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# WOOD PRODUCTS FOR CLIMATE CHANGE MITIGATION IN THE ASIA-PACIFIC REGION

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**ABSTRACT:**

Global use of wood products is growing and, when they are produced from sustainably managed forests, increasing carbon in wood products can reduce $CO_2$ emissions and mitigate climate change. However, these climate change mitigation opportunities are not well understood by policy makers or building and construction practitioners. Emission reduction can be achieved by more efficiently processing and using wood; extending wood product lifetimes, including through better design, recycling and reuse, and substituting wood for energy intensive materials. The Asia-Pacific region has become a major producer and consumer of wood and wood products and growth in consumption of wood products is projected to increase. This paper presents information on factors to consider in including harvested wood products in Nationally Determined Contributions under the Paris Agreement and other climate policies. Key findings are (i) using more long-lived wood products can make a relatively small, but significant, contribution to reducing emissions in wood consuming countries; (ii) few countries in the region currently report on changes in carbon stocks in wood products in their greenhouse gas inventories; (iii) accounting for wood and products traded between countries can significantly impact on reported net emissions; (iv) using wood products to replace carbon intensive building products can further reduce emissions but assessing these emission reductions requires comprehensive life cycle analyses informed by better data on wood production and use and (v) including these emission reductions in NDCs is complicated by sector-based target setting and reporting.

**KEYWORDS:** harvested wood products, carbon, climate change, NDC, decarbonization.

## 1 – INTRODUCTION

Global use of wood products is growing with increasing demand for housing, furniture, clothing, paper, packaging, chemicals and other products. Increasing stocks of carbon in wood products can reduce carbon dioxide (CO2) emissions and mitigate climate change. These climate mitigation benefits of wood products depend on wood being produced in sustainably managed forests in which carbon stocks are maintained. Emission reductions can be achieved by optimizing harvests to increase wood supply while maintaining carbon stocks and providing ecosystem services, by more efficiently processing and using wood, by extending wood product lifetimes (including through recycling and reuse) and by substituting wood products for energy-intensive materials.

Forests and forest products can make significant contributions to the Paris Agreement target of net zero emissions by 2050. Conserving and sustainably managing forests could reduce or offset 3.3 GtCO2/year of emissions in the tropics alone - the largest emission reduction opportunity for many developing countries [1]. Using more long-lived wood products from new and sustainably managed forests can further reduce emissions by storing carbon in wood products and using wood to replace emissions-intensive products such as steel and concrete, or to replace fossil fuels to produce energy. Using wood to replace other building products has additional benefits including capacity for modular construction, lower construction and transport costs, and lower energy use in service. Wood buildings are also generally more aesthetically pleasing and healthier places in which to live and work.

This paper describes results from a study to assess opportunities for climate change mitigation through increased use of wood products in the Asia-Pacific region and to analyse issues and challenges for achieving emissions reduction potential in harvested wood products.

## 2 – BACKGROUND

Forests and wood products are part of the global cycle of greenhouse gases (Figure 1). These arise and are accounted for in different sectors. In country reports to the

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UN Framework Convention on Climate Change (UNFCCC), and in assessments by the Intergovernmental Panel on Climate Change (IPCC), forest and harvested wood products (HWPs) are included in the AFOLU (agriculture, forestry and other land use) sectors. In the decade between 2010 and 2019, total anthropogenic emissions from all sectors averaged 55.9 ± 6.1 Gt $CO_2$-e (carbon dioxide equivalent)/year [1]. AFOLU sectors generated 21 percent of total emissions of all greenhouse gases and 14 percent of total $CO_2$ emissions. About half of these $CO_2$ emissions are due to deforestation (the long-term conversion of forests to other land uses).

The potential to reduce greenhouse gas emissions through increased use of wood products has been understood for some time [2]. However, technical and political challenges have impeded the incorporation of this potential in national climate policies and Nationally Determined Contributions (NDCs) under the Paris Agreement. In support of objectives to increase the supply and use of sustainable wood products, the Seoul Forest Declaration at the 2022 XV World Forestry Congress called for the full potential of legal, sustainably produced wood to support transformation of the building sector, to provide renewable energy and to supply innovative new materials. At the Congress, a Ministerial Forum called for a significant increase in use of sustainable wood-based solutions within NDCs by 2030 by:

- addressing the lack of awareness of the potential of wood products for climate mitigation;
- enhancing global and regional policy dialogues on pathways and related synergies and trade-offs, and ways to strengthen investments; and
- roving modalities to promote technical exchange, sharing experiences and learning to drive innovations in sustainable forest management and efficient wood value chains.

