Aide Memoire -- Technical Annexes

31st Montréal Process Working Group Meeting

Republic of Korea (physical/virtual)

3rd- 4th May 2022

Annex C

Australian Government
Department of Agriculture, Water and the Environment

Country Experiences with Sustainable Forest Management - Australia

International Forest Policy Team

3 May 2022

The Australian Department of Agriculture, Water and the Environment acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to traditional owners, their cultures and elders past, present and emerging

Australian Government
Department of Agriculture, Water and the Environment

Australia's State of the Forests 2023 Report

Australia is preparing its next 5-yearly State of the Forests Report

- These reports are based on Montréal Process Criteria and Indicators
- We are moving towards web-presentation of our indicators, updated more frequently than every 5 years

Five-yearly reports will continue and synthesise the data at that point in time

Australia's reports can be viewed on the Montréal Process website or below:

awe.gov.au/abares/forestsaustralia

Australian Government
Department of Agriculture, Water and the Environment

FAO Asia-Pacific Primary Forests Reporting Workshop

Australia hosted an FAO Asia-Pacific Primary Forests Reporting Workshop in November 2021

Discussed approaches and challenges with reporting on primary forests

- Australia has found issues such as fire challenging for this reporting

Outcomes feed into FAO's work on supporting improved reporting

Australian Government
Department of Agriculture, Water and the Environment

Agriculture Biodiversity Stewardship Package initiatives

Australia is piloting new initiatives to support forest carbon & biodiversity outcomes on agricultural land

- These build on the success of Australia's Emissions Reduction Fund

Pilots include:

Combining payments for carbon and biodiversity outcomes

Payments for enhancing remnant (degraded) forests

A new trading platform to help projects attract support

Australian Government
Department of Agriculture, Water and the Environment

Thank you

Further questions, please contact:

Ellie.Carmichael@awe.gov.au

Assistant Director
International Forest Policy Section
Department of Agriculture, Water and the Environment

3 May 2022

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Annex D

Exploration and Lessons Learned from China's Pilot Practices on Forest Management




Prof. Wang Xuejun
Department of Forest Resources Management, National Forestry and Grassland Administration

May 2022 Beijing

1.Backdrop

- China revised its Forest Law in 2019 and the amendments emphasized the legal status of and roles played by forest management from legislation perspective.
- China has pledged to the world to reach peak carbon emissions by 2030 and achieve carbon neutrality by 2060. (i.e. the two carbon goals)
- When considering improving the quality of forests and forest carbon sequestration and sinking capacity, it is the necessity to give high priority to appropriate forest management.

2.Challenges and issues faced by China's forest management

We have made a lot of efforts and achievements in developing legislation, regulations, policy measures and technical norms, exploring best practices, distilling exemplary models, training up specialists and so on. Nevertheless, there is still a considerable gap to be filled when compared to the current forest status of China, what is in demand for the construction of ecological civilization and the contribution in need to the two carbon goals, especially in the context of daily decreasing suitable land for forestation in the country at present. As a result, it is necessary to further increase pilot efforts and gain useful experience to improve the forest quality, in order to support the attainment of carbon neutrality.

Several typical forest stand types in urgent need of management

3.Goals and significance of the pilots

Forest management pilots characterized by their tenures, localities, site conditions, resource endowments, etc., were started nationwide in 2020 based on previous SFM pilots. In 2021, more pilot sites characterized by collective tenures were included and the pilot program was further developed, aiming at setting up exemplary demonstration to navigate towards the forest quality improvement at national level and a well-established and competent forest management system, so as to accelerate the cultivation of forest resources and their high-quality development.

Magnolia Forestry Administration: The development of planted single-storey pure forests to multi-species mixed-age complexes is evident

4.An overview of the pilots--- Objectives and tasks

- Exploration of developing an up-to-date forest management planning system well-informed by science evidence;
- Exploration of developing a practical and maneuverable decision-making process for forest management;
- Exploration of developing an input mechanism for secured implementation of forest management plans
- Trials in establishing model forests in diverse modes and replicable successes.

A three-dimensionalview of FM

Ulqihan Forestry Bureau:A case study in forest management practice

4.2 Blueprint of demonstration pilots

- Total :70 pilots， 51 state-owned and 19 collective ownership.
- involved areas of 23,400 ha,112 management modes, 1,697 sample plots.

4.3 Purpose of the pilot program

It is aimed at the development of a three-tier management scheme at national, provincial and site-specific levels, with enhanced application of multi-functional, close-to-nature and full-cycle forest management and other innovative concepts as well as more emphasis put on the task assignments in a holistic view, plot delineation and mapping, performance evaluation, dynamic control, etc.

5. Lessons learned from China's forest management pilots

5.1 The importance and role of forest management planning should be highlighted.

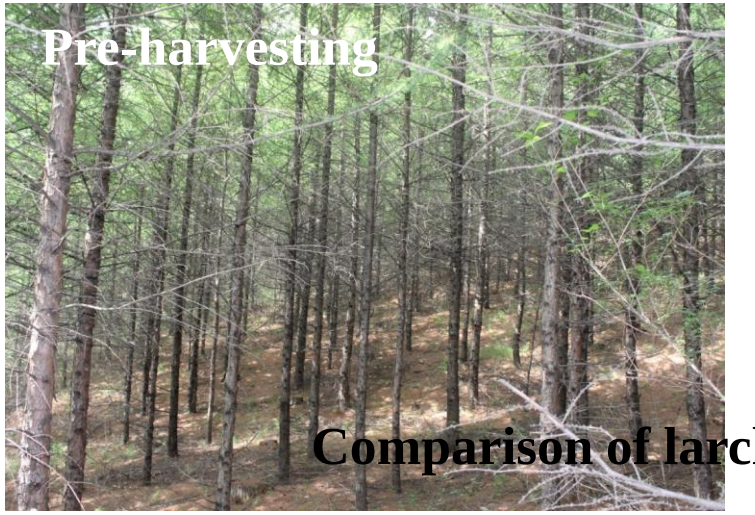
- The characteristics of forests, including expansive area, lengthy cycle and diverse benefits, determine the necessity of systematically planned forest management activities, which should be exempted from the influence of externality such as anthropogenic factors.
- The forest management planning system provides the sole approach to and platform for SFM.



5. Lessons learned from China's forest management pilots

5.2 Supportive policies for forest managers should be improved to encourage intensive forest management.

- It is of paramount importance to establish a competent and sustained forestry funding security system.
- All sectors of society may be fully mobilized to engage in forest management and diverse social capital may be effectively attracted into the forestry development. The involvement of the whole society in forestry is the necessary key factor to advance its sustainable development.

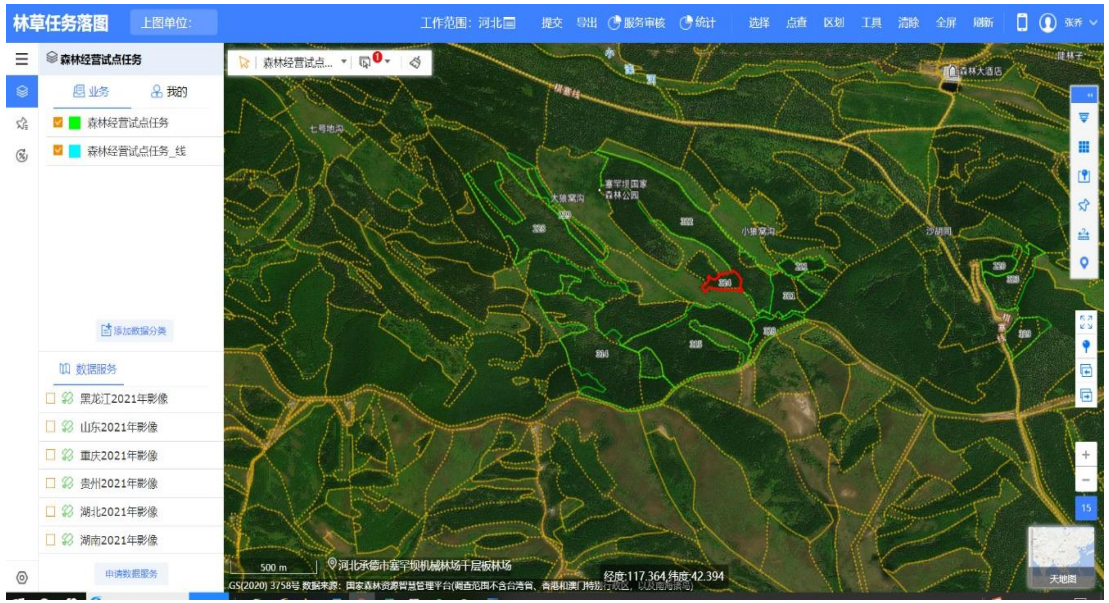


Comparison of larch forest management operations

5. Lessons learned from China's forest management pilots

5.3 A new scheme of plot delineation and mapping should be established to strengthen the evaluation on management performance.

- The delineation and mapping of forest management measures and plots assigned for such operations should be enhanced, and monitoring, review and evaluation on the management performance should be provided
- A stern and standardized institutional framework of management, evaluation and monitoring is the cornerstone safeguard for the work to achieve substantial effectiveness.



FM tasks on the ground on the map

Strict quality checks

5. Lessons learned from China's forest management pilots

5.4 An advisory process for expertise serving the forest management decision-making should be identified.

- Experts should be established and involve in the whole process of forest management decision-making, consultation, training and guidance.
- Meanwhile, the communication, education and public awareness provided by experts can help raise wider recognition of relevant concepts, connotations, principles, and approaches to forest management.

Expert guidance

Seminar Forum

International Exchange

5. Lessons learned from China's forest management pilots

5.5 A counterpart specialist training scheme should be developed for forest management. Specialist training and skill training courses can be given separately to different targeted groups, where the training provided to frontline technical staff is particularly emphasized.

National forest management pilot unit conducts technical training

谢谢！ Thank you!

Annex E

31st Meeting of the Montréal Process Working Group

Recent action for achieving SFM in KOREA

2022. 5. 3.

Korea Forest Service

Contents

History of Reforestation in Korea

1960

Korea Forest Service (1967)
Fuelwood plantation,
Erosion control

70-80

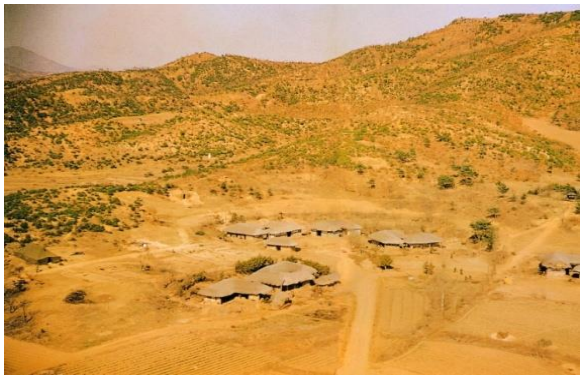
1st & 2nd Reforestation
(1973 - 1987)
Rehabilitation of slash & burn sites,
Erosion control

1990

Reforestation for forest goods & services;
Policies for mountain village and forest recreation

2000

Policies for Sustainable Forest Management (SFM),
Green Growth and
Climate Change



Devastated forest in 1960s

Reforestation project in 1970s

Forest managed sustainably in 2000s

Driving Forces on Successful Rehabilitation

Public Participation

- Sanlimgye (a kind of forest community structure)

Strong Leadership

- Reforestation as a national agenda

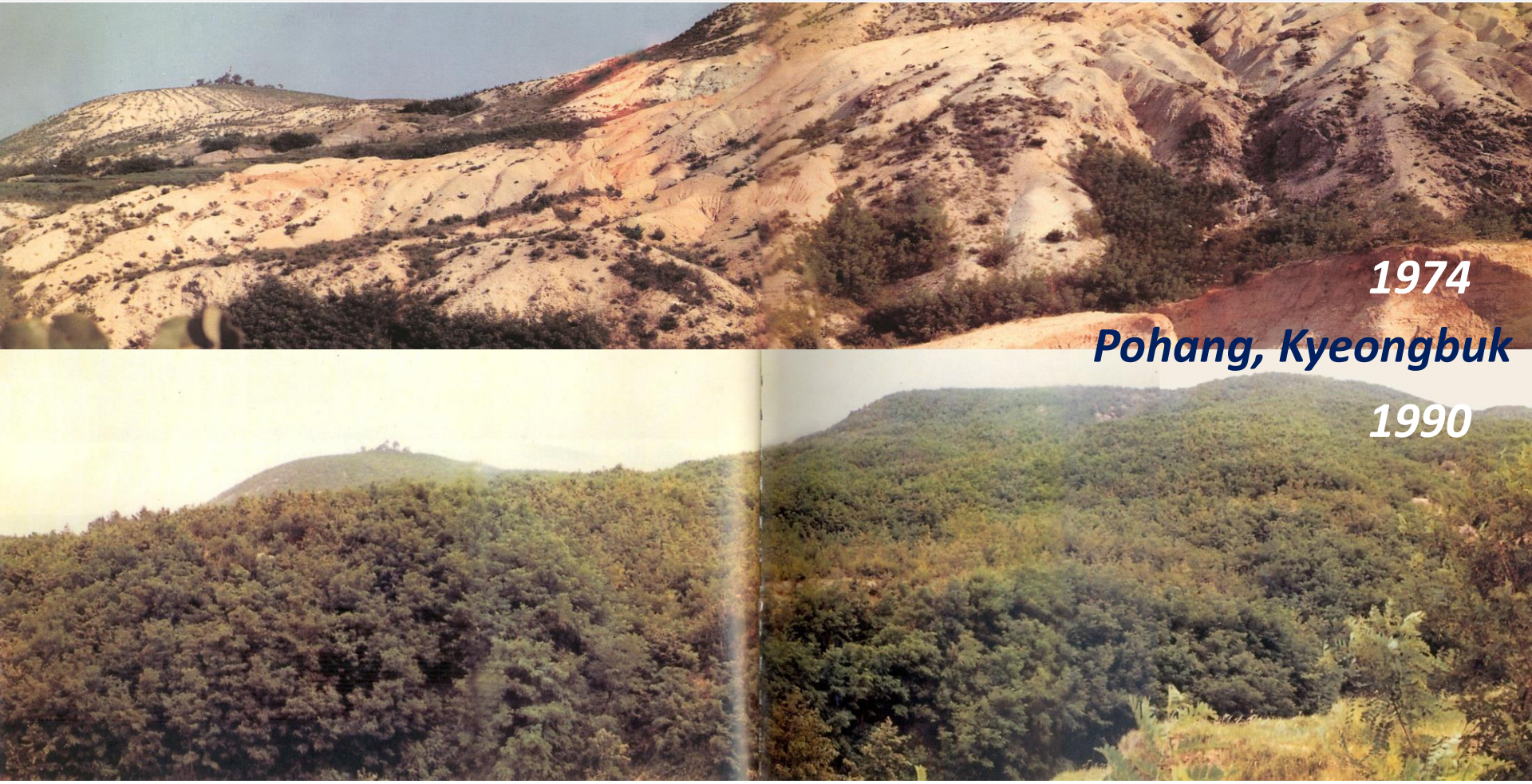
Implementation of Policies

- Korea Forest Service
- Forest Protection Law
- National Forest Plan

Economic Growth

- Substituting firewood with fossil fuel

Reforestation



Korea – the only country to have succeeded with post-World War II reforestation – will lead collective forest restoration efforts.

Trees are living greenhouse gas sinks. Growing trees and reviving forests are important solutions to the climate crisis.

They also constitute a way that can help prevent desertification and promote peace in border areas.

We welcome the Glasgow Leaders' Declaration on Forests and Land Use and will actively cooperate with developing countries in their efforts for forest recovery.

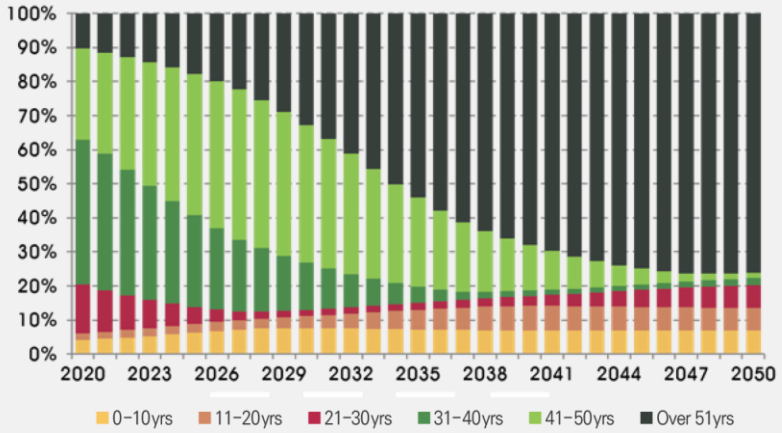
Moreover, through inter-Korean forestry cooperation, we will reduce greenhouse gas emissions on the entire Korean Peninsula.

(Address by President Moon at COP26)

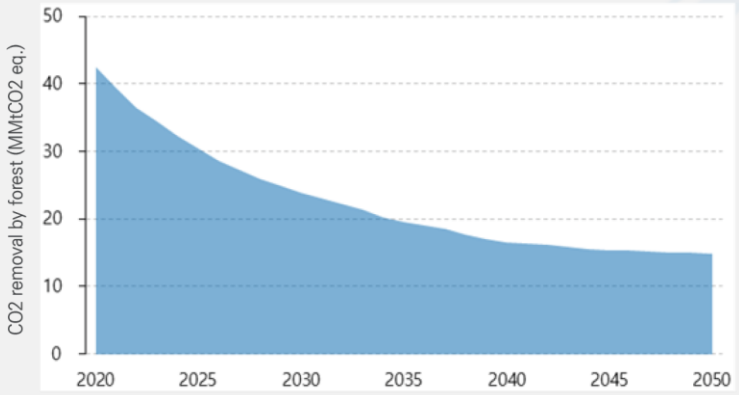
Current Status

: Sharp decrease of net standing growth due to aging forests afforested in 1970s-1980s

▪ Outlook for percentage of forestland by age-class



▪ Estimated CO_2 absorption by forest

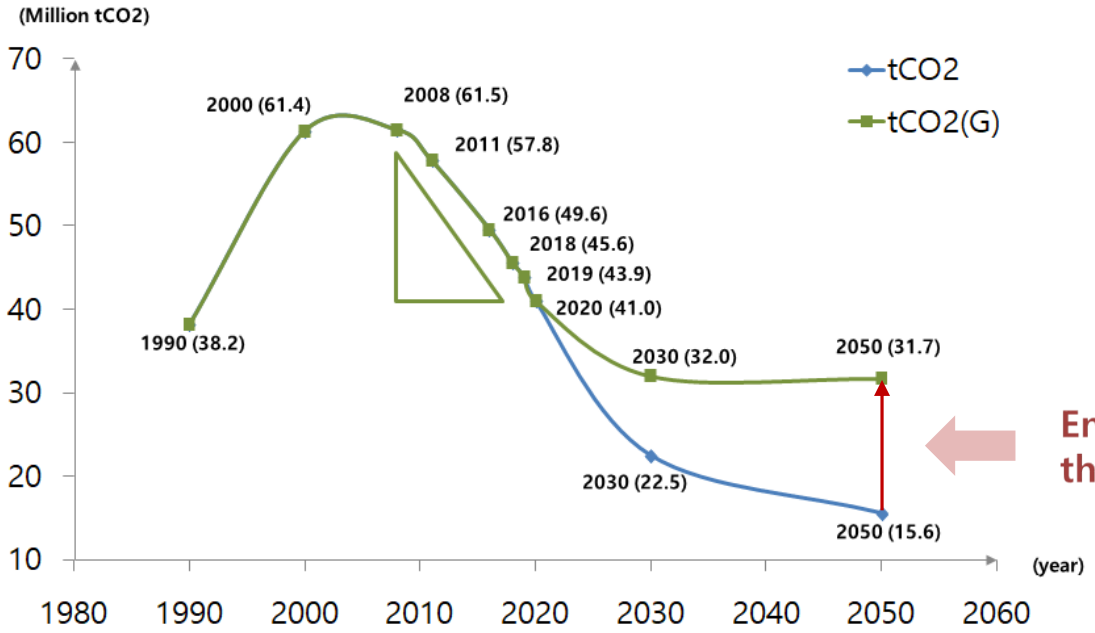


* Age-class: 10-year basis age structure of a forest. Age-class 1 includes 1 to 10-year old trees, age-class 2 includes 11 to 20-year old trees.

