BACKGROUND PAPER

Asia-Pacific Climate Report 2025

Climate Mitigation Potential of Forests in Asia and the Pacific

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Climate Mitigation Potential of Forests in Asia and the Pacific

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Highlights:

- ***The total mitigation potential of forests in Asia and the Pacific is large.***
  - Seven mitigation strategies could reduce emissions by up to 151.7 gigatons of carbon dioxide ($GtCO_2$) over 30 years, of which 69.6 $GtCO_2$ (46%) is achievable below an estimated cost of $100 per ton of CO_2.
- ***Asia and the Pacific plays a critical role in achieving global climate mitigation goals.***
  - The 46-economy region offers 28% of the global forest-based climate mitigation potential—second only to Latin America (33%).
  - Asia and the Pacific ranks among the top-three world regions in mitigation potential from avoided deforestation and reforestation, and leads globally in mitigation potential from forest management, avoided peat degradation, peat restoration, avoided mangrove conversion, and mangrove restoration.
  - Eight countries in Asia and the Pacific rank among the top 25 globally for forest-based mitigation potential: Indonesia (#2), the People's Republic of China (#6), India (#7), Malaysia (#13), Myanmar (#14), Papua New Guinea (#15), Thailand (#20), Viet Nam (#22).
- ***Forests are important for national climate mitigation goals throughout Asia and the Pacific.***
  - In 12 economies, forests account for more than 50% of total climate mitigation opportunity.
  - In 30 economies, forests account for more than 10% of total climate mitigation opportunity.
- ***The largest opportunities for climate mitigation lie in avoided deforestation*** (41% of mitigation potential below $100/$tCO_2$) ***and avoided peat degradation*** (26%), followed by ***forest management*** (11%), ***reforestation*** (11%), and ***peat restoration*** (10%).
  - Although total mitigation potential from avoided mangrove conversion and mangrove restoration is smaller overall, the mitigation potential from these strategies is relatively large on a per-hectare basis, and Asia and the Pacific offers 81% of the global mitigation potential from avoided mangrove conversion and mangrove restoration
- NB: A companion background paper covers related topics, such as how to achieve and fund forests' potential for climate mitigation, biodiversity conservation, and other ecosystem services.

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Abbreviations

CO_2	–	carbon dioxide
$GtCO_2$	–	gigaton of carbon dioxide
ha	–	hectare
IPCC	–	Intergovernmental Panel on Climate Change
PRC	–	People's Republic of China
tCO_2	–	ton of carbon dioxide

Note: In this report, “$” refers to United States dollars

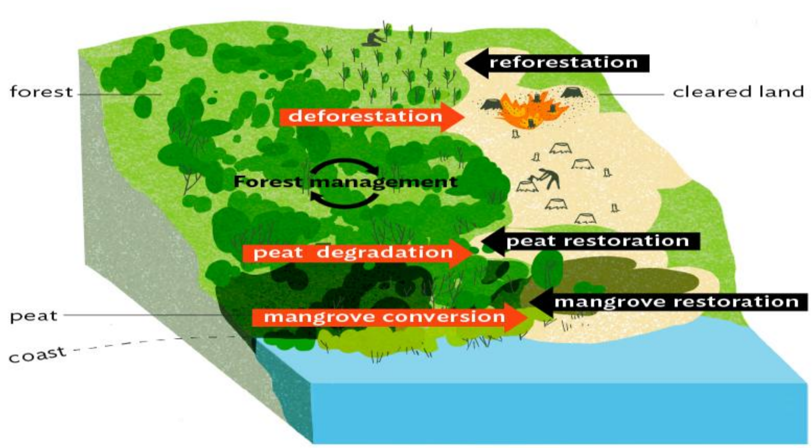
Introduction

Forests affect the carbon balance of the atmosphere in two primary ways. As trees grow, they absorb carbon dioxide from the atmosphere and convert it to carbon stored in biomass (e.g., roots, trunks, branches, and leaves) through photosynthesis. When trees die, decay, or burn, this carbon oxidizes and is released back into the atmosphere as carbon dioxide.

Between 2001 and 2023, global forests provided a net carbon sink of 5.5 gigatons of carbon dioxide ($GtCO_2$) per year, with emissions to the atmosphere at 9.0 $GtCO_2$ per year outweighed by removals from the atmosphere totaling 14.5 $GtCO_2$ per year (Gibbs et al. 2025). However, this net sink has been decreasing over time as deforestation emissions have increased (Gibbs et al. 2025), contributing to global climate change.

People can mitigate climate change by reducing forest loss or increasing forest gain. There are multiple strategies for mitigating climate change using forests, depending on how and where the forest loss or gain takes place (**Figure 1**). This paper presents the estimated mitigation potential of seven strategies. First, people can reduce or avoid **deforestation**, which is the conversion of forested land to non-forested land, such as cropland or pastureland. Second, they can increase or accelerate **reforestation**, which involves returning non-forested land to forest, or **afforestation**, the conversion of land that has not been forested for many decades, or ever, into forest. Third, people can increase the carbon stored within forest biomass through improved **forest management**, which includes reducing forest degradation, and the loss of carbon stocks within forests. Note that the term forest degradation may also refer to the loss of forests' other, non-carbon services in some contexts.

Figure 1: Illustration of Seven Forest-Based Climate Mitigation Strategies



Source: Author's conception (Image by Kseniia Goniaeva and Christian Fischer).

Two carbon-rich forest ecosystems are particularly significant for climate mitigation on a per-area basis, and climate mitigation strategies for these ecosystems are calculated and presented separately. Peat swamp forests, characterized by a deep-water table and carbon-rich soil, face severe risks when cleared for agriculture. Often, they are drained by cutting channels, which dries and contracts the peat soil, making it flammable and vulnerable to hard-to-extinguish fires. The fourth mitigation strategy, avoiding **peat degradation**, aims to prevent carbon loss from both the trees and the soil. A fifth strategy, **peat restoration**, involves restoring the ecosystem's trees, soil, and water table. Mangroves, coastal forests inundated by seawater or brackish water, have especially carbon-dense soil as well. In a sixth mitigation strategy, people can reduce or involve **mangrove conversion** from forests to other coastal land uses, such as aquaculture. The seventh strategy, **mangrove restoration**, focuses on restoring forest cover and hydrological function to once-forested coastlines.

The estimates of potential climate mitigation from forests presented here are calculated for the 46-economy region referred to as "Developing Asia" or "Asia and Pacific" by the Asian Development Bank.[1] These estimates are derived from economy-specific data obtained by the author from Roe et al. (2021). This source has several positive features. It provides data across 20 land-based mitigation strategies and offers comprehensive national-level data across economies. It was developed through collaboration among more than 30 scientists and served as the basis for the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (IPCC 2022). While this source synthesized the best available science at the time, research in this field is continually advancing, and where available, estimates from other published sources are included for comparison. For the purposes of the calculations in this paper, forests are defined as in Roe et al. (2021). However, see Box 1 for discussion of alternative definitions of forests.

Protecting and restoring forests has benefits and implications that extend far beyond carbon. Co-benefits include biodiversity conservation, clean water provision, and disaster risk reduction. Mangrove forests, in particular, offer essential co-benefits, such as protection against storm surges and serving as nurseries for coastal fisheries. These co-benefits and their implications are discussed in a companion background paper, which also covers conservation strategies and financing, benefit sharing, stewardship, transitions, trade-offs and synergies between carbon and biodiversity, among other topics.

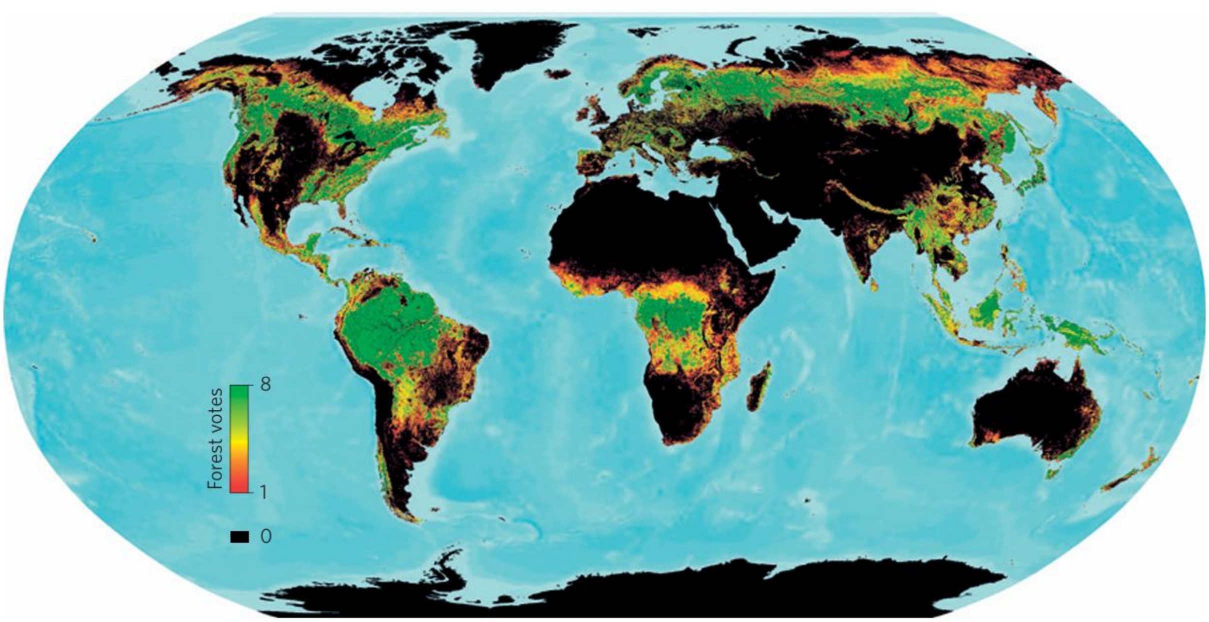
[1] In these calculations, "Developing Asia" or "Asia and the Pacific region includes 46 economies: Afghanistan; Armenia; Azerbaijan; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; the People's Republic of China; the Cook Islands; Fiji; Georgia; Hong Kong, China; India; Indonesia; Kazakhstan; Kiribati; the Republic of Korea; the Kyrgyz Republic; the Lao People's Democratic Republic; Malaysia; Maldives; the Marshall Islands; the Federated States of Micronesia; Mongolia; Myanmar; Nauru; Nepal; Niue; Pakistan; Palau; Papua New Guinea; the Philippines; Samoa; Singapore; Solomon Islands; Sri Lanka; Taipei,China; Tajikistan; Thailand; Timor-Leste; Tonga; Turkmenistan; Tuvalu; Uzbekistan; Vanuatu; and Viet Nam.

