2020

Assessment of Progress Towards the APEC 2020 Forest Cover Goal

Synthesis of Economy Reports and Additional Research

Asia-Pacific Network for Sustainable Forest Management and Rehabilitation

Foreword

In 2007, leaders of the Asia-Pacific Economic Cooperation (APEC) agreed to set an aspirational goal of increasing forest cover in the region, by at least 20 million hectares of all types of forests by 2020.

The APEC 2020 Forest Cover Goal formed a part of the Sydney Declaration on Climate Change, Energy Security and Clean Development, developed at the 15th APEC Economic Leaders' Meeting in Sydney, Australia. Ever since the goal was set, APEC economies set to work in implementing a diverse range of measures to collectively achieve the goal.

If achieved, the APEC 2020 Forest Cover Goal has the potential to store 1.4 billion tonnes of carbon, equivalent to around 11% of annual global emissions (as of 2004).

In order to summarize and document the progress that has been made towards the APEC 2020 Forest Cover Goal, and to expedite further actions to make major contributions to achieving the goal, the Chinese Government in collaboration with the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet) proposed the program: "Assessment of the Progress Towards the APEC 2020 Forest Cover Goal" in 2014, the approximate midpoint of the goal period. The program was adopted during the APEC Senior Officials' Meeting in the same year. APEC economies were then mobilized to share forest information on the progress achieved to-date.

In collaboration with FAO, the assessment was successfully completed in September 2015 after nine months of extensive data collection, analysis and consultation.

To-date, the assessment estimates that an inspiring 77% of the goal has been achieved. Most economies have also increased their per-hectare forest growth stock and total forest growth stocks in the same period, while increasing forest area. Given the progress achieved to-date, the region holds a reasonable degree of confidence that the APEC 2020 Forest Cover Goal will be achieved.

We are grateful for the active involvement of APEC economies in this process, in sharing with us their experience and achievements in increasing and improving their forests.

I would like to take this opportunity to express my deep gratitude to FAO, Senior Consultant Mr. Chris Brown and the APEC economies who participated in this assessment, for all their hard work and extensive contributions in making this assessment a success. Our gratitude is extended to the Chinese State Forestry Administration for driving forward this important effort on the APEC platform, and without whom this assessment would not have materialized in the first place.

We hope that our readers can find guidance and inspiration in this assessment report, to develop further efforts on sustainable forest management and forest area growth. In so doing, I look forward to making the achievement of the APEC 2020 Forest Cover Goal a reality.

Qu Guilin
Executive Director of the APFNet Secretariat

Contents

This publication adopts the following subregional groupings for APEC economies:

Americas	Canada, Chile, Mexico, Peru, United States of America
East Asia	People's Republic of China, Hong Kong (China), Japan, Republic of Korea, Chinese Taipei
Pacific	Australia, New Zealand, Papua New Guinea
Russia	Russia
Southeast Asia	Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam

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Acronyms and Abbreviations

ANR	Assisted Natural Regeneration
APEC	Asia-Pacific Economic Cooperation
APFNet	Asia-Pacific Network for Sustainable Forest Management and Rehabilitation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CONAFOR	Comisión Nacional Forestal /National Forestry Commission of Mexico
CSA	Canadian Standards Association
DENR	Department of Environment and Natural Resources
DoA	Department of Agriculture
EGILAT	Expert Group on Illegal Logging and Trade
ERC	Ecosystem Restoration Concessions
ETS	Emission Trading Scheme
EU-FLEGT	European Union – Forest Law Enforcement, Governance and Trade
FAO	Food and Agriculture Organization of the United Nations
FRA	Global Forest Resources Assessment
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HoB	Heart of Borneo
INDCs	Intended Nationally Determined Contributions
ITTO	International Tropical Timber Organization
JFA	Japan Forestry Agency
KFRI	Korea Forest Research Institute
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry for Primary Industries
MRV	Measurement, Reporting and Verification
NFI	National Forest Inventory
NRC-CFS	Natural Resources Canada – Canadian Forest Service
NZU	New Zealand Units
PEFC	Program for the Endorsement of Forest Certification
PNGFA	Papua New Guinea Forestry Authority

REDD	Reduction in Emissions from Deforestation and Forest Degradation
RFD	Royal Forest Department
RMB	Chinese Yuan Renminbi
SFA	State Forestry Administration
SFI	Sustainable Forestry Initiative
UN	United Nations
UNFF	United Nations Forum on Forests
UNFCCC	The United Nations Framework Convention on Climate Change
UNORCID	United Nations Office for REDD+ Coordination in Indonesia
UN-REDD	United Nations Collaborative Initiative on Reducing Emissions from Deforestation and forest Degradation
WWF	World Wide Fund

Executive Summary

The Sydney Declaration on Climate Change, Energy Security and Clean Development, adopted at the 15th APEC Economic Leaders' Meeting in 2007, set a goal of increasing forest cover in the APEC region by at least 20 million hectares by 2020.

APEC economies account for 46% of the world's land area and 54% of global forests (2.19 billion hectares). Five economies – Australia, Canada, China, Russian Federation and United States – account for 82.3% (1.81 billion hectares) of forests in the APEC region. Ten APEC economies have more than 40% forest cover, while five economies have less than 25% forest cover. Four economies have greater than 4 hectares of forests per capita. Another four economies have less than 0.1 hectares of forests per capita.

Broad trends are indicative of improving quality of forest management in most APEC economies. Almost all economies are participants in either the ITTO criteria and indicators process for tropical forest or the Montreal Process for temperate and boreal forests. The area of forest in protected areas in APEC economies has increased by more than 15 million hectares in the period 2007–2015. Planted forest area in the APEC region has increased by slightly more than 20 million hectares since 2007. A significant trend has been devolution of forest ownership and forest management responsibilities away from governments to the private sectors, communities and households. Extensive areas of forests in APEC economies have received forest management certification under the Program for the Endorsement of Forest Certification (180 million hectares) or from the Forest Stewardship Council (114 million hectares).

According to the FAO Global Forest Resources Assessment (FRA) 2015, the area of forest in the APEC region has increased by 15.4 million hectares in the period 2007–2015 to a total of 2.19 billion hectares. As a best estimate, the APEC economies have currently achieved 77% of the 20 million hectares APEC 2020 Forest Cover Objective. During the period 2007–2015, forest areas have increased in 11 economies, with the largest increases in forest area achieved in China (12.3 million hectares), United States (3.8 million hectares) and Russian Federation (3.6 million hectares). Conversely, forest areas have declined in nine economies, with the largest losses in Indonesia (5.5 million hectares), Peru (1.3 million hectares) and Australia (1.1 million hectares). Most economies have increased their per hectare forest growing stock and total forest growing stocks in the period 2007–2015 in line with increased forest areas and improved forest management.

Since 2007, APEC economies have variously implemented a diverse range of measures that support progress toward achievement of the APEC 2020 Forest Cover Objective. Efforts and achievements include: development of new legislation, policies and action plans;

implementation of government and voluntary planting programs; enhanced conservation and protection programs; measures to promote forest rehabilitation and regeneration and to reduce deforestation and regulate forest harvesting; development of forest-related climate change programs; provision of direct incentives for forestation and improved forest management; strengthening forest tenure provisions; improving forest law enforcement and governance arrangements and participating in global and regional processes that support improved forest management.

Among specific policies and initiatives promoting the greatest increases in forest areas in APEC economies have been the "*Decision on Accelerating Forestry Development*" issued in China in 2003 leading to subsequent key forestry programs, Viet Nam's "*Five Million Hectares Reforestation Program*", the Philippines "*National Greening Program*" and a "Bonn Challenge" committed by the United States to rehabilitate 1.5 million hectares of degraded lands each year.

Key direct drivers of deforestation and forest degradation in APEC economies include agricultural expansion, forest products extraction (legal and illegal), infrastructure development and biophysical factors (including climate and weather events, forest fires, and pests and diseases). Important indirect drivers of change are identified as poverty, population increases, wood products demand, governance factors, urbanization, and lack of coherent cross-sectoral policies.

The main risks to achievement of the APEC 2020 Forest Cover Objective relate to major or catastrophic forest loss as a result of natural disturbances including climate-related risks such as droughts, cyclonic storms and floods, as well as wildfires and invasive pests and diseases. Major policy shortfalls could also compromise achievement of the target.

A number of APEC economies have established identifiable targets for future expansion of forest area. The cumulative total of targeted increases amounts to approximately 32 million hectares of additional forest area in the APEC region in the period 2016–2020.

Extrapolations of forest area expansion for the 2007–2015 period suggest that for the full period 2007–2020 APEC economies will increase total forest area by 24.4–25.1 million hectares. Forest area in East Asia is forecasted to increase by 19.9 million hectares over the period 2007–2020, with smaller increases anticipated in the Americas (4.2 million hectares), Russia (3.4 million hectares) and the Pacific (369,000 hectares). Forest area in Southeast Asia is expected to decline by 3.5 million hectares in the period 2007–2020.

Among forest types, planted forest area in APEC economies is expected to increase by 31.3

million hectares between 2007 and 2020. Conversely, the total area of primary forests in the APEC region is expected to decline by 1.4 million hectares and the area of other naturally regenerated forests is anticipated to decrease by 4 million hectares.

Given the progress achieved to date, APEC economies should maintain a reasonable degree of confidence that the APEC 2020 Forest Cover Objective will be achieved.

Chapter 1　Introduction

- Current status of forests and forest resources
- Current status of forest resources management
- Changes of forest cover and forest quality during 2007−2015

Asia-Pacific Economic Cooperation (APEC) comprises 21 member economies located in and around the Pacific Rim. The APEC economies extend across 46% of global land area, are home to approximately 38.8% of the global population, produce more than 56% of global GDP, and account for almost 47% of net global trade in merchandise goods and commercial services (APEC Key Indicators Database, 2015).

In terms of forests, APEC economies encompass 2.19 billion hectares of forest cover, slightly more than 54% of the global total (FRA 2015). The APEC region accounts for 60% of global industrial roundwood production and 44.6% of global forest products trade by value (FAOSTAT).

In terms of the scale alone, the APEC economies constitute an important grouping for forestry. Not only does the region account for more than half of the world's forests, it also contains extensive areas of marginal agricultural land, degraded lands and other land potentially suitable for afforestation or reforestation. Equal importance is the region's economic dynamism. APEC contains the world's three largest economies (United States, China and Japan) and nine of the world's 20 largest economies. It also includes many of the world's fastest growing economies, with most APEC economies expected to outpace average global GDP growth over the next decade. APEC is also a center for intellectual leadership in the development of new ideas and forward-thinking solutions and, with strong private sector linkages, is ideally placed to demonstrate the feasibility of large-scale expansion in the global forest estate using a diverse range of policies, incentives, tools and programs. In this context, in 2007, APEC leaders adopted an objective of increasing forest cover in the region by at least 20 million hectares by 2020 (Box 1).

Box 1 APEC 2020 Forest Cover Objective

In 2007, the 15th APEC Economic Leaders' Meeting adopted the Sydney Declaration on Climate Change, Energy Security and Clean Development. The Declaration noted, among other things, that "*Sustainable forest management and land use practices play a key role in the carbon cycle and need to be addressed in the post–2012 international climate change* arrangement". The Declaration identified an Action Agenda that includes an agreement to "*work to achieve an APEC-wide aspirational goal of increasing forest cover in the region by at least 20 million hectares of all types of forests by 2020 – a goal which if achieved would store approximately 1.4 billion tonnes of carbon, equivalent to around 11% of annual global emissions (in 2004)*".

In 2015, with five years still remaining to achieve the APEC 2020 Forest Cover Objective, this report – a synthesis of progress reports prepared by 13 APEC economies and desk research–

provides a stocktaking of efforts and progress in expanding forest cover in APEC economies during the period 2007–2015.

The first Section of the paper outlines the current status of forests and forest resources in the APEC region, particularly referencing the extensive new forest data released as part of the Global Forest Resources Assessment 2015. It discusses significance of forests in APEC economies and changes in management of forest resources including analysis of key forest statistics. It also assesses and analyses changes in forest cover and quality in APEC economies during the period 2007–2015.

Section 2 describes the efforts and achievements of APEC economies during the period 2007 to 2015 that support progress towards the APEC 2020 Forest Cover Objective. It outlines a variety of policies, tools and programs being implemented in APEC economies to expand forest cover and enhance the quality of forests, as well as efforts to reduce deforestation and forest degradation. It identifies key socio-economic and environmental factors driving changes in forest area and forest quality during 2007 to 2015.

Section 3 charts a path forward to 2020 including likely developments, changes and expectations in relation to forest cover. It outlines a range of actions, plans and programs identified for implementation by APEC economies in the period 2016–2020 that will support achievement of the APEC 2020 Forest Cover Objective. It also identifies significant impediments and risks that may hamper progress towards the forest cover objective. The section concludes by providing an assessment of the likely extent and types of forest cover in APEC economies in 2020.

1.1 Current Status of Forests and Forest Resoures

APEC economies extend across 46% of the world's land area and account for 54% of global forests. However, of the 2.19 billion hectares of forests in APEC economies, 1.81 billion hectares (82.3%) are located in just five economies – Australia, Canada, China, Russian Federation and United States. Conversely, the five economies with the smallest forest areas Brunei Darussalam, Chinese Taipei, Hong Kong (China), Republic of Korea, and Singapore– account for a total of 8.6 million hectares (0.4% of the APEC regional total). Forest cover in the other 11 economies amount to 379 million hectares (17.3% of the APEC total). Figure 1 shows the distribution of forests in the APEC region by economy.

In terms of proportionate forest cover, 10 APEC economies have greater than 40% of their land area under forests, with Papua New Guinea (74.1%), Brunei Darussalam (72.1%) and Japan (68.5%) the economies with highest proportions of forests to total land area. Australia (16.2%), China (22.1%) and Chile (23.7%) have the lowest proportions of forest cover. [1]

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[1] Forest cover data obtained from the FAO Global Forest Resource Assessment 2015.
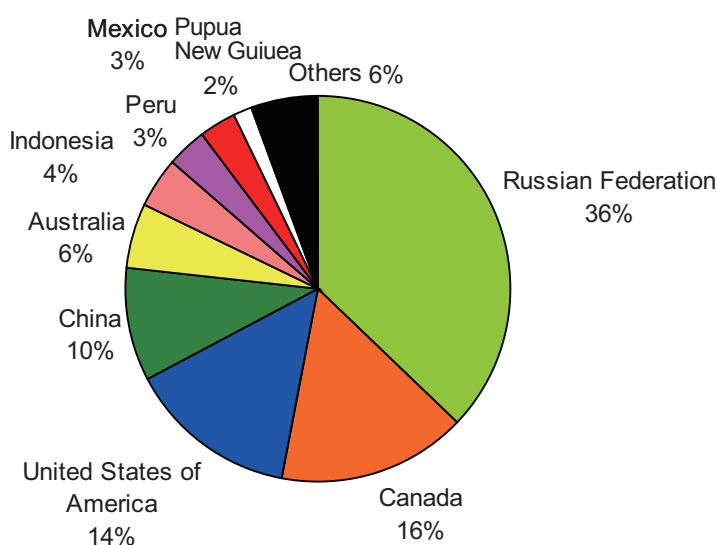
Figure 1   Proportion of forests in APEC region by economy
Source: FAO 2015

In general, the economies with highest population densities also have the smallest areas of forests per capita. Singapore (0.003 hectares per person), Hong Kong (China) (0.004 hectares per person), the Philippines (0.08 hectares per person) and Chinese Taipei (0.09 hectares per person) have the lowest per capita forest areas among APEC economies. Conversely, the large (by area) and more sparsely populated economies of Canada (9.7 hectares per person), Russian Federation (5.7 hectares per person) Australia (5.2 hectares per person), and Papua New Guinea (4.4 hectares per person) have the highest areas of forest per capita.

Table 1 categorizes APEC economies according to their total areas of forest, proportionate forest cover and per capita forest areas. Table 1 shows a broad diversity of forest situations in the various APEC economies resulting from a wide range of bio-geographical factors, demographic and socio-economic factors and, in some instances, political and policy factors. For example, bio-geographical factors limit the extent of forests in very arid and desert areas in parts of Australia, Chile, Peru and Mexico and in tundra areas of Canada and the Russian Federation. In the small predominantly urban economies of Singapore (23.7% forest cover) and Hong Kong (China) (23.8% forest cover) demographic pressures place significant restrictions on the proportions of land area available for afforestation. In several economies, for example Brunei Darussalam, China, and Viet Nam, the government continues to have a significant "hands-on" role in forest management and government directly influences land-use decisions relating to forests. In a number of other economies, including Chile, Japan, Republic of Korea, New Zealand and the United States market-based economic factors – particularly financial returns – are a major determinant of land-use allocation decisions.

However, in general most economies have a mixed system of public-private forest ownership and even in economies where the vast majority (or all) forests are owned by the state, market-based factors have at least some influence.

