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Standardization in the Global Bamboo Industry: A Trade-Standard Nexus Approach

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Abstract: Bamboo, once a traditional material, has become a global commodity through innovation and market growth. Bamboo standards are now essential to reduce non-tariff trade barriers and maintain market competitiveness. This study systematically examines global bamboo standards across international, regional, national, and association levels, employing a novel trade-standard nexus approach to analyze development trends and driving factors. ISO/TC 296 and ISO/TC 165 are the primary technical committees for international bamboo standards. The priority areas for future promotion include daily-use bamboo articles, and engineered bamboo construction products with structural design. Thirty-one countries have established national bamboo standards (13 in Asia, 8 in Africa, 7 in Latin America and the Caribbean, and 3 in Europe). China leads in coverage (12 categories), while India pioneered national standards in the 1970s. Colombia's standards have influenced bamboo construction regulations in Brazil, Ecuador and Peru, and the adoption of ISO standards has driven standardization in Kenya, the Philippines, Indonesia, Ethiopia, the UK, and the Netherlands. No bamboo-specific regional standards have been established to date. Association standards are rapidly expanding in China, with China Association for Engineering Construction Standardization (CECS) and China Bamboo Industry Association (CBIA) playing pivotal roles. Four key drivers of global standardization were identified: legal and market recognition, trade facilitation, research and application support, and quality assurance with consumer confidence. Based on these findings, four actionable recommendations are proposed to promote both international and national standardization, namely, accelerating international standard development under the two TCs, broadening national-body participation in international standardization, promoting regional collaboration, and establishing incentives to engage all stakeholders.

Keywords: bamboo; standardization; international standards; national standards; trade; International Organization for Standardization (ISO)

1. Introduction

Bamboo is one of the world's most important non-timber resources, traditionally used in construction, food, furniture, crafts, and fencing. With over 1600 species widely distributed across Asia, Africa and the Americas [1], it has

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emerged as one of the most sustainable materials of the 21st century, offering a unique combination of environmental, mechanical, and socio-economic advantages that position it as a strategic resource for green development.

Environmentally, bamboo is a highly renewable material: unlike most commercial timber species that require decades to reach maturity, bamboo matures in just three to five years [2]. It regenerates from its root system after harvesting, which eliminates the need for replanting and helps prevent soil erosion [3]. As a carbon-negative crop, bamboo possesses a carbon storage capacity comparable to that of timber plantations over its entire lifecycle [4]. Mechanically, bamboo provides an exceptional strength-to-weight ratio and inherent flexibility; its hollow, segmented culm provides seismic resilience, while its high-density fibers offer tensile strength comparable to steel [5]. Through lamination, compression, and adhesive bonding, raw culms can be transformed into uniform engineered bamboo composites that preserve and enhance these mechanical advantages, offering improved stability under moisture and temperature fluctuations, slower carbonization during fire exposure, and enhanced safety performance [6]. Beyond environmental and structural merits, bamboo generates tangible economic and social benefits. In countries where bamboo is locally available, construction costs can be reduced by 20 to 30 percent compared to imported materials [7], while plantation management and processing create rural employment opportunities and support regenerative agriculture by restoring degraded land and purifying contaminated water sources [8,9]. These multifaceted benefits have catalyzed growing interest from policymakers, manufacturers, engineers, architects, consumers and farmers alike, transforming bamboo from a traditional subsistence material into a high-performance, globally traded commodity.

Over the past three decades, the global bamboo industry has evolved from a traditional craft into a modern, innovation-driven green economy. From the 1990s to the 2000s, China spearheaded rapid industrialization in the bamboo sector. Bamboo flooring production soared from 0.3 million m^2 in 1998 to 24 million m^2 in 2008, making China the world's largest exporter to the USA, Europe and Japan, where bamboo flooring increasingly replaced tropical hardwoods [10]. Around the same period, India cultivated its own bamboo sector, with industries spanning bamboo pulp and paper, as well as agarbatti (incense stick) manufacturing, collectively employing millions of workers across diverse rural and industrial sectors, while Thailand focused on bamboo shoot production for global market [11,12]. By the 2000s, technological diversification gained momentum as bamboo fiber textiles entered global markets [13] and engineered composites like glued laminated bamboo and bamboo scrimber were used in construction projects ranging from the roofing decoration of Madrid's Terminal 4 of Barajas Airport to a demonstration engineered bamboo house at Nanjing Forestry University in China [6]; into the 2010s, these innovations matured further: natural bamboo fibers emerged as a sustainable alternative to viscose [14–16], while both round and engineered bamboo gained wider structural use across Colombia, China, Indonesia, Thailand and Vietnam [6,17,18]. From 2020 onward, climate urgency elevated bamboo's status as a carbon-negative material, fostering the South-South Cooperation among bamboo-resource-rich countries. The "Bamboo as a Substitute for Plastic" initiative, jointly proposed by the Government of China and the International Bamboo and Rattan Organization (INBAR) in 2022 [19], has accelerated R&D progress in several key application areas: biodegradable packaging [20], automotive interior parts [21,22], and single-use tableware [23,24], with pilot projects now underway in China, Ethiopia, Cameroon, Ecuador and Brazil [25]. Today, the global market of bamboo industry exceeds USD 70 billion [26], with annual trade growing steadily. Propelled by product innovation, technological advancement, and surging global demand, the sector has undergone remarkable transformation, securing bamboo's position as a key commodity in the circular bioeconomy across continents.

However, as bamboo products increasingly penetrate global markets, the absence of internationally harmonized standards has become a critical bottleneck, underscoring the urgent need for robust standardization to support further trade expansion. In the era of globalization, standards provide common reference points and compliance frameworks that enable trade at national, regional, and international levels [27], and have become essential tools for reducing non-tariff barriers and maintaining competitiveness. This is particularly true for bamboo, a relatively new entrant to global commodity markets where product definitions, testing methods, and quality grades remain inconsistent across jurisdictions.

Standardization, the process of formulating, issuing, and implementing standards [28], offers a pathway to address these inconsistencies. A standard is a document, established by consensus and approved by a recognized body, that provides requirements, rules, or guidelines for a process, product, or service to ensure repeatability and achieve order in a given context [28,29]. For bamboo, this means establishing uniform protocols for fiber tensile testing, glue bond durability, dimensional stability, and fire resistance, enabling manufacturers to produce consistent quality and buyers to confidently specify bamboo across construction, textiles, packaging and daily-use applications. Standards benefit diverse stakeholders across the value chain, including bamboo farmers, processors, manufacturers, exporters, customers, traders, technologists, regulators, and governments.

Standards are commonly developed at four levels: international, regional, national, and association as follows:

- International standards are developed by international bodies, such as International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and International Telecommunication Union (ITU). ISO, IEC and ITU standards are ideal tools for developing trade agreements, and provide essential confidence that the products and testing have global relevance and acceptance. In general, international standards are non-mandatory. The standard development process engages globally-established experts and their full discussion during the development process. Therefore, international standards generally offer a solid foundation for either direct national adoption or subsequent adaptation.
- Regional standards are developed by regional organizations, such as European Committee for Standardization (CEN), African Regional Standards Organization (ARSO), Euro-Asian Interstate Council for Standardization, Metrology and Certification (EASC). They can be either mandatory or non-mandatory ones, depending on regional policies. For example, the national standardization institutes in Europe are obliged to adopt all CEN standards [30].
- National standards are developed by countries on their own, or adopt/adapt international or regional standards. National standards related to health, safety, food, structure safety and other critical areas, have certain legal status for facilitating its compulsory implementation. National standards are the most widely used among the other three types of standards.
- Association standards are developed by different professional associations. There are over 500 associations, professional bodies and governmental agencies that have issued and continue to issue thousands of association level standards in a wide range of fields [28]. For example, organization such as the American Society for Testing Materials (ASTM), the American Petroleum Institute (API), the American Society of Mechanical Engineers (ASME), China Association for Engineering Construction Standardization (CECS) issue association level standards.

This study investigates bamboo standards across these four levels, aiming to present their current status and development trends in the global bamboo sector, and to provide recommendations for further advancement. The novel contributions of this article are as follows: (i) Compilation of world's first comprehensive bamboo standards inventory: a systematic checklist of published bamboo standards (international, regional, national and association standards)—see Section 4, Appendices A and B; (ii) A novel categorization of standards based on the World Customs Organization's (WCO) Harmonized System (HS) codes and the categorization methodology of INBAR trade report, aimed at illustrating the synergies between standardization and trade; (iii) Comparative analysis for national standards: top 10 countries with bamboo standards, with parallel cross-regional assessments conducted across Asia, Latin America and the Caribbean, Africa, and Europe; (IV) Strategic insights for future perspectives of bamboo standardization: four key drivers for bamboo standardization were identified. A set of recommendations for future actions is also presented.

2. Global Bamboo Industry

In this study, the global bamboo industry refers to the entire value chain of bamboo, from planting and harvesting to processing, manufacturing, and trade across national borders. It consists of both domestic production systems and international supply chains, and involves stakeholders ranging from primary producers and manufacturers to regulators and consumers. The global bamboo industry covers a wide range of products, from round culms and traditional handicrafts to bamboo shoot, charcoal, pulp and paper, panels, flooring, furniture, tableware and kitchenware, daily-use bamboo articles, and engineered bamboo products for construction [26,31].