Box 1: Definition of Forests

There is no single, universally accepted definition of forests. An expert working group has tallied more than 800 official definitions of forests (FAO 2002). For example, the United Nations Framework Convention on Climate Change (UNFCCC) Kyoto Protocol defines forests as a *land cover* of woody biomass above a certain height at maturity (between 2 and 5 meters), extent (between 0.05 and 1.0 hectares), and canopy density (between 10% and 30%), with these ranges to be further specified by individual countries (UNFCCC 2006). In contrast, the Swedish Forest Act defines a forest as a *land use* suitable for wood production and not used for other purposes, including currently treeless areas (IPCC 2025). Forest definitions can also vary by age (primary or secondary); type (natural or planted; native or exotic; monoculture or mixed); administrative designation (e.g., under the jurisdiction of the Department of Forestry, or zoned for protection, conservation, production, or conversion); ownership (public or private), and other factors.

Differences in forest definitions have implications, such as whether orchards, agroforests, palm oil plantations, short-rotation timber plantations, bushes,and shrublands, or bushy swamps are classified as forests. These differences affect the size of the mitigation potential a country can achieve through forests or claim through international policy mechanisms (Romijn et al. 2012). Consequently, efforts to map the world's forests using satellites often lead to disagreements over the proper classification of individual sites and result in considerable discrepancies in calculations of total forest extent (Sexton et al. 2016).

Global Consensus of Forest Presence from Eight Satellite Data Sets



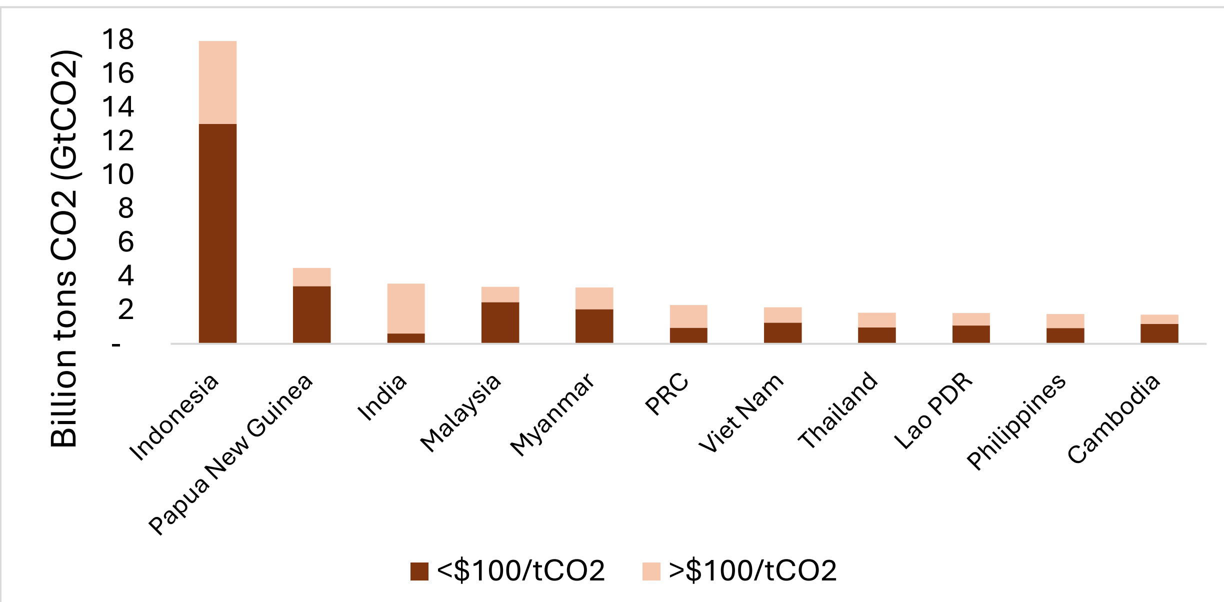
Source: Sexton et al. (2016).

1. Mitigation Opportunities from Avoided Deforestation

Roe et al. (2021) project an average annual forest loss of 5.0 million hectares (ha) in Asia and Pacific forests from 2020 to 2050. This compares to a total forest area of 604 million ha in 2000 and 580 million ha in 2010, and a historical rate of forest loss of 3.4 million ha per year from 2001 to 2020 (WRI 2025a).

This projected loss equates to a mitigation potential from avoided deforestation of 46.5 $GtCO_2$ over 30 years (2020–2050)—equivalent to 26% of the global total. This places Asia and the Pacific as the region with the third-largest mitigation potential from avoided deforestation, after Latin America and the Caribbean (85.8 $GtCO_2$) and Africa (48.0 $GtCO_2$). Within Asia and the Pacific, the highest mitigation potential from avoided deforestation is in Indonesia (17.9 $GtCO_2$), followed by Papua New Guinea (4.5 $GtCO_2$), India (3.6 $GtCO_2$), Malaysia (3.4 $GtCO_2$), and Myanmar (3.3 $GtCO_2$) (**Figure 2).**

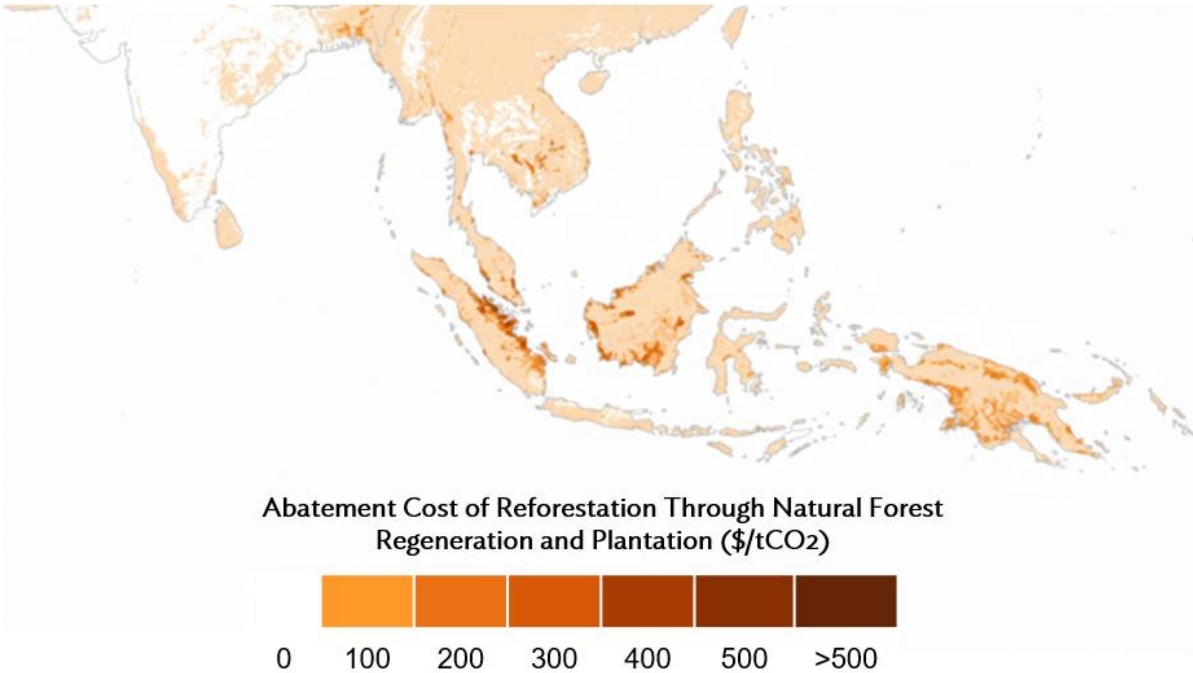
Figure 2: Climate Mitigation Potential from Avoided Deforestation by Economy



PRC = People's Republic of China, $GtCO_2$ = gigaton of carbon dioxide, Lao PDR = Lao People's Democratic Republic.
Source: Roe et al. (2021).

Not all of this potential is feasible, suitable, desirable, or practical. At a cost below $100 per ton of CO_2 (tCO_2) the region could mitigate 28.5 $GtCO_2$ through avoided deforestation. Of this, 81% is in Southeast Asia, followed by 12% in the Pacific. Below a cost of $20/$tCO_2$, the mitigation potential across Asia and Pacific forests was mapped by Busch et al. (2019) (as shown in **Figure 3**).

