

POLICY BRIEF

No. 1, December 2025

Strengthening Malaysia's Bamboo Policy for Carbon Sequestration and Sustainable Products

By Marcela Pimid, Kumara Thevan Krishnan,
and Marzalina Mansor

POLICY BRIEF

Strengthening Malaysia's Bamboo Policy for Carbon Sequestration and Sustainable Products

Marcela Pimid
Kumara Thevan Krishnan
Marzalina Mansor

2025

POLICY BRIEF

Strengthening Malaysia's Bamboo Policy for Carbon Sequestration and Sustainable Products

©2025 INSTITUT MASA DEPAN MALAYSIA (PPAB-03/2019)

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic, or mechanical, including photocopy, recording, or any other information storage, and retrieval system without prior permission in writing from Institut Masa Depan Malaysia.

Publisher:



Institut Masa Depan Malaysia (MASA)
192, Jalan Ara, Bukit Bandaraya,
59100 Kuala Lumpur.
Tel: 03-23881059 Fax: 03-23881049
E-mail: policy@institutmasa.com

Advisor:

Azril Mohd Amin

Editorial Team:

Lili Fariza Ariffin
Liwani Che Long

ABOUT MASA POLICY BRIEF SERIES

The MASA Policy Brief Series (SRDM) is an initiative by the Institut Masa Depan Malaysia (MASA) aimed at providing a strategic platform for academicians, think tanks, non-governmental organisations, and collaborative researchers from Public Universities (IPTA) and Private Universities (IPTS) to present policy inputs and recommendations in the form of Policy Briefs.

This initiative is aligned with the goals of the Sustainable Development Goals (SDG) and the Shared Prosperity Vision 2030 (WKB2030), ensuring that research outputs support the nation's agenda for sustainable and inclusive development.

With support from IPTA, IPTS, industry, and government agencies, the SRDM not only offers a research platform but also opens up opportunities for strategic collaboration towards strengthening national policy. MASA remains committed to serving as a catalyst for high-quality research and encourages researchers and industry experts to participate in the SRDM to help shape more sustainable policies for the people and the nation as a whole.

Specifically, the SRDM was introduced with the following objectives:

1. To provide opportunities for academicians and researchers from various backgrounds to contribute evidence-based policy recommendations.
2. To connect research findings with national policy needs in line with the aspirations of the SDG and WKB2030.
3. To enhance collaboration between external researchers and MASA while cultivating a culture of high-quality and impactful policy writing.

TABLE OF CONTENTS

Table of Contents	1
Biography	2
Executive Summary	4
Introduction	9
Problem Statement	12
Methodology	16
Findings & Analysis of Existing Relevant Policies	18
Policy Recommendations	23
Conclusion	32
References	34
Annex 1: List of bamboo species found in Malaysia	37

BIOGRAPHY

MARCELA PIMID

Marcela Pimid is a senior lecturer at the Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah. She holds a Ph.D. in Rural Planning/Environment from Universiti Sains Malaysia. She actively participates in nature conservation, community-based tourism development, and stakeholder management. Her expertise is advanced quantitative analysis, qualitative methods, and mixed-method research. She leads projects that connect local native communities in Sabah with international-based tour operators. She aspires to work closely with relevant stakeholders and researchers to integrate interdisciplinary studies about sustainability, human values, and socioeconomic development to deliver better outcomes to society. She is open to collaboration and can be contacted via marcela@ums.edu.my.

KUMARA THEVAN KRISHNAN

Kumara Thevan Krishnan is an esteemed member of the Faculty of Agro-Based Industry at Universiti Malaysia Kelantan, where he specialises in Applied Entomology. With a wealth of knowledge in tropical rainforest ecology, insect ecology, epiphytic plants, and sustainable agricultural practices. He teaches a variety of courses, including crop protection, plant disease management, apiculture, meliponiculture, agricultural policies, agroecology, and risk analysis management. His research efforts encompass a broad spectrum of projects, with a particular focus on meliponiculture, agricultural pest management, insect climate change modelling, and carbon sequestration through bamboo. Currently, he is actively involved in initiatives that promote bamboo plantations, meliponiculture, and durian disease management. These projects are designed to enhance community engagement with local industries, particularly in the Kelantan region. He can be reached at thevan@umk.edu.my.

MARZALINA MANSOR

Marzalina Mansor currently a retiree, holds BSc in Biology, a Ph.D. in Biotechnology, including an MBA. She served 33 years at FRIM as Biotechnologist for Forest Conservation. Her final post as Deputy Director General for FRIM's Research and Development. Her prime achievement was establishing Malaysia's two gene-banks as Forestry Seed Centres in Pahang and Sarawak. She received numerous awards, including WIPO Best Investor (2008), the Distinguished Fellow in Biotechnology (2010) and received Malaysian Book of Record (MBoR) award for successfully conducted the "First Synthetic Timber Seed to Survive Cryopreservation" (2017). From 2019 – 2024, she was the President of Malaysian Bamboo Society (MBS). Currently, she is Lifetime Advisor to MBS, assisting communities with bamboo-based green products, and Co-Leader of a Forest Community Farming program on forestry and bamboo cultivation. Additionally, she co-founder of Yayasan Buluh Malaysia, promoting bamboo innovation – from seeds to green products.

Executive Summary

Malaysia stands at a critical juncture, facing the dual challenges of achieving its Net Zero 2050 target and stimulating sustainable economic growth. Bamboo, with its remarkable properties of rapid growth, versatility, and significant carbon sequestration potential, emerges as a promising solution to simultaneously address both challenges.

However, current policies in Malaysia need to fully leverage bamboo's multifaceted benefits. The current study examines expert perspectives on utilising bamboo for carbon sequestration and other relevant applications in Malaysia.

Two primary objectives of this study are:

(1)
to examine the perspectives and existing practices of bamboo in Malaysia; and

(2)
to enhance the bamboo value chain by strengthening relevant policies in Malaysia.

