

ESG Summer series

Dead or alive – the worth of a tree

Free to View
ESG - Global

- ◆ Economically speaking, cutting down a tree and selling it makes sense as it contributes to jobs, raw materials and global trade
- ◆ However, environmentally, trees perform so many functions that ecosystems and biodiversity would collapse without them
- ◆ Many carbon credit projects rely on forestry, but investors are becoming more aware of the risks that could impact tree value

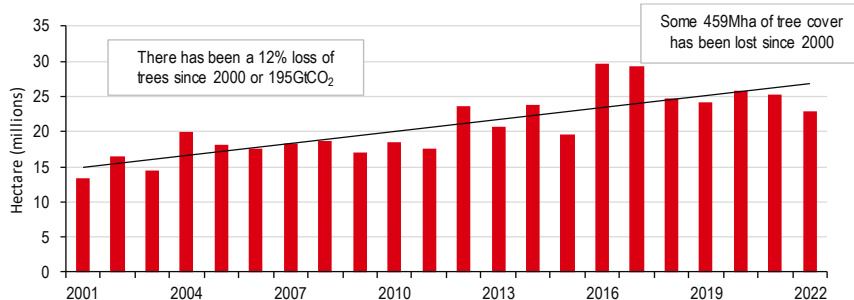
This is the 2nd report in our [ESG summer series](#) – looking at sustainability issues in less obvious places. These issues could grow to become bigger trends in the future.

Money for nothing: Consider this, in purely economic terms, a tree is worth more dead than alive. A tree that has been harvested (cut down) results in wood that can be sold for processing into goods – those can be further sold, generating economic value. A living tree, however, cannot readily be sold for economic gain (unless it produces fruit or nuts). Nonetheless, these are just the tangible direct benefits that do not consider the environmental functions of a tree.

Nothing for money: Consider this, in environmental terms, a tree is worth more alive than dead. A living tree absorbs CO₂, produces oxygen, stabilises the soil, and provides a habitat to birds and other wildlife. Collectively, a forest is a vital part of many ecosystems as forests provide shade to animals and other plants, regulate the local temperature, are critical to the water cycle, including holding water and generating rainfall. In urban areas, they can also act as sound barriers, air purifiers, and offer protection from storms, winds and flooding. The functions of trees and forests are many – both locally and globally – but can we put a price on them.

Climate solution or climate problem? Many consider planting trees as a solution to solving climate change – and it can and should be part of the solution. For example, trees can absorb and store significant amounts of carbon in their biomass (roots, branches and trunks) and help to keep CO₂ out of the atmosphere (where it causes global warming). Many national and corporate climate plans involve planting trees as an offset to emissions. However, there are multiple layers of complexity when considering species, interactions within ecosystems, carbon storage and what happens when things go wrong, including forest fires and insect infestations.

Figure 1: The loss in global annual tree cover has been increasing this century



Source: Global Forest Watch

This is a Free to View version of a report with the same title published on 13-Jul-23. Please contact your HSBC representative or email AskResearch@hsbc.com for more information.

Wai-Shin Chan, CFA

Head, Climate Change Centre; Head, ESG Research
The Hongkong and Shanghai Banking Corporation Limited

Polo Heung

Associate, ESG Research
The Hongkong and Shanghai Banking Corporation Limited

Anushua Chowdhury

ESG Research
HSBC Securities and Capital Markets (India) Private Limited

Disclosures & Disclaimer

This report must be read with the disclosures and the analyst certifications in the Disclosure appendix, and with the Disclaimer, which forms part of it.

Issuer of report: The Hongkong and Shanghai Banking Corporation Limited

View HSBC Global Research at:
<https://www.research.hsbc.com>

Value of trees – more than on paper

On paper, standing forests do not contribute much to the economy unless harvested...