A Ministerial Call on Sustainable Wood (XV World Forestry Congress, 2022) invited the Food and Agriculture Organization of the United Nations (FAO) and members of the Collaborative Partnership on Forests (CPF) to support these efforts. At the 28th Conference of the Parties to the United Nations (UN) Framework Convention on Climate Change (COP28) in Dubai, the Forest and Climate Leaders' Partnership called for increased use of wood to reduce emissions in construction [3], and this has been echoed at regional and national levels [4]. In addition, the Wood for Globe project, delivered by IUFRO, FAO and Boku University under the CPF joint initiative Sustainable Wood for a Sustainable World aimed to strengthen wood policy dialogues by exchanging knowledge and good practices and mobilizing scientific evidence to support decision-making [5,6]. The project culminated with a ministerial "Call for Action" to advance sustainable wood pathways signed by representatives of 15 countries and several international organizations [7].

In assessing the potential to store more carbon in wood products, holistic assessment of the benefits and impacts of alternative forest management to produce more wood and to use products more efficiently is needed. This needs to include assessment of contributions and impacts on other SDGs. Producing wood from illegal or unsustainable operations contributes to deforestation,forest degradation and biodiversity loss, and has economic and social impacts. Such practices also reduce forest carbon stocks and emit greenhouse gases.

## 3 – STUDY BACKGROUND

For this study, the Asia-Pacific region includes those countries in the FAO Asia and the Pacific regions, focusing on member countries of the Asia-Pacific Forestry Commission [8]. These countries are home to 55 percent of the world's population but only 18 percent of the world's forests (740 million ha), with low forest area per person compared to other regions. The region is a large producer of wood (Figure 1), with the majority used for fuelwood. Wood processing in the Asia-Pacific region has risen steeply but capacity to supply more industrial wood is currently limited and the region is a major importer of wood and wood products, with imports expected to continue to 2030 and beyond. Asia (predominantly China) dominates imports of unprocessed logs and wood fibre, with 45 percent of the global trade in 2018 to 2019. Interregional trade is high. Australia, New Zealand and Papua New Guinea are large wood exporters, mostly to other countries in the region. Half of the logs harvested in Australia and 62 percent of those harvested in New Zealand [9] are exported as either roundwood or woodchips. Wood supply from natural forests in the region is projected to decline [10].

Roundwood consumption in the region grew by 104 percent between 1980 and 2019, while roundwood production in Asia grew by only 95 percent [13]. Asian countries produced 28 percent of the world's sawn wood, 58 percent of wood-based panels and almost a half (49 percent) of the world's paper and paperboard in 2020. Asian countries consumed 40 percent of global sawnwood, 57 percent of wood-based panels and half (52 percent) of all paper and paperboard. Between 1990 and 2020 apparent consumption of wood products in the region rose by 194 percent, with sawnwood consumption increasing 64 percent, paper and paperboard by 226 percent and wood-based panels by 685 percent [14]. This


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has had significant implications for carbon stored in wood products in the region.

Wood consumption in the Asia-Pacific region is expected to rise further, from 506 million to 736 million $m^3$/year between 2020 and 2030, while timber supply is expected to grow by only 35 million $m^3$ [13], further exacerbating this deficit and driving more imports of roundwood and woodchips to Asia (particularly China) mainly from Europe and North America. Growth in demand for longer-lived wood products from sustainable forests drive investment to expand production forests [15]. The region is a large consumer of raw wood and wood products as well as an important manufacturer and exporter of wood products. Forests in the region provide direct sources of livelihoods to people living in or near forests. Economic and societal transitions, such as urbanization, are shifting demand for forest products from traditional fuelwood or housing uses to more complex buildings, homewares and packaging products and for forest ecosystem services such as clean water, carbon sequestration, recreation and social services.