Data relating to forest area, proportionate forest cover and per capita forest cover in APEC economies are summarized in Table 1.

Table 1   Current significance of forest resources in APEC economies

	More than 100 million ha of forest in total		More than 10 million ha of forest in total		Less than 10 million ha of forest in total	
	More than 40% forest cover	Less than 40% forest cover	More than 40% forest cover	Less than 40% forest cover	More than 40% forest cover	Less than 40% forest cover
More than 0.6 ha of forest per person	Russian Federation	Australia Canada United States of America	Malaysia Papua New Guinea Peru	Chile Mexico New Zealand	Brunei Darussalam	
Less than 0.6 ha of forest per person		China	Indonesia Japan Viet Nam	Thailand	Chinese Taipei Republic of Korea	Hong Kong (China) Philippines Singapore

Source: FAO 2015

1.2 Current Status of Forest Resources Management

In general, any detailed assessment of the status of forest resources management in APEC economies is beyond the scope of this paper. Nonetheless, some broad and qualitative commentary identifying key trends including, particularly, information and indicators that suggest ongoing overall improvement in forest resources management is included. This section briefly considers utilization of criteria and indicators for sustainable forest management in APEC economies; relationships between ownership and forest management; significance of forest classification; trends in management of forests in protected areas, production forests and planted forests; efforts in forest rehabilitation and restoration; and progress in certifying forest management.

Criteria and indicators for sustainable forest management

Notably, almost all APEC economies are members and participants in either the ITTO criteria and indicators process for tropical forests or the Montreal Process for temperate and boreal forests (Table2). Peru is also a member of the Tarapoto Process for Amazon forests. These processes identify overarching criteria for sustainable forest management and develop more detailed indicators against which progress can be measured. Criterias generally relate

to common aspects including (for example, for the Montreal Process): (i) conservation of biological diversity; (ii) maintenance of productive capacity of forest ecosystems; (iii) maintenance of forest ecosystem health and vitality; (iv) conservation and maintenance of soil and water resources; (v) maintenance of forest contribution to global carbon cycles; (vi) maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies; (vii) legal, institutional and economic framework for forest conservation and sustainable management.

Table 2   International criteria and indicators processes

Criteria and indicators process	Participating APEC economies
ITTO criteria and indicators for the sustainable management of tropical forests	Indonesia, Malaysia, Mexico, Papua New Guinea, Peru, Philippines, Thailand, Viet Nam
Montreal Process (Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests)	Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, United States of America
Tarapoto Proposal of Criteria and Indicators for Sustainability of the Amazon Forest	Peru

Economies use criteria and indicators to monitor and report on progress toward sustainable forest management. For example, by 1995, Canada had developed its first framework of domestic criteria and indicators for SFM, based on broad consultations with stakeholders. Canadian criteria identify important social, economic and environmental values while the indicators are objective scientific measures that can be monitored over time. In Canada, criteria and indicators help to: (i) clearly demonstrate Canada's environmental credentials; (ii) clarify issues related to the environment and trade; (iii) provide a common understanding of sustainable forest management; (iv) inform the public and decision makers; and (v) identify where forest management policies and practices can be improved. Also in 1995, under Canadian leadership, Canada and the other 11 countries that formed the Montreal Process agreed to use a common set of science-based indicators that would give government, industry, researchers and the public a way to consistently define, assess, monitor and report progress on the sustainable management of 90% of the world's boreal and temperate forests.

Forest ownership

Forest ownership provides a very broad indication of who is responsible for managing forest resources in APEC economies. In general, when forests are in private ownership, forest management responsibility also usually accrues to the private sector. However, in Papua New Guinea, for example, the vast majority of forests are under customary ownership. The government has a key role in approving and allocating these forests as concessions for harvesting. Conversely, in many economies with very high state ownership of forests,

commercial management, particularly harvesting in production forests, is often carried out by private sector entities, while government retains an oversight and regulatory role.
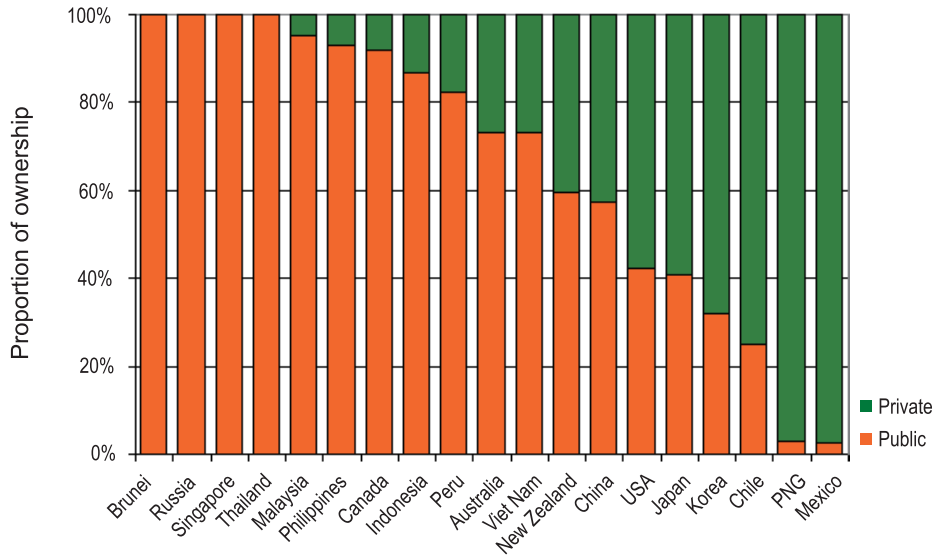
Figure 2   Public versus private ownership of forest in APEC economies 2015
Source: FAO 2015

In general there has been a significant trend in devolution of forest ownership and forest management responsibilities away from governments and toward the private sector, communities and households. Economies such as Australia, Chile and New Zealand have embarked on extensive forest privatization programs, while other economies including China, Philippines, Thailand and Viet Nam have developed programs to transfer forest property and user rights from government entities to households and communities.

Forest classification

In a number of economies, forests have been formally segregated according to their primary designated functions. For example, in 1996, under Papua New Guinea's first National Forest Plan, forests were classified into production forests, protection forests, reserve forests, and salvage forests. Similarly, in Peru, forests are under designated management regimes of which 17 million hectares are classified as Production Forests, 20 million hectares are in natural protected areas, and 12.3 million hectares are forests managed by indigenous and smallholder communities. In Malaysia, approximately 70% of the forest area is designated as Permanent Reserved Forest, with another 9.5% of forests in Totally Protected Areas.

More generally, most economies, at a minimum, draw a clear distinction between protected forests and production forests, while some economies further segregate forests according to particular values including cultural and spiritual values, provision of ecosystem services, and

(as a specific subset of ecosystem services) soil and watershed protection. Different types of management may be applied to different classes of forests; particularly production forests where more intensive silviculture may be applied compared with protection forests.

Management of forest in protected areas

In terms of forest management for conservation of biodiversity, a positive indicator is increasing area of forests in protected areas. The Global Forest Resources Assessment 2015 indicates that the area of forests in protected areas in APEC economies increased by more than 15 million hectares in the period 2007–2015. The largest net increases were in Australia (3.6 million hectares), China (3 million hectares) and the United States (2.6 million hectares), while Papua New Guinea, Indonesia, Mexico and Thailand also recorded significant increases in forests in protected areas. Figure 3 shows proportionate change in forests in protected areas in selected APEC economies for the period 2007–2015.
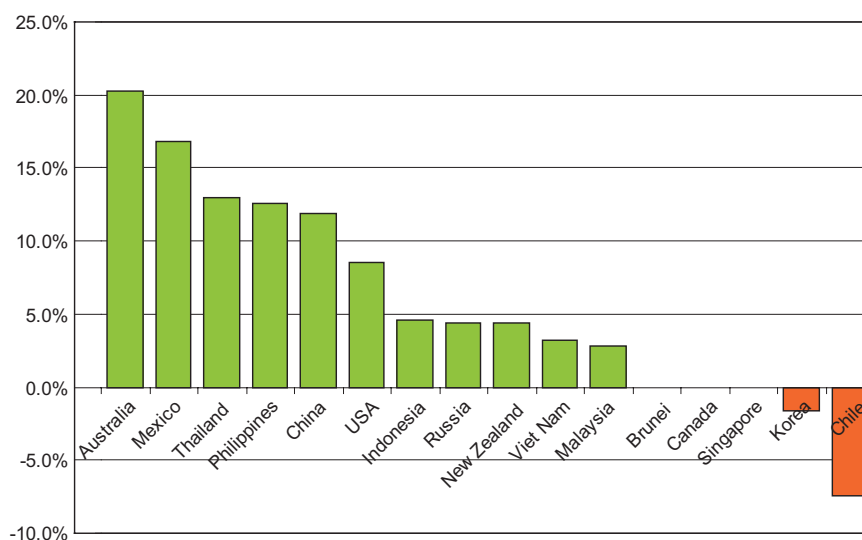
Figure 3   Percentage change in forest area in protected areas in selected APEC economies during 2007–2015 [1]
Source: FAO 2015

Among significant changes in policies governing ecological protection, in China, the "*Decision on Various Issues on Overall Deepening Reform*" in 2013 requires the delineation of "red lines" for ecological protection including for forests and forest lands. Similarly, the State Council's "*Opinion on Quickening Construction of Ecological Civilization*" issued in 2015 requires enhanced efforts in efficient resource utilization, protection of natural ecosystems, and improvement of the natural environment, with forests having prominent roles in all of

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[1] Papua New Guinea reports a 474% (1.5 million hectares) increase in forests in protected areas between 2007 and 2015.

these aspects.

Production forests

Areas designated as production forests have increased significantly in some APEC economies and decreased in others, since 2007. Three major dynamics appear to be occurring. Increases in production forest area is significantly driven by new planted forest establishment, while decreases in production forest area are mainly the result of either forests being withdrawn from the production forest estate or the result of production forest loss due to deforestation. Figure 4 shows proportionate change in area of designated production forest in APEC economies in the period 2007−2015. The total area of designated production forests in APEC economies has increased by 5.4 million hectares since 2007.
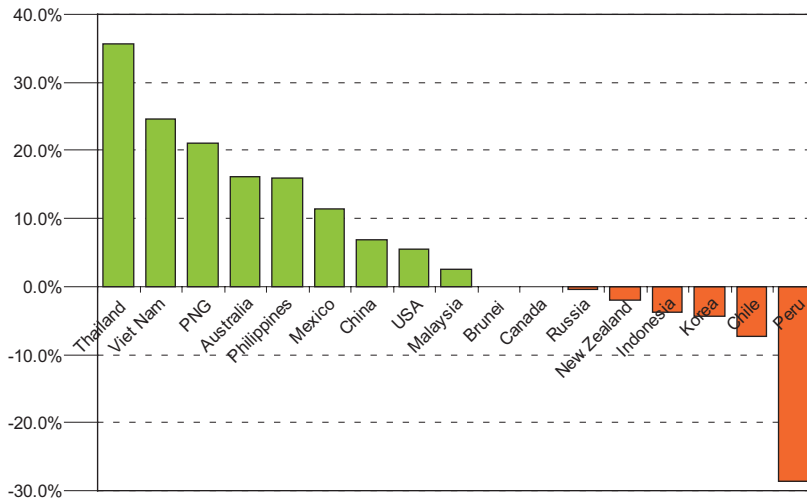
Figure 4   Change in area of designated production forest in APEC economies during 2007−2015
Source: FAO 2015

The significance of increased area of planted forests in increasing the overall area of designated production forest, as well as in achieving the APEC 2020 Forest Cover Objective is demonstrated in Figure 5. Increasing planted forest areas in economies such as China, Philippines, Thailand, Viet Nam and United States correlate significantly with increases in the production forest estate. Planted forest area in the APEC region has increased by slightly more than 20 million hectares in the period 2007−2015, making a major contribution to meeting the APEC 2020 Forest Cover Objective. China (9.4 million hectares) has easily recorded the largest increase in planted forests, while Canada, Russia, the United States and Philippines also recorded increases in planted forest area of more than one million hectares.
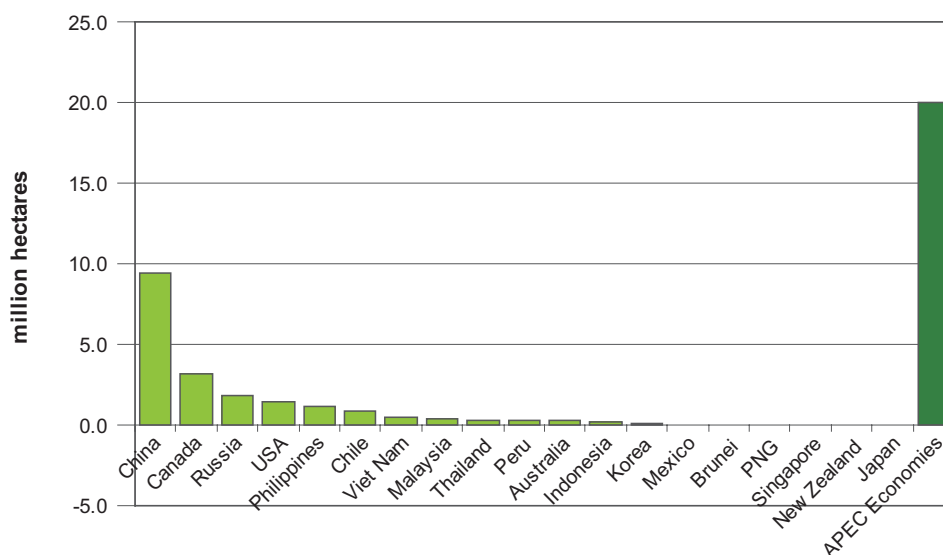
Figure 5   Change in area of planted forest in APEC economies during 2007−2015
Source: FAO 2015

Forest rehabilitation and restoration

A wide range of techniques to rehabilitate and restore forests are being implemented in APEC economies at many scales.

In recent times forest restoration at landscape levels has garnered significant attention. In parallel to the APEC 2020 Forest Cover Objective, in 2011 a Ministerial Conference issued the Bonn Challenge, to restore 150 million hectares of degraded and deforested lands by 2020 using landscape approaches. The United States Forest Service, in partnership with other stakeholders has committed to the restoration of 15 million hectares by 2020. This restoration aims to develop climate resilient ecosystems, restore watersheds, increase biodiversity, and enhance productive capacity.

A range of regeneration methods are used to restore degraded forests and lands. Natural regeneration, after harvesting and wildfires on abandoned agricultural lands is doubtless the most common. Artificial regeneration (planting and seeding) are also widely used in many economies. Assisted Natural Regeneration (ANR) techniques are increasingly being introduced, to provide tending assistance to naturally regenerated seedlings and expedite their growth. ANR is particularly promising as a means of regenerating forests on large areas of degraded *Imperata cylindrica* grasslands in East and Southeast Asia.

Enrichment planting is a specific form of ANR and is also widely used in degraded forests and to add diversity to planted forests. In Hong Kong (China), for example, an enrichment planting

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project has been implemented since 2009 to speed up transformation of exotic pioneer planted forests into more diverse forest habitats and picturesque landscape. Enrichment planting has also carried out in over-logged production forest in Brunei Darussalam since 1997. To date, enrichment planting has been successfully carried out in almost 13,000 hectares of over-logged forest in Brunei Darussalam.

A variety of specific forest restoration and rehabilitation initiatives are discussed in Section 2.

Certification

Forest management certification provides independent recognition that a particular forest or group of forests is being managed in a way that meets or exceeds a defined set of standards. The world's two largest forest certification systems are operated by Forest Stewardship Council (FSC) and the Program for the Endorsement of Forest Certification (PEFC), which encompasses a range of smaller national certification schemes (for example, the Malaysian Timber Certification Scheme). A number of other mainly national forest management schemes that are not affiliated with PEFC, for example Lembaga Ekolabel Indonesia, are also in operation.
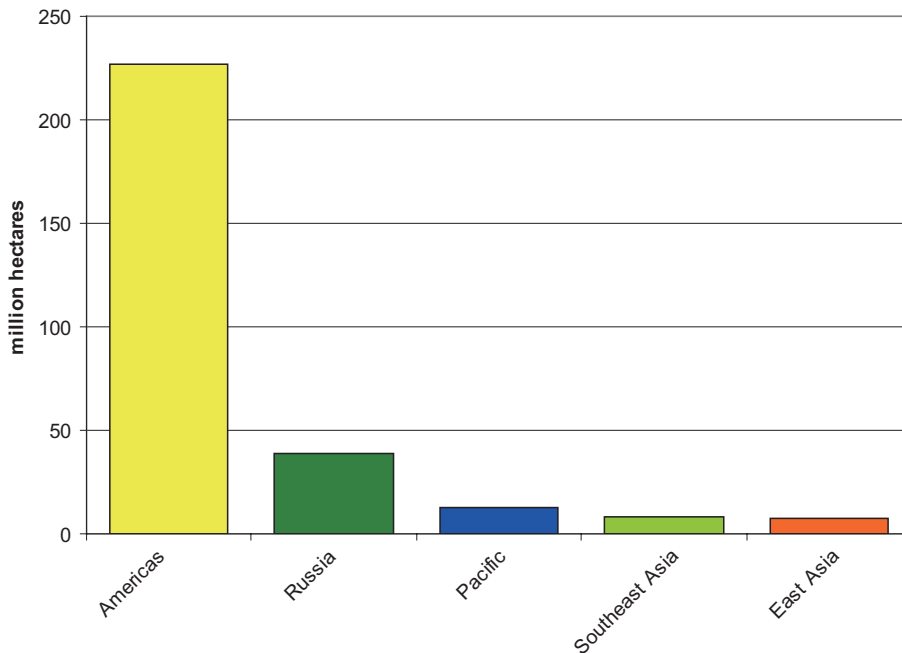
Figure 6   Area of forest certified by PEFC and FSC in APEC economies 2015[1]
Source: FSC 2015, PEFC 2015

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[1] n.b. some forest areas may hold both PEFC and FSC certification.