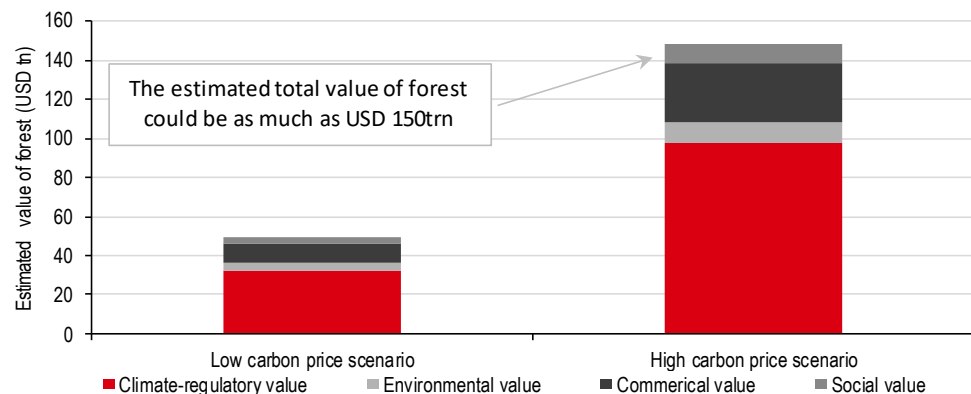
Paper value: GDP or Gross Domestic Product is the most commonly used measure of the health an economy. As a contributor to GDP, however, the conservation of trees and forests is tiny. On the contrary, logging trees for timber creates jobs for lumberjacks, generates revenue and consumption through trading, contributing to GDP, on paper, at least. However, GDP does not accurately reflect the value of trees to the wider economy, through ecosystem benefits. For example, through transpiration, forests regulate the water cycle and precipitation, which are essential to several sectors, e.g., agriculture, energy and industrials. The Boston Consulting Group¹ estimates the total value of the world's forests to be USD50trn to USD150trn (Figure 2) due to their:

- 1) climate regulatory function
- 2) environmental benefits
- 3) social value
- 4) commercial output

All four components are interlinked, but only the commercial output component tends to be quantified through the manufacturing and trading of forest-originated products, such as pulp, paper and medical raw materials.

...however, this is because it is difficult to put a number on the value of the functions that forests perform

Figure 2: The world's forests could be 1.5x the value of total assets under management*



Source: BCG, HSBC. *If total assets under management (AUM) around the world are roughly USD100trn.

Environmental value: The numerous environmental and ecosystem benefits derived from forests are much less easily quantified. Forests provide habitat for many of the world's 60,000-73,000 tree species but also for around 80% of amphibian species, 75% of bird species, 68% of mammal species, and countless species of fungi. For example, it is estimated that 60% of all vascular plants occur in tropical forests². Some estimates find that one third of the 73,000 tree species are under threat from extinction.

Social value: The diverse range of habitats sustained by forests contribute to cultural services, pharmaceutical purposes and agricultural production. However, the social value of forests is also not fully reflected in conventional economic indicators. Apart from recreational activities and eco-tourism, forests provide intangible benefits, such as psychological, mental health support and well-being. Studies suggest beneficial therapeutic effects of forest-based interventions on cardiovascular system, immune system, and mental disorders, such as depression and anxiety³.

¹ BCG, The Staggering Value of Forests – and How to Save Them, 9 June 2020

² Food and Agriculture Organization of the United Nations (FAO), The State of the World's Forests 2022: Forest pathways for green recovery and building inclusive, resilient and sustainable economies, 27 September 2022

³ Stier-Jarmer et al., The Psychological and Physical Effects of Forests on Human Health: A Systematic Review of Systematic Reviews and Meta-Analyses, 11 February 2021

Do we have enough land to plant all the trees required in the net zero strategies of countries and companies?

The (over)reliance of trees in net zero targets and strategies

Many national and corporate climate strategies include tree planting projects to remove atmospheric carbon dioxide to balance out emissions. One study finds that 112 countries are relying on carbon dioxide removal, including land and forest restoration, and reforestation in their climate mitigation pledges⁴. This would require c633m hectares (ha) of land to establish new forests, reforestation or plantations – the required land area is larger than India and would account for more than 4.5% of the global land area (excluding ice and barren rock).