Decrease of national forests which remove 45.6M tons of GHG (2018) and offset 6.3% (728M tons) of national emissions

- Forestlands at age-class 6 (51yrs) or older (%) : 10.2 (2020) → 32.7 (2030) → 72.1 (2050)
- Annual growth volume decline due to aging (㎥/ha/yr) : 4.3 (2020) → 2.6 (2030) → 1.9 (2050)

Assessment



Enhancing Carbon absorption through active SFM

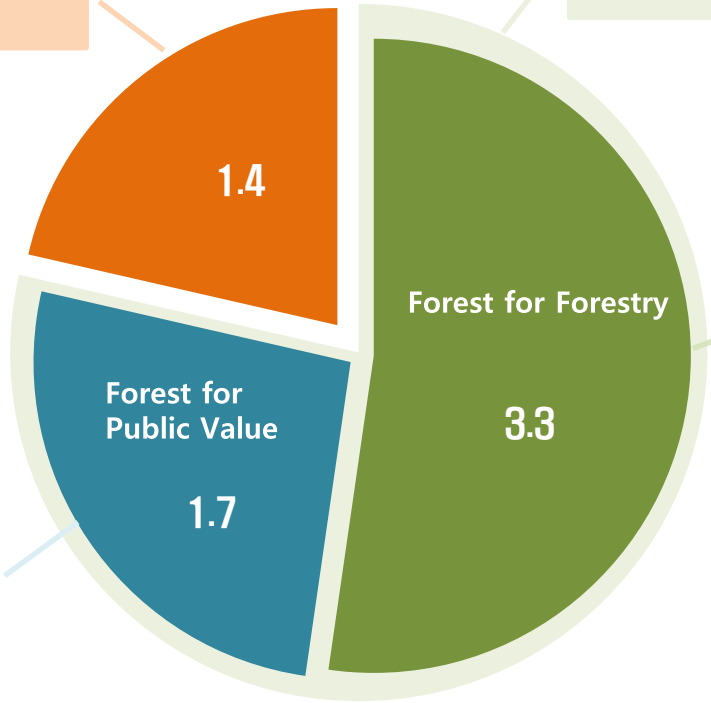
If forest management remains unchanged, carbon absorption of forests is expected to decline to 14M tons in 2050

※ Total contribution of forestry sector is estimated to be 15.6M tons, including carbon storage In wood products (1.2M tons), emission reduction from using forest biomass (0.4M tons)

Forest Zoning

Semi-Conservation Forest(22%)

Conservation Forest(78%)



- Timber
- Edible Forest Products

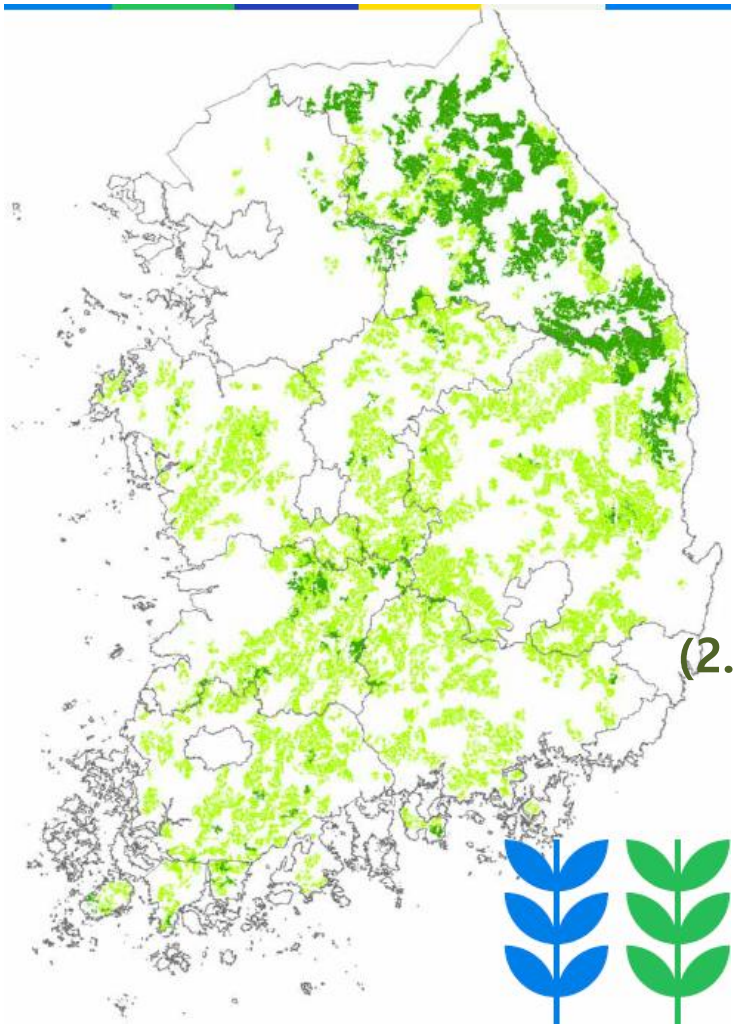
...

- Watershed Enhancement
- Biodiversity Conservation
- Forest Landscape
- Landslide prevention

...

(Million ha)

Commercial Forests



(2.3 million ha)

Operative Cycle of Harvesting, Utilizing, Planting and Tending trees

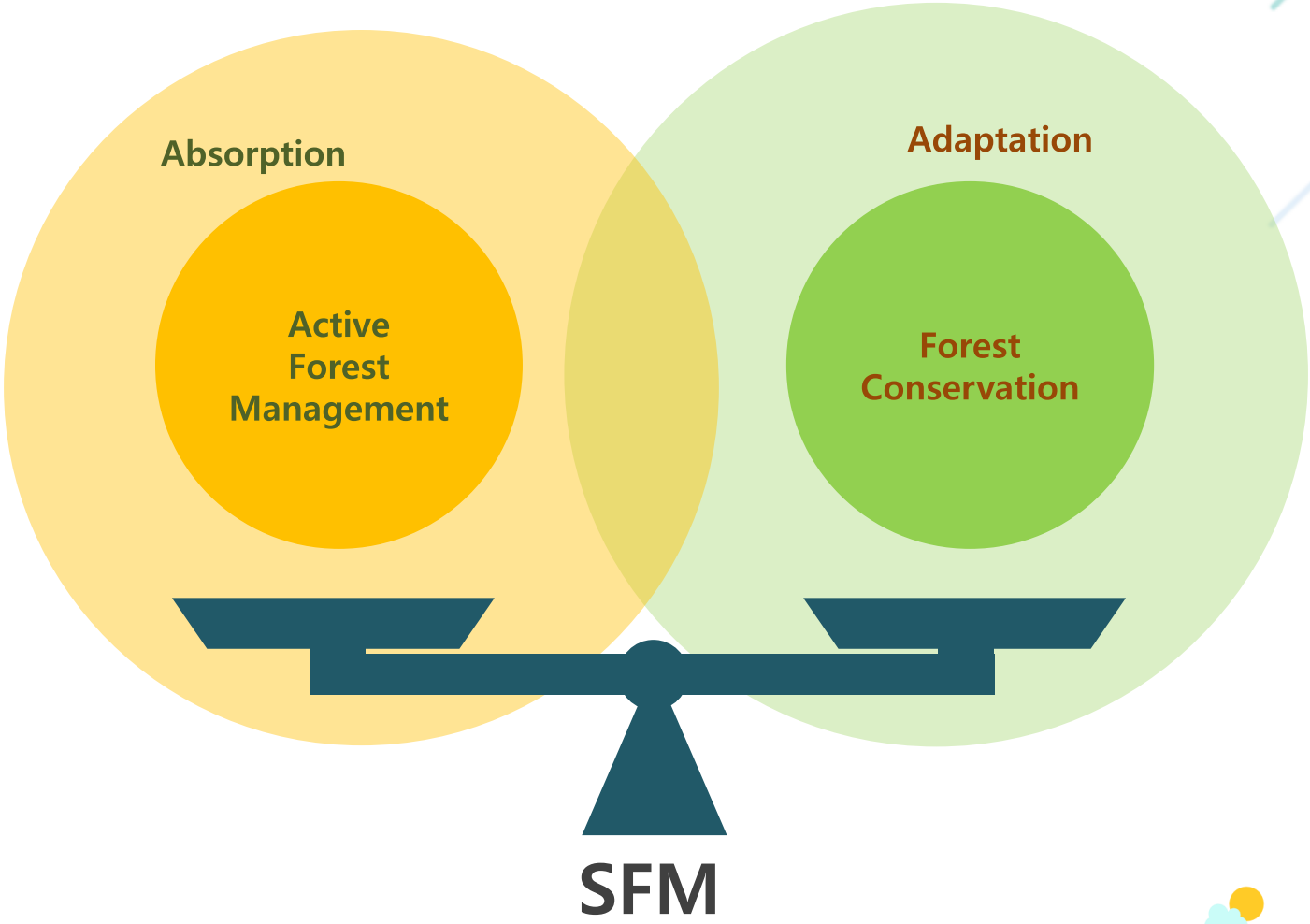
Protected Forests

- Biodiversity Conservation(173Kha)
- Watershed Enhancement(258Kha)
- Forest Landscape(16Kha)
- Landslide prevention(3Kha)

- Baekdudagan (277Kha)

A mainline mountain system which extends 1,400km from Baekdu Mountain to Jiri Mountain

SFM with Balance




Thank you!

Annex F

Country Update: New Zealand

Montreal Process Working Group

3-4 May 2022

Topics

- Proposed legislative changes to manage afforestation
- AS/NZS 4708 Sustainable Forest Management

Context

- Afforestation is a key pathway for New Zealand to meet its climate change targets and transition to a low-carbon bioeconomy.
- The New Zealand Emissions Trading Scheme (NZ ETS) provides an incentive for afforestation by providing New Zealand Units (NZUs) for carbon sequestration.
- The NZU price has more than doubled in recent years, from around $35 in late 2020, rising to >$85 in early 2022, and is now approximately $75 in late April.

Context

- The increase in NZU price is a driver for increased afforestation. Potential environmental risks (if not well managed) include pests, fire, and disease.
- A new permanent forest category (for exotic and indigenous species) in the NZ ETS will become available in 2023.
- The Government acknowledges the need to balance wider objectives and outcomes for the environment and biodiversity, national and regional economies, land use, and rural communities.

Proposed legislative changes to manage afforestation

- The proposed changes are consistent with the Climate Change Commission's recommendations for the Government to:
  - reduce reliance on forestry for emission reductions
  - manage the impacts of afforestation
- Consultation has recently concluded on:
  - whether to exclude exotic forests from the permanent post-1989 category in the New Zealand Emissions Trading Scheme (NZ ETS).
  - whether to adjust how carbon accounting applies to forests on remote and marginal to harvest land, and
  - feedback on opportunities for improving incentives for indigenous afforestation.
- Final policy decisions are expected in mid-2022

AS/NZS 4708 Sustainable Forest Management

- Initially developed as an Australian Standard in 2003. Adapted to cover NZ in 2014.
- Administered by Responsible Wood.
- Objective to provide forest managers with cultural, economic, environmental and social requirements that support the sustainable management of forests.
- Establishes a systematic approach to forest management.
- Provides a base for independent, accredited third party certification.
- Endorsed by PEFC (programme for the Endorsement of Forest Certification)

AS/NZS 4708

- Recently completed a full review of the standard (published in late 2021)
- Review undertaken by a review committee with representatives from a wide range of industry and stakeholder organisations from Australia and NZ
- Now a fully joint Australian/NZ Standard
- Updated to align with the new PEFC Meta-standard for Sustainable Forest Management and the structure of ISO 14001
- All aspects of the standard have been reviewed and updated taking into account new knowledge and changing community expectations
- Standard can be found at https://www.responsiblewood.org.au/resources/

FSC®

- Many NZ production forests are also certified to FSC® (Forest Stewardship Council)
- FSC also provides for independent third party certification
- FSC ‘principles and criteria’ apply worldwide and cover the full range of environmental, economic and social aspects of responsible forest management
- FSC NZ standard has also recently been reviewed and updated – currently being approved by FSC
- Standard information: https://nz.fsc.org/en-nz
- Current certified forest area in NZ:
    - FSC 1.3 million ha
    - AS/NZS 4708 0.6 million ha

Annex G

USA Country Status Report

Near Mendenhall Glacier in SE Alaska

31st MP Working Group Meeting
Seoul, Korea (Virtual)
May 3-1, 2022

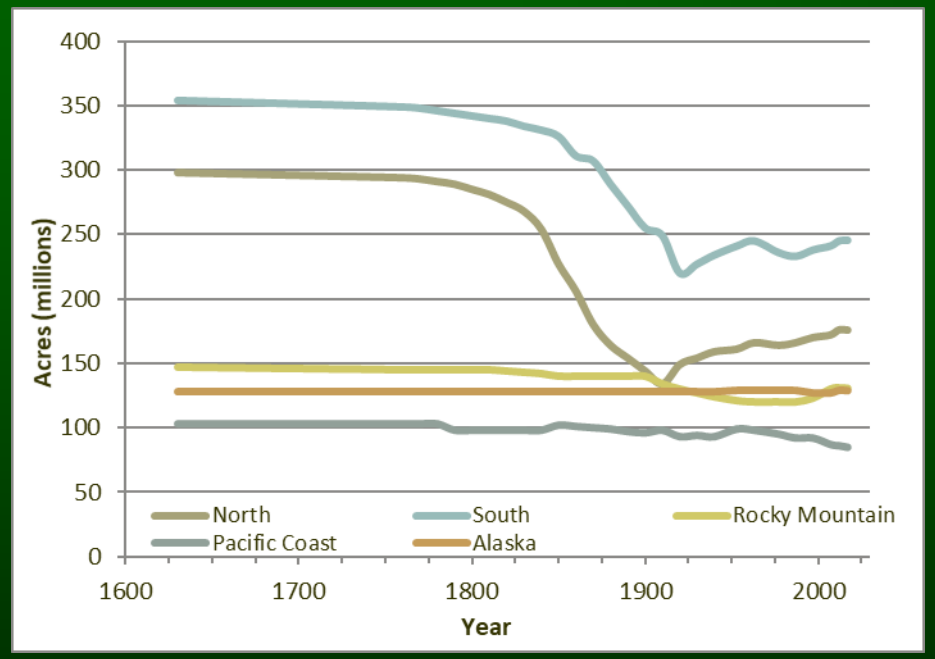
Guy Robertson
US Forest Service R&D (Retired)

USDA

Overall Sustainability Statement

- The total area of forests in the USA is stable and timber volumes in these forests are increasing as they continue to mature
- Forest disturbance processes exacerbated by climate change and management history are our greatest concern relative to SFM
- Forest fragmentation and removal for development is an issue in more populous areas
- Employment in wood products continues to decline as a result of structural and cyclical factors

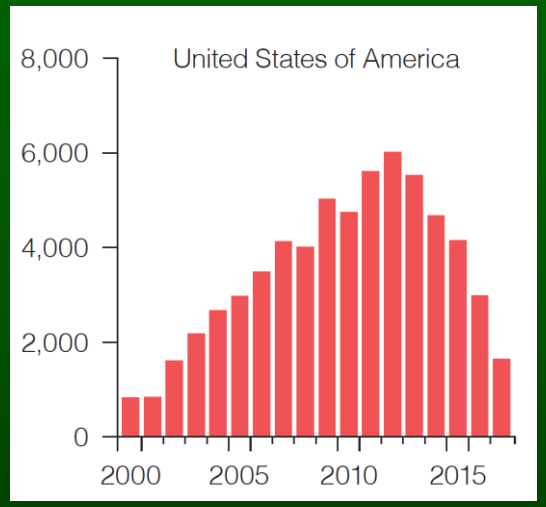
Forest Area in the United States MP i1.1.a



Historical forest area in the United States by geographic region, 1630–2017
(Nelson 2021, MP indicator 1.1a)

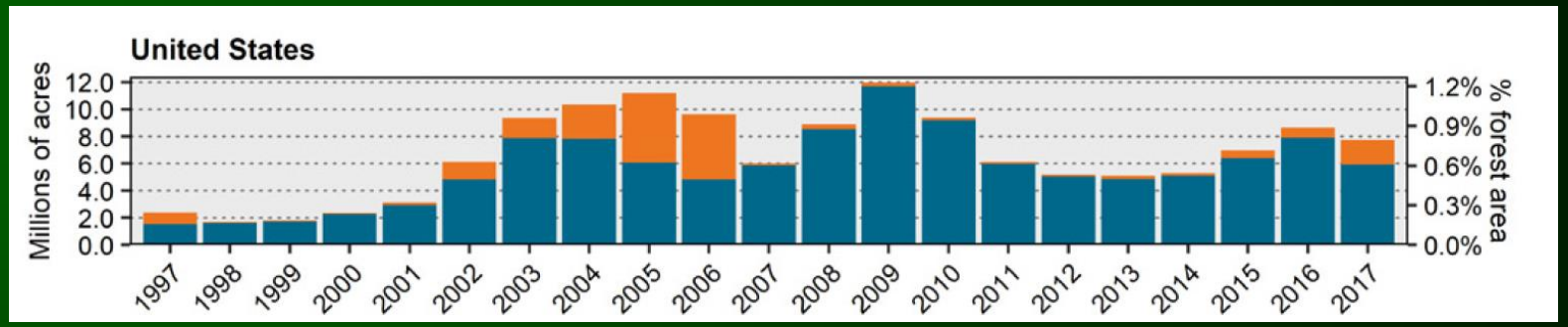
- Rapid loss of forests in the Eastern USA from around 1800 to 1900
- Rebound in the last century
- More recent declines on the West Coast

Forest Disturbed by Insects (MP i3.a)



Total area of forests disturbed by insects as calculated from national forest inventory (1,000 ha)

(FAO FRA, as reported in MP Synthesis Report)

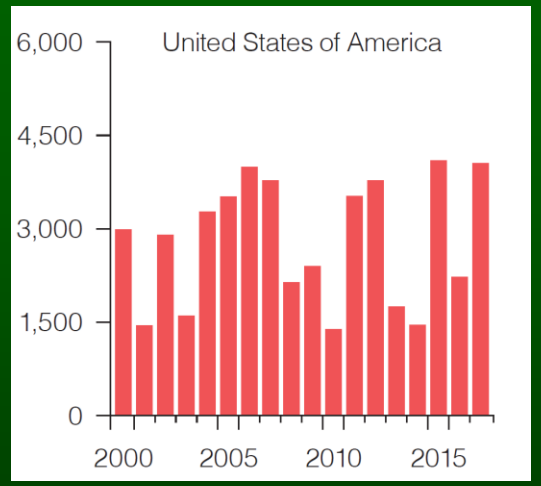


Total area of forests Disturbed by Insects (native blue, invasive orange) as Calculated from Forest Health Protection IDS Survey (targeted sample)

(US Forest Service Forest Health Protection as reported in Koch 2021, MP Indicator 3.a)

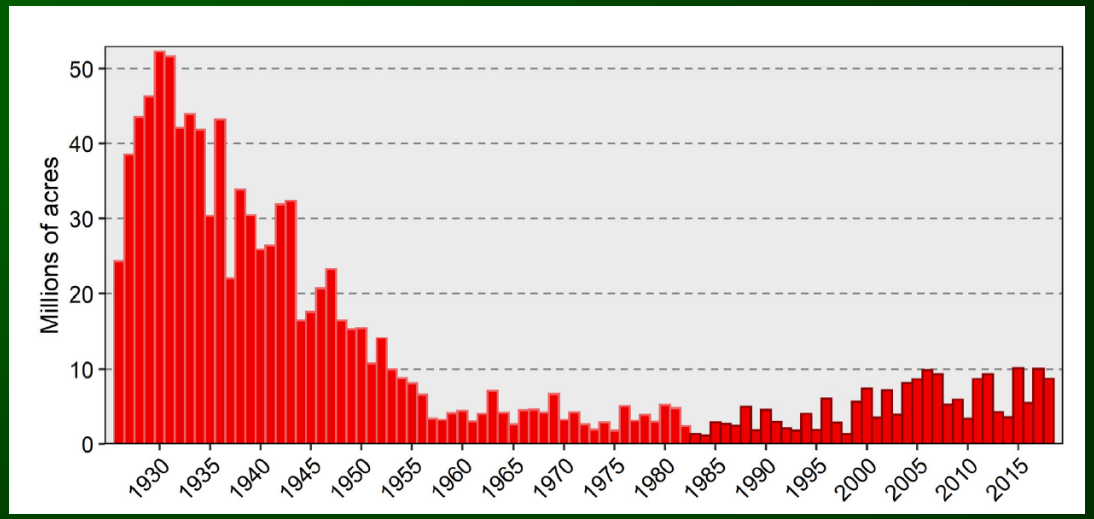
- Note different variance over time depending on sampling scheme

Forest Damaged by Fire (MP i3.b)



Total area of forests disturbed by fire (1,000 ha) compiled annually from incident reports

(FAO FRA, as reported in MP Synthesis Report)

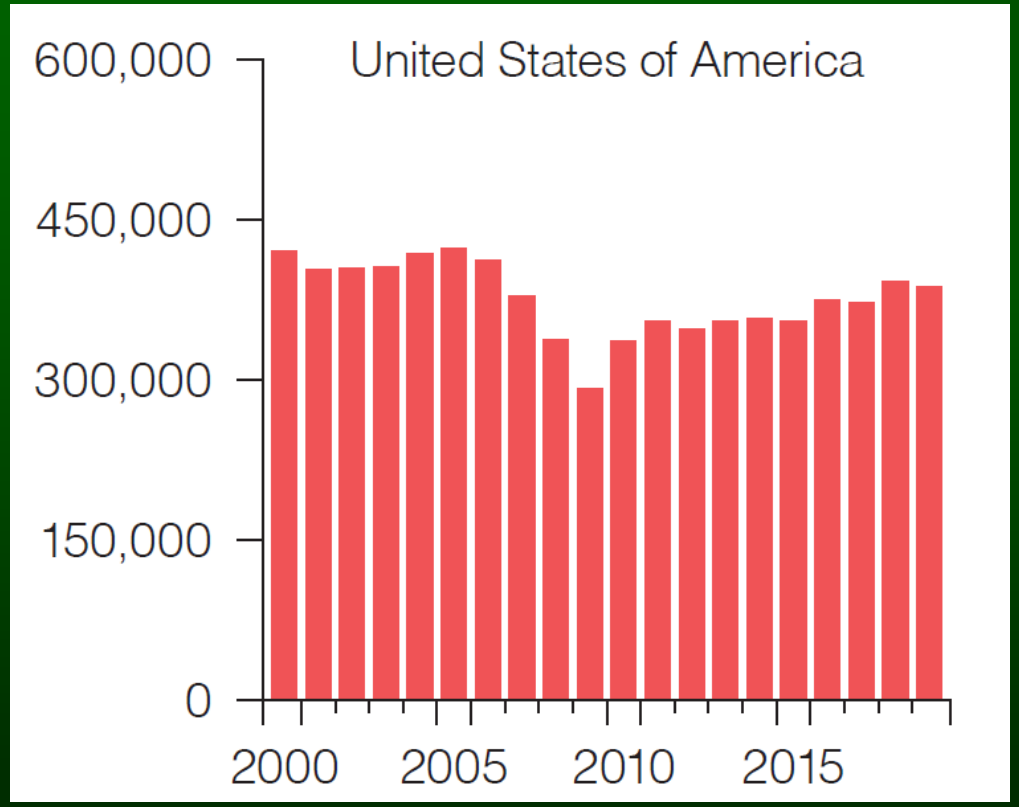


Total area of forests Disturbed by fire 1926-2018. Note that pre-1983 data is of unknown provenance and not directly comparable to more recent data

(National Interagency Fire Center as reported by Koch 2021, MP Indicator 3.b)

- Historical context is important

Roundwood Production (MP i6.1b)



- Slightly increasing in recent years
- But still not fully recovered following 2008 recession

Industrial Roundwood Production
(1,000 Cubic Meters)

(FAO FRA, as reported in MP Synthesis Report)

Roundwood Production (MP i6.1b)

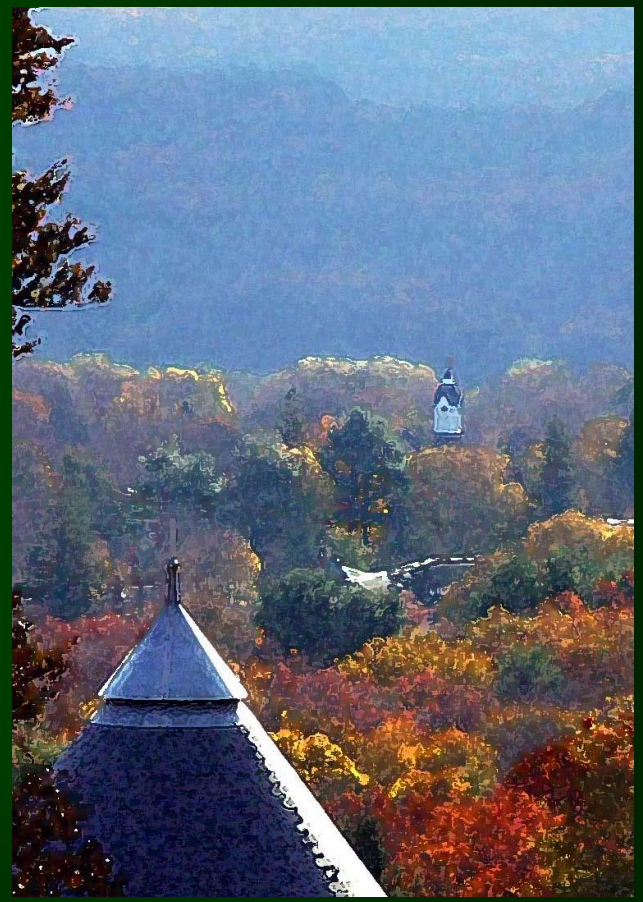
Includes forestry & logging, wood products, and paper products

(US Bureau of Economic Affairs)

- Long term structural decline since the 1990s
- Sharp decline around 2008 followed by relatively stable levels

Also Note:

- Increasing recognition of the many different ways that forests benefit humans and may help solve pressing problems we currently face, notably global climate change.
  - In situ carbon sequestration (e.g., Trillion Trees effort):
  - Pursuit of multiple benefits from forest (e.g. the “America the Beautiful” project and “30 by 30” conservation effort.