Figure 3: Potential Mitigation Available from Avoided Deforestation Below a Cost of $20 per Ton of Carbon Dioxide (tCO_2/ha)

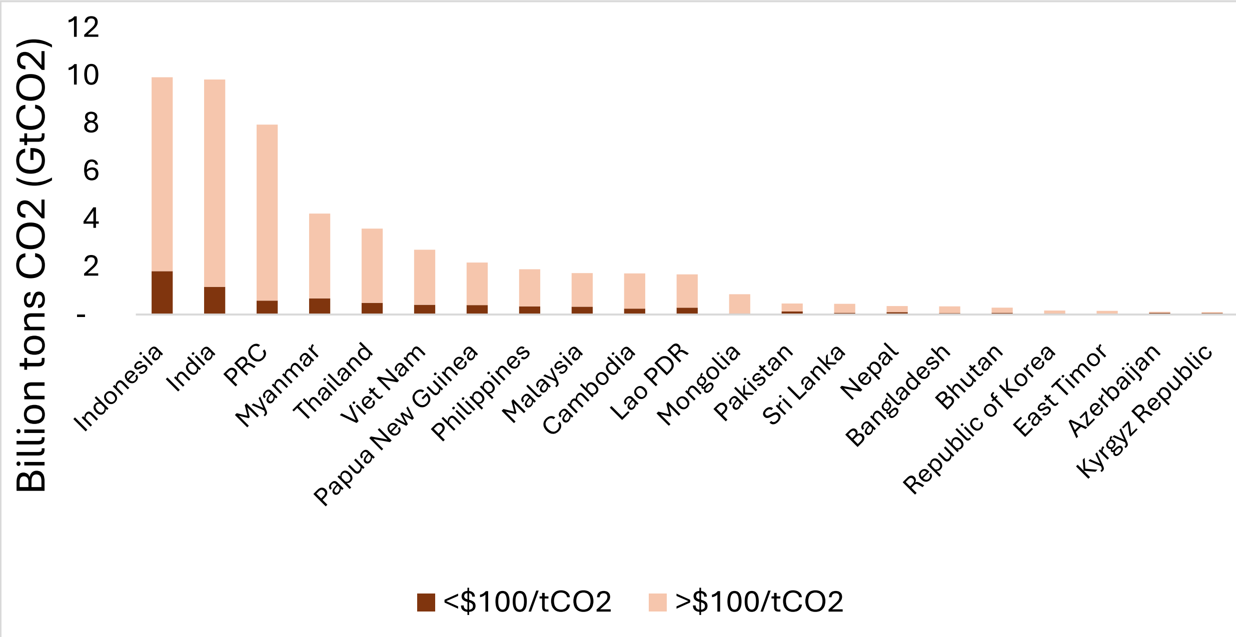


ha = hectare, tCO_2 = ton of carbon dioxide.
Source: Busch et al. (2019).

Estimates of potential mitigation from avoided deforestation vary across studies. Busch et al. (2019) estimated 72.5 $GtCO_2$ in total for the region (28.5 $GtCO_2$ below $100/$tCO_2$), while Austin et al. (2020) estimated 17.2 $GtCO_2$ (8.9 $GtCO_2$ below $100/$tCO_2$).

Mitigation Opportunities from Reforestation and Afforestation. Roe et al. (2021) estimate a reforestation mitigation potential of 50.8 $GtCO_2$ over 30 years from 2020 to 2050)—20% of the global total. This places Asia and the Pacific third globally, after Latin America and the Caribbean (82.6 $GtCO_2$) and North America (61.9 $GtCO_2$). Within Asia and the Pacific, the top economies are Indonesia (9.9 $GtCO_2$), India (9.8 $GtCO_2$), the People's Republic of China (PRC) (8.0 $GtCO_2$), Myanmar (4.2 $GtCO_2$), and Thailand (3.6 $GtCO_2$) (**Figure 4).**

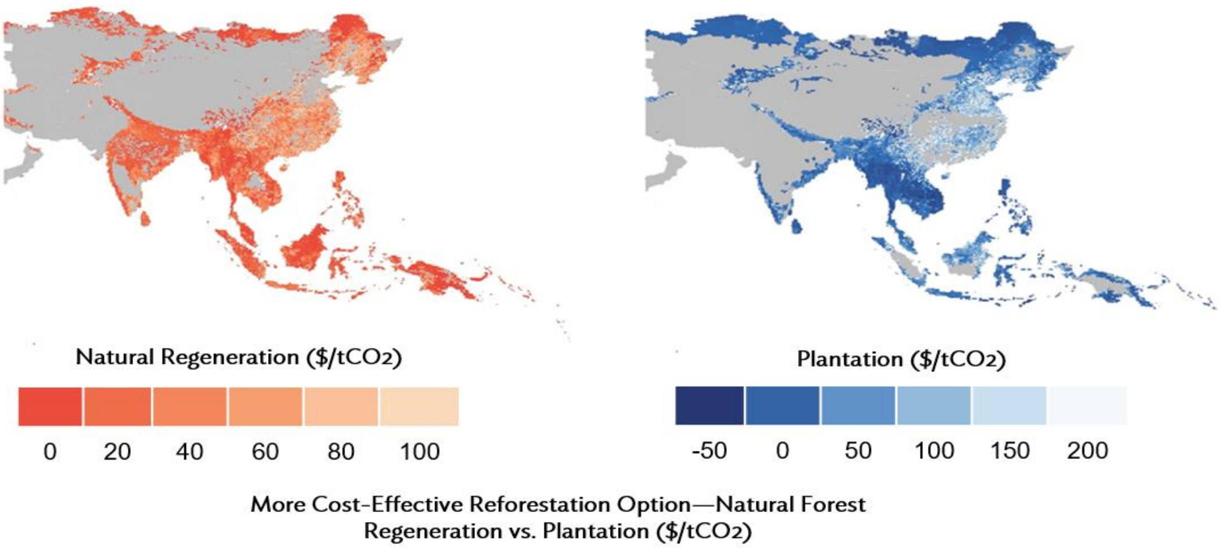
Figure 4: Climate Mitigation Potential from Reforestation by Economy



PRC = People's Republic of China, $GtCO_2$ = gigaton of carbon dioxide, Lao PDR = Lao People's Democratic Republic.
Source: Roe et al. (2021).

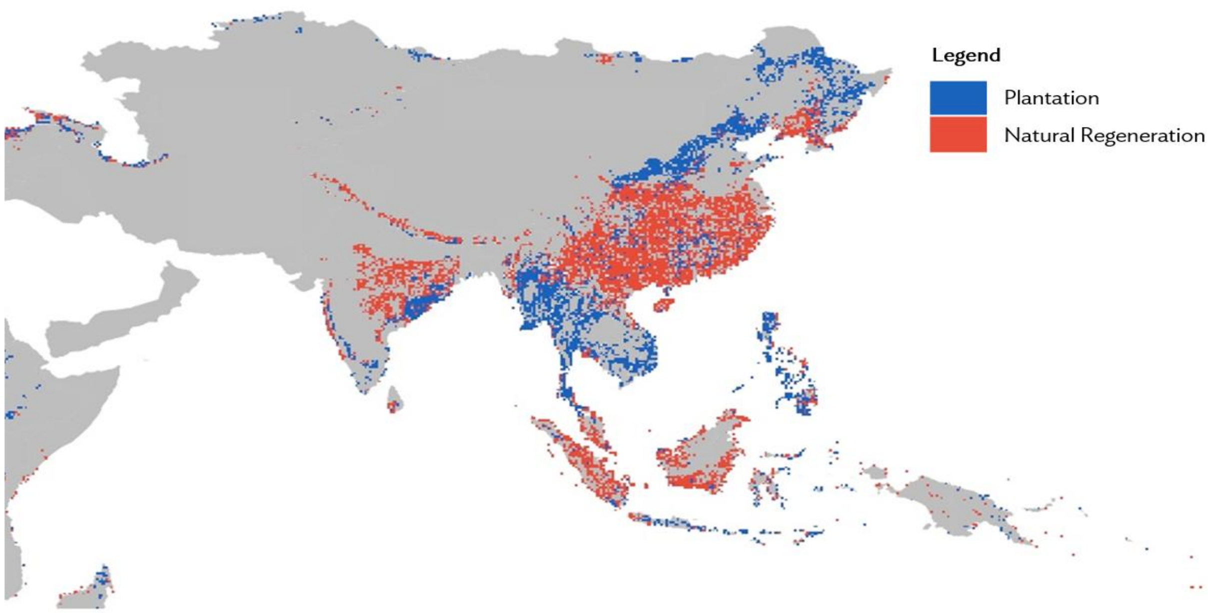
At a cost below $100/tCO_2$, the region has 7.5 $GtCO_2$ in reforestation potential, with 62% in Southeast Asia and 21% in South Asia. Cost estimates for reforestation (for both natural forest regeneration or plantations) have been mapped by Busch et al. (2024), as shown in **Figure 5.** The more cost-effective of these two reforestation types is mapped in **Figure 6.**

Figure 5: Abatement Cost of Reforestation Through Natural Forest Regeneration and Plantation ($/tCO_2$)



tCO_2 = ton of carbon dioxide.
Source: Busch et al. (2024).