The current study employed a qualitative approach using in-depth interviews with selected expert panels in Malaysia. The panellists were selected through a purposive approach, with at least five years of experience in direct involvement with carbon sequestration management, bamboo planting, bamboo-based downstream products, and bamboo environmental management.

The main finding shows that while bamboo presents a promising solution due to its carbon sequestration potential, the implementation of its capacity remains limited in the Malaysian context.

The findings uncover two potential models: utilising bamboo for carbon sequestration on degraded tin mining land and producing high-value bamboo products. However, the experts highlight challenges such as land disputes, specialised knowledge gaps, carbon regulatory limitations, funding constraints, and public-industry engagement.

Despite bamboo's recognised potential, there is no dedicated policy in Malaysia that integrates its cultivation for carbon sequestration on degraded lands, aligned with international standards. Stakeholders, including planters, carbon credit consultants, industry experts, and government bodies, possess valuable but fragmented expertise.

For example, planters may understand bamboo cultivation but lack knowledge of its economic and carbon-sequestering potential, while carbon credit consultants can assess carbon capture yet are unfamiliar with optimal bamboo species and soil conditions. This fragmentation makes it difficult to develop a unified, holistic approach to solving the problem.

Panel experts were unable to reach a consensus on which bamboo species are suitable for specific soil conditions, necessitating extensive field trials to identify the most appropriate species for different soil types and to avoid introducing invasive species.

Land tenure disputes also present significant barriers, with many suitable plantation areas being contested between state, community, and commercial interests. Legal interventions are crucial to resolving ownership issues and promoting sustainable bamboo cultivation on these lands.

Furthermore, funding challenges remain for small-scale planters and communities, who face difficulties securing financial support without a proven track record. Scientific research is needed to ensure that bamboo can contribute to ecosystem restoration in former mining areas without absorbing harmful contaminants.

The study recommends enhanced training programs, policy revisions, and further research into suitable bamboo species to enhance bamboo's application in land rehabilitation. This policy brief outlines a comprehensive strategy to strengthen Malaysia's approach to bamboo utilisation, focusing on five key areas: policy integration, economic viability, community empowerment, value chain enhancement, and environmental restoration.

By establishing a dedicated bamboo development policy, developing specific carbon credit methodologies for bamboo-based projects, launching a national bamboo research program, creating a Bamboo Industry Development Fund, and integrating bamboo cultivation into national reforestation and land rehabilitation programs, Malaysia can unlock the full potential of its bamboo resources.

These initiatives have the potential to sequester millions of tons of CO₂ annually, generate revenue from bamboo products, rehabilitate substantial areas of degraded land, and create thousands of green jobs, particularly in rural areas.

This holistic approach not only addresses climate change and economic development but also positions Malaysia as a leader in sustainable development on the global stage, especially in achieving Net Zero 2050.

By embracing this innovative strategy, Malaysia can effectively combine climate action with robust economic growth, setting a new standard for the creative use of natural resources in the 21st century.

Key Messages and Recommendations

Recommendation 1

- Create a dedicated bamboo policy and task force to address carbon sequestration, downstream product development, and land tenure complexities, across Peninsular Malaysia, Sabah, and Sarawak.

Recommendation 2

- Promoting bamboo cultivation for carbon sequestration and high-value downstream product production, encouraging cooperatives for small-scale bamboo planters, and collaborating with Bursa Carbon Exchange Malaysia for transparent carbon credit registration and management processes.

Recommendation 3

- Establish funding mechanisms for community-level bamboo cultivation projects, develop partnerships with communities, banks, and private companies, and launch public awareness campaigns about bamboo's carbon sequestration value.

Recommendation 4

- Strengthen the Bamboo Value Chain by connecting bamboo planters with buyers through competitive pricing structures such as buy-back system and promoting quality diversification of bamboo-based downstream products.

Recommendation 5

- Bamboo conservation and rehabilitation efforts in Malaysia include promoting its use in degraded lands, researching optimal species, and integrating cultivation into buffer zone management and ecosystem restoration projects.

Introduction

Climate change poses a significant threat to global ecosystems and economies, with greenhouse gas (GHG) emissions at the heart of this challenge. Carbon dioxide (CO₂), accounting for 76% of these emissions, plays a pivotal role in driving climate change (Ramirez-Corredores et al., 2023). Projections indicate that rising CO₂ levels could lead to a global temperature increase of approximately 1.5°C by 2050 (The World Counts, 2024; Wisconsin Department of Natural Resources, 2024).

The consequences of unmitigated GHG emissions are far-reaching, particularly for countries like Malaysia, encompassing extreme weather events, shifts in pest and disease patterns, unpredictable crop yields, and reduced plant survival rates. These factors contribute to substantial financial losses, jeopardise food security, and exacerbate natural disasters (Prajapati et al., 2024; Zaman et al., 2021).

Malaysia has already experienced the adverse effects of climate change on its environment and economy. The agricultural sector, crucial to the nation's food security and economic stability, has been particularly vulnerable to erratic weather patterns. Droughts and extreme rainfall have led to significant declines in crop production, underscoring the urgent need for sustainable solutions.

In response to these challenges, Malaysia has demonstrated a strong commitment to climate action through various policies and initiatives. The 12th Malaysia Plan outlines ambitious goals, including increasing the share of renewable energy in the national energy mix to 31% by 2025 and achieving net-zero emissions by 2050.

These domestic efforts align with Malaysia's international commitments, such as its pledge under the Paris Agreement to reduce greenhouse gas emissions intensity of GDP by 45% by 2030. As Malaysia strives to meet these targets, the search for innovative and sustainable solutions has intensified.

One promising avenue that has gained increasing attention is the utilisation of bamboo, a versatile and fast-growing grass abundant throughout the country. Bamboo's unique properties make it an invaluable asset in combating climate change:

(1)

Rapid carbon sequestration: Bamboo's fast growth rate allows it to absorb and store significant amounts of carbon dioxide, acting as an efficient carbon sink.