The view from Grey Towers in Pennsylvania

Thanks…

Temperate rainforest in S.E. Alaska

USDA

Annex H

Montréal Process

www.montreal-process.org

MONTRÉAL PROCESS 31st WORKING GROUP MEETING

AGENDA ITEM 8: TECHNICAL ADVISORY COMMITTEE ACTIVITIES

Tim Payn - TAC Convenor

Thursday, 28 April 2022

FOR INFORMATION AND DISCUSSION

Background

Since the 30th virtual Working Group meeting chaired by USA on the 14th and 15th September 2021 the TAC has undertaken a range of activities. These are reflected in the Action Item list Appendix 1, plus some additional activities.

TAC activity has been documented in a range of TAC Updates and Updates to the Working Group over the period.

Summary of activities:

- Fortnightly TAC data and reporting team Zoom meetings (12)
- Working Group updates and informal meetings (3)
- Synthesis report development
    - Narrative drafting
    - Graphics development
    - Review of drafts and revisions
    - World Forestry Congress side event presentation development
- Revision of XV World Forestry Congress Side event proposal and submission to reflect postponement to 2022
- Interactions with FAO, IUFRO Working Party on C&I, Forest Europe
- TAC Convenor and synthesis report support discussions with New Zealand, Canada, Australia and USA

Commentary

Synthesis report development

Most of the TAC activity since the last Working Group meeting has been on the Synthesis Report. The report is 95% complete but we have had a number of delays in the final weeks ahead of the Working Group meeting that has affected our ability to present the finalised report at the meeting.

All the text and graphics are complete, and a draft fully laid out report has been reviewed and revised by the TAC ahead of finalization for sign off by the Working Group. There are a number of things still to complete.

Still to complete

- Technical edit of text – Scion, New Zealand
- Review of technical edit text – Canada and lead authors of sections
- French translation – Canada
- Spanish translation - Argentina
- Incorporation of English, French and Spanish text into report templates – Scion, New Zealand
- Development of communications plan – TAC
- Final review - Working Group
- Sign off - Working Group
- Launch of the report

We propose a revised timeline to get the report to the Working Group for review by the end of June, make any final revisions following that and re-submit to the Working Group for out of session sign off by mid August.

Covid survey

Due to the changes to the timing of the World Forestry Congress and availability of team members to work on this topic there has been no work on this since the last Working Group meeting. The deadline to submit a full paper to the WFC was not achievable so the work has been paused. It is an important topic, insights from the Working Group on a way forward would be appreciated.

XV World Forestry Congress (WFC)

TAC Convenor and TAC members have been involved in the development of the side event programme and the Montreal Process presentation. The programme involves IUFRO, ITTO, Forest Europe, FAO and the Montreal Process and is titled 'Building data foundations for Sustainable Forest Management'. The flyer for the side event is appended as is the draft presentation.

Interactions with FAO, ITTO, Forest Europe, IUFRO

Ongoing links with the IUFRO Working Party on C&I for Sustainable Forest Management[1] have been maintained and MP updates incorporated in the Working Party's regular newsletter to increase the profile of our activities. This is also a very useful site to share developments in C&I through listing recent publications and other activities.

New developments and things to look out for

- The IUFRO World Congress will be held in 2024. A good opportunity for Montreal Process engagement via the IUFRO Working Party on C&I for SFM a number of TAC members are involved with.

[1] https://www.iufro.org/science/divisions/division-9/90000/90100/90105/

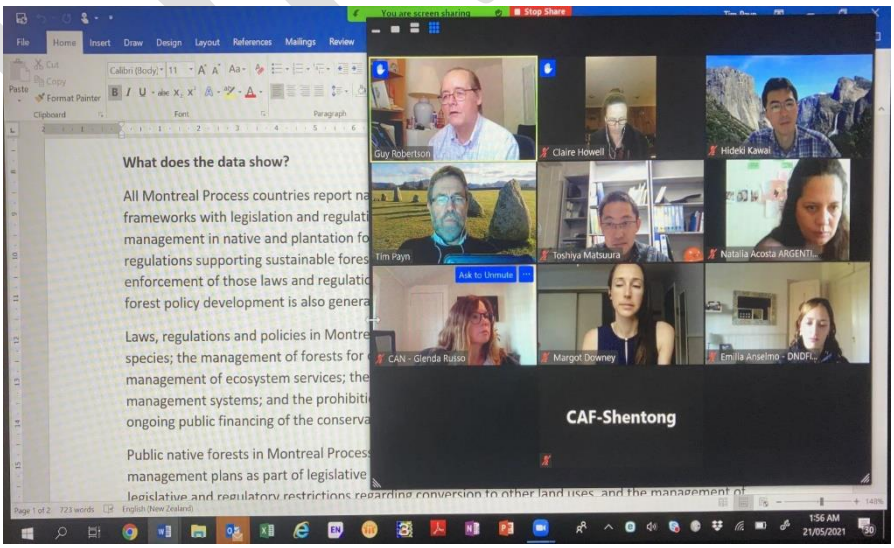
- Montreal Process material. With the need to change the website address[2] we should update a range of documents we hold on the website to the new address. These include the C&I poster, C&I booklet, technical notes, and the fact sheet.
- The last review of the Indicator set and supporting documents was completed in 2015 with the updating of indicator 6.1.c (Revenue from forest-based ecosystem services) and revision of the technical notes supporting the full indicator set. There have been significant developments around climate change, bioeconomy and the global role of forests since 2015. A number of projects, such as the applicability of the Forest Europe indicators to a bioeconomy[3], have been undertaken. It would be timely for the Montreal Process to consider if revisions to our set may be necessary.
- As the long-term indicator datasets build up and our ability to look at trends improves through better data it is a good time to consider how we use the indicator framework strategically to address issues such as climate adaptation. There has been some exploratory work by countries in how to use the framework in a forward-looking approach. It may be time to build on these foundations.

TAC Convenor support

The TAC Convenor role and synthesis report development has been financially supported over the period by New Zealand, Canada and the USA. This support is most appreciated by the Convenor.

Acknowledgements

I would like to thank all the TAC representatives for their enthusiasm for the work and engagement since WG 30, especially with the development of the Synthesis Report. Sharing the load across multiple team members has made us much more productive. We would not have been able to make the progress we have under such difficult circumstances without this commitment and enthusiasm.



Virtual TAC meetings

[2] Separate WG 31 agenda item

[3] https://www.researchgate.net/publication/322332318_Monitoring_and_assessing_the_sustainable_forest-based_bioeconomy

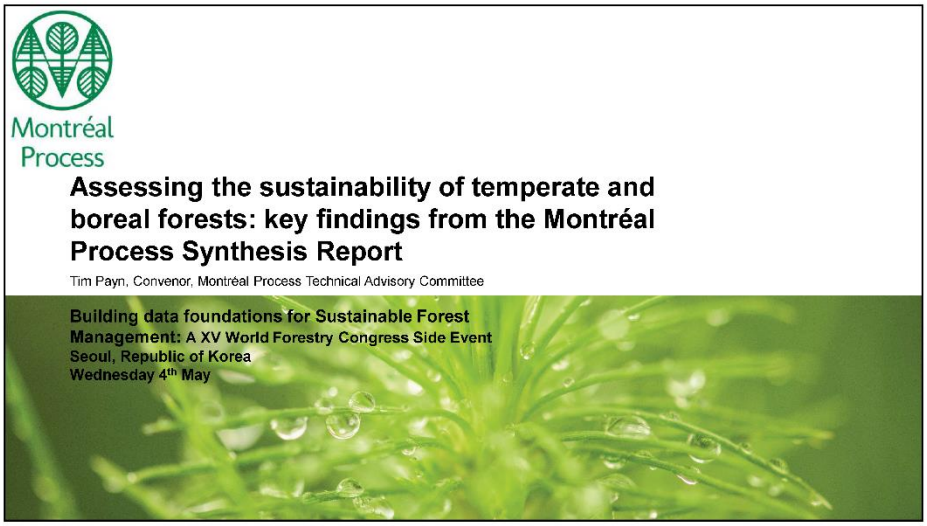
Appendix 1: Action items for the TAC from the 30th Working Group meeting Aide Memoire and comments on progress.

TAC related action item	Comment
Action Item 4: TAC to submit the Covid-19 project report for approval by the WG out of session (in concert with the MP Synthesis Report process) and present the report at the MP Side Event at the XV WFC.	Not achieved. This project has been paused due to changes to the World Forestry Congress programme, deadline for submission of a full paper, and team members availability.
Action Item 7: TAC Convenor to provide clarity on the timeline for resourcing needs for the Montréal Process Synthesis Report production and dissemination, including translations and graphics.	Achieved, revised timeline included in Working Group update. Timeline and resourcing needs has since been an ongoing topic of discussion and due to the unusual work environment
Action Item 8: TAC to implement the proposed process and timeline for completion of the synthesis report, present the findings at the MP Side Event for the XV WFC, and launch the report (subject to availability of production resources) at the same event.	Not achieved. Various delays have meant we could not hit the target of launching the report at the WFC but are only able to make a presentation. Process for finalisation is an agenda item for MPWG 31. Details on progress in separate item in this report.
Action Item 9: TAC to develop a communications and social media plan to support the launch of the synthesis report	Not achieved, some discussions have been held. Will be a priority as the report is finalised.
Action Item 13: Primary and alternate presenters to work with TAC Convenor to develop presentation for review by the Working Group (via email) and subsequent presentation at WFC.	Achieved. Draft circulated to Working Group members for discussion at 31st meeting.

Appendix 2: World Forestry Congress Side Event programme

Appendix 3: Montreal Process draft presentation for the World Forestry Congress side event.

28/04/2022



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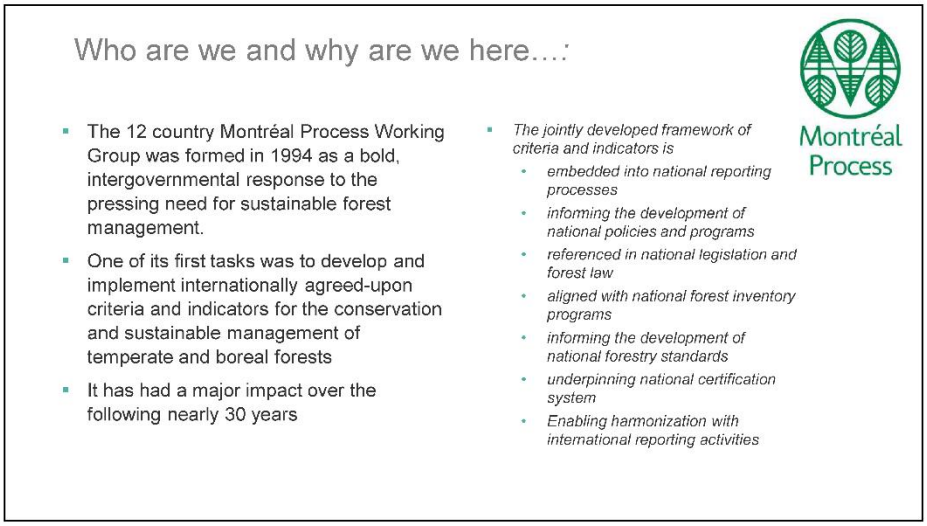

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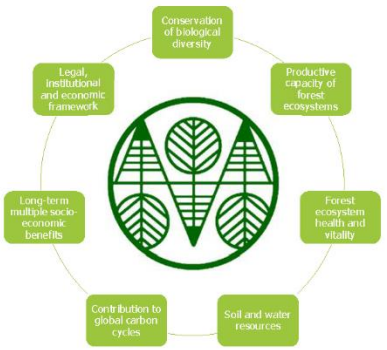
Many Languages, Many Cultures, Many Forests, One Framework



- Guide policy makers, forest managers and the general public
- Easy to use tools to assess national progress
- Help public and decision-makers identify current status and trends
- Contribute to improved decision making

The Montréal Process framework was developed to characterize the essential components of sustainable forest management to maintain the range of forest values in perpetuity

3

4

Today's focus – looking backwards and forwards

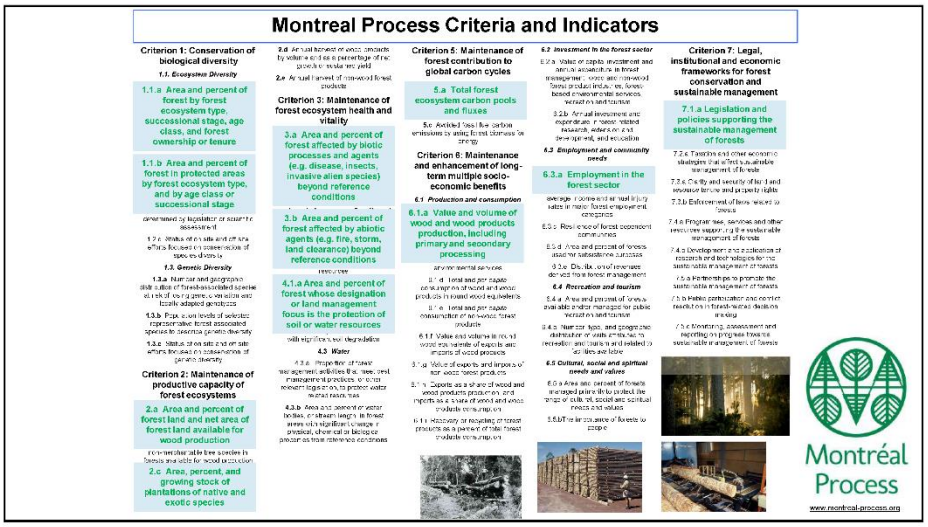
Montréal Process

5

The report

- Aim: to analyse trends from 11 selected indicators covering the 1990 to 2020 time period, and to explore what these trends may be in the future
- Data
  - Quantitative data (Country and FRA)
  - Questionnaire (narratives, future perspectives)
- Individual indicator analysis
  - Importance, trends, future
- Overall synthesis – what does it mean colectivley and individually

6



7

What the data shows

- **Forest area** is generally stable to increasing
- Total area of **plantation forests** has increased steadily, and growing stock has nearly tripled since 1990
- Aggregate data for **insect and fire** disturbance show an overall increasing trend
- **Carbon stock** densities in above-and below-ground biomass have increased in most countries
- Industrial **roundwood production** has increased in most countries
- Area of forests designated or managed primarily for the **protection of soil and water** showed a steady increase from 1990 – 2020
- Aggregate **employment** totals have been steadily declining throughout the reporting period
- All countries have solid **legislative frameworks** for SFM

Note: country to country variability in trends, data gaps and methods challenges

Montréal Process

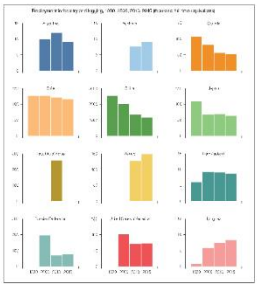
8

Three Key Drivers

- Climate change
- Increasing environmental concerns and recognition of the value of forest-based ecosystem services
- Developments in technology and forest management

Image of Protective Functions - NZ

Employment



9

What the future may hold

- Climate change impacts – fire, storms, biotic agents will affect forests and their carbon stocks with increasing severity
- Total forest area likely to remain stable or increase slightly overall with increases in planted forest areas and growing stock offsetting some deforestation and production decreases
- Regulatory and policy frameworks likely to become strengthened to reflect global drivers related to climate change, biodiversity conservation, production pressures and market demands

10

The importance of data

- The accuracy and consistency of data needed to assess forest sustainability remains a perennial problem
- Inconsistences and data gaps are apparent
- Diversity of MP countries – size, forest types, reporting conventions compound challenges
- Steady progress towards global standards good – collect once use many times
  - CFRQ
  - Global set of indicators
  - New technologies
- C&I frameworks provide a common language and comprehensive view of SFM

Montréal Process

11

Final words

- **Pressures on forests** for production will increase as demand for fibre rises and the planet moves towards low carbon economies – plantations will take the pressure off natural forests
- The **C&I framework** is incredibly useful for assessing our progress towards Sustainable Forest Management
- More importantly the **C&I framework** can be a tool for designing responses to pressures on our forests
- **C&I frameworks** will continue to evolve and we must rise to the data challenges

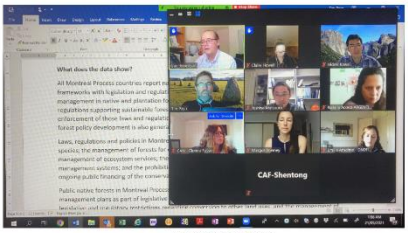
Montréal Process

12

Acknowledgements

- Participants at the 17th TAC meeting, Montevideo, Uruguay for design and scoping of the synthesis report
- All the participants at the regular virtual TAC meetings
- Glenda Russo, Canada for data coordination
- Lorie Wagner and Margot Downey, Canada for report design coordination
- Sebastian Klinger, New Zealand for undertaking indicator data graphing and analysis
- Indicator lead authors: Margot Downey (Canada), Hee Han (Republic of Korea), Claire Howell (Australia), Toshiya Matsuura (Japan), Sebastian Klinger (New Zealand), Guy Robertson (USA), Talha Sadiq (Canada)
- Scion (New Zealand) graphics and technical editing team
- Anssi Pekkarinen, UNFAO – FRA2020 lead for his assistance with access to data

Participants at 17th TAC meeting Montevideo, Uruguay. 2019



Virtual TAC meetings

13

Further information, contacts and links

- Montreal Process website: www.montreal-process.org
- Synthesis of Indicator trends 1990 to 2020 and future outlook. 2022: link to come
- Overview and Country Highlights Report 2019: https://www.montreal-process.org/documents/publications/techreports/Montr%C3%A9alProcessOverviewandCountryHighlightsReportNovember2019FINAL.pdf
- 5th Edition of the Montreal Process Criteria and Indicators 2015: https://www.montreal-process.org/documents/publications/techreports/MontrealProcessSeptember2015.pdf
- Montreal Process Indicator Poster: https://www.montreal-process.org/documents/publications/techreports/MPCIposter2015.pdf
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- Montreal Process Technical Advisory Committee Convenor: Dr Tim Payn, Scion, New Zealand (tim.payn@scionresearch.com)

14

Annex I

Montréal Process

Montréal Process Working Group
Synthesis Report

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Acknowledgements

Contents

Montréal Process

Key findings about boreal and temperate forests in Montréal Process countries

Introduction/purpose of the synthesis report

Pressure on forests globally has never been greater. Deforestation continues at an alarming rate, population growth and consequent demand for both food and fibre is increasing (e.g. Gresham House reference), and climate change is stressing our existing forests significantly through increasing numbers of extreme climatic events. The challenges are immense if we are to continue to retain forests with ecological function that provide the full suite of ecosystem services to support communities, countries, regions and the entire planet.

Over the years here have been many initiatives support the conservation and sustainable management of forests. Most recently individual countries have pledged to reduce deforestation rates (COP26), committed to planting more trees to restore degraded lands and forests (e.g. NZ 1BT, India 1Tn trees), and included trees and forests as a key component to mitigate climate change (Paris Agreement and NDCs).

These initiatives are underpinned by the understanding that for forests to be managed sustainably they must take into account cultural, social, environmental and economic factors, and that these factors need to be described. To this end the concept of Criteria and Indicators (C&I) of Sustainable Forest Management was developed in the 1990s and refined since then. These C&I enable a comprehensive description of the state of forests, using a common or standardised set of descriptors. Today many countries subscribe to one or more of the X active C&I processes. Those with the widest areal coverage globally are the Montreal Process, Forest Europe, and the International Tropical Timber Organisation (ITTO).