Figure 6: More Cost-Effective Reforestation Option—Natural Forest Regeneration vs. Plantation ($/tCO_2$)



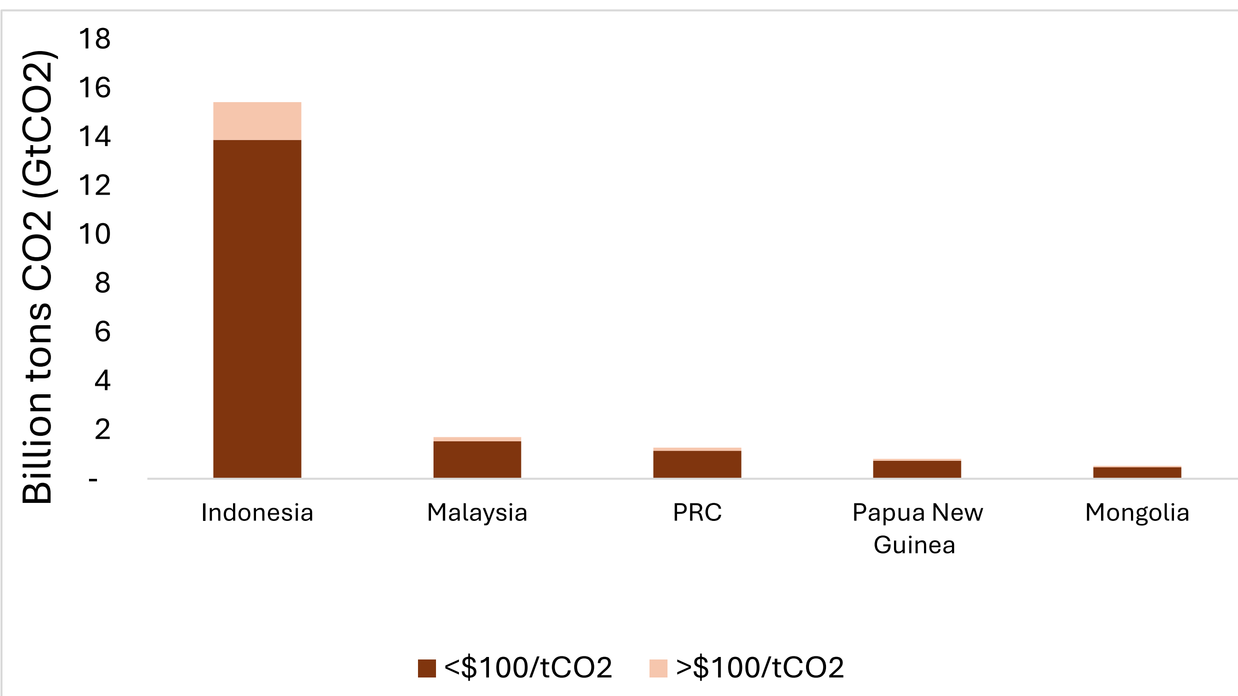
tCO_2 = ton of carbon dioxide.
Source: Busch et al. (2024).

Estimates of potential mitigation from reforestation vary greatly depending on assumptions about where reforestation is feasible or suitable (e.g. Griscom et al. 2017; Bastin et al. 2019; Walker et al. 2022; Brancalion et al. 2019). Furthermore, estimates of potential mitigation from reforestation also vary across studies. Busch et al. (2019) estimated 53.4 $GtCO_2$ for the region (8.0 $GtCO_2$ below $100/$tCO_2$), while Austin et al. (2020) estimated 46.1 $GtCO_2$ (6.4 $GtCO_2$ below $100/$tCO_2$), and Busch et al. (2024) estimated 11.9 $GtCO_2$ below $100/$tCO_2$.

2. Mitigation Opportunities from Improved Forest Management

Asia and the Pacific contain at least 36.3 million ha of peatlands (Austin et al. 2025). Roe et al. (2021) estimate a mitigation potential of 19.8 $GtCO_2$ from avoided peat degradation over 30 years (2020–2050)—88% of the global total. This positions Asia and the Pacific as the region with the highest potential for climate mitigation from avoided peat degradation, far ahead of the Middle East (1.0 $GtCO_2$) and Africa (0.7 $GtCO_2$). Within Asia and the Pacific, the greatest potential for climate mitigation from avoided peat degradation is in Indonesia (15.4 $GtCO_2$), followed by Malaysia (1.5 $GtCO_2$), the PRC (1.1 $GtCO_2$), Papua New Guinea (0.73 $GtCO_2$), and Mongolia (0.47 $GtCO_2$) (**Figure 8**).

Figure 8: Climate Mitigation Potential from Avoided Peat Degradation by Economy

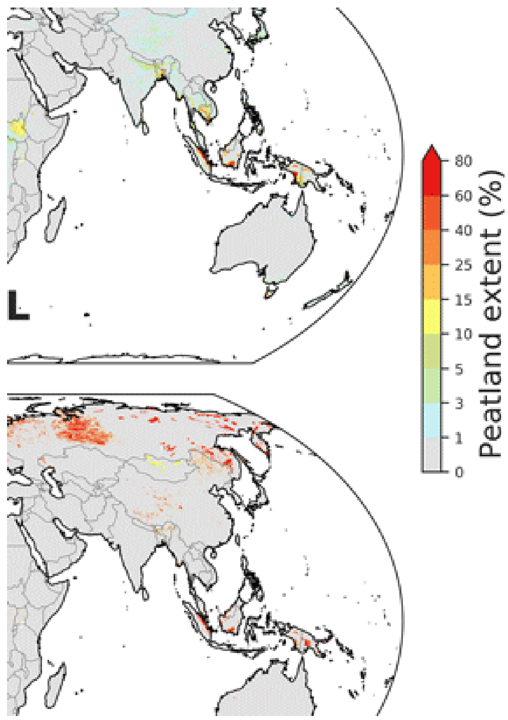


PRC = People's Republic of China, tCO_2 = ton of carbon dioxide.
Source: Roe et al. (2021).

As before, not all of this potential mitigation is feasible, suitable, desirable, or practical. Below a cost of \$100/tCO_2, Asia and Pacific forests have the potential to mitigate 17.9 GtCO_2 through avoided peat conversion, with 87% of this potential in Southeast Asia and 9% in East Asia.

Estimates of avoided peat conversion vary significantly depending on maps of peat distribution. The spatial agreement across two publicly available maps of peat distribution (Xu et al. 2018; Melton et al. 2022) is shown in **Figure 9.**

Figure 9: Distribution of Peat According to Peat-ML and PEATMAP

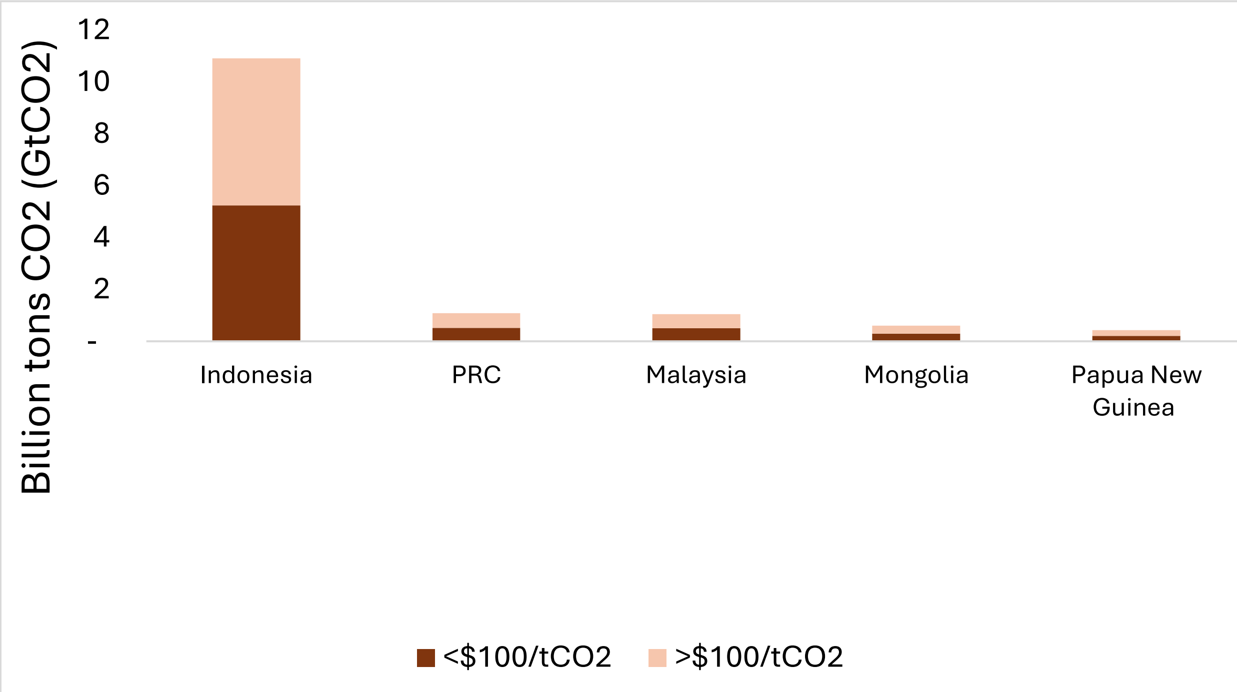


Sources: Melton et al. (2022); Xu et al. (2018).

3. Mitigation Opportunities from Peat Restoration

Roe et al. (2021) estimate a mitigation potential of 14.5 GtCO_2 from peat restoration over 30 years (2020–2050)—59% of the global total. Asia and the Pacific leads globally, followed by Europe (3.7 GtCO_2) and Eurasia (3.4 GtCO_2). Within Asia and the Pacific, the greatest potential for climate mitigation from peat restoration is in Indonesia (10.9 GtCO_2), followed by the PRC (0.52 GtCO_2), Malaysia (0.50 GtCO_2), Mongolia (0.29 GtCO_2), and Papua New Guinea (0.21 GtCO_2) (**Figure 10**).

