perspective, countries should work together to harmonize their definitions of primary forest, as well as the corresponding metrics and assessment methods. These definitions and metrics should reflect the diverse perceptions and views of diverse stakeholders, including indigenous peoples. Information and Communication Technologies (ICTs) hold a huge potential to improve data collection, data quality, information-sharing and transparency on primary forest status and trends.

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

The scoping note must clarify the role of the roadmap. Its elaboration should involve largely regional experts and policy-makers. The roadmap must suggest practical solutions to inform primary forest conservation policies in the region.

Building on the suggestions made during the workshop, the study should start from the functions and services provided by primary forests, some of which can also be delivered by old-growth secondary

[10] For instance, in Brazil, land-owners are required by the law to set aside a portion of their land for conservation purpose.

[11] A participant highlighted that, in Philippines, the most accurate forest maps are often used by illegal loggers.

forests, and develop a matrix of criteria to identify and map the hotspots/priorities for primary forest conservation across the region.

The study should: provide an overview of the regulations in place and of their actual implementation; inform on existing good practices and successful national legislations; and, suggest innovative regulatory frameworks.

6 Innovative forest technologies

6.1 Plenary session: presentation of the scoping note (ICRAF)

James ROSHETKO, Senior Agroforestry Systems & Integrated Natural Resources Management Scientist, ICRAF, presented the objectives of the innovative forest technologies study, the method to be followed and the questions that will structure the breakout group discussions (see **Section 6.3**). The full presentation (.ppt) is included in **Appendix 5**.

Building on the findings of the APFSOS III, he distinguished two categories of innovative technologies: (i) new technologies still in development phases: (ii) recent technologies emerging for new purposes or in new contexts. He highlighted the huge opportunities and challenges for sustainable forest management associated with the use of innovative technologies in the Asia-Pacific region. In particular, he said, these innovative technologies have the potential to out-perform current technologies or to provide completely new functions or applications. He gave examples of innovative technologies, developed either outside or within the forest sector, including ICT technologies, process innovation or new wood-based materials.

He discussed pros and cons of innovative technologies as well as some of their key impacts. A key advantage of innovative technologies is attracting young people to work in the forestry, forest management and conservation sectors. Others are reducing operational cost, increasing productivity, developing new products, enabling increased reuse and recycling, reducing adverse environmental impacts, improving energy efficiency, and increasing transparency in forest governance. A potential drawback is the improperly utilization of innovative technologies could accelerate exploitation, deforestation and forest degradation. Other concerns include the loss of unskilled labour jobs, which would negatively impacting communities involved in the traditional and labour-intensive forest management systems common across the region.

He recalled that this study aims at evaluating how the application of innovative technologies in the forest sector can contribute to sustainable forestry and sustainable forest management in the Asia-Pacific region. This study will be developed through a participative process consisting of: (i) a web-based survey; (ii) a series of online interviews; (iii) a set of additional technical workshops; (iv) a validation workshop at the end of the process possibly organized back-to-back to the XV World Forestry Congress. This process will pay a specific attention to the contribution of students and young professionals. An essay competition will be organized to gather and emphasize their views and ideas.

6.2 Breakout groups: organization of the discussions

At the end of the plenary participants broke out in 7 smaller groups to allow more active interactions among participants and fruitful discussions. Registered participants to the workshop were pre-affected to the different groups before the workshop in order to ensure a certain level of diversity and representativity within each group and to save time for substantial discussions during the workshop itself.

Each breakout group was given one hour to answer collectively a set of predefined questions (see **Section 6.3**), under the leadership of a chair-person, with the support of a rapporteur, both of whom have been selected and briefed ahead of the meeting.

The discussions in each group were summarized by each rapporteur in a common template and reported by each chair to plenary.

Appendix 3 gathers the reports of the seven breakout groups on innovative forest technologies, including for each group:

- its composition,
- the guiding questions discussed by the group (a sub-set of the 4 questions presented in **Section 6.3**),
- the main points emerging from the discussions on each question,
- a summary for the chair's report to plenary.

6.3 Breakout groups: guiding questions

Four questions were proposed to structure the breakout groups' discussions:

Q1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

Q2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

Q4. Do you have any further comment on the scoping note?

These questions were circulated to all invitees a few days before the workshop to leave them enough time to get prepared for informed discussions, and to allow those unable to attend the workshop to provide written comments.

To enable more in-depth discussions, each group focused on a sub-set of questions as indicated in the table below (see also **Appendix 3**):

	Group 8	**Group 9**	**Group 10**	**Group 11**	**Group 12**	**Group 13**	**Group 14**
Q1	X	X	X	X			X
Q2	X	X		X	X	X	X
Q3	X	X	X	X	X	X	
Q4	X	X	X		X	X	X

6.4 Breakout groups: reports to plenary

The chairs of all breakout groups were invited to report to plenary the most salient points emerging from the discussions. These points are summarized below, organized around the four guiding questions presented in the previous section. For more details on the breakout groups discussions see **Appendix 3.**

Q1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

The breakout groups highlighted the potential contribution of innovative technologies to primary forest conservation and sustainable forest management. Among the most promising innovative technologies, they identified four main categories listed below.

Information and Communication Technologies (ICTs). Digital technologies - including drones, satellite-based observations, light detection and ranging (LIDAR), RADAR,[12] and other remote-sensing technologies, acoustic and camera monitoring, mobile Apps, early warning systems, GPS

[12] Radars (Radio detection and ranging) can penetrate through clouds which limit optical instruments' detection capacity from space.

and geographic information systems, social media, cloud computing and big data etc. - can help: monitor and map forest status and trends in the region; detect early forest fires and other natural or human threats; track illegal logging and other illegal activities; clarify forest tenure and access rights; thus improving transparency and accountability and advancing forest conservation and sustainable management. Online platforms, such as SEPAL[13], Global Forest Watch[14] and others, are collecting and sharing largely 'real-time' data that can inform more reactive and effective sustainable forest management strategies. The Covid-19 pandemic provides an incentive to better use such digital platforms and tools. Digital technologies make monitoring more efficient, accurate, affordable and accessible. They can also highlight the ecosystem services provided by forests and help promote them, including through ecotourism. Digital technologies (e.g. social media, video-conferencing) can also encourage more active participation in decision-making, and facilitate innovative governance mechanisms. These tools can also promote citizen science and citizen control. They can be very powerful, but they should be properly managed to ensure the quality of information.

Low-carbon technologies hold a huge promise to address the challenges of climate change and sustainable development. Wood-based products can provide sustainable alternatives to traditional products, non-renewable and more energy-intensive. For instance, wood-based bioplastic can be used instead of fuel-based plastics for packaging, or cross-laminated timber instead of concrete and steel as construction material.

Biotechnologies. Genetics can be used to improve productivity or resource use efficiency, adapting a trait characteristic to the expected use of the product (e.g. reducing the amount of lignin in wood to improve pulp yield or increasing it to produce biomass for energy). DNA identification can improve traceability in forest value chains, contributing to prevent illegal logging. Participants raised the difficult question of how to broaden the access to these genetic resources, including for smallholders and local communities: how to match the improved genetic material to the right site? How to make the germplasm available at reasonable prices?

Fintech. Innovative technologies (e.g. blockchain) and mechanisms (such as blended finance, green bonds, responsible investments and crowdfunding) can revolutionize finance for sustainable forest management. The challenge remains how to utilize and deploy these financial innovations.

Q2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

The breakout groups discussed the different impacts of innovative technologies, including in terms of livelihoods and employment. Most participants shared the feeling that innovation will likely improve the situation and that benefits will outweigh the risks.

Innovative technologies can provide new products and services, improve productivity and cost-efficiency, thus generating further income and employment opportunities in the forest sector. Innovative technologies, including new processing technologies, have the potential to reduce waste and improve resource-use efficiency, thus increasing profitability of the forest sector and contributing to sustainable management of natural forest resources. They can also limit or avoid collateral environmental damages to ecosystems (e.g. pollutions, destruction of untargeted organisms or species). Product and process innovations can help to preserve natural and primary forests by opening new markets for certain wood products (e.g. small-diameter timber or fast-growing tree species).

Innovative technologies have the potential to generate new skills and new job opportunities (e.g. drone operator). Innovative, safer and greener jobs can help make the forest sector more attractive, in particular to young professionals, who will be the forest managers of tomorrow. However, innovative technologies, including automation, might also lead to the loss of many unskilled jobs and exclude

[13] See: http://www.openforis.org/tools/sepal.html
[14] See: https://www.globalforestwatch.org/

many people with limited human or financial capacity to use them. Innovative jobs might benefit skilled external people more than local communities. Participants considered how to recycle unskilled jobs and create more job opportunities for the local population in a strengthened local, circular, biomass-based economy. Local production of high value for low volume products should be prioritized, instead of exportation of low value raw material, to reap benefits locally and create local jobs with value added through transformation. The breakout groups highlighted the important roles of capacity building, technological transfer and south-south cooperation.

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

The breakout groups identified two main barriers limiting the uptake and upscaling of innovative technologies: (i) the lack of capacity (in terms of infrastructures and equipment, human capital and financial resources); (ii) policies and regulations.

One of the major challenges is to "scale-down" innovative technologies, so that they can also benefit to traditional users, smallholders and local communities, even with limited human and financial resources, and in remote areas. In other words, technologies should benefit those who really take care of forests. Participants recalled that technology adoption is highly context-specific and very uneven across the region. To be adopted, a technology must be adapted to the local context (e.g. income and education levels, labour market, infrastructure, cultural values, etc.). This is why technology dissemination needs to follow a decentralized, bottom-up process, starting from local needs and engaging local communities. Investment, infrastructure (e.g. access to electricity and the Internet), education and capacity building will be key not only to facilitate access to innovative technologies, but also to support those at risk of losing their jobs because of technology (e.g. older, local, and unskilled workers). Public procurement and public support of research and development are powerful tools to support the uptake and upscaling of innovative technologies. Private sector, as part of multi-stakeholder approaches and partnerships, will be crucial for technology-transfer and dissemination.

Innovative technologies and their potential applications are rapidly evolving. Some participants highlighted the long timeframe of tree growing, which does not match the rapid evolution of technologies and rapid shifts in wood demand. In this changing context, policies often lag behind technological advancements and may restrict the use of new technologies (e.g. legal restrictions of drone flights; use of wood-based products in tall-building construction; etc.), thus limiting their potential benefits. However, strong regulations are needed to limit the negative impacts of innovative technologies. Regional and international cooperation, including further work to increase the harmonization and interoperability of national rules, norms and standards, is needed to support the uptake and upscaling of innovative technologies.

Q4. Do you have any further comment on the scoping note?

The study needs to clarify the definition of "innovative" technologies. Some participants found that the scope is too broad and that the study should focus only on the most promising technologies, building on the answers to question 1 above.

The current version of the scoping note focuses almost exclusively on the "what", listing the "innovative" technologies that should be covered by the study, but does not really cover the "who" and the "how". The study needs to focus more on the use of and access to innovative technologies than on the technologies themselves. It should describe the innovation process of dissemination of new technologies, the actors involved and the related challenges in terms of financing, education and capacity building. The study should not neglect the gender dimension of access to technologies.

The important question in this study is not the "what" but the "why". The study shouldn't start by listing innovative forest technologies but by identifying and categorizing the functions and needs to be addressed by these technologies, keeping in mind that these functions and needs may vary across

contexts. Assessing the performance of each technology (strengths and weaknesses, pros and cons) in addressing these needs could contribute to identify the gaps, i.e. the key needs and functions currently not addressed, as well as the emerging technologies or technologies imported from outside the forest sector, that could fill these gaps. This assessment would also offer a method to compare very different innovative technologies, whether “modern” or “traditional”. The study should not neglect traditional and indigenous knowledge which, matched where appropriate with “modern” technologies, could bring transformative changes in the forest sector.

The study should demonstrate the potential contribution of innovative technologies to primary forest conservation and sustainable forest management. It should also consider the negative impacts of new technologies across scales, as well as the associated uncertainties or knowledge gaps, in particular their impacts on local communities (access to natural resources, food security and livelihoods), on natural ecosystems and on biodiversity.

The study should embrace not only primary forests or sustainable forest management but also forest and landscape restoration and all forest industries and value chains. It should analyse not only technological but also institutional innovations. It could also be inspired by innovative approaches outside the forest sector (e.g. smart city approaches, urban forestry, urban greening, artificial intelligence). Some participants proposed that the study could cover the application of innovative technologies outside the forest sector (e.g. sustainable agricultural intensification) that can reduce the external pressures on forests, particularly on primary forests. Many technologies are available but there is no systematic understanding of how these technologies can be used, accessed or applied to sustainable forestry.

