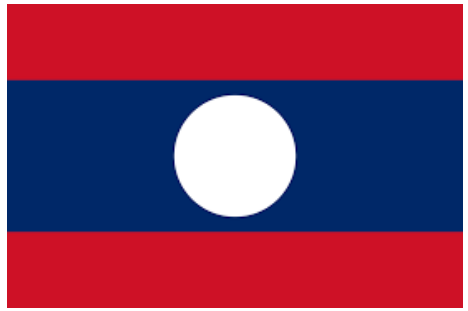
ADB ASIAN DEVELOPMENT BANK

Sustainable Construction Material Study

Preliminary Results of Market Analysis for Cambodia and Laos



Sustainable Construction Material Study

The Sustainable Construction Materials Market Analysis identifies **opportunities to enhance resource efficiency in key construction materials**. It aims to **inform stakeholders about the availability, costs, and potential market share of greener alternatives**. The focus is on materials such as **asphalt, cement, concrete and steel.**

The terms of reference for the study include:

1. **Identify resource efficiency improvements for asphalt, cement, concrete, and steel.**
2. **Provide feedback on the survey** framework.
3. **Recommend next steps.**
4. Draft a **technical note outlining the availability and provisional cost estimates** of identified opportunities against technical standards.

National Strategic Goals

Are there national goals to support sustainable development and resource-efficiency in construction?

Laos PDR	**Cambodia**
Key initiatives include the Sustainable Consumption and Production (SCP) Roadmap (2022-2025), Green Public Procurement (GPP) Action Plan (2023-2025), Nationally Determined Contribution (NDC) and a National Green Growth Strategy (2018-2030), all aiming to integrate sustainable practices across various sectors.	Cambodia has set strategic goals to support sustainable development and resource efficiency in construction as part of its environmental and economic sustainability commitment. These goals are articulated in its National Strategic Development Plan (NSDP), Nationally Determined Contribution (NDC), and related initiatives like the Cambodia Sustainable Development Goals (CSDGs).

Resource Efficiency Targets

Do laws set specific targets for efficient use of asphalt, cement, concrete, and steel?

Laos PDR	Cambodia
There are no **specific national laws** targeting resource efficiency in construction materials like asphalt, concrete or steel, but broader sustainability guidelines exist.	Cambodia has not yet established **specific legal targets for efficiently using** asphalt, cement, concrete, and steel materials. However, the country's **policies emphasize broader goals** focusing on reducing greenhouse gas emissions through energy efficiency, renewable energy adoption, and improved resource use.

Government Incentives

Are there government incentives (e.g., tax breaks, subsidies) for sustainable construction materials?

Laos PDR	Cambodia
Limited incentives are provided for sustainable construction materials, though pilot projects funded by international donors have included subsidies.	Tax incentives and donor-funded programs encourage sustainable practices, especially in urban areas like Phnom Penh. Royal Degree states Qualified Investment Projects (QIP) are entitled to customs duty, special tax and value added tax exemption for construction material used in related projects.

Current Practice

Laos PDR

Laos is improving its production of key construction materials like cement and steel but still **relies on imports to meet demand and quality standards**. Production costs are competitive yet influenced by regional trade and internal efficiency.

Since 2020, construction input costs have risen by over 20% due to global supply chain disruptions and inflation (CBRE, 2022). Furthermore, **high-grade cement and steel imports from Thailand, China, and Vietnam have increased costs** compared to local alternatives (OEC, 2022).

Material	Production/Import	Average Cost (Lao Kip)	Average Cost (USD)
Asphalt	Imported*		$500 - $700 / ton
Cement	Local & Imported	25,000 - 37,000 /50kg bag	$3.10 - $4.50 / 50kg bag
Concrete	Local		$50 - $80 / cbm
Reinforcement Steel	Local & Imported**		$750 - $850 / ton

* mainly from Thailand | ** mainly from China and Vietnam.

Current Practice

Cambodia	
In Cambodia, the construction sector **relies on both local and imported materials** to meet the demands of rapid urbanization and infrastructure development, while the industry works to bolster local production and sustainability efforts, aiming for greater self-reliance.	Over the past five years, **construction material costs in Cambodia**, including cement, steel, and asphalt**, have fluctuated due to local and global factors. Steel prices have risen significantly,** cement prices have remained stable, specialized imports have increased. Asphalt prices likely mirrored global oil trends.