Recently these three processes have worked closely with the UNFAO to develop and refine the concept and systems to ensure they are widely used, complementary, and link to the Global Forest Resources Assessment through for example the Collaborative Forest Resources Questionnaire (CFRQ). All these processes have been active since the 1990s and have been reporting on the state of forests by individual country and also collectively. This has led to an extremely valuable and powerful sets of data that have informed changes in forest policy and management and moved countries and groups towards the goal of sustainable forest management.

The Montreal Process is a 12[1] country Working Group established in 1994 which focuses on the conservation and sustainable management of temperate and boreal forests. An initial set of seven criteria and 67 indicators were developed in 1995 and have been revised to the current 5th edition of the 7 criteria (biodiversity, forest productivity, soil and water, health and vitality, carbon cycle, socio-economic, and legal and institutional frameworks) and reduced number of 54 indicators (Appendix 1). Countries have reported on the state of their forests on a roughly five-year cycle and have built up a significant body of data and knowledge of trends over time.

This report explores trends in 11 indicators spanning all seven criteria, that are important to ensuring the sustainable management of our forests. The trends will allow us to gain perspectives on the past and what the future may hold for forests within Montreal Process countries in the context of global drivers such as deforestation, population growth and climate change. It builds of a wealth of past information including individual country reports and the 2020 Overview and Country Highlights report.

Photo: Forestry Agency of Japan - Japan.

[1] Argentina, Australia, Canada, Chile, China, Japan, Korea, Mexico, New Zealand, Russia, United States of America and Uruguay.

The importance of forests and Sustainable Forest Management

The contribution of forests and sustainable forest management to sustainable development first received global recognition in 1992 when the United Nations Conference on Environment and Development adopted the "Rio Forest Principles" and Chapter 11 of Agenda 21.

Forests are essential to the long-term well-being of local populations, national economies and the earth's biosphere as a whole. They provide food, fuel, shelter, clean water and air, medicine, livelihoods and employment for people around the world. They reduce concentrations of greenhouse gases in the atmosphere, minimize sedimentation in lakes and rivers, and protect against flooding, mudslides and erosion. Forests are home to 80% of the world's terrestrial animals and plants. When managed sustainably, forests can provide a wide range of economic, social and environmental goods and services for the benefit of current and future generations.

The contribution of forests and sustainable forest management to sustainable development first received global recognition in 1992 when the United Nations Conference on Environment and Development adopted the "Rio Forest Principles"* and Chapter 11 of Agenda 21. At about the same time, the International Tropical Timber Organization (ITTO) did some pioneering work on "Criteria for the Measurement of Sustainable Tropical Forest Management."

Following the Rio Earth Summit, the concept of "criteria and indicators for sustainable forest management" gained increasing international attention as a tool to monitor, assess and report on forest trends at national and global levels. By 1995, the Ministerial Conference on the Protection of Forest in Europe (MCPFE) and the Montréal Process had adopted comparable sets of national level criteria and indicators for sustainable management of temperate and boreal forests.

The importance of criteria and indicators as tools to assess progress toward sustainable forest management has been recognized by the Intergovernmental Panel on Forests (1995-1997) and its successor Intergovernmental Forum on Forests (1997-2000), the United Nations Forum on Forests (UNFF), and the Food and Agriculture Organization of the United Nations (FAO). They are also relevant to the forest-related programs of member organizations of the Collaborative Partnership on Forests,** including the Rio conventions on biodiversity, climate change and desertification.

More recently a project carried out by the IUFRO Working Party on C&I for SFM analysed how C&I processes have made a difference over the 25 years since they were first established and what some of the factors of success were. The Working Party contains members from a number of active processes and the project developed out of an international experts workshop held in Ottawa, Canada in 2016.

Six areas of positive impact were identified:

- Enhanced discourse and understanding of SFM
- Shaped and focused engagement of science in SFM
- Improved monitoring and reporting on SFM to facilitate transparency and evidence-based decision making
- Strengthened forest management practices
- Facilitated assessment of progress towards SFM goals, and
- Improved forest-related dialogue and communication.

Some of the 11 C&I processes established post Rio have prospered, some have become inactive. There are a number of reasons for this. Criteria for success (Linser et al 2018b) include ongoing political commitment to C&I for SFM, a commitment to collect significant amounts of data on a wide range of indicators, coordination, efficient tools for monitoring, communication and capacity building and good linkages to official statistics. The C&I frameworks also need to be responsive to change and new global challenges or market developments emerge.

Photo: Margot Downey - Canada.

Why the Montréal Process Working Group works together on Sustainable Forest Management

The Montréal Process is one of the more active processes and brings together countries with diverse social, economic and political situations in a voluntary forum to share ideas, address common problems, and foster collaboration toward a shared goal of sustainably managing temperate and boreal forests. The Montréal Process provides countries with an internationally-agreed consistent framework of 7 criteria and 54 indicators to monitor, assess and report to their citizens using credible and relevant information that demonstrates the sustainable management of their forests. It was established din 1995. Together the countries account for:

- 90% of the world's temperate and boreal forests
- 49% of the world's forests
- 58% of the world's planted forests
- 49% of the world's roundwood production
- and 31% of the world's population

Through the development of the C&I and working together over nearly 30 years the Process has developed a very significant network of knowledge across member countries where sharing of experiences has helped progress towards SFM in individual countries.

The common language and comparable data of the C&I also helps countries engage in international discussions on emerging issues. Through the Montréal Process, countries have engaged with other Criteria and Indicators processes and forest-related international organizations to streamline reporting and improve the consistency of global forest information.

Photo: Sebastian Klinger - New Zealand.

The jointly developed framework of criteria and indicators is now embedded into national reporting processes; informs the development of national policies and programs; is referenced in national legislation and forest law; is aligned with national forest inventory programs; informs the development of national forestry standards; underpins national certification systems; and harmonises with international reporting activities.

A joint study in 2009 shared responses to climate change, energy, water and biodiversity issues (2009 report), and the Technical Advisory Committee has worked on issues of common interest such as forest degradation, ecosystem services and the impacts of the COVID-19 pandemic.

The common language and comparable data of the C&I also helps countries engage in international discussions on emerging issues. Through the Montréal Process, countries have engaged with other Criteria and Indicators processes and forest-related international organizations to streamline reporting and improve the consistency of global forest information. The result is that national data on forests are more useful for multiple reporting requirements, more accessible to a larger audience, and more robust for improving management practices and addressing emerging policy issues.

Summary of progress

Approach

The intent of the report is to analyse trends in data of the 11 indicators from 1990 to 2020, and to explore what these trends may be in the future.

The indicators were agreed at the 29th Working Group meeting in Chile in 2019. The indicators are a subset of the 54 indicators and span all seven criteria and were chosen predominantly as all countries had reported on them in the past. This could then give a comprehensive view of trends.

The 11 indicators are:

- 1.1.a Area of Forest
- 1.1.b Area of forest in protected areas
- 2.a Area of forest available for wood production
- 2.c Area and growing stock of plantations
- 3.a Area affected by biotic processes
- 3.b Area affected by abiotic processes
- 4.1.a Area of forest designated for protection of soil and water
- 5.a Carbon pools and fluxes
- 6.1.a Value and volume of wood and wood products production
- 6.3.a Employment
- 7.1.a Legislation supporting SFM

Data was collected in parallel to the FRA 2020 process and included both data collected for FRA variables (these were mapped to the MP indicators), and country specific data not included in the FRA survey. All these data were compiled into a dataset for analysis. At the same time a questionnaire survey was undertaken to gain country specific commentary on current state of the indicators and also perspectives on the future. For more details please see Appendix 2.

A narrative was developed for each indicator that presented and discussed past trends collectively and individually and outlined a future perspective. Findings from each indicator narrative were then combined to give an overall perspective of Montréal Process forests past present and future. The next section outlines the overview of state, trends and future for the indicators collectively, followed by the individual indicator narratives.

Photo: Margot Downey - Canada.

What the data shows – indicator trends in Montréal Process countries

Photo: Sebastian Klinger - New Zealand.

- **The Montréal Process reflects the diversity of its member countries,** each with different forest types, institutional characteristics, reporting capacities, and histories of forest use and management. Countries engage in the Montréal Process as a forum for sharing information and a framework for comprehensive sustainable forest monitoring and management.
- **The accuracy and consistency of data needed to assess forest sustainability remains perennial problem for all countries including those participating in the Montréal Process.** The FAO FRA data used in this report represents an international baseline for forest reporting, but even at this foundational level inconsistencies and data gaps are common and aggregation or comparison across countries challenging. The diversity of Montréal Process countries (in terms of size, forest types, and reporting conventions) further compounds these challenges.
- **Forest area is generally stable to increasing in Montréal Process countries.** While some countries have experienced significant forest loss on a percentage basis since 1990, these losses have been more than offset by large gains in China and stable forest area in Russia and North America. In terms of this limited but crucial measure of forest sustainability, we find no evidence of unsustainable conditions across Montréal Process countries at large (though certain locations may require attention). The area of protected forest has likewise increased slightly. However, many of the Montréal Process indicators for biological diversity covered in Criterion 1, are not addressed in the FAO FRA data (e.g. forest-associated species), and biodiversity conservation remains a concern.
- **Total area of planted forests in all Montréal Process countries has increased steadily and growing stock on these forests has nearly tripled since 1990.** If managed sustainably, the enhanced productivity associated with these forests can substitute for less sustainable timber harvest elsewhere. Increased stocking levels are also evident in natural and semi-natural temperate forests in many countries, and this increase in stocking is correlated with an increase in captured carbon in many countries. In general, we are not running out of wood in Montréal Process countries, though this conclusion cannot be automatically extended to specific locations or forest types.
- **Aggregate data for insect and fire disturbance in Montréal Process countries show an overall increasing trend for these disturbance categories** mainly as a result of increases in Canada, the Russian Federation, USA, and (in the case of fire) Australia. Forest disturbance processes are considered to be a large and increasing threat to the forest sustainability globally, and the statistics presented here tend to support this concern. The observed trends, however, are somewhat obscured by the high variability of disturbance activity year-to-year and between countries. Gathering disturbance data in a consistent fashion is difficult, and reporting is uneven across Montréal Process countries.
- **Carbon stock densities in above-and below-ground biomass have increased in nine among twelve Montréal Process countries, particularly in East Asia and the US.** Carbon stock in the soil is high in high latitudes, cool temperate regions. Expected change in carbon stock per hectare varies among countries, depending on their situation, e.g., forest age distribution, forest types, forestry activities, and various natural disturbances such as fires and pests.
- **Industrial roundwood production has increased in most Montréal Process countries,** with the exception of countries in North America where the economic recession in 2008 severely affected harvest, and production levels were slow to recover. In many countries, increasing roundwood production occurred along side stable forest area and increased wood stocking.
- **Area of forests designated or managed primarily for the protection of soil and water** in the MP countries showed a steady increase from 1990 - 2020
- **Employment totals across all Montréal Process countries have been steadily declining throughout the reporting period,** decreasing by 40% between 1990 and 2015. Reasons for this decline are variable, but they include increased mechanization, prioritization of environmental values over conventional forest sector resources, and changing market conditions.

Distilling the information from all of the indicator narratives we identified three common drivers of change affecting the forests: climate change, increasing environmental concerns, and developments in technology and forest management.

What the future may hold for temperate and boreal forests in Montréal Process countries

The total forest area is expected to grow steadily if China, which has the largest increase in forest area in the past 30 years, maintains its trend. Given the current legislations, policies and regulations in Australia, New Zealand and Uruguay, the pattern of increase in forest area is expected to be maintained.

However, the forest areas in some countries, such as the US and the Republic of Korea, are expected to decrease somewhat in the future owing to forest conversion to developed land in the coming decades. Some areas in those countries, a high demand for other land uses is expected to continue and affects the reduction of forest area.

The area of forest protected for conservation is expected to continue to grow across Montréal Process countries. This could include through protection of forest types that are currently under-represented in protected areas, the expansion of existing protected areas of forest, and the protection of forest in regions not previously considered for protection. However, the proportion of forest area protected could decrease if the total forest area increases outside protected areas.

Scientific evidence may show whether or not passive management through protection alone is having the expected conservation impact on biological diversity. This may in turn result in increased active management of protected forests for conservation, through sustainable regimes of planned disturbance customised to each forest ecosystem.

Increased protection of forests from illegal logging could also occur as more Indigenous and non-Indigenous communities see the need to protect the tangible and intangible values that forests have always provided.

From a policy consistency perspective, most MP countries are expected to maintain the current size of wood production area . In some countries, for instance, the United States continues the process of primary use designation for undesignated forests thus more forest land designated as production use is anticipated. It is also estimated that the area of plantation forests will continue to increase in Uruguay, given the recent industrial projects approved in the country. In reference to native forests, Uruguay's cover of the plantation forests is expected to remain constant or a slight increase in the future.

Future land claim settlements with Canada's Indigenous peoples could reduce the area of forest land managed for wood production as ownership of these lands is transferred to Indigenous peoples who may manage the land for other, non-timber objectives. The establishment of additional protected areas could further reduce the area of publicly-owned forest land managed for wood production in Canada.

A survey of member countries indicates that the overall expectation is for the plantation area to either remain stable or grow moderately in coming years, as will the growing stock. However, the rate of increase in area may slow with more focus on producing higher volumes of timber per unit area. There are suggestions that there may be a move to more planting of native species in some countries (NZ, Korea). The importance of plantations for timber supply will remain high reflecting likely increased demands at the national and global level.

Given the variable lifecycles and impacts of different insects, it is difficult to predict future activity across the Montréal Process countries. Climate change, however, may be a common factor driving increasing insect activity across all or most countries, particularly in regions where changing climate results in increased stress to forests or expanding ranges for insect species (particularly in the north). The introduction of invasive insect species is another factor, though whether the rates of introduction through human commerce and travel will increase in the future is unknown.

Given the high visibility and impact of catastrophic forest fires in recent years, and their linkage to climate change as an underlying driver, measures of forest fire activity are receiving growing attention. Current trends and anecdotal information support the expectation of increasing fire extent, severity, and impact in the future. However, the degree to which this is true will vary from place to place and year to year.

Australia, Canada, Japan, the Republic of Korea, Uruguay and the United States of America expect the area of forest designated for soil and water to remain stable or, if any, expect a modest increase with new designated areas mostly to be established on state/national forest land.

China has successfully reduced erosion and run-off around major rivers with strong and successful afforestation efforts. Since natural and plantation forest area are expected to increase and there is a strict natural forest protection policy, the area of forest designated for soil and water can be expected to increase similarly.

Photo: Glenda Russo - Canada.

Carbon stock per hectare is controlled by several factors such as forest age distribution, forest types, various natural disturbances such as fires and pests, and human activities of afforestation, reforestation, and deforestation. The biomass carbon increase rate is expected to slow down as planted or restoration forests mature such as in Japan and South Korea. In China, the rise of biomass carbon is expected to continue due to the current high percentage (i.e., 64.7%) of young forests. An increase is expected in the US the short to medium-term but long-term futures are unclear and will depend in part on trends in forest disturbance activity, notably fire. In Australia, forest carbon stocks will be at the present level, except for commercial plantation forests on previously cleared agricultural land. Based on the current trends in Canada, carbon stocks in biomass and litter pools are expected to decline due to natural disturbances such as fires and pests, whereas it will increase in soil pool. Climate change would also affect changes in potential forest growth and distribution.

Australia, China, Argentina and Uruguay are forecasting continued growth and profitable log volumes. In Australia, this will depend on key consumer markets, particularly in the home building sector. There are also supply limitations present in Australia both in native forests and in plantations following recent bushfires. In China, forestry investments and promotional policies should have a positive impact. Japan has targets of an increased production volume aiming at 2035 and Uruguay expects recent trends to continue. In Korea, future domestic wood production is expected to decrease due to a slowdown in the construction industry and economic growth; competition from imported wood products will also contribute.

In China and Korea, a continued decline in employment levels is expected due to decreasing traditional wood-based forest product manufacturing. However, potential increases may occur in relation to the promotion of tourism and conservation.

In Canada, USA, and Australia, a continued overall reduction in employment is expected due to continued mechanization and market restructuration. However, potentially significant fluctuations can be expected in some production sectors due to new product development (such as cross laminated timber and expansion of use of wood in multi-storey buildings) and demand, modernisation, and shifting market conditions. For example, in Canada, though employment in the pulp and paper product manufacturing subsector continued to decrease after 2015, the wood product manufacturing subsector grew in importance, accounting for nearly 50% of total forest sector employment in 2018.

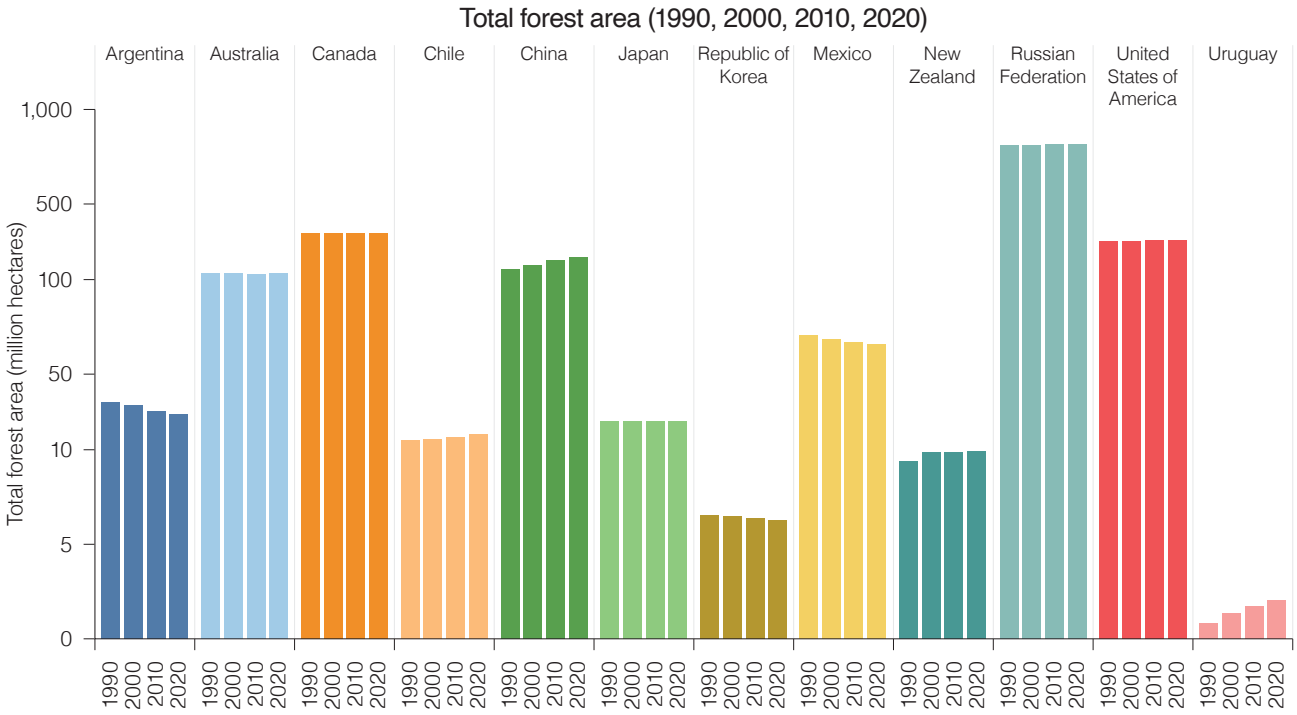
In Uruguay, employment is expected to continue to increase due to the new pulp mill. In Argentina the hope is that the recent legal framework changes will continue to promote forest sector employment.

Individual indicators - status, trends and future perspectives

The following section outlines in detail the findings from the analysis of the 11 indicators. The analysis focuses on trends since 1990 – 'what do the data show', and perspectives on future trends – 'what could change in the future'. It is important to note that in some cases data for all countries was not available for all years or indicators. However, the coverage was wide enough to draw a range of conclusions, and key findings are presented for each indicator.

Criterion 1 – Conservation of biological diversity

1.1.a Area of forest Lead author: Hee Han



Why is this indicator important?

This indicator provides information on the current forest area and its changes in Montréal Process (MP) countries. The sustainability and stability of forest ecosystems is largely related to their size. If this is not maintained, forests may become vulnerable to habitat degradation and loss.

What do the data show?

Since 1990 total forest area has increased by 69 million hectares in MP countries. This trend is due to a large increase in forest area in China (approximately 63 million hectares). Forest areas in Australia, Chile, New Zealand, Russia, USA, and Uruguay have also increased over the same period. On the other hand, countries such as Argentina, Mexico, and Korea have seen their forest areas continue to decline. Canada and Japan's forest area have shrunk slightly over the past 30 years less than 0.5% of total forest area, thus there has been no significant change.

The reason for the significant increase in China is that the Chinese government has implemented strict natural forest protection policies and attached great importance to nurturing plantation resources, and carried out large scale afforestation and regreening. The increase of forest area in the United States is due to the fact that loss of forest land has been compensated by natural regeneration or forest planting on abandoned agricultural lands.

Times-series data of Australia's forest area shows a decrease from 1990 to 2010, followed by a progressive increase in 2020. The net increase in forest area over the period (2010-2020) was 4.5 million hectares. This recent increase in forest area is due to the net effect of forest clearing or re-clearing for agricultural use; regrowth of forest on areas previously cleared for agricultural use; expansion of forest onto areas not recently containing forest; establishment of environmental plantings; and changes in the commercial plantation estate. All states and territories in Australia have legislation, and dependent regulations, designed to ensure the conservation and sustainable management of forests. In most states and territories there is a legislated requirement to apply best practice

Total forest area (thousand hectares)

	Year				Percent change
Country	1990	2000	2010	2020	
Argentina	35,204	33,378	30,214	28,573	-18.8
Australia	133,882	131,814	129,546	134,005	0.1
Canada	348,273	347,802	347,322	346,928	-0.4
Chile	15,246	15,817	16,725	18,211	19.5
China	157,141	177,001	200,610	219,978	40
Japan	24,950	24,876	24,966	24,935	-0.1
Republic of Korea	6,551	6,476	6,387	6,287	-4
Mexico	70,592	68,381	66,943	65,692	-6.9
New Zealand	9,372	9,850	9,848	9,893	5.6
Russian Federation	808,950	809,269	815,136	815,312	0.8
United States of America	302,450	303,536	308,720	309,795	2.4
Uruguay	798	1,369	1,731	2,031	154.5
All countries	1,913,409	1,929,569	1,958,149	1,981,639	3.60

standards to forest management activities. Uruguay is another country with an increased forest area. Uruguay's forests are managed by forest law that has two fundamental objectives, the conservation of the native forest and the expansion of the forest base through the promotion of forest plantations. This law prohibits the cutting of the native forests while creating a forest fund for the payment of plantation subsidies.