Some participants found that the communication dimension is neglected in both scoping notes. Consumers have the power to orient the forest sector towards sustainability. It is fundamental that the roadmaps contribute to raise consumer awareness on the two topics discussed during this workshop. A communication package should be developed.

7 Wrap-up and next steps

7.1 Wrap-up (FAO)

Thomas HOFER concluded the workshop, appreciating the fact that most people were still connected after 4 hours of intensive discussions and commending the audience for its high-level of enthusiasm, interest and engagement in the discussions.

He shared a few general comments that emerged from the discussions on each topic. To be effective, the protection of natural and primary forests needs to consider the diversity of local contexts and national circumstances. Remnant primary forests must be considered within a broader landscape, considering the surrounding areas (agriculture, urban, …) which directly or indirectly impact forests. Many innovative technologies that can potentially transform or disrupt the forest sector in the Asia-Pacific region are already available but, he said, we don’t have a systematic understanding of their benefits and constraints, including for local communities. The study will help the region to get better prepared to harness fast evolving technologies.

He listed the main general points he retained from the discussions. We need better clarity in the definitions used for both topics. Facing the challenges associated with primary forests conservation and application of innovative technologies in the forest sector requires a multi-stakeholder and cross-sectoral approach, paying a special attention to the voice of young people that are usually much more tech-savvy and that will be the decision-makers of tomorrow. The discussions have evidenced how much the two topics are in fact connected and inter-related. They have confirmed that the publication of the Outlook Study was not the end but rather the beginning of a long-term follow up process. In our future work on the two studies we always have to keep the big picture in mind as well as the regional and global frameworks to which we contribute, including: APFC, United Nations Decade on Ecosystem Restoration, Global Forest Goals, SDGs, etc.

In the spirit of the Third Outlook Study, Thomas HOFER invited all participants to adopt, for this study, a forward-looking perspective. Starting from what we know, we need to “go to the unknown” and explore new directions, keeping in mind the big picture and the contribution that this study could make to the sustainable development goals. He finally thanked all the participants for their attention and perseverance during the workshop and invited them to remain committed and to continue to contribute actively to the work ahead.

7.2 Next steps (CIFOR)

Vincent GITZ closed the workshop. He reminded the audience that the results of this workshop will be largely communicated and described the next steps. The scoping notes will be revised, based on the comments received during the workshop. A Google form allows all participants to provide additional written comments, examples, case studies about the two topics, as well as resource persons that could provide valuable contribution to the roadmaps. An open electronic consultation will be launched on both topics. A call for contribution will also be organized for students and young professionals to gather their views on innovative forest technologies. Technical inputs will also be gathered through direct interviews of key regional stakeholders and reviews of the existing literature. Additional technical workshops will be organized, as appropriate, at critical steps of the process of development of the roadmaps. The results of this work will be presented during a regional and multi-stakeholder validation workshop to be held possibly back-to-back to the XV World Forestry Congress (Seoul, Republic of Korea, 24-28 May 2021).

Appendix 1. List of participants

The table below contains basic information on the people that registered for or attended to the inception workshop, as filled by the participants themselves in the registration form.

Name, Given name	Gender	Country	Organization
Amanubo Amos	Male	Uganda	International Forestry Students Association (IFSA)
Animon Illias	Male	Thailand	FAO
Baldwin Brian	Male	Italy	Consultant
Barbour Liz	Female	Australia	University of Western Australia
Binti Farazi	Female	Bangladesh	FAO
Bontuyan Philip	Male	Lao PDR	GIZ
Branthomme Anne	Female	France	FAO
Brawner Jeremy T.	Male	USA	University of Florida
Brown	Male	Australia	Forest Research Institute - USC
Bull Lyndall	Female	Italy	FAO
Byambasuren Oyunsanaa	Male	Mongolia	Department of Forest Policy and Coordination, Ministry of Environment and Tourism, Mongolia
Coroza Oliver	Male	Philippines	Center for Conservation Innovations Ph
De Lu	Male	China	Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet)
Durst Patrick	Male	Thailand	Asia Forests
Edirisinghe Nishantha	Male	Sri Lanka	Forest Department
Ei Ei Swe Hlaing	Female	Myanmar	Forest Research Institute
Elliott Stephen	Male	Thailand	Chiang Mai University
Endozo Claudett	Female	Philippines	Department of Environment and Natural Resources- Forest Management Bureau
Evans Melissa	Female	New Zealand	Scion
Faisal Hussain	Male	Maldives	Ministry of Fisheries, Marine Resources and Agriculture
Gan Kee-Seng	Male	Malaysia	Asia Pacific Association of Forestry Research Institutions (APAFRI)
Gerrand Adam	Male	Indonesia	FAO
Gitz Vincent	Male	Indonesia	CIFOR/FTA
Hampton Ross	Male	Australia	Australian Forest Products Association (AFPA)
Hansen Eric	Male	USA	Oregon State University
Herbohn John	Male	Australia	University of the Sunshine Coast
HJ. Abdul Khalim Bin HJ. Abu Samah	Male	Malaysia	Forestry Department Peninsular Malaysia
Hofer Thomas	Male	Thailand	FAO
Inthirath Baisone	Female	Lao PDR	National Agriculture and Forestry Research Institute (NAFRI), Ministry of Agriculture and Forestry (MAF)
Jadin Jenna	Female	Thailand	RECOFTC - The Center for People and Forests
Jigme Dorji	Male	Bhutan	Department of Forest and Park Services
Johnson Kristofer	Male	Bangladesh	FAO
Joowon Park	Female	Republic of Korea	Asian Forest Cooperation Organization (AFoCO)

Name, Given name	Gender	Country	Organization
Kabigting Ray Thomas	Male	Philippines	Department of Environment and Natural Resources- Forest Management Bureau
Keenan Rodney	Male	Australia	University of Melbourne
Kong Young-Ho	Male	Cambodia	Korea-Mekong Forest Cooperation Center
Kono Marija	Female	Canada	US Forest Service International Programs
Laumonier Yves	Male	Indonesia	Center for International Forestry Research (CIFOR)
Lee Stephanie	Female	Canada	Independent Consultant
Li Yanxia	Female	China	International Bamboo and Rattan Organisation (INBAR)
Mahoney Jesse	Male	Australia	Australian Government Department of Agriculture, Water and the Environment
Mateboto Jalesi	Male	Fiji	Pacific Community (SPC)
Matta Rao	Male	Thailand	FAO
May Mike	Male	Brazil	Suzano/FuturaGene
Meechantra Kallaya	Female	Thailand	FAO
Meybeck Alexandre	Male	Italy	CIFOR/FTA
Nair CTS	Male	India	None - Formerly FAO
Nasi Robert	Male	Indonesia	Center for International Forestry Research (CIFOR)
Nguyen Manh Hiep	Male	Viet Nam	Department of Protected Forest Management
Norbu Chencho	Male	Bhutan	Asian Forest Cooperation Organization (AFoCO)
Norbu Wangdi	Male	Bhutan	Department of Forests and Park Services
Nyi Nyi Kyaw	Male	Myanmar	Forest Department
Ogawa Shun	Male	Japan	Forestry Agency
Page Tony	Male	Australia	University of the Sunshine Coast
Pauig Cathy	Female	Philippines	Department of Environment and Natural Resources- Forest Management Bureau
Payn Tim	Male	New Zealand	Scion
Payuan Edwin	Male	Lao PDR	RECOFTC - The Center for People and Forests
Piazza Marco	Male	Thailand	FAO
Pingault Nathanaël	Male	Italy	CIFOR/FTA
Putz Jack	Male	USA	University of Florida
Quyen Nguyen	Female	Viet Nam	Asian Disaster Preparedness center
Rico Edmund Leo	Male	Philippines	Center for Conservation Innovations Ph
Rocas Nelissa Maria B.	Female	Philippines	Department of Environment and Natural Resources- Forest Management Bureau
Roshetko James M.	Male	Indonesia	ICRAF, World Agroforestry Centre
Sapkota Lok Mani	Male	Nepal	RECOFTC - The Center for People and Forests
Sarigumba Maria Paula	Female	Philippines	University of Saskatchewan
Shengfu Wu	Male	China	China National Forest Products Industry Association
Silori Chandra	Male	Thailand	RECOFTC - The Center for People and Forests
Sinha Rakesh	Male	India	FAO
Smithies Chris	Male	Lao PDR	Earth Systems

Name, Given name	Gender	Country	Organization
Suntra Hang	Male	Cambodia	Forestry Administration
Tacconi Luca	Male	Australia	The Australian National University
Tandin	Male	Bhutan	Department of Forest and Park Services
Thaung Naing Oo	Male	Myanmar	Forest Department
Ugyen	Male	Bhutan	Jomotsangkha wildlife Sanctuary
Ujihashi Ryosuke	Male	Japan	Forestry Agency of Japan
Uzzaman Arfan	Male	Bangladesh	FAO
Vave Uatea	Male	Tuvalu	Department of Agriculture
Vigulu Vaeno	Male	Solomon Islands	Solomon Islands Government
Vongsouthi Kevaly	Female	Lao PDR	Earth Systems
Walter Sven	Male	Italy	FAO
Woodgate	Male	Australia	SmartSat CRC
Xi Luo	Female	China	Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet)
Yamanoshita Makino	Female	Japan	Institute for Global Environmental Strategies
Yasmi Yurdi	Male	Cambodia	International Rice Research Institute (IRRI)
Yong Harry	Male	Malaysia	Forestry Department Peninsular Malaysia
Yutaka Machida	Male	Japan	Forestry Agency
Zahari bin Ibrahim	Male	Malaysia	Forestry Department Peninsular Malaysia
Zhe Kong	Female	China	Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet)

Appendix 2. Reports of the breakout groups on primary forest conservation

This appendix gathers the reports of the seven breakout groups on primary forest conservation, including for each group:

- its composition,
- the guiding questions discussed by the group (a sub-set of the 4 questions presented in **Section 5.3**),
- the main points emerging from the discussions on each question,
- a summary for the chair's report to plenary.

Group 1

Chair: Vaeno Vigulu
Rapporteur: Yves Laumonier

Q1. According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?

- Hotspots everywhere, well known in the region from Western Ghats to Himalaya, Yunnan, Indochina; Malaysia Indonesia; Papua; Pacific islands; Australia, New Zealand.
- Identify future hotspots, i.e. other areas that may become hotspots for conservation before it is too late.
- Small patches of natural forest are worth considering, not only the large national parks and reserves; debate until which size the patch is not considered "primary" anymore.
- Importance of considering and well defining all forest types in this AP region (climatic zone, elevation).
- Eco-floristic Zoning (UNESCO FAO) to consider (Institut de la Carte Internationale de la Végétation - ICIV Toulouse - & French Institute of Pondicherry).
- Watershed as unit is important for forest landscape management.

Not in order of importance, threats are:

- Logging,
- Unsustainable agriculture (especially conversion to monoculture plantation, e.g. oil palm, rubber),
- Cattle grazing,
- Mining,
- Oil extraction,
- Hydro-electric power dams,
- Wildfires,
- Droughts,
- Storms,
- Volcanic activity,
- Pollution,
- Industrial/infrastructure development and activities,
- Hunting and poaching,
- War/conflicts,
- Road construction,
- Uncontrolled tourism.

Q3. Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?

- Multi-stakeholder platforms and trans-disciplinary actions.
- Incentives for communities, people do not understand properly such mechanisms like payments for ecosystem services (PES).
- Ecosystem services, role of big business in investing in conservation.
- Indigenous communities must participate to decision-making.

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

- The challenge will be to assess properly the “primary” forest. It is anticipated that the assessment could be different from different perceptions in different countries or different governmental institutions, decision-makers.
- Problem of training in data management and DATA QUALITY understanding.
- Data needed to convince decision-makers.
- Mention the issue of legality. How primary forest are considered in the legislation?

Main points for Chair report (max 200 words):

Q1. Small size forests very important to consider; looking at the area with the most dramatic changes as important as just looking at hotspots; importance of better categorize various ecosystems representation (eco floristic zoning); relationship watershed and conservation/protection of hotspots.

Q3. Multi-stakeholder platforms; Landscape approach; Not only looking at present hotspots, but trying to identify the next potential hotspots; refine the hotspots; convince the decision/makers of the importance of conservation; Incentives for communities; ecosystem services; role of big business in investing in conservation; participation of indigenous communities.

Q4. Question the quality of data to discuss primary forest; problem of training young foresters in data management; lot of pressure from policy-makers, we should bring evidence that conserving forest is good (differences in perception with decision-makers).