Material	Production/Import	Average Cost (K Riel)	Average Cost (USD)
Asphalt	Imported	~3.2 MRiel /ton	$550-750 / ton
Cement	Local & Imported	21,000 Riel /50 kg bag	$3.50-5.00 / 50kg bag
Ready-Mix Concrete	Local & Imported	~350,000 Riel /cbm	$70-80.00 / cbm
Reinforcement Steel	Imported	~2,5 MRiel /ton	$800-900 per ton

C&D Waste Regulations

Do regulations mandate the use of construction and demolition (C&D) waste in new projects?

Laos PDR	Cambodia
Regulations are minimal, with C&D waste management primarily guided by international development agencies.	C&D waste policies exist in draft form, focusing on landfill diversion and recycling targets.

1

ASTM D 6370 (USA), EN 13108-8 (EU), BS 6187 (UK): Standard for RAP in asphalt mixes.

AASHTO M 323 (USA): Standard for recycled aggregates in asphalt pavements.

EN 12620 (EU): Standard for aggregates for concrete, incl. recycled aggregates from C&D waste.

ASTM C33 (USA), ASTM C94 (USA): : Standard for using natural aggregates in concrete

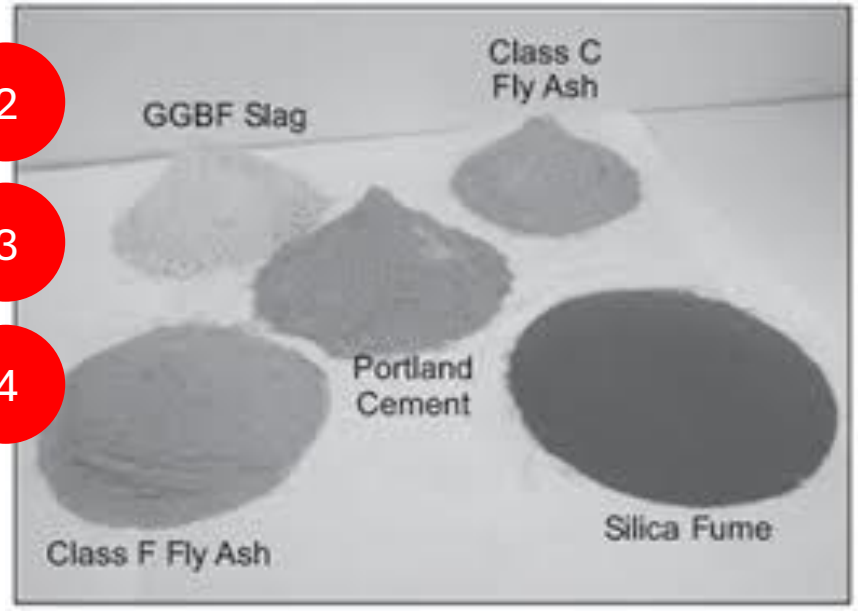
BS 8500 (UK): Guidelines on aggregates from C&D waste

ISO 14044 (International): Standard on life cycle assessment (LCA)

Supplementary Cementitious Materials

Are materials like fly ash, slag, or limestone allowed in cement and concrete?

Laos PDR	Cambodia
Fly ash and slag are sometimes used in experimental projects, but no formal standards exist.	SCMs like fly ash and limestone are being promoted under private-sector green building initiatives or for specific performance purposes. Use of SCMs is gaining acceptance in green building certifications.