(2)

Low resource requirements: Bamboo cultivation demands fewer resources compared to traditional crops, making it an environmentally friendly option.

(3)

Versatility in application: Beyond carbon sequestration, bamboo can serve as a sustainable alternative in various industries, including construction and manufacturing, contributing to a more circular economy.

(4)

Land restoration: Bamboo cultivation can help restore degraded lands and prevent soil erosion, offering environmental benefits beyond carbon capture.

(5)

Economic opportunities: The development of a bamboo industry can create new economic avenues for rural communities, aligning environmental goals with economic development.

Given Malaysia's commitment to achieving carbon neutrality by 2050 and the pressing need to reduce greenhouse gas emissions, evaluating alternative methods for carbon sequestration is critical. Bamboo, naturally adapted to Malaysia's tropical climate, is a compelling candidate for immediate research and potential large-scale implementation.

This policy brief explores the potential of bamboo as both an environmental solution and an economic driver in Malaysia. By assessing bamboo's capacity for carbon sequestration and its applications in downstream products, we can inform policies integrating bamboo into national afforestation and economic development programs.

Timely research and policy implementation in this area could significantly contribute to Malaysia's sustainable development goals, offering a multifaceted approach to addressing climate change while fostering economic growth and environmental restoration.

Problem Statement

Climate change presents a significant global challenge, with extreme weather events impacting agricultural yields and increasing natural disasters worldwide. While the Malaysian government is pursuing various initiatives to achieve its Net Zero 2050 target, the full potential of bamboo—a versatile, fast-growing plant with promising applications for both economic development and environmental management remains largely untapped.

This study addresses the urgent need for innovative solutions to mitigate the impacts of climate change by examining bamboo's potential for carbon sequestration, economic value creation, and environmental management in Malaysia. Despite its recognised versatility, bamboo's implementation in these areas is not well-known.

The research aims to identify the current state of bamboo utilisation, public perceptions, existing practices, policy gaps, and barriers to the widespread adoption of bamboo-based solutions in Malaysia.

Some Malaysians remain unaware of bamboo's potential for carbon sequestration and its economic benefits, often viewing it as a waste product. Raising awareness about bamboo's advantages, especially its carbon capture capabilities, could shift public perception and promote community-led initiatives.

This study identifies key challenges and outlines the criteria for developing a strategic plan that connects policy recommendations to maximise bamboo's benefits for carbon sequestration, land rehabilitation, and rural job creation.

A strategic plan to overcome the challenges of bamboo utilisation begins with conducting extensive research and development, identifying relevant stakeholders, and securing funding for initiatives (Figure 1).

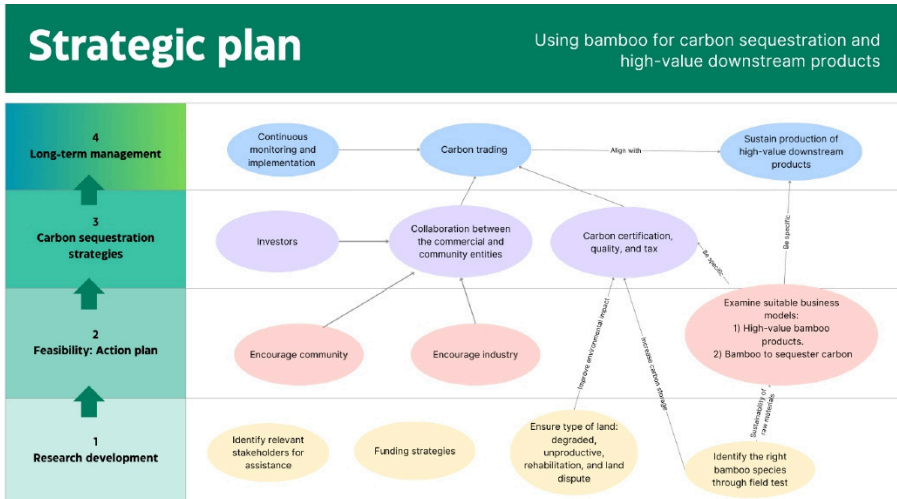


Figure 1: Strategic plan to enhance the multiple benefits of bamboo in Malaysia. Source: Authors' data (2023-2024).

It is essential to focus on the suitability of land for bamboo cultivation, particularly degraded or unproductive areas that are viable for rehabilitation. Field tests should be conducted to identify the right bamboo species for different environmental conditions, ensuring optimal growth and carbon sequestration capacity.

Equally important is fostering local community engagement and industry participation by offering training, incentives, and financial support to encourage bamboo cultivation and its downstream applications.

Communities can be empowered to view bamboo as a sustainable income source, while industries can explore high-value bamboo-based products such as furniture, textiles, and construction materials.

Additionally, integrating bamboo into carbon sequestration projects on a larger scale requires strategic collaboration between government agencies and private companies to ensure feasibility, market readiness, and economic viability.

The next strategic focus is developing robust carbon sequestration strategies using bamboo, which involves engaging local and international carbon investors and fostering collaboration between commercial entities and community groups.

Effective carbon sequestration must adhere to internationally recognised standards, including carbon certification and tax regulations. Central to this effort is implementing effective 'Monitoring, Reporting, and Verification' (MRV) system for bamboo carbon sequestration in Malaysia.

This system comprises three key components: Monitoring, which involves continuous data collection through permanent sample plots; Reporting, which provides a structured framework for documenting and communicating the data; and Verification, which ensures data credibility through rigorous internal and external validation processes.

The MRV system will integrate with national carbon reporting standards and international requirements, adapting to emerging technologies and best practices. This strategy ensures long-term sustainability through continuous monitoring and adaptive management and supports the sustained production of high-value bamboo downstream products.