Significant areas of forests in APEC economies have been certified by PEFC and FSC. PEFC has certified more than 180 million hectares of forests in the APEC region (67% of the global total of PEFC-certified forests), while almost 114 million hectares of forests have received FSC certification (62% of FSC-certified forests). As Figure 6 shows, the largest area of certified forests is in the Americas, particularly Canada and the United States. Canada (35.8%), Malaysia (21%) and the United States (10.8%) are among the APEC economies with the highest proportions of their forests certified under systems endorsed by PEFC, while Canada (14.6%), Chile (13.4%) and New Zealand (12.4%) have the highest proportions of FSC-certified forests. Canada, Russian Federation and United States are the economies with the greatest areas of certified forests – collectively these economies have at least 195 million hectares of certified forests.

Box 2　Forest management certification in Canada

Three internationally recognized certification systems are used in Canada – Canadian Standards Association (CSA), Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI). Both CSA and SFI are endorsed by the Program for the Endorsement of Forest Certification (PEFC), the world's largest certification system. As of the end of the reporting period in 2013, Canada had the largest area of independent third-party certified forests in the world at 153 million hectares.

<div align="right">NRCan-CFS 2015</div>

1.3　Changes of Forest Cover and Forest Quality During 2007−2015

Changes in forest cover

According to the FAO Global Forest Resources Assessment (FRA) 2015, the area of forests in the APEC region has increased from 2,175,134,000 hectares in 2007 [1] to 2,190,581,000 hectares in 2015, an increase of 15,447,000 hecta res. As a best estimate, the APEC economies have currently achieved 77% of the 20 million hectares APEC 2020 Forest Cover Objective.

The contributions by various APEC economies to this increased area of forest cover have varied quite markedly. As Figure 7 shows, the largest increases in forest area during the period 2007-2015 have been achieved in China (12.3 million hectares), the United States (3.8 million hectares) and Russian Federation (3.6 million hectares). Conversely, forest areas have declined in nine economies, with the largest losses in Indonesia (5.5 million hectares), Peru (1.3 million hectares) and Australia (1.1 million hectares).

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① This 2007 total is calculated as a straight-line extrapolation between 2005 and 2010 totals; i.e 2007=2005+(2010-2005)*2/5.
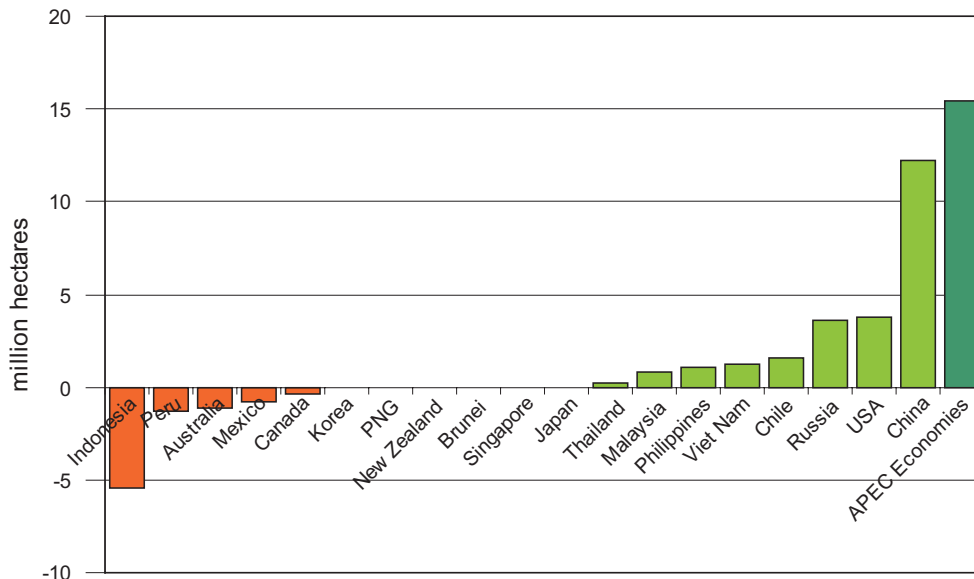
Figure 7   Change in forest area by economy during 2007−2015
Source: FAO 2015

Economies with increased forest cover 2007-2015

China has been implementing a set of key forestry programs during the period 2007−2013 resulting in a significant increase in forest cover. Chinese statistics show the cumulative area of afforestation attributable to key forestry programs is 23.6 million hectares, although part of this increase is offset by forest loss in other parts of the economy.

Forest cover in the United States has increased by approximately 3.8 million hectares in the period 2007−2015 as a result of increases in the area of other naturally regenerated forests and planted forests. A significant part of the increase in forest cover is driven by the establishment of public-private partnerships for ecological restoration. Policies that have markedly reduced timber harvesting in National Forests and increasing transferred these into environmental conservation and recreational purposes have also contributed to an increase in forest regeneration.

Since the 1950s, the Russian Federation has experienced a general trend of increasing forest cover, mainly due to gradual rejuvenation of forests after harvesting, forest fires, etc. and, particularly, through the reversion of marginal agricultural lands to immature forests. FAO (2012) notes that, "*In particular, many young growth areas were transferred between 2003 and 2008, resulting in an increase of land areas under forests by 20 million hectares*."

In Chile an expansion in planted forest areas has largely been driven by market forces, assisted by extensions of the long-running planted forest subsidy program under Decree Law

701. A significant increase in the area of primary forests reported to the FRA 2015 in Chile between 2010 and 2015 appears to be the result of expansion of open forests in arid and semi-arid regions.

Viet Nam had an extended period of forest loss up until 1990. In 1943, forest cover in Viet Nam was 14.3 million hectares, but by 1990 this area had declined to 9.18 million hectares. Since 1990, Viet Nam's forest area has been continuously increased through afforestation efforts and rehabilitation of natural forests, particularly driven by a variety of government projects and policies. By 2013, Viet Nam's forest area stood at 13.95 million hectares.

In the Philippines, a long-term deforestation trend continued up until 2010. In the period 2003−2010, total forest cover decreased from 7.17 million hectares to 6.84 million hectares, a decline of 4.6%. Forest degradation was also apparent in the conversion of closed forests to open forests, and in reduction in the proportion of canopy cover within both closed and open forests. However, since 2010 the long run deforestation trend has been reversed and by 2015, total forest cover is estimated to have increased to 8.04 million hectares. DENR (2015) notes, "*Among the National Greening Program's milestone accomplishments from Years 2011−2014 includes the rehabilitation of 1,005,013 hectares of open, denuded and degraded forest lands.*"

In Malaysia, an increase in forest cover of approximately 800,000 hectares 2007−2015 comprises moderate increases in each of the primary, other naturally regenerated and planted forest types. Expansions in the area of fast-growing plantation species account for a significant proportion of the increase, with regeneration of forests on previously cleared areas also significant.

Forest cover in Thailand was in decline for an extended period from the 1960s through to the late 1990s. Estimated forest cover fell from 53.3% in 1961 to 25.3% in 1998. However, by 2013 forests were estimated to cover 31.6% of the total land area, although much of the increase is attributable to the use of satellite imagery to provide more precise measurement.

Several other economies have achieved increases in forest areas in the period 2007−2015 including:
○ Chinese Taipei, which increased forest cover by 31,600 hectares to 2.18 million hectares, including through government reforestation efforts and support to private sector efforts;

○ Hong Kong (China), which has increased forest cover from 24,700 hectares in 2007 to 26,400 hectares in 2013. In the longer term, Hong Kong (China) has increased its proportion of forest cover from 4% of total land area during the 1950s, to almost 24% in 2013;

○ Japan, which has increased forest cover by approximately 10,000 hectares.

Economies with decreased forest cover 2007−2015

Deforestation and forest degradation continue to be significant issues in Indonesia. Global Forest Resources Assessment data suggests forest cover in Indonesia has declined by 5.7% (5.5 million hectares) in the period 2007−2015. During the same period, Indonesia's forest growing stock is estimated to have declined by almost 15%.

The decline in forest area in Peru between 2007 and 2015 is estimated at 1.27 million hectares and is primarily a result of clearing forests in the Peruvian Amazon for agriculture. Notably, Peru grants property rights to forest dwellers who provide evidence of extended settlement. Other causes of deforestation include legal and illegal logging, road development providing access to previously inaccessible area, mining and oil exploration.

While forest cover in Australia is estimated to have declined by 1.1 million hectares between 2007 and 2015, much of this change is the result of short-term factors such as the impacts of drought and fire from which forests will recover. Data and measurement inconsistencies also suggest that actual forest area change may differ from this estimate (Box7). Australian forestry statistics reported in the Global Forest Resources Assessment show that Australia's forest cover declined by 4.4 million hectares in the period 2005−2010 (largely a result of forest dieback due to drought). However, since 2010, Australia's forest cover has increased by 1.5 million hectares (mainly due to natural regeneration). Changes in forest area in Australia also result from land-use changes including urban and agricultural development and planted forest establishment.

In Mexico, a deforestation trend has been recorded over a long period. However, in recent times the rate of deforestation has slowed markedly. In the period 1990−2000 deforestation was recorded as 354,000 hectares per annum. During 2000−2005, annual deforestation was 235,000 hectares and since 2007, the annual deforestation rate has declined to 101,000 hectares. Conversion of forest to agricultural activities, particularly establishment of grasslands for livestock grazing and conversion to seasonal and irrigation crops are the main causes of loss of forest cover in Mexico. Forest fires, most of which are caused by human activity are also a major source of deforestation and forest degradation. In the period 2007−2012 an annual average of 348,000 hectares was affected by forest fires.

The annual (permanent) deforestation rate in Canada is less than 0.02% of total forest area and that rate has been declining for more than 25 years. In the period 2007−2013, an area of 338,000 hectares (0.1% of the total forest area in Canada) was converted from forest to non-forest land uses. Agricultural expansion is the leading cause of deforestation in Canada, while significant areas of forest are also converted as a result of oil and gas resource development and urbanization. Forests temporarily affected by timber harvesting, forest fires and insect infestations are not included in Canada's definition of deforestation as the affected areas will be replanted or will naturally regenerate.

The Republic of Korea has experienced forest loss over the past 45 years; mainly as a result of rapid economic growth, industrialization and urbanization. Forest lands have been converted to agricultural lands, as well as for urban and industrial development. In the period 2007–2015, Korea's forest area declined by almost 60,000 hectares. However, KFRI (2012) notes that, "*marginal agricultural lands and abandoned grass lands within forests have been converted back to forests due to natural regeneration. Thus the annual conversion area of forest lands has been declining.*"

Forest cover in Papua New Guinea, New Zealand and Brunei Darussalam also declined by relatively modest amounts between 2007 and 2015:

○ In Papua New Guinea, forest area is estimated to have declined by approximately 22,000 hectares in the period 2007–2015. Most of the deforestation resulted from the conversion of forest land to large scale oil palm plantations. Forest conversion for subsistence agriculture has also contributed to deforestation over a long period of time.

○ New Zealand is estimated to have incurred approximately 18,000 hectares of deforestation in the period 2007–2015. A large proportion of New Zealand's natural forests are in protected areas and stringent regulations are in place governing harvesting or clearing natural forests outside protected areas. New Zealand's area of natural forests has increased since 2007 largely due to regeneration on marginal farmland. The deforestation relates to conversion of planted forest areas to other land-uses, mainly dairy farming, but also small areas to sheep and beef farming and for lifestyle and residential purposes. New Zealand's planted forest estate has declined from 1.79 million hectares in 2007 to 1.75 million hectares in 2014.

○ Forest cover in Brunei Darussalam decreased during 2007 to 2015, due to deforestation and forest conversion to other land-uses such as for agriculture and other development activities. However, Brunei-Darussalam remains among the world's most heavily forested economies and maintaining a high level of forest cover as an international exemplar in addressing global issues such as greenhouse effect, climate change, biodiversity conservation and food security is a significant element in its forest management agenda.

Data relating to forest change as reported to the Global Forest Resources Assessment 2015 are listed in Annex.

Forest growing stock

Changes in economies' forest growing stocks provide a very broad indication of changes in the quality of forest management. In general, an increase in an economy's forest growing stock is indicative of an increase in forest area, relative maturing of forest vegetation (in either or both natural and planted forests) and/or an improvement in the quality of forest management applied to forests. Conversely, a reduction in total forest growing stock may

be indicative of a reduction in forest area, replacement of mature vegetation with younger vegetation (e.g. through harvesting and replanting of planted forests) or a reduction in quality of forest management.

Figure 8 shows percentage change in average per hectare growing stocks in APEC economies for the period 2007–2015. In a number of economies, significant increases in per hectare stocks are indicative of a relative maturing of forests and/or improved forest management. In economies such as the Philippines and Viet Nam, the reduction in per hectare growing stocks is likely a function of significant expansion in forest areas increasing the proportion of very young forests.
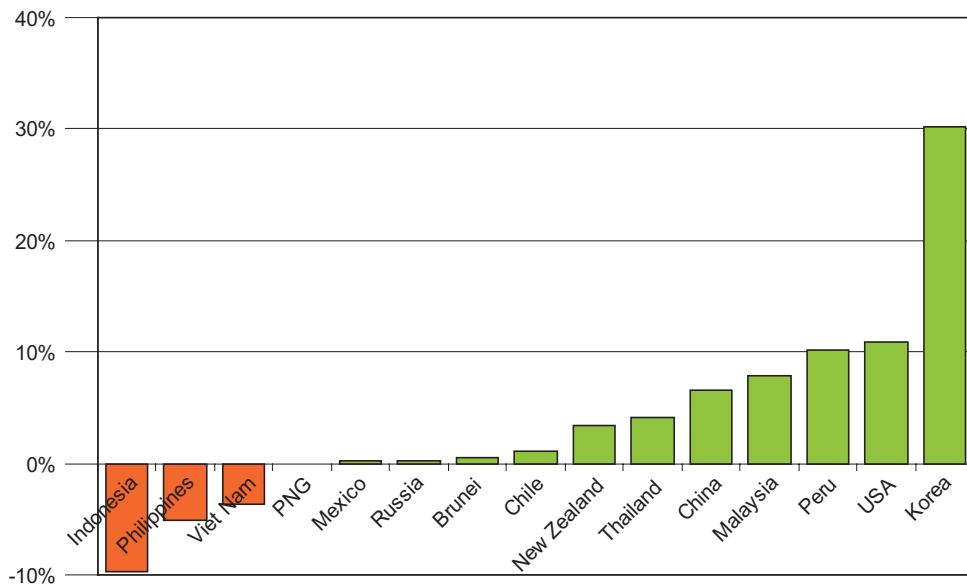
Figure 8   Percentage change in average per hectare forest growing stock reported by APEC economies during 2007–2015
Source: FAO 2015

In Republic of Korea, efforts to reverse historical devastation of forest area and forest growing stocks accelerated in the 1960s through large-scale reforestation efforts. In the 1970s a 30-year plan was developed with the aim to establish 2.7 million hectares of planted production forests by 2010. The success of Korean afforestation programmes through the subsequent 20 years is reflected in significant ongoing increases in the economy's forest growing stocks (illustrated in Figure 8).