Figure 10: Climate Mitigation Potential from Peat Restoration by Economy



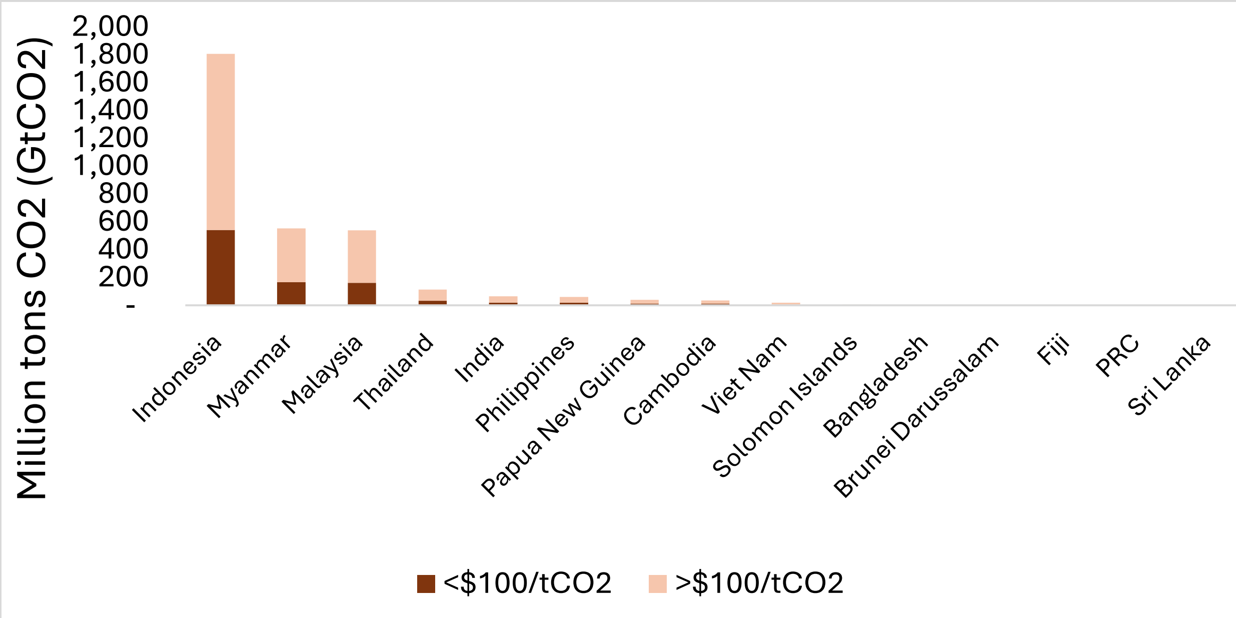
PRC = People's Republic of China, tCO_2 = ton of carbon dioxide.
Source: Roe et al. (2021).

As in previous sections, not all of this potential mitigation is feasible, suitable, desirable, or practical. Below a cost of $100/$tCO_2$, Asia and Pacific forests can mitigate 7.0 $GtCO_2$ through peat restoration. Of this, 84% is in Southeast Asia, followed by 12% in East Asia.

4. Mitigation Opportunities from Avoided Mangrove Conversion

Asia and the Pacific contain 384,000 ha of coastal areas that could be restored as mangrove forests (Worthington et al. 2024). Roe et al. (2021) estimate a mitigation potential from avoided mangrove conversion of 3.24 $GtCO_2$ over 30 years (2020–2050)—84% of the global total. This places Asia and the Pacific as the region with the highest potential for climate mitigation from avoided mangrove conversion, well ahead of Latin America and the Caribbean (0.43 $GtCO_2$) and North America (0.11 $GtCO_2$). Within Asia and the Pacific, the greatest potential for climate mitigation from avoided mangrove conversion is in Indonesia (1.8 $GtCO_2$), followed by Myanmar (0.55 $GtCO_2$), Malaysia (0.54 $GtCO_2$), Thailand (0.11$GtCO_2$), and India (0.065 $GtCO_2$) (**Figure 11**).

Figure 11: Climate Mitigation Potential from Avoided Mangrove Conversion by Economy



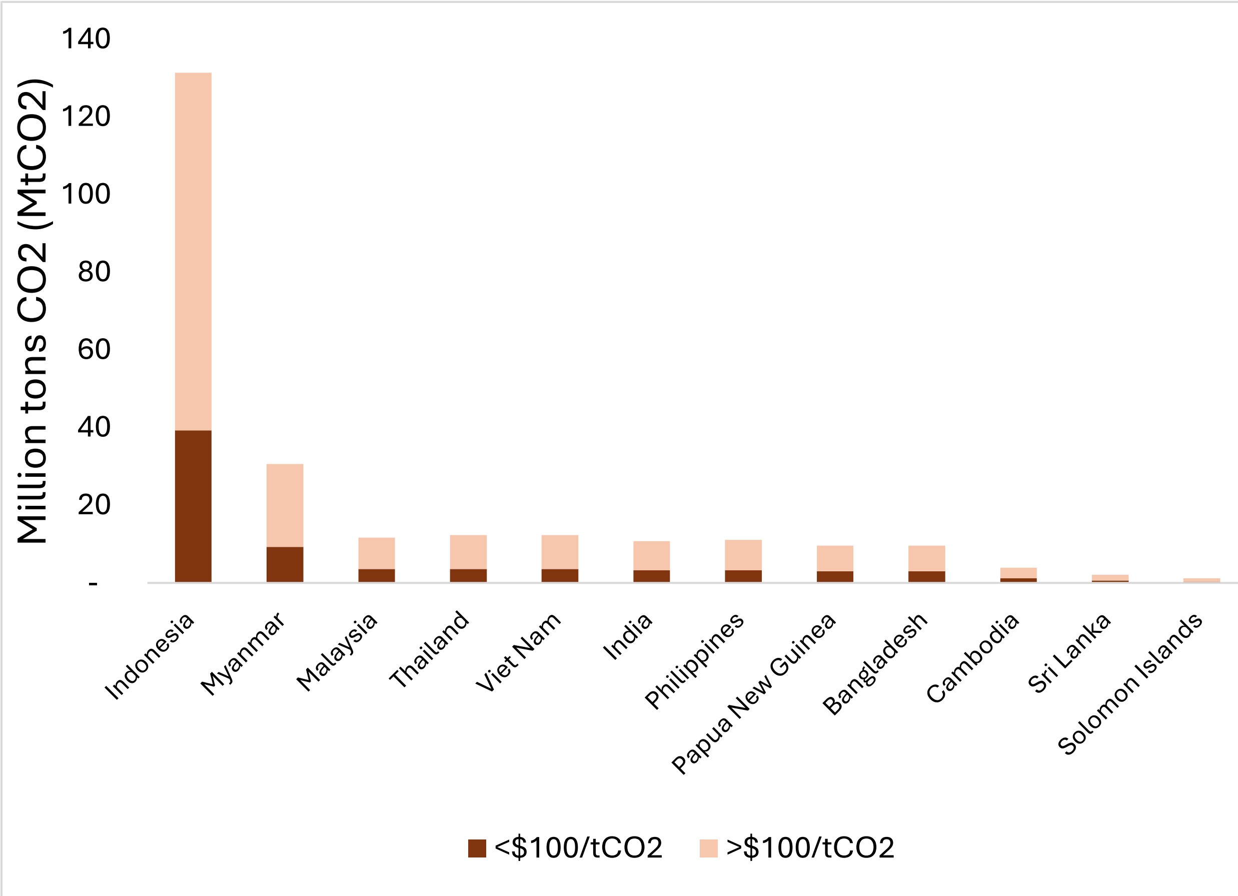
PRC = People's Republic of China, $MtCO_2$ = million tons of carbon dioxide.
Source: Roe et al. (2021).

Not all of this potential mitigation is feasible, suitable, desirable, or practical. Below a cost of $100/$tCO_2$, Asia and Pacific forests have the potential to mitigate 0.97 $GtCO_2$ through avoided mangrove conversion. In this case, 96% of the mitigation potential below $100/$tCO_2$ is in Southeast Asia, followed by 2% in South Asia.

5. Mitigation Opportunities from Mangrove Restoration

Roe et al. (2021) estimate 0.247 $GtCO_2$ in mitigation potential from mangrove restoration over 30 years (2020–2050)—47% of the global total. Asia and the Pacific again leads, followed by Latin America and the Caribbean (0.214 $GtCO_2$) and Africa (0.059 $GtCO_2$). Within Asia and the Pacific, the greatest potential for climate mitigation from mangrove restoration is in Indonesia (0.131 $GtCO_2$), followed by Myanmar (0.031 $GtCO_2$), Malaysia (0.012 $GtCO_2$), Thailand (0.012 $GtCO_2$), and Viet Nam (0.012 $GtCO_2$) (**Figure 12**).