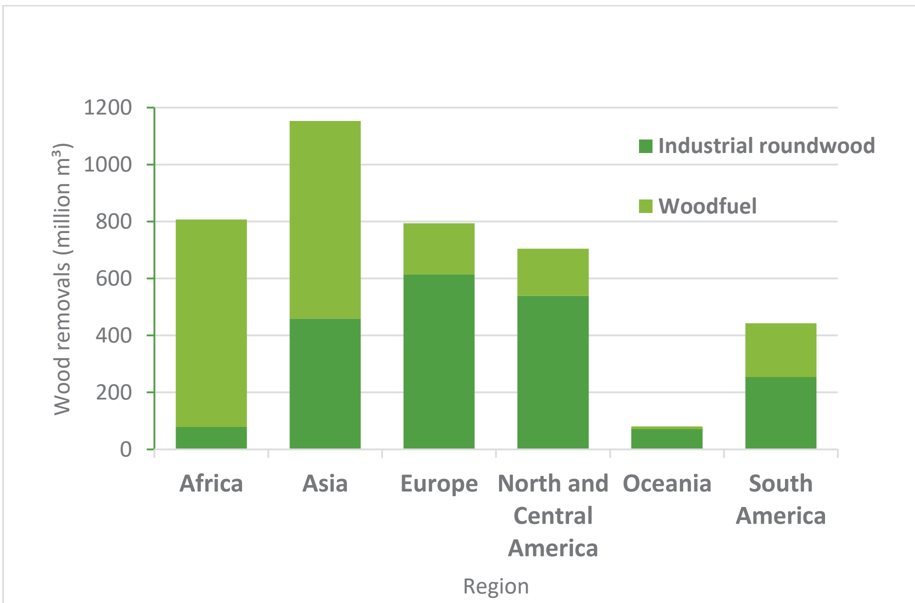


*Figure 1. Source FAOSTAT. [Accessed 1 November 2024].*

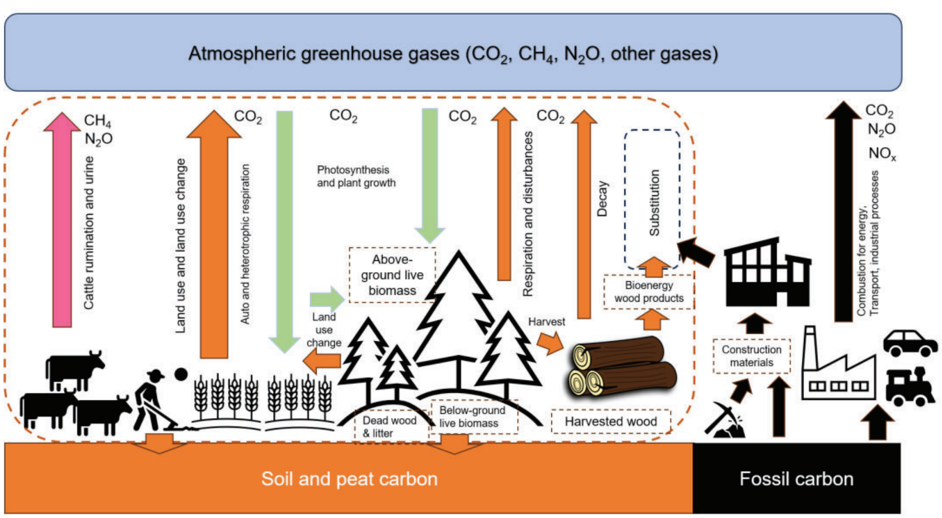


*Figure 2. Elements of the global cycle of greenhouse gases in terrestrial ecosystems Redrawn after [1].*

## 5 – FINDINGS

Results are summarised in five topics: current national reporting on carbon in wood products, global potential for increasing carbon stocks in wood products, future potential for increasing carbon stocks in wood products in the Asia-Pacific region, and data needs and uncertainties.

### 5.1 National reporting on carbon in wood products

In the Asia-Pacific region, 11 countries are industrialized and produce the bulk of greenhouse gas emissions, 11 are least developed countries, and 17 are Small Island Developing States. Between 2010 and 2019, about 20 percent of total emissions in the region were in the AFOLU sectors, a decrease from over 40 percent in 1990, mainly due to the proportional rise of energy and industrial emissions in East Asia. In the region between 2010 and 2019, AFOLU has been a net source of emissions of 5.0 (±0.4) Gt CO2-e/year [16]. The region has one of the highest potentials to increase emissions by 2050 but also the greatest potential to reduce overall emissions under the most optimistic scenarios.