Box 3   Increasing growing stock in Japan

Forest area in Japan has remained relatively stable at around 25 million hectares (68.5% of total land area) for at least the past 50 years. However, a significant feature of Japan's forest management is intensive tending, particularly thinning in planted forests, which has led to marked increases in forest growing stock, as shown in Figure 9. For example, the Japan Forestry Agency (JFA 2015) reports that in 2012, afforestation/reforestation totaled 30,000 hectares of land, thinning was carried out in 490,000 hectares of forests and other silvicultural treatments (pruning, weeding, etc.) were applied in 270,000 hectares of forests.
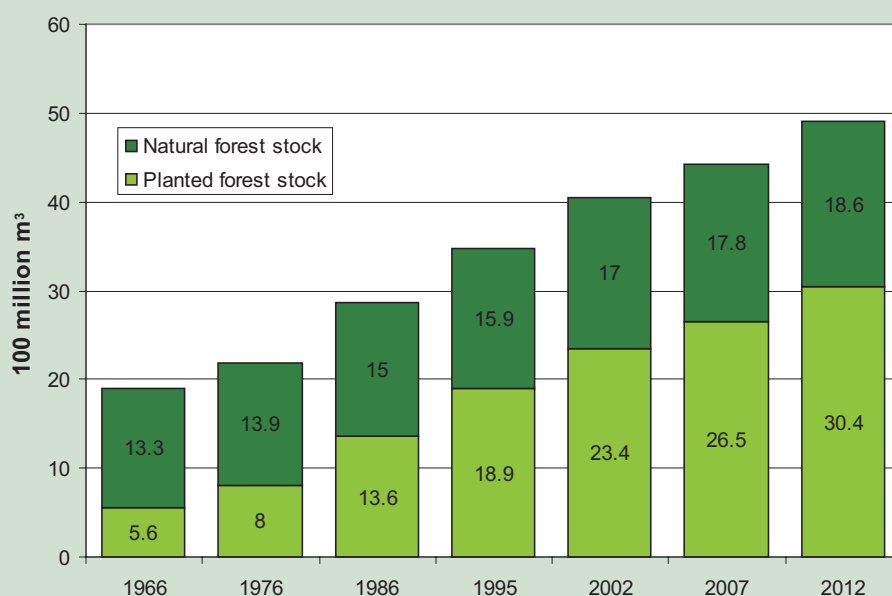
Figure 9   Changes in Japan's forest growing stock
Forestry Agency Japan 2014

Chapter 2 Activities and Progress

- Efforts and achievements during 2007 to 2015 that support progress towards the APEC 2020 Forest Cover Objective
- Drivers of the changes in forest area and forest quality during 2007 to 2015

In general, all APEC economies have articulated well-defined forest policies and programs that are largely underpinned by objectives relating to sustainable forest management and sustainable development. Many of these have been in place for an extended period of time and continue to promote forest expansion, enhance forest management and discourage deforestation.

Nonetheless, since 2007, APEC economies have also variously implemented a diverse range of measures that support progress toward achievement of the APEC 2020 Forest Cover Objective. Among others, APEC economies have:

○ developed new legislation, policies and action plans;

○ implemented direct government and voluntary planting programs;

○ implemented conservation and protection programs;

○ given attention to forest rehabilitation and regeneration;

○ imposed measures to reduce deforestation and regulate forest harvesting;

○ implemented forest-related climate change programs;

○ provided direct incentives for forestation and improved forest management;

○ strengthened forest tenure provisions;

○ improved forest law enforcement and governance arrangements;

○ participated in global and regional processes that support improved forest management.

This section elaborates some of the key efforts and achievements of APEC economies supporting progress toward the APEC 2020 Forest Cover Objective.

2.1 Efforts and Achievements During 2007 to 2015 That Support Progress Towards the APEC 2020 Forest Cover Objective

Forest legislation, policies and action plans

Given the overall significance of China's contribution to achieving the APEC 2020 Forest Cover Objective, one of the most important policy measures promoting increased forest cover has been the "*Decision on Accelerating Forestry Development*", issued by the State Council of China in 2003. This Decision clearly outlined an intention to change the orientation of forest management in China from timber production to ecological reconstruction. Four key roles have been specified for forestry in China, namely to:

(i)   significantly contribute to broad sustainable development strategies;

(ii)   play a primary role in ecological reconstruction and development;

(iii) support development in Western China;

(iv) assist in mitigating the impacts of climate change.

China has implemented a wide range of additional measures to both increase its area of forest cover and improve the quality of its forests and forest management. Among key forestry initiatives, China continues to implement programs related to (i) natural forest protection; (ii) conversion of croplands to forest; (iii) desertification control for areas in the vicinity of Beijing and Tianjin; (iv) shelterbelt development in the "Three Norths" and the Yangtze River Basin regions; and (v) voluntary planting including greening of flatlands and development of gallery forests. The Chinese Government's "*Plan of National Forestland Protection and Utilization (2010–2020)*" gives priority to improved forest management through comprehensive silvicultural interventions, rigorous adherence of allowable forest cuts, intensification of enforcement efforts to reduce illegal forest activities, strengthening forest fire prevention efforts and enhancing biosecurity measures to prevent and control the outbreaks of forest pests and diseases. In addition, 114.4 million hectares of forests have been incorporated into the natural forest resources protection program.

Among policies and plans developed in other economies, in 2008, Chinese Taipei launched a "*Green Forestation Plan*"; by 2015, an estimated 30,352 ha of new forest had been created, achieving Chinese Taipei's "share" of the target set in the APEC Leaders Declaration in Sydney in 2007. Chinese Taipei has four major afforestation goals:

(i)   regeneration of degraded state-owned forest land;

(ii)   planting coastal forests and forests on outlying islands;

(iii) provision of incentives and guidance to encourage reforestation of slope land;

(iv) planting forests in lowland areas.

In 2009, Singapore launched a "*National Biodiversity Strategy and Action Plan*". It identifies five key strategic objectives: conserving and safeguarding biodiversity, including biodiversity issues in policy and decision-making, improving knowledge, enhancing education and public awareness, and strengthening partnerships and international collaboration.

In 2013, the Government of Japan formulated a "*Plan to create dynamism through agriculture, forestry, and fisheries and local communities*", which calls for the transformation of forestry into a growth industry, the promotion of forest sink activities through forest management and conservation and creation of wood demand through development of new products and technologies.

A new "*Forest Code of the Russian Federation*" came into force in 2007. The Forest Code established three of forests, Protective, Industrial and Reserved. Key objectives of the new

Forest Code are to preserve biodiversity, especially in high conservation value forests and to reduce illegal logging and forest loss through wildfires.

In 2013, the Russian Federation launched a new "*National State Forest Policy*", as an important step in modernizing the economy's regulatory framework for forest management. The primary objectives of the forest policy are: to ensure sustainable forest management and conservation including increasing the productive and ecological potential of forests; to promote a greater contribution of forests to regional socio-economic development; and ensuring ecological stability in meeting demands for forest products and ecosystem services.

Since 2000, several APEC economies have introduced new forest-related legislation or made significant changes to existing legislation, which have helped to create general frameworks for forest management and shape the development of forestry in the 2007−2015 period. New legislation developed includes:

○ In 2001, Japan's Forestry Basic Law underwent major revision to become the Forest and Forestry Basic Law 2001. The new legislation provides the legislative basis for forest management in Japan and emphasizes multifunctional roles of forests for sustainable resource management as well as conservation, recreation and other values. Operational implementation of the Basic Law is through the "Forest and Forestry Basic Plan" as well as through the "National Forest Plan", and prefectural and municipality forest plans.

○ In Mexico, the principal legislation governing resource management is the General Sustainable Forest Development Law 2003, which serves to regulate and promote conservation, protection, restoration, production, management and utilization of forest ecosystems.

○ Under Forest Act (Amendment) Order of 2007, Brunei Darussalam has emphasized the importance of forest protection, biological diversity conservation, bio-prospecting, forest access and benefit sharing.

○ In 2015, Peru enacted a new Forest and Wildlife Law N°29763 which emphasizes a multiple use framework for forests, promotion of planted forests, provision of forest goods and ecosystem services, and protects the rights of various users of forest resources and wildlife, including indigenous people.

Planting programs

In a number of APEC economies, governments maintain major operational roles in forestry, including afforestation/reforestation and forest rehabilitation activities. As noted above, the State Forestry Administration of China has responsibility for a number forest expansion programs. China also encourages its citizens to participate in voluntary tree planting

initiatives. In the period 2007-2014 more than 19 billion trees have been planted by voluntary planting programs.

Similarly, a cornerstone in Viet Nam's reforestation efforts has been the "Five Million Hectares Reforestation Program". This program established targets and provided subsidies to with an aim to achieve overall forest cover of 43% by 2010. Of the planned five million hectares, two million hectares were planned as protection forests and three million hectares as production forests. Although the program resulted in significant reforestation, it fell short of the five million hectare target and has been supplemented by a new program in support for development of forest plantations (2007–2015) which focuses on establishment of planted production forests. Viet Nam is also implementing a number of large-scale projects and programs directed at specific regions or types of forests and supported by overseas development aid and reciprocal capital. These include, among others, the "Viet Nam Forests and Deltas Program", "Protection forests restoration and sustainable management" and "Sustainable management of forests and biodiversity to reduce CO_2 emissions".

Since 2011, two major forestry policies/programs have provided the foundation for forest protection and rehabilitation in the Philippines; "Logging moratorium in natural and residual forests" and the "National Greening Program". The "National Greening Program" addresses broad socio-economic and environmental priorities including poverty reduction, resource conservation and protection, productivity enhancement and climate change mitigation and adaptation. The program aims to plant 1.5 billion trees covering about 1.5 million hectares of open, denuded and degraded forest lands during the period 2011–2016.

In Indonesia, once logging concessions have been depleted, further rehabilitative forest management has often not been carried out. As a result, the concessions have been left open to encroachment and illegal logging and/or conversion to other land uses. The Ecosystem Restoration Concessions (ERC) program was launched in 2004 with a view to rehabilitating degraded logging concession areas through private funding. By 2014, almost 500,000 hectares of forests had been licensed under 12 Ecosystem Restoration Concessions. Indicative allocations of an additional 2.7 million hectares of forests to the program had also been made.   Similarly, the "Industrial Community Forest Plantation (Hutan Tanaman Rakyat) Program" was planned for implementation from 2007 to 2016. The program planned to allocate property rights to 5.4 million hectares of degraded production forest, especially in areas already facing tenurial disputes.

The Indonesian government has also set a variety of ambitious planting targets supported by events such as "Indonesia's Tree Planting Day" and "National Tree Planting Month". In 2009, the President of Indonesia urged the planting of 4 billion trees by 2020 and 9.2 billion trees by 2050. In support of this target, the "One Man, One Tree" planting program was launched in 2009 by the Ministry of Forestry help combat the impact of climate change and preserve

forests. In 2014, a new government elected in Indonesia made a commitment to reforest two million hectares of degraded land annually.

Malaysia has developed and implemented several tree planting programs that have contributed to increasing forest cover. In 2005, the "*Tree Planting Program with Mangrove and Other Suitable Species along the National Coastlines*" was initiated in response to the destruction of the 2004 Indian Ocean tsunami. The program was operational for a nine-year period during which time 6.2 million mangrove seedlings were planted across 2,500 hectares of coastal areas. Malaysia has also initiated the "*26 Million Trees Planting Campaign"*as a collective effort by government agencies, non-governmental organizations, private companies, educational institutions and local communities. By the end of 2013, a total of 53 million trees covering 65,560 hectares had been planted.

In Chile, the "Trees for Chile" planting program has been administered by the National Forestry Corporation since 2010. The program aims to plant more than 1.5 million trees in residential areas to "green" communities and create new woodlands.

Despite its predominantly urban characteristics, Hong Kong (China) has carried out significant tree planting work that contributes to achievement of the APEC 2020 Forest Cover Objective. From 2007 to 2013, more than 750,000 seedlings have been planted in areas damaged by hill fires and heavily eroded where forest regeneration failed to match ongoing degradation. Since 2009, a program of progressive removal of exotic pioneer trees to provide space for in-planting of native trees has been adopted. The main objectives of the program are to accelerate the transformation of exotic pioneer planted forests into more diverse woodland habitats, enhance biodiversity, reduce the risk of pest and disease outbreaks and create more picturesque landscapes. Community support also plays an important role in woodland conservation work. Through various public tree planting activities, the general public is directly involved in nature conservation, and their awareness of tree preservation is significantly increased. For example, since 2009 the "*Nature in Touch"* educational project has been helping to better connect people with nature.

Development of urban forests is also an ongoing theme in Singapore with intensive management of roadside urban forests and tree plantings and including ongoing voluntary urban afforestation schemes such as the 2005 "*Plant 100,000 Native Plants*".

Reducing deforestation, conservation and protection

A number of APEC economies have introduced conservation and protection measures aimed at reducing deforestation. For example, in 2007, Brunei Darussalam, Indonesia and Malaysia signed a trans-boundary agreement, the "*Heart of Borneo*" initiative The initiative aims to facilitate the conservation of forest resources while, at the same time, enabling sustainable development. In terms of scale, the initiative is of particular significance to

Brunei Darussalam, which has committed 58% of its land area to management under Heart of Borneo provisions.

In addition to participating in the Heart of Borneo initiative, Peninsula Malaysia has established the *"Central Forest Spine"* project to increase connectivity between major forest complexes and reduce fragmentation while improving natural resource management. The Central Forest Spine is the source of 90% of Peninsula Malaysia's water supplies and provides other ecosystem services including conservation of biodiversity (including the remaining population of Malayan tigers), climate regulation, soil protection, and carbon storage and sequestration. Additionally, all Malaysian states have committed to efforts to identify and gazette more forest area as Permanent Reserve Forest or Totally Protected Areas, encourage forest certification and promote Reduced Impact Logging techniques.

A number of APEC economies have implemented either full or partial bans on logging. In Thailand, for example, a ban on logging in natural forests has been in place since 1989. In New Zealand, while no formal ban is in place, a very high proportion of natural forests are in protected areas and those that are not are subject to rigorous provisions that restrict harvesting. In New Zealand, more than 99% of wood production is sourced from planted forests. In China, a partial logging ban is in place, prohibiting logging in the upper reaches of the Yangtze River and the middle and upper reaches of the Yellow River.

The Philippines' has had various logging restrictions in place for the past 40 years. Since 2011, a broad logging moratorium prohibits the issuing or renewing of logging contracts and tree-cutting permits in all natural and residual forests and required the closure of all logging concessions operating in natural and residual forests. Additionally, the moratorium authorized the shutdown of any sawmill unable to present proof that logs for processing are from legal and sustainable sources. Subsidiary to the logging moratorium a "Five-year national forest protection program – menu of options for effective and efficient forest protection and law enforcement" has been developed to provide the foundation for field-level forest protection and law enforcement.

In 2011, the Indonesian President signed a Presidential Instruction on a deforestation moratorium to be applied to more than 43 million hectares of primary forests and peat land. The moratorium aimed at curbing the impacts of climate change and preserving remaining tropical forest biodiversity. In 2013, the President extended the moratorium for a further two years.

In 2009, the Government of Papua New Guinea issued a policy directive that any new timber concessions would be for supply to domestic downstream processing operations only. However, existing concessions are allowed to continue operations under their negotiated terms under which approximately 80% of the harvest is exported as roundwood logs. Among other measures designed to promote more sustainable forest harvesting in Papua New Guinea have been the development of a Logging Code of Practice and, since 1996,

a requirement for independent third party auditing of all log exports to discourage illegal logging and its associated trade.

In Australia, codes of forest practice and externally accredited environmental management systems provide a structured approach to the planning and management of protection of the environment. DoA 2015 notes that, "*Codes of forest practice vary in their legal status and coverage, but generally provide specific operational guidance for sustainable forest management practices in public and private forests available for wood production, including plantations. In Tasmania, there is a code of practice for the management of nature conservation reserves, including forested nature conservation reserves.*"

Several APEC economies control forest harvesting levels through the prescription of maximum levels of harvest allowed on a particular area of public land over a set number of years. In Canada, for example, provincial governments regulate harvest levels and practices on public lands by specifying an annual allowable cut, which forest companies are legally required to abide by. In Malaysia, the National Land Council sets annual allowable cuts, which each Malaysian State government is required to enforce and report against. Similarly, in Brunei Darussalam, timber harvesting is governed by an economy-wide maximum annual allowable cut of 100,000 cubic metres, in force since 1990. All logging activity is carried out under strict supervision by the Forestry Department to ensure that harvesting activities comply with standards set by the Brunei Selective Felling System.

Efforts to make forestry more profitable are likely to also enhance afforestation. In New Zealand, the government is developing a single "*National Environmental Standard*" for planted forests, which will provide a single harmonized standard economy-wide, rather than the current situation where each local authority sets its own standards and rules relating to forestry activities. The National Environmental Standard will reduce compliance costs for forestry companies and enhance profitability.

Forest rehabilitation and regeneration

Activities to rehabilitate and regenerate forests on degraded lands have significant potential to increase forest areas, build carbon sequestration capacities and enhance provision of ecosystem services.

In Peru, two specific programs have been developed to guide forest rehabilitation and development:

(i) The "Sustainable, inclusive and competitive development program in the Peruvian Amazon" is designed to rehabilitate and preserve natural forests in the Amazon region. The program has been allocated 241 million Nuevo sol (US$73 million) and encompasses strengthening of inventory and mapping work, forest law enforcement and monitoring, improved forest management in relation to climate change, preservation, agroforestry

and ecotourism, value chain development and participatory programs.