Global trade represents the cross-border dimension of this broader industry. In 2023, recorded exports of bamboo commodities reached USD 6.193 billion [26]. However, these official statistics do not capture domestic consumption or informal market transactions. The development of the global bamboo industry follows uneven but interconnected patterns across regions. Resource-rich countries in Asia, Africa, and Latin America and the Caribbean are not only major suppliers of raw bamboo but are also gradually moving toward value-added manufacturing. On the demand side, large consumer markets, particularly the EU, the USA, and Japan, which were the top three importers in 2023 [26], play a pivotal role in shaping product specifications, testing standards, and import requirements. Industrial upgrading tends to progress fastest where manufacturing capacity, research capabilities, market demand, and regulatory frameworks reinforce one another. This is evident in China, where these factors have converged to create a comprehensive bamboo processing industry that produces a wide array of high-value products for both domestic and international markets. In 2022, the total output value of China's bamboo industry reached RMB 415.3 billion (approximately USD 61.7 billion) [32], more than 20 times China's bamboo commodity export value of USD 2.698 billion [33]. In contrast, in many bamboo-rich but industrially underdeveloped countries, such as Uganda in Africa and Myanmar in Southeast Asia, technological,

infrastructural, and institutional constraints continue to confine bamboo use to traditional applications like biofuel, basic handicrafts, and raw culm exports [34,35].

The coexistence of traditional products, rapidly expanding consumer goods, and emerging engineered materials creates different regulatory and conformity-assessment needs. Consequently, standards are not separate from industrial development: they connect product innovation and research evidence with quality assurance, market access, and repeatable international trade.

3. Materials and Methods

In this section, two parts of contents are introduced as follows: (1) the data source; and (2) the novel categorization methodology of standards used in this study.

3.1. Data Source

The data for this study were compiled from various sources: (1) International standards (see tables in Section 4.1): ISO website and information from key experts working at relevant ISO technical committees; (2) National standards (listed in Table A1 to Table A11 in Appendix A and Appendix B): official websites of national standardization organizations of bamboo resources and bamboo products consuming countries; (3) Regional standards: official websites of regional standardization organizations; and checklists of standards published; (4) Association standards (detailed in tables in Section 4.3): official website of standardization association. All the relevant official websites were presented in Table A12 in Appendix C.

3.2. Categorization Methodology for Bamboo Standardization

The categorization methodology of bamboo standards is a foundation for the analysis in this study. Building on the HS codes developed by the WCO and the INBAR trade report classification, a novel categorization methodology was proposed for bamboo standardization (Figure 1), with a detailed introduction as follows.

Based on an analysis of the United Nations Comtrade database, 18 WCO HS codes pertaining to bamboo products were identified. Each product category is assigned a unique HS code for statistical reporting purposes. However, it should be noted that certain products may fall under multiple HS codes. Bamboo furniture, for instance, are classified into two distinct categories: bamboo seats (HS 940152) and bamboo furniture (HS 940382).

To facilitate the compilation and comparative analysis of international bamboo trade statistics, INBAR aggregates individual HS codes into broader product groupings. For example, the category “bamboo tableware and kitchenware” within INBAR’s classification encompasses three HS codes, namely bamboo kitchenware and tableware (HS 441911), bamboo chopsticks (HS 441912), and small bamboo sticks (HS 441919). The complete classification system employed in INBAR’s trade reports comprises ten categories: bamboo shoots, bamboo raw materials, bamboo charcoal, bamboo-based panels, bamboo panels for construction, bamboo tableware and kitchenware, bamboo articles of daily use, bamboo pulp and paper articles, bamboo furniture and woven bamboo products.

Taking into consideration the existing ISO bamboo standardization working groups, and with the objective of addressing the identified gaps between standardization efforts and trade practices, this study proposes a novel categorization framework consisting of 15 categories, which are detailed as follows:

- Bamboo food products: this category encompasses not only bamboo shoot products but also other edible products derived from bamboo, such as bamboo leaf antioxidant and polysaccharides from bamboo leaves.
- Bamboo articles for daily use: various daily use items made from bamboo, consisting of three categories “bamboo tableware and kitchenware”, “Bamboo articles of daily use” and “Bamboo paper articles” in INBAR’s trade reports.
- Bamboo furniture: different types of furniture made primarily from bamboo.
- Bamboo charcoal: charcoal products made from bamboo, including relevant test methods, products specifications, etc.
- Bamboo-based panels: panel products made from bamboo.
- Bamboo flooring: flooring materials made from bamboo.
- Woven bamboo products: woven items made from bamboo, such as mats and baskets.
- Bamboo construction: test methods of physical and mechanical properties of structural bamboo products, structural round bamboo and engineered bamboo products specifications, and design methods of bamboo structures.
- Bamboo pulp: pulp made from bamboo for paper production. Standards on the preservation of bamboo intended as raw material for paper production are classified in this category according to their end use.
- Bamboo processing: methods or techniques for transforming bamboo into industrial or commercial materials.

- Bamboo plantation: planting and management of bamboo forest for commercial uses.
- Bamboo preservation: techniques for enhancing bamboo's durability.
- Bamboo fiber: textile material derived from bamboo, primarily used in clothing production.
- Bamboo terminology: terminologies of variety of bamboo products, processing methods and relevant technologies.
- Others: standards that fall outside all previously defined categories.

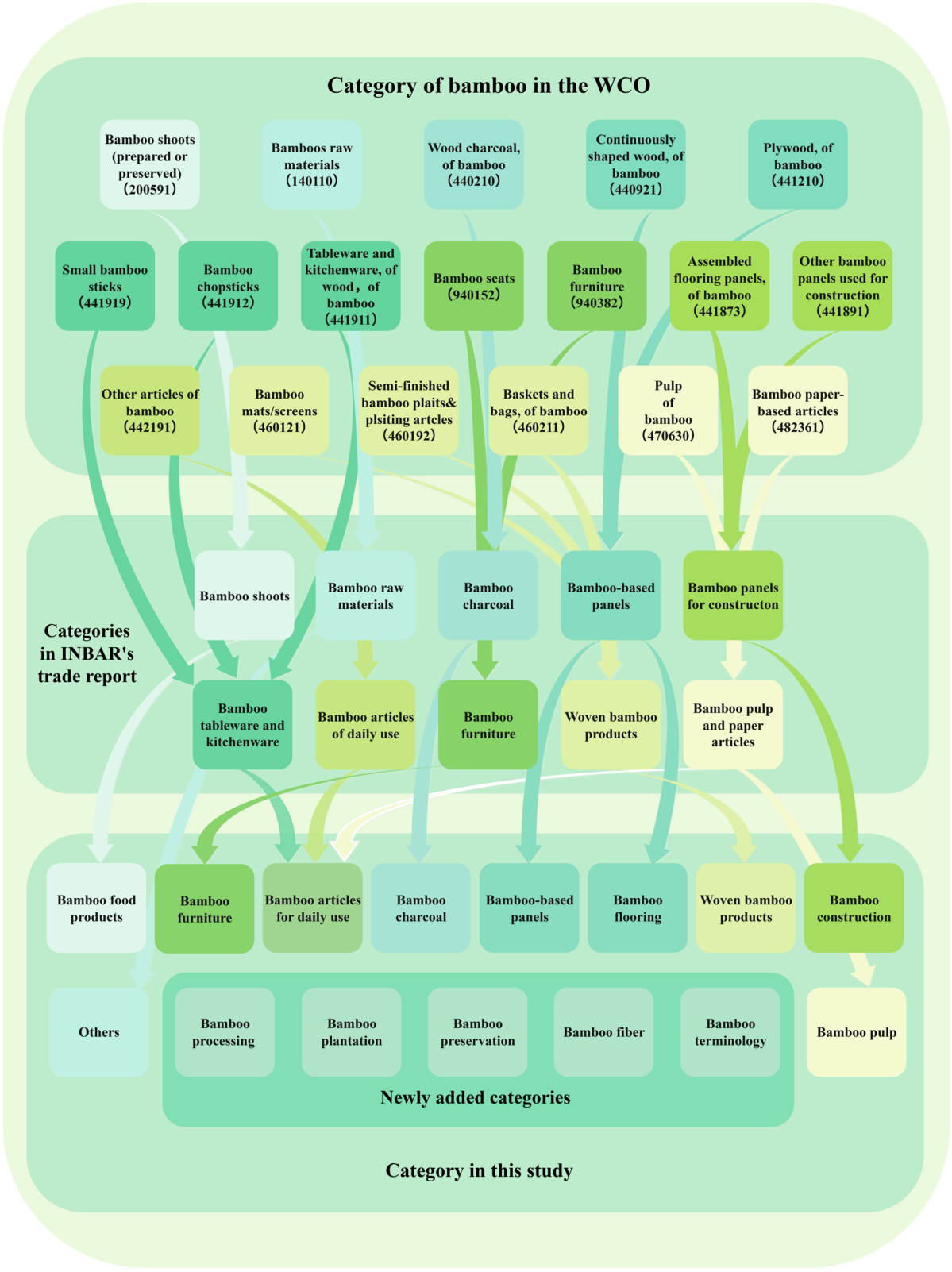


Figure 1. Categorization methodology for bamboo standardization developed in this study.

4. Results

4.1. International Standards

Since the beginning of the 21st century, ISO has gradually incorporated bamboo into its standardization system. In 2004, Technical Committee ISO/TC 165 "Timber Structures" published the first set of international standards on bamboo, including ISO 22156, ISO 22157-1 and the technical report ISO/TR 22157-2 (see Table 1). The release of these three standards laid the foundation for international standards governing the application of bamboo in the global construction sector. However, in the following decade, progress in bamboo standardization was limited: existing standards were not revised in a timely manner, and emerging engineered bamboo products such as glued laminated bamboo were not covered.

Subsequently, with the collaboration of INBAR, ISO/TC 165 established Working Group 12 (WG 12) in 2014, specifically to work on revising of existing ISO standards and developing of new ones for structural use of bamboo. INBAR is an intergovernmental organization that promotes environmentally sustainable development by using bamboo and rattan. Currently, INBAR has 52 member states. In addition to its secretariat based in Beijing, it has five regional offices based in Cameroon, Ecuador, Ethiopia, Ghana and India. The establishment of WG 12 led to the publication of the following six ISO standards during the last decade (see Table 1).