In other examples, by 2025 China plans to raise the forest coverage rate by 24.1% and the forest stock volume (the total volume of living tree stems) by 19bn m³. We estimate it could absorb c4% of annual emissions in the period of 2021-25. Also, New Zealand projects total exotic and native afforestation to reach 500,000 ha and 280,000 ha in 2021-35; however, New Zealand's independent climate advisor expressed concerns over the reliance on planting trees to reach net zero targets⁵.

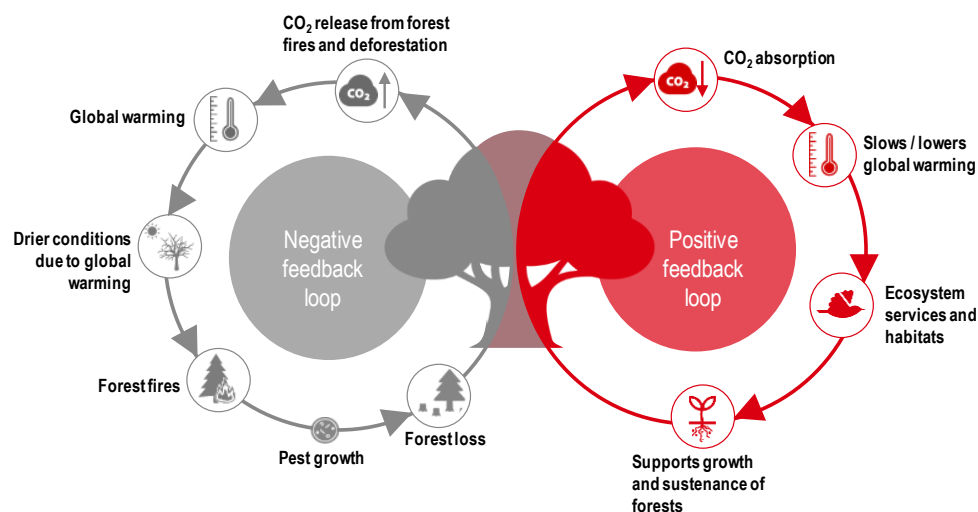
Nature-based removals are also commonly included in corporate net zero strategies. For instance, Shell and ENI plan to sequester 120Mt⁶ and 20Mt of CO₂ respectively from nature-based solution (NbS) annually by 2030. Oxfam estimated that the two plans together would need 19m ha of area⁷, which is more than the size of Cambodia.

The circularity of trees and carbon – a sink and a source

There is a feedback loop with trees and carbon – this can be positive or negative

Tree circles: Generally speaking, more carbon stays in a tree whilst it is alive. In a positive feedback loop – trees absorb carbon, slow or lower global warming and provide functional ecosystems and habitats for millions of species, which then perform other useful functions, allowing forests and trees to thrive, and to absorb even more carbon. In a negative feedback loop – global warming causes drier conditions, which fuel forest fires and cause pests to multiply/migrate, causing further deforestation and tree decay, which, in turn, releases more CO₂ and causes more global warming (Figure 3).

Figure 3: The positive and negative circularity of trees and carbon



Source: HSBC. Note: This is merely a slice of the overall carbon cycle.

⁴ Dooley et al., The Land Gap Report, 2022

⁵ He Pou a Rangi Climate Change Commission, Aotearoa New Zealand must build momentum on climate action, 26 April 2023

⁶ Shell, Shell accelerates drive for net-zero emissions with customer-first strategy, 12 February 2021

⁷ Oxfam, Tightening the Net: Net zero climate targets – implications for land and food equity, 3 August 2021

When trees burn or decay, the carbon stored is released into the atmosphere in the form of CO₂ or methane (CH₄)