(ii) The "Program for the management and sustainable promotion of forest production in Peru" is presently being formulated but will contain elements to both promote sustainable forest production and promote establishment of planted forests and agroforestry plantations. Investment of more than US$1 billion is being targeted to expand Peru's planted forest estate to two million hectares.

Regarding forest land owned by the Chinese Taipei authority, a project to regenerate degraded forest land has been implemented, with priority being given to areas that pose a potential risk to public safety such as areas vulnerable to landslides, areas affected by forest fires, areas of forest that have previously been leased out for private use and areas of illegally cleared forest land. Chinese Taipei is also giving attention to rehabilitation and regeneration of coastal forests to protect against detrimental effects of salt spray, strong winds and sand encroachment.

The Papua New Guinea Forest Authority has developed "*Reforestation naturally*" guidelines, which are being promoted to encourage regeneration of natural forests. It is also expanding the size of the planted forest estate including through International Year of Forests commemorative plantings, which planted more than 3 million trees in 2011.

In the wake of the 2011 Great East Japan earthquake and tsunami, Japan is working actively to rehabilitate damaged coastal forests. It is estimated that building "berms" for replanting trees along the coast will take five years, and the rehabilitation work will be completed within ten years.

Singapore's greening policy is guided by a mission of making Singapore a "*city in a garden*". Since 1991, Singapore has been assisting forest regeneration by planting saplings and removing aggressive weeds in nature reserves and surrounding areas to accelerate succession and promote development of late-secondary forest with a primary forest component.

Climate change-related programs

Given the current importance of climate change within the international forestry agenda, not surprisingly most APEC economies have developed forestry programs relating to climate change.

Significant focus in developing economies is on "*Reduction in Emissions from Deforestation and Forest Degradation (REDD)*" and REDD+ initiatives. Among APEC economies, Chile, Indonesia, Malaysia, Mexico, Papua New Guinea, Peru, Philippines and Viet Nam are partners in the United Nations REDD (UN-REDD) program. Indonesia, Papua New Guinea, Philippines and Viet Nam are receiving UN-REDD financial support to their internal REDD programs, while other economies engage in the partnership through knowledge sharing and capacity

building. Examples of REDD-related activities in APEC economies include:

○ The Indonesian Government's "Medium Term Development Plan (2015–2019)" renews a commitment to reduce greenhouse gas emissions by 26% by 2020 through internal efforts and by an additional 41% through support from external development partners. More than 60% of the target for emissions reductions is planned to be achieved through reductions in deforestation and forest degradation associated with REDD+. In this regard, Indonesia has pledged to implement large-scale tree planting programs. During the 2010 to 2013 period, at least one billion trees were planted under tree planting programs. In 2014, planting of an additional one billion trees was targeted.

○ Mexico is progressing in the development of a REDD+ strategy including the development of a measurement, reporting, and verification (MRV) system, development of a social and environmental safeguard system, the strengthening of local governance and implementation of activities to reduce emissions from deforestation and forest degradation in early action areas.

○ Papua New Guinea is implementing several REDD+ Pilot Projects with a view to future replication on a larger and wider scale. REDD+ will present future opportunities for forest dependent land-owning communities to conserve their forests and protect biodiversity.

○ In Malaysia, REDD+ is expected to play a role in assisting retention of forest and tree cover. Malaysia has committed to reducing carbon emissions per GDP by 40% by 2020 subject to technology transfer and support from developed countries. Reducing forest emissions is a key element in Malaysia's overall strategy.

○ Thailand has conducted preliminary work to identify forest areas that could potentially be eligible for REDD+ project initiation. However, RFD (2015) notes, "Thailand has the potential and capacity to carry out REDD+ projects in many parts of the country although some obstructions exist as a result of misconceptions, lack of technical knowledge and lack of clarity over benefit sharing and carbon rights."

○ In Viet Nam, the "Support for the REDD+ Readiness Preparation in Vietnam" project has been established through a grant from the Forest Carbon Partnership Facility and contributions from government and pilot provinces. The project is scheduled to run for the period 2013–2015 and aims to assist Vietnam develop an effective system for future REDD+ implementation.

Climate change is also playing a role in stimulating forestry activities in other economies. For example, Japan has set a target of reducing greenhouse gas emissions by 3.8 percent (compared to 2005 levels) by 2020. Almost 75% of this target is planned to be met through

forest sink activities (thinning of 520,000 hectares of forests per year).

In New Zealand, an Emission Trading Scheme (ETS) was enacted in 2008, with forestry being the first sector to which the scheme was applied. Forest owners who enter the ETS receive New Zealand Units (carbon credits) as their carbon stocks increase and must surrender units if stocks decrease (e.g. through harvesting or fire). In early-2011, NZUs were trading at approximately NZ$21 but, as international carbon prices fell rapidly, NZU prices followed suit and by 2013 were trading at approximately NZ$2. At this price level, the ETS provides little incentive for afforestation and little disincentive to deforestation. MPI (2015) notes that, "*Should NZU prices reach around $10 per NZU deforestation intentions are likely to decrease. Even land-owners who hold sufficient NZUs to meet deforestation liabilities will reassess plans if the opportunity cost of surrendering these NZUs becomes too high*." NZUs are presently trading at around NZ$7. A separate government program, the Permanent Forest Sink Initiative offers forest-owners alternative incentives to establish planted forests for carbon sequestration.

In Chile, the government has established a "*Platform for generating and trading carbon credits for the forestry sector in Chile*", which aims to provide the foundation for developing state-of-the art forest carbon trading in Chile.

Direct incentives

Incentives are policy instruments designed to increase the comparative advantage of a particular activity and thereby stimulate investment in that activity. Since 2007, the most evident direct incentives offered in several APEC economies have been subsidies.

Since 2009, the Chinese Government has offered financial subsides for forest tending. In the period 2009-2013, almost 25 billion RMB (US$3.9 billion) in subsidies have been paid to improve silviculture in 15.2 million hectares of forests. Similarly, under the 2009 *Regulation on National Level Public Welfare Forest Management* forest areas owned by collectives and individuals may be classified as public welfare forest. These forest areas are eligible for ecological compensation grants of up to 150 RMB (US$23) per hectare to cover management and protection costs. A total of approximately 200 million hectares of forests have been designated as public welfare forests.

In Chile, Decree Law 701 introduced subsidies for establishing planted forests in 1973. The law has been one of the primary drivers of Chile's extensive development of planted forests. The law is still in force though its focus has shifted toward smallholder afforestation rather than providing support to large forest companies. More recently, a "*Fund for Conservation and Sustainable Management of Native Forests*" has been established to provide support to smallholders to carry out natural forest restoration.

In the United States, the "*Conservation Reserve Program*" makes annual rental payments to farmers who agree to remove environmentally-sensitive lands from agricultural production and plant tree species to enhance ecosystem health. The Conservation Reserve Program has been operational since 1985 and participating farmers have committed more than 12 million hectares to the scheme.

In 2008, Chinese Taipei formulated "*Measures for the Encouragement and Guidance of Forestation Work*", under which direct subsidies of up to NT$600,000 (US$18,460) per hectare over 20 years is available for private sector reforestation. Priority is given to steep land, reservoir catchment areas, areas that have suffered forest fires and other land zoned for forestry. Until 2013, additional direct grants of NT$1.8 million (US$55,385) per hectare for reforestation of lowland areas, including marginal and unproductive farmlands, were available.

The New Zealand government has introduced several incentives programs to encourage new forest planting to help offset conversion of planted forests to other land uses. An "Afforestation Grant Scheme" offers grants of US$850 per hectare to plant forests and aims to encourage the establishment of 15,000 hectares of planted forests by 2020. Similarly, an "Erosion Control Funding Program" offers grants up to US$970 per hectare to plant forests on targeted steep land.

In 2013, the Malaysian Government established the "National Conservation Trust Fund", which provides financial support to efforts to enhance sustainable forest management and conserve biodiversity.

Tenure reform

The distribution of forest ownership and forest management responsibilities impacts on the approach governments take to either directly or indirectly influence increases in forest area. Consequently, tenure reform, under which ownership or user rights to forests and forest lands are transferred from the state to individuals, communities or the private sector, can have significant impacts on establishment and management of forests.

For example, reform of collective forest tenure has been a major development in China. In 2008, the Chinese Government released the "Opinion on Comprehensively Promoting Collective Forest Tenure System Reform", under which property rights to collective forest lands would be transferred to households. By the end of 2013, tenure certificates transferring rights to 176 million hectares of forest lands had been issued.

Similarly since 1993, Viet Nam has issued a series of laws, policies and decrees to transfer user rights for state-owned forestry lands to households. By 2006, land use rights certificates relating to 55% of forest lands had been issued to households. However, forest land allocation

programs have been hampered by funding shortages and the overlapping mandates of MONRE, which oversees land allocation, and MARD, which is in charge of forest land.

Community forestry has been a cornerstone of Thailand's approach to forest management. To date, more than 9,300 community forests covering over 640,000 hectares have been registered in Thailand. Community-based forest management allied with pilot and demonstration sites aiming to sustainably manage forests forms the basis of best practice models in Thailand. However, tensions between government agencies and forest dwelling communities have hampered forest management in many areas of Thailand. More than one million households are estimated to be currently living within national parks, wildlife sanctuaries and national forest reserved lands. Thai law regards these inhabitants as illegal occupants in protected areas. To date, finding a suitable balance between forest resource protection and forests' social, cultural and economic functions has proven elusive and been a major source of friction and distrust. For example, a proposed "Community Forestry Bill" which would govern community-based forest management in Thailand has been stalled for many years.

Forest law enforcement and governance measures

Weak forest law enforcement and governance capacities have been identified as a major cause of forest degradation and deforestation in many economies including some APEC members. Consequently, efforts to improve forest governance systems can contribute significantly to achievement of the APEC 2020 Forest Cover Objective.

In Indonesia, for example, a key government focus is on strengthening forest governance systems, with measures including a moratorium on granting new harvesting licenses in primary forest and improvements in the forest licensing system, as well as greater recognition of the rights of indigenous people and local communities.

Illegal logging and associated challenges relating to governance and land tenure are also significant concerns in Mexico, where an estimated 30% of lumber is produced from illegally logged timber. Preventing illegal logging is a key strategy in Mexico's *National Forest Program (2014–2018)*.

Monitoring of illegal logging in the Russian Federation is challenging due to the scale of the forest resource. Estimates of the scale of illegal logging range from official Rosleshoz data, which suggest illegal logging represents less than 1% of the total wood harvest in the Russian Federation to World Bank and WWF Russia estimates that up to 20% of logging in Russia (about 35 million cubic metres) is of illegal origin.

Illegal logging is also identified as a significant problem in Viet Nam, where it is perceived as a major contributor to forest degradation. MARD 2015 notes that: "Some forest crimes are

committed by local households driven by poverty and desperation, while much is driven and controlled by criminal gangs and networks. In response to illegal forest practices a raft of policies, strategies and decrees to tackle this problem have been introduced, most notably the Law on Forest Protection and Development and the establishment of a Task Force on forest protection. Even with these efforts forestry law violations continue to be prevalent."

Dedicated attention to forest law enforcement and illegal logging can be effective, a shown in the Philippines where – after implementation of the logging moratorium – an intensified forest protection and law enforcement initiative by the government led to a 60% decline in the apprehension of illegal loggers and confiscation of illegally logged forest products.

Several economies have adopted measures to discourage trade in illegally-logged timber. In the United States, amendments to the Lacey Act in 2008 make it a crime to import into the United States any tree species illegally obtained in the country of origin and any product (including wood, paper, or pulp) containing illegally obtained tree material. Similarly, in Australia, the Illegal Logging Prohibition Act 2012 makes it a criminal offense to import timber and timber products containing illegally sourced timber into Australia or to process Australian logs that have been illegally logged. JFA (2013) notes that the Government of Japan has taken a different path promoting, "the use of appropriately produced wood products based on a basic philosophy of not using wood products from illegal logging. Based on 'Basic Guidelines for Green Purchasing', it uses wood products with certified legality and sustainability in government procurements. It is also engaging in publicity activities that encourage private companies and general consumers to use legal wood products."

Data collection, monitoring and forest inventories

Recognizing the importance of strengthening information capture to comprehensively assess forest change and evaluate progress toward sustainable forest management a number of APEC economies are developing and implementing new forest inventory systems and other means of capturing forestry data. Initiatives among APEC economies include:

○ In Canada, a new National Forest Inventory has been established to gather data that are both spatially and temporally consistent across all provinces and territories. Statistical estimates based on the first National Forest Inventory re-measurement (2008-2017) will be available after the first NFI re-measurement has been completed.

○ In Peru, the National Service for Forestry and Wildlife has been implementing a range of information-related measures to improve forest management including updating forestry inventories and information systems, addressing land-use issues such as zoning and land registry, monitoring forestry licenses, employing certification and verification systems to prevent illegal logging, and building capacities of officials and forest dependent people.

○ Malaysia (as one example) is pursuing application of advanced information technologies in forestry and biodiversity to improve forest management. Tools employed include remote sensing, geographical Information systems, radio frequency identification, hyperspectral airborne sensing and global positioning systems.

○ In the Philippines, the Forest Management Bureau is currently conducting a ground-based forest resources inventory including re-measurement of 371 Forest Resource Assessment tracts. At the same time the National Mapping and Resource Information Authority is doing comprehensive forest and land cover mapping of the Philippines.

○ Since 2004, Mexico has established more than 26,000 field plots, which combined with satellite imaging and other high resolution spaceborne imagery contribute to the National Forest and Soil Inventory (INFyS) and, more broadly, as a contribution to strengthening forest policies and improved forest management.

○ In a slightly different initiative, New Zealand conducts an annual survey of deforestation intentions to assist in projecting likely carbon emissions from planted forests. The 2014 survey estimates deforestation of approximately 28,000 hectares of planted forests to 2020. However, some or all of this deforestation will likely be offset by new planting elsewhere.

Others

A variety of other diverse initiatives have been implemented by various APEC economies. Several of the more notable include:

○ In Mexico, the National Forestry Commission (CONAFOR) has promoted the development of forest and chain of custody certification systems to promote the development and marketing of products from sustainably managed forests. As well as carrying out inspection and surveillance activities, CONAFOR also highlights the use of compensation mechanisms, through the granting of payments for ecosystem services to support actions to reduce deforestation and forest degradation.

○ Regional Forest Agreements are a cornerstone of Australia's approach to forest management. The 10 Regional Forest Agreement regions encompass 18% of Australia's total forest area but, significantly, contain 94% of the area of Eucalypt tall open forests, and 43% of the area of the Eucalypt medium open forests, which are major wood-production forest types. Regional Forest Agreements provide a framework for forest management and conservation in regions containing substantial forestry activities.

○ Viet Nam has made significant efforts to develop schemes relating to Payments for Forestry Ecosystem Services (PFES). The initial focus was on capturing the value of watershed

protection services provided by intact forests in two pilot sites in Lam Dong and Son La Provinces. Based on the success of the pilot programs, in 2010 the Vietnamese Government issued as a decree a "*Policy on Payment for Forest Environmental Services (PFES)*", under which carbon sequestration and conservation are considered as forest services. This policy provides an important legal foundation for implementation of REDD+ in Vietnam.

Box 4   Global and regional processes

A range of global, multilateral, bilateral and other organizations, processes and initiatives dealing with forestry are active in the APEC region and implement activities supportive to achievement of the APEC 2020 Forest Cover Objective. FAO and APFNet (2011) notes that: *International organizations including the Food and Agriculture Organization of the United Nations (FAO), the International Tropical Timber Organization (ITTO), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the United Nations Forum on Forests (UNFF) have roles and interests that encompass forestry, natural resources and the environment. The World Bank and Asian Development Bank have important forestry financing roles. APEC members also participate in a wide range of processes associated with forest-related international conventions and agreements; for example the Convention on Biological Diversity (CBD), UN Convention to Combat Desertification (UNCCD) and the UN Framework Convention on Climate Change (UNFCCC). Specialized international agencies and programs that focus on specific aspects of forestry include the Center for International Forest Research (CIFOR), the Forest Carbon Partnership Facility (FCPF), the International Model Forest Network (IMFN), the International Network for Bamboo and Rattan (INBAR), the World Conservation Union (IUCN), Mangroves for the Future (MFF), The Center for People and Forests (RECOFTC) and UNREDD. Examples of multilateral programs include Lowering Emissions in Asia's Forests (LEAF) and Responsible Asia Forestry and Trade (RAFT). A wide range of international non-governmental organizations are also active in forestry in the APEC region.*

2.2 Drivers of the Changes in Forest Area and Forest Quality During 2007 to 2015

Drivers of change for forestry can be either positive or negative. Negative drivers are those that lead to deforestation and forest degradation, while positive drivers help to promote afforestation and reforestation, forest conservation and sustainable forest management.

Drivers of change for forestry can also be either direct or indirect. Direct drivers are human activities that directly increase or decrease forest cover and/or degrade or rehabilitate

forests. Indirect drivers occur on many scales (local to international) and include a full range of economic, social, political, cultural and technological factors that influence direct drivers. Indirect drivers include factors such as population growth, policies and governance, dynamics of subsistence and poverty, and evolution of markets and commodity prices.