By creating a circular economy around bamboo cultivation – focused on both carbon sequestration and commercial value – Malaysia can secure long-term economic viability and environmental resilience, positioning itself to achieve its Net Zero 2050 target in a more realistic and sustainable manner by incorporating locally grown Malaysian bamboo.

Methodology

The study adopted a qualitative approach, conducting in-depth interviews with twelve expert panels in Malaysia. The panellists were selected through purposive sampling based on specific criteria, requiring a minimum of five years of direct experience in areas such as carbon sequestration management, bamboo cultivation, bamboo-based downstream products, bamboo environmental management, or the rehabilitation of degraded or unproductive land.

A snowball sampling technique was used, allowing the initial panellists to recommend other relevant experts. Invitations and consent letters were sent to each panellist to schedule interviews, conducted either online or in person, depending on their availability. All interviews were audio-recorded to ensure data accuracy.

Interview questions were developed based on prior studies on the benefits of bamboo, carbon sequestration, degraded land restoration, carbon credit management, and the role of bamboo in improving local socioeconomic through downstream products (Binfield et al., 2022; International Fund for Agricultural Development, 2020).

Data analysis was conducted using thematic analysis to identify patterns and key insights from the interview transcripts. Responses were anonymised to ensure no personal identifiers were linked to the panellists or their organisations, and the data was treated with strict confidentiality.

The analysis focused on understanding expert perspectives on bamboo's potential for carbon sequestration and its role in rehabilitating degraded or unproductive land, as well as its socioeconomic benefits.

This qualitative approach provided an in-depth understanding of the expert panel's perspectives on bamboo utilisation for carbon sequestration, land rehabilitation, and the improvement of local livelihoods through downstream bamboo products. The findings can serve as valuable guidance for policymakers, environmental managers, bamboo cultivators, and industry stakeholders in promoting sustainable bamboo-based solutions in Malaysia. We gratefully acknowledge the Tin Industry (Research and Development) Board for funding this study.

Findings & Analysis of Existing Relevant Policies

(1) The National Bamboo Industry Development Action Plan 2021-2030 (NBIDAP)

Malaysia's current policy landscape regarding bamboo utilisation and carbon sequestration reveals a complex picture of progress and missed opportunities. The National Bamboo Industry Development Action Plan 2021-2030 (NBIDAP), which serves as the primary framework for bamboo utilisation across various industries, demonstrates the government's recognition of bamboo's economic potential (Ministry of Plantation Industries and Commodities, 2021).

However, it falls short in addressing bamboo's environmental benefits, particularly its capacity for carbon sequestration. The NBIDAP's focus on economic gains from upstream and downstream products overshadows the crucial role bamboo could play in environmental conservation and climate change mitigation. This imbalance is particularly striking given Malaysia's rich bamboo resources, with approximately over 80 species (refer to Annex 1), 45 of which naturally occur in the country's forests with 24 species have been documented as potential commercial bamboo (Gimino, 2023; Mohd Tarmizi et al., 2019).

Panel experts were unable to reach a consensus on which bamboo species are suitable for specific soil conditions, necessitating extensive field trials to identify the most appropriate species for various soil types and to prevent the introduction of invasive species.

(2) The 12th Malaysia Plan (RMKe-12)

The 12th Malaysia Plan (RMKe-12), from 2021 to 2025, further illustrates the government's commitment to developing the bamboo industry as part of its strategy to transform Malaysia into a developed, high-income, and sustainable nation by 2030 (Economic Planning Unit, 2021).

While the plan recognises bamboo as a strategic commodity for agricultural diversification and economic opportunities, it fails to explicitly integrate bamboo's potential for carbon sequestration into its sustainability goals.

This oversight represents a missed opportunity to align economic development with environmental conservation efforts, particularly in the context of climate change mitigation.

(3) MADANI Economy Framework

The MADANI Economy Framework, supported by key policy documents such as the National Energy Transition Roadmap and the National Energy Policy 2022-2040, demonstrates a more explicit focus on carbon capture and renewable energy as strategies to reduce greenhouse gas emissions and achieve net-zero emissions by 2050 (Ministry of Finance, 2024).

However, these policies primarily emphasise technological solutions for carbon capture, overlooking the potential of natural carbon sequestration methods, particularly through bamboo plantations. While carbon credit, storage, and trading mechanisms exist within Bursa Carbon Exchange Malaysia, there is a noticeable lack of concrete actions to implement carbon sequestration projects, especially in degraded and unproductive land areas where bamboo cultivation could provide significant environmental benefits.

A critical examination of these policies reveals a consistent pattern of underutilising bamboo's environmental potential, particularly its capacity for carbon sequestration (Figure 2).

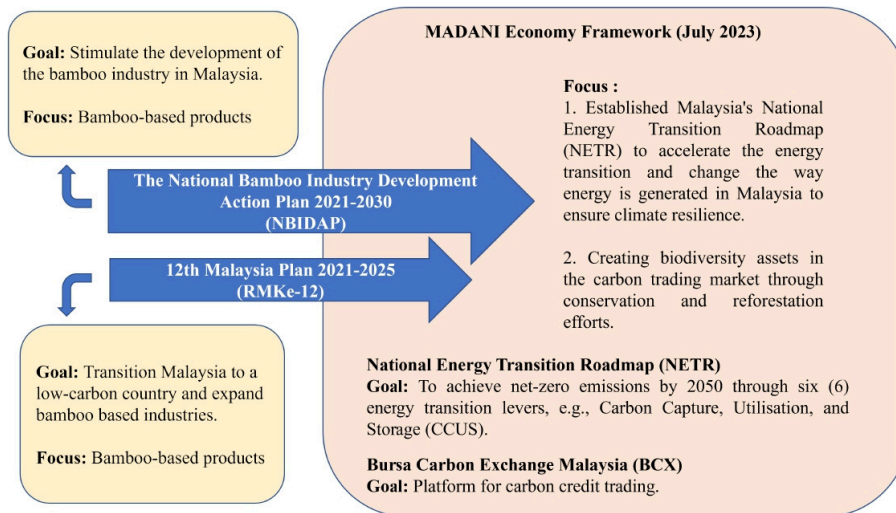


Figure 2. Mapping of existing policies relevant to bamboo utilisation in Malaysia.