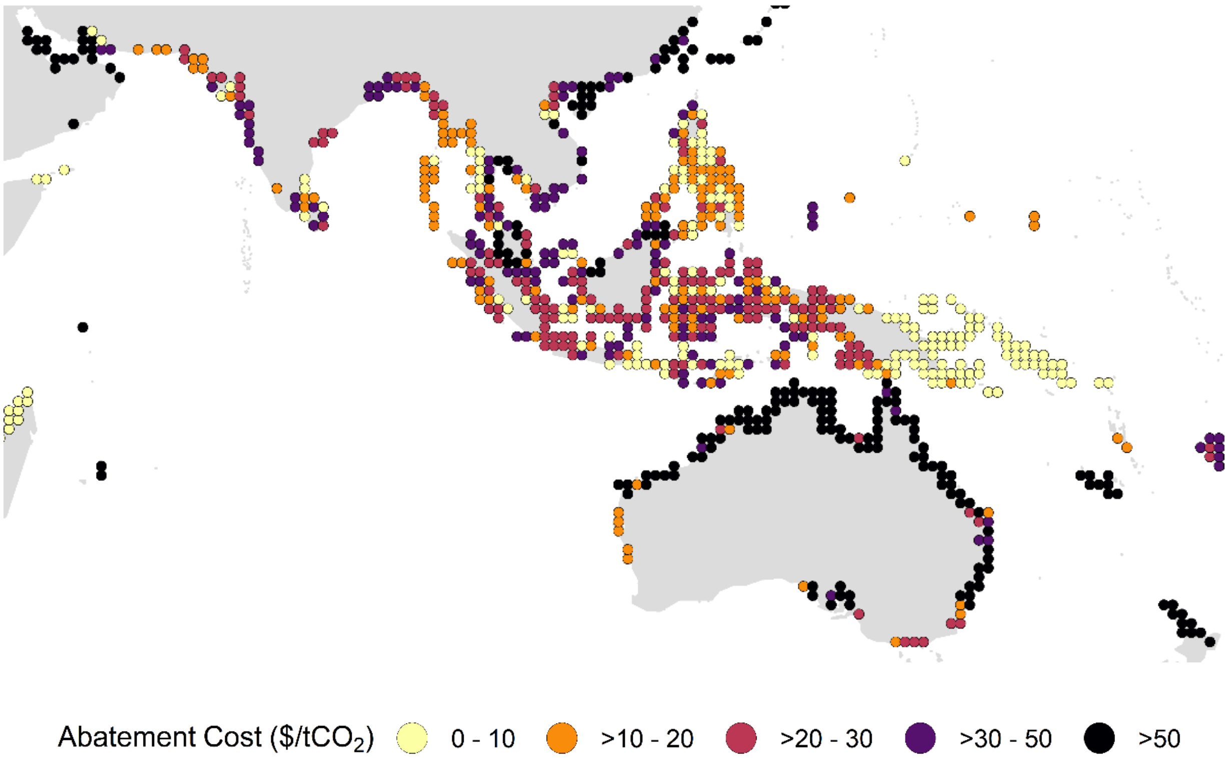
Figure 12: Climate Mitigation Potential from Mangrove Restoration by Economy



$MtCO_2$ = million tons of carbon dioxide.
Source: Roe et al. (2021).

As before, not all of this potential mitigation is feasible, suitable, desirable, or practical. Below a cost of $100/t$CO_2$, Asia and Pacific forests can mitigate 0.074 GtCO_2 through mangrove restoration. Of this, 86% is in Southeast Asia, followed by 9% in South Asia. The cost of mangrove restoration in $/t$CO_2$ was mapped across Asia and the Pacific by Goto et al. (2025), as shown in **Figure 13.** Estimates of potential mitigation from improved forest management vary across studies. Goto et al. (2025) also estimate 0.485 GtCO_2 in cost-effective mitigation below $100/t$CO_2$.

Figure 13: Abatement Cost of Mangrove Restoration ($/$tCO_2$)

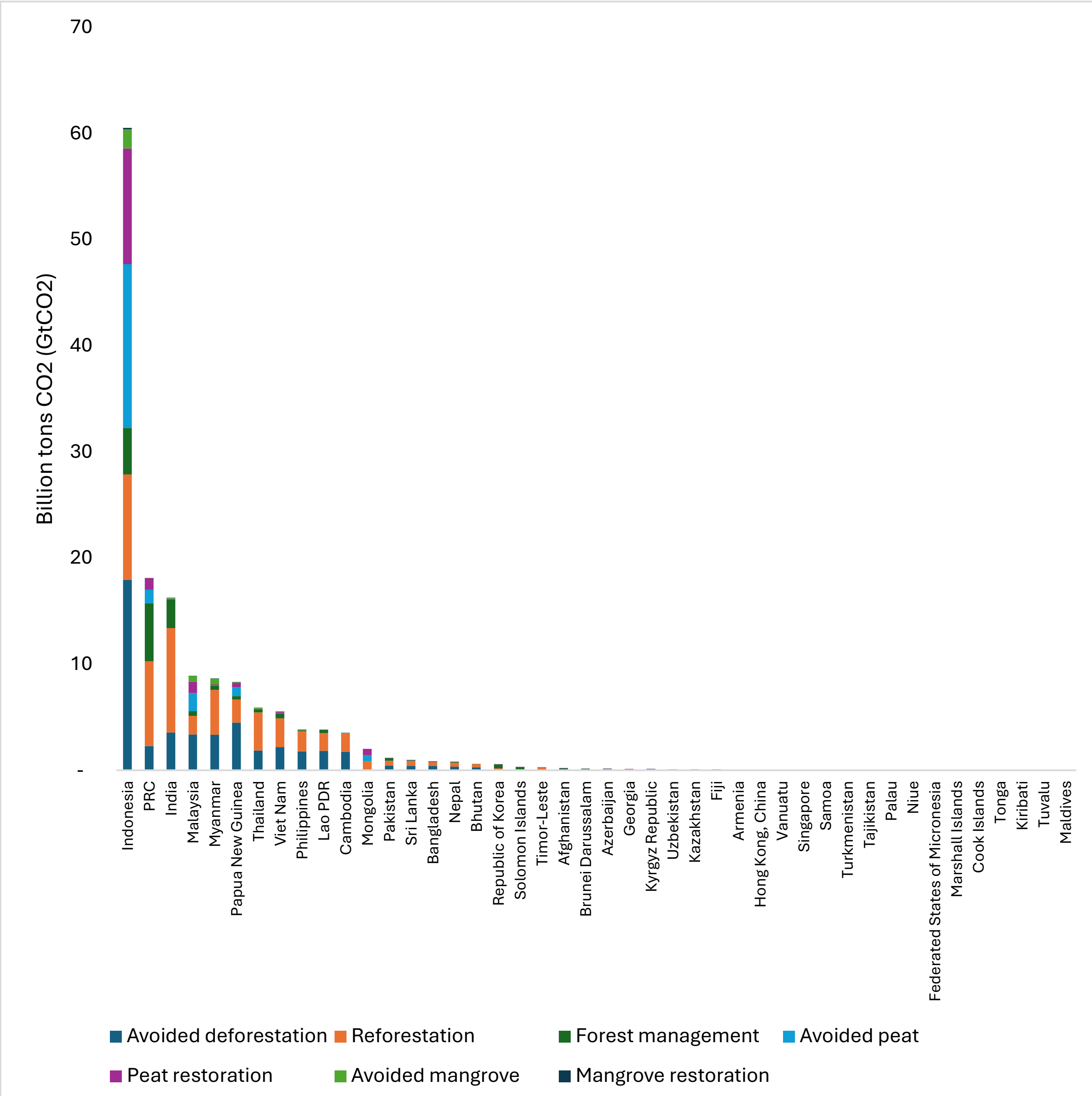


tCO_2 = ton of carbon dioxide.
Source: Goto et al. (2025).

6. Total Mitigation Potential

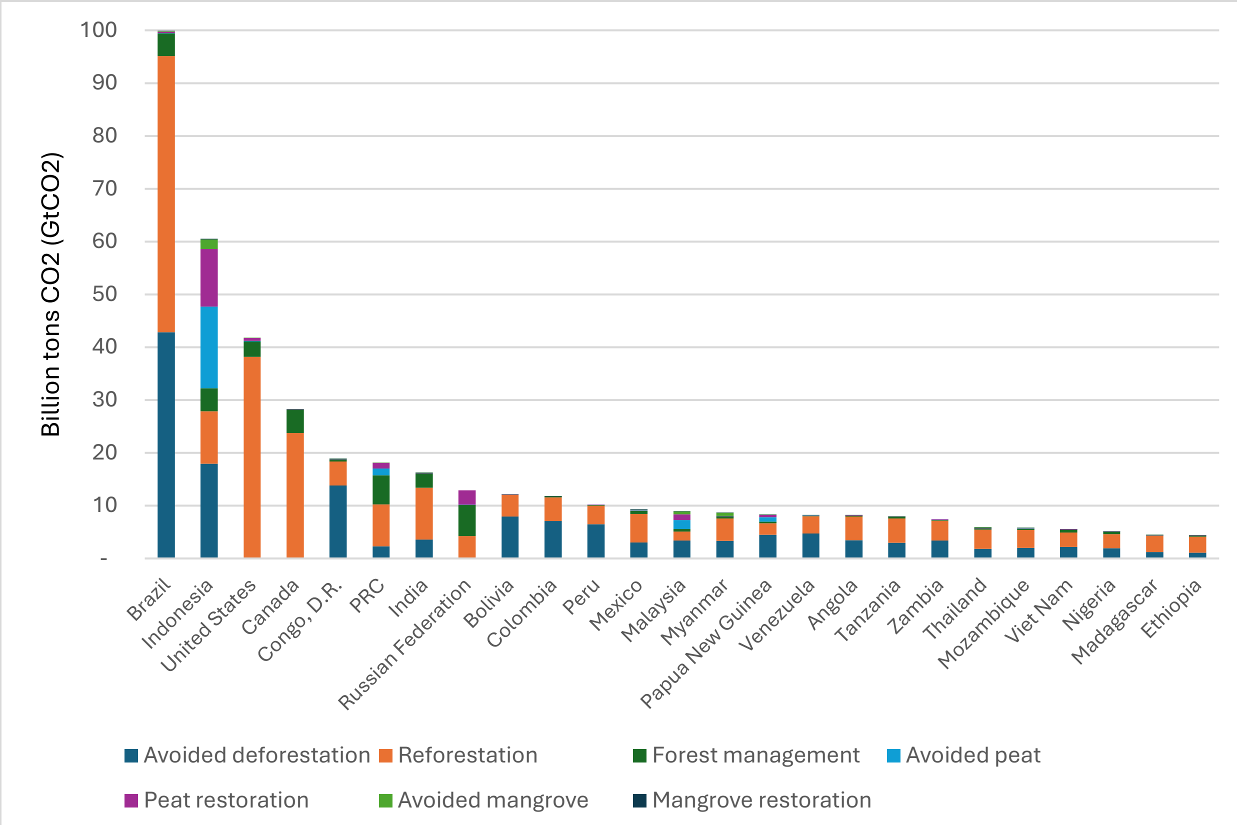
Summed across all seven strategies, the total forest-based mitigation potential in Asia and the Pacific is 151.7 $GtCO_2$—28% of the global total potential (**Figure 14**). This positions Asia and the Pacific as the region with the second-greatest potential for climate mitigation from forests, after Latin America and the Caribbean (177.8 $GtCO_2$) and ahead of Africa (105.2 $GtCO_2$) (**Figure 15**). It should be noted that there is potential for partial double counting between mitigation potential from avoided deforestation and avoided peat degradation.