Drivers of deforestation and forest degradation

Several economies have carried out or participated in specific studies on drivers of forest change. For example, in 2013, a DENR and GIZ study on "*Analysis of Key Drivers of Deforestation and Forest Degradation in the Philippines*", identified 13 direct drivers of deforestation under four main categories: (i) forest products extraction (including timber harvesting, illegal logging, fuelwood gathering and charcoal making, and non-timber forest products extraction); (ii) agricultural expansion (shifting cultivation, conversion of forest land into settlement areas, and conversion of forests for oil palm and rubber plantations and highland vegetable farming); (iii) infrastructure expansion (including road construction, mining, wood processing plant construction, hydro-power dam construction and tourist facility development); and (iv) biophysical factors (natural causes such as typhoons, landslides, floods, droughts, forest fires and climate change).

The DENR-GIZ study also identified indirect drivers of deforestation and forest degradation. Governance factors, including weak institutional capacities, weak law enforcement, corruption and political interference, were identified as major indirect drivers of deforestation and forest degradation. From the socio-demographic perspective, indirect drivers of deforestation include increasing numbers of informal settlers in forests and irresponsible attitudes towards forests. Economic and market aspects included high demand for wood and wood products and limited livelihood options other than forest exploitation.

Similarly, Viet Nam and Thailand participated in a study of drivers affecting forest change in the Greater Mekong subregion (Costenbader et al, 2015). In Thailand, the major factors driving declines in forest cover were identified as being connected to policy gaps and forest management approaches that lag behind international best practices. Negative drivers particularly include infrastructure development, forest fires, illegal logging and agricultural expansion. Conflicts of interest and controversy regarding the use of forest resources have also constrained development of integrated land use policies while driving deforestation and forest degradation in Thailand. Forest encroachment remains a significant challenge. Encroachment results from both direct and indirect factors, including agricultural expansion, tourism development, illegal logging and land speculation. Indirect drivers of deforestation were identified as including rural poverty, population increases and national development policies. For example, some major government-initiated projects have caused large-scale forest disturbance through construction of roads, dams, power transmission lines and associated infrastructure.

In Viet Nam, the current major direct drivers of deforestation were generally agreed to be conversion of forests for agricultural cultivation (particularly industrial perennial crops); the impacts of infrastructure development and hydropower plans; unsustainable logging; and forest fires. Similarly, Malaysia (2015) identifies main drivers to deforestation as "*agriculture expansion, settlements and infrastructure development like highway, gas pipelines, power line and mining.*"

Persistent poverty is an important indirect driver of deforestation in Viet Nam, particularly amongst ethnic minorities who live in upland forested areas and constitute 44.7 per cent of Viet Nam's poor. Livelihood pressures drive the poor to convert forest land for subsistence agriculture in order to alleviate poverty, often through shifting cultivation.

Generally conversion of forest land to agriculture is a common theme driving deforestation in most APEC economies. For example, PNGFA (2015) notes that, "*the main driver of forest change or loss in Papua New Guinea is the agricultural sector.*" Since 2001, conversion of forest to oil palm has accounted for approximately 70% of deforestation in Papua New Guinea, while subsistence agriculture has accounted for an additional 20%. However, given that almost 80% of Papua New Guinea's population lives in rural areas, historically, subsistence agriculture – particularly shifting cultivation – has been the major driver of forest change. Forest degradation is also a major concern in Papua New Guinea with almost 40% of the total forest area disturbed by human activities including commercial harvesting of timber, shifting cultivation and forest fires.

> **Box 5   Agricultural expansion as a driver of change in Viet Nam**
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> In Viet Nam, since 2000 industrial agricultural crops have expanded faster than expected. For example, in the period 2005–2008 the area of industrial agricultural crops increased from 1.63 million hectares to 1.89 million hectares. MARD (2015) notes that, "*Future agricultural policies and plans intend to stabilize the total area for coffee and tea, while rubber areas are projected to expand more than 120,000 hectares to reach an area of 800,000 hectares; and cashew crops are expected to expand 30,000 hectares to reach a target of 430,000 hectares by 2015. Between 1990 and 2000 the area for coffee plantations increased from 50,000 hectares to 500,000 hectares. Current and future policies and plans for the expansion of agriculture point to a large scale expansion of rubber and to a lesser extent cashew as highlighted in the first draft of the Five Year Plan of 2011–2015 Agriculture and Rural Development.*"

In market-based economies, especially, where the private sector dominates forest and land ownership, financial returns and the regulatory environment pertaining to competing land-uses is often a key driver of deforestation or a major limiting factor on afforestation. For example, in New Zealand, rapid escalation in dairy prices over the past decade has driven

significant conversion of planted forests into dairying. However, a recent decline in dairy prices and concerns over the environmental impacts of dairying on soil and water quality could potentially reverse this trend. Similarly, Malaysia (2015) notes that, "*the drop in the deforestation rates is primarily due to improved forest management and the enhancement of agricultural crop production in the 3rd National Agriculture Policy (1998–2010)… [which] focused on new approaches to increase productivity and competitiveness*."

In Peru, Velarde *et al* (2010) identify key direct drivers of deforestation as including agricultural expansion, infrastructure development (especially road building), logging, gold mining and energy projects. Indirect drivers of deforestation include Andean migration, rural poverty, urbanization, and lack of coherent cross-sectoral policies.

Drivers of deforestation in Canada include agricultural expansion, as well as urbanization and infrastructure development. More significant, temporary reductions in forest cover occur in Canada as a result of natural disturbances, such as fires and insect attacks. NRC-CFS (2015) notes that, "*These disturbances are part of the natural cycle in the regeneration of Canada's forests. The annual timber harvest in Canada makes up less than 0.5% of total forest area. In contrast, 6% of Canada's forests are damaged by insects each year, and 1% is burned in forest fires.*" Similarly, Australia experiences temporary decreases in forest cover as a result of fires, droughts and insect or pathogen, with forest cover being regained over years or decades as forest regenerates, recovers and regrows.

Drivers of afforestation, forest rehabilitation and enhanced forest management

Many positive drivers of change for forests are listed in the section *efforts and achievements during the period 2007 to 2015 that support progress toward the APEC 2020 Forest Cover Objective* (above). However, several economies identify specific positive drivers of change.

In Thailand, positive drivers of forest change include community forestry, public participation, the EU-FLEGT scheme, technological improvements, demands for income and employment and REDD+.

Expansion in Australia's forest area primarily occurs through revegetation of previously cleared native forest, and planted forest expansion. New planted forests are usually established on agricultural land thereby increasing Australia's planted forest estate, and total forest. Planted forest establishment is largely driven by market forces including relative opportunity costs of alternative land-uses.

In Hong Kong (China), shifts in social and economic development in the city have altered perceptions of forests and driven a shift in afforestation objectives and strategies. A focus on soil and water conservation from the late 19th century through to the 1980s has shifted to priority being given to recreation, biodiversity enhancement and landscape appreciation in recent years.

Chapter 3   Way Forward

- Action plan supporting achievement of the APEC 2020 Forest Cover Objective for 2016 to 2020
- Impediments and risks
- Outlook for extent and quality of forest cover in 2020

The period 2016–2020 will be critical in ensuring achievement of the APEC 2020 Forest Cover Objective. It provides an opportunity to build on progress to date by initiating and implementing new and additional plans, programs and policies to support afforestation, forest rehabilitation and improved forest management as well as implementing measures to curb forest loss. This section describes a range of most recent initiatives and plans developed by APEC economies that will support achievement of the APEC forest cover goal as well as making recommendations for potential additional actions to enhance efforts. These measures jointly constitute an Action Plan to support achievement of the APEC 2020 Forest Cover Objective.

The section also identifies key impediments and risks that could compromise achievement of the target and concludes with an assessment of the outlook for extent and quality of forest cover in 2020 based on identifiable forest area targets set by various economies and extrapolations of progress to date.

3.1 Action Plan Supporting Achievement of the APEC 2020 Forest Cover Objective for 2016 to 2020

As noted earlier a wide range of diverse policies, programs and initiatives that support achievement of the APEC 2020 Forest Cover Objective have been implemented since 2007 by APEC economies. Many of these remain operational and will continue to work to support expansions or curb losses in forest area through to 2020. These existing initiatives provide the overall framework and key elements of an Action Plan for achieving the forest cover objective. Other elements of an Action Plan include new initiatives identified by APEC economies for implementation in the period 2016–2020 and recommendations for potential additional measures to support increased forest area in the APEC region.

New legislation, policies and action plans

Several APEC economies have developed new legislation, policies and/or programs to support improved forest management and increasing forest areas.

In Peru, for example, a specific National Policy for Forests and Wildlife was launched in 2013 based around five thematic principles: institution building and governance; sustainability; competitiveness; social inclusion and intercultural development; knowledge, science and technology. The principles include promotion of improved management of natural forests and planted forest establishment by addressing issues relating to "*preservation, protection, maintenance, improvement and sustainable use of national forest and wildlife assets, as well as forest plantations located in communal and private lands, within an eco-systemic approach*". In 2015, Peru enacted a new law for Forests and Wild Fauna, which contains

provisions promoting establishment of planted forests and contains an absolute prohibition on lands identified as having "greater potential for forestry and protection" being converted for agricultural and livestock use.

Peru has also identified more than 10.5 million hectares of land suitable for reforestation and initiatives are underway to promote planted forest establishment by both government and local government agencies and the private sector. A Supreme Decree established a "*Regime for the promotion of forest plantations in private lands*" and subsidiary "*Guidelines for the Promotion of Forest Plantations in Privately Owned Lands*". In 2014, Peru also approved new "*Agricultural Policy Guidelines"* that encompass forestry and provide a basis for building a competitive, integrated and sustainable forest sector, prioritizing small and medium producers and indigenous and rural communities. Particular objectives include promoting sustainable use of forests through agro-forestry and the development of socially and commercially viable planted forests.

In Papua New Guinea, the "*National Forest Development Guidelines"* issued in 2009 provide the overarching policy statement directing how forests are to be managed and utilized in the medium term. Provisions for developing "*Five-Year National Reforestation Programs*" are key elements of the guidelines. In 2014, the Papua New Guinea Government released draft "*National Strategies for Reforestation and Afforestation in Papua New Guinea*". The strategies emphasize improving and increasing planted forest areas in the economy, but also encourage rehabilitation of natural forest to increase forest area, enhance biodiversity, and promote regeneration of valuable timber species.

Forestry in Mexico is currently guided by the *National Forest Program 2014–2018*, which aims at rational use of forest resources by curbing deforestation and encouraging the development of sustainable planted forests. An underlying principle is to promote economic growth while conserving the environment including attention to climate change adaptation and mitigation measures. The main proposed strategies that directly related to increasing forest cover and/or which help to halt its loss include broadening the forest area under sustainable management and improving land productivity, improving and promoting restoration of forests and soils as well as of genetic forest resources, preventing illegal logging, promoting reduction of greenhouse gas emissions from deforestation and forest degradation, strengthening schemes involving payments for ecosystem services and preventative measures relating to forest fires and forest invasive species.

In Viet Nam, the current strategy for the forest sector is the *National Forest Development Strategy (2006–2020)*. This builds on previous strategies and programs, setting out ambitious targets for planted forest establishment and policy reform, as well as allocating subsidies for forest protection and planted forest establishment. A particular feature is identification of larger roles and responsibilities for local communities. The orientation of Viet Nam's forestry

development program for the period of 2015–2020, emphasizes restructuring of the forestry sector.

The *11th Malaysia Plan (2016–2020)* identifies mainstreaming environmental and natural resources management as one of the main thrusts for the economy's vision to achieve advanced, high income economic status by 2020. Malaysia is also currently reviewing its National Forest Policy and forestry legislation to incorporate new developments relating to issues including climate change, food security and livelihoods.

> *Key recommendations for additional action: Economies may wish to review existing policies and legislation with a view to identifying and removing possible impediments to afforestation/reforestation efforts and to identifying additional measure to promote increased forest areas or reduce deforestation.*

Planting programs

Several APEC economies have announced tree planting targets, some linked to specific planting programs, through to 2020 and beyond. In China, for example, a variety of well-defined strategies and programs are already in place. During the past decade, these have led to major expansion in China's forest area and significant enhancement of forest quality, biodiversity and ecology. In the period 2016–2020, the Chinese Government plans to continue its programs promoting ecological restoration and improved forest management with an aim to achieve a forest cover goal of 23% by 2020. This target will require establishment of an additional 8.46 million hectares of forests.

In 2015, Viet Nam approved a project on *Coastal forest protection and development responding to climate change* (2014–2020), which established targets to protect 310,000 hectares of existing coastal forest, to reforest 10,000 hectares of low quality coastal forest and to afforest an additional 46,000 hectares of coastal land.

Papua New Guinea plans to increase its planted forest area from 60,000 hectares to 100,000 hectares by 2020. The "*National Strategies for Reforestation and Afforestation in Papua New Guinea*" provide guidance and support to achieve this target.

Chinese Taipei is presently in the process of implementing the government's "*Medium-term Policy Implementation Plan (2013–2016)*". The plan identifies afforestation-related objectives including budgetary support for tree planting. Particular objectives of the policy include environmental conservation, sustainable development, carbon sequestration and revitalizing marginal agricultural lands, with a focus on stepping up afforestation efforts, effective monitoring of experimental tree-planting and establishment of new forest parks in low-lying areas.

On a greater time-scale, Brunei Darussalam has a long-term objective to establish a 30,000 hectare planted forest resource to supply the economy's timber requirements. It is envisaged that timber harvesting in natural forests will be phased out, with wood production gradually relocated to planted forests. Since 1992, more than 4,800 hectares of planted forests have been established.

Hong Kong (China) plans to continue increasing forest cover at a steady rate in the coming few years. It is estimated that about 27,000 hectares will be covered by woodlands in 2020. This will be a 9.3% increase on Hong Kong's 2007 forest area. Key priorities include management, conservation and enhancement of woodlands, public involvement in woodland conservation work, and use of woodland resources for conservation education, nature interpretation and landscape appreciation.

> *Key recommendations for additional action: Economies may wish to examine potential and need for either new and additional direct government planting programs or prospects for promoting new voluntary planting programs.*

Forest rehabilitation and regeneration

A variety of approaches and initiatives relating to forest rehabilitation and regeneration are being implemented in all APEC economies. Forest landscape restoration embodies a relatively new approach to forest restoration, while techniques such as Assisted Natural Regeneration and Enrichment Planting may offer alternatives to natural forest regeneration and direct planting and seeding. A number of economies have developed specific greening initiatives relating to forest rehabilitation including China, Chinese Taipei, Japan, Papua New Guinea, Peru, Philippines and Singapore. The Philippines is currently exploring new initiatives and approaches to further expand forest cover including the development of community-based forest rehabilitation and landscape restoration approaches.

> *Key recommendations for additional action: Economies may wish to consider developing new programs for forest restoration and rehabilitation around emerging techniques and methodologies such as Forest Landscape Restoration and Assisted Natural Regeneration.*

Measures to reduce deforestation and regulate forest harvesting

In Papua New Guinea, large areas of forests designated as "Reserved" and "Protected" will remain intact for the foreseeable future. However, logging will continue in the significant areas of production forests allocated as forest concessions. Generally, conditions in Papua New Guinea's forest ecosystems are highly favorable for rapid regeneration and supportive government policies promoting forest replenishment and management of the natural forests should further facilitate restoration.

Other economies have measures in place including logging bans and restrictions, annual allowable cuts, reduced impact logging and forest codes of practice designed to reduce deforestation and reduce damage in residual forests.

> *Key recommendations for additional action: Economies may wish to examine key drivers of deforestation and forest degradation and implement measures to mitigate the impacts of these.*

Forest-related climate change programs

All APEC economies are implementing initiatives to reduce greenhouse gas emissions and sequester carbon. Most economies specifically include roles for forestry. Chile, Indonesia, Malaysia, Mexico, Papua New Guinea, Peru, Philippines and Viet Nam are participating in the UN-REDD program and developing "REDD-readiness" to capitalize on future opportunities to improve forest management arising from REDD+. Other economies have developed alternative instruments and mechanisms encompassing forests and forestry.

> *Key recommendations for additional action: Developing economies may wish to accelerate "REDD-readiness" and development of REDD strategies as part of their implementation of climate mitigation actions under the UNFCCC and in light of the advantages accruing to economies that qualify for results-based financing. In other economies the development of Intended Nationally Determined Contributions (INDCs) will be a key part of new frameworks and expanding forest areas may have significant roles to play within these.*

Direct incentives

A number of APEC economies currently offer incentives for afforestation, reforestation and/or forest rehabilitation including Chile, China, Chinese Taipei, Malaysia, New Zealand and the United States.