Despite acknowledging bamboo's potential in this area, existing policies fail to fully leverage this capability, focusing more on economic aspects. This lack of integration between bamboo's carbon sequestration capabilities and its potential for high-value downstream products represents a significant policy gap. Moreover, the absence of specific bamboo-related carbon sequestration projects in Malaysia indicates a missed opportunity to contribute significantly to the country's Net Zero 2050 target.

(4) Malaysia Forest Fund (MFF)

The MFF was established in 2021 under the initiative of the Ministry of Natural Resources and Environmental Sustainability to provide financing for forest conservation and to adhere to the National REDD+ Strategy under the United Nations Framework Convention on Climate Change (UNFCCC), with a specific focus on forest carbon activities. It is important to note that while Malaysia's forests contain large carbon stocks due to millions of years of forest growth, they may not necessarily be high in carbon sequestration.

Since bamboo is a native plant and an integral component of Malaysia's rainforest ecosystem, integrating bamboo – known for its high carbon sequestration potential – should be considered, especially in forest restoration and rehabilitation efforts. This requires careful consideration of the principle of additionality for carbon sequestration.

The principle of additionality is essential for accurately evaluating carbon sequestration projects, as it ensures that carbon credits are only awarded for mitigation efforts that go beyond what would have occurred naturally.

Therefore, projects should focus on land that is not already effectively storing carbon. For instance, planting bamboo in existing forests (deforestation followed by bamboo planting) would not provide additional carbon sequestration and could even reduce the overall capacity. To maximise carbon sequestration benefits, bamboo should be prioritised for planting on degraded or unproductive lands, such as reclaimed mining sites.

(5) ASEAN Common Carbon Framework (ACCF)

The 'Monitoring, Reporting, and Verification' (MRV) system for carbon sequestration varies depending on the country or group of countries. MRV can be implemented through mechanisms such as Voluntary Carbon Markets (VCM), Emission Trading Systems (ETS), or Carbon Tax policies. Malaysia is leading the ASEAN Common Carbon Framework (ACCF) to create a unified platform for ASEAN countries to engage in carbon trading and stimulate green investments.

With the establishment of the ACCF, it is hoped that transparency among ASEAN member states will be enhanced, ensuring equitable carbon trading and supporting the achievement of the Net Zero 2050 target.

Given the ongoing efforts to address climate change within ASEAN, it is expected that discussions and negotiations related to carbon markets and emissions reductions will continue leading up to and during the 30th annual Conference of the Parties (COP30), scheduled to take place in November 2025.

Policy Recommendations

Recommendation 1: Establish a Dedicated Bamboo Policy and Task Force

Malaysia needs a comprehensive bamboo policy to address carbon sequestration, downstream product development, and land tenure issues across Peninsular Malaysia, Sabah, and Sarawak. Creating a dedicated policy and task force is crucial, as current bamboo planting lacks alignment with carbon sequestration and downstream product development strategies.

Although bamboo is recognised for its potential, there is no dedicated policy that integrates these elements effectively, particularly the need to plant bamboo on degraded lands to sequester carbon that adheres to international standards. Stakeholders, including planters, carbon credit consultants, industry experts, and government bodies, each hold valuable expertise but lack a unified approach.

For instance, planters may know how to cultivate bamboo but are unaware of its economic or carbon-sequestering potential. Similarly, carbon credit consultants have expertise in assessing carbon capture but lack knowledge of optimal bamboo species and soil conditions. Government bodies understand downstream applications but have limited insights into carbon credit management.

To maximise bamboo's potential, the policy must integrate these diverse expertise areas, ensuring a collaborative and coordinated approach.

Addressing land tenure complexities is essential, as most suitable regions for bamboo plantation have disputed areas among state, communities, and commercial entities claim ownership. Such disputes hinder bamboo cultivation. Legal entities, certified negotiators, and mediators can facilitate agreements between states, communities, and businesses, helping develop disputed and unproductive lands sustainably. This dedicated policy must focus on incentivising bamboo planting for carbon mitigation while aligning with sustainable product development goals.

Recommendation 2: Promote Bamboo Cultivation for Carbon Sequestration and High-Value Products

Bamboo offers dual benefits: carbon sequestration and the production of high-value downstream products like biochar, biomass, and construction materials (Figure 3). Establishing a robust business model that promotes these benefits is key for successful bamboo cultivation.

Malaysia should support the formation of cooperatives or consortia among small-scale bamboo planters to overcome challenges like high initial costs and achieve profitability through pooled resources. Cooperatives could help small-scale growers access funding, manage the substantial initial costs associated with carbon credit schemes, and reach the scale needed for long-term success.

Bamboo dual benefits in Malaysia

Bamboo in tin mining ecosystem: to sequester carbon and produce bamboo-based downstream products.

Where do we stand?	Bamboo potentials in Malaysia	
<ul style="list-style-type: none"> • <i>Ongoing export for bamboo-based products.</i> • <i>Construction uses bamboo as a green material.</i> • <i>Many bamboo planters only know bamboo-based products and have no awareness about their potential for carbon sequestration.</i> 	To sequester carbon	Bamboo-based downstream products
	Bamboo has fast growth	Renewable: Biochar, biomass, biofuel, pellet, and handicraft.
	High absorption rate	Food: Bamboo rice (Lemang), bamboo shoot, and chopstick.
	Stabilise soil	Green construction: Primary building material, roof, housing frame and interior.
Future recommendations	Easily grow on any soil	Bamboo is chosen for its strength, quick renewability, lightweight, cost-effective, and can be harvested locally.
<ul style="list-style-type: none"> • <i>Recommend a specific task committee at the federal and state levels to develop policy and guidelines.</i> • <i>Initiate and increase scale for trial plots of bamboo in degraded areas to identify suitable bamboo species.</i> • <i>Carbon credit assessment: create a robust monitoring, reporting, and verification (MRV) system.</i> 		

Figure 3. Bamboo dual benefits in Malaysia.