The coverage of forests in Japan has been maintained for more than a half century. This is mainly due to low pressure of conversion to other lands uses as well as existing legislative framework on forest management such as forest planning system, protection forest, and forest development permission system in the country. In contrast, the area of forest in Republic of Korea has been decreasing. This is mainly due to the land-use conversion in forests. Approximately 8-10 thousand hectares of forests (0.1-0.2% of total forest area) per year have been converted to other land uses, such as industrial sites, road construction and housing development.

Photo: Glenda Russo - Canada.

What could change in the future?

The global forest area is expected to grow steadily if China, which has the largest increase in forest area in the past 30 years, maintains its trend. Given the current legislations and regulations in the both Australia and Uruguay, the pattern of increase in forest area is expected to be maintained.

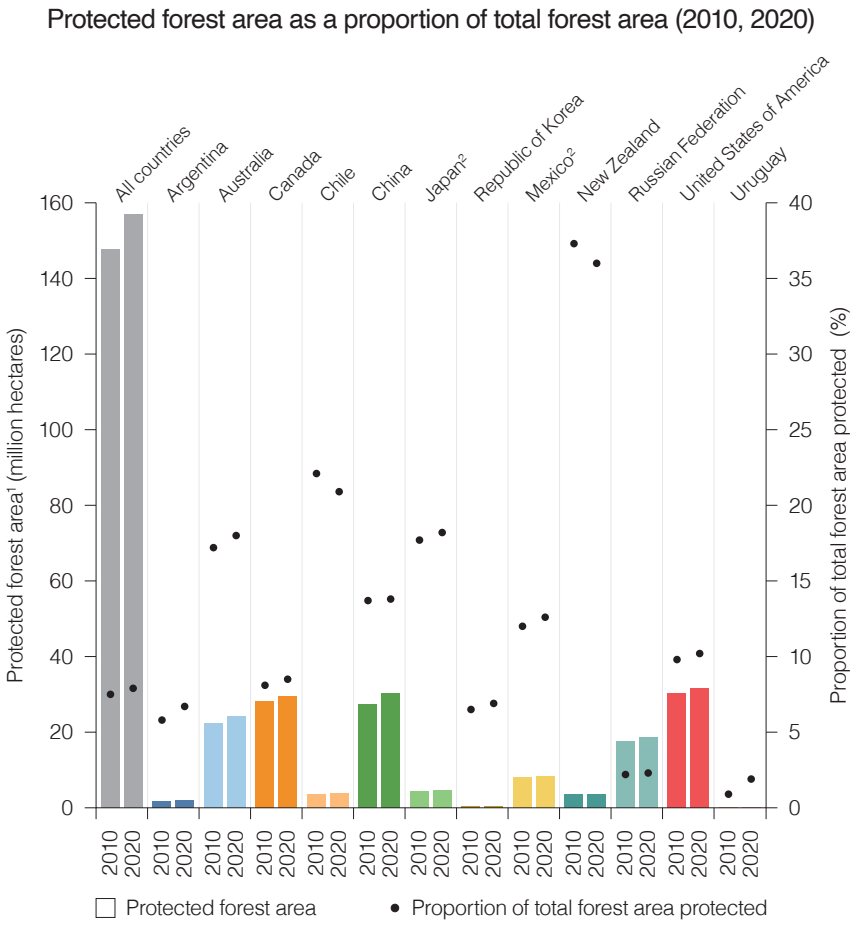
However, the forest areas in some countries, such as the US and the Republic of Korea, are expected to decrease somewhat in the future owing to forest conversion to developed land in the coming decades. Some areas in those countries, a high demand for other land uses is expected to continue and affects the reduction of forest area.

Key findings:

- Total forest area has increased by 69 million hectares in MP countries since 1990. Most of the increase (92%) is due to a large increase in forest area in China.
- For those countries that reported an increase of forest area, strict natural forest protection policies, legislations and regulations, afforestation, or re-afforestation have been implemented while some other countries have a high demand for land-use conversion which affects the reduction of forest area respectively.
- Expectations for this indicator are to remain stable or increase in most countries, a few countries expect a slight decrease.

Criterion 1 – Conservation of biological diversity

1.1.b Area of forest in protected areas. Lead author: Claire Howell



[1] Protected forest area include both native (natural) and plantation (planted) forest.
[2] Japan and Mexico only reported for 2010 and 2017, therefore the 2017 data is a proxy for 2020.

Why is this indicator important?

The biodiversity (biological diversity) of forests supports the function, productivity, and resilience of forest ecosystems, and the conservation of biodiversity and the protection of forest ecosystems are key aims of sustainable forest management. The creation of protected areas has been recognised by individual countries and internationally as the principal mechanism for the conservation of biodiversity.

This indicator provides information on area and percent of forest in protected areas by forest ecosystem type, and by age class or successional stage. This synthesis will focus on the area of forest in protected areas as a measure of the conservation and sustainable management of temperate and boreal forests.

This indicator uses the area and proportion of forest within protected areas of member countries of the Montréal Process as measures of the value that society places on forest protection for the conservation of biodiversity. The reporting of the type, age and successional stage of forest ecosystems in protected areas can demonstrate progress over time towards forest conservation, including progress towards international targets and goals such as United Nations Sustainable Development Goal 15, Indicator 15.1.2, and the United Nations Strategic Plan for Forests Goal 3, Target 3.1.

What do the data show?

All 12 Montréal Process countries have forest protection mechanisms in place. In 2020, the total area of forest in protected areas in Montréal Process countries was 157 million hectares (see below). Five countries individually reported greater than 18 million hectares of forest within protected areas in 2020, and the total area of protected forest in the remaining seven countries was 23 million hectares.

The total area of forest within protected areas across all Montréal Process countries increased by 9 million hectares between 2010 and 2020, including increases for almost all member countries (Figure below). Drivers for the increase in protected forest area included the expansion of existing protected areas, and the protection of new forest areas.

The proportion of forest area within protected areas reported across all Montréal Process countries increased from 7.5% to 7.9% between 2010 and 2020 (Figure below). By 2020, all but two individual Montréal Process countries reported greater than 6% of their forest area within protected areas, and four countries reported greater than 17% of their forest area within protected areas.

What could change in the future?

Further areas of forest are likely to become protected for conservation across the Montréal Process countries. This could include through protection of forest types that are currently under-represented in protected areas, the expansion of existing protected areas of forest, and the protection of forest in regions not previously considered for protection. However, the proportion

of forest area protected could decrease in a country if the total forest area increases outside protected areas.

Scientific evidence may show whether or not passive management through protection alone is having the expected conservation impact on biological diversity. This may in turn result in increased active management of protected forests for conservation, through sustainable regimes of planned disturbance customised to each forest ecosystem.

Increased protection of forests from illegal logging could also occur as more Indigenous and non-Indigenous communities see the need to protect the tangible and intangible values that forests have always provided.

Key findings:

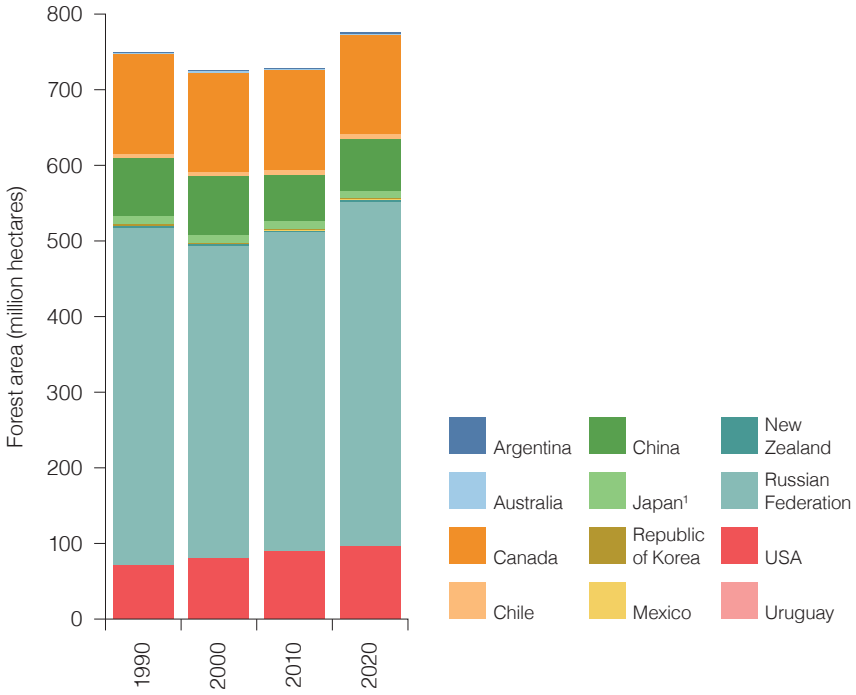
- The protection of forests is important for a number of reasons, including conservation of biodiversity.
- All Montréal Process countries have mechanisms to protect forests by creation of protected areas.
- The area and proportion of protected forest in Montréal Process countries has increased from 2010 to 2020.

Photo: Forestry Agency of Japan - Japan.

Criterion 2 – Maintenance of productive capacity of forests

2.a Area of forest available for wood production. Lead author: Hee Han

Forest area available for wood production (1990, 2000, 2010, 2020)



¹ For Japan, the area of plantation forests is a proxy for the area with a primary designated management objective of wood production.

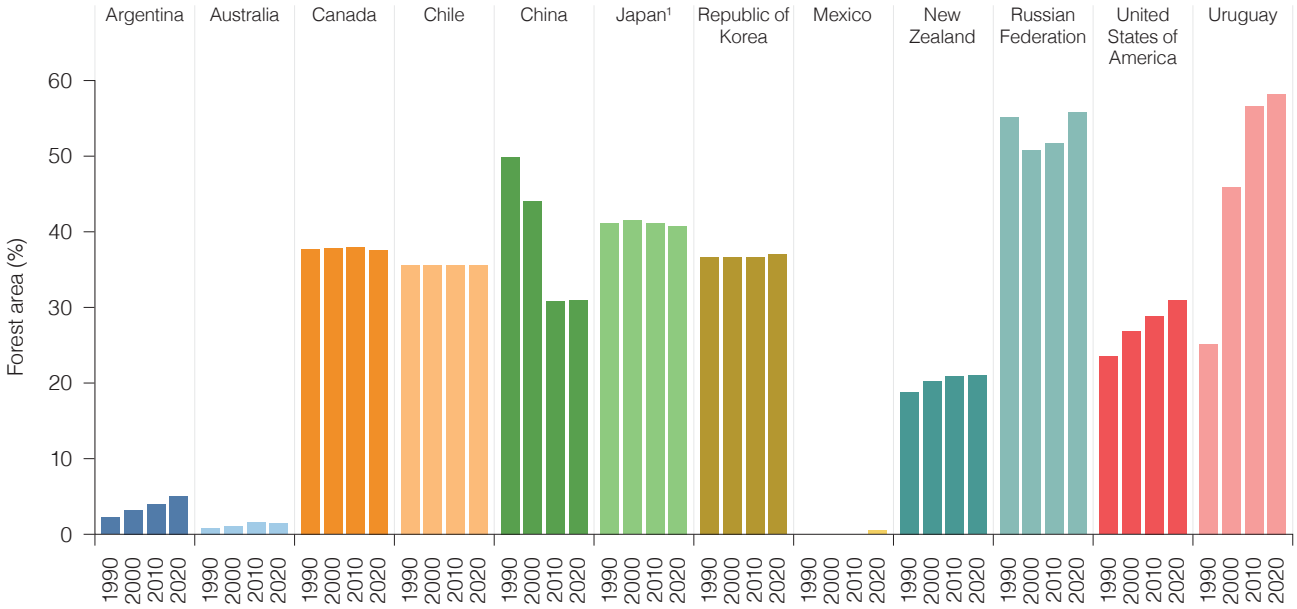
Why is this indicator important?

This indicator provides information fundamental to calculating the annual wood production capacity of forests and shows the area of forest land where trees are mature enough to harvest. This indicator especially measures the area of forest that is primary designated for wood production relative to the total forest area. This represents indirectly whether a country has the capacity of wood supply required for economic and social development in stable and sufficient amount as well as the healthy and sustainable development of wood industries at national level.

What do the data show?

From 1990 to the present, total forest area with a primary designated management objective of production in Montréal Process (MP) countries has remained unchanged but there were differences by countries: the primary production area in countries such as Argentina, Australia, Chile, Mexico, New Zealand, USA, and Uruguay increased in size whereas China decreased during the same

Proportion of forest area with a primary designated management objective of wood production (1990, 2000, 2010, 2020)



period. Meanwhile Canada, Japan and Korea have not changed much and Russia has been on the decline but has recently expanded again.

The total area of Canada's forest managed primarily for wood production has remained relatively constant at about 131 million hectares since 1990. The stability of the wood production area reflects the forest management planning objectives for Crown land in Canada, as determined by the individual provincial and territorial governments: forest management plans are long-term in nature, providing economic benefits to labour, forestry businesses and governments.

According to the results of the nine national forest inventories conducted between 1973 and 2018, the forest cover in China has increased from 12% to 23%. Particularly since the late 1980s, China has maintained "dual growth" in both forest area and stock volume for the 30 consecutive years, becoming the country with the largest growth in forest resources worldwide. The area of forest available for wood production in China has decreased, however, it is mainly because of the expansion of protection policy to the natural forest over the country.

The area of Korean forests designated for wood production covers approximately 37% of the total forest area. Korea is implementing polices to intensively manage those areas for improving income of forest household and the vitality of forest industry in the country. Area of production forest in the United States increased steadily since 1990, increasing 28% from 1990 to 2015. Likely reason is assignment of designated primary management objective to previously unclassified forest land, and not actual change in forest land use.

In case of Uruguay, which allocated forest plantations for timber production while protecting and limiting the cutting of native forest, the area available for timber production is equal to the plantation area and the size of these areas is increasing rapidly.

Photo: Forestry Agency of Japan - Japan.

Japan is another country that reports the area of planted forests as a proxy for the area available for production as well, the data is remained unchanged over the past three decades.

What could change in the future?

From a policy consistency perspective, most MP countries are expected to maintain the current size of wood production area for a while. In some countries, for instance, the United States continues the process of primary use designation for undesignated forests thus more forest land designated as production use is anticipated. It is also estimated that the area of planted forests will continue to increase in Uruguay, given the recent industrial projects approved in the country. In reference to native forests, Uruguay's cover of the planted forests is expected to remain constant or a slight increase in the future.

Future land claim settlements with Canada's indigenous peoples could reduce the area of forest land managed for wood production as ownership of these lands is transferred to indigenous peoples who may manage the land for other, non-timber objectives. The establishment of additional protected areas could further reduce the area of publicly-owned forest land managed for wood production in Canada.

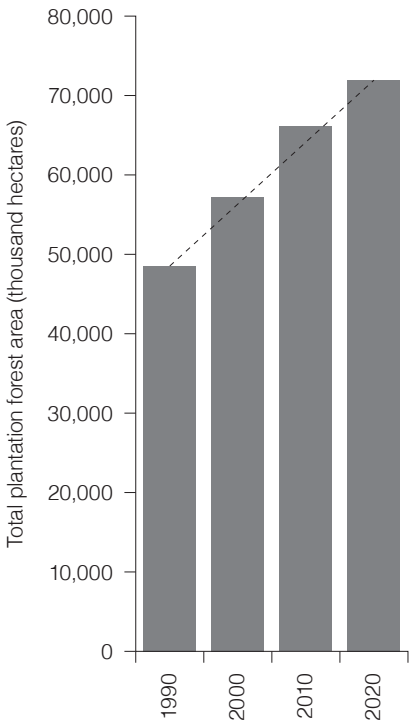
Key findings:

- From 1990 to the present, total forest area with a primary designated management objective of production in Montréal Process countries has remained unchanged but there were differences by countries.
- China and Uruguay have seen the biggest changes in their forest area available for wood production. While the production area in China has decreased with the expansion of protection policy to the natural forests, the size of production area is increasing rapidly in Uruguay because of extending forest plantations for timber production over the country.
- Most MP countries are expected to maintain the current size of wood production area for a while. Expectations in some countries, such as the United States and Uruguay, are to increase but Canada expects decrease due to changes in ownership in wood production areas.

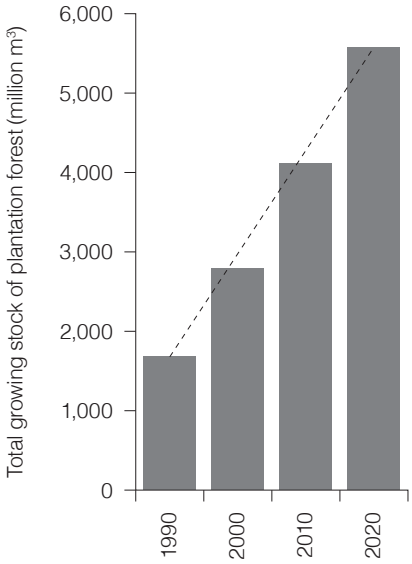
Criterion 2 – Maintenance of productive capacity of forests

2.c Area and growing stock of plantations. Lead author: Tim Payn

Total plantation forest area (1990, 2000, 2010, 2020)



Total growing stock of plantation forest (1990, 2000, 2010, 2020)



Why is this indicator important?

Globally, deforestation continues to be a major issue. Between 1990 and 2020 420 million hectares of forests have been lost. Continued loss will have further adverse impacts on biodiversity, environmental quality and human well being. Additionally, wood and fibre demand are projected to increase by up to 300% by 2050 as global population increases suggesting increased pressure on the natural forest resource.

Plantations are defined as a forest that is intensively managed, and is composed of one or two species of even ages with regular spacing. Plantation forests with their characteristic high management intensity and rotational cropping cycle are able to produce much more fibre and timber than the same area of natural forest and therefore can act as a safety valve and reduce pressure on natural forests. It is therefore important to understand how much plantation resource exists and estimate future timber supplies to support the increased demand.

While the predominant purpose for establishment of plantations is for timber production they also contribute many other ecosystem services such as erosion control, water flow regulation, water quality protection, carbon sequestration, recreation, and aesthetics.

What do the data show?

Plantation area: Of the Montréal Process countries only Argentina, Australia, Canada, Chile, China, New Zealand, Korea, United States of America and Uruguay report on plantation areas. Data for Canada, Japan, and Russia is an integral part of their planted forest area and unfortunately cannot be separated out. For those countries reporting it, plantation area increased from 48.52m hectares in 1990 to 71.93m hectares in 2020 (Figure 1) There was some fluctuation in areas over this time for individual countries, Australia for example decreased its area in the mid 2000s from a peak in 2010 as plantations were returned to agricultural use. New Zealand showed a similar change to agricultural land use in the late 2000s. The total plantation area accounts for 55% of the global total of 131.13 m ha in 2020.

Plantation growing stock: While forest area is important, a measure of growing stock gives an indication of the volume

Photo: Sebastian Klinger - New Zealand.

of timber available over time and changes in those volumes. Only Argentina, Chile, China, New Zealand, USA and Uruguay provided data for this variable (shown in Figure 2). As with area it shows an increase, but it appears the rate of increase in growing stock is increasing exponentially. This may reflect the age class distribution of the forests, or potentially improvements in productivity through enhanced silviculture.

What could change in the future? A survey of member countries indicates that the overall expectation is for the plantation area to either remain stable or grow moderately in coming years, as will the growing stock. However, the rate of increase in area may slow with more focus on producing higher volumes of timber per unit area. There are suggestions that there may be a move to more planting of native species in some countries (NZ, Korea). The importance of plantations for timber supply will remain high reflecting likely increased demands at the national and global level.

Key findings:

- Plantation forest area has increased from 48.52m to 71.93m hectares between 1990 and 2020 in all Montréal Process countries reporting plantation forest area
- Total growing stock increased for all countries reporting data
- The increase in growing stock is likely to be through a combination of increased area of plantation and increased plantation productivity (age and silviculture)
- Total area of plantations is projected to grow in some but not all countries, and focus will move to increased per hectare volume production

Criterion 3 – Maintenance for forest ecosystem health and vitality

3.a Disturbance by insects (biotic disturbances) Lead author: Guy Robertson

Note: *1. Colours indicate different area scales (left-hand axis), 2. Japan has insect-damaged forests of pine and oak wilt recorded as the timber volume of damaged trees, but the area is unknown and not included in this graph.*

Why is this indicator important?

Insects constitute a major forest disturbance agent and are active in most, if not all, forest settings to a greater or lesser extent, causing tree mortality, foliar damage and stunted growth. In many forests, insect activity is endemic and fully compatible with ecosystem functions, biodiversity conservation, and the provision of ecosystem goods and services. In other instances, particularly in tree plantations and other settings where wood production is the primary objective, the damage caused by insects can result in considerable negative impacts to productivity. In some cases, insect infestations may reach epidemic proportions causing extensive mortality in particular forest types and resulting in dramatic changes in forest structure, species composition and ecosystem goods and services. In these cases, insects often act in combination with other forest disturbance agents, such as drought and fire. Moreover, climate change may affect both the range and lifecycle of certain insects as well as the susceptibility of their host trees. As a result, broadscale increases in insect activity may signal the influence of a changing climate and the transition to different ecosystem types. Invasive insects are an important subtype, but they are not delineated in the data displayed here.

What do the data show?