Group 2

Chair: Maria Paula Sarigumba
Rapporteur: Rao Matta

Q1. According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?

- Land conversion,
- Invasive species,
- Challenges in law enforcement,
- Governance issues (corruption),
- Lack of private sector involvement,
- Policy/Institutional challenges (federal vs. state policies),
- Absence of strong commitment from policymakers (because of not having incentives/financial support).

Q2. According to you, what are the "hotspots" for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?

- Indonesia (primary forests, peatlands),
- Forest fires,
- Erodible lands,
- Coastal and mangrove forests,
- Cloud forests, montane forests,
- Important catchment areas,
- Wildlife/endangered species habitat,
- Forests adjacent to development zones.

Q3. Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?

- Primary forests should be designated with highest protection category in a certain country.
- Promote the economic benefits of ecotourism and forest bathing.
- Legal "personhood" or granting rights to forests/natural resources.
- Connecting fragmented forest complex (ecological corridors).
- Tenure classification needs to be clarified.
- Understand youth perspectives and provide incentives for rural youth for forest management.

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

- Countries to provide definition of some terms.
- Consult stakeholders beyond the forestry sector (i.e. Department of Conservation of New Zealand).
- Difficulty of providing maps due to clearance mechanisms.
- Provide evidence on rural youth perspectives on forest management.

Group 3

Chair: Makino Yamanoshita
Rapporteur: Illias Animon

Q1. According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?

- **Yanxia Li (INBAR):** Several species are neglected; for example, habitats of bamboo and rattan are lost. Lack of awareness of the uses of the resources is an issue. Likewise, land tenure and governance of lands under various ministries. Better adapt to climate change and the impacts of Covid-19 and provide alternate livelihoods to people. Put in place technical interventions for creating jobs.
- **Hiep Nguyen Manh (Vietnam)**: Quality of forests is not good; low population of wildlife is a problem caused by illegal activities including poaching. Need to promote benefit sharing and enhance benefits to people. Promoting sustainable forest management is the main aspect, bringing different stakeholders together. Restoring primary forests- technology needs to be known better from other places.
- **Cathy Pauig (Phillipines)**: development pressures, agriculture and infrastructure needs. Reversed immigration due to pressure like Covid-19 and they will depend on agriculture.
- **Kevaly Vongsouthi (Lao PDR)**: Climate change and wild fires are key issues. Not enough people to handle the fires.
- **Luo Xi (APFNet)**: With Covid-19 reverse migration and economic downturn challenges and they will increasingly encroach primary forests. Climate change is another challenge.
- **Makino Yamanoshita (Japan):** Primary forests are not easily accessible in Japan because they are in the steep mountainous region, so they remain intact. Climate change especially the warming is the main threat in the high mountain.
-

Q2. According to you, what are the "hotspots" for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?

- **Yanxia Li (INBAR):** Bamboo and rattan and peatlands in Indonesia.
- **Hiep Nguyen Manh (Vietnam)**: Use an internationally accepted primary forest system for harmonization with international standards. Lower Mekong region.
- **Cathy Pauig (Phillipines)**: Strengthening conservation of existing protected areas. Increase the staff and strengthen enforcement and increase finance. Protect from people.
- **Kevaly Vongsouthi (Lao PDR):** Focus on high diversity of species with less impacts on forests.
- **Luo Xi (APFNet)**: All primary forests are the hotspots. There is no need to differentiate; focus on all.

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

- **Luo Xi (APFNet)**: The roadmap has to be clearer. What is its role? How stakeholders will use it? How the study will reflect the reality in the region? What it will contain? Will they have solutions that can be considered? How to collect feedback from policy-makers/technical experts?

Main points for Chair report (max 200 words):

Q1. Climate change and wild fires, habitats loss. Illegal activities including poaching, quality loss, development pressures like agriculture and infrastructure, lack of awareness of the uses of the resources, reverse immigration due to Covid-19, land tenure and land governance. Better adapt to climate change and impacts of Covid-19. Provide alternate livelihoods to people. Technical

interventions for creating jobs. Benefit sharing and enhancing benefits to people and promoting sustainable forest management and work with different stakeholders. Technologies for restoring primary forests need to be shared.

Q2. Bamboo and rattan rich and peatlands in Indonesia. Lower Mekong region in Vietnam. Primary forests are not accessible in Japan and so they remain intact. Hotspots are different because of this reason. All primary forests have hotspots. There is no need to differentiate; focus on all. If we differentiate, use an internationally accepted primary forest system. Focus on high species diversity areas with less impacts on forests. Strengthen conservation of existing protected areas by increasing the number of staff and strengthening enforcement and increasing finance.

Q4. The roadmap has to be clearer. What is its role? How stakeholders will use it? How the study will reflect the reality in the region? What it will contain? Will they have practical solutions that can be considered? How to collect feedback from policy-makers/technical experts?

Group 4

Chair: Rod Keenan
Rapporteur: Vincent Gitz

Q1. According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?

- **Oliver Coroza:** Challenges to overcome, income diversification, livelihoods: charcoal, need alternative to firewood.
- **Rod Keenan:** Needs an institutional change and planning policy.
- **Luca Tacconi:** Lack of knowledge about which forests are primary forests? Which countries have mapped correctly in details primary versus secondary and have recognized this for land planning purposes, then anything can happen in any type of forests, be it primary or secondary? Recognized in FAO 2019 report, agricultural activities. There have been efforts to reduce illegal logging. Lack of political commitment.
- **Zahari bin Ibrahim:** Conflicting land uses. Hydro power development (Sarawak).
- **Marija Kono:** Pressures come from other sectors. Relates to how land use planning is done and overlapping priorities. How to maximize use of information from different line ministries to make smarter decisions about conservation.
- **Forest department Myanmar** -> will send written comments
- **Hussain Faisal (Maldives)**: Very specific situation as small islands. Climate change. Governments to protect forests. Protected areas. North south Mangroves: having problems of pest infestations, dying out. The bigger mangroves areas are protected areas by law.
- **Rod Keenan:** Knowledge of forest condition and mapping of primary forests or "old growth forests", assessments in some regions some time ago, but challenging also when we talk about regularly disturbed systems (by indigenous people, even if it was careful management). Challenge to define what we actually mean by primary forests and then identify mapping of where these might be. Conservation on public land is good but on private land, still areas being cleared for agriculture.
- **Vincent Gitz:** first challenge = 1) population density -> demands plus land demand on infrastructure. Special challenges (not same as Democratic Republic of the Congo, Brazil). Link to value chain development -> zero deforestation products (included exported products). Including Mangroves. 2) Link to land ownership -> and when public land to protection, concession models and their enforcement, national priorities.

Q2. According to you, what are the "hotspots" for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?

- **Rod Keenan:** Robert mentioned mountain forests, in the past they were not an opportunity for agriculture, less accessible areas.
- **Zahari bin Ibrahim:** due to rapid development, they become fragmented, due to plantation establishment, mining activities.
- **Philippines:** there are primary forests in the lowlands and in the uplands. The hotspots are those of high conservation value, high biodiversity areas, with high numbers.
- **Marija Kono:** even small forests can be important for communities.
- **Luca Tacconi:** Indonesia, Mainland Southeast Asia, old Papua.
- **Rod Keenan:** Showing the Global Land Analysis and Discovery (GLAD)[15] database and maps at the University of Maryland. Significant areas left in Indonesia, esp. Saba, Kalimantan, fewer areas in Java. Residual lowland areas.

[15] https://glad.umd.edu/

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

- Need for recognition in national legislation of the role of primary forests, look at institutional recommendations of the study.
- Need to map primary forests but to link to the mapping the status of legislations in the countries.
- Need for recommendation of the roadmap on appropriate legislation.
- Need to seek clarification in the note, on the required information on maps.
- Need to include information on countries that proved being successful in maintaining forest cover.
- What is the right target in primary forests for the Asia-Pacific region, due to particular population density in the region?
- It's difficult to track back in time the knowledge on natural regenerated forests and lessons on how human influence was harnessed in the past.
- How to differentiate primary forests and advanced secondary growth forests?
- Start from the functions and services of primary forests: these can also be delivered by old growth secondary forests. In Australia: "old growth" values, large trees, species diversity, woody debris… How these values can be accounted for?
- Can we restore primary forests, protect degraded areas to allow them to go back to the state over time? Where can this be done and how?

Main points for Chair report (max 200 words):

Q1. Main challenges:

- Lack of knowledge about which forests are primary forests? If not known, then anything can happen in any type of forests, be it primary or secondary.
- There have been efforts to reduce illegal logging. But still lack of political commitment in some places. Issue of land ownership, and concessions and their enforcement, national priorities.
- Pressures comes from other sectors (e.g. hydropower…).
- Need options for income diversification for smallholders.
- Charcoal, need alternatives to firewood.
- Needs an institutional change and planning policy.
- Population density in Asia and Pacific (different than Democratic Republic of the Congo, Brazil) -> demands on land, infrastructures and food. Link to "zero deforestation" value chain development -> zero deforestation products.

Q2. Hotspots:

- Remaining primary forests include mountain forests, in the past they were not an opportunity for agriculture, less accessible areas.
- But lowlands forests are specially under threat (e.g. peat forests).
- Specific situation of small islands e.g. Maldives, mangroves.
- Discussion on the databases existing, maps (University of Maryland and others).

Q4. Scoping note:

- Need to link forest mapping to the mapping of the status of legislations in the countries.
- Need to include recommendations on appropriate legislation and institutions.
- Need to include information on countries that proved being successful in maintaining forest cover.
- How to differentiate primary forests and advanced secondary growth forests?

- Start from the functions and services of primary forests: these can also be delivered by old growth secondary forests. In Australia: “old growth” values, large trees, species diversity, woody debris… How these values can be accounted for?
- Can we restore primary forests, protect degraded areas to allow them to go back to the state over time? Where can this be done and how?

Group 5

Chair: Mike May
Rapporteur: Alexandre Meybeck

Q2. According to you, what are the "hotspots" for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?

- **Gan Kee Seng:** Borneo hot spot because forest reducing drastically. Forest fires driven by development. Less fires this year because of Covid-19.
- **Mike May**: notes that it might be due to governance issues.
- **John Herbohn**: agrees that Borneo is a hot spot. (work of a PhD on west Kalimantan that he can share). Papua New Guinea, uncontrolled logging. Vast tracts of forests heavily degraded, then converted to oil palm. A large chunk has already been lost. Preserve what remains.
- **Mike May:** where are these logs going.
- **John Herbohn:** mainly to Malaysia. There is a desire to transform in Papua New Guinea. Economics not very transparent. (PhD student working on it, very opaque): logging companies say they lose money but they continue.
- **Mike May:** may be a role for international organizations to support the local capture of value added.
- **Wu Shengfu** working with industries and companies, wood-based panels is half wood capacity. Used for residues, fibres from city residues, plantations in China the best in the world, make some plantations everywhere. I fear guys are talking too much and not working enough. Papua New Guinea recovery of wood is very low. We could make 3 or 4 times more value: there is waste of wood, of value. Need to make technical training to make better use of the wood. What can be done well, the market is here. If every country, every industry was doing its work everything would be better. Need to go on working to better use the resource and improve the governance.
- **Mike May:** need to better use resources in order to reduce deforestation. A lot can be done by using existing technologies and working more efficiently.

Q3. Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?

- **Ray Thomas Kabigting**: forest conservation should be inside the forest. Usually we rely on bottle necks, road blocks, catch hunters and illegal loggers but trees are already cut. Need to focus on technologies that enable to prevent tree cutting, better monitoring. Land use planning very crucial. We import in the Philippines but there is also high rate of deforestation, encroachment. Land use planning is crucial.
- **Mike May:** provide incentives for those that are doing illegal logging, provide them with alternatives.
- **Ray Thomas Kabigting**: best forest guards are former illegal loggers. But government can only give that much.
- Beware of unintended consequences of policy changes. For technical and economic reasons. For instance, selective logging in Papua New Guinea. No silver bullet for such complex socio-ecosystems as forests.

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

- **Wu Shengfu:** forest people culture is an important potential for value added. For instance, in the Philippines. Needs to be organized. Transfer of skills. If they do not have anything to do, they will do illegal logging.

Main points for Chair report (max 200 words):

- Hotspots: Borneo, Papua New Guinea. Importance of drivers, development, logging. Economics of logging is opaque. Create local value chains instead of exporting, with better valorisation of resources, and better technical use of wood resource, including residues. Plantations as an alternative to illegal logging.
- Forest conservation should be inside the forest, with good monitoring. Former illegal loggers make good guards. Importance of land use planning. Of providing alternative sources of income to illegal logging. For instance, valorise culture of forest people.
- Beware of unwanted consequences of policy changes. No silver bullet for such complex systems as forests.
- Often looking for technical solutions but there are generally social issues.