Table 1. Checklist of ISO standards on structural use of bamboo published by ISO/TC 165 [36].

No.	Designation	Title of Standards	Status
1	ISO 22156:2004	Bamboo—Structural design	replaced by ISO 22156:2021
2	ISO 22157-1:2004	Bamboo—Determination of physical and mechanical properties—Part 1: Requirements	replaced by ISO 22157:2019
3	ISO/TR 22157-2:2004	Bamboo—Determination of physical and mechanical properties—Part 2: Laboratory manual	withdrawn
4	ISO 19624:2018	Bamboo structures—Grading of bamboo culm—Basic principles and procedures	active
5	ISO 22157:2019	Bamboo Structures—Determination of physical and mechanical properties of bamboo culms—Test methods	active
6	ISO 22156:2021	Bamboo Structures—Bamboo culms—Structural design	active
7	ISO 23478:2022	Bamboo structures—Engineered bamboo products—Test methods for determination of physical and mechanical properties	active
8	ISO 5257:2023	Bamboo structures—Engineered bamboo products—Test methods for determination of mechanical properties using small size specimens	active
9	ISO 7567:2024	Bamboo structures—Glued laminated bamboo—Product specifications	active

Meanwhile, considering the rapid development of the global bamboo and rattan industry, ISO, with the support of INBAR, established a new technical committee in 2016-ISO/TC 296 "Bamboo and Rattan", with its secretariat based in China. Unlike TC 165, which focuses on structural applications of timber, wood-based panels and other wood-based products, TC 296 specifically focuses on bamboo and rattan industry chain. Its first published standard was ISO 21625:2020 Vocabulary related to bamboo and bamboo products, which laid the foundation for further standard development on bamboo flooring, bamboo charcoal, bamboo products, and bamboo article for daily use [37], see details in Table 2. Their latest publication, ISO 16830:2025 Specification for bamboo drinking straws, exemplifies the committee's response to the booming bamboo straw market—a sector rapidly expanding as a sustainable alternative to combat global plastic pollution.

Table 2. Checklist of ISO standards on bamboo published by ISO/TC 296 [37].

No.	Designation	Title of Standards	Status
1	ISO 21625:2020	Vocabulary related to bamboo and bamboo products	active
2	ISO 21626-1:2020	Bamboo charcoal—Part 1: Generalities	active
3	ISO 21626-2:2020	Bamboo charcoal—Part 2: Fuel applications	active
4	ISO 21626-3:2020	Bamboo charcoal—Part 3: Purification applications	active
5	ISO 21629-1:2021	Bamboo floorings—Part 1: Indoor use	active
6	ISO 21629-2:2022	Bamboo floorings—Part 2: Outdoor use	active
7	ISO 5946:2022	Bamboo-based activated carbon—General specifications	active
8	ISO 6128:2023	Laminated products made of bamboo strips for indoor furniture purposes—Requirements and test methods	active
9	ISO 5942:2024	Bamboo-wood composite for container flooring	active
10	ISO 16830:2025	Specification of bamboo drinking straws	active

Through the establishment of TC 165/WG 12 (Structural uses of bamboo) and TC 296 (Bamboo and Rattan), now ISO has developed a comprehensive international bamboo standardization framework that could address both construction engineering needs and any other industrial development in bamboo sector.

4.2. National Standards

The review of national standards agencies websites of bamboo producing and consuming countries illustrates that 31 countries have active national bamboo standards published by the end of September 2025 (see Appendices A and B). Out of which, 13 are in Asia, 8 in Africa, 7 in Latin America and the Caribbean and 3 in Europe (see Figure 2). Except for four bamboo-consuming countries—the Netherlands, the United Kingdom (UK), Italy and Korea—the other 27 countries are all bamboo-resources-rich countries, which closely aligns with the three major bamboo-resource continents shown in Figure 2. The top 10 countries in terms of published bamboo standards are China (49), India (25), Colombia (24), Kenya (22), Indonesia (17), the Philippines (17), Ethiopia (16), the Netherlands (12), Vietnam (10) and the UK (8). Among them, five Asian countries published 118 bamboo standards, accounting for 45% of the total published national standards (263) across the world.

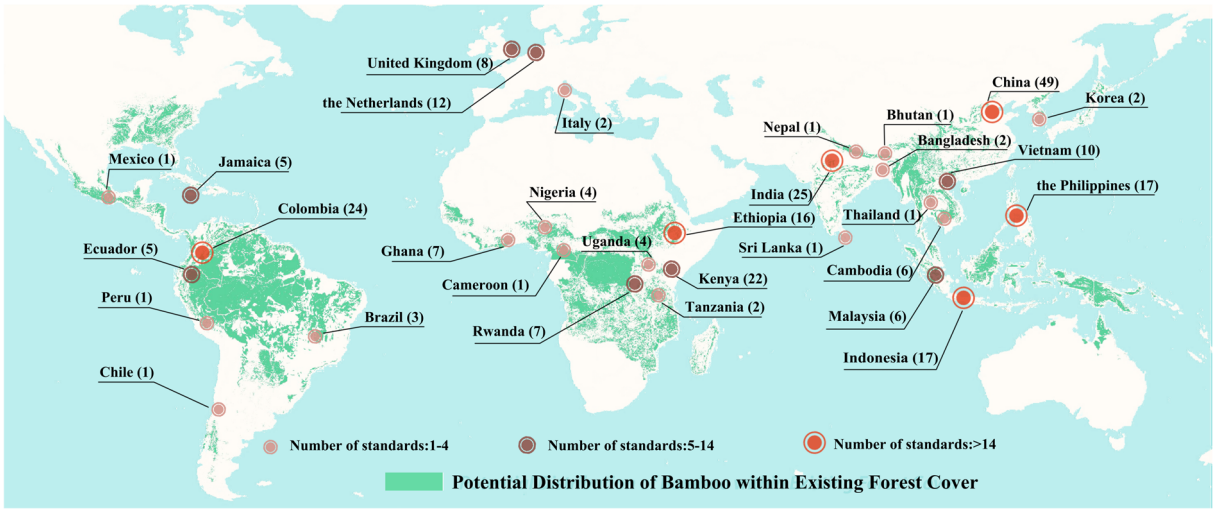


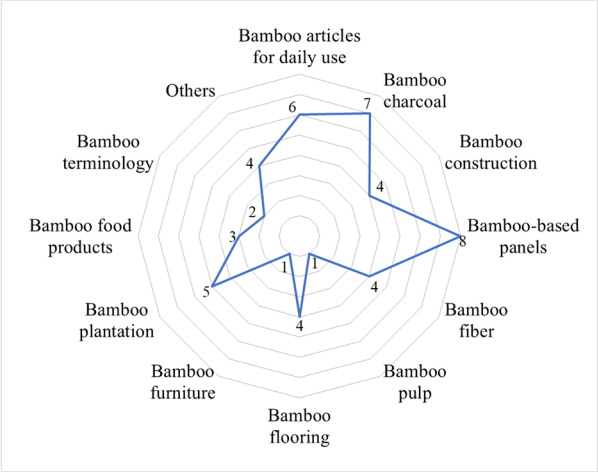
Figure 2. Distribution of countries published national bamboo standards.

4.2.1. The Top Ten Countries

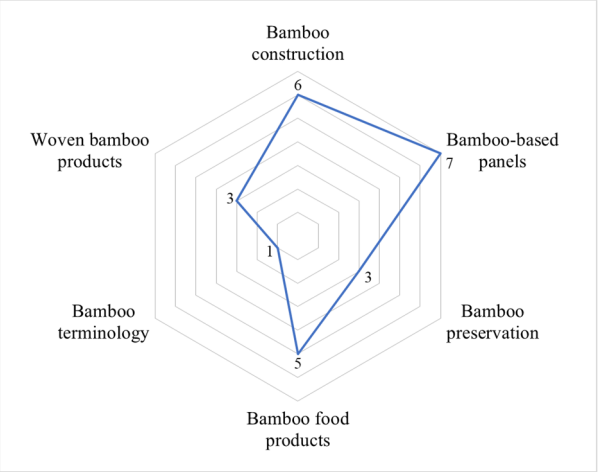
Figure 3 below illustrates the comparative analysis of bamboo standards developed by the top ten countries, categorized by standard types and their respective number of standards. China has published 49 national standards on bamboo (detailed checklist in Table A1 of Appendix A), becoming the country with the largest number of bamboo standards. It is important to note that the Chinese national bamboo standardization work started in the 1990s, with the publishing of GB/T 13123-1991: *Bamboo-mat plywood* and GB/T 13124-1991: *Test methods of bamboo-mat plywood* as the first two national bamboo standards. Further, establishment of the National Bamboo and Rattan Technical Committee (SAC/TC 263) in 2003 resulted in rapid growth of bamboo standards development. After two decades, Chinese national bamboo standards now cover 12 categories, including terminology, plantation, construction, and a wide range of products, such as food, flooring, panels, charcoal, woven products, pulp, fiber, furniture and articles for daily use (Figure 3a). These standards mainly focus on four categories, including bamboo-based panels (8), bamboo charcoal (7), bamboo articles for daily use (6), bamboo plantation (5). Most of those product standards are for the most widely distributed local bamboo species (5.28 million ha), *Phyllostachys edulis* (moso bamboo), which accounts for 69.8% of the total bamboo forests (7.56 million ha) in China [38]. The standard GB/T 30762-2014, entitled *Quality grading standards of main bamboo shoots*, applies to bamboo shoots of five species, namely moso bamboo, *Dendrocalamus latiflorus*, *Phyllostachys praecox*, *Dendrocalamus oldhamii*, and *Pleioblastus amarus*.