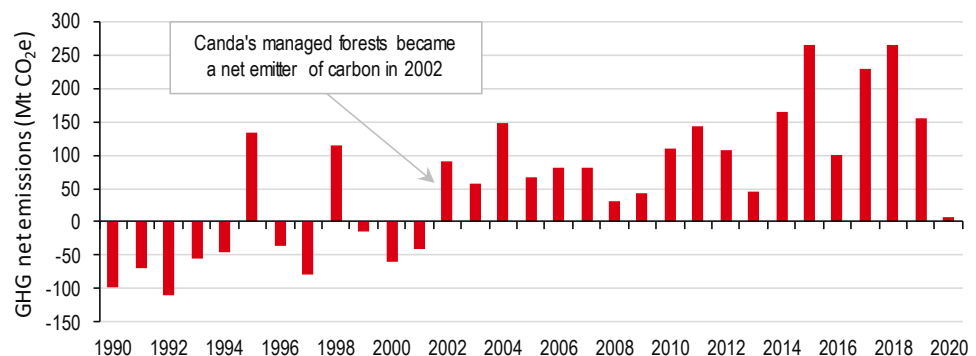
Pests, combined with fires, can turn forests into net emitters of carbon

Fires: Trees can sometimes be a source of carbon emissions instead of a carbon sink. For example, scientists estimate that approximately 1.76bn tons of CO₂ were released from wildfires in North America and Eurasia in 2021⁸. In addition to natural wildfires, some fires are anthropogenic and not naturally occurring. In 2019, the Amazon Basin suffered one of the worst forest fires in a decade. Due to the naturally high moisture content of the forest, the fire was linked to the clearing of forests through 'slash and burn' tactics – the most common method used to clear land for cattle ranching, agriculture, mining, and logging.

Pests: Insect infestation is another serious event that can damage and kill trees – resulting in the release of sequestered carbon. A Nature Conservancy study found that forests damaged by insects sequestered 69% less carbon than undamaged forests in the US⁹, and led to nearly 50 MtCO₂ more released into the atmosphere annually. *Note: Although insect numbers are generally on the decline globally, warmer temperatures can cause species migration (so that pests appear in new locations) or can enable more pests to survive the winter and not only reproduce more but reproduce more often.*

According to the State of Canada's Forest Annual Report 2022 published by Natural Resources Canada, the department of the Canadian government responsible for natural resources, Canada's managed forests have been a net source of emissions, since 2002 when forest fires and insect infestation are taken into account (Figure 4).

Figure 4: Net carbon emissions in Canada's managed forests (1990-2020)



Source: Natural Resources Canada, HSBC

Tree planting is not always good for the environment

Not every tree species is suitable for tree planting projects

Species count: The selection of tree species is critical to the carbon storage potential and other environmental benefits. As reported by one scientific study, planting non-native species could reduce the carbon sequestration rate and accelerate the releases of carbon dioxide from the soil by 150% or more¹⁰. Also, exotic species compete for resources like water and nutrients with local species. This unnatural competition could result in a decline in overall biomass and carbon storage capacity, as well as the disruption to the local ecosystem and biodiversity. That said, careful consideration of tree species is important as some non-native species may be better able to cope with a changing climate (and, as such, long-term survival). The ratio of native to non-native trees is heavily debated by scientists.

⁸ Zheng et al., Record-high CO₂ emissions from boreal fires in 2021, 2 March 2023

⁹ The Nature Conservancy, Tree-Killing Pests Across the United States Are Increasing the Threats of Climate Change, 19 October 2021

¹⁰ Waller et al., Biotic interactions drive ecosystem responses to exotic plant invaders, 29 May 2020

The spice of life: Furthermore, monoculture (single species) planting is common in forestry projects since fast-growth species are often chosen and monoculture planting is less costly than mixed-species planting. However, the carbon storage volume of mixed planting is substantially higher than monoculture planting. Studies show that monoculture plantations are more susceptible to pests and diseases¹¹. For example, pathogens could more easily colonise, replicate and spread around monoculture forests with a uniform genetic composition – therefore, the importance of species and genetic diversity when it comes to an ecosystem to give it more resilience to changing conditions.

True climate benefits might take more than 10 years to materialise

Carbon patience: Tree planting projects do not generate net climate benefits from the onset. It might take more than 10 years for a programme to demonstrate true climate impacts (as originally envisaged before planting). For instance, a study in California found that carbon accumulated in offset projects in the State of California had not been additional to a business-as-usual scenario in the projects' first 10 years¹². Therefore, management and monitoring are important to ensure genuine climate benefits from tree planting projects. However, Yale University reported that only 18% of tree planting organisations reported any monitoring work and only 5% reported the tree survival rate¹³.