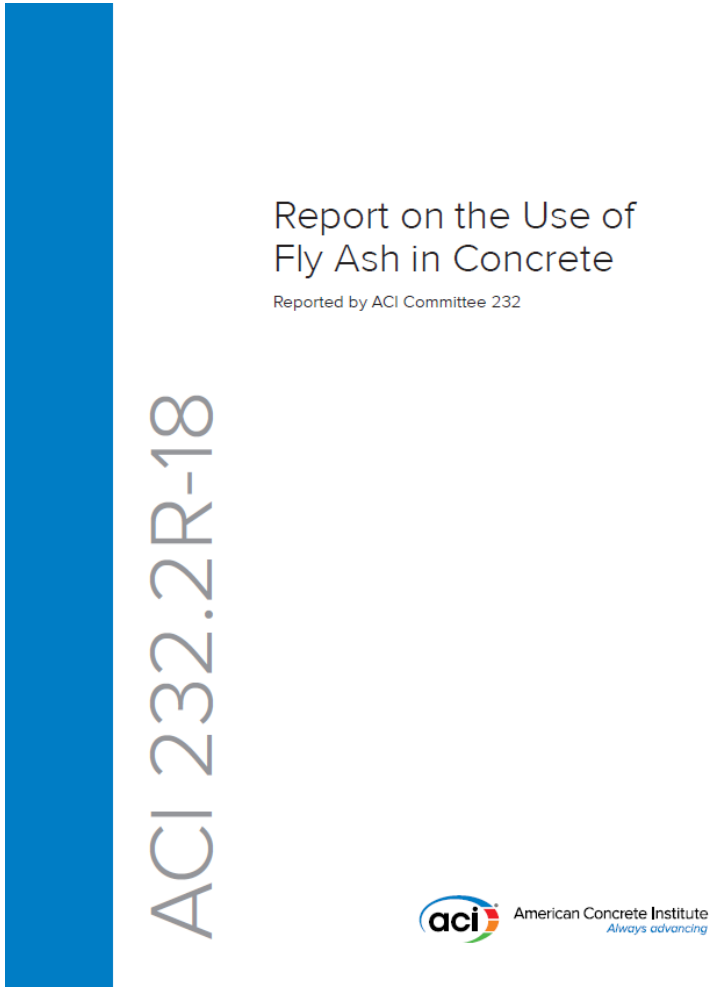


ASTM and EN standards govern SCM usage. For example, ASTM C595 and EN 197-1 provide specifications for blended cement containing limestone and other SCMs (Thomas et al., 2010).

Laos typically adopts regional practices influenced by ASEAN frameworks, but specific national regulations may still be underdeveloped or evolving.

Supplementary Cementitious Materials

Are materials like fly ash, slag, or limestone allowed in cement and concrete?



Natural Fiber Composites in Reinforced Concrete

Are natural fibers (e.g., bamboo, hemp) allowed in reinforced concrete?

Laos PDR	Cambodia
Experimental use of natural fibers like bamboo is limited to non-structural applications.	Bamboo and hemp are explored for low-cost housing but lack structural testing standards.

5

ASTM C78/C78M-10e1 (flexural strength test) and ASTM C1609 for fiber-reinforced concrete are commonly cited in studies on the use of bamboo and hemp in composites (Sankar et al., 2017).

ISO standards for bamboo, such as ISO 22157, provide mechanical test methods that find application to concrete reinforcement.

Alternative Binding Materials for Asphalt

Are materials like rubber or plastic allowed as asphalt substitutes?

Laos PDR	Cambodia
Use of rubber and recycled plastic is undocumented.	Natural latex or rubber can be used as additive in Polymer Modified Asphalt (PMB). Tipco Asphalt Cambodia is currently a research partner with Techo Sen Institute of Ministry of Public Works and Transport. The main challenges to adopting resource-efficient construction materials are costing and stakeholders knowledge of new product.

5

ASTM D6114/D6114M sets out specifications for rubber-modified asphalt binders. ASTM D5976 provides detailed specifications for the use of recycled materials in asphalt. Specifications from Thailand and China, where such materials are being tested, could also influence adopting similar practices in Laos.

Alternative Binding Materials for Asphalt

Are materials like rubber or plastic allowed as asphalt substitutes?

Recycled Co-products as Aggregates

Are recycled materials (e.g., reclaimed asphalt) allowed as construction aggregates?

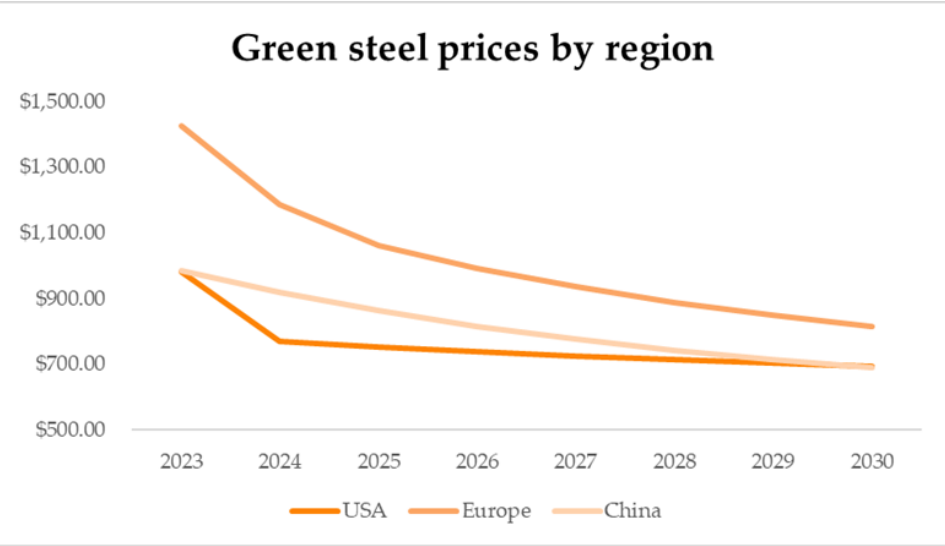
Laos PDR	Cambodia
Recycled aggregates are occasionally used, guided by donor projects.	Recycled concrete is gaining acceptance in green building certifications.