Ranked second globally, India has released 25 national standards on bamboo (detailed checklist in Table A2 of Appendix A). However, India started to publish national bamboo standards as early as the 1970s (see Table A2 of Appendix A), approximately two decades earlier than China. Its earliest national standard, Bamboo tent poles, was published in 1974. During the next decade, India published two bamboo construction related standards. A series of standards on bamboo shoots were later published in 2006 and revised in 2018. Now Indian national standards cover 6 categories (Figure 3b), focusing on bamboo-based panels (7), bamboo construction (6), bamboo food products (5). Two standards SP 7: 2016 *National building code of India 2016, Section 3 Timber and bamboo:*

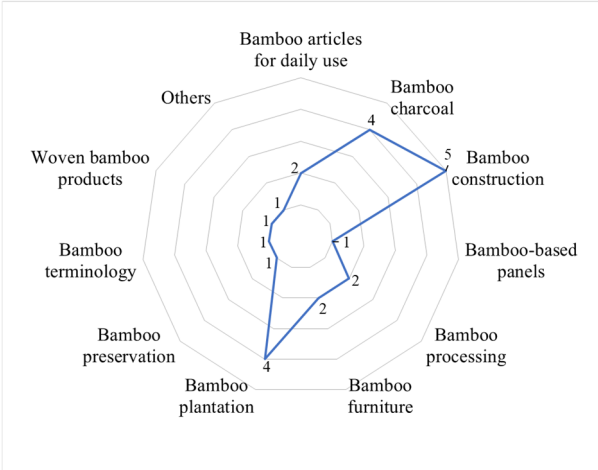
3B and IS 15912: 2018 *Structural design using bamboo—Code of practice*, recommend usage of fifteen species of bamboo. The recommended species include: *Bambusa nana*, *Dendrocalamus strictus*, *Oxytenanthera abyssinica*, *Bambusa balcooa*, *Bambusa pallida*, *Bambusa nutans*, *Bambusa auriculata*, *Bambusa burmanica*, *Cephalostachyum pergracile*, *Melocanna baccifera*, *Thyrsostachys oliveri*, *Bambusa bambos*, *Bambusa ventricosa*, *Bambusa vulgaris*, *and Dendrocalamus longispathus*.



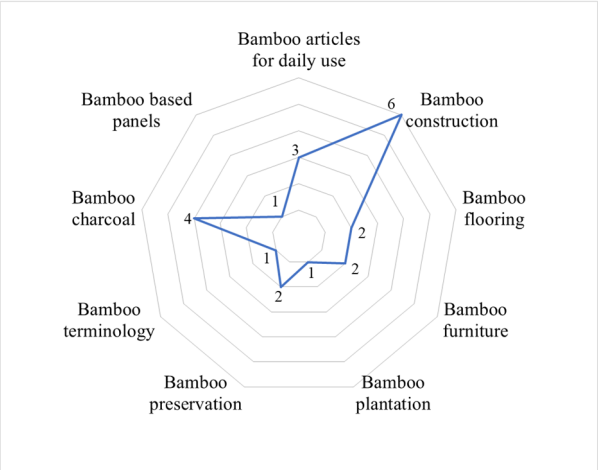
(**a**) China (49)



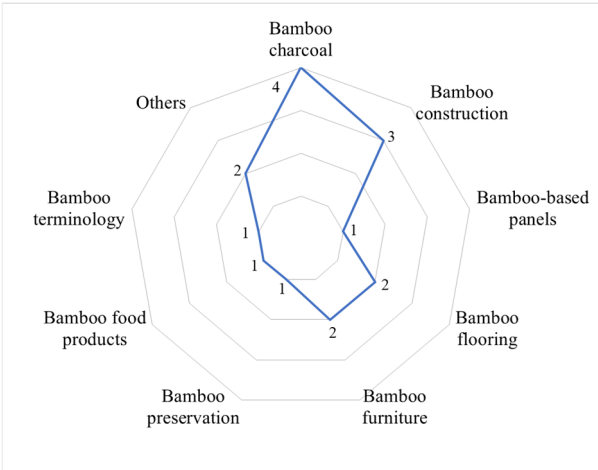
(**b**) India (25)



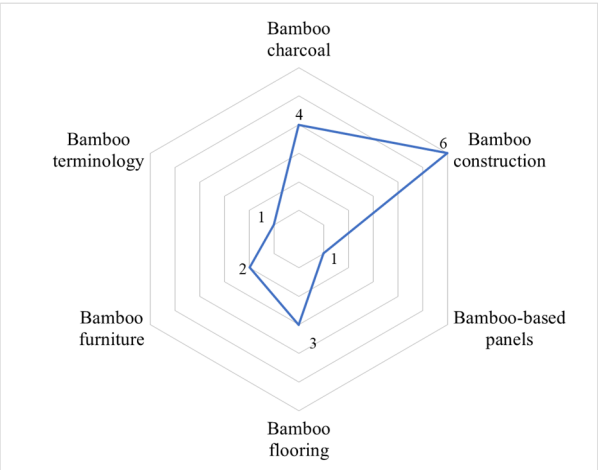
(**c**) Colombia (24)



(**d**) Kenya (22)

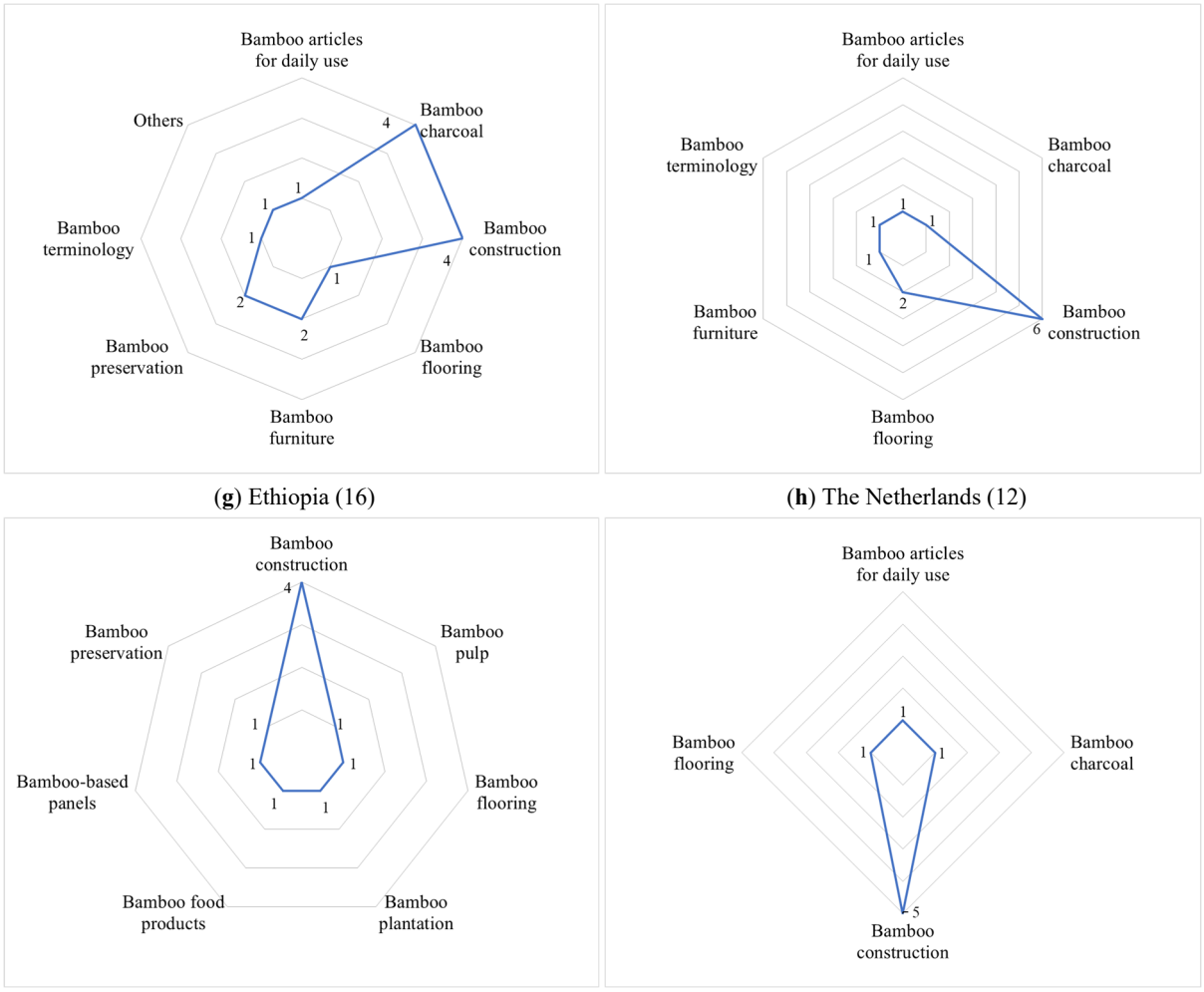


(**e**) Indonesia (17)



(**f**) The Philippines (17)

Figure 3. *Cont.*



(**g**) Ethiopia (16) (**h**) The Netherlands (12)

(**i**) Vietnam (10) (**j**) UK (8)

Figure 3. Comparative analysis of national bamboo standards of the top ten countries.

Colombia published 24 national standards on bamboo (detailed checklist in Table A3 of Appendix A), ranking first in Latin America and the Caribbean and third globally. Most of those standards are specifically targeted towards the most widely distributed bamboo species in region, *Guadua angustifolia Kunth*. In Colombia, the scope of standards on bamboo mainly focuses on bamboo construction (5), bamboo charcoal (4), and bamboo plantations (4) (Figure 3c). Colombia incorporated bamboo into its national building standards at an early stage. Colombia's initiative has also influenced the development of national standards on bamboo construction in countries from the region, including Brazil, Ecuador and Peru.