Group 6

Chair: Edmund Leo Rico
Rapporteur: Nathanaël Pingault

Q2. According to you, what are the "hotspots" for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?

Participants gave examples of hotspots, including: Papua New Guinea + Solomon Islands and Vanuatu. Mangrove forests in India. Thailand/Myanmar.

However, given the huge extent and diversity of area covered by study, it might not be possible in this small group to list all the hotspots.

Hence, participants suggested to develop during this study a list of criteria that could define a "hotspot", e.g.: size, level of threats, pressures (last frontier effect), uniqueness and richness in terms of biodiversity (including threatened species) and ecosystem value, endemism, economic social and cultural value of the ecosystem to different stakeholders

All primary forests have an important role to play. We need a strategy to prioritize our conservation efforts.

Q3. Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?

Participants considered that a lot of policies and regulations are already existing.

The main challenges are:

- implementation,
- financing,
- involvement of civil society,
- capacity building in particular for enabling local communities to exercise their rights (land tenure and use rights),
- contradicting mandates across government departments. We need better cross-sectoral strategy, considering pressure on forests from agriculture, mining, infrastructures and economic development… We also need better articulation among scales (national, subnational and local levels).

Look at the dynamics at stake in secondary and planted forest as well as the impact on primary forest.

Q4. Do you have any further comment on the scoping note distributed as background document for this workshop?

The scoping note should:

- provide an overview of the regulations in place,
- show the legal issues and challenges,
- and suggest innovative regulations and good practices.

Main points for Chair report (max 200 words):

Overall, in selecting primary forest hotspots, because of the diversity across countries, in terms of policies, definitions and sizes, the group has agreed that having a scoping report with a matrix of criteria such as (size, level of threats, pressures (last frontier effect), uniqueness and richness in terms of biodiversity (including threatened species) and ecosystem value, endemism, economic social and cultural value) will help improve the report. It was also noted that national and local legislations

and mandates must somehow be harmonized as well as recognize a holistic approach that recognizes sectors outside of forestry that are potentially threatening the forest as well as maybe can contribute to the conservation of primary forest.

Group 7

Chair: Stephen Elliott
Rapporteur: Anne Branthomme

Q1. According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?

Biggest threats:

- Failure to fully understand and monetize all the values of the primary forest (ecosystem benefits).
- Resource demand driving land use changes:
    - infrastructure construction (mining) – Cambodia,
    - Forest plantation (eucalyptus, acacia),
    - Agriculture through shifting cultivation (Laos, Philippines, not in Thailand), commercial agriculture (corn in Philippines and Thailand, sugarcane in Thailand driven by new economy),
    - Rubber.
- Rising human population.
- Inconsistent policies and lack of regulatory measures.

Challenges:

- Understanding that primary forests are valuable, value to be converted to cash (Carbon credit).
- Change human behaviour, including for actors to work together.

Q3. Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?

- Policy and regulatory measures: benefit sharing for Carbon payments, tenure (who owns the trees and the carbon).
- Capacity to adopt and implement structural measures required to conserve primary forest.
- Create markets (develop the trading system in countries).
- Marketing (advertising).
- Technical Capacity for monitoring (assess the status and trends of primary forest).
- Capacity building (education, awareness raising).
- Harmonizing different ministries (agriculture and forestry): enhanced coordination and dialogue.
- Involve all actors including private sector, NGOs (we need to learn how to do that).
- Finance:
    - Access to start up investment to protect forest + monitoring, reporting and verification (MRV) funding,
    - Ensure Sustainable financing (move away from project approach).

Main points for Chair report (max 200 words):

Q1 Threats and Challenges

Biggest threats:

- Failure to monetize full values of primary forest.
- Rising resource demand, driven by rising human population, rising aspirations and global economy: plantations – wood products, oil, rubber, shifting cultivation, infrastructure construction.

- Inconsistent policies and lack of regulatory measures.

Challenges:

- Understanding the primary forest values.
- Change human behaviour, including for actors to work together.

Q3. Transformations and institutional changes

Institutional Capacity and collaboration:

- Policy and regulatory measures, particularly land tenure.
- Harmonizing among ministries.
- Private sector & NGO involvement.

Markets – create markets (develop trading system):

- Marketing (advertising).

Finance:

- Access to start up investment to protect forest.
- MRV costs (should be lowered).
- Ensure sustainable financing (move away from project donors).

Capacity Building:

- Capacity for monitoring (assess the status and trends of primary forest).
- Capacity building (education, awareness raising).

Appendix 3. Reports of the breakout groups on innovative forest technologies

This appendix gathers the reports of the seven breakout groups on innovative forest technologies, including for each group:

- its composition,
- the guiding questions discussed by the group (a sub-set of the 4 questions presented in **Section 6.3**),
- the main points emerging from the discussions on each question,
- a summary for the chair's report to plenary.

Group 8

Chair: CTS Nair
Rapporteur: Illias Animon

Q1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

- Technologies are improving, but their adoption is uneven. To address sustainable forest management and climate change issues, technologies are very relevant.
- Use of drones for forest monitoring at different levels for sustainable forest management (even in remote areas).
- Satellite technologies are improving rapidly, but interpretation ability and analysis needs considerable improvement.
- Citizen science and consequent power transfer from government to people (can be powerful; quality control is needed).
- Information and Communication Technologies (ICT) are promising for governance improvement. Encourage public-people participation.
- Early warning systems for detecting fires in an early stage is possible via ICT. Some of the innovations developed in the context of Covid-19 have potential for adaptation in the context of sustainable forest management.
- Technologies from other sectors that can be employed in forest sector.
- Industrial revolution 4.0[16] will lead to the use of a wide range of technologies, especially satellite-based technologies, drones (etc.) for resource monitoring.
- Circular bioeconomy is developing faster, wood substitution is an important aspect. Technologies in the value chain are emerging, resulting in new products and processes. Value chains not well developed yet. Need to invest more in such value chains to move away from traditional processing.
- GPS in mobile phones for locating areas.

Q2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

- Some of the technologies could reduce employment. Developing new skills for embracing new technologies is relevant.
- Trade-offs in the choice of technologies (especially increased productivity and higher incomes and reduction in the number of people employed) need to be assessed. We talk more on

16 The Fourth Industrial Revolution denotes extraordinary technological advances (e.g. artificial intelligence, digital twins…) that are merging the physical, digital and biological worlds in ways that create both huge opportunities and threats. See: https://www.weforum.org/focus/fourth-industrial-revolution

green jobs and increasing productivity, but technologies should not lead to job loss affecting livelihoods.
- New jobs emerge: for example, drone operators and others will find jobs.
- Enhancing safety is a major concern in the case of certain forestry activities.

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

- Technology adoption is highly context specific. Most technologies have been developed in a specific context. Lack of access is an issue.
- Consider a combination of technologies from different sectors, in whole value chains
- Forest sector not very popular among people. Need to use technologies to promote forest related issues among public.

Q4. Do you have any further comment on the scoping note?

- Adopt perspectives beyond the forest sector.
- Emerging areas like urban forestry requires attention.
- Gender dimensions of new technologies need consideration.

Main points for Chair report (max 200 words):

Q1. Drones, Geographic Information System (GIS), satellite related technologies, using GPS in mobile phones for identifying location, Citizen science and crowd sourcing, ICT, quality control is important.

Need to consider the entire value chains – including new products and processes and consider what is appropriate in different contexts.

Addressing access and capacity to use technologies are key to wider adoption of innovations.

Q2. Considerable potential exists for green technologies that enhance employment and livelihoods. There are trade-offs involved in the choice of technologies between economic, social, and environmental implications. New jobs are emerging, for example as drone operators. Need to inspire and attract the young people with greener jobs. Technologies will avoid injuries.

High capital needs may restrict people to embrace technologies. Appropriate technologies need to be embraced (that benefit the primary stakeholders), avoiding disruptive technologies. Increasing the opportunities for small-scale actors needs to be considered for improving livelihood opportunities. Technologies need to be adapted to the scale needed. More inclusive approach is needed than leaving some stakeholders behind. Popularizing technologies can help in greater transparency and accountability. Social media can help advance the actions for forests.

Q3. Lack of access, investments and capacity, legislation (restrictions on products/ area), lack of literacy and basic education,

Q4. Adopt perspectives from beyond forest sector, for example smart city approaches.

Group 9

Chair: Maria Paula Sarigumba
Rapporteur: James Roshetko

Q1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

- Incremental (technologies from within the sector), transformative (these technological gains often occur by leaps and bounds – many come from outside the sector), and disruptive technology.
- Examples of innovative technologies – drones, LIDAR (light detection and ranging), affordable data storage … can support effective mapping, land rights, conservation, sustainable management.
- Monitoring is essential at the government (central) and local (communities) levels. Innovative technologies make monitoring more efficient, precise, accessible, cost-effective, and storable.
- Remote sensing for data collection and analysis facilitate effective planning and management.
- It is very important to disseminate information and know-how on innovative technologies to users.
- Monitoring & Evaluation (M&E) are very important – enhancing transparency, access to information, …
- Use of innovative technologies in tracking illegal logging and DNA finger printing for forest management very important.
- M&E technology for cloud computing: also need to provide open data access to encourage transparency and level the playing field – provide opportunities to small-scale managers/producers and communities.
- User platforms for data and analysis sharing.
- M&E system – partnership with Malaysian space agency to promote precise and cost-effective M&E.
- Partnership with aerospace agencies to apply technologies in forestry sector or develop 'new' applications of those technologies to the forestry sector.
- Processing and harvesting technologies can improve cost effectiveness and productivity.
- Environmentally friendly machinery – decrease environmental damage.
- Forest fires monitoring and earlier warning detection through Information and Communication Technologies (ICT) and geospatial technology (can ICT and geospatial technology be applied to invasive species identification and monitoring also?).
- Mobile apps for M&E of forests, particularly to document degradation and causes (identifying perpetrators, etc.).
- Sensors for early detection of forest fires.
- Use of drones for planning and M&E.
- Processing technologies that increase recovery and reduce waste. What new technologies are out there that are not being used or in the generation phase?
- Genetic material / resources to improve productivity – and broad access to those resources (for small-scale managers, communities, …).
- Matching the improved genetic material to the right site. Making that information available to small-scale managers and communities (as well as making the germplasm available at reasonable prices).

Most innovative technologies have an important role in promoting, facilitating and achieving sustainable management of the region's primary forests.

Q2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

- Great potential to improve cost effectiveness of management.
- Danger of reducing work opportunities for rural people and the poor.
- Transparency increases effective forest management and opportunities for income generation: emphasis should be placed on opportunities for rural communities.
- At the large scale, innovative technologies increase effective production and reduce damage, leading to greater profitability. At the small scale (communities) transparency improves knowledge/awareness which can lead to jobs and income.
- Technology used to improve planning and management of coastal areas (parks, ecotourism sites, …) enhances protection/sustainable management of the natural resources from production uses all the way to tourism. This can (should) lead to improved eco-tourism income opportunities for local people (in places where eco-tourism is established).
- In Malaysia, the technology applied to coastal areas also protects the fisheries in mangroves and other areas. Providing sustainable and improved income opportunities at a large and community scale.
- **Thomas:** What are the advantages for small-scale forest producers? What are the e-commerce advances for the local rural populations?
- These two points are important. How to ensure application of the innovative technologies to address/provide income opportunities to rural communities and particularly the poor?
- Transfer to local communities very important: the technology, capacity to use the technology, and the access to the opportunities created by the technologies.
- Need a plan to be sure that benefits reach the communities. Target the youth (both genders) as the managers of tomorrow's forest and forest resources.
- Indirect use of the technology. Application of the technologies to improve resource management outside the forest (including on agricultural lands) 'can' reduce production/use pressure on the forest (particularly primary forests).
- Experience demonstrates that improved productivity of tree and forest products from outside the forests does not automatically reduce production pressure on the forest. Need a plan!
- Environmental services (rewards & payment) schemes could be applied here.

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

- It is not only about using the innovative technologies for M&E, but (more importantly) also about how to respond in real time to challenges identified through the M&E process; many forests (natural resource areas) are remote, requiring time to access.
- The costs of the technologies and the capacity building to use the technologies may be too high for medium-scale and small-scale operators/user; thus, deployment and use of the technologies by others put them at a disadvantage.
- Lack of knowledge and awareness of the technologies.
- Old school mentality.
- Policies often lag behind the generation of technologies. Policies were not intended to apply to the use of the technologies, but they are.
- Policies – example, drone policy lag far behind – making the use of drone ineffective or not being able to deploy all of the drone's potential.