Source: Authors' data (2023-2024).

The collaboration with Bursa Carbon Exchange Malaysia and other stakeholders is vital for developing transparent carbon credit registration and management systems. For bamboo cultivation projects to be economically viable, it is crucial to establish plantations that span at commercial scale to secure a consistent and sustainable supply of raw bamboo materials for industries. However, the challenge lies in balancing bamboo's use as an industrial raw material with its carbon sequestration potential, as harvesting for downstream products can reduce carbon storage capacity if not managed properly.

Recommendation 3: Establish Funding Mechanisms for Community-Level Bamboo Cultivation Projects

Developing community-level bamboo cultivation projects requires establishing effective funding mechanisms. The government and private sector must work together to provide funding opportunities for local communities interested in bamboo cultivation. Creating a Bamboo Industry Development Fund will help the communities face difficulties securing financial support without a proven track record.

By developing strong business proposals that demonstrate a return on investment and approaching banks and private investors with these plans, communities can secure the financial backing needed to launch bamboo cultivation projects. Additionally, partnerships with banks, private companies, and local communities can open alternative funding avenues.

Public awareness campaigns play a vital role in reshaping perceptions of bamboo. Since 2016, the Malaysian Bamboo Society (MBS) has been actively educating local communities, from primary school children to university students, to raise awareness (Marzalina, 2024). The society has established several bamboo gardens (bambusetum), for educational purposes and to preserve Malaysia's native bamboo species.

Many Malaysians remain unaware of bamboo's potential for carbon sequestration and its economic benefits, seeing it instead as a waste product or a parasitic plant. Raising awareness of bamboo's value, particularly its carbon sequestration potential, could change public perception and inspire community-driven initiatives. Emphasising bamboo's ability to rehabilitate degraded lands and its cost-effectiveness compared to other carbon sequestration methods may also attract broader support and investment.

Recommendation 4: Strengthen the Bamboo Value Chain

To support the bamboo industry's growth, Malaysia must enhance its bamboo value chain by establishing direct connections between bamboo planters and buyers through competitive pricing structures. Ensuring that bamboo planters receive fair prices and diversifying bamboo-based downstream products are essential. Bamboo cultivation, particularly in rural areas and among indigenous communities (Orang Asli), has a rich history in Malaysia.

However, without the understanding that this bamboo can be utilised for carbon sequestration projects, the communities would not be able to gain more beyond selling the bamboo culm. Besides selling bamboo-based products, states like Sabah, Sarawak, Pahang, Perak, Kelantan, and Terengganu have traditionally incorporated bamboo into ecotourism, handicrafts, and construction.

Creating a streamlined market structure that connects planters directly with buyers could stabilise pricing, with treated and processed bamboo fetching higher market values. Additionally, promoting diversification in bamboo-based products, such as construction materials, furniture, handicrafts, and eco-friendly products, will increase economic opportunities and ensure a reliable income stream for communities.

By supporting indigenous craftsmanship and integrating it into modern market demands, Malaysia can promote sustainable bamboo farming practices while boosting local economies.

Recommendation 5: Bamboo Conservation and Rehabilitation Efforts

Bamboo can play a significant role in environmental conservation and rehabilitation projects across Malaysia. For instance, the Kinta Valley Bamboo Sanctuary, Perak exemplifies how bamboo can transform former tin mining sites into ecotourism destinations that showcase the plant's potential for landscape rehabilitation. This model should be replicated on other degraded lands unsuitable for traditional agriculture, such as mining areas or buffer zones.

Bamboo's adaptability to poor soils and various environmental conditions makes it an ideal candidate for these projects. In addition, research is needed to identify optimal bamboo species suited for different regions, particularly those compatible with local ecosystems to avoid ecological disruptions. Malaysia must also evaluate soil toxicity and radioactivity levels in degraded lands before planting bamboo, ensuring it does not absorb harmful contaminants.

In Malaysia, it is essential to test suitable bamboo species for their growth performance, lifespan, carbon sequestration capacity, and economic potential for planters. Importantly, non-native bamboo species must undergo extensive field trials to ensure they do not encroach on natural forest ecosystems. Integrating bamboo into ecosystem restoration and buffer zone management projects will yield multiple benefits, including job creation, community support, and economic revenue from bamboo-based products (Gimino, 2022). This holistic approach could transform degraded lands into productive areas, enhance biodiversity, and support Malaysia's carbon sequestration and conservation efforts (Table 1).

Policy Initiative	Objective	Strategy	Method	Remark
1) Establish a dedicated bamboo policy and task force.	To create a comprehensive bamboo policy that integrates carbon sequestration, downstream product development, and land tenure resolution.	Develop a dedicated policy and establish a task force to align bamboo planting with carbon sequestration strategies.	Collaborate with planters, carbon credit consultants, industry experts, and government bodies. Facilitate land tenure negotiations with legal entities.	Unifies fragmented efforts in bamboo utilisation, addressing land disputes and policy gaps.
2) Promote bamboo cultivation for carbon sequestration and high-value products.	To support bamboo cultivation for dual benefits: carbon sequestration and high-value downstream products.	Establish cooperatives for small-scale planters and develop carbon credit schemes.	Form cooperatives to pool resources, reduce initial costs, and secure sustainable bamboo supply. Collaborate with Bursa Carbon Exchange Malaysia for transparent carbon credit management.	Balances bamboo's industrial use with its carbon sequestration role, ensuring long-term economic and environmental viability.