Applicable Standards are ASTM C33 for concrete aggregates and ASTM D692 for coarse aggregates in asphalt applications. Moreover, ASEAN and other neighboring countries' practices influence material use standards, emphasizing sustainability.

Green Steel Standards

Are there standards that require sustainable practices like recycled content or renewable energy?

Laos PDR	Cambodia
No formal green steel standards exist, though imported recycled steel is used.	Green steel is discussed in private-sector sustainability frameworks.



Globally, standards such as ISO 14001 (Environmental Management) and ISO 50001 (Energy Management) are used to guide sustainable practices in steel production (Laskurain et al., 2015).

Steel recycling and increased use of renewable energy in production processes are key features of sustainable steel production in countries leading green steel initiatives (Nechifor et al., 2020).

US$17 million Steel Recycling Plant to Open in Kampong Speu

22 September 2020 Local News 7667 Views

Structural Bamboo Standards

Is bamboo approved as a structural material?

Laos PDR	Cambodia
Structural use of bamboo is largely unregulated, though international NGOs have piloted its use.	Bamboo is used in informal construction but lacks regulatory approval for structural use.

ASTM C78/C78M-10e1 (flexural strength test) and ASTM C1609 for fiber-reinforced concrete are commonly cited in studies on the use of bamboo and hemp in composites (Sankar et al., 2017). ISO standards for bamboo, such as ISO 22157, provide mechanical test methods that find application to concrete reinforcement.

Findings

Ongoing from conducted interviews

Laos PDR and Cambodia
› Alternative implementation of asphalt so far undocumented › Examples of using rubber and plastic waste exist from neighbor country (Thailand)
› Use of blended cements/concrete for structural components prohibited, due to specification requirements (especially of internationally funded projects) › Use of blended cements for performance adjustment purposes only › Use of blended cement limited availability due to shortage of fly ash or limestone, alternative may be biochar or risk husks › Some factories focus on operations improvement for reducing carbon footprints (alternative fuels, photovoltaics (which exposes controversy in governmental support) › Most building certification projects are avoiding alternative material usage
› Use of scrap steel so far undocumented › One factory under construction in Cambodia › No documentation of green steel (H2 production) in the countries

Findings

Ongoing from desk study

Laos PDR and Cambodia
› **Asphalt** in Laos and Cambodia offers moderate potential for better resource efficiency. Greener alternatives such as warm mix asphalt and recycled asphalt pavement (RAP) are not widely available due to low demand and low awareness of sustainable construction practices. However, RAP is expected to gain importance, driven by growing interest in sustainable infrastructure and possible regulatory incentives. **The main constraints include lack of technical know-how, limited regulatory support, market inertia and cost sensitivity**.
› **Cement** offers moderate potential for improved resource efficiency in Laos and Cambodia. While neighbors currently benefit from a significant supply of pulverized fuel ash (PFA) and blast furnace slag (BFS), these resources are limited in supply. This shift requires research into more sustainable cement production methods. › Resource efficiency in the cement industry can be improved through cement optimization, material substitution, use of complementary cementitious materials (SCMs) such as natural pozzolans and agricultural waste as sustainable alternatives to PFA and BFS. › **Limitations and challenges include availability of supplement materials, market awareness, policies and standards, infrastructure constraints, and high upfront costs.**