Q4. Do you have any further comment on the scoping note?

- Innovative technologies are integrated with sustainable primary forest management.
- Dissemination of information and capacity to effective use innovative technology is essential.
- Even in rural areas, youth are often technology savvy. This is a huge opportunity to engage youth (of both genders) in forest related opportunities.

Main points for Chair report (max 200 words):

- Planning and monitoring/evaluation are huge areas of opportunity for the use of ICT and geospatial technologies.
- Much technology is available – but there is no systematic understanding of how technologies can be used, accessed or applied to sustainable forestry or forest management.
- The region needs to be prepared for the deployment of the technologies.
- Need to clarify definitions of innovative technology.
- Use of innovative technologies needs to be under multi-stakeholder and integrated landscape approaches.
- There are unknowns related to the use/application of technologies … See points above regarding how to ensure the technologies will have local benefit and utilization.

Group 10

Chair: Yanxia Li
Rapporteur: Rao Matta

Q1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

- Every kind of technology, particularly mobile phone-based technology.
- Smart technology- Realtime data on threats. Rainforest connection.[17] To detect illegal activities
- **INBAR-** Remote sensing to monitor.
- Mobile phone Apps, gives automatic report. Geospatial database. International trade of bamboo and rattan. Genetic improvement, packaging, substitution to high energy use products.

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

Barriers:

- Delay in provision of real time monitoring.
- Not all staff are familiar with new technologies. Capacity limited. Language barriers.
- Poor Internet connectivity; funding.
- Infrastructure, equipment/facilities; lack of access to new technologies

Solutions:

- Build capacity. Make use of local community to gather data.
- Stronger support from the govt; funding.
- Service providers improve net connectivity.

Impacts:

- Faster, accurate, efficient.
- Additional job opportunities.
- Huge demand for digital systems and platforms.
- Additional income.

Q4. Do you have any further comment on the scoping note?

- Forest fires monitoring technology immediately needed
- Technology should be accessible to local people

[17] See for instance: https://www.nationalgeographic.com/news/2017/06/topher-white-engineer-rainforests-explorer-festival/

Group 11

Chair: Rod Keenan
Rapporteur: Vincent Gitz

Q1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

Luca Tacconi:

- Question about scope of study -> **VG** reply not only related to sustainable forest management or primary forests, but whole value chains and even institutional innovations? This is open and precisely to be discussed here.
- How can these tools be linked to national level strategies and then adopted at national level? How to link them to policy frameworks at national level? Otherwise, are they just new ideas? What is the institutional way forward to link up to policy level to increase the likelihood of policy change?
- Drones, applications to look at what is happening.
- Crowdsourcing: regional institutions required at national level.

Oliver Coroza:

- Priority would be to have an up-to-date regional system of forest monitoring, to provide state of forest, not only conservation. Share the costs between countries, bring the costs down, increase transparency, information to be shared to various stakeholders. Could also include data on illegal logging and hotspots of deforestation.
- Mobile applications, Information and Communication Technologies (ICTs).
- Use of observation data. Optical data: clouds limit the detection capacity from space.
- Acoustic monitoring: Use of active satellite platform, radar that can penetrate through clouds.

Baisone Inthirath:

- Mobile phone technologies: program can record list of timber and benefits. Share information.

Rod Keenan:

- Low-level micro-satellites, to focus over a property and forest areas to gather real time information on tree growth, fires, diseases impacts, illegal activity.
- Acoustic monitoring.
- Using data in real time for decision making.
- Value chains, block chains, improving transactions.
- Finance: blended finance models to integrate funding from different sources.
- Video-conferencing, bringing people from remote communities into real time discussion and decision making about what should happen with forests. Can lead to innovations in governance and adoption pathways.

Vincent Gitz:

- Functions and needs: technologies from within the sector – easy to find. How to import technologies from other sectors to fill some of the key needs/functions? Could be a screening of technologies based on needs.

Q2 What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

- **Oliver Coroza:** Risk that the jobs for innovations are not for the community but for external people.

- **Luca Tacconi:** Need for capacity building transition support for those who lose their job because of the introduction of a new technology.
- **Baisone Inthirath:** Wood trader application all example in Lao: for communities who want to sell wood. Communities may avoid paying commission to traders by using. Can identify the provenance of the wood. Information about prices etc. Opening up new markets. Reduce transaction costs, provide new market opportunities, providing new income to community growers, better informed communities. More connected remote communities, less drift to the seas, more economic opportunities in rural remote areas.
- Technology can improve efficiency and effectiveness of monitoring: more government control but also impact on illegal activity that were in fact "traditional" uses.

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

- Software availability can be a constraint. Need open source software that are as good as industry software.
- Need for open source data, high resolution data, that can be used on a desktop computer.
- Interoperability and coordinating harmonizing national standards. Role of FAO or of the Regional commission?
- Technical capacity.
- Financing, including to cover important initial investment costs.
- Licensing (mobile phone technology, including government barriers to this).

Main points for Chair report (max 200 words):

Q1. Most promising technologies:

- Video-conferencing, bringing people from remote communities into real time discussion and decision making about what should happen with forests. Can lead to innovations in governance and adoption pathways.
- Regional system of forest monitoring, to provide state of forest, not only conservation. Would enable to share the costs between countries, bring the costs down, increase transparency of information to be shared to various stakeholders. Could also include data on illegal logging and hotspots of deforestation.
- Mobile applications, ICTs, Google earth.
- Low-level micro-satellites, acoustic monitoring.
- Using data in real time for decision making.
- Value chains, block chains, improving transactions.
- Finance: blended finance models to integrate funding from different sources.

Q2. Livelihood impacts (economic benefits, job creation):

- Risk that the jobs for innovations are not for the community but for external people.
- Smartphone: Benefit that the (forest) communities can have access to data.
- Need for capacity building, to use the technologies but also to support transition for those who lose their job because of the technology.

Q3. Barriers to upscaling:

- Need for more regional cooperation, integration of systems, joined systems.
- Need for open source data, high resolution data, that can be used on a desktop computer.
- Interoperability and coordinating harmonizing national standards. Role of FAO or of the Regional commission?
- Technical capacity.
- Financing.

Group 12

Chair: Wu Shengfu
Rapporteur: Alexandre Meybeck

Q2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

Eric Hansen: Laminated took time to be adopted in the west coast of the US. Potential of such technologies depend on regulations.

Progress in China for wood housing.

Opportunities are different by countries.

Artificial Intelligence, robotics, how many jobs eliminated, but jobs created, but not the same, high-knowledge jobs. Winners and losers. Compensate by developing cultural products. Advanced technologies not adapted for everywhere. Contexts are very different. Automation often develops by lack of labour force.

Ray Thomas Kabigting: In Philippines, use of drones to scan forests, identify clearings, fires. Will replace forest rangers. Look for alternative opportunities. In South-east Asian countries, better monitoring will create other job opportunities like direct response to what has been identified by drones.

Need to have a good concept first, before a technology. Need to look at pros and cons.

Mike May: in any transition there will be a change in job composition. Transformational change can bring disruptive changes in employment. Circular economy brings a diversification of uses of wood fiber, creating multiple value chains. Including better use of resource. Net result on employment could be positive. Potential for high level jobs, making it more of a career option. Multiple value chains with multiple tiers of knowledge requirements. Prospect more optimistic.

What do you do with old workers?

If wood is better used for fiber, could it reduce fire risks. It is a social issue.

Recycling and value added to lower value wood could create lots of jobs, including non-skilled jobs.

Using residues in Brazil: branches left behind are left to local people that use them for selling them or making charcoal. Social innovation. How to help local communities in these transitions? If circular economy is organized locally, there is a better chance for the local economy to benefit. And after the present crisis things may be much more local.

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

- Technology transfer, both for technologies developed inside and outside, and whether it benefits to end-users. Enabling technology transfer. South-south cooperation.
- Refer to general literature on adoption.
- Forest industry is specific. In China good planification system. Importance of management.
- In the US, the main problem is culture risk adverse and traditional. Same experience in the Philippines. Before 2014, biodiversity monitoring was very manual. Then we used a mobile phone it was difficult to have it adopted. Philippines very conservative because of traditional, indigenous culture.
- There is a tension between the very traditional knowledge intensive forestry sector and innovative technologies.
- Issues are not technical but social.

- Need to change behaviour.
- Finance can be a driver of change.

Q4. Do you have any further comment on the scoping note?

- Clean the forests before they burn instead of using all this labour to extinguish fires. Need better monitoring.
- Technology to deal with future cycles of pests. Urgent attention needed.
- Monitoring.

Main points for Chair report (max 200 words):

- Transformational change can bring disruptive change in employment. Adoption also depends on labour market. Mechanisation generally driven by high-labour costs. A shift to knowledge intensive, higher value jobs. Can reduce opportunities for some categories of workers.
- But, for instance, recycling and value-added to lower value wood could create lots of jobs, including non-skilled jobs.
- Depends also on how circular economy is organized, if more local will create more jobs locally.
- There is a tension between forestry, with traditional knowledge and culture, including indigenous knowledge, and disruptive changes of practices. Need to find appropriate ways to incentivize changes of behaviour.
- Importance of technology transfer, including south-south cooperation.
- Innovative technologies have a key role to play in better monitoring biomass growth and its use, both for value added, and for fire prevention for instance.
- A key role also to prevent, monitoring and address all types of risks, including fires, pests, and also changes in forests brought by climate change.

Group 13

Chair: Robert Nasi
Rapporteur: Nathanaël Pingault

Q2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

- Economic benefits, job creation and improvement of natural ecosystems are the main potential impact of innovative technologies.
- Innovative technologies (such as digital technologies and mobile apps) can make the sector more attractive to young people.
- Product and process innovations provide opportunity for new markets, using new kind of wood (e.g. small diameter timber), and can contribute to preserve natural and primary forests. For instance, innovative wood products provide new opportunities for construction in the Asia-Pacific region, comprising 50 percent of the global population and rapidly urbanizing.
- Negative impacts of new technologies must be considered across scales, in particular their impact on local communities (access to natural resources, food security and livelihoods), as well as their impact on natural ecosystems and biodiversity (example of biofuels). Innovative technologies should benefit people who really take care of the forest.
- Consider also the indirect impacts on forest sector of technologies developed in other sectors (mining, agriculture): e.g. increased productivity in agriculture reduce pressure on forests.

Q3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscaling of innovative technologies in the forest sector and what are the solutions to overcome them?

- Lack of government funding for research and development, for training and capacity building. Lack of incentive for the private sector to support adoption and uptake of innovative technologies.
- Need a decentralized, bottom up process, starting from the needs of stakeholders at local level.
- Lot of implementation issues requires a multi-stakeholder approach including public and private sector.
- The timeframe involved in wood production constrain investments and make it difficult to adjust wood production to a rapidly evolving demand.
- Consumer awareness (see below)

Q4. Do you have any further comment on the scoping note?

- Investment capacity and capacity development should be better covered in the scoping note.
- Scoping note focus on the “what” but not on the “who” and the “how”: “who” relates to multi-stakeholder partnerships and decentralized processes. “How” relates to capacity building at all scales.
- Consumers are a very powerful brand: important to raise consumer awareness on the two topics addressed today: communication package missing in this concept note.
- Scoping paper to broad in terms of innovative technologies. Narrow it down to the most promising technologies in the region (using replies to question 1)
- Draw experience from people working on innovative technologies implemented in other sectors (artificial intelligence, agriculture)

Main points for Chair report (max 200 words):

Q2. General feeling that innovations will improve the situation and that the benefits outweigh the risks. There is however the need to mitigate possible negative consequences and this can be done by creating a proper legal and regulatory framework as well as proper appropriation (e.g. something like

FPIC before implementing new technologies on community forests… or ethical rules on data collection or use)

Q3. Major barriers to adoption are lack of human and financial capacities both in the government agencies and in the private sector. There is also in several cases a lack of incentive to invest in new technologies (situation is good enough for the actors, so why bother…). Investment is key!

Q4. the scoping note is looking too much at the technologies per se and should rather put much more emphasis on the who will use these technologies and how. This might require a bit of redirection

Group 14

Chair: Amos Amanubo
Rapporteur: Marco Piazza

Q1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

- Drones and mobile apps (part of university curricula):
    - For monitoring of plantations (private sector),
    - For land use planning (GIZ project) tracking illegal activities / wildlife poaching,
    - Forest landscape restoration (production driven, teak),
    - Single tree identification,
    - For tree identification (biodiversity surveys),
    - For planting (air seeding),
    - Weeding (bio herbicides),
    - Seed extractors from trees (possible future application).
- LIDAR (light detection and ranging), used for Forest Reference Emission Level (FREL) in the Philippines.
- Remote-sensing satellites (matched with Artificial Intelligence).
- Telecommunication satellites (with sensors, to record environmental variables).
- Digital twin concept.