Bamboos are integral to the culture, lives and livelihoods of bamboo-rich South East Asian countries, namely, Indonesia, the Philippines and Vietnam. Indonesia and the Philippines were tied for fifth, while Vietnam ranked ninth, in terms of the number of published national bamboo standards. Indonesia published 17 bamboo standards (detailed checklist in Table A5 of Appendix A), nine were directly adopted from ISO, two were modified from ISO and six were home-grown. These bamboo standards belong to nine categories, mainly focusing on bamboo charcoal (4), bamboo construction (3), bamboo furniture (2), and bamboo flooring (2) (Figure 3e). Of the 17 standards, the Philippines developed two standards on furniture and bamboo-based panels, and the other 15 were adopted directly from ISO standards (detailed checklist in Table A6 of Appendix A). The scope mainly focuses on bamboo construction (6), bamboo charcoal (4), bamboo flooring (3) and bamboo furniture (2) (Figure 3f). Vietnam published 10 national bamboo standards (detailed checklist in Table A9 of Appendix A), including bamboo construction (4), bamboo preservation (1), bamboo pulp (1), bamboo-based panels (1), bamboo flooring (1), bamboo food products (1), and bamboo plantation (1) (Figure 3i).

By the end of September 2025, Kenya and Ethiopia had published 22 and 16 national bamboo standards respectively, with the full detailed checklists provided in Tables A4 and A7 of Appendix A; these two East African countries ranked fourth and seventh globally, making them the most advanced African nations in the field of bamboo standardization. For Kenya, 13 national standards are developed based on ISO frameworks, covering bamboo construction, bamboo charcoal, bamboo flooring, bamboo furniture and bamboo articles for daily use

(Figure 3d), while the remaining 9 standards, spanning categories including terminology, preservation, plantation, flooring, furniture, bamboo-based panels, and articles for daily use, are independently developed by local institutions. Following a nearly identical pattern to Kenya, Ethiopia has adopted 8 ISO-derived standards and formulated another 8 self-developed standards, the latter category covering bamboo construction, furniture, preservation, articles for daily-use, and others (bamboo bicycle) (Figure 3g). It is worth noting that the INBAR Dutch-Sino East African Bamboo Development Programme has played a key supporting role in advancing the construction of bamboo standard systems across Ethiopia, Kenya and Uganda.

As bamboo products consuming countries, the Netherlands and the UK rank eighth and tenth globally, respectively. Both countries have adopted ISO standards directly, with the Netherlands adopting 12 as NEN-ISO standards and the UK publishing 8 as BS-ISO standards (detailed checklists in Tables A8 and A10 of Appendix A). As shown in Figure 3h and3j, both countries prioritize the development of standards related to bamboo construction (round and engineered bamboo structures), adopting 6 and 5 ISO standards, respectively. In addition to bamboo construction, the Netherlands has adopted ISO standards in five categories: bamboo terminology, bamboo flooring, bamboo furniture, bamboo charcoal, and bamboo articles for daily use, while the UK has adopted standards in three additional categories: bamboo flooring, bamboo charcoal, and bamboo articles for daily use (Tables A8 and A10).This reflects the high market acceptance of relevant bamboo products in Europe, such as bamboo flooring for both indoor and outdoor use, bamboo activated carbon, laminated bamboo furniture, as well as bamboo drinking straw.

4.2.2. Other Countries

Among the other 21 countries that have published national bamboo standards, the statistics data is as follow: (i) the countries with more than four standards include Rwanda (7), Ghana (7), Cambodia (6), Malaysia (6), Ecuador (5), and Jamaica (5); (ii) countries with two to four standards include Uganda (4), Nigeria (4), Brazil (3), Bangladesh (2), Italy (2), Korea (2), and Tanzania (2); (iii) Bhutan, Cameroon, Chile, Mexico, Nepal, Peru, Sri Lanka, and Thailand have published only one bamboo standard. The detailed checklist of published national standards of these countries is shown in Table A11 of Appendix B, mainly covering categories of bamboo construction, bamboo furniture, bamboo charcoal and bamboo flooring.

4.3. Association Standards

This study investigated both ASTM and CECS, who published association standards on bamboo construction. ASTM International develops standards across numerous sectors, including metals, construction, petroleum, consumer products, aerospace, textiles, and plastics [39]. Within the scope of the present bamboo inventory, one ASTM standard is relevant to laminated veneer bamboo: ASTM D5456-21e1 (2021) *Standard specification for evaluation of structural composite lumber products*, see Table 3.

Table 3. Checklist of association standards on bamboo published by ASTM [39] and CECS [40].

No.	Category	Designation	Title of Standards	Language	Status
1	Bamboo construction	ASTM D5456-21e1 (2021)	Standard specification for evaluation of structural composite lumber products	English	Active
2	Bamboo construction	CECS 434:2016	Technical specification for round bamboo structure building	Chinese	Active
3	Bamboo construction	T/CECS 470-2017	Technical specification for bamboo winding composite pipe	Chinese	Active
4	Bamboo construction	T/CECS 10138-2021	Engineered bamboo	Chinese	Active
5	Bamboo construction	T/CECS 945-2021	Technical specification for bamboo winding utility tunnel engineering	Chinese	Active
6	Bamboo construction	T/CECS 1101-2022	Standard for design of engineered bamboo structures	Chinese	Active
7	Bamboo construction	T/CECS 1102-2022	Standard for construction and acceptance of construction quality of engineered bamboo structures	Chinese	Active
8	Bamboo construction	T/CECS 1103-2022	Standard for inspection of engineered bamboo structures	Chinese	Active
9	Bamboo construction	T/CECS 10257-2022	Green building material assessment—Wood or bamboo scrimber	Chinese	Active

CECS is a leading Chinese standardization association in civil engineering, which has published more than 2000 standards since 1979 [40]. To support the booming bamboo construction, CECS has published 8 association standards on bamboo construction since 2016, including engineered bamboo products, bamboo winding composite pipe product, and design standards for both round bamboo and engineered bamboo structures (Table 3). These association standards on bamboo construction play an important role in advancing Chinese bamboo construction sector, particularly in the absence of national standards. For instance, although T/CECS 1101-2022 Standard for design of engineered bamboo structures was recently published, several projects of engineered bamboo structures have already adopted it as a reference for designing. Two three-storey office buildings constructed using glued laminated bamboo components in Jiangxi and Hunan Provinces of China are shown in Figure 4.



(**a**) (**b**)

Figure 4. Two office buildings designed using CECS association standards for structural design in China. (**a**) Office building of Ganzhou Sentai Bamboo & Wood Company (2023). (**b**) Office building of Hunan Taohuajiang Bamboo Science & Technology Co., Ltd. (2024).

Since 2019, the China Bamboo Industry Association (CBIA) has been developing standards. The Technical Committee for Bamboo Industry Association Standardization, affiliated with the Wood Industry Research Institute of the Chinese Academy of Forestry, was established to oversee the development and revision of bamboo-related association standards. To date, CBIA has published nine association standards covering categories such as bamboo articles for daily use, bamboo construction, bamboo furniture, and bamboo shoots (Table 4).

Table 4. Checklist of association standards on bamboo published by CBIA.

No.	Category	Designation	Title of Standards	Language	Status
1	Bamboo articles for daily use	TCBIAS 2102-2024	Drilled bamboo drinking straw	Chinese	Active
2	Others	TCBIAS 2110-2025	Code of practice for the harvesting and transportation of moso bamboo	Chinese	Active
3	Bamboo furniture	TCBIAS 2104-2024	Testing methods for the bending flexibility and toughness of bamboo	Chinese	Active
4	Bamboo shoot	TCBIAS 2103-2024	Quality classification specification of Chimonobambusa utilis shoots	Chinese	Active
5	Bamboo construction	TCBIAS 2101-2024	Tea room decorated with bamboo-based materials	Chinese	Active
6	Others	TCBIAS 2105-2025	Modified polyethylene bamboo-plastic composite granules for extruded pipes	Chinese	Active
7	Others	TCBIAS 2106-2025	Polyethylene bamboo-plastic composite protection pipe for cables	Chinese	Active
8	Bamboo furniture	TCBIAS 2113-2025	Indoor bamboo scrimber furniture	Chinese	Active
9	Bamboo articles for daily use	TCBIAS 2107-2025	Greenhouse gases— Quantification methods and requirements for product carbon footprint—Bamboo knife, fork and spoon	Chinese	Active

5. Discussion

This section presents discussions on bamboo standardization, including the current status of international and national bamboo standards, development trends, primary drivers for bamboo standards, and finally several actionable recommendations.

5.1. Development Trends of Bamboo Standards

5.1.1. International Standards

The development of ISO bamboo standards started in the 2000s and the first three standards were published in 2004 (see Section 4.1). Then, there was a hiatus in bamboo standards development work for about a decade. Following the establishment of ISO/TC 165 WG 12 in 2014 and ISO/TC 296 in 2016, 16 active ISO standards were published between 2018 and 2025 (Figure 5). From 2020 to 2024, at least two ISO standards on bamboo were published annually (Figure 5). The published ISO standards cover six categories (Figure 6), including bamboo construction (6), bamboo charcoal (4), bamboo flooring (3), bamboo terminology (1), bamboo furniture (1) and bamboo articles for daily use (1).