Aggregate data for insect disturbance across all Montréal Process countries show an increasing trend; on average, 25 million ha of forests were reported to be impacted annually by insects in the 2000 to 2004 time period as opposed to around 30 million ha in the 2012 to 2017. Year-on-year variation was relatively high, ranging from a low of 17 million ha in 2000 to a high of 35 million ha in 2013. Each insect species is unique in terms of its lifecycle and impact to forests, and the aggregate statistics shown here represent the sum-total of impacts from very different insect infestations rising and falling at different points in time.

Photo: Stephan Philipp - Austria.

Country level data (figure above) show large differences in impact extent across countries and within certain countries over time. Canada displays the highest levels of insect disturbance in all years, and it exemplifies the varying dynamics of insect infestation and damage. Canada's high reporting levels are driven first by the mountain pine beetle, which peaked at 9 million ha in 2009 and since has declined to well under 1 million ha, and more recently by eastern spruce budworm and jack pine budworm, which have expanded to upwards of 7 million ha in the boreal forests of Northern Canada. Climate change is identified as an important factor as warming temperatures have allowed both the mountain pine beetle and the budworms to expand their range into northern territories where they previously were rare.

When viewed in terms of percent of total forest area impacted (calculated here from mean values for all years with positive reporting), insect damage is high in Canada and China, where approximately 4 percent of forests have been affected annually. The republic of Korea had similar rates throughout the first half of the reporting period, but these rates have dropped steadily in the last decade in part because of management response. Chile and Uruguay report the highest rates for recent years, between about 10 and 20 percent, but statistics for earlier years are unavailable. In general, it should be noted that measuring insect impacts is a difficult undertaking that is highly sensitive to measurement techniques, definitions, and underlying assumptions. Several countries do not report insect disturbance to the FAO, FRA, and the differences between countries that do report may be due to different reporting techniques and conventions as much as to different forest conditions.

What could change in the future?

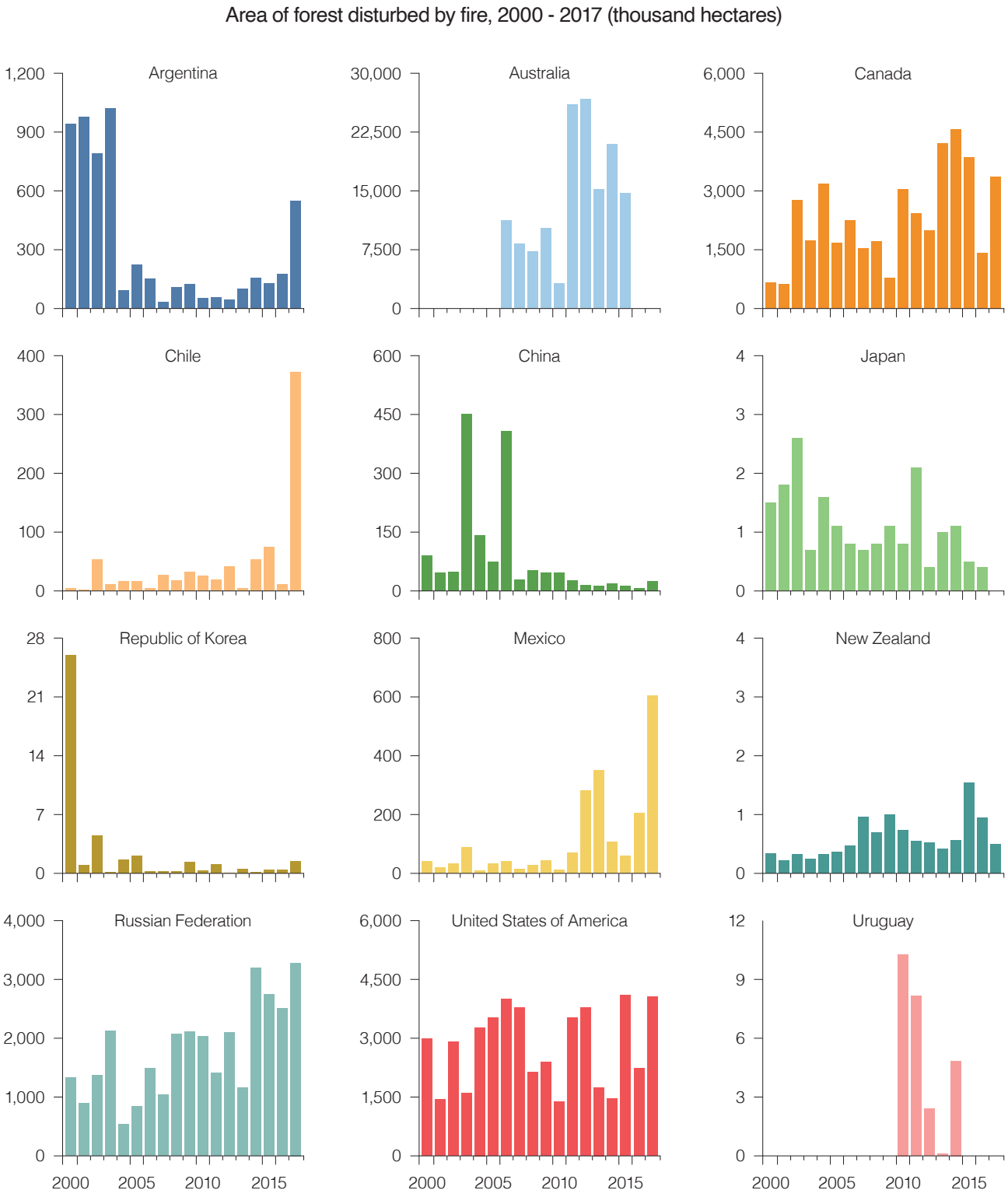
Given the variable lifecycles and impacts of different insects, it is difficult to predict future activity across the Montréal Process countries. Climate change, however, may be a common factor driving increases in insect activity across all or most countries, particularly in regions where changing climate results in increased stress to forests or expanding ranges for insect species (particularly in the north). The introduction of invasive insect species is another factor, though whether the rates of introduction through human commerce and travel will increase in the future is unknown.

Key findings:

- Aggregate data on area of insect disturbance for all MP countries shows an increasing trend, rising from 25 million ha in 2000-2004 to 30 million ha in 2014-2017
- Forest area affected by insects is highly variable across countries and years.
- Reporting insect damage is difficult, and country level reporting conventions likely drive a lot of the variance between countries.
- Major changes in country level data are often the result of specific insect outbreaks occurring within specific forest types and limited time spans.

Criterion 3 – Maintenance for forest ecosystem health and vitality

3.b Forest area affected by fire (abiotic disturbances) Lead author: Guy Robertson



Note: *Colors indicate different area scales (left-hand axis).*

Why is this indicator important?

This indicator displays the area of forested ecosystems affected by fire. Some forested ecosystems are not adapted to fire, some are adapted to relatively frequent, low-intensity fire, and some are adapted to infrequent, high-intensity fire. In some forested ecosystems, therefore, fire can have a dramatic negative effect on forest structure, species composition, and many other forest characteristics valued by society. Large and intense fires also pose a direct threat to human lives, health, and property. However, in other forested ecosystems, fire can have positive effects on ecosystem services, and is a requirement for the regeneration of some forest species. Departures from previous fire regimes, especially departures involving an increase in fire extent, intensity or frequency or a change in spatial pattern, are cause for considerable concern. Such increases signal potentially increased damage to ecological, social, and economic values, and may indicate major ongoing shifts in ecosystem types. Through increasing heat and shifting precipitation patterns, climate change has been linked to increasing fire activity. Changes in this indicator over the last two decades may indicate greater change in the coming decades.

What do the data show?

The total area reported to be disturbed by fire in Montréal Process countries varies substantially between countries, and within countries there are relatively large year-on-year variations (Figure above). In recent years, Australia has reported a larger area of fire in forests than the other 11 Montréal Process countries combined, but the change in reported areas of fire disturbance in Australia reflect methodological changes in sampling rather than actual trends over time in on-the-ground fire activity. Omitting Australia, the total area of fire for all MP countries shows a significant increase (rising to an average of 9.4 million hectares in 2013-2017). Countries in the Northern hemisphere with large forest areas dominate the data series when Australia is excluded, with countries elsewhere reporting levels that are one or more orders of magnitude lower than those reported by Australia, Canada, Russia and the USA.

In many cases, the difference between countries in area disturbed by fire can be explained by the relative size of total forest area, but forest structure, species composition, climatic conditions, and other factors play an important part in determining the relative extent of fire in all countries. Different reporting conventions may also affect reported outcomes. As a result, the relative impact of fire when viewed as a proportion of total forest area varies widely: the mean annual proportion of total forest area impacted by fire (averaged for all years reported by each country in the 2000-2017 time period) ranges between 1 and 0.5 percent for Argentina, Canada and the USA; Australia stands out with 11 per cent; and the remaining countries range between 0.2 per cent (Russian Federation) and 0.01 per cent or less (New Zealand and Japan). In general, the variance between countries and between years points to the fact that fire is a complex and heterogeneous phenomenon with different patterns, intensities and ecosystem effects, and with various measurement challenges.

Photo: Margot Downey - Canada.

Australia provides a case in point. Area affected by fire in Australia is reported for 2006 through 2015, Much of Australia's forest estate includes fire-adapted sub-tropical forests subject to frequent (sometimes annual) fire return. Moreover, planned fire is a common management technique with approximately one third of the forest area disturbed by fire in Australia over the 2011-2015 period being attributed to fires that were purposefully set. In this context, directly comparing Australia's burn area with that of other countries is misleading. This issue no doubt applies to comparisons between other Montréal Process countries (and, in fact, comparisons between different regions within a single country), but it is most striking for Australia given the relative extent of its reported forest areas disturbed by fire.

What could change in the future?

Given the high visibility and impact of catastrophic forest fires in recent years, and their linkage to climate change as an underlying driver, measures of forest fire activity are receiving growing attention. Current trends and anecdotal information support the expectation of increasing fire extent, severity, and impact in the future. However, the degree to which this is true will vary from place to place and year to year.

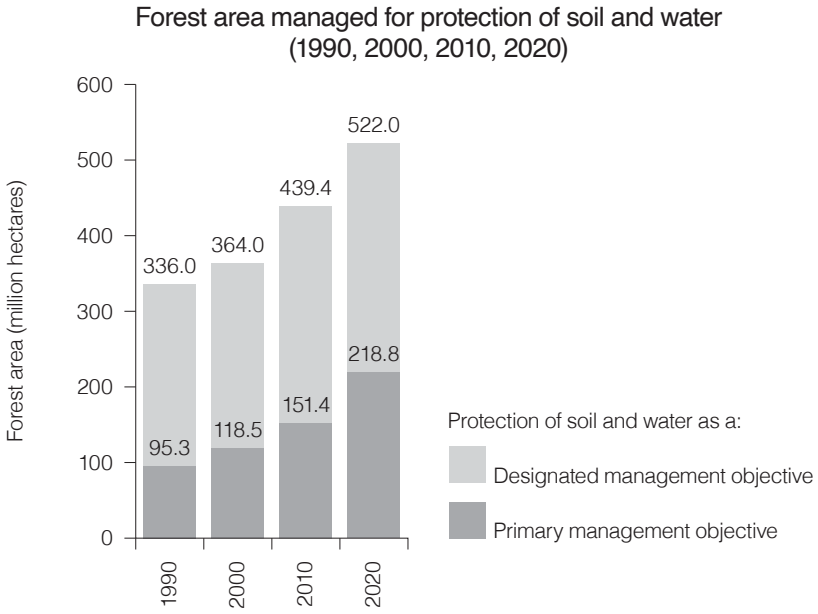
Photo: Paul Quinlan - Xxxxxxx.

Key findings:

- Forest area impacted by fire is highly variable across countries owing to different climate, fire ecologies, and reporting conventions.
- Impacted area in the major forest countries of the north show an increasing trend with high annual variation.
- Australia, with its fire adapted forest ecologies subject to high burn frequency, shows the highest level of impact-ten times the level reported by Canada, the USA, or the Russian Federation.
- Fire area and intensity are expected to rise as a result of global climate change.

Criterion 4 – Conservation and maintenance of soil and water resources

4.1.a Area of forest designated for protection of soil and water. Lead author: Sebastian Klinger



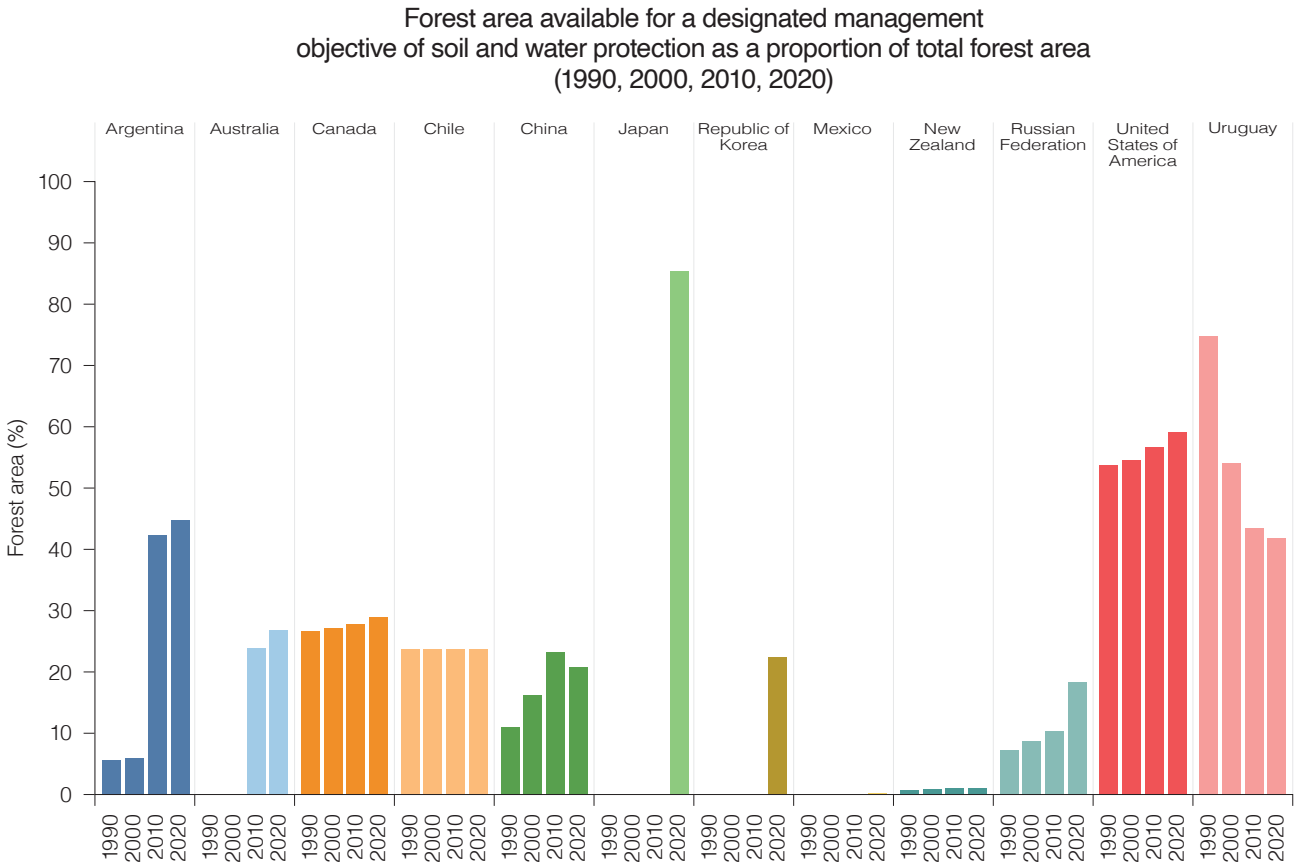
Why is this indicator important?

Forest ecosystems play an important role in the regulation of surface and groundwater flow which is essential to the quality of human life. Appropriate forest management can protect and conserve the soil and water values of a forest.

The area and percent of forest designated or managed primarily for the protection and regulation of soil and water reflects the importance of these resources to society, including the tradeoffs made between other uses.

What do the data show?

The total area of forests designated or managed primarily for the protection of soil and water in the Montréal Process



Total forest area with designated management objective of protection of soil and water (thousand hectares)

Country	Year			
	1990	2000	2010	2020
Argentina[1]	2,000	2,000	12,800	12,800
Australia			30,962	36,053
Canada	92,830	94,704	96,648	100,334
Chile	3,625	3,761	3,977	4,330
China	17,340	28,657	46,723	45,936
Japan[2]				21,285
Republic of Korea				1,414
Mexico				145
New Zealand	62	92	103	110
Russian Federation	58,695	70,388	85,111	149,364
United States of America	162,818	165,687	175,093	183,448
Uruguay	597	740	752	849
All countries	337,968	366,029	452,168	556,068

[1] Argentina provided data directly, not through the FRA database.
[2] Japan only reported from 2013 to 2016, therefore the 2016 data is a proxy for 2020.

countries increased steadily from 1990 with around 336 million ha to 522 million ha in 2020. Particularly the share of protection of soil and water as a ***primary*** management objective more than doubled from around 95.3 million ha in 1990 up to 218.8 million ha in 2020.

While in some countries the area remained nearly constant or increased slightly, China's and Russia's designated and primarily managed areas for the protection of soil and water tripled in size from 1990 to 2020. Due to the simultaneous increase of total forest area in these two countries, the percentage of protection of soil and water of the total forest area only increased from around 10 per cent to 20 per cent in both countries.

Chile's area of forests designated or managed primarily for the protection of soil and water increased in the same amount as the total forest area in this country increased. Therefore, the percentage of forest for the protection of soil and water remained constant at around 24 per cent.

The proportion of forests designated for the protection of soil and water in Uruguay decreased from around 75 per cent to around 42 per cent in 2020. However, Uruguay's area of forests designated for the protection of soil and water strongly increased from 597,000 ha in 1990 to 849,000 ha in 2020. The decline in share can therefore be explained by the extreme increase of total forest area in this country (2.5-times more forest area in 30 years).

In the United States of America, the functions for soil and water protection are

Photo: Forestry Agency of Japan - Japan.

included in a 'multiple use' designation which includes biodiversity conservation and social services but excludes production forestry as a primary designation. The proportion of forests designated for the protection of soil and water increased from around 54 per cent in 1990 to over 59 per cent in 2020 of the total forest which equates to an increase of 20 million ha during that time. In Argentina, the conservation of soil and water resources is implemented together with the conservation of biodiversity and other purposes and is therefore not reported separately to FRA. Around 25% of the forest area is currently protected. The strong increase in protected area shown in the table is a result of the Law for the Conservation of Native Forests from 2007.

What could change in the future?

Australia, Canada, Japan, the Republic of Korea, Uruguay and the United States of America expect the area of forest designated for soil and water to remain stable or, if any, expect a modest increase with new designated areas mostly to be established on state/national forest land.

China has successfully reduced erosion and run-off around major rivers with strong and successful afforestation efforts. Since natural and plantation forest area are expected to increase and there is a strict natural forest protection policy, the area of forest designated for soil and water can be expected to increase similarly.

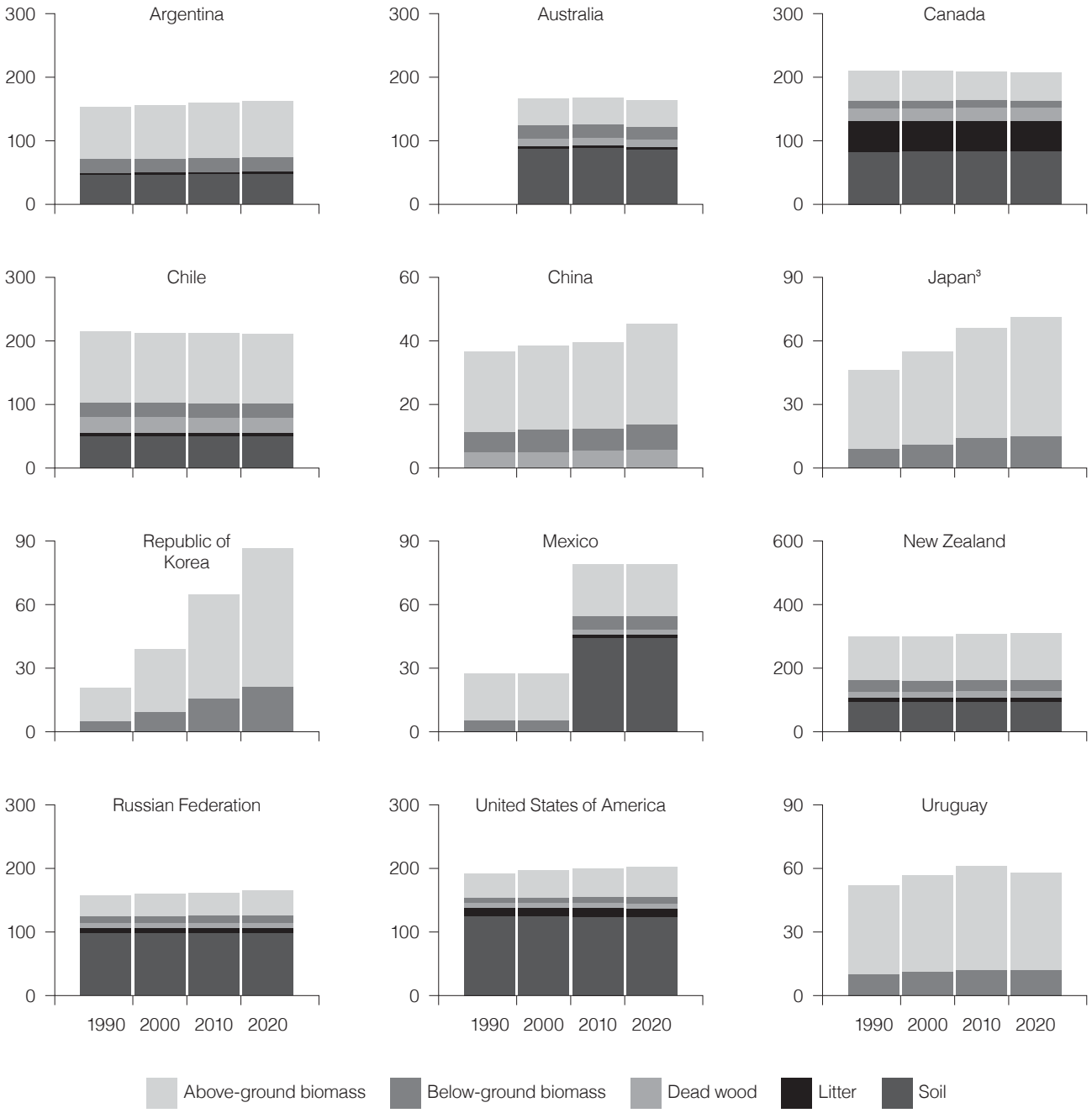
Key Findings:

- Steady increase of the area of forests designated or managed primarily for the protection of soil and water in the Montréal Process countries from 1990 - 2020.
- All countries reported an increase of area designated for the protection of soil and water over the past decades, conversely the proportion of designated area for the protection of soil and water of the total forest area is more variable in some countries.
- Expectations for this indicator are to remain stable or only have a modest increase in most countries, few countries expect a larger increase.