Findings

Ongoing from desk study

Laos PDR and Cambodia

- There is moderate potential to improve resource efficiency in **concrete** production in Laos and Cambodia. While cement manufacturing is well-established, low-carbon options are still emerging. Dependence on imported advanced materials can lead to higher costs and logistical challenges.
- In these cost-sensitive markets, **price premiums of 2-5% for sustainable materials are notable**, though international development projects may afford to adopt these alternatives.
- **Limitations include market awareness, regulatory gaps, infrastructure challenges, and performance concerns.**

- Rebar has moderate potential for improved resource efficiency in Laos and Cambodia. Having limited formal recycling infrastructures, there is no notable recognition of local production from scrap into construction steel products. Steel produced from scrap might already be entering these markets as imported goods.
- **Market Limitations are high cost-sensitivity, lack of regulatory enforcement for low-carbon materials, and logistical challenges.**

Environmental Product Declarations (EPDs)

Are EPDs required for construction materials to document life cycle impacts?

Laos PDR	Cambodia
The country is still in the early stages of adopting comprehensive sustainability regulations in construction. **EPDs**, which provide detailed life cycle impact data for products, **are currently not a mandatory standard** for local building projects.	EPDs are gaining traction for green-certified projects, but no mandates exist. With increasing interest in sustainability, particularly in green building certifications **there is a growing emphasis on using data from EPDs** to meet the standards set by these international certification systems.

Eco Label and Certifications

Are there eco labels to support sustainable production (and procurement)?

Laos PDR	Cambodia
Efforts to establish eco-labels are relatively new, there are altogether 6 int. ecolabels active in Laos. A project aimed at building the capacity for eco-label establishment of products is spearheaded by the Thailand Environment Institute (TEI), in partnership with the German International Cooperation (GIZ).	There are altogether 6 int. ecolabels active in the country. Cambodia is developing a Roadmap for Sustainable Consumption and Production (SCP), focusing on eco-labels and sustainable procurement. This initiative aims to reduce environmental impact by minimizing waste and pollution, enhancing resource efficiency, and supporting the circular economy.

https://www.ecolabelindex.com
https://www.giz.de/en/worldwide/137510.html

Eco Label and Certifications

Are there eco labels to support sustainable production (and procurement)?

Laos PDR	Cambodia
Another collaboration with GIZ seeks to embed Green Public Procurement (GPP) into Laos' procurement processes. It aims for incorporating environmental factors into planning, evaluation, and bidding.	

Green Public Procurement Projects

Are there eco labels to support sustainable production (and procurement)?

Cambodia, Vietnam, …

The SWITCH-Asia program, funded by the European Union, is actively promoting sustainable public procurement (SPP) initiatives in 5 countries, among them Cambodia, with a focus on sustainable construction and infrastructure. Key projects include:

1. Green Public Procurement (GPP)
2. Sustainable Consumption and Production (SCP) Programs
3. Capacity Building and Policy Support

https://www.switch-asia.eu/resource/elevating-sustainable-green-public-procurement-for-transformation/
https://www.switch-asia.eu/resource/sustainable-public-procurement-of-construction-and-infrastructure-in-vietnam/

Green Public Procurement Projects

Are there eco labels to support sustainable production (and procurement)?

Conclusions from Switch Asia project
To prioritize sustainable procurement in green infrastructure development, support eco-friendly construction, and reinforce the countries commitment to sustainability.

Key focus areas include:

- **Providing guidance on calculating life-cycle costs for construction projects.**
- Mandating green building certifications for high-value public buildings.
- **Developing standards for reusing and recycling construction materials.**
- Offering incentives for sustainable construction materials and technologies.
- **Implementing mandatory use of construction and demolition (C&D) waste in new projects.**
- **Upskilling procurement officials to incorporate sustainability criteria in decision-making.”**

- Developing standards for low carbon construction materials.

Low Carbon Building Project

Current Initiative

	Cambodia
	The Asia Low Carbon Buildings Transition (ALCBT) project is to promote a shift towards low-carbon buildings in Cambodia, **significantly reducing energy consumption and greenhouse gas emissions**. The National Energy Efficiency Policy 2022-2030 aims for a 19% reduction in total energy consumption, with specific targets of 34% in residential and 25% in commercial buildings by 2030.

Green Building Certification (Local)

Is there country specific green building certification system for addressing sustainable materials?