This study also explored the future work plans for both ISO/TCs. Dr. Changhua Fang, the author of this journal paper and the ISO/TC 296 manager, introduced that a new working group (WG) on bamboo for special applications was established recently, aiming to develop standards for novel engineered bamboo products, such as bamboo winding composite pipes (Figure 7a), and bamboo-based packing products for cooling towers (Figure 7b). Moreover, ISO/TC 296 also focuses on bamboo articles for daily use, such as bamboo mats (Figure 7c), bamboo chopping boards (Figure 7d), and disposable bamboo cutlery (Figure 7e), which have already achieved high market acceptance but lack international standards. According to the author of this journal paper, Ms. Kewei Liu, the Convener of ISO/TC 165/WG 12, is overseeing the development of three key deliverables: the product specification of bamboo scrimber (Figure 7f), the design standard for engineered bamboo structures, and a technical report on applying national engineered wood standards to the design of engineered bamboo structures. All three are currently under development by ISO/TC 165/WG 12. These standards will greatly enhance the international trade of both glued laminated bamboo products and bamboo scrimber for structural applications. In addition, WG 12 is open to other novel structural bamboo products that have achieved both market validation and a robust research foundation.

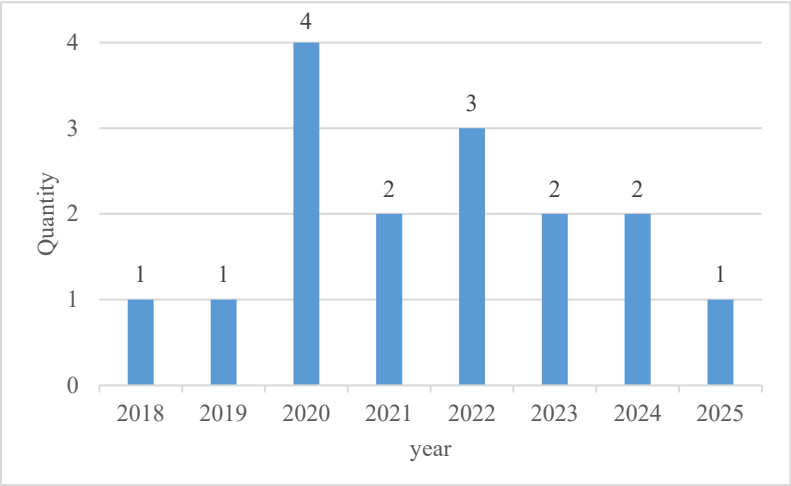


Figure 5. Number of ISO bamboo standards published annually.

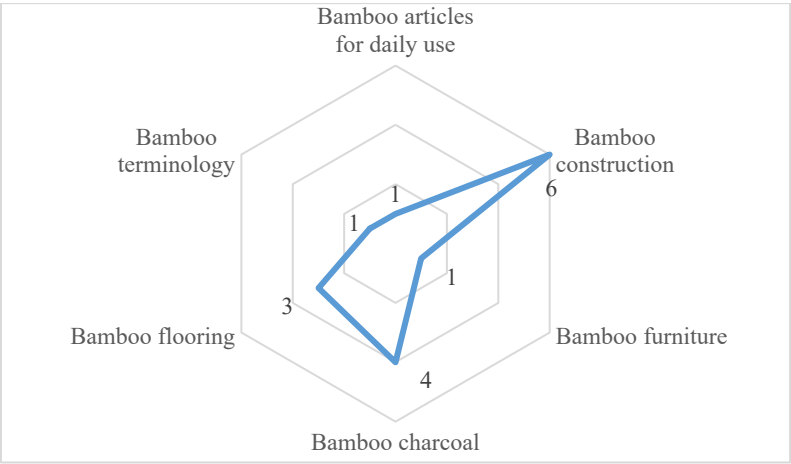


Figure 6. Categories and numbers of published ISO standards on bamboo.

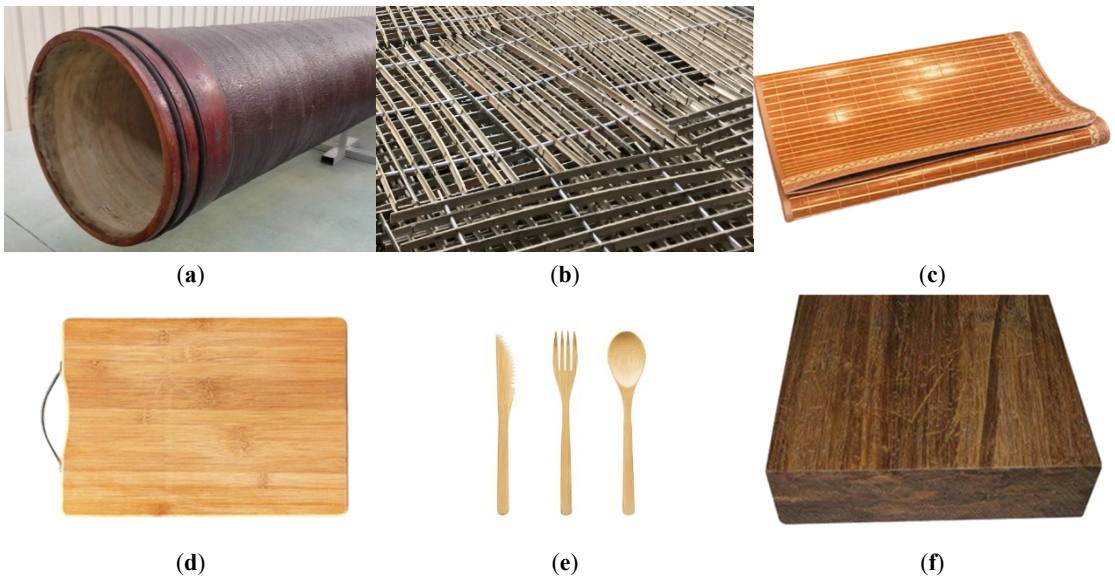


Figure 7. Photos of different bamboo products. (**a**) Bamboo winding composite pipes. (**b**) Bamboo-based packing products for cooling towers. (**c**) Bamboo mats. (**d**) Bamboo chopping boards. (**e**) Disposable bamboo cutlery. (**f**) Bamboo scrimber.

5.1.2. National Standards

In this section, the development trends of national standards were analyzed from the following three perspectives: publishing periods, issuing countries and regions, and categories.

The number of active national bamboo standards published during different periods is presented in Figure 8. The statistical data indicate the issuing year of active national standards, including both newly issued and revised standards. However, each country has its own guidelines regarding the review and revision cycles for national standards. For example, Chinese national bamboo standards need to be reviewed five years after issuance. The revision work typically requires approximately 3.5 years, including one year for project approval, 16 months for standard revision, and one year for final approval. Therefore, once a national standard is issued, it typically remains active for at least 8.5 years before the publication of the next revision. Figure 8 illustrates the rapid upward trend of national bamboo standardization. During the period from 2021 to 2025, a total of 129 national bamboo standards were published, representing an increase of approximately 67.5% compared with the 77 standards issued during 2016 to 2020. Also, the number of standards published between 2016 and 2020 was more than twice that of the preceding five years (2011 to 2015). In addition, 22 bamboo standards were issued up to and including 2010.

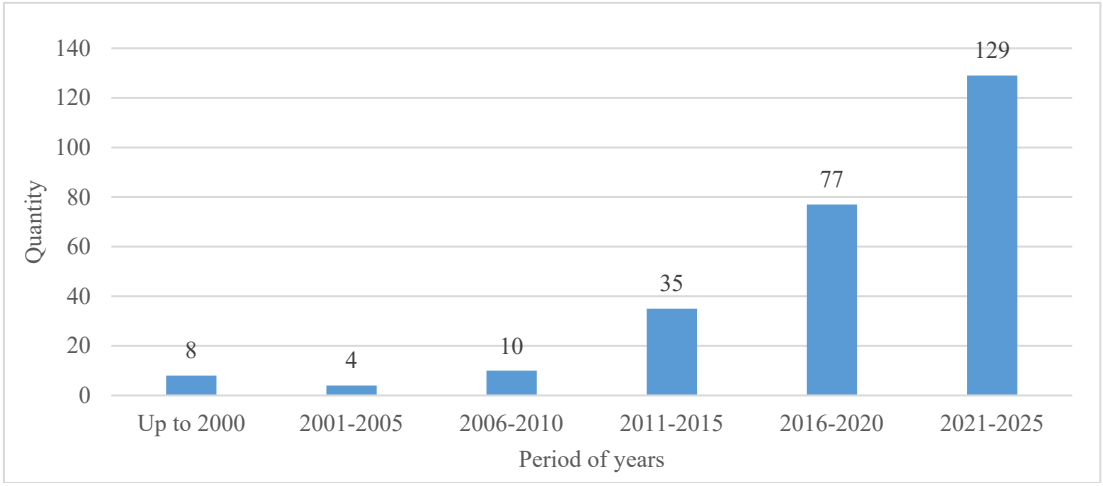


Figure 8. National bamboo standards published between different periods.

Figure 9 shows comparison of number of standards across issuing countries by regions. Asia published a total of 138 national bamboo standards, surpassing the aggregate number (125) of standards published across other three continents: Africa (63), Latin America and the Caribbean (40), and Europe (22). The active development of

national bamboo standards by Asian countries aligns with the international trade dynamics of bamboo commodities. Asia is the largest exporting region for bamboo commodities. In 2023, China accounted for 73.6% of the global export value of bamboo commodities [26]. The total export value of bamboo commodities from Asia was USD 5.029 billion in 2023, accounting for 81.2% of the global export value [26]. In 2023, China, Vietnam, Thailand, Indonesia, India and Japan were among the top ten bamboo products exporting countries [26], and most of them also actively develop their national bamboo standards. Asia's leadership results from decades of industrial-scale production, coordinated policy frameworks, and strong research infrastructure, which have led into a greater number of standards.