Q2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

Concerns:

- Technology must be matched with on-the-ground presence.
- Careful use of technology.
- Measure and assess impact of utilization of technology.
- Impact of technology: boost exploitation vs. promote efficiency.
- Some groups end-up being marginalized if they have no access to technology.
- Commercial applicability vs. up-take at community and rural level.
- Some “traditional” methods are just as efficient and less costly.
- Assumption that technology is (always) good.
- Fast pace of technological development.

Positive impacts:

- Several examples of positive impacts of technology on livelihoods.
- Help to attract young people to the forest sector.
- Efficiency and cost benefits.
- Positive capacity building experiences.
- Start-up funding mechanisms (higher initial cost, but lower on the long run).
- Land tenure issues are magnified when technology is involved.
- Consideration of macro-economic effects: in case successfully integrated sustainably into the forestry sector, there is a huge opportunity for reaping macro-economy benefits.
- Preservation of Indigenous Knowledge (IK) could be effective and enhanced if matched with technological application.

Q4. Do you have any further comment on the scoping note?

- Participants encouraged to complete Google form.

Main points for Chair report (max 200 words):

- The uptake and upscaling of innovative technologies in sustainable forest management should be matched with the application of relevant policy and regulatory tools to check and balance for any negative impacts of technologies, especially in the social values that accompany sustainable forest management (Jobs, the capacity of small and medium scale forestry enterprises to utilize these technological tools sustainably).
- In a region with fast paced technological development, uptake of innovative technologies should be commensurate with capacity building efforts at all levels, most notably at the grassroots. Special attention should be paid to finding a complementarity between innovative scientific technologies and equally efficient and less costly indigenous knowledge / traditional technologies.
- A relatively high consideration should be given to technological innovation that promotes forest resources monitoring and evaluation. Where exploitation is considered (especially in wood-based enterprises), the imperative of uptake of technologies (processing technologies) to optimize production efficiency and minimize losses along the value chain should be highly considered.
- Bottom-line: application of innovative technologies carries both threats and opportunities for sustainable forest management. The economic, social and environmental impacts thereof should be closely monitored and analysed before implementation.

Appendix 4. Scoping notes

This appendix reproduces the last version of the two scoping notes as revised to take into account the feedback received during the inception workshop.

Status, trends and future outlook on primary forests in Asia and the Pacific

The 'Third Asia-Pacific Forest Sector Outlook Study' (APFSOS III: FAO, 2019), launched in June 2019 at the Asia-Pacific Forestry Week in South Korea, highlighted that conservation of primary forests – i.e. forests largely unaffected by human activities (see definition in annex) -, and the sustainable management of other natural forests are urgently needed to safeguard biodiversity, ecosystem services and the quality and health of the physical environment in the Asia Pacific region.

Following up on the APFSOS III, FAO and CIFOR, lead center of the CGIAR research programme on Forests, Trees and Agroforestry (FTA), collaborate to develop a roadmap for primary forest conservation in the Asia-Pacific region. In particular, FAO and FTA will prepare and co-publish a technical paper on **the status, trends and future outlook on primary forests in the Asia-Pacific region** with maps and key recommendations (for policy and concrete actions) for their conservation. A policy brief will also be prepared for decision-makers, gathering the main findings and concrete recommendations emerging from this work.

The present note describes the scope of this publication and the methodology to be followed for its development.

Framing: scope and definitions

Multiple and very diverse definitions of forest and wooded areas are used around the world, reflecting both the diversity of forest ecosystems and the diversity of human perceptions and uses of forests. Most definitions of forests are based on land cover, usually combining criteria of canopy cover, tree height and minimum area, and on considerations of land use. The definition and criteria used determine which ecosystems can be considered as forest and impact strongly forest area (HLPE, 2017).

FAO global forest resources assessments (FRA) have contributed to harmonize at the global level the definitions and categorizations of forests allowing compared analysis across countries at regional or global level. In the FRA 2020, forest is defined as *"land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ"* (FAO, 2018). This definition excludes agricultural and urban tree stands.

The FRA 2020 (FAO, 2018) further distinguishes two main categories of forests defined as follows:

- Naturally regenerating forest (or natural forest): *"forest predominantly composed of trees established through natural regeneration"*;
- Planted forests: *"forest predominantly composed of trees established through planting and/or deliberate seeding"*.

Among natural forests, primary forests are defined as *"naturally regenerated forests of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed"* (FAO, 2018: See annex below for more details).

Primary forests and natural landscapes in the Asia-Pacific region are under increasing pressure from a range of threats including: climate change and natural disasters, population and economic growth, overexploitation and illegal exploitation of forests, conflicting land uses (e.g. infrastructure development and agricultural expansion), inconsistent policies across sectors and scales, weak governance, migration and conflicts. Despite an overall increase in the regional tree cover area since 2000 due to the establishment of plantations and restored areas in some countries such as China, the area of primary forests is still declining, along with the ecosystem services they provide (e.g. wood, food and medicines provision, biodiversity, water and soil protection, climate regulation and carbon

sequestration, amenity and cultural values). Of the region's 723 million hectares of forest, only 19 percent (140 million hectares) is primary, which is much lower than the global average (32 percent) (FAO, 2019). Primary forests degradation and fragmentation weaken the ecosystem resilience, i.e. its capacity to cope with external shocks. Reversing this trend must be a priority for all countries in the region now and in the next decade to ensure our survival, especially in the face of dangerous climate change. The COVID-19 crisis risk putting additional pressure on forests and their capacity to provide essential environmental services – the nature and dimension of these impacts still need to be understood.

Purpose and content of the technical paper

The purpose of this technical paper is to provide a broad picture of the status, current trends and future perspectives for primary forests in the Asia-Pacific region[18].

Building on the FRA definition for primary forests, this paper will highlight the huge diversity of ecosystems that can be considered as primary forests in the Asia-Pacific region. It will recall the multiple ecosystem functions of primary forests and show the critical importance of their conservation for sustainable development in the region.

Building on the detailed results of the last FRA2020, and on complementary sources as appropriate, the paper will then describe the status and trends of primary forests in the region in terms of deforestation, fragmentation and forest degradation. This description will be illustrated as appropriate by graphs and maps showing the spatial distribution and the evolution of primary forests since 1990 in the region. The study will also identify and map "hotspots", i.e. priorities, for primary forest conservation based on a list of criteria including for instance: size, richness and uniqueness of the ecosystem, importance of ecosystem services, level of threats. The study will discuss in particular the appropriate size threshold that should be considered to define an intact forest.

The paper will consider the remaining primary forests within broader landscapes, analyzing the dynamics at stake in surrounding areas (whether other natural forests, planted forests, agricultural land, mining or industrial site, infrastructure or human settlement) that directly or indirectly impact forest status and trends. It will illustrate the increasing pressures on primary forests, due to a range of drivers/stressors including: climate change, population growth, migrations and conflicts, globalization and economic growth, urbanization and infrastructure development, agriculture and planted forest expansion, illegal logging and illegal trade of forest products.

Besides, the paper will draw a broad picture of primary forest governance in the region, describing the various governance tools, instruments and mechanisms implemented at different scales – from international and regional agreements to national rules and instruments and local arrangements –. The paper will discuss the institutional changes required to achieve various objectives associated with primary forest conservation, including: the accurate monitoring of primary forest values; the sustainable funding of forest conservation; the importance of education and capacity building; the effective enforcement of existing laws and rules. It will cover critical governance issues such as land tenure security, access to forest and natural resources, and equitable participation of indigenous peoples and local communities in decision-making processes. It will assess the actual implementation of existing laws and regulations, inform on existing good practices and successful national legislations, and suggest innovative governance mechanisms and regulatory frameworks.

[18] The geographical scope of the roadmaps covers the countries of the FAO region of Asia and the Pacific (see: http://www.fao.org/asiapacific/countries/en/). However, it excludes France and the United States of America (USA) mainland, situated outside the region. The Russian Federation, although covering 29 percent of Asia, is also excluded because issues related to Russian forests are usually discussed within the European Forestry Commission.

The paper will finally suggest key recommendations (policy and concrete actions) for primary forest conservation.

Method of work: process and provisional timeline

This co-publication will build upon recent FAO publications, in particular the abovementioned regional outlook (FAO, 2019) and the latest FAO Global forest resources assessment (FAO, 2020), as well as on preparatory reviews of the existing scientific literature. It will mobilize FAO and FTA experience, expertise and knowledge.

This co-publication will be developed through a participative process, launched with an online inception workshop co-organized by FAO and FTA on July 30th, 2020, involving key regional stakeholders and technical experts from governments and intergovernmental organizations, from the private sector and civil society organizations, as well as from academia and research institutions.

Technical inputs, including information on best practices for primary forest conservation will be gathered through interviews with key stakeholders (face to face and/or online) and through an online consultation.

Technical online workshops will be organized as appropriate at critical steps of the process of development of the roadmap. A validation workshop will be organized at the end of the process to discuss and validate the main findings and key recommendations of these papers. This workshop could be organized back-to-back to the XV World Forestry Congress, to be held on 24-28 May 2021 in Seoul, to gain visibility. The final draft of the technical paper will be submitted in parallel to an independent scientific peer-review. The objective is to publish the technical paper and the corresponding policy brief by end November 2021.

Annex – FRA 2020 definition of primary forest (FAO, 2018)

"Naturally regenerated forest of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed".

Explanatory notes

1. Includes both pristine and managed forests that meet the definition.
2. Includes forests where indigenous peoples engage in traditional forest stewardship activities that meet the definition.
3. Includes forest with visible signs of abiotic damages (such as storm, snow, drought, fire) and biotic damages (such as insects, pests and diseases).
4. Excludes forests where hunting, poaching, trapping or gathering have caused significant native species loss or disturbance to ecological processes.
5. Some key characteristics of primary forests are:
    - they show natural forest dynamics, such as natural tree species composition, occurrence of dead wood, natural age structure and natural regeneration processes;
    - the area is large enough to maintain its natural ecological processes;
    - there has been no known significant human intervention or the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established.

Initial list of references

FAO. 2018. *Terms and definitions. FRA 2020.* Global Forest Resources Assessment 2020. Forest Resources Assessment Working Paper 188. Rome. http://www.fao.org/3/I8661EN/i8661en.pdf

FAO. 2019. *Forest futures – Sustainable pathways for forests, landscapes and people in the Asia Pacific region.* Asia-Pacific Forest Sector Outlook Study III. Bangkok. 352 pp. http://www.fao.org/3/ca4627en/ca4627en.pdf

HLPE. 2017. *Sustainable forestry for food security and nutrition.* A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. http://www.fao.org/3/a-i7395e.pdf

Innovative technologies in forestry and forest management in Asia and the Pacific

The 'Third Asia-Pacific Forest Sector Outlook Study' (APFSOS III) (FAO, 2019), launched in June 2019 at the Asia-Pacific Forestry Week in South Korea, highlighted that the use of **innovative technologies -** including ICT technologies, processing technologies and new wood-based products - creates huge opportunities and challenges for sustainable forest management in the Asia-Pacific region. Nearly 300 forestry students and young professionals from more than 30 countries, consulted for this Outlook Study, found that the uptake of new technologies in the forest sector has been too slow and called for better opportunities for young people to learn and apply these new technologies.

Following-up on the APFSOS III, FAO and CIFOR, lead center of the CGIAR research programme on Forests, Trees and Agroforestry (FTA), are developing a roadmap on innovative forest technologies. In particular, FAO and FTA will prepare and co-publish a technical paper, with key recommendations (for policy and concrete actions) informed by science, on the use of innovative technologies to advance sustainable management in the forest sector in the Asia-Pacific region[19]. A policy brief, directed to key decision-makers, will gather the main findings and concrete recommendations emerging from this work.

This note describes the scope of this publication and the methodology to be followed for its development.

Framing: scope and definitions

Multiple and very diverse definitions of forest and wooded areas are used around the world, reflecting both the diversity of forest ecosystems and the diversity of human perceptions and uses of forests. This paper will use the FAO definition of forest used for the latest FAO Global Forest Resources Assessment (FRA2020): "*land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ"* (FAO, 2018). This widely used and recognized definition allows compared analysis across countries at regional or global levels.

In the APFSOS III, the terms "forestry" and "forest sector" are used interchangeably to encompass "all economic activities that mostly depend on the production of goods and ecosystem services from forests" (FAO, 2019). During its 28th session (17-21 June 2019) held in Incheon, South Korea, the Asia-Pacific Forestry Commission (APFC), considering the "impacts of technological advancements on forests and forestry", also used this broad definition of forestry and the forest sector covering not only forest management but also forest industries (APFC, 2019).