Laos PDR	**Cambodia**
Laos is developing **green building standards** based on the standards of TREES, LEED, and CASBEE. These standards are appropriate for Laos because cultural distinctions have unique requirements. The Lao government and the Global Green Growth Institute (GGGI) launched a **Green City Action Plan** for Pakse city. The plan is part of a larger project to improve the city environment. GGGI is also developing a similar plan for Vientiane Capital.	Guidelines are emerging in green building frameworks and donor-funded research. Guidelines and Certification for Green Building **(CamGCGB)** is in the draft version by the MoE and MLMUPC. It aims to guild to green construction and building. The **Cambodia Green Building Council** offers building certification based on adapted LEED criteria.

Green Building Certification (International)

Is there international building certification system for addressing sustainable materials?

Laos PDR	Cambodia
LEED (Leadership in Energy and Environmental Design): LEED is recognized globally and is often applied to large-scale commercial and residential buildings in many Southeast Asian countries, including Laos **(2 certified projects).**	**LEED (Leadership in Energy and Environmental Design)**: LEED is recognized globally and is often applied to large-scale commercial and residential buildings in many Southeast Asian countries, including Cambodia **(12 certified projects).**
The World Bank Group's office in Lao PDR is certified as "**Green Mark**" by Singapore's building rating system designed to evaluate a building's environmental impact and performance **(1 certified project).**	**EDGE (Excellence in Design for Greater Efficiencies)**: EDGE is a popular certification system in Southeast Asia, including Cambodia **(3 certified projects).** It focuses on energy, water, and material efficiency in buildings. EDGE is designed to be a cost-effective solution for emerging markets. It provides a simple, fast, and affordable certification process for developers.

https://www.usgbc.org/projects
https://edgebuildings.com/project-studies/
Green Mark Buildings Directory

Green Building Certification (International)

Is there international building certification system for addressing sustainable materials?

LEED projects Cambodia (Laurelton Cambodia - Canteen building v2)

MATERIAL & RESOURCES		AWARDED: 6 / 14
MRp1	Storage and collection of recyclables	REQUIRED
MRc1.1	Building reuse - maintain existing walls, floors and roof	0 / 3
MRc1.2	Building reuse - maintain interior nonstructural elements	0 / 1
MRc2	Construction waste Mgmt	2 / 2
MRc3	Materials reuse	0 / 2
MRc4	Recycled content	2 / 2

MATERIAL & RESOURCES		AWARDED: 4 / 14
MRp1	Storage and collection of recyclables	REQUIRED
MRc1.1	Building reuse - maintain existing walls, floors and roof	0 / 3
MRc1.2	Building reuse - maintain interior nonstructural elements	0 / 1
MRc2	Construction waste Mgmt	2 / 2
MRc3	Materials reuse	0 / 2
MRc4	Recycled content	0 / 2

MATERIAL & RESOURCES		CONTINUED
MRc5	Regional materials	2 / 2
MRc6	Rapidly renewable materials	0 / 1
MRc7	Certified wood	0 / 1

MATERIAL & RESOURCES		AWARDED: 0 / 14
MRp1	Storage and collection of recyclables	REQUIRED

MATERIAL & RESOURCES		AWARDED: 5 / 13
Prereq	Storage and collection of recyclables	0 / 0
Prereq	Construction and demolition waste Mgmt planning	0 / 0
Credit	Building life-cycle impact reduction	3 / 5
Credit	Building product disclosure and optimization - environmental product d...	0 / 2
Credit	Building product disclosure and optimization - sourcing of raw materia...	0 / 2
Credit	Building product disclosure and optimization - material ingredients	0 / 2
Credit	Construction and demolition waste Mgmt	2 / 2

https://www.usgbc.org/projects

Conclusions

Ongoing

Laos PDR and Cambodia
Local Inter-ministerial Collaboration: Ministries should work together to optimize the specifications and procurement processes, ensuring alignment with national sustainability goals.
Research and Development Integration: Research institutions and development aid agencies should support developing and testing alternative material applications. This can be achieved through collaboration with pilot projects that serve as models for scalable implementation.
Public-Private Synergy: Trade and professional associations, in partnership with government representatives, should work to bridge national strategies with practical implementation, fostering coherence and alignment across sectors.
Incentivizing Sustainable Practices: The government should consider implementing financial and policy incentives, such as tax breaks or subsidies, to encourage the adoption of sustainable construction materials and techniques.
ASEAN Regional Collaboration: Active collaboration with ASEAN neighbors is vital to exchange expertise, harmonize standards, and expedite the adoption of updated specifications for low-carbon construction techniques across the region.