In contrast, Africa, and Latin America and the Caribbean face systemic constraints that hinder standard development, including fragmented institutional frameworks, insufficient research, policymaker awareness gaps, financial and human resource constraints, as well as insufficient market demand and private sector engagement. Most countries in these two regions lack the capacity to develop their own national standards. According to this research, Ethiopia and Kenya have been particularly active in recent five years in African region. Between 2021 and 2025, Ethiopia and Kenya published a combined total of 29 national bamboo standards (Tables A4 and A7). As indicated in Section 4.2.1, this coincides with INBAR's Dutch Sino East Africa Bamboo Development Programme implemented in Ethiopia, Kenya and Uganda. The programme actively engaged with national standards bodies and facilitated the standard development process. Meanwhile, Ghana has adopted ISO standards on bamboo construction and charcoal, while Nigeria has adopted ISO bamboo charcoal standards (Table A11). In Latin America and the Caribbean, Colombia leads the development of national bamboo standards compared with other countries in the region. The other two major bamboo standards publishing countries are Ecuador and Jamaica. The former focuses primarily on bamboo construction and bamboo food products (shoots), while the latter has a broader scope, covering furniture, shoots, charcoal and articles for daily use. Despite hosting over 40% of the world's known bamboo resources [6], Africa and America (except for the USA and Canada) jointly contributed to USD 118.42 million to the international bamboo trade in 2023, accounting for approximately 1.9% of the total global export value [26]. With extensive bamboo resources, countries in Africa and Latin America and the Caribbean can effectively use bamboo as a tool for livelihood development, green economic development and environmental management through appropriate value chain development and standardization.

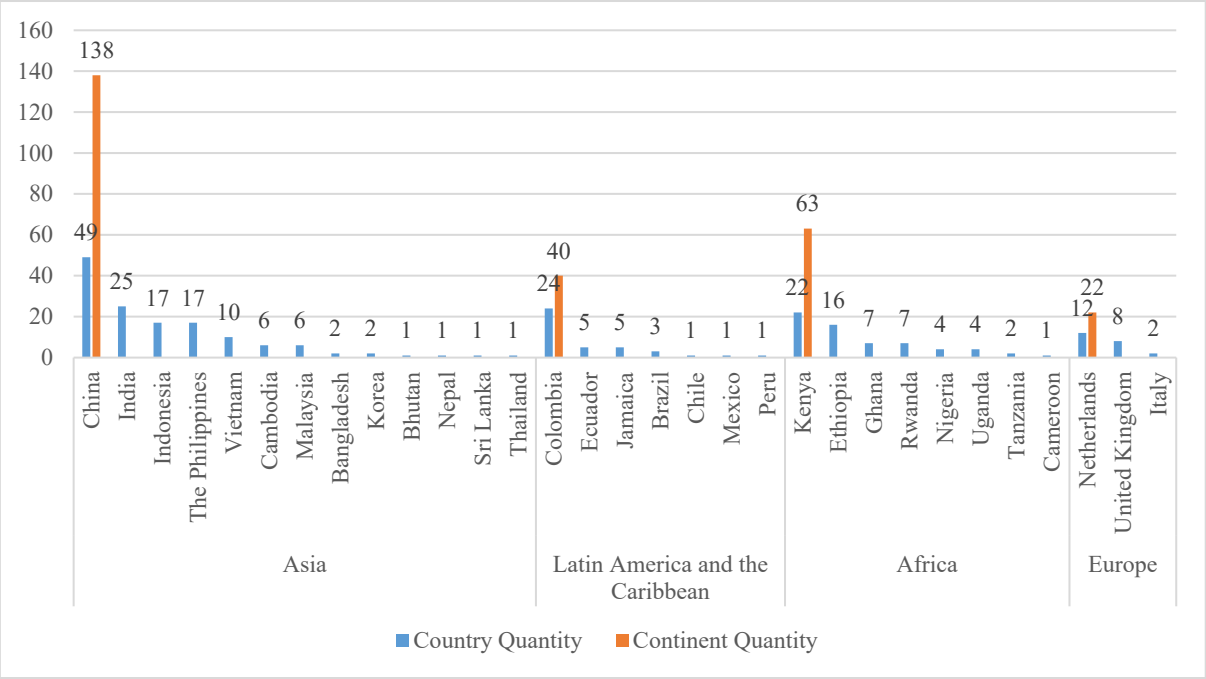


Figure 9. Published national bamboo standards in different countries and regions.

In Europe, the Netherlands, the UK and Italy are the only three countries included in this study's inventory of national bamboo standards. Europe was the largest importer of bamboo commodities and the second-largest exporting region for bamboo commodities in 2023 [26]. According to the United Nations Comtrade database, the Netherlands, Germany, Poland and Italy were the top four exporters, while France, the Netherlands, Germany, the UK and Italy ranked as the top five importers in 2023 [41]. Forty-four countries in this region imported and/or

exported bamboo products in 2023 [41], indicating great potential to develop their national standards on bamboo in the future.

Although the USA, Japan, Saudi Arabia, Canada and Australia are among the top ten importing countries of bamboo commodities in 2023, no national bamboo standard is available in these countries. This may be because, although these countries are among world's largest economies, bamboo trade constitutes only a minor percentage of their total trade volume and value.

The comparison of the number of published national bamboo standards across different product categories is presented in Figure 10. National standards on Bamboo construction (67) rank first, far exceeding the second-highest category, bamboo charcoal (43). This trend can be attributed to the widespread adoption of ISO standards on bamboo construction as national standards since the 2000s, with 39 national standards in total. Bamboo charcoal ranks second, with 30 of the 43 listed national standards (approximately 69.8%) identified as ISO adoptions, including modified adoptions (MOD). Other high ranking standard categories include bamboo-based panels (21), bamboo food products (20) and bamboo flooring (19).

In this study, "bamboo tableware and kitchenware" was included under the category of "bamboo articles for daily use". Analysis of the 2023 UN Comtrade data for this category (HS 441911) shows an international trade value of USD 1.865 billion, ranking first and accounting for 30% of the total global trade value. However, only 18 national standards have been issued in this category, indicating there is a great potential for further standard development. In contrast, the situation for bamboo construction is different. Despite the growing interest shown by many countries in bamboo construction, the international trade value of structural bamboo components remains low (2%), probably due to lack of national design standards for engineered bamboo structures. Once relevant ISO standards are developed, many countries can potentially adopt them as their national standards, potentially leading to increased international trade value. The development of national standards on bamboo charcoal ranks second, and this commodity has seen a rapid growth of international trade value in recent years. Among the national bamboo charcoal standards listed in Appendices A and B, 29 carry publication years from 2021 to 2025. Of the four current ISO bamboo charcoal standards listed in Table 2, one was published in this period. In 2023, bamboo charcoal was sold to 122 countries worldwide by 56 exporting countries [26], indicating potentials for further development of national standards on bamboo charcoal in the future.

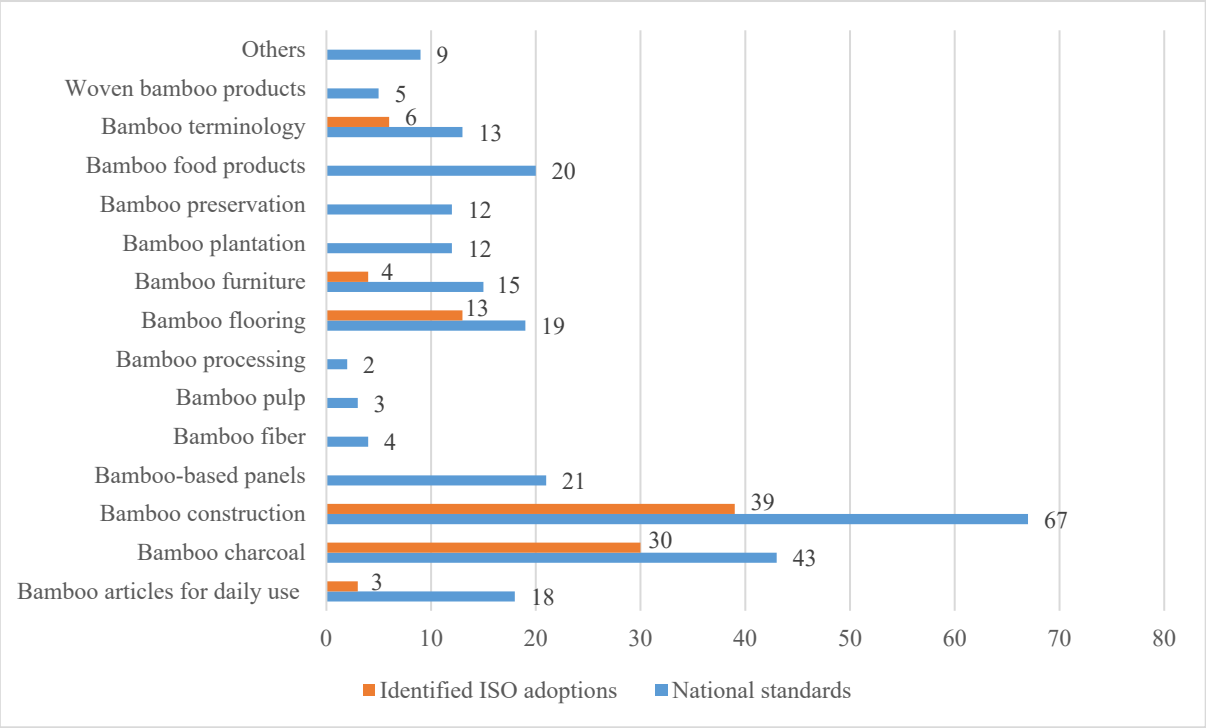


Figure 10. National bamboo standards and ISO adoptions identified in Appendices A and B, including modified adoptions (MOD).