For the purpose of this roadmap, the term "innovative" technologies embraces: (i) new technologies either in the generation phase, or in the pre-pilot or pilot phase, that could become mainstream or mature before 2030, as well as (ii) recent technologies emerging for new purposes or in new contexts. These technologies could perform better than currently utilized technologies, or even provide new functions.

In a note distributed during this session (APFC, 2019), the APFC's Secretariat distinguished two types of innovative technologies impacting forestry: (i) those developed outside the forest sector, for example, information and communications technologies (ICTs) as well as geospatial technologies; and (ii) those developed within the forest sector, for example, production of new-generation wood-

[19] The geographical scope of the roadmaps covers the countries of the FAO region of Asia and the Pacific (see: http://www.fao.org/asiapacific/countries/en/). However, it excludes France and the United States of America (USA) mainland, situated outside the region. The Russian Federation, although covering 29 percent of Asia, is also excluded because issues related to Russian forests are usually discussed within the European Forestry Commission.

based materials such as engineered wood products, bioplastics, natural chemicals, bioenergy products, and pharmaceuticals.

ICTs, remote sensing and big data analysis are revolutionizing forest management, allowing real time forest monitoring and precision management. Governments are beginning to leverage new technologies to improve land mapping, the management of land-ownership information, and forest governance. Huge volumes of forest data will be generated and collected in the future, requiring increased human-resource capacity in data processing and analysis. Product and process innovations can contribute to reduce waste and improve productivity and efficiency in forest products processing. A new generation of wood-based materials and forest products including engineered wood products, bioplastics, biochemicals and biomaterials are enabling new uses and applications for forest products including in general construction, tall buildings, energy, packaging and medicine. Among other things, this dynamic has the potential to contribute to reduced CO_2 emissions, low-carbon economies, and the circular bioeconomy; by substitution of biological products for fossil fuels or energy-intensive products like cement and concrete (IPCC, 2014).

Content and objectives of the technical paper

Building upon APFSOS III, this paper will discuss "innovative technologies", "innovation process", technology transfer, uptake and upscale, as applied to "forestry", the "forest sector", and "sustainable forest management", to further refine the scope of the analysis. Examining innovations, the study will distinguish: incremental vs. transformative and disruptive innovations; product vs. process innovations; technological vs. institutional innovations. It will describe different categories of innovative technologies applied in the forest sector in the region, along with illustrative examples, including:

- *Digital technologies*, including ICTs and geospatial technologies, such as: social media, video-conferencing, big data analysis, cloud computing, artificial intelligence, drones, satellite-based observations and other remote-sensing technologies, light detection and ranging (LIDAR), RADAR, acoustic and camera monitoring, early warning systems, global positioning systems and geographic information systems;
- *Biological technologies*, including: tree breeding, genetic selection, biotechnologies, DNA identification and tracking;
- *Technical innovations*, within this category we can further distinguish: *process innovations* in forest exploitation (such as improved chainsaw or reduced impact logging) and wood transformation; and *product innovations* (such as cross-laminated timber as construction material or wood-based bioplastics for packaging);
- *Innovative finance technologies* (e.g. blockchain) and mechanisms (e.g. blended finance, green bonds, responsible investments or crowdfunding).

The paper will examine how the application of innovative technologies affect different functions throughout the value chain and the extent to which this contributes to sustainable management in the forest sector. Among these functions are (not an exhaustive list): germplasm selection, production and breeding; forest monitoring; forest management (tree planting, tree growing, forest protection); wood harvesting; wood processing (first and second transformation); quality control; traceability; transport; distribution; final use of wood-based or non-wood forest products (for e.g. medicine, energy, packaging, construction material, furniture…); reuse and recycling; waste management; marketing; etc.

Assessing the strengths and weaknesses of each innovative technology in performing these different functions will ground an analysis of their advantages and disadvantages in different contexts. Such an assessment can offer a framework to compare very different innovative technologies, whether "modern" or "traditional", and help identify and categorize the most promising innovative technologies for the forest sector in the coming decade. Innovative technologies can not only perform existing

functions better than currently utilized technologies but may also provide completely new functions, products and services. The way one technology performs one function, as well as its positive or negative impacts for people and the planet, may vary significantly across contexts and, even in the same context, may be perceived differently by different stakeholder groups. In addition, the social, economic and technical contexts are also evolving.

The Fourth Industrial Revolution,[20] through extraordinary technological advances (e.g. artificial intelligence, digital twins, etc.), is merging the physical, digital and biological worlds in ways that create both huge opportunities and threats. The study will describe the main challenges and opportunities, advantages and disadvantages, associated with the application of innovative technologies in the forest sector in different contexts. The study will also consider the potential negative impacts of new technologies on local communities (access to natural resources, food security and livelihoods), natural ecosystems and biodiversity.

Innovative technologies can provide new products and services, reduce operational costs and improve productivity, thus generating further income and employment opportunities in the forest sector. The adoption and dissemination of innovative technologies will likely generate major shifts in forest value chains, modifying wood demand, including increased needs for high quality and diverse planting material, and the labour market. Innovative technologies have the potential to generate new skilled jobs (e.g. drone operators, ICT developers and operators, etc.). Innovative, safer and greener jobs can, in turn, help make the forest sector more attractive, in particular to young professionals. However, innovative technologies, including automation, might also lead to the loss of many unskilled jobs. This might marginalize traditional practices and impact negatively people, with limited human or financial capacity to adapt, involved in traditional labour-intensive management systems, common in the region. Innovative jobs might benefit external people with a different set of skills rather than local communities, exacerbating social inequalities.

Innovative technologies can also reduce waste and improve energy- and resource-use efficiency, thus increasing profitability of the forest sector and contributing to the sustainable management of natural forest resources. Precision technologies can also limit or avoid collateral environmental damages to ecosystems (e.g. pollutions, destruction of untargeted organisms or species). Product and process innovations can help preserve natural and primary forests by opening new markets for certain wood products (e.g. small-diameter timber or fast-growing tree species). On the other hand, innovative technologies, if not used wisely, can accelerate deforestation and forest degradation, habitat destruction and species extinction. Digital technologies and institutional changes can help strengthen participation, transparency and accountability in forest governance, thus advancing the sustainable management of natural resources.

The study will analyze the process of dissemination of innovative technologies and the actors involved (without overlooking the gender dimension). The rate of uptake of innovative technologies is far from uniform in the region, with use varying by country and sub-region. There is also a greater uptake of technologies to increase forest productivity and industrial efficiency in the planted-forest sector than in the management of natural forests.

The paper will analyze the technical, economic and social barriers preventing the uptake and upscale of innovative technologies in the forest sector. In particular, the study will explore: (i) the lack of capacity (e.g. limited access to natural resources, limited access to information, limited access to credit and markets, limited transparency and limited participation in decision making); and, (ii)

[20] See: https://www.weforum.org/focus/fourth-industrial-revolution

restrictive policies and regulations lagging behind the rapid evolution of technologies and the rapid shifts in wood demand.

It will also consider the institutional changes needed in forest sector governance (land planning, land tenure and other relevant development policies), to overcome these barriers, to support the uptake and upscale of innovative technologies in the region, and to ensure that these technologies will effectively contribute to sustainable forestry and sustainable forest management. Regional cooperation, investment, infrastructure development, education and capacity building will be key to support technology transfer and dissemination, and accompany the populations at risk of being marginalized by these technological advances. The public and private sectors will have to work hand-in-hand to address these issues.

The paper will finally suggest key recommendations (policy and concrete actions) to ensure that the use of innovative technologies effectively contribute to sustainable development.

Method of work: process and provisional timeline

This study will build upon recent FAO publications, in particular the abovementioned APFSOS III and the latest FRA (FAO, 2020), as well as on preparatory reviews of the existing scientific literature. It will mobilize FAO and FTA experience, expertise and knowledge.

The roadmap will be developed through a participative process, launched with an online inception workshop co-organized by FAO and FTA on July 30th, 2020, involving key regional stakeholders and technical experts from governments and intergovernmental organizations, from the private sector and civil society organizations, as well as from academia and research institutions.

Technical information on the application of innovative technologies in forestry and forest management, will be gathered through interviews with key stakeholders (face to face and/or online) and through online open consultation.

Technical intermediate workshops will be organized as appropriate at critical steps of the process of development of the roadmap. In particular, the November 2020 workshop on innovative forest technologies will be the occasion to discuss the application of innovative technologies in forestry and forest management, as well as the results of the call for abstracts for the youth (students and young professionals) competition.

A final validation workshop will be organized at the end of the process to discuss and validate the main findings and key recommendations of the study. This workshop could be organized back-to-back to the XV World Forestry Congress, to be held on 24-28 May 2021 in Seoul, to gain visibility. The final draft of the technical paper will be submitted in parallel to an independent scientific peer-review.

The whole process will give special attention to the contribution of students and young professionals of the forest sector in the Asia-Pacific region. Specifically, a competition will be organized to gather their ideas and suggestions. The intermediate workshops will include a substantial participation from youth. The validation workshop could be the occasion to present not only the main findings of the technical paper, but also the best contributions from students and young professionals, emerging from the competition.

The objective is to publish the technical paper and the corresponding policy brief by end November 2021.

Initial list of references

APFC. 2019. *Impacts of technological advancements on forests and forestry.* (APFC/2019/5). Secretariat note for the 28th session held in Incheon, Republic of Korea, 17-21 June 2019. http://www.fao.org/3/ca4938en/ca4938en.pdf

FAO. 2018. *Terms and definitions. FRA 2020.* Global Forest Resources Assessment 2020. Forest Resources Assessment Working Paper 188. Rome. http://www.fao.org/3/I8661EN/i8661en.pdf

FAO. 2019. *Forest futures – Sustainable pathways for forests, landscapes and people in the Asia Pacific region.* Asia-Pacific Forest Sector Outlook Study III. Bangkok. 352 pp. http://www.fao.org/3/ca4627en/ca4627en.pdf

FAO. 2020. *Global Forest Resources Assessment 2020: Main report.* Rome. http://www.fao.org/3/ca9825en/CA9825EN.pdf

IPCC. 2014. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_full.pdf

Appendix 5. Powerpoint presentations displayed during plenary sessions

List of the presentations

1. Conservation of Primary Forests & Innovative Technologies in Forestry (Rao MATTA, FAO)
2. Status, trends and future outlook on primary forests in Asia and the Pacific (Yves LAUMONIER, CIFOR)
3. Innovative technologies – key points from the scoping note (James ROSHETKO, ICRAF)

Food and Agriculture Organization of the United Nations

CIFOR

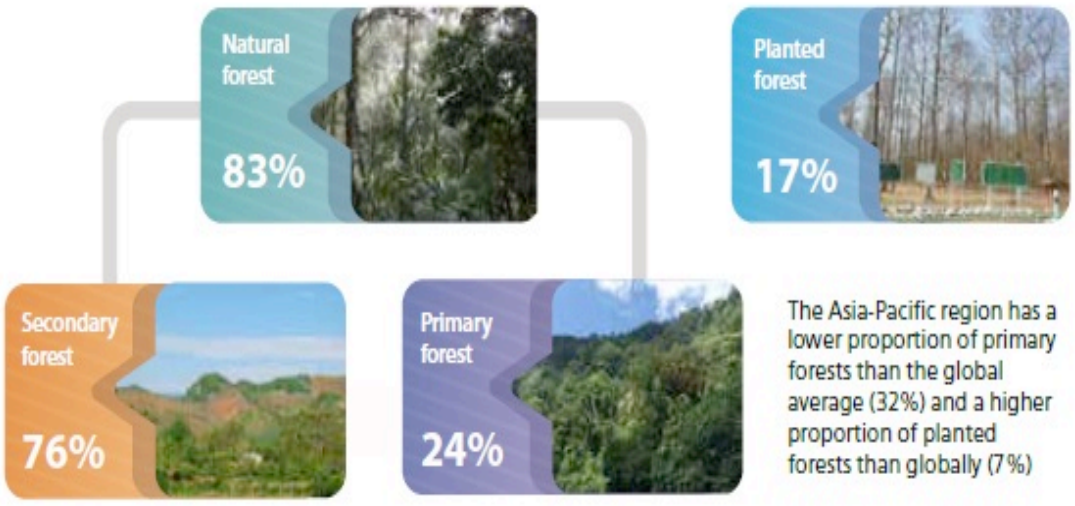
Conservation of Primary Forests & Innovative Technologies in Forestry

Inception Workshop

30 July 2020

Rao.Matta@fao.org

Conservation of Primary Forests



Conservation of Primary Forests

Concerns:

- Of the region's 723 mi ha of forest, only 19% (140 mi ha) is primary, - much lower than the global average (32%).
- The area under primary forests declined in all countries except Japan and Malaysia,
- Indonesia and Papua New Guinea (almost half) registering some of the region's sharpest reductions.
- Protecting and conserving them is vital to ensure continued provision of ecosystem services such as water quality, soil health, biodiversity conservation, carbon sequestration and local climatic effects.