Policy Initiative	Objective	Strategy	Method	Remark
3) Establish funding mechanisms for community-level bamboo cultivation projects.	To create financial support mechanisms for community-based bamboo cultivation.	Launch a Bamboo Industry Development Fund and partner with banks and private investors.	Develop business proposals for funding, launch public awareness campaigns to reshape bamboo's image, and foster partnerships with financial institutions.	Encourages local communities to initiate bamboo projects by providing financial backing, increasing bamboo cultivation for carbon capture and economic gain.
4) Strengthen the bamboo value chain.	To enhance economic opportunities for bamboo planters by improving market access and product diversification.	Create direct connections between planters and buyers, and diversify bamboo-based products.	Establish competitive pricing structures and support diversification in bamboo products (e.g., construction, handicrafts, eco-products).	Ensures fair pricing for bamboo, promotes indigenous craftsmanship, and supports sustainable farming, benefiting rural and indigenous communities.

Policy Initiative	Objective	Strategy	Method	Remark
5) Bamboo conservation and rehabilitation efforts.	To utilise bamboo for environmental conservation, particularly on degraded lands	Use bamboo for rehabilitation of degraded lands, including former mining areas, and assess soil quality for bamboo planting.	Research suitable bamboo species for different regions, evaluate soil conditions, and integrate bamboo into ecosystem restoration projects.	Enhances biodiversity, rehabilitates degraded lands, and contributes to carbon sequestration, making bamboo a key tool for environmental restoration.

Table 1. Policy initiative recommendations for the implementation of bamboo in carbon sequestration in Malaysia.

These policy recommendations are vital to fully harness bamboo's potential in Malaysia for both environmental and economic benefits. A dedicated bamboo policy and task force will align expertise, resolve land tenure issues, and guide strategic bamboo cultivation. Promoting bamboo for carbon sequestration and high-value products can help balance industrial demand with environmental sustainability.

Community-level funding mechanisms empower local participation, while strengthening the value chain ensures fair pricing and product diversification. Bamboo's role in conservation and land rehabilitation will transform degraded areas, supporting Malaysia's sustainable development and Net Zero 2050 goals.

Conclusion

The current policy landscape highlights the need for better alignment between agricultural, industrial, and environmental policies to create a cohesive strategy for bamboo utilisation. Such an approach should balance economic benefits with environmental conservation, recognising bamboo not just as an economic resource but as a vital tool in the fight against climate change.

There is a pressing need to develop policies that promote the use of bamboo as a green environmental tool, particularly in unproductive and degraded lands. This approach could contribute significantly to Malaysia's climate goals while fostering sustainable development and community empowerment.

In conclusion, while Malaysia has laid foundational policies for bamboo industry development and carbon reduction, there is a critical need to bridge the gap between these initiatives. Future policy recommendations should focus on creating a more integrated approach that fully harnesses bamboo's potential for both environmental conservation and economic growth.

Therefore, it would be constructive to incorporate the findings of the current study into the 13th Malaysia Plan, which is set to take effect in 2026. This forward-looking approach would help ensure the policy brief remains relevant to future national priorities.

This could involve developing specific incentives for bamboo-based carbon sequestration projects, integrating bamboo cultivation into broader land restoration and climate mitigation strategies, and promoting research and development in bamboo-based technologies for carbon capture and storage.

By addressing these policy gaps, Malaysia can position itself as a leader in sustainable development, effectively leveraging its bamboo resources to meet both economic and environmental objectives.

References

Binfield, L., Britton, T. L., Dai, C., & Innes, J. (2022). Evidence on the social, economic, and environmental impact of interventions that facilitate bamboo industry development for sustainable livelihoods: A systematic map protocol. *Environmental Evidence*, 11(1), 33. <https://doi.org/10.1186/s13750-022-00286-8>

Economic Planning Unit. (2021). *Twelve Malaysia Plan 2021–2025: A prosperous, inclusive, and sustainable Malaysia*. <https://rmke12.ekonomi.gov.my/en/documents/twelfth-plan>

Gimino, G. (2022). Transforming ecosystems and empowering communities through bamboo. *The Star*. <https://www.thestar.com.my/news/nation/2022/12/02/transforming-ecosystems-and-empowering-communities-through-bamboo>

Gimino, G. (2023). Fadillah: Vast potential for bamboo industry to grow. *The Star*. <https://www.thestar.com.my/news/nation/2023/09/22/fadillah-vast-potential-for-bamboo-industry-to-grow>

International Fund for Agricultural Development. (2020). Five ways bamboo can fight climate change. <https://www.ifad.org/en/w/explainers/five-ways-bamboo-can-fight-climate-change>

Marzalina, M. (2024). *Taman Buluh Kuala Kangsar @ Sek. Keb. Clifford: Melentur buluh biarlah dari rebungnya – To reshape bamboo, it begins with the shoot*. OCA Publication.

Ministry of Finance. (2024). Pre-budget statement 2025: Ekonomi MADANI – Ekonomi makmur, rakyat sejahtera. <https://www.mof.gov.my/portal/pdf/siaran-media/Pre-Budget-Statement-2025.pdf>

Ministry of Plantation Industries and Commodities. (2021). National Bamboo Industry Development Action Plan 2021–2030. <https://www.bernama.com/en/business/news.php?id=2004985>

Mohd Tarmizi, M., Hamdan, H., Abd. Latif, M., & Amir Saaiffudin, K. (2019). Buluh komersial Malaysia / Commercial bamboos of Malaysia. FRIM Special Publication No. 30.