Many countries in the Asia-Pacific region have incorporated forests in NDCs, but few refer directly to potential in wood products. This is probably due to challenges in assessing potential for emissions reductions. Energy efficiency and decarbonization in buildings are included as mitigation options in NDCs.

The analysis indicated that only six of 34 countries in the Asia-Pacific region currently report on net emissions from wood products to the UNFCCC. From those that do report, net emissions from wood products range from positive 7.5 percent of the national total reported by the Lao People's Democratic Republic to negative net emissions (removals) of 15.6 percent of the national total reported by New Zealand. Australia, China and Mongolia reported net negative emissions in wood products equivalent to about 1 percent of national emissions, while Japan reported net negative emissions equivalent to 0.1 percent of national emissions.

Emissions in internationally traded wood products are important. Countries in the region import and trade large quantities of wood and wood products. Under IPCC guidelines, countries can choose one of five accounting approaches to report on net emissions in traded products. The choice of approach affects emissions accounted and reported by countries and creates varying incentives for countries to produce, or to use, more wood and wood products. If countries use different approaches, emissions or removals in wood products may be double counted or missed. Trade is also important because reducing wood harvest to increase carbon stocks may result in emissions "leakage" from one country or region, resulting in no overall reduction, or even an increase, in global greenhouse gas emissions.

The reporting approach used for traded products also affects the distribution of potential benefits of higher carbon stocks in the HWP pool. Large net exporters of domestically produced wood or wood products (such as New Zealand, Papua New Guinea, Malaysia or Indonesia) are likely to prefer the production or simple decay approaches, because it allows them to account for carbon stored in the HWP pool in exported products.

However, the consistent use of these approaches across countries reduces the incentive for importing countries to increase carbon stocks in wood products. The importing country will potentially benefit from substituting wood products for materials with higher emissions intensity, but only if these products are produced in country and contribute to national emissions. Emissions from imported alternative products will not be included in national emissions. Conversely, large wood product importers (Australia, India, Japan, the Republic of Korea) will prefer to use the stock-change or atmospheric-flow approaches, as the climate benefits of increasing carbon in the HWP pool will accrue to the importing country.

### 5.2 Global potential for increasing carbon stocks in wood products

Global estimates indicate that increasing carbon in the HWP pool can make a small, but important, contribution to reducing greenhouse gas emissions. Johnston and Radeloff [17] found that carbon in wood products produced and used in countries grew by 0.34 Gt $CO_2$/year in 2015 (about 0.6 percent of the average annual anthropogenic emissions between 2010 and 2019). Including traded wood products could increase this by 0.12 Gt $CO_2$/year). Another recent study estimated that the total carbon in the global HWP pool (including traded and processed secondary wood products such as furniture) increased by 0.44 Gt $CO_2$/year between 2010 and 2015 [18]. This does not include reduced emissions due to substitution of wood for fossil energy-intensive materials.

Looking ahead, projections of carbon in the global HWP pool depend on assumptions about economic growth and product consumption. The pool can continue to


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increase if wood product consumption continues to expand, or their lifetimes are extended. However, this increased consumption needs to be supported by an increase in sustainable wood supply.

Carbon sequestration in global wood products can potentially increase to 0.44 Gt $CO_2$/year by 2030 but would slowly decline beyond 2030 because future wood supply will not be sufficient to compensate for emissions from products consumed during the rapid rise in consumption over the past 20 years [17]. This effect will vary between countries. For example, the HWP pool for some current significant wood producers, like Canada, may potentially become a source of emissions due to reduced sawnwood production and a shrinking pulp and paper industry because of high "inherited" emissions from past high levels of production.

In the longer term, the IPCC estimated a global technical potential for carbon stocks in HWPs to increase by 2050 to 1.0 Gt $CO_2$/year. However, this technical potential is constrained by economic factors and the estimated "economic potential" is 0.4 Gt $CO_2$/year, assuming a carbon price below USD 100/t[1]. Based on these figures, 0.7 to 1.7 percent of the annual global anthropogenic emissions in the decade to 2019 could have been stored each year, depending on the carbon price, not including substitution effects of using wood in buildings or bioenergy.