Carbon credit schemes (especially the voluntary carbon markets) rely heavily on forestry projects

Tree planting, forests and carbon credits

Planting trees and forests are a major source of carbon credits – for use in the compliance and voluntary carbon markets. There is much discussion on the integrity of carbon credits from forestry (*not for this report*). So, assuming a credible forestry project has generated carbon credits that are sold in the markets, in theory, these credits represent a tonne of CO₂e that has been removed from the atmosphere – and once the credits are sold, they should be cancelled so as not to be sold again as the CO₂ removal has been completed (once). However, forest fires and insect infestations not only threaten the trees but also the integrity of the carbon credits generated from their planting/growth. In other words, if there is a forest incident, what should happen to the carbon credits? This is not something that has been agreed in the carbon markets yet. For example, CarbonPlan estimates that the 2020 and 2021 wildfire seasons in California are likely to fully deplete the credits currently in the buffer pool from California's forest offset programme, which were intended to cover all risks over a 100-year period¹⁴.

Conclusion

Trees play a crucial part of many ecosystems as they provide habitats for countless species of animals and plants (and fungi). Their contribution to the economy is not always valued (or correctly attributed, in our view) as their functions are difficult to monetise. The circularity of trees and carbon can be both positive and negative as they enter into a feedback loop.

Tree planting should be done with careful consideration to species, especially as this can make or break a local ecosystem but also be part of the evolution of an ecosystem as the planet warms. Trees have to mature (around 10 years or more, depending on the species) before the carbon trees remove from the atmosphere is considered to be secure. This has implications for countries and companies that intend to rely on carbon credits to reach their climate and net zero goals. We think investors are becoming much more aware of these aspects as they engage with businesses over the implementation of their carbon strategies. In our view, a tree is worth so much more alive.

¹¹ Liu et al., Mixed-species versus monocultures in plantation forestry: Development, benefits, ecosystem services and perspectives for the future, 15 July 2018

¹² Coffield et al., Using remote sensing to quantify the additional climate benefits of California forest carbon offset projects, 12 September 2022

¹³ Martin et al., People plant trees for utility more often than for biodiversity or carbon, 7 July 2021

¹⁴ CarbonPlan, California forest carbon buffer pool update, 1 December 2022

ESG Summer series

[Ice cream: deliciously sustainable?](#) 6 July 2023

Disclosure appendix

The following analyst(s), who is(are) primarily responsible for this document, certifies(y) that the opinion(s), views or forecasts expressed herein accurately reflect their personal view(s) and that no part of their compensation was, is or will be directly or indirectly related to the specific recommendation(s) or views contained in this research report: Wai-Shin Chan, CFA, Polo Heung and Anushua Chowdhury

This document has been issued by the Research Department of HSBC.

HSBC and its affiliates will from time to time sell to and buy from customers the securities/instruments, both equity and debt (including derivatives) of companies covered in HSBC Research on a principal or agency basis or act as a market maker or liquidity provider in the securities/instruments mentioned in this report.

Analysts, economists, and strategists are paid in part by reference to the profitability of HSBC which includes investment banking, sales & trading, and principal trading revenues.

Whether, or in what time frame, an update of this analysis will be published is not determined in advance.

For disclosures in respect of any company mentioned in this report, please see the most recently published report on that company available at www.hsbcnet.com/research.

Additional disclosures

- 1 This report is dated as at 13 July 2023.
- 2 All market data included in this report are dated as at close 12 July 2023, unless a different date and/or a specific time of day is indicated in the report.
- 3 HSBC has procedures in place to identify and manage any potential conflicts of interest that arise in connection with its Research business. HSBC's analysts and its other staff who are involved in the preparation and dissemination of Research operate and have a management reporting line independent of HSBC's Investment Banking business. Information Barrier procedures are in place between the Investment Banking, Principal Trading, and Research businesses to ensure that any confidential and/or price sensitive information is handled in an appropriate manner.
- 4 You are not permitted to use, for reference, any data in this document for the purpose of (i) determining the interest payable, or other sums due, under loan agreements or under other financial contracts or instruments, (ii) determining the price at which a financial instrument may be bought or sold or traded or redeemed, or the value of a financial instrument, and/or (iii) measuring the performance of a financial instrument or of an investment fund.