> *Key recommendations for additional action: APEC economies may wish to examine current rates of afforestation, reforestation and forest rehabilitation and consider whether new or additional direct incentives may have a role to play in encouraging additional activity. Economies may also wish to carefully consider the merits of focusing on creating an enabling environment ("enabling incentives")that encourages investment in forests through the removal of structural impediments and operational constraints.*

Forest ownership and tenure provisions

Programs to reform forest tenure and transfer property rights to forests to communities and households are ongoing in economies including China, Peru, Philippines, Thailand and Viet

Nam. In Australia, the Western Australian state government recently announced plans to privatize state-owned planted forests.

> *Key recommendations for additional action: Programs to strengthen and devolve forest tenure are long-term efforts and any new process is unlikely to have any effect on forest area before 2020. Economies already implementing programs to reform forest tenure and/or transfer property rights to forests may wish to review programs to identify impediments to successful implementation.*

Improved forest law enforcement and governance arrangements

Illegal logging and issues relating to weak forest governance and law enforcement have been identified as significant factors in a number of APEC economies including China, Indonesia, Malaysia, Mexico, Papua New Guinea, Peru, Philippines, Russian Federation, Thailand, and Viet Nam. Most of these economies have implemented significant measures to improve the situation, but major challenges remain.

> *Key recommendations for additional action: Economies may wish to implement new and additional measures to improve forest governance and curb illegal logging. Major importing economies may wish to consider imposing regulations similar to the United States amendments to the Lacey Act and Australia's Illegal Logging Prohibition Act 2012 to discourage imports of illegally sourced timber.*

3.2 Impediments and Risks

In general, the major impediments and risks to achievement of the APEC 2020 Forest Cover Objective relate to natural disturbances. Major or catastrophic forest loss as a result of natural disturbances carries a risk that net increase in forest area would fall short of 20 million hectares expansion targeted for 2020. Under current policy settings, afforestation efforts across APEC economies should significantly and sufficiently outweigh anthropogenic forest loss (excluding potential impacts of human-initiated wildfires) to enable achievement of the APEC objective. However, major policy shortfalls could also compromise achievement of the target.

Climate-related risks

Climate-induced forest loss is likely to be the greatest risk factor. Climate is a major influencing factor on forests. Droughts, high winds, floods, and rain-induced landslides can all result in significant forest losses. For example, in relation to drought in Australia, FAO 2010(a) reports that, "...*[since 2000] there has subsequently been a net decline in Australia's forest area. It is understood the most likely reason for the detected decline in forest extent is the extended drought across much of Australia since 2000 which has resulted in a double loss: a*

decline in forest regrowth along with a decline in tree foliage from water stress."

Forests in most APEC economies are susceptible to damage from cyclonic storms. As just one example, in August 2009, Chinese Taipei was struck by Typhoon Morakot, which brought up to 2,500mm of rain and caused landslide damage affecting almost 26,000 hectares including forested areas. Super-typhoon Haiyan which struck the Philippines in 2013 similarly caused widespread damage to forests. In terms of exposure to natural disasters, the World Risk Index 2014 estimates several APEC economies to be among the highest risk in the world, with Philippines ranked 3rd, Japan 4th, Brunei Darussalam 6th, and Chile 11th. With global climate change apparently occurring more rapidly than in the past, forests in the APEC region could also be altered in new and significant ways. For example, in some economies there have been increases in the frequency and severity of wildfires and forest pest and disease infestations.

Forest wildfires

Forest wildfires are a major source of forest loss in many APEC economies. In Canada, for example, wildfires are the predominant cause of temporary forest cover loss. During the period 2007–2013, wildfires burned an average of 2.1 million hectares per year in Canada. Over 80% of the forest area burned in Canada is through fires caused by lightning strikes.

Similarly, in Australia and the United States, fire is a major part of the natural forest ecology, although human-initiated fires also contribute significantly to areas burned each year. Both economies have suffered devastating and widely reported forest fires in recent years. In the United States, the government has engaged with various stakeholders to develop a "National Wildland Fire Management Strategy". The principal objectives of the strategy are to restore ecosystems on a landscape scale, focusing on fire adaptations in ecosystems and human communities to better manage the expanding wildland/urban interface in the United States. Key elements of the strategy are reducing hazardous fuels and biomass and continuing to invest in fire suppression.

In years of extreme seasonal drought – at least once every 10 years – fires cause catastrophic damage to forests in the Russian Federation. A relatively high proportion of forest fires (77%) in the Russian Federation are attributable to human carelessness, with lightning strikes accounting for an additional 19%. Catastrophic fires cause major socioeconomic and ecological damage to the forest resources in affected areas. Catastrophic fires in the Russian Federation occur at a scale beyond the capacity of the forest fire-fighting service to combat and are only stopped by abundant precipitation (Alexeenko, 2012).

Forest fires are also a significant cause of forest loss in China, despite significant efforts to build fire prevention and fire-fighting capacities. During the period 2007–2013, the annual incidence of forest fires in China declined by 58% from 9260 to 3929, and area of forest damage reduced from 29,286 hectares in 2007 to 13,724 hectares in 2013.
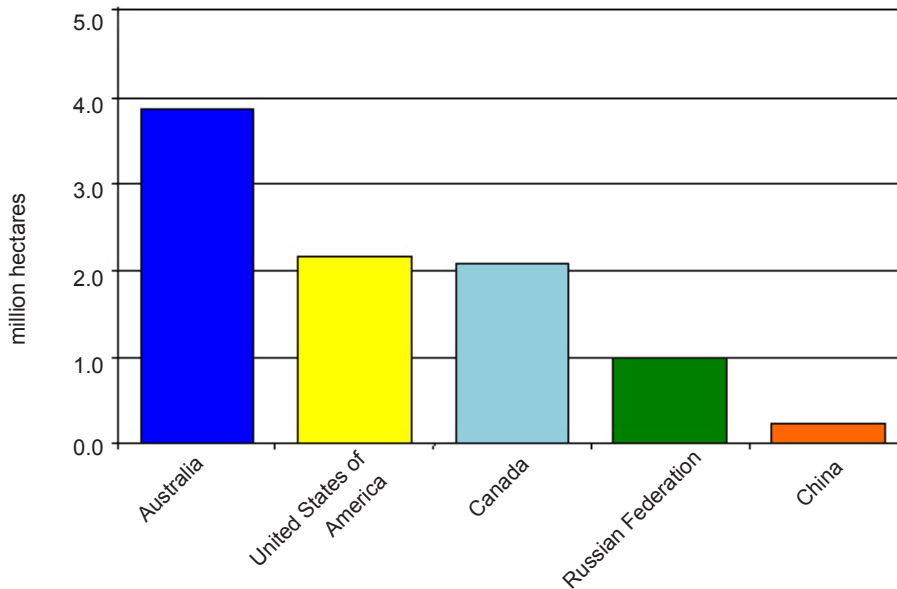
**Figure 10   Area of forest affected by fires in selected APEC economies during 2003–2007 (annual average)
Source: FRA 2010**

Forest fires also significantly impact on smaller APEC economies. In Thailand, for instance, dry season fire is a significant cause of deforestation and forest degradation. In 2012, forest fires burned almost 5,500 hectares of forests in Thailand. Clearing forest for agriculture, including shifting cultivation, is a major contribution to forest fires in Thailand. Similarly, hill fires are among the major challenges Hong Kong (China) faces in woodland conservation.

Pests and diseases

Forest pest and disease outbreaks can be a major cause of forest disturbance, although only the most severe outbreaks result in substantial forest cover loss. In Canada, for example, insect outbreaks affect a greater area of forest than does any other form of disturbance. During the period 2007–2013, 14 million hectares of forests in Canada were affected annually by insect outbreaks. The most severe has been an outbreak of mountain pine beetle (*Dendroctonus ponderosae*) in the province of British Columbia, which has killed about 50% of the total volume of commercial lodgepole pine.

In the United States, a range of forest invasive species have caused billions of dollars in ecosystem damage during the past decade. The emerald ash borer (*Agrilus planipennis*) and the hemlock woolly adelgid (*Adelges tsugae*) have caused significant damage in the Eastern United States. Other notable introduced forest pests and diseases include sudden oak death (*Phytophthora ramorum*), Asian long-horned beetle (*Anoplophora glabripennis*) and european gypsy moth (*Lymantria dispar*).

Most other APEC economies are also affected by forest pests to a greater or lesser extent. In China, for instance, Sun (2005) notes, "*there are over 8 000 known forest pests…including insects, diseases and rodents. Of these pests, there are 5 020 species of insects, 2 918 different types of disease, and 160 species of rodents.*"

Policy shortfalls

A notable feature of progress towards the APEC 2020 Forest Cover Objective is the relatively high proportion of increased forest area attributable to vigorous promotion of afforestation in China. Despite its significant achievements in substantially increasing forest cover during the past two decades, SFA (2015) notes that China faces some significant challenges in further expanding and enhancing its forest resources. For example, China's national forest inventory indicates a decline in the rate of forest area expansion and also that, despite increases in average per hectare growing stock, many of the forests remain relatively low quality. Furthermore, the quality of land available for future afforestation is declining, the acceleration of urbanization and industrialization are reducing opportunities for large-scale afforestation, and the frequency of serious natural disasters is causing significant damage and losses to forests. Consequently, a significant risk to achievement of the APEC target would be if China's afforestation programs would stall in the period 2016-2020.

A similar impact could occur with more widespread forest policy or program failures among other APEC economies. For example, a major global recession could serve to curb afforestation efforts across a number of APEC economies. A specific case of policy failure that might compromise achievement of the APEC target would be breakdown of efforts to curb illegal forest clearance and logging in one of the major forest economies.

3.3 Outlook for Extent and Quality of Forest Cover in 2020

The publication of the Global Forest Resources Assessment 2015 in September 2015 provides a sound, up-to-date and consistent dataset that, allied with economy reports of efforts and achievements in enhancing and expanding forest areas, provides a strong basis for assessing current progress toward the APEC 2020 Forest Cover Objective. While the FRA data also provide a statistical basis for calculating likely future forest cover achievements to 2020 and many economies identify targets for specific forestry programs, fewer economies have established clearly articulated targets for future total forest areas. Consequently, this concluding session relies heavily on data extrapolation to conclude an outlook for extent and quality of forest cover in 2020.

Economy forecasts

In many APEC economies where market-based economic systems predominate, governments' primary contribution to increasing forest cover is to provide a policy environment that

encourages and enables other actors to participate in increasing the extent of forests and enhancing their quality. As a consequence, quantifying likely on-the-ground changes to forests is extremely difficult. For example, while supportive of the APEC 2020 Forest Cover Objective, Canada recognized, "*that our contribution to increasing forest cover would be minimal as our robust management system has helped ensure stable forest cover for many years with deforestation rates at less than 0.02% of total forest area*".

Nonetheless, a number of economies have set broad forest area targets or identified expectations of forest area increases. These include:

○ In line with the National Forestry Policy, Brunei Darussalam has a long term aspiration to ensure at least 55% of land area remains under forest cover.

○ In China, in accordance with strategic objectives of ecological enhancement land greening, the government plans to continue to promote ecological restoration and improved forest management with an overall objective of achieving 23% forest coverage by 2020. This implies an increase in forest area of approximately 8.5 million hectares on 2015 levels.

○ Hong Kong (China) estimates that about 27,000 hectares (an increase of 600 hectares on 2013 area) of land will be covered by woodlands in 2020.

○ In Japan, according to the National Forest Plan (2014–2029), forest area is expected to generally remain stable (neither increase nor decrease) through to 2029.

○ The Malaysian Government has a long term aspiration to ensure at least 50% of land area remains under forests and tree cover. Currently Malaysia's forest area significantly exceeds this aspiration.

○ Mexico is aiming to reverse its current deforestation trend and, by 2018 plans to achieve a net increase in forest area of 0.2% (132,000 hectares). Mexico has identified 18.3 million hectares of priority land for forest restoration with eligibility to apply for financial support.

○ In the Philippines, forest cover is expected to increase to 8.34 million hectares by 2020 (an additional 300,000 hectares compared to 2015) as a result of activities carried out under the National Greening Program, intensification of efforts to protect existing forests, and various other supportive policies and activities.

○ FAO (2012) anticipated forest area in the Russian Federation will increase by 2 million hectares between 2015 and 2020.

○ In Thailand, the 1985 National Forest Policy specifies a target of 40% forest cover, which entails an increase of 4.36 million hectares on the current forest area. In 2014, a Master Plan for Forest Resources Protection and Sustainable Management was released, which specified that the forest cover target is to be achieved by 2024.

○ The United States has committed to fulfilling the Bonn Challenge, by restoring 1.5 million hectares of forests per year until 2020.

○ In 2007, the Viet Nam Forestry Development Strategy (2006–2020) set a target of achieving 47% forest cover by 2020. This target was reiterated in the 2012 Plan on Forest Protection and Development (2011–2020) and, based on data reported to the FRA 2015, has been achieved.

Box 6 describes Initiative 20x20 under which Chile (0.1 million hectares), Mexico (8.5 million hectares) and Peru (3.2 million hectares) have committed to specific targets for restoring degraded lands including through forestry.

> **Box 6   Initiative 20×20**
>
> Chile, Mexico and Peru are participants in Initiative 20×20 – a country-led effort to bring 20 million hectares of land in Latin America and the Caribbean into restoration by 2020. The initiative will support reforestation and conservation of forests as key elements of an ecological recovery process designed to restore land functionality including soil conservation, biodiversity conservation, carbon storage and other ecosystem values. The initiative is particularly designed to support the Bonn Challenge, a global commitment to restore 150 million hectares of land around the world by 2020. The three APEC economies have collectively committed to the restoration of 12.2 million hectares of degraded lands.

The various targeted forest area increases listed above, if achieved, would amount to approximately 32 million hectares of additional forest area in the APEC region in the period 2016–2020.

Extrapolating APEC forest area to 2020

Comprehensive Global Forest Resources Assessments in the 21st century have been published by FAO for 2000, 2005, 2010 and 2015, with significant attention paid to enhancing the consistency of time series data. Straight-line extrapolations of FRA data provide a simple, but relatively valid means of predicting broad forest change in the APEC region between 2007 and 2020.

As noted in Section 1.3, total forest area in APEC economies is estimated to have increased by 15,447,000 hectares in the period 2007–2015. A simple straight line extrapolation of the growth rate for the full 2007–2015 period suggests that for the period 2007–2020 total forest area in APEC economies will increase by 25.1 million hectares. Extrapolating using

the slightly slower rate of growth in the period 2010−2015 predicts total forest area in APEC economies will increase by a slightly lower amount of 24.4 million hectares [①]. In either case, the APEC 2020 Forest Cover Objective will be comfortably achieved.

Figure 11 shows the results of extrapolating 2010−2015 rates of forest change through to 2020 across broad forest types and APEC subregions. Some significant variations in forest change are notable in both subregions and among forest types. For example, forest area in East Asia is forecast to have increased by 19.9 million hectares over the period 2007− 2020, virtually the entire total of the APEC 2020 Forest Cover Objective. Smaller increases in forest area can also be anticipated in the Americas (4.2 million hectares), Russia (3.4 million hectares) and the Pacific (369,000 hectares). However, forest area in Southeast Asia is expected to have declined by 3.5 million hectares across the period 2007−2020.
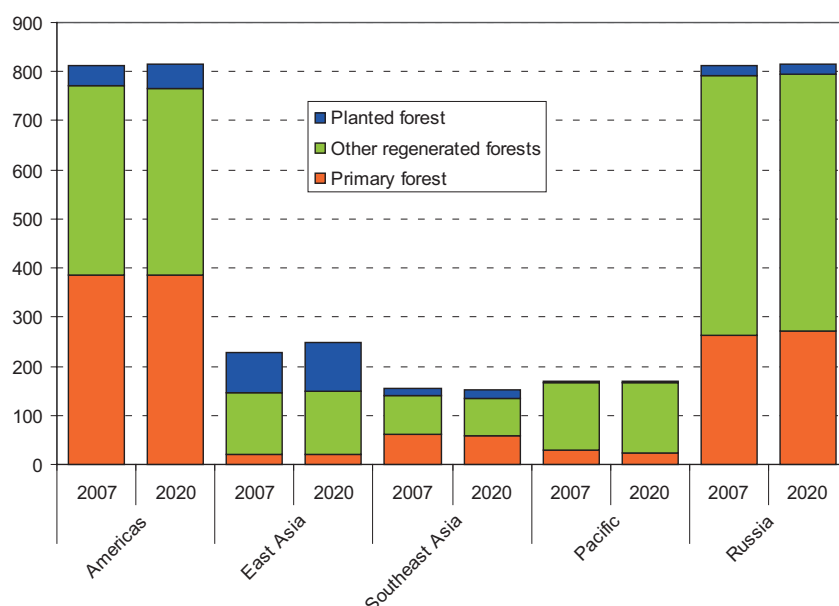
Figure 11   Forest area by category in APEC economies 2007 and extrapolated to 2020
Source: FAO 2015, extrapolation

Among forest types, planted forest area is expected to increase by 31.3 million hectares, an almost 20% increase on the 2007 area of planted forests in the APEC region. Conversely, the total area of primary forests in the APEC region is expected to decline by 1.4 million hectares and the area of other naturally regenerated forests is anticipated to decrease by 4 million hectares.