**5.3 Asia-Pacific regional potential**

Potential for increasing carbon stocks in wood products varies between countries in the Asia-Pacific region. Potential depends on population size and growth rate, national income, urbanization, wood production and processing capacity, and cultural attitudes towards wood adoption in economic sectors, such as the building and construction sector. In forming policy on wood products for climate mitigation, countries need to individually assess their potential and comparative advantages for use of wood products.

Assessing the potential future contribution of wood products to climate mitigation is complex. Analysis needs to include estimates of net emissions across the entire production and usage of wood and alternative products over long time frames. These assessments require data on: (i) carbon dynamics in production forests; (ii) emissions generated from producing, processing, using and disposing of different types of wood products; (iii) wood products imports and exports; and (iv) emissions from producing and using alternative products. Data and frameworks are required to compare emissions across products. Projections of future demand depend on assumptions about population and economic growth, product prices and use. Cost–benefit and trade-off analyses can assist decision-making and policy.

Developing strategies to decarbonize building materials, and formalizing targets for overall embodied carbon and/or embodied energy of buildings, also need comprehensive data collection and standardized tools and benchmarks so performance targets are set against established baselines.

The most promising options to increase carbon stocks in wood products in the next 10 to 20 years are through more efficient product processing and sustainable use of current wood supply. This includes producing more higher-value, long-lived products, such as sawn timber and engineered wood products, extending lifetimes of these products and using them to substitute for energy-intensive products.

Using wood products to reduce emissions in construction has high potential. An estimated 65 percent of global new building floor area to be constructed from 2017 to 2050 will be in Southeast Asia, China and India [18].

Assessing the effects of substitution of products on emissions requires comparative analyses using comprehensive, whole-of-system approaches that include emissions from removals in forests and emissions from production, transport, manufacture, transformation and use of wood and other products [19]. These life cycle assessments (LCAs) need independent datasets and analyses to compare emissions across products. Life cycle assessments (LCAs) indicate that construction materials such as steel, concrete and bricks have high embodied emissions, with six percent of global emissions generated from producing these materials [20]. Recent estimates indicate replacing half the conventional building materials with mass timber in expected new urban construction could reduce cumulative global emissions in construction between 2020 and 2050 by 25 percent [21].

**5.4 Data needs**

Including substitution effects of using more wood products (to replace high-emission equivalent products) in NDCs requires analysis for each country and engagement and coordination across sectors and industries. In national greenhouse gas inventories, net emissions in forests and harvested wood products are reported in land use, land-use change and forestry. Emissions from processing wood products and other materials are reported in the energy, industrial processes and waste sectors.

For wood products, LCAs fall into two types [22]: consequential LCAs (which estimate the effect on emissions of changes in system operation to produce a given quantity of product) and attributional LCAs (which estimate the absolute quantity of emissions produced over a given time frame for a given quantity of wood product). The former estimates are used to assess potential to change processes to reduce emissions. The latter estimates can be used to compare emissions from wood products with alternative products. Life cycle assessments (LCAs) need data to compare emissions across products to make valid comparisons and assess substitution effects, including on emissions from mining, processing, transport, construction, use and end-of-life disposal of alternative products.

As well as emissions generated per amount of product, these comparisons require data or assumptions about the relative quantities of a product (say concrete, steel, brick, plastic or aluminium) needed for different uses, and comparative product use lifespans. It has been argued that assumptions about these "displacement factors" used to analyse the benefits of replacing material with wood are often not supported, or only partially supported by rigorous analysis [23]. Further uncertainty is associated with assumptions about future trends in product use, which depend on projections of economic activities, consumption patterns and industry trends. A recent review of 117 studies found 15 studies evaluated the climate impact of complex product systems at the national or regional scale, with about 60 percent of these concluding that using HWPs reduces emissions, 27 percent had mixed results and 13 percent indicated that HWPs contributed to emissions, with results varying with assumptions regarding forest management practices (including harvesting methods, intensity, and rotation period), product lifespans and disposal and fossil fuel reference scenarios [24]. Only about half the studies included forest carbon stock changes.

Comprehensive analyses of emissions from solid or fibre-based wood products are also complex due to the generally long timeframes for forest growth and product lifespans and the many types of products derived at different stages of tree growth (intermediate thinning or final felling), processing and product use, including secondary products such as furniture or joinery, and end of product life reuse or disposal.