Criterion 5 – Maintenance of forest contribution to global carbon cycles

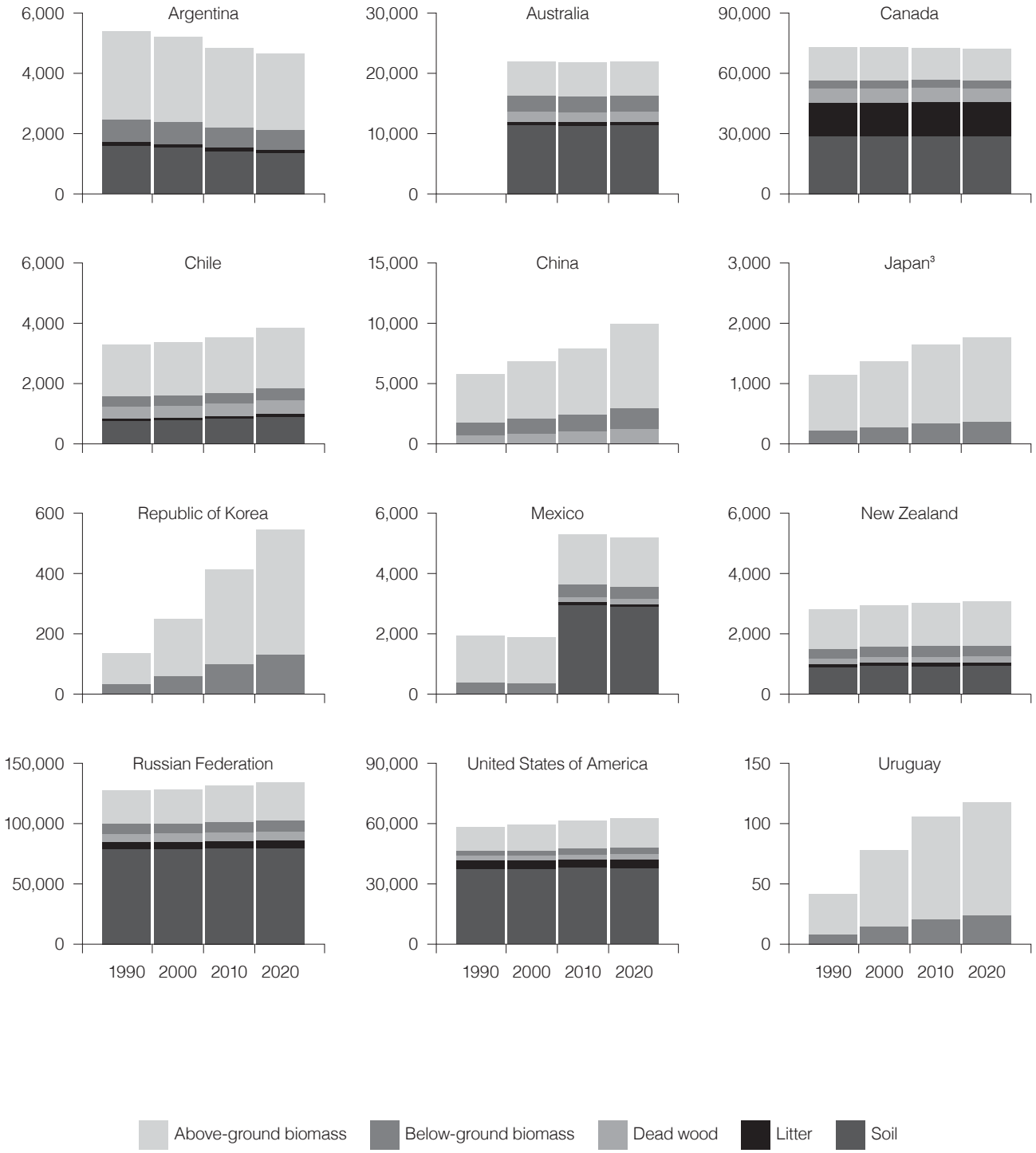
5.a Total forest ecosystem carbon pools and fluxes. Lead author: Toshiya Matsuura

(A) Carbon stock density, 1990, 2000, 2010, 2020 (tonnes per hectare)[1]



[1] Countries with larger values in the y-axis are located in the upper left.
[3] Japan reported the carbon stock density till 2017.

(B) Estimated* carbon stock, 1990, 2000, 2010, 2020 (million tonnes)[2]



* Data is estimated by multiplying carbon stock density and total forest area.

[2] Carbon stock (B) is estimated simply by multiplying carbon stock density (A) and forest area (index 1.1.a) since not all countries have reported the carbon stock in FRA.

[3] Japan reported the carbon stock density till 2017.

Change[1] in carbon stock density by pool, 1990 - 2020 (%)

Country	Above-ground biomass	Below-ground biomass	Dead wood	Litter	Soil
Argentina	7.3	5.5		6.0	4.6
Australia	-1.8	-2.3	-2.3	-2.0	-1.4
Canada	-4.9	-4.6	-3.1	1.3	0.9
Chile	-2.5	-2.5	-2.5	-2.5	0.0
China	25.3	22.3	18.6		
Japan	51.4	66.7			
Republic of Korea	12.1	11.7	0.0	0.0	0.0
Mexico	5.3	4.3	8.1	-1.5	-0.4
New Zealand	321.0	326.5			
Russian Federation	13.8	11.5	6.6	1.8	0.1
United States of America	20.6	24.9	24.4	-0.7	-1.4
Uruguay	9.4	19.4			

[1] Percents calculated between earliest and latest measurements reported between 1990 - 2020.

Why is this indicator important?

Forest carbon monitoring is essential because forests play a role in controlling climate change as a source and sink of carbon stock on earth. Forests absorb carbon from the atmosphere through photosynthesis, whereas they release carbon through respiration, decomposition, forest fires, and deforestation. Forest carbon stock in each pool varies widely in different climatic regions, depending on forest types and age distribution, controlled by natural and anthropogenic disturbances. Forest management and the use of forest products significantly affect the release and sequestration of carbon in the atmosphere.

What do the data show?

Figure A and the Table show changes in forest carbon stock per hectare by carbon pool. Carbon stock per hectare in aboveground biomass is consistently higher than belowground biomass in all the countries. Carbon stocks in both above- and below ground biomass have increased in nine among twelve Montréal Process countries. This increase is exceptionally high in East Asian countries such as South Korea (more than three times), Japan (more than 50 %) and China (more than 20 %), and the US (more than 20 %). In South Korea, after the successful restoration of forests in the 1970s and 1980s, biomass carbon stock has steadily increased. In Japan, the increase in biomass carbon stock is mainly due to the planted forest's growth. Biomass carbon stock per hectare rose more than 10% in Mexico, Russia, and Uruguay. In Canada, biomass carbon stocks have declined since 1990 due to natural disturbances such as fires and outbreaks of mountain pine beetle, which affect the fluctuation of deadwood carbon stocks. In most MP countries, approximately 80% (i.e., from 76 to 83%) of tree biomass carbon stock is stored aboveground, but it is slightly low in Australia (i.e., about 68%), where arid areas dominate. Carbon stock in the soil is high in each country, particularly in high latitudes, cool temperate regions such as Australia, Canada, New Zealand, Russia, and the US.

Figure B shows the estimated changes in total carbon stock in each country by

Photo: Forestry Agency of Japan - Japan.

multiplying carbon stock per hectare and forest area (index 1.1.a). This graph shows that those countries with large forest areas have greater carbon stock, particularly in Canada, Russia and the US.

What could change in the future?

Carbon stock per hectare is controlled by several factors such as forest age distribution, forest types, various natural disturbances such as fires and pests, and human activities of afforestation, reforestation, and deforestation. The biomass carbon increase rate is expected to slow down as planted or restoration forests mature in Japan and South Korea. In China, the rise of biomass carbon is expected to continue due to the current high percentage (i.e., 64.7%) of young forests.

A steady increase in biomass carbon is expected in the US, owing mainly to increased forest stocking volumes on existing forest stands, but its future direction is unclear. In Australia, forest carbon stocks will be at the present level, except for commercial plantation forests on previously cleared agricultural land. Based on the current trends in Canada, carbon stocks in biomass and litter pools are expected to decline due to natural disturbances such as fires and pests, whereas it will increase in soil pool. Climate change would also affect changes in potential forest growth and distribution.

Key findings:

- Carbon stock densities in above- and below-ground biomass have increased in nine among twelve MP countries, particularly in East Asia (e.g., South Korea, Japan, and China) and the US.
- Carbon stock in the soil is high, particularly in high latitudes, cool temperate regions, e.g., Australia, Canada, New Zealand, Russia, and the US.
- Expected change in carbon stock per hectare varies among MP countries, depending on their situation, e.g., forest age distribution, forest types, forestry activities, and various natural disturbances such as fires and pests.

Criterion 6 – Maintenance and enhancement of long-term multiple socio-economic benefits

6.1.a Value and volume of wood and wood products production. Lead author: Talha Sadiq

Note: Data source: FAOSTAT

Figure displays Industrial Roundwood Production in MP countries on the y-axis over the last two decades with varying scales of production distinguished through different colours.

Why is this indicator important?

This indicator provides information on the volume of industrial roundwood, which includes all industrial wood in the rough (sawlogs and veneer logs, pulpwood and other industrial roundwood) and, in some Montréal Process countries, it also includes chips, particles and wood residues. It comprises all wood obtained from removals, i.e. the quantities removed from forests and from trees outside the forest, including wood recovered from natural, felling and logging losses during the period.

This indicator contributes to all three pillars of sustainable development in that it is critical in understanding socio-economic benefits (i.e. employment per unit of wood harvested) and environmental benefits (i.e. quantity of wood harvested and the harvesting rate to demonstrate sustainability), as well as the economic contribution of roundwood.

What do the data show[2] ?

In most Montreal Process countries, roundwood volume increased slightly between 2000 and 2019, with a peak occurring in 2006/7 followed by a low in 2009 driven mostly by the global financial crisis. The peak volume occurred in 2018 at 1.1 million cubic meters, representing 55% of global production. Over the last decade, most Montréal Process countries have reported stable growth and production with the exception of a few. The United States has consistently dominated roundwood production. Canada and the United States experienced a downward trend in roundwood production in the late-2000s, driven both by the collapse of the US housing market and, in Canada, by changes in roundwood availability due to mountain pine beetle infestation.

Photo: Stephan Philipp - Austria.

Following the global economic crisis, the upward trend in roundwood production has been driven by strong demand for solid wood products (lumber and structural panels), as the US housing market recovered. Nevertheless, fibre supply issues due to wildfires and insect outbreaks have influenced softwood lumber production in Canada in recent years (falling 15% from 2018 to 2020).

Australia, China and the Republic of Korea experienced overall increases in roundwood production. In Australia, this was due to manufacturing, new homes, sawn wood, panel production, paper and paperboard, and wood product exports peaking in 2015-16. In Korea, domestic wood production increased partly due to rising demand for wood at the national level following the financial crisis in 1997, affecting the capacity to import wood - producers preferred steady domestic supplies. In China, the annual volume of roundwood production showed an overall increase of 47% between 2000 and 2019 due to rapid development of plantations in southern China, contributing to sustainable growth of roundwood products.

Chile, New Zealand, Argentina and Uruguay's roundwood production increased consistently over the last two decades. Uruguay produced nearly 14 million cubic meters of roundwood in 2018 and this trend has been increasing since 2012. This increase in production is a result of wide spread afforestation efforts in the country and opening of new mills. In Argentina, the increase is a result of traditional products demand (sawnwood, board, cellulose, certain papers, furniture) and in new applications in wooden construction and biomaterials.

What could change in the future?

Australia, China, Argentina and Uruguay are forecasting continued growth and profitable log volumes. In Australia, this will depend on key consumer markets, particularly in the home building sector. There are also supply limitations present in Australia both in native

[2] Note that the data collection methodology and content vary somewhat between countries.

forests and in plantations following recent bushfires. In China, forestry investments and promotional policies should have a positive impact. Japan has a target of an increased production volume aiming at 2035 and Uruguay expects recent trends to continue. In Korea, future domestic wood production is expected to decrease due to a slowdown in the construction industry and economic growth; competition from imported wood products will also contribute.

In North America, the demand for roundwood is expected to rise in large part due to the growing demand for solid wood products, particularly in the housing sector. As U.S. new residential construction grows, the demand for softwood lumber and structural panels from Canada will follow, increasing the demand for roundwood from Canadian mills.

Key findings:

- Overall in most MP countries, volume of industrial roundwood increased slightly between 2000 and 2019, with a peak occurring in 2006/2007 followed by a low in 2009 driven mostly by the global financial crisis.
- Following the global economic crisis of 2008/2009, the upward trend in roundwood production has been driven by strong demand for solid wood products.
- Most Montréal Process countries have reported stable growth and production with the exception of a few; expectations for this indicator are to increase or remain stable in most Montréal Process countries.

Criterion 6 – Maintenance and enhancement of long-term multiple socio-economic benefits

6.3.a Employment in forestry and logging. Lead author: Margot Downey

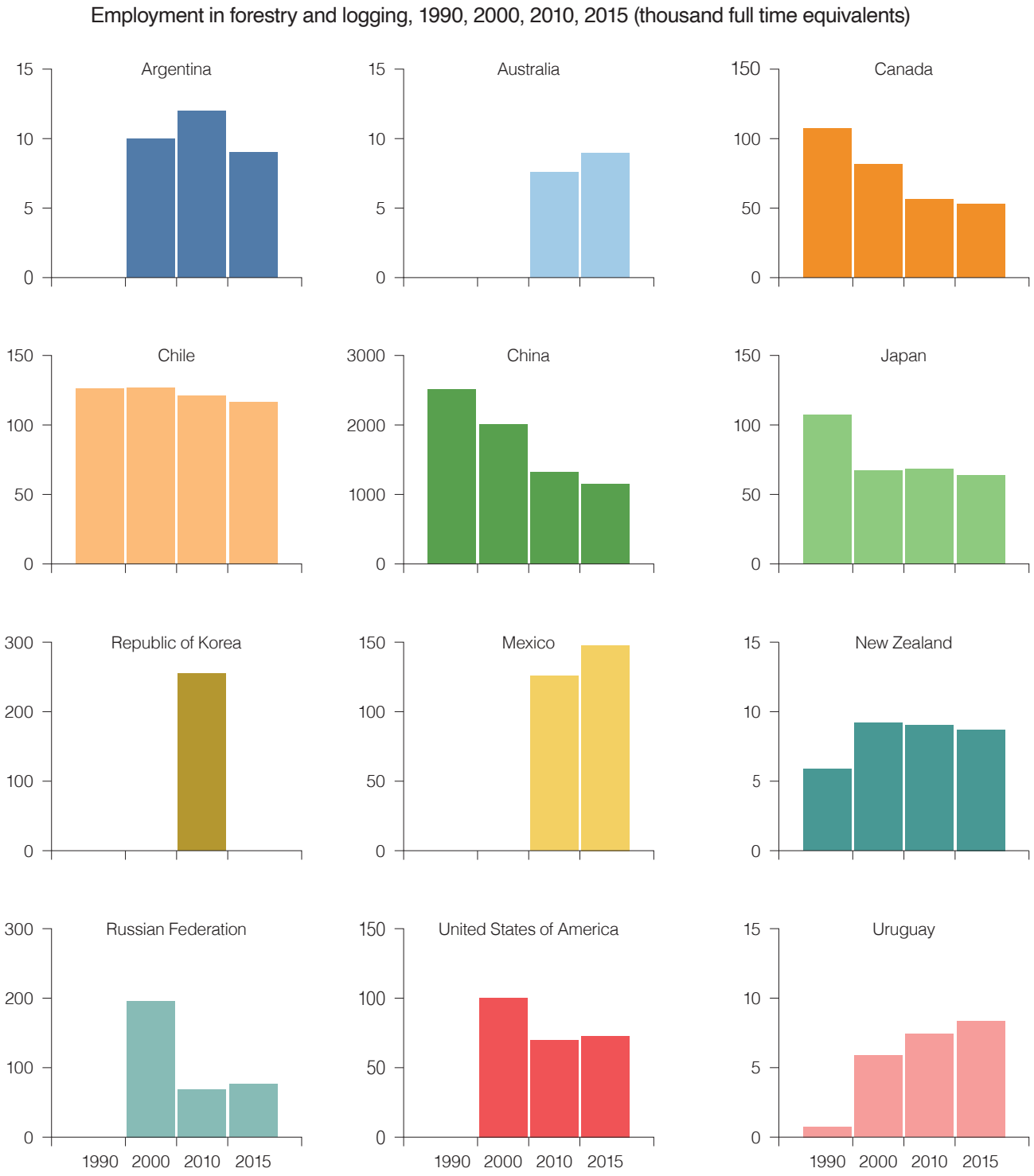


Photo: Xxxxx Xxxxx - New Zealand.

Why is this indicator important?

Employment in the forest sector is an important economic driver, especially in rural and Indigenous communities where other economic opportunities may be limited. It is also a widely understood measure of economic, social and community wellbeing, and promotes the distribution of income. That being said, forest-reliant communities are also more vulnerable to the impacts of policy changes that affect the forest sector as well as fluctuations in national and international markets.

What do the data show?

It should be noted that the data collection methodology, coverage and content vary somewhat between countries, and for some years data were not available. As such, comparisons between these datasets should be made with caution. This analysis serves as a broad, high-level exercise.

As a whole, employment totals across all Montreal Process countries have been steadily declining throughout the reporting period, decreasing by 40% between 1990 and 2015. Certain notable country-specific trends will be discussed below. Note that in some cases, country-level data external to what was submitted to the FRA was consulted and referred to in order to fill gaps in certain years' data, and to provide additional context for the trends (e.g., Australia, Korea).

In China and Korea, there were reductions in employment numbers in response to environmentally-motivated decisions (e.g., the promotion of tourism and regeneration instead of traditional forestry activities). In Korea, there were differing trends between the national and private forest working groups. In Korean national forests, jobs are being created with the input of the national budget, while jobs in private forests are gradually decreasing due to the lack of invigoration of the forest industry. China has increasingly invested in ecological restoration programs to better protect its existing natural forests and restore lands which have been degraded in the last decades. The reduction in commercial logging has resulted in a loss of employment in the conventional forest sector. Conversely, the total number and share of employees in forest cultivation (state-owned forest farms, seedling nurseries, planting stations, stations of controlling disease and pest infestation and combating desertification) have increased during this time period.

Canada, USA, and Australia, saw reduced employment because of increased mechanisation, as well as sector restructuring in response to changing market conditions (e.g., decline in global paper demand, especially newsprint and printing and writing paper). Overall production has been increasing, while employment is reducing. For example, in Tasmania (Australia), forest sector employment fell by almost half between 2006 and 2011; in Canada, forest sector employment decreased by 50% from 1990 to 2015, though the rate of decrease slowed between 2010 and 2015.

In Uruguay, employment saw increases due to the development of a new pulp mill. In Argentina, though most forest

sector employment is concentrated in the sawmill, boards, pulp, paper and cardboard industries, employment increased to fulfill greater management and planning needs enforced by the new forest sector legal framework (2007).

What could change in the future?

In China and Korea, a continued decline is expected due to decreasing traditional wood-based forest product manufacturing. However, potential increases may occur in relation to the promotion of tourism and conservation.

In Canada, USA, and Australia, a continued overall reduction in employment is expected due to continued mechanization and market restructuration. However, potentially significant fluctuations can be expected in some production sectors due to new product development and demand, modernisation, and shifting market conditions. For example, in Canada, though employment in the pulp and paper product manufacturing subsector continued to decrease after 2015, the wood product manufacturing subsector grew in importance, accounting for nearly 50% of total forest sector employment in 2018.

In Uruguay, employment is expected to continue to increase due to the new pulp mill. In Argentina the hope is that the recent legal framework changes will continue to promote forest sector employment.

Key findings:

- Employment totals across all Montréal Process countries have been steadily declining throughout the reporting period, decreasing by 40% between 1990 and 2015. Reasons for this decline are variable, but they include increased mechanisation, prioritization of environmental values over conventional forest sector resources, and changing market conditions.
- China and Russia saw the greatest decrease in forest sector employment between 2000 and 2015, with reductions of 43% and 61%, respectively.
  - In Russia, this decrease is due to a lack of qualified employees as well as forest sector reforms (in 2007).
  - In China, this decline was largely due to the implementation of projects aimed at protecting natural forests, industrialization and the transfer of employment from formal to non-formal forestry sectors.
- Uruguay saw the greatest rise in forest sector employment between 2000 and 2015, with an increase of 43%.
- These historical trends in both increased and decreased employment are expected to continue. However, subsector development and increased capacity in some countries or regions may lead to new employment opportunities in the future.

Criterion 7 – Legal, institutional, and economic framework for forest conservation and sustainable management

7.1.a Legislation and policies supporting SFM. Lead author: Claire Howell

Why is this indicator important?