Figure 14: Climate Mitigation Potential from Seven Forest Strategies by Economy



PRC = People's Republic of China, Lao PDR = Lao People's Democratic Republic, tCO_2 = ton of carbon dioxide.
Source: Roe et al. (2021).

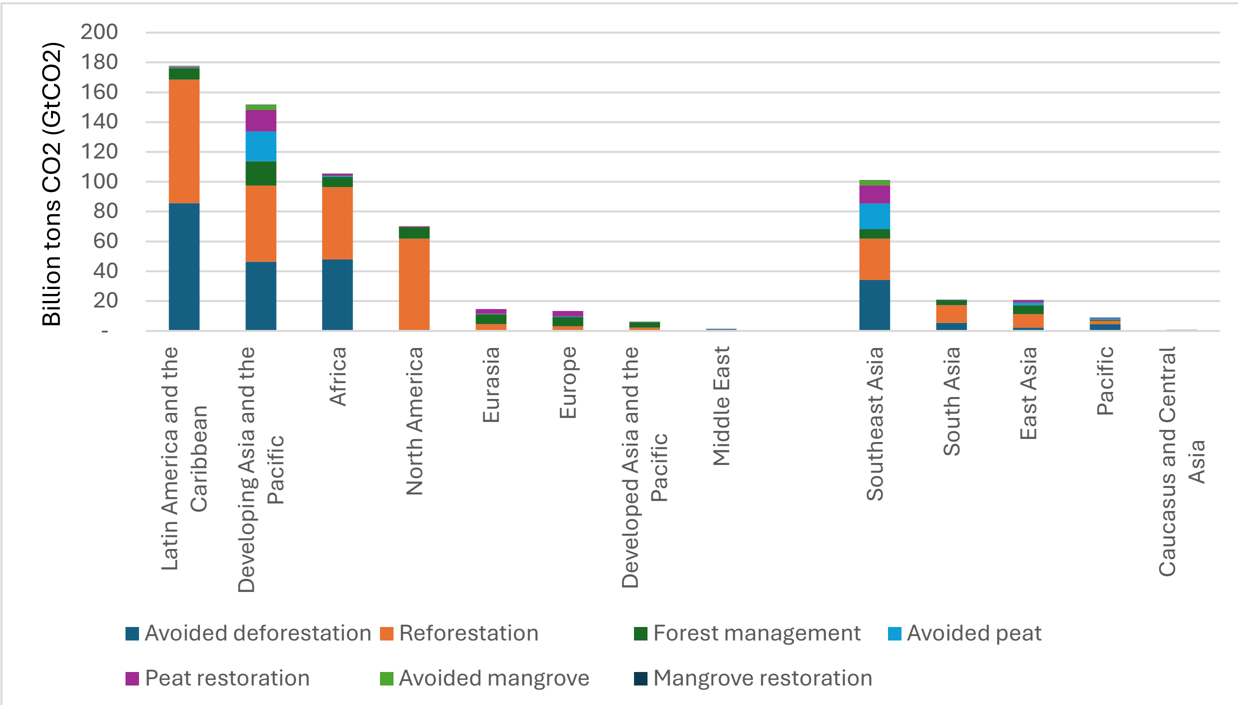
Figure 15: Climate Mitigation Potential from Seven Forest Strategies – Top 25 Economies Globally



PRC = People's Republic of China, $GtCO_2$ = gigaton of carbon dioxide.
Source: Roe et al. (2021).

Eight economies in the Asia and Pacific region rank among the top 25 globally for forest-based mitigation potential: Indonesia (#2), the PRC (#6), India (#7), Malaysia (#13), Myanmar (#14), Papua New Guinea (#15), Thailand (#20), and Viet Nam (#22) (**Figure 16**).

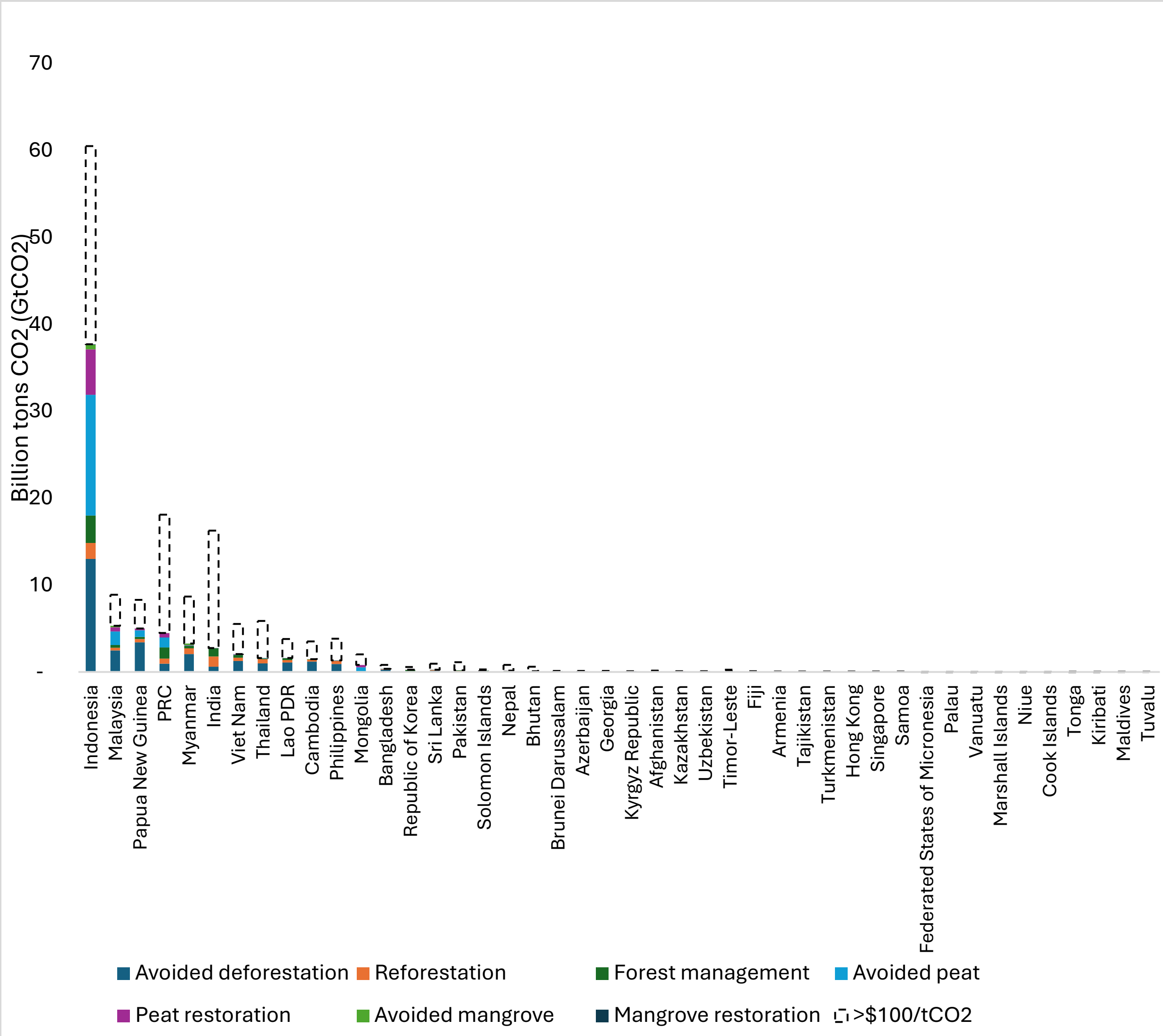
Figure 16: Climate Mitigation Potential from Seven Forest Strategies, by World Region and Subregions of Asia and the Pacific



$GtCO_2$ = gigaton of carbon dioxide.
Source: Roe et al. (2021).