In making comparisons, the boundary of the analysis is important [25]. A complete accounting of emissions associated with production of wood products includes any changes in carbon pools in production forests, emissions during processing, product use and disposal (Figure 3). Assessing emissions reductions by replacing fossil energy with modern wood-based energy requires understanding of the carbon dynamics in wood production forests (including those from imports) and processing and transport of the energy feedstock used (most commonly wood pellets). Emission reductions from replacing fossil fuels with wood will be reported by the country where the energy is generated and accounted and reported in the energy sector.

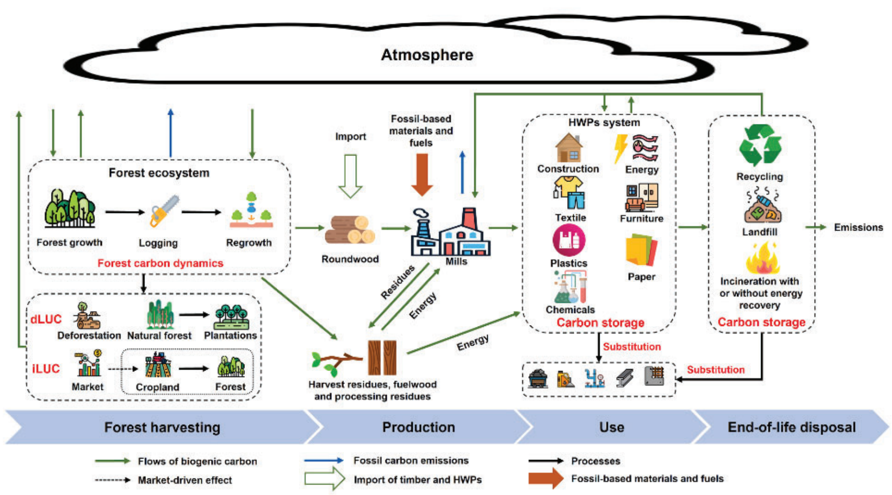


*Figure 3. System boundaries for analysis of the harvested wood products (HWPs) system From [23]*


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In the longer term, over 500 million ha of degraded forestland or marginal or retired farmland in the Asia-Pacific region could be used to expand forest area and sustainably produce more wood and wood products for use (in the region). With suitable policies, incentives, investment and production techniques, growing more trees for wood in the region can increase forest and wood product carbon stocks; contribute to forest landscape restoration goals; and generate social, economic and environmental benefits.

**5.5 Uncertainties for reporting on carbon in harvested wood products**

Most countries in the region lack reliable, consistent data and models to analyse and report on carbon in wood products. Improved data are needed on forest carbon dynamics, wood production and product processing, imports and exports, and product use and disposal. Such data have associated uncertainty. For countries with high potential to grow carbon stocks in wood products, or reduce emissions through substitution, better understanding of these uncertainties can be factored into decision-making and policy design. This can reduce the risk of unintended consequences of policy measures and incentivize and target data collection to reduce the greatest uncertainties.

To reduce uncertainty in reporting on carbon stocks and emissions in the HWP pool, countries will need robust information on wood removals, conversion factors, wood production and usage based on industry surveys. These involve errors and uncertainties in sampling, assessment methods and extent of quality control and therefore vary in data accuracy and precision [26].

In the Asia-Pacific region, collecting this data will present problems for many countries. For example, in some countries wood is generated from cropland (trees around rice paddies), farm trees or small private forests but data on wood harvested is only that reported from the state forest management organisation. A standardized approach is needed for the government and private sector to enhance monitoring and reporting systems for activity data for the LULUCF sector [27].

For countries with high potential to grow carbon stocks in wood products and reduce emissions through substitution, better understanding of uncertainties in estimates of the mitigation potential of HWPs can support better policy design and reduce the risk of unintended consequences of policy measures. A clear understanding of uncertainties, and the value of certain types of information in reducing those uncertainties, will incentivize and enable targeting of data collection.