A country's legislation and policies determine its ability to effectively conserve forest ecosystems, and to ensure the sustainable management of forests to meet the needs of dependent communities and society in general. Reporting against this indicator aims to demonstrate the strength and scope of each country's forest-related legislation and policies.

This indicator provides information on legislation and policies, including regulations and programmes, which govern and guide forest management, operations and use. Legislation and policies designed to conserve and improve forest functions and values are prerequisite to achieving the sustainable management of forests.

Laws, regulations and policies in Montréal Process countries cover the conservation of forest habitats and species; the management of forests for cultural, social and scientific values; the maintenance and management of ecosystem services; the harvesting of wood and non-wood products; the governance of management systems; and the prohibition of illegal logging. In some countries, legislation also ensures the ongoing public financing of the conservation and sustainable management of forests.

What do the data show?

Montréal Process member countries vary in their approaches to applying legislation, regulation and polices towards the sustainable management of forests, partly determined by governance and administrative arrangements in each country. All countries have national arrangements, while some countries with sub-national jurisdictions also have varying degrees of sub-national arrangements.

All Montréal Process countries report national environmental and forest-specific policies supporting the conservation and sustainable forest management in native and plantation forests (Figure below). Ten of the twelve member countries also have similar policies at the sub-national level. The participation of stakeholders in forest policy development is also generally promoted and allowed for by Montréal Process countries.

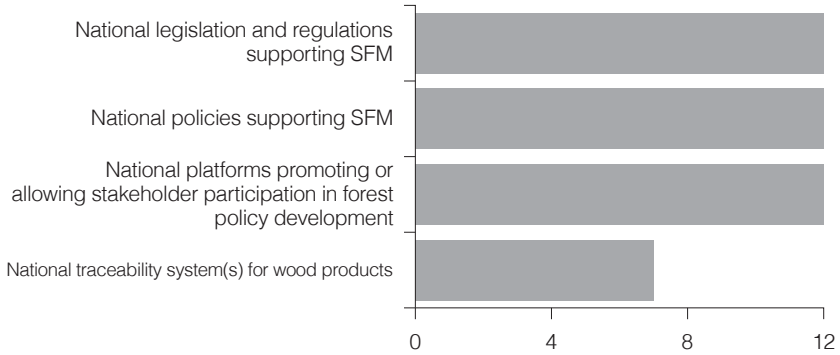
All Montréal Process member countries have national environmental and forest-specific legislation and regulations based on principles of conservation and sustainable forest management, applying to native and plantation forests (Figure below). The enforcement of these laws and regulations, and their periodic review, also forms part of the legislative framework in each country. Eight of the twelve member countries also have legislation and regulations supporting sustainable forest management at the sub-national level.

Seven countries report national wood product traceability systems, and four of these also have sub-national wood product traceability systems. An eighth country operates its wood product traceability system at the sub-national level.

Codes of best practice and compliance systems relating to operations in production forests generally form part of the regulatory framework in Montréal Process countries. These codes and compliance systems aim to minimise impacts on ecosystems, and maintain forest health and productivity. The strongest regulatory frameworks specify independent officers with powers to investigate, report findings and make recommendations to governing bodies, and address the effectiveness of environmental planning and management.

The member countries of the Montréal Process are participants in international agreements and processes such as the United Nations Forum on Forests, the World Trade Organisation, the Convention on International Trade in Endangered Species, the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, and the Intergovernmental Panel on Climate Change. This participation demonstrates the commitment of Montréal Process countries to being responsible participants in global

Number of countries having national legislation, policies, stakeholder participation mechanisms and wood product traceability systems



global matters of significance, including the sustainable management of forests. International engagement also assists in creation of an enabling environment for the sustainable management of forests within member countries.

Some Montréal Process countries participate in the International Model Forest Network, by endorsing and maintaining the Principles and Attributes of Model Forests. These principles are based on flexible landscape and ecosystem management that combines the social, environmental and economic needs of local communities with the long-term sustainability of large landscapes. This involves planning and managing sustainable development of forest ecosystems in ways that also aims to improve the quality of life in marginalised or poor communities.

What could change in the future?

Legislation and policy changes may result from the increased pressures on forests from their use to generate products and services, the effects of climate change, and social drivers for greater conservation. The twelve member countries of the Montréal Process collectively manage 60% of the world's forests, including 90% of the world's temperate and boreal forests. The legislation and policies of these countries support the sustainable management of forests, and serve as a positive influence on global management practices and progress regarding the conservation and sustainable management of forests.

Photo: Xxxxx Xxxxx - Australia.

Key findings:

- XXX
- XXX
- XXX

Conclusion

- **Climate change** is having an increasing impact on the forests and is the overriding issue facing them
- Increasing **recognition** of the planetary **value of forests**
- Pressures on forests for production will increase as demand for fibre rises and the planet moves towards low carbon economies – plantations will take the pressure off natural forests
- The **C&I framework** is incredibly useful for assessing our progress towards Sustainable Forest Management, but there are still data challenges

Appendix 1: MPWG C&I Framework

The Montréal Process Working Group has 12 member countries, Argentina, Australia, Canada, Chile, China, Japan, Korea, Mexico, New Zealand, Russian Federation, Uruguay and USA (see map). Since it was established in 1995 the Working Group has developed a framework of Criteria and Indicators (C&I) of Sustainable Forest Management. These have been revised over the years to culminate in the current set of 7 Criteria and 54 Indicators (Figure X). The C&I span all aspects of Sustainable Forest Management and enable a comprehensive description of the state of a country's forests to be made and presented. Countries periodically publish 'Country Reports' outlining the state of their forests, generally on about a 5-year cycle. The C&I set is also applied at the sub country level.

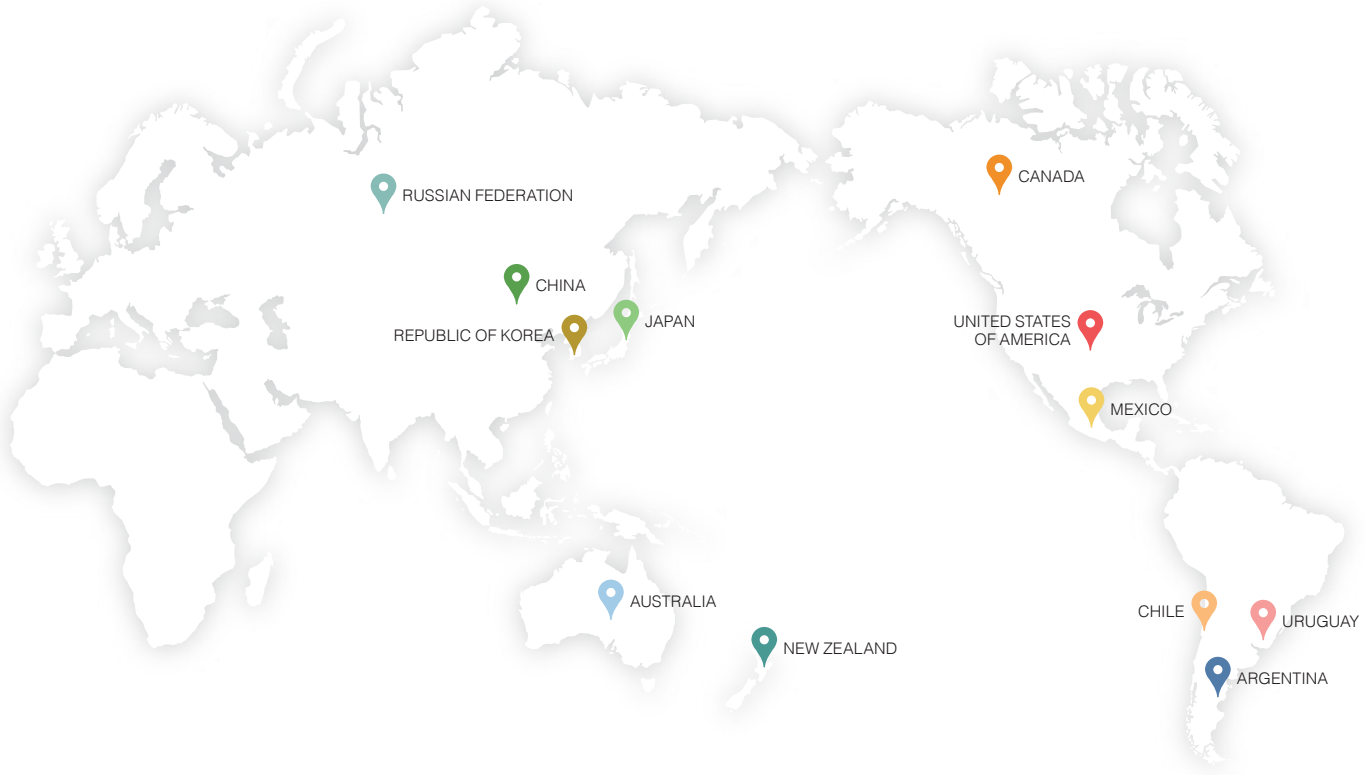


Figure X: *Montréal Process C&I set Fourth Edition (2015).*

Appendix 2: Data and information

This report was based on numeric data and also on information gathered through a general questionnaire.

Data

Table X shows the Montréal Process Indicators, and the equivalent variables captured by the Global Forest Resources Assessment. The Montréal Process has been involved with the FRA and other C&I processes in past year in the Collaborative Forests Resources Questionnaire designed to improve alignment between indicator processes and the FRA. This enabled this project to utilise a mix of FRA 2020 data and member country data where the report developers and country contributors deemed appropriate. The Montréal Process was closely involved with the FAO Forestry Department as part of the FRA 2020 process, and this has led to easy accessibility to combined data for the Montréal Process countries and we acknowledge the great support of the FRA team in assisting us with this access. One major outcome of the interaction has been the development of 'custom regions' within the online FRA data portal, we were fortunate to have a specific Montréal Process region created where data from the combined group or individual countries can be displayed or down-loaded for all FRA variables https://fra-data.fao.org/MP/fra2020/home/. Other data sources were also used – for indicator 6.1.a which focussed on round wood production we accessed data from FAOSTAT https://www.fao.org/faostat/en/#home. Other data was provided by individual countries for some indicators where they felt it fitted better with the purpose of the report.

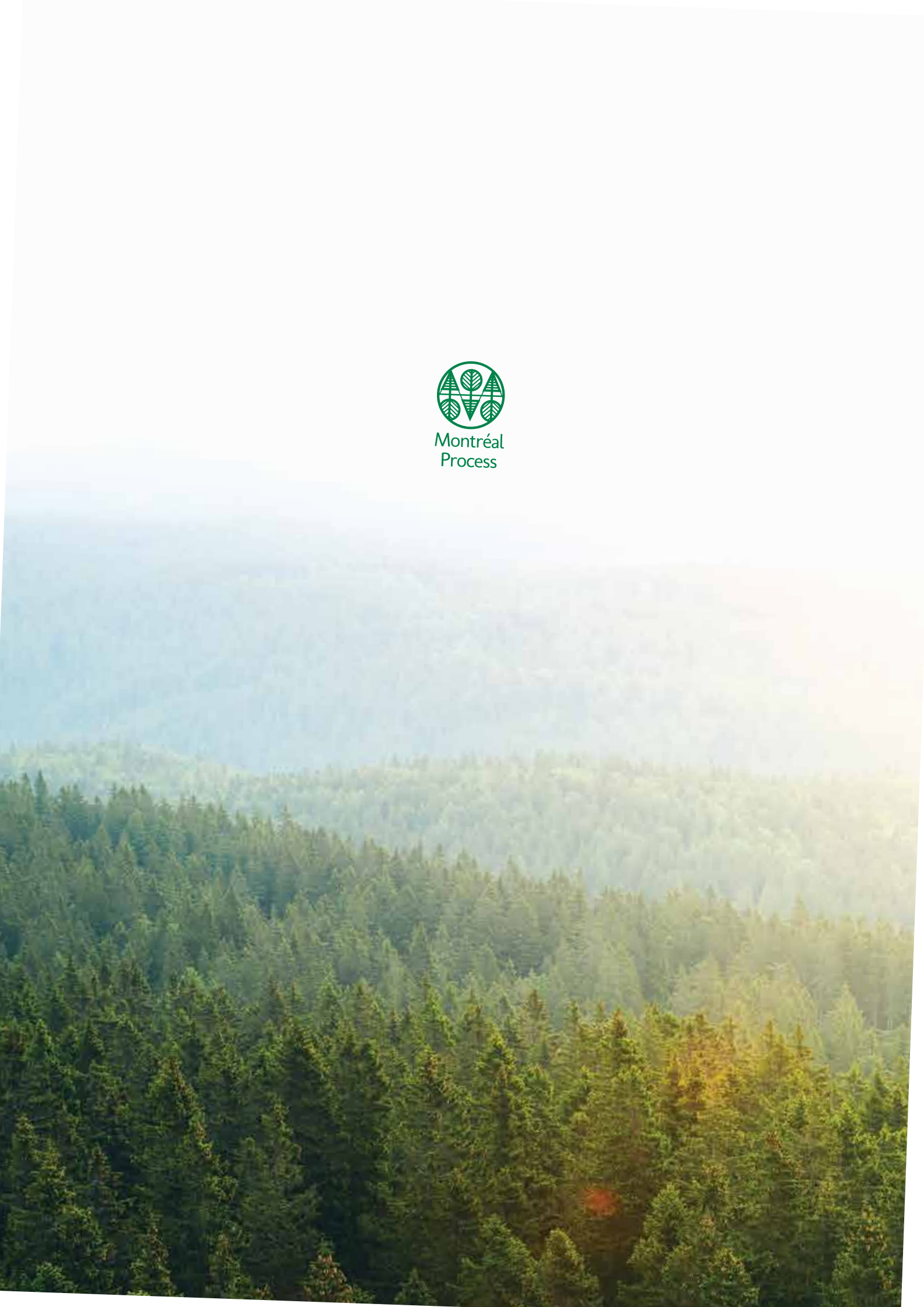
Montréal Process Indicator	Equivalent FRA2020 variables
1.1.a Area of Forest	1a Extent of forest and other wooded land - forest
1.1.b Area of forest in protected areas	3b Area of forest within legally established protected areas
2.a Area of forest available for wood production	3a Designated Management Objective: production
2.c Area and growing stock of plantations	1b Forest Characteristics - plantation forest
3.a Area affected by biotic processes	2a Total Growing stock - plantation forest
3.b Area affected by abiotic processes	5a Disturbances by insects
4.1.a Area of forest designated for protection of soil and water	5b Forest area affected by fire
5.a Carbon pools and fluxes	3a Designated Management Objective: protection of soil and water
	2d Carbon stock - carbon in above ground biomass
	2d Carbon stock - carbon in below ground biomass
	2d Carbon stock - carbon in dead wood
	2d Carbon stock - carbon in litter
	2d Carbon stock - soil carbon
6.1.a Value and volume of wood and wood products production	FAOSTAT - Industrial roundwood production
6.3.a Employment	7a Employment in forestry and logging - silviculture
	7a Employment in forestry and logging -logging
	7a Employment in forestry and logging - gathering of non wood forest products
	7a Employment in forestry and logging - support services
7.1.a Legislation supporting SFM	6a Policies legislation and national platform for stakeholder participation in SFM - policies supporting SFM (Y/N)
	6a Policies legislation and national platform for stakeholder participation in SFM - legislation &/or regulation supporting SFM (Y/N)
	6a Policies legislation and national platform for stakeholder participation in SFM - stakeholder participation platform
	6a Policies legislation and national platform for stakeholder participation in SFM - traceability system

Table X: *Montréal Process Indicators analysed within this synthesis report with equivalent FRA 2020 variables.*

Appendix 3: Links/literature cited

The Montréal Process Working Group has 12 member countries, Argentina, Australia, Canada, Chile, China, Japan, Korea, Mexico, New Zealand, Russian Federation, Uruguay and USA (see map). Since it was established in 1995 the Working Group has developed a framework of Criteria and Indicators (C&I) of Sustainable Forest Management. These have been revised over the years to culminate in the current set of 7 Criteria and 54 Indicators (Figure X). The C&I span all aspects of Sustainable Forest Management and enable a comprehensive description of the state of a country's forests to be made and presented. Countries periodically publish 'Country Reports' outlining the state of their forests, generally on about a 5-year cycle. The C&I set is also applied at the sub country level.

Montréal
Process



Annex J

Concept note – Micro-symposia

Overview

The Micro-symposia are intended to be a series of meetings on specific subject matter that are intended to share experiences, progress understanding, and highlight challenges that countries face on the use of C&I to support the conservation and management of temperate and boreal forests. The Micro-symposia will be conducted virtually and will be hosted on a voluntary basis by member countries, in any of the official Montreal Process languages.

Goals

1. Develop greater understanding and challenges that Member Countries face in developing and using criteria and indicators for sustainable forest management.
2. Progress the continued development and understanding of sustainable forest management through Montreal Process Criteria and Indicators.
3. Provide a forum to share knowledge, enable learning from Member Country experiences, and progress topics of interest highlighted in Montreal Process meetings.
4. To have a forum to discuss emerging trends and topics that could affect approaches to describing sustainable forest management.
5. Broadly promote and encourage wider participation in the Montreal Process and the use of C&I.

Relevance

The stated purpose of the Montreal Process is to advance the development of internationally agreed criteria and indicators for the conservation and sustainable management of temperate and boreal forests. To achieve this, the Montreal Process Working Group brings together participants from across 12 Member Countries to share experiences and approaches with the application of Criteria and Indicators and their implications. This network of knowledge is a strength of the Montreal Process and provides a key deliverable from the Working Group meetings.

The ongoing Covid-19 pandemic has presented an obstacle for Member Countries with travel restrictions, meaning that virtual meetings have become the norm. Virtual meetings have a relatively small carbon footprint, provide a useful way to meet, and increase opportunities to regularly share ideas and knowledge on target issues. They are, however, limited in length which can hamper the ability for members to have sustained discussion on agenda items.

This concept note proposes to start a series of targeted virtual Micro-Symposia on specific topics of interest to Member Countries. These Micro-Symposia will allow Member Countries to delve deeper into efforts that countries are undertaking, progress discussions from the Working Group Meeting, share expertise, and develop linkages across countries. The targeted nature of these discussions will allow a wider array of participants to take part in the discussions; this could include domestic policy, technical experts, and non-government participants.

These micro-symposia will deliver a cost-effective alternative and play a key part in developing the network of knowledge that has been an acknowledged strong point of the Montreal Process. They

will resolve some of the limitations from virtual meetings by providing members with an ability to have sustained engagement on sustainable forest management beyond the Annual Working Group Meeting.

Proposed Methodology

Quarterly meetings will be scheduled each year, coordinated and managed by the Liaison Office (LO). Working Group meetings will be used to identify topics of interest and agree on lead countries for each topic. Each lead country then works with the LO to schedule their Micro-symposia session. Micro-symposia sessions will be Member-driven - any interested Member Country may volunteer to lead and organise a session. These duties may be shared if Member Countries wish to undertake a session in partnership with another Member.

The schedule and agendas for Micro-Symposia will be hosted on the Montreal Process website. While it is not a pre-requisite to seek expressions of interest from other Member Countries, it is highly recommended to socialise potential micro-symposia sessions and topics prior to implementation.

Once a session is agreed to, the host member country will prepare an official invitation for agreement by the liaison office. The Liaison Office will then share the invitation with all Montreal process Member Countries and Technical Advisory Committee (TAC) members. The invitation should include:

- The subject of the session
- Brief overview of the topic and a description of the session, this should include the session's relationship to the Montreal Process.
- The format, (presentation, discussions, roundtable, workshop etc)
- Virtual Platform (Teams, Zoom, etc)
- Date and length
- Indicative agenda
- Relationship to Montreal Process Criteria and Indicators
- Key outcomes/outputs sought

Attendance at Micro-Symposia meetings will be voluntary for Member Countries and TAC members. However, interested members must indicate prior to the meeting if they are able to attend or not.

It is intended that these Micro-symposia may capture attendance from a wider audience than those that normally attend Montreal Process Working Group and Technical Advisory Committee Meetings.

The Working Group may invite representatives from other C&I processes and relevant international fora to participate where there are shared areas of interest under discussion. . However, any participation from outside the Montreal Process will need to be agreed by all Member Countries. This should take the form of an email to Montreal Process Working Group Members stating the name of the non-member, their organisation, and a brief description of their work and how it relates to the Montreal Process. This will operate on a no-objections basis.

The length of the session is to be determined by the host country but should not exceed a total of three hours. The host country is responsible for organising the virtual platform to be used, including translation into English, if necessary.

Follow up steps

At the conclusion of the meeting, the host economy will complete a file note to be shared with all Member Countries. The file note should provide a description of the meeting, participants, topics raised, key outcomes, a general record of the discussions, and any next steps agreed to. The file note will be shared on the Montreal Process website and a running agenda item will be made available during Montreal Process Working Group meetings to share key outcomes from sessions held between regular meetings.

Annex K

Montreal Process Working Group Meeting (MPWG-31) – Day 2: Other effective-conservation measures (OECMs) item – pre-meeting note

Dear Colleagues

At the last Montreal Process Working Group meeting (MPWG-30), Australia led a discussion on reporting on other effective-conservation measures (OECMs) under the Montreal Process Criteria and Indicators.

We thank China, Canada, USA, New Zealand, Japan and Argentina for all contributing useful perspectives on this issue.

For the upcoming Montreal Process Working Group meeting (MPWG-31) we would like to resume the discussion and invite all members to contribute to an exchange around three key questions:

1. Under your reporting, how do you capture conservation management that occurs in forests that are not within formal protected areas?
2. What are the key challenges you face in reporting on this category of land?
3. Would it be useful to request the Technical Advisory Committee to document, and compare and contrast, reporting approaches among Montreal Process members?

To refresh memories, Australia will briefly outline the key context for OECMs, including the Convention on Biological Diversity (CBD) definition and IUCN guidance, and what we heard in our last discussion, before inviting comments.

We would like to highlight that we are focussed on how to integrate reporting on these areas into sustainable forest management reporting. Questions around the merits and role of OECMs in the broader conservation context, are evidently best discussed within the CBD and related contexts.

CBD definition (2018):

"Other effective area-based conservation measure" means "a geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values"