Disclaimer

Issuer of report**The Hongkong and Shanghai Banking Corporation Limited**

This document has been issued by The Hongkong and Shanghai Banking Corporation Limited, which has based this document on information obtained from sources it believes to be reliable but which it has not independently verified. Neither The Hongkong and Shanghai Banking Corporation Limited nor any member of its group companies ("HSBC") make any guarantee, representation or warranty nor accept any responsibility or liability as to the accuracy or completeness of this document and is not responsible for errors of transmission of factual or analytical data, nor is HSBC liable for damages arising out of any person's reliance on this information. The information and opinions contained within the report are based upon publicly available information at the time of publication, represent the present judgment of HSBC and are subject to change without notice.

This document is not and should not be construed as an offer to sell or solicitation of an offer to purchase or subscribe for any investment or other investment products mentioned in it and/or to participate in any trading strategy. It does not constitute a prospectus or other offering document. Information in this document is general and should not be construed as personal advice, given it has been prepared without taking account of the objectives, financial situation or needs of any particular investor. Accordingly, investors should, before acting on it, consider the appropriateness of the information, having regard to their objectives, financial situation and needs. If necessary, seek professional investment and tax advice.

The decision and responsibility on whether or not to purchase, subscribe or sell (as applicable) must be taken by the investor. In no event will any member of the HSBC group be liable to the recipient for any direct or indirect or any other damages of any kind arising from or in connection with reliance on any information and materials herein.

Past performance is not necessarily a guide to future performance. The value of any investment or income may go down as well as up and you may not get back the full amount invested. Where an investment is denominated in a currency other than the local currency of the recipient of the research report, changes in the exchange rates may have an adverse effect on the value, price or income of that investment. In case of investments for which there is no recognised market it may be difficult for investors to sell their investments or to obtain reliable information about its value or the extent of the risk to which it is exposed. Some of the statements contained in this document may be considered forward looking statements which provide current expectations or forecasts of future events. Such forward looking statements are not guarantees of future performance or events and involve risks and uncertainties. Actual results may differ materially from those described in such forward-looking statements as a result of various factors.

This document is for information purposes only and may not be redistributed or passed on, directly or indirectly, to any other person, in whole or in part, for any purpose. The distribution of this document in other jurisdictions may be restricted by law, and persons into whose possession this document comes should inform themselves about, and observe, any such restrictions. By accepting this report, you agree to be bound by the foregoing instructions. If this report is received by a customer of an affiliate of HSBC, its provision to the recipient is subject to the terms of business in place between the recipient and such affiliate. The document is intended to be distributed in its entirety. Unless governing law permits otherwise, you must contact a HSBC Group member in your home jurisdiction if you wish to use HSBC Group services in effecting a transaction in any investment mentioned in this document.

Certain investment products mentioned in this document may not be eligible for sale in some states or countries, and they may not be suitable for all types of investors. Investors should consult with their HSBC representative regarding the suitability of the investment products mentioned in this document.

HSBC and/or its officers, directors and employees may have positions in any securities in companies mentioned in this document. HSBC may act as market maker or may have assumed an underwriting commitment in the securities of companies discussed in this document (or in related investments), may sell or buy securities and may also perform or seek to perform investment banking or underwriting services for or relating to those companies and may also be represented on the supervisory board or any other committee of those companies.

From time to time research analysts conduct site visits of covered issuers. HSBC policies prohibit research analysts from accepting payment or reimbursement for travel expenses from the issuer for such visits.

The Hongkong and Shanghai Banking Corporation Limited is regulated by the Hong Kong Monetary Authority.

© Copyright 2023, The Hongkong and Shanghai Banking Corporation Limited, ALL RIGHTS RESERVED. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, on any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of insert issuing entity name. MCI (P) 017/01/2023, MCI (P) 027/10/2022

[1216722]