At costs below $100/tCO_2$, Asia and Pacific forests offer 69.6 $GtCO_2$ in mitigation potential (**Figure 17**). Indonesia leads with 37.7 $GtCO_2$, followed by Malaysia (5.3 $GtCO_2$), Papua New Guinea (5.0 $GtCO_2$), the PRC (4.5 $GtCO_2$), and Myanmar (3.3 $GtCO_2$). Of this, 78% is in Southeast Asia, followed by 8% in East Asia, 7% in the Pacific, and 6% in South Asia.

Figure 17: Climate Mitigation Potential from Seven Forest Strategies Below $100 per Ton of Carbon Dioxide, by Economy

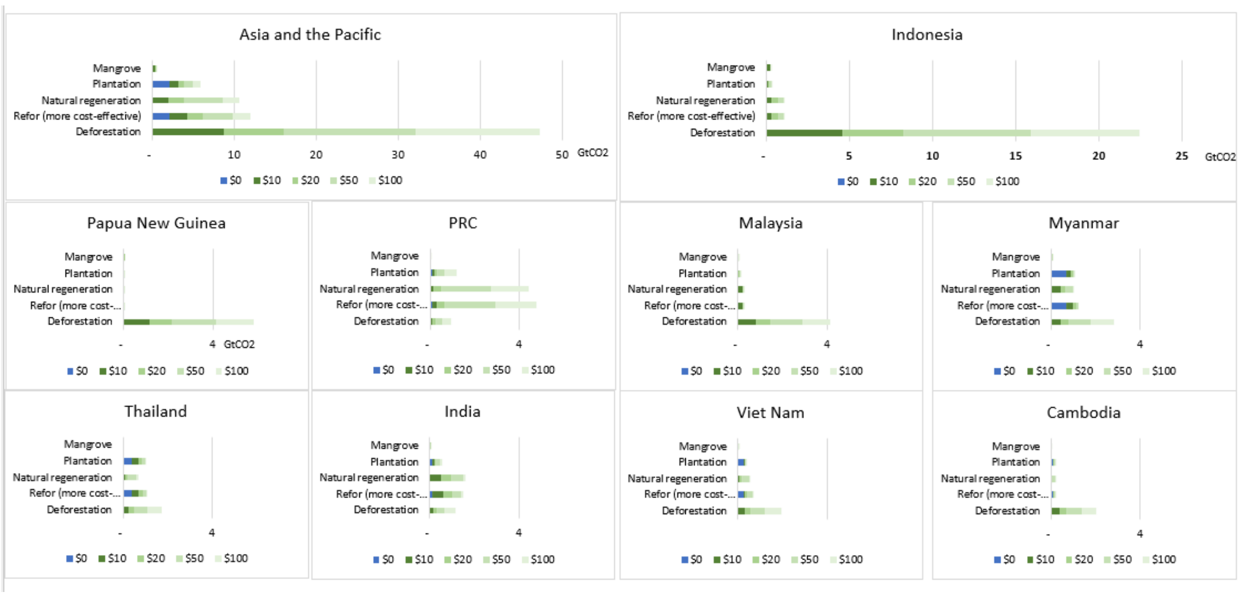


PRC = People's Republic of China, Lao PDR = Lao People's Democratic Republic, tCO_2 = ton of carbon dioxide.
Source: Roe et al. (2021).

Avoided deforestation (41% of mitigation potential from forests below $100/$tCO_2$) and avoided peat degradation (26%) offer the greatest opportunities for climate mitigation, followed by forest management (11%), reforestation (11%), and peat restoration (10%). While the mitigation potential from avoided mangrove conversion and mangrove restoration is smaller overall, these strategies provide relatively large mitigation potential on a per-hectare basis. Asia and the Pacific accounts for 81% of global mitigation potential from avoided mangrove conversion and mangrove restoration combined.

Marginal abatement cost curves—presentations of how much climate mitigation is available below a given cost per ton—have been produced for selected strategies, e.g., avoided deforestation (Busch et al. 2019); reforestation via natural regeneration, plantation, or a more cost-effective combination of the two (Busch et al. 2024); and mangrove restoration (Goto et al. 2025) (**Figure 18**). More mitigation is available below at higher costs than at lower costs, consistent with a higher price in a hypothetical carbon market. For example, avoided deforestation in Indonesia could yield 4.6 $GtCO_2$ below a cost of $10/$tCO_2$ or 22.5 $GtCO_2$ below a cost of $100/$tCO_2$; reforestation in the PRC could provide 0.31 $GtCO_2$ below a cost of $10/$tCO_2$ or 4.8 $GtCO_2$ below a cost of $100/$tCO_2$.

Figure 18: Marginal Abatement Cost Curves by Economy



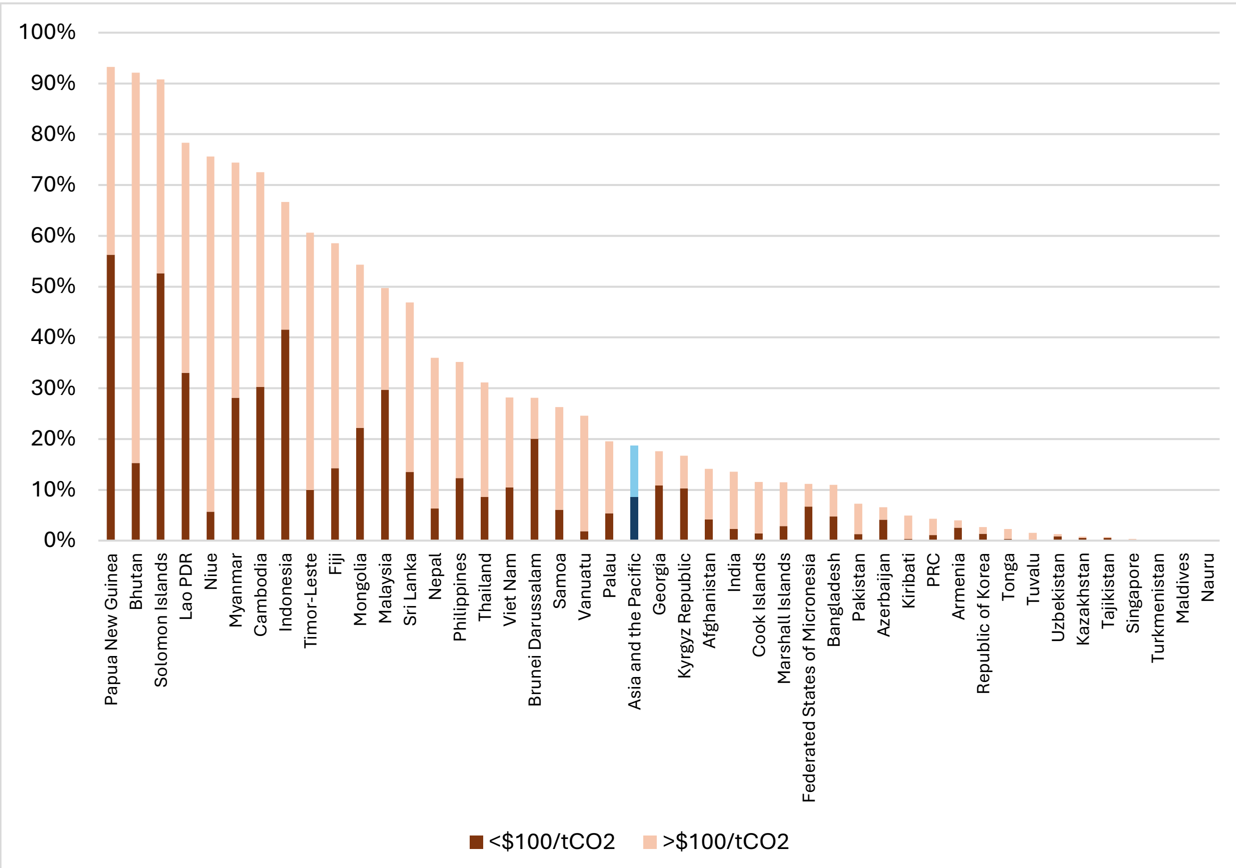
Sources: Busch et al. (2019); Busch et al. (2024); Goto et al. (2025).

The share of the Asia and Pacific region's climate mitigation potential that can come from forests, compared to other sectors (energy, transportation, buildings, agriculture, etc.), is 19%.[2] The economy with the largest share of potential mitigation from forests is Papua New Guinea (93%), followed by Bhutan (92%), Solomon Islands (91%), the Lao People's

[2] Here, we calculate the share of total mitigation potential from forests as equal to A/(A+B), where A = annual forest mitigation potential from the seven forest strategies described above, and B = annual non-LUCF mitigation potential as of 2021 (WRI 2025b). Note that integrated assessment models (IAMs) would calculate this share differently, incorporating assumptions about mitigation scenarios and the macroeconomy.

Democratic Republic (78%), and Niue (76%). Forests contribute more than 50% of total mitigation opportunity in 12 economies and more than 10% in 30 economies (**Figure 19**). The share of potential climate mitigation from forests is highest in the Pacific (92%) and Southeast Asia (55%), but significantly lower in South Asia (14%), East Asia (5%), and the Caucasus and Central Asia (2%).

Figure 19: Share of Total Mitigation Potential from Forests



PRC = People's Republic of China, Lao PDR = Lao People's Democratic Republic, tCO_2 = ton of carbon dioxide.
Note: Calculated as A/(A+B), where A is the annual forest-based mitigation potential from the seven forest strategies, and B is the estimated annual mitigation potential from non-land use, land-use change, and forestry sectors as of2021.
Source: Author's calculations based on WRI (2025b).

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