Uncertainties in country estimates of carbon stocks, stock changes and emissions in HWPs include unknowns, measurement errors and sampling issues related to:

- quantities of wood produced from forests and from outside forests;
- amounts of wood going into different products;
- quantity and fate of wood left in forests;
- rates of recovery during product processing;
- extent and use of biomass residues;
- informal, unregulated or illegal removals of wood for fuel and the proportion of that wood that comes from harvested trees versus from collected sticks and branches;
- conversion factors from timber volume to mass and from wood mass to carbon;
- amount of wood traded (in raw logs, chips or semi-processed or processed products); and
- decay rates and half-lives for HWP categories, including products and lifespans in the country of use (domestic or export).

Uncertainties can also come from assumptions about end of life of wood products, including recycling, energy generation or landfill disposal, and assumptions about landfill emissions. Landfills with anaerobic conditions may contain and store carbon but also produce methane. Trade-off and cost–benefit analyses can also assist decision-making and policy to reduce emissions.

Determining quantities of wood harvested in the past (prior to extensive industry surveys on wood removals and processing) needed to initialize accounting models with products in long-term storage can also be a challenge.

**5.5 Policies and carbon trading**

A mix of policies and other measures can support more use of wood products for climate mitigation. Policy options include regulatory changes to product standards and building codes; incentives for sustainable wood production; incentives and guidelines for specifying wood in buildings (including public buildings); education programmes for architects and builders; and increasing the capacity to grow, process and use wood products.

Carbon offset markets provide a mechanism to incentivise increased carbon in wood products. These markets operate in two forms: (i) regulated markets that require certain entities (private or publicly owned companies, government businesses enterprises and large emitters) to meet legally prescribed emissions targets, and (ii) voluntary markets where entities (for example, companies, non-government organizations or individuals) take on self-motivated commitments to reduce emissions. Regulated markets include emissions trading schemes (ETS) such as those in China, the European Union (EU) Emissions Trading Scheme (ETS), Indonesia (Carbon Exchange), New Zealand, the Republic of Korea, California (the Compliance Offset Program) and Japan (J-Credit Scheme). Voluntary market offset providers include Gold Standard, Plan Vivo, Puro Earth, and Verra. Other types of activity include the Thailand Voluntary Emission Reduction Program [28].

The carbon market in Australia has largely operated through government purchase of accredited, voluntarily supplied emission reduction units (Australian carbon credit units). This is being transformed to a fully-fledged private market under the "safeguards mechanism" used to impose more stringent emission reduction requirements on large emitters. The United Kingdom of Great Britain and Northern Ireland (UK) has a regulated Woodland Carbon Code that provides a platform for voluntary carbon trading in forest carbon project offsets. The EU ETS does not currently include forest-based projects. This may change with the recent agreement in the European Parliament to establish a certification framework for permanent carbon removals, for carbon farming and carbon storage in products [29]. The European Commission will produce a report on the feasibility of certifying activities that result in the reduction of emissions, including permanent carbon removal (storing atmospheric or biogenic carbon for several centuries) and temporary stores of carbon in long-lasting products (such as wood-based construction products) for a duration of at least 35 years.

Emission and removals in the HWP pool are included in some regulated market instruments. For example, Australian carbon credit units generated using the plantation forestry method include delayed emissions for carbon stored in wood products. The proportion of harvested wood going to these products varies with the species, harvest interval, rotation length and region and these are specified in the accounting model, Full Carbon Accounting Model (FullCAM) [30]. Carbon stock changes in HWPs is not included in accounting for credits in planted forests in the New Zealand ETS.

A review of the potential to incorporate the HWP pool in the UK Woodland Carbon Code [31] recommended a system of temporary carbon units based on the expected lifespan of different product types (softwood, hardwood, etc.) using a simple approach that accounts for carbon storage benefits over a fixed time horizon (e.g. the longest lifespan of the different product types). This system has not yet been implemented.

Despite the technological potential [32], the effects of increasing carbon stocks in the HWP pool, or for using wood products in place of materials with higher embodied emissions are not currently included in forest carbon accounting for any regulated or voluntary carbon market mechanism. Emissions from harvested products are used in some cases to determine baseline emissions (the assumed trajectory of emissions in the absence of a project). These projects also need to account for leakage of emissions from activities within the project area (such as timber harvesting or deforestation) to outside the project boundary.