These changes in forest area largely reflect changes recorded to date. For example, vigorous

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① N.b. Figure 11 displays results using this lower rate of extrapolation.

afforestation efforts have seen the area of planted forests in China increase by 9.4 million hectares in the 2007–2015 period, while other naturally regenerated forests have increased by 2.8 million hectares. In the United States, planted forests and other naturally regenerated forests have increased by 1.5 million hectares and 2.5 million hectares respectively. Similarly in Viet Nam planted forests have increased by 0.5 million hectares and other naturally regenerated forests have increased by 0.8 million hectares. In the Philippines, greening efforts have increased the area of planted forests by 1.2 million hectares. In Chile, the area of planted forests has increased by 0.85 million hectares while the area of primary forests has increased by 0.89 million hectares.

In terms of primary forests, the Russian Federation has substantially increased its area of primary forests, by slightly more than 10 million hectares (other naturally regenerated forest area in Russia has declined by 8.9 million hectares suggesting a strong natural maturation dynamic between these forest types). Japan (328,000 hectares), Malaysia (136,000 hectares) and New Zealand (16,000 hectares) are other economies that have recorded increased areas of primary forest.

Conversely, the area of primary forest in Papua New Guinea declined by 4.4 million hectares in the period 2007–2015, with an offsetting increase in other naturally regenerated forests of 4.4 million hectares reflecting harvesting and regeneration activities. In the same period, primary forest area in Indonesia has declined by 1.8 million hectares and other naturally regenerated forest area has declined by 4.4 million hectares reflecting a substantial overall loss of forests. Similar, though smaller scale patterns of primary and other naturally regenerated forest loss are reported in Mexico and Peru. A full set of tabulated data summarizing change in forest areas in APEC economies by forest type is contained in Annex , Tables 8 to10.

Conclusion

 In the period 2007–2015, total forest area in APEC economies is estimated to have increased by 15,447,000 hectares (77% of the APEC 2020 Forest Cover Objective). In the remaining period 2016–2020, an additional forest area increase of at least 4,553,000 hectares is required to achieve the APEC 2020 Forest Cover Objective. Given progress achieved to date, APEC economies should maintain a reasonable degree of confidence that the forest cover objective will be achieved. However, there are some significant risks to successful achievement of the target including potential for catastrophic loss of forest as a result of extreme climatic and weather events, wildfires, or pests and diseases. The relatively high proportion of China's contribution to achieving the overall target also creates a risk of shortfall if, particularly, China's afforestation programs should falter for any reason.

A notable feature of increased forest area in the APEC region is the very marked increase in planted forest area while, overall, significant areas of primary forests and other naturally

regenerated forests have been lost or degraded. Clearly, planted forests are not perfect substitutes for natural forests, and different types of forests may have markedly different ecological, cultural, ecosystem service and economic values. The loss of primary forests and other naturally regenerated forests and the distribution of losses across the APEC region should remain an issue of substantial concern to the APEC leadership, forest stakeholders and broader society.

Box 7   A note on forest measurement

With forest area in APEC economies estimated to total 2.17 billion hectares in 2007, a 20 million hectare increase in forest area amounts to slightly less than 1% of forest area. Ascertaining the actual increase in forest area in APEC economies in the period 2007–2020 is a challenging exercise since few if any economies will conduct comprehensive forest inventories in both 2007 and 2020. Similarly, forest inventory methodologies can vary markedly, even in provinces and states within the member economies. In some instances various agencies within economies may compile significantly difference data. The data cited in this report are based on those reported to the FAO Global Forest Resources Assessment (FRA), which strive for overall consistency in reporting. However, even the straightforward extrapolation used to derive 2007 data may be at significant variance with forestry statistics in some economies. A final accounting to measure achievement of the APEC forest cover target will require economies to ensure consistency and agreement in the baseline forest data that are used.

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Annex

Table 1   Current significance of forest resources in APEC economies

	More than 100 million ha of forest in total		More than 10 million ha of forest in total		Less than 10 million ha of forest in total	
	More than 40% forest cover	Less than 40% forest cover	More than 40% forest cover	Less than 40% forest cover	More than 40% forest cover	Less than 40% forest cover
More than 0.6 ha of forest per person	Russian Federation	Australia Canada United States of America	Malaysia Papua New Guinea Peru	Chile Mexico New Zealand	Brunei Darussalam	
Less than 0.6 ha of forest per person		China	Indonesia Japan Viet Nam	Thailand	Chinese Taipei Republic of Korea	Hong Kong (China) Philippines Singapore

Source: FAO 2015

Table 2   International criteria and indicators processes

Criteria and indicators process	Participating APEC economies
ITTO criteria and indicators for the sustainable management of tropical forests	Indonesia, Malaysia, Mexico, Papua New Guinea, Peru, Philippines, Thailand, Viet Nam
Montreal Process (Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests)	Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russian Federation, United States of America
Tarapoto Proposal of Criteria and Indicators for Sustainability of the Amazon Forest	Peru

Table 3   Extent of forest in APEC economies

Economy	Forest area (1000 ha) 2015	Population (1000)***	Per capita forest area (ha)	Land area (1000 ha)	% of land area
Australia	124 751	23 969	5.20	768 228	0.16
Brunei Darussalam	380	423	0.90	527	0.72
Canada	347 069	35 940	9.66	909 351	0.38
Chile	17 735	17 948	0.99	74 880	0.24
China	208 321	1 376 049	0.15	942 530	0.22
Chinese Taipei*	2 186*	23 268	0.09	3 268	0.67
Hong Kong, China	26**	7 288	0.00	111	0.23
Indonesia	91 010	257 564	0.35	181 157	0.50
Japan	24 958	126 573	0.20	36 450	0.68
Malaysia	22 195	30 331	0.73	32 855	0.68
Mexico	66 040	127 017	0.52	194 395	0.34
New Zealand	10 152	4 529	2.24	26 771	0.38
Papua New Guinea	33 559	7 619	4.40	45 286	0.74
Peru	73 973	31 377	2.36	128 000	0.58
Philippines	8 040	100 699	0.08	29 817	0.27
Republic of Korea	6 184	50 293	0.12	9 873	0.63
Russian Federation	814 930	143 457	5.68	1 638 139	0.50
Singapore	16	5 604	0.00	69	0.24
Thailand	16 399	67 959	0.24	51 089	0.32
United States of America	310 095	321 774	0.96	916 193	0.34
Viet Nam	14 773	93 448	0.16	31 008	0.48
APEC Economies	2 190 581	2 853 129	0.77	6 016 618	0.36

Sources:FAO 2015

∗ Forestry Bureau, Chinese Taipei. 2015

∗∗ Agriculture, Fisheries and Conservation Department, Hong Kong(China). 2015.

∗∗∗ UNDESA. 2015.

<p style="text-align:center">Table 4   Trends in extent of forest during 2005–2015</p>

Economy	Forest area (1000 ha)				Change (1000 ha)
	2005	2007	2010	2015	2007-2015
Australia	127 641	125 869	123 211	124 751	-1 118
Brunei Darussalam	389	385	380	380	-5
Canada	347 576	347 451	347 302	347 069	-382
Chile	16 042	16 118	16 231	17 735	1 617
China	193 044	196 070	200 610	208 321	12 251
Chinese Taipei*	2 141	2 150	2 164	2 186	36
Hong Kong, China**	-	25	25	26	2
Indonesia	97 857	96 487	94 432	91 010	-5 477
Japan	24 935	24 947	24 966	24 958	11
Malaysia	20 890	21 384	22 124	22 195	811
Mexico	67 083	66 849	66 498	66 040	-809
New Zealand	10 183	10 170	10 151	10 152	-18
Papua New Guinea	33 586	33 581	33 573	33 559	-22
Peru	75 528	75 241	74 811	73 973	-1 268
Philippines	7 074	6 980	6 840	8 040	1 060
Republic of Korea	6 255	62 42	6 222	6 184	-58
Russian Federation	808 790	811 328	815136	814 931	3 602
Singapore	16	16	16	16	0
Thailand	16 100	16 160	16 249	16 399	239
United States of America	304 757	306 342	308 720	310 095	3 753
Viet Nam	13 077	13 497	14 128	14 773	1 276
APEC Economies TOTAL	2 170 823	2 175 119	2 181 600	2 190 581	15 447

Sources: FAO 2015
∗ Forestry Bureau, Chinese Taipei. 2015
∗∗ Agriculture, Fisheries and Conservation Department, Hong Kong (China). 2015

Table 5   Extent of change in total forest growing stock

Economy	Growing Stock (million m^3)				Growing stock per hectare % change (2007-2015)
	2005	2007	2010	2015	
Australia	-	-	-	-	-
Brunei Darussalam	75	74	72	73	0.52
Canada	47 320	-	-	-	-
Chile	2 974	2 983	2 997	3 316	1.04
China	13 585	14 136	14 962	16 002	6.55
Chinese Taipei*	422	432	446	463	-
Hong Kong, China	-	-	-	-	-
Indonesia	12 459	12 013	11 343	10 227	-9.74
Japan	4 255	4 433	4 699		-
Malaysia	4 436	4 496	4 585	5 034	30.14
Mexico	4 787	4 773	4 752	4 727	7.88
New Zealand	3 816	3 850	3 902	3 975	0.24
Papua New Guinea	5 199	5 198	5 197	5 195	3.42
Peru	8 249	8 213	8 159	8 891	10.11
Philippines	1 218	1 187	1 141	1 298	-5.04
Republic of Korea	654	712	799	918	0.00
Russian Federation	80 479	80 897	81 523	81 488	0.29
Singapore					-
Thailand	1 352	1 425	1 535	1 506	4.13
United States of America	35 201	36 259	37 847	40 699	10.89
Viet Nam	825	833	844	878	-3.65

Sources:FAO 2015

∗ **Forestry Bureau, Chinese Taipei. 2015**

Table 6 Area of production forests and forests in protected areas

Economy	Production forests (1000 ha)				Forests in Protected Areas (1000 ha)			
	2005	2007	2010	2015	2005	2007	2010	2015
Australia	1 628	1 738	1 903	2 017	17 012	17 812	19 011	21 422
Brunei Darussalam	219	219	219	219	19	19	19	19
Canada	18 337	18 330	18 322	18 310	23 924	23 924	23 924	23 924
Chile	7 297	7 372	7 485	6 835	3 992	3 992	3 992	3 697
China	85 384	86 969	89 346	92 958	23 831	25 107	27 021	28 097
Chinese Taipei*	453	465	491	515	1 311	1 311	1 320	1 326
Hong Kong, China	-	-	-	-	-	-	-	-
Indonesia	60 493	59 928	59 080	57 668	29 855	30 797	32 211	32 211
Japan	-	-	-	-	-	-	4 110	-
Malaysia	11 819	12 107	12 539	12 419	4 930	4 905	4 867	5 041
Mexico	9 226	9 664	10 321	10 758	7 219	7 535	8 010	8 800
New Zealand	2 130	2 107	2 073	2 065	3 587	3 595	3 607	3 752
Papua New Guinea	7 311	7 239	7 132	8 758	313	313	313	1 796
Peru	25 175	25 065	24 900	17 881	-	-	16 439	18 844
Philippines	5 386	5 324	5 230	6 175	1 688	1 657	1 610	1 865
Republic of Korea	3 337	3 313	3 276	3 171	713	710	706	699
Russian Federation	413 103	416 458	421 491	415 074	16 488	16 922	17 572	17 667
Singapore	0	0	0	0	3	3	3	3
Thailand	2 244	2 408	2 653	3 265	9 394	9 407	9 426	10 624
United States of America	84 954	86 657	89 212	91 339	28 189	30 267	33 384	32 863
Viet Nam	4 946	5 517	6 373	6 870	1 959	1 976	2 002	2 040

Sources: FAO 2015

∗ Forestry Bureau, Chinese Taipei. 2015

Table 7 Areas in public and private ownership

Economy	Public forest (1000 ha)		Private forest (1000 ha)	
	2005	2010	2005	2010
Australia	94 836	89 349	31 060	32 506
Brunei Darussalam	389	-	0	-
Canada	317 652	317 402	28 467	28 445
Chile	3 997	4 052	12 045	12 179
China	132 100	115 211	60 944	85 400
Chinese Taipei*	1 540	1 534	176	237
Hong Kong, China	-	-	-	-
Indonesia	85 073	82 095	12 784	12 337
Japan	10 142	10 168	14 793	14 799
Malaysia	20 559	21 104	331	1 020
Mexico	848	840	34 384	34 051
New Zealand	6 055	6 054	4 128	4 097
Papua New Guinea	1 008	1 007	32 578	32 566
Peru	62 911	61 684	12 617	13 127
Philippines	6 173	6 356	901	484
Republic of Korea	1 931	1 984	4 324	4 237
Russian Federation	808 790	815 136	0	0
Singapore	16	16	0	0
Thailand	16 100	16 249	0	0
United States of America	124 936	129 974	179 821	178 746
Viet Nam	9 398	9 587	3 120	3 543

Sources: FAO 2015

∗ **Forestry Bureau, Chinese Taipei. 2015**

Table 8   Area of primary forest

Economy	Primary Forest (1000 ha)			
	2005	2007	2010	2015
Australia	5 233	5 155	5 039	5 039
Brunei Darussalam	275	270	263	263
Canada	206 225	206 151	206 062	205 924
Chile	4 488	4 468	4 439	5 355
China	11 632	11 632	11 632	11 632
Chinese Taipei*	-	-	-	1 054
Hong Kong, China	-	-	-	-
Indonesia	48 310	47 853	47 167	46 024
Japan	4 449	4 577	4 770	4 905
Malaysia	4 930	4 905	4 867	5 041
Mexico	33 826	33 563	33 168	33 056
New Zealand	2 144	2 144	2 144	2 160
Papua New Guinea	23 091	21 993	20 345	17 599
Peru	67 148	66 898	66 524	65 790
Philippines	861	861	861	861
Republic of Korea	3 617	3 586	3 540	3 460
Russian Federation	255 470	262 619	273 343	272 718
Singapore	-	-	-	-
Thailand	6 726	6 726	6 726	6 726
United States of America	75 709	75 543	75 294	75 300
Viet Nam	85	84	83	83

Sources: FAO 2015
∗ Forestry Bureau, Chinese Taipei. 2015

Table 9   Area of other naturally regenerated forest

Economy	Other Naturally Regenerated Forest (1000 ha)			
	2005	2007	2010	2015
Australia	120 780	118 976	116 269	117 695
Brunei Darussalam	112	113	114	114
Canada	129 641	128 593	127 265	125 361
Chile	9 492	9458	9 408	9 336
China	114 192	114 880	115 911	117 707
Chinese Taipei*	-	-	-	748
Hong Kong, China	-	-	-	-
Indonesia	44 888	43 918	42 462	40 040
Japan	10 162	10 059	9 904	9 783
Malaysia	14 387	14 886	15 634	15 188
Mexico	33 217	33 239	33 271	32 897
New Zealand	5 932	5 929	5 925	5 905
Papua New Guinea	10 495	11 588	13 228	15 960
Peru	7 626	7 493	7 294	7 026
Philippines	6 166	6 073	5 934	5 934
Republic of Korea	858	858	858	858
Russian Federation	536 358	530 687	522 180	522 372
Singapore	16	16	16	16
Thailand	5 930	5 773	5 537	5 687
United States of America	204 623	205 919	207 862	208 431
Viet Nam	10 283	10 259	10 222	11 027

Sources: FAO 2015

∗ Forestry Bureau, Chinese Taipei. 2015

Table 10   Area of planted forest

Economy	Planted forest (1000 ha)			
	2005	**2007**	**2010**	**2015**
Australia	1 628	1 738	1 903	2 017
Brunei Darussalam	2	2	3	3
Canada	11 710	12 707	13 975	15 784
Chile	2 063	2 191	2 384	3 044
China	67 219	69 558	73 067	78 982
Chinese Taipei*	-	-	-	384
Hong Kong, China	-	-	-	-
Indonesia	4 659	4 717	4 803	4 946
Japan	10 324	10 311	10 292	10 270
Malaysia	1 573	1 593	1 623	1 966
Mexico	40	48	59	87
New Zealand	2 107	2 097	2 082	2 087
Papua New Guinea	0	0	0	0
Peru	754	850	993	1 157
Philippines	47	46	45	1 245
Republic of Korea	1 781	1 798	1 823	1 866
Russian Federation	16 963	18 023	19 613	19 841
Singapore	0	0	0	0
Thailand	3 444	3 661	3 986	3 986
United States of America	24 425	24 881	25 564	26 364
Viet Nam	2 709	3 155	3 823	3 663

Sources: FAO 2015
∗ Forestry Bureau, Chinese Taipei. 2015