Prajapati, H. A., Yadav, K., Hanamasagar, Y., Kumar, M. B., Khan, T., Belagalla, N., Thomas, V., Jabeen, A., Gomadhi, G., & Malathi, G. (2024). Impact of climate change on global agriculture: Challenges and adaptation. *International Journal of Environment and Climate Change*, 14(4), 372–379. <https://doi.org/10.9734/ijecc/2024/v14i44123>

Ramirez-Corredores, M. M., Goldwasser, M. R., & Falabella de Sousa Aguiar, E. (2023). Carbon dioxide and climate change. In M. M. Ramirez-Corredores, M. R. Goldwasser, & E. Falabella de Sousa Aguiar (Eds.), *Decarbonisation as a route towards sustainable circularity* (pp. 1–14). Springer. https://doi.org/10.1007/978-3-031-19999-8_1

The World Counts. (2024). CO₂ concentration: In the atmosphere, right now (ppm). <https://www.theworldcounts.com/challenges/global-warming/CO2-concentration>

Wisconsin Department of Natural Resources. (2024). The science of climate change. <https://dnr.wisconsin.gov/climatechange/science>

Zaman, M., Kleineidam, K., Bakken, L., Berendt, J., Bracken, C., Butterbach-Bahl, K., Cai, Z., Chang, S. X., Clough, T., Dawar, K., Ding, W. X., Dörsch, P., dos Reis Martins, M., Eckhardt, C., Fiedler, S., Frosch, T., Goopy, J., Görres, C. M., Gupta, A., ... Müller, C. (2021). Greenhouse gases from agriculture. In *Measuring emission of agricultural greenhouse gases and developing mitigation options using nuclear and related techniques* (pp. 1–10). Springer. https://doi.org/10.1007/978-3-030-55396-8_1

Annex 1: List of bamboo species found in Malaysia

Note: *potential as commercial species

No	Scientific name
Genus: <i>Bambusa</i>	
1	<i>B. bambos</i>
2	<i>B. beecheyana</i> *
3	<i>B. blumeana</i> *
4	<i>B. farinacea</i>
5	<i>B. heterostachya</i> *
6	<i>B. laxa</i>
7	<i>B. nana</i>
8	<i>B. multiplex</i> *
9	<i>B. tuldooides</i>
10	<i>B. vulgaris</i> *
11	<i>B. vulgaris striata</i> *
Genus: <i>Chamonobambusa</i>	
12	<i>C. quadrangularis</i>
Genus: <i>Dendrocalamus</i>	
13	<i>D. asper</i> *
14	<i>D. dumosus</i>
15	<i>D. elegans</i>
16	<i>D. giganteus</i> *
17	<i>D. hirtellus</i>
18	<i>D. longipathus</i>
19	<i>D. pendulus</i> *
20	<i>D. sinuatus</i>
21	<i>D. strictus</i>
Genus: <i>Dinochloa</i>	
22	<i>D. darvelana</i>
23	<i>D. obclavata</i>
24	<i>D. prunifera</i>
25	<i>D. robusta</i>
26	<i>D. scabrada</i>
27	<i>D. sipitangensis</i>
28	<i>D. sublaevigata</i>
29	<i>D. trichogona</i>
30	<i>Dinochloa sp. 1</i>
31	<i>Dinochloa sp. 2</i>

No	Scientific name
Genus: <i>Gigantochloa</i>	
32	<i>G. atter</i> *
33	<i>G. albociliata</i> *
34	<i>G. albopilosa</i>
35	<i>G. albovestita</i>
36	<i>G. balui</i> *
37	<i>G. brang</i> *
38	<i>G. hasskarliana</i> *
39	<i>G. holttumiana</i>
40	<i>G. latifolia</i> *
41	<i>G. levis</i> *
42	<i>G. ligulata</i> *
43	<i>G. ridleyi</i>
44	<i>G. rostrata</i>
45	<i>G. scortechinii</i> *
46	<i>G. thoi</i>
47	<i>G. wrayi</i> *
Genus: <i>Holttumochloa</i>	
48	<i>H. korbuensis</i>
49	<i>H. magica</i>
50	<i>H. pubescens</i>
Genus: <i>Kinabaluchloa</i>	
51	<i>K. wrayi</i>
Genus: <i>Maclurochloa</i>	
52	<i>M. montana</i>
Genus: <i>Melocanna</i>	
53	<i>M. baccifera</i>
Genus: <i>Phyllostachys</i>	
54	<i>P. glauca</i>
55	<i>P. nigra</i>
56	<i>P. pubescens</i>
57	<i>P. viridis</i>

No.	Scientific name
Genus: <i>Racemobambos</i>	
58	<i>R. setifera</i>
59	<i>R. gibbsiae</i>
60	<i>R. glabra</i>
61	<i>R. hemburnii</i>
62	<i>R. hirsuta</i>
63	<i>R. pairinii</i>
64	<i>R. rigidifolia</i>
Genus: <i>Schizostachyum</i>	
65	<i>S. aciculare</i>
66	<i>S. blumei</i>
67	<i>S. brachycladum</i> *
68	<i>S. latifolium</i>
69	<i>S. lima</i>
70	<i>S. gracile</i>
71	<i>S. grande</i> *
72	<i>S. iraten</i>
73	<i>S. jaculan</i> *
74	<i>S. latifolium</i>
75	<i>S. lengguanii</i>
76	<i>S. pilosum</i>
77	<i>S. terminale</i>
78	<i>S. zollingeri</i> *
79	<i>S. lengguanii</i>
Genus: <i>Soejatnia</i>	
80	<i>S. ridleyi</i>
Genus: <i>Sphaerobambos</i>	
81	<i>S. hirsuta</i>
Genus: <i>Thyrsostachys</i>	
82	<i>T. siamensis</i> *
Genus: <i>Yushania</i>	
83	<i>Y. tessellata</i>

Source: List gathered from Mohd Tarmizi et al. (2019).



© 2022 INSTITUT MASA DEPAN MALAYSIA. All rights reserved.

Institut Masa Depan Malaysia
192, Jalan Ara, Bukit Bandaraya,
59100 Wilayah Persekutuan Kuala Lumpur

For more information, visit our website:
www.institutmasa.com

eISBN 978-629-7928-05-0