One challenge is allocation of credits for storage in wood products between forest owners and wood processors or users in a way that provides incentives to enhance the supply and quality of wood, and the carbon storage benefits per unit of wood used. In the case of renewable energy projects, the project developer running a renewable energy plant, who is generally not the forest owner, receives the carbon credits [33]. In a 2018 discussion paper [34], the New Zealand Government found that, at the national level, international accounting recognized the contribution of HWPs and that the value of this in carbon credits was NZD 16.8 million/year (given a carbon price at that time of NZD 21/t).

Two options were put forward to distribute this value: (i) using an "average value" to issue additional credits to planted forest projects planned for harvest, or (ii) creating an "industry good" fund targeted at encouraging the forestry sector to develop longer-lived HWPs. It was considered that the first would not deliver a direct incentive for any particular use for HWPs because it is too difficult to track wood from individual projects through to end use. The second was considered more likely to improve the contribution of HWPs to international targets. Increasing interest from, and pressure on, corporate entities to reduce emissions is driving the development of target setting and disclosure at the corporate level with reporting in different formats to NGHGIs or traded carbon credit units.

A suite of alternative assessment programmes is being developed to support disclosure and target setting for greenhouse gas emissions. These include the Task Force on Climate-related Financial Disclosures (TCFD), and the Science Based Targets Initiative (2024), which uses the Greenhouse Gas Protocol (2024) Land Sector and


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Removals Guidance to support target setting and corporate reporting.

New international accounting standards and frameworks [35] aim to incorporate sustainability measures into corporate accounting practices to inform investors through common standards for sustainability-related disclosures. Emissions reporting includes Scope 1 (directly generated by the company), Scope 2 (generated indirectly from inputs) and Scope 3 (generated from downstream use of products or services) emissions. The International Organization for Standardization [36] has released a draft standard for greenhouse gas dynamics in wood and wood-based products that specifies how calculations of different parts can be combined into a carbon balance calculation for the entire value chain related to wood and wood-based products. These different corporate standards and reporting requirements do not directly align with national reporting requirements. Reconciling corporate and national reporting will present challenges for interpreting collective actions to reduce emissions and avoiding gaps or double counting, particularly when corporations operate in multiple jurisdictions, or their products move across national boundaries.

## 6 – CONCLUSIONS AND RECOMMENDATIONS

Carbon stored in wood products is an important global carbon pool. This pool is affected by various factors: socioeconomic, technological and environmental, including the impacts of climate change on forests and on the wood products pool. Increasing the size of this pool in the Asia-Pacific region can potentially contribute to international targets for net zero emissions. Using more long-lived wood products such as engineered wood and sawn timber in construction presents the greatest opportunity to increase this carbon pool and reduce emissions, particularly when these substitute for fossil energy-intensive building products. More efficient utilization of harvested wood and reduced emissions from harvesting, transport and processing can also contribute to emissions reductions. Realizing these climate benefits of wood products is constrained by availability of sustainably- produced forest biomass, the feasibility of large-scale substitution, and trade-offs with environmental, economic and social impacts.

Assessment of potential to reduce emissions using wood products needs to consider complete production systems for wood and alternative products, including forest carbon stock changes, land-use change emissions, emissions at the end of product life, and those from internationally traded products. The time horizon for analysis is also important. A short-term (<30 year) analysis can result in quite different conclusions from those considering a longer-term view. Countries in the region that wish to explore their potential need improved data on wood and product supply from different sources (including imports), product types and processing techniques, product lifetimes and fate of products at the end of life. More research is needed to support these assessments and to initiate accounting and reporting on emissions and removals in the HWP pool.

Policies to promote sustainable timber production, industry development and growth in production capacity of new construction materials include incentives for forest certification, support for value chain management, consumer behaviour campaigns, public procurement policies, carbon pricing, tax incentives, subsidies, and construction sector regulations. Construction sector regulations can include recognition of technical advances in wood construction, harmonization of fire protection, and environmental product disclosure statements and regulations.

International organizations supporting countries on their climate mitigation and adaptation plans can play an important role in providing systematic and comprehensive frameworks for countries to collect and report data on carbon in forests and on wood product processing, use and trade. These data can inform national analyses and reporting and support decisions in international processes. International organizations can support knowledge sharing between countries in the region, capacity development and adoption of models and tools for analysis, as well as supporting wood product value adding and value chains.

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