Conservation of Primary Forests

Factors contributing to the decline

- Economic growth, infrastructure development, and other pressures.
- Deforestation, including conversion of carbon-rich peatlands.
- Continued allocation of primary forests for logging (driven by acute demand).
- Systemic governance failures, especially in regulating logging concessions, and
- Shifting cultivation
- Silvicultural -natural regeneration is uncertain.

Conservation of Primary Forests

Mitigation Measures

- Policy related
  - Govts have imposed moratoria on new concessions in primary forests and peatlands.
  - Discontinuation of shifting cultivation
- Other measures (not truly in the sense of primary forests)
  - Reduced impact logging
  - Aided natural regeneration
- A lot remains to be done
  - Policy/governance, awareness, monitoring, technology, networking and partnerships, finance

Innovative Technologies in Forestry

What technologies?

- Earth observation technologies- high-resolution satellite imagery, remote sensing- forest monitoring and management.
- New ICT (handheld comp/GPS/Mobile Apps) are unleashing unprecedented changes, including in the forest sector.
- Data collection/mgmt/proc/sharing including open-source technologies –amount/accuracy/transparency of information available for forest administrations
- The widespread use of digital platforms and e-commerce, (demand for paper and paperboard- news print)
- **Product innovations,** such as engineered wood, achieve transition to low-carbon economies

Innovative Technologies in Forestry

Challenges

- Huge untapped potential for wider uptake of technologies
- Adoption is not uniform across the region- some are yet to fully benefit even from older technologies
- Concerns related to potential unemployment etc.

Innovative Technologies in Forestry

Better enabling environment

- Conducive policies and laws including proactive administrations;
- Improvements in communication and other related infrastructure;
- Public investment in technology development and transfer;
- Strengthening of forest R&D and educational institutions; and
- Strategic partnerships.

Expected Outcomes & Outputs of the Two Initiatives

Outcomes:

- Improved knowledge and understanding
- Increased awareness and action at various levels
- Enhanced partnerships, and collaboration

Specific outputs:

- A technical paper on each informed by science
- A policy paper on each for concrete action

Multi stakeholder, participatory and analytical

- Inception workshop, expert consultations, secondary research and analysis, youth seminar, validation workshop

Objective & Expected Outputs of the Inception Workshop

Objective:

- Associate key regional experts, govt. reps, devp partners, private sector, academia and research organizations with the two initiatives
- Familiarize prospective participants with the technical aspects, scope and the methodology

Specific outputs:

- To have a common understanding on the general direction of the work / study;
- To identify experts and organizations willing to further contribute to the study;
- To start building a strong and broad community that will accompany the development of the roadmap.

Thank you

Rao.Matta@fao.org

Status, trends and future outlook on primary forests in Asia and the Pacific

FAO and the CGIAR research programme on Forests, Trees and Agroforestry (FTA)

Center for International Forestry Research

Online Inception Workshop, July 30th 2020

Background

- **Of the region's 723 million hectares of forest, only 19 percent (140 million hectares) is primary, much lower than the global average (32 percent) (APFSOS III: FAO, 2019)**
- **Primary forests degradation and fragmentation weaken the ecosystem resilience, i.e. its capacity to cope with external shocks.**
- **Reversing this trend must be a priority for all countries in the region now and in the next decade to ensure our survival, notably in the face of climate change**

Objectives

- Discuss the definitions and categorizations of natural and primary forests
- Highlight the diversity of forest types covered by the primary forests in the Asia-Pacific region
- Recall the multiple ecosystem functions of primary forests (importance of their conservation for SD, CC etc…)
- Describe the status and trends of primary forests in the region (area, fragmentation, potential threats, spatial distribution and their evolution since 1990)
- Draw a broad picture of primary forest governance, i.e. various governance tools, instruments and mechanisms at different scales (land tenure security, access to forest and natural resources, equitable participation of local communities in decision-making processes)
- Formulate key recommendations (policy and concrete actions) for primary forest conservation

Definitions

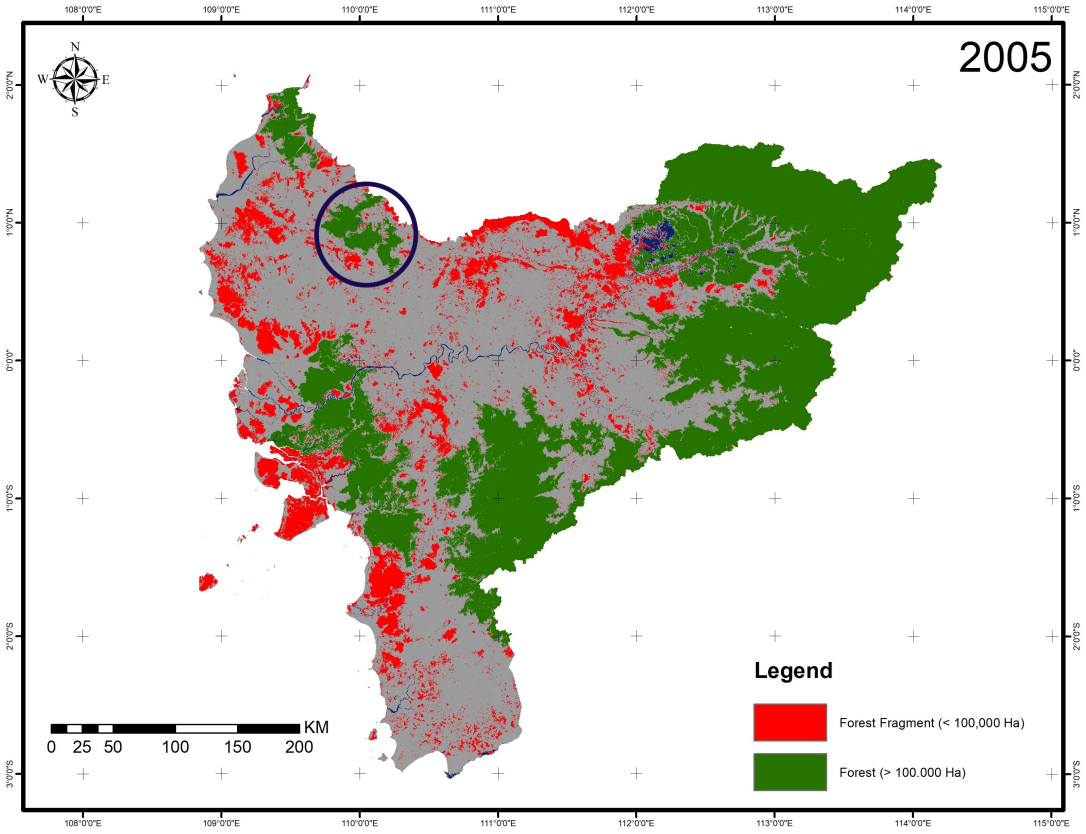
FAO 2018 *"land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent"*

Natural forest vs. planted forest

Primary forest

"Naturally regenerated forests of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed" (FAO, 2018); *Similar to others CBD, WRI, etc…*

Size of fragments to be considered (FRA 2000, 30 000 ha)



CGIAR

Method

- Mobilize FAO and FTA experience, expertise and knowledge,
- Built upon recent FAO publications, regional outlook (FAO, 2019) and the latest FAO FRA Global forest resources assessment (FAO, 2020)
- Participatory process involving key regional stakeholders and technical experts from governments and intergovernmental organizations, from the private sector and civil society organizations, as well as from academia and research institutions.
- Associate a wide range of partner organizations and key regional stakeholders, paying a specific attention to the contributions of students and young professionals.
- Technical recommendations on best practices for primary forest conservation gathered through interviews with key stakeholders
- Technical online workshops
- Validation workshop organized at the end of the process to discuss and validate the main findings and key recommendations

  (XV World Forestry Congress, 24-28 May 2021 in Seoul)

CIFOR CGIAR

Questions

- According to you, what are the main challenges / threats facing primary forests conservation in the coming decades in the Asia-Pacific region?
- According to you, what are the "hotspots"for primary forest conservation in the Asia-Pacific region, in terms of importance (extent, uniqueness) or threats?
- Which transformations and institutional changes are needed in forest governance, land tenure legislation and land planning policies to prevent deforestation and degradation and enhance primary forest conservation?
- Do you have any further comment on the scoping note distributed as background document for this workshop?

Thanks for listening!

Produced as part of
CGIAR RESEARCH PROGRAM ON Forests, Trees and Agroforestry

CIFOR
Center for International Forestry Research (CIFOR)
CIFOR advances human well-being, environmental conservation and equity by conducting research to help shape policies and practices that affect forests in developing countries. CIFOR is a member of the CGIAR Consortium. Our headquarters are in Bogor, Indonesia, with offices in Asia, Africa and South America.
CGIAR

cifor.org blog.cifor.org

Innovative Technologies

(key points from the Scoping Note)

Roadmap for Primary Forests and Innovative Technologies

Online Inception Workshop

30 July 2020

Idea for the Roadmap

Third Asia-Pacific Forest Sector Outlook Study
Launched June 2019 at the Asia-Pacific Forestry Week in South Korea

- highlighted that the use of **innovative technologies** - *creates both huge opportunities and challenges for sustainable forest management in the Asia-Pacific region*
- Categories - **ICT technologies, processing technology and new wood-based products**

What are Innovative Technologies?

- **(i) new technologies either in the generation phase, or in the pre-pilot or pilot phase**, that **could become mainstream or mature before 2030**, as well as

- (ii) **recent technologies emerging for new purposes or in new contexts**.

Key idea: These technologies have potential to perform better than currently utilized technologies, or provide new functions/applications

Innovative Technologies - Types

- (i) those **developed outside the forest sector, for example, information and communications technologies (ICTs) as well as geospatial technologies**;
- (ii) those developed within the **forest sector, for example, production of new-generation wood-based materials such as engineered wood products, bioplastics, natural chemicals, bioenergy products, and pharmaceuticals**.

Some of the Key Impacts

ICTs, remote sensing and big data analysis

- are revolutionizing forest management, allowing real time forest monitoring and precision management. These new technologies are being used to improve land mapping, land-ownership information, and forest governance

Product innovations

- **are improve productivity and material efficiency in forest products processing. A new generation of wood-based materials and forest products including engineered wood products, bioplastics, biochemicals and biomaterials are enabling new uses and applications for forest products including in medicine, tall buildings, energy and packaging**

Pros & Cons of the Technologies

Pros:

- Attractiveness for young people to work in the forestry sector, forest management and conservation.
- **New technologies should lead to reducing operational cost, increasing productivity, developing new products, enabling increased reuse and recycling, reducing adverse environmental impacts, improving energy efficiency, and increasing transparency in forest governance.**

Pros & Cons of the Technologies

Cons:

- If improperly utilized, can accelerate exploitation, deforestation and forest degradation.
- Can also result in job loss for the unskilled labor, negatively impacting people involved in the labor intensive forest management systems, common in the region.

Outputs -
Technical Paper & Policy Brief

Purpose:

- **evaluate how the application of innovative technologies in the forest sector can contribute to sustainable forestry and sustainable forest management in the Asia-Pacific region**

Focus:

- **Asia-Pacific region.**
- **Specific attention to students and young professionals.**
- *With an essay competition to gather/emphasize their ideas & views.*

Study Process:
Innovative Technologies

- Online inception workshop (today)
- Technical inputs through a web-based survey
- Technical inputs through interviews (online due to COVID)
- Additional online workshops to further discuss the application of the technologies in forestry and forest management
- Validation workshop – organized 'back-to-back' with the XV World Forestry Congress, to be held on 24-28 May 2021 in Seoul

Guiding Questions – Breakout Groups

(each group will have three questions. All groups will have the last question)

1. What innovative technologies seem to you the most promising for sustainable forest management in Asia-Pacific in the next ten years?

2. What are the impacts of innovative technologies in terms of livelihoods (economic benefits, job creation)?

3. What are the main (technical, socio-economic and institutional) barriers that prevent the uptake and upscale of innovative technologies in the forest sector and what are the solutions to overcome them?

4. Do you have any further comment on the scoping note?