5.2. Key Drivers for Standards Development

The development of standards is critical to the competitiveness of countries and regions, particularly in emerging sectors such as bamboo. As a renewable and highly versatile bio-based material, bamboo holds

considerable promise for a wide range of applications. Nevertheless, its market integration and technological adoption are often hindered by insufficient or inconsistent standardization. The principal drivers for the further development of bamboo standardization are summarized as follows:

First, standards enable bamboo to obtain legal and market recognition. Standards carry varying legal weight across countries, ranging from mandatory to voluntary. Mandatory national standards, enforced by designated agencies, ensure compliance and establish minimum performance requirements. Consequently, products that meet these standards gain greater market recognition, as they are perceived as reliable and safe. For instance, mainstreaming bamboo as a construction material on par with concrete, steel, and wood hinges on the development of relevant national standards that codify design parameters, test methods, and performance criteria [42].

Second, international standards facilitate cross-border trade. Unified standards are a fundamental prerequisite for international commerce, particularly for bamboo, where product specifications vary widely across countries. International standardization harmonizes national requirements, reducing technical barriers to trade. Developed through consensus among technical experts, international standards establish accepted benchmarks for quality control, testing methods, and performance classification, enhancing market transparency and facilitating trade. Empirical research confirms that international standards promote trade, while participation in their development gives countries a channel to shape technological trajectories [43].

Third, robust research and empirical data underpin standard development. Scientific research is a cornerstone of standardization, especially for novel bamboo materials lacking long-term performance records. Standards rely on technical data, mechanical properties, durability, fire resistance, as the basis for quality control. Nations with strong research capacities are better positioned to generate evidence for developing and revising standards. China has leveraged its research on glued laminated bamboo to inform ISO standards [44], while Colombia's work on guadua bamboo has supported local construction standards [45]. These cases show that empirical capacity directly drives the evolution of bamboo standardization, keeping standards evidence-based and technologically relevant.

Fourth, standards enhance product quality and consumer confidence, while market feedback drives continuous improvement. Manufacturers and suppliers must meet standard specifications to access domestic and international markets. This compliance ensures product reliability and safety, building consumer trust. As market adoption expands, real-world data and user feedback inform future revisions, creating a virtuous cycle: standards improve quality; reliable products gain acceptance; market experience generates data; and data refines standards. This reciprocal relationship is particularly evident in engineered bamboo, where standardized test methods, building codes, and design data are prerequisites for wider structural acceptance [46,47].

5.3. Recommendations

Based on the current status, challenges and key drivers of bamboo standardization, a set of recommendations is proposed to promote the development of both international and national standards on bamboo.

First, market opportunities should be identified to speed up the development of international standards under ISO/TC 165 and ISO/TC 296. As indicated in Section 5.1.1, bamboo articles for daily use have gained considerable market acceptance but remain unsupported by dedicated international standards, such as bamboo mats, chopping boards and disposable cutlery, making them a high-priority target for future standardization. In addition, drawing on the precedent of design standards for round bamboo structures, ISO standards for engineered bamboo products and structures could be developed, which would address a critical gap and unlock substantial market potential. To turn these opportunities into tangible results, national standardization bodies should proactively submit new work item proposals to ISO/TC 165 and ISO/TC 296 and assign dedicated technical experts to working groups to accelerate drafting and consensus building. Regular consultations among industry, government and academia should also be held to identify emerging product categories and ensure that standardization priorities reflect market needs.

Second, more national bodies should be encouraged to participate in the development of international standards, and the adoption of published ISO standards as national standards should be promoted in more countries. Active participation of national standardization bodies in international standard development should be strongly encouraged, especially among bamboo-producing and bamboo-consuming countries. To achieve this, awareness raising workshops and outreach programs can be organized by ISO and regional standardization organizations to inform countries about the benefits of participation and the procedures involved. At the same time, the adoption of existing ISO standards as national standards should be facilitated, especially in countries that have already formulated national bamboo policies but lack comprehensive technical frameworks. Financial and technical support, such as translation services, legal review assistance, and adaptation guidelines, should be provided to lower the barriers to adoption. Furthermore, capacity building and knowledge transfer through South-South cooperation initiatives, including bilateral training programs, exchange visits, and joint technical seminars, should

be scaled up to enable major bamboo growing and consuming nations to develop their own national standards in alignment with international best practices.

Third, regional collaboration should be promoted among countries that share similar bamboo species, similar product portfolios, and comparable development status. Countries within the same geographical region often face common technical challenges and market conditions, making regional cooperation a particularly effective pathway for standardization. To operationalize this, it is recommended to establish regional standardization working groups or platforms, such as Asia-Pacific or Latin American bamboo standardization networks, to facilitate regular dialogue and information exchange. These platforms can jointly develop regional technical specifications or harmonized testing methods that later serve as the basis for national standards. Neighboring countries with similar bamboo resources are also encouraged to undertake comparative studies of their respective standards, identify gaps, and engage in cross-learning exercises through study tours, expert missions, and joint research projects. Such collaborative efforts not only reduce duplication of effort but also accelerate the development of nationally relevant standards that are technically sound and locally adaptable.

Finally, incentive mechanisms should be established and investment increased to encourage the participation of all relevant stakeholders in the development of standards. Standardization is a multi-stakeholder endeavor that requires active engagement from universities, research institutes, enterprises, international organizations, and industry associations. To mobilize these actors, governments and standardization authorities should establish tangible incentive schemes, such as tax benefits, research grants, public recognition awards, and preferential treatment in public procurement for enterprises and individuals actively contributing to standard development. In parallel, increased financial investment is needed to fund standardization research, cover the operational costs of technical committees, and support the participation of experts from developing countries in international meetings. Dedicated training programs should also be offered to equip researchers and practitioners with the necessary knowledge and skills to effectively engage in standard drafting and review processes. Public-private partnerships and multi-stakeholder advisory committees can be established to ensure that the voices of industry, academia, and civil society are adequately heard and integrated into the standardization agenda.

6. Conclusions

Bamboo, a strategic renewable resource with exceptional environmental, mechanical and socio-economic advantages, has evolved over the past three decades into a globally traded commodity. However, its full potential as a cornerstone of the circular bioeconomy hinges on robust and harmonized standards, a gap that this study systematically addresses.

This study examines global bamboo standardization across international, national, regional, and association levels. Based on a novel categorization methodology developed for this research, a checklist of bamboo standards was compiled for global users. The findings reveal a multilevel but uneven system. At the international level, ISO/TC 296 and ISO/TC 165 are the leading bodies responsible for international bamboo standards. As of the end of September 2025, there were 16 active ISO standards covering six key areas—construction, flooring, daily-use articles, charcoal, furniture, and terminology. The next frontier lies in advancing standards for daily-use bamboo articles and engineered bamboo construction products. At the national level, 31 countries have issued national bamboo standards—13 in Asia, 8 in Africa, 7 in Latin America and the Caribbean, and 3 in Europe. The top ten are China (49), India (25), Colombia (24), Kenya (22), Indonesia (17), the Philippines (17), Ethiopia (16), the Netherlands (12), Vietnam (10), and the UK (8). China has the widest coverage (12 categories), while India pioneered standards in the 1970s. Colombia's standards have influenced Brazil, Ecuador, and Peru. ISO adoption is driving progress in the Philippines, Indonesia, Kenya, Ethiopia, the UK, and the Netherlands. To date, no bamboo-specific standards have been established at the regional intergovernmental level. By contrast, association-based standardization is expanding swiftly in China, with CECS leading efforts in bamboo construction and CBIA covering a wider array of bamboo industry segments.

Across these levels, four interacting drivers underpin bamboo standardization: legal and market recognition, trade facilitation, research and application support, and quality assurance with consumer confidence. On that basis, four proposals are put forward to advance both international and national bamboo standards, namely identify market opportunities to accelerate standard development under ISO/TC 165 and ISO/TC 296; encourage broader participation of national bodies in international standardization and promote the adoption of ISO standards as national standards in more countries; promote regional collaboration among countries; and establish incentives to engage all stakeholders. Overall, the findings of this study indicate that increasing the number of standards alone is insufficient; effective progress requires alignment among research evidence, market demand, international participation, and implementation capacity.

Author Contributions

K.L.: writing—original draft preparation, methodology, supervision; Y.S. (Yiming Sun): writing—original draft preparation, data curation; A.C.R.: writing—reviewing and editing; C.F.: writing—reviewing and editing; P.J.E.: writing—reviewing and editing; Y.S. (Yongjiu Shi): writing—reviewing and editing; R.K.: writing—reviewing and editing; Y.S. (Yuechu Shi): writing—reviewing and editing; D.J.: writing—reviewing and editing, conceptualization, methodology. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Not applicable.

Data Availability Statement

The data supporting the findings of this study are included within the article.

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Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

No AI tools were utilized for this paper.

Appendix A. Checklist of the Top 10 Countries by Number of Bamboo Standards (Access to National Standards Websites as of 30 September 2025)

Table A1. National standards on bamboo in China.

No.	Category	Designation	Title of Standards	Original Title in Chinese
1	Bamboo construction	GB/T 15780-1995	Testing methods for physical and mechanical properties of bamboos	竹材物理力学性质试验方法
2	Bamboo-based panels	GB/T 13123-2003	Bamboo-mat plywood	竹编胶合板
3	Bamboo articles for daily use	GB 19790.2-2005	Disposable chopsticks-Part 2: Bamboo chopsticks	一次性筷子 第2部分:竹筷
4	Bamboo plantation	GB/T 20391-2006	High—yield management techniques for moso bamboo stands	毛竹林丰产技术
5	Bamboo-based panels	GB/T 21128-2007	Structural bamboo & wood composite board	结构用竹木复合板
6	Bamboo-based panels	GB/T 21129-2007	Decorative bamboo veneered panel	竹单板饰面人造板
7	Bamboo charcoal	GB/T 21819-2008	Product of geographical indication—Suichang bamboo charcoal	地理标志产品 遂昌竹炭
8	Bamboo-based panels	GB/T 13144-2008	Packaging containers—Cases with plybamboo	包装容器 竹胶合板箱

Table A1. *Cont.*

No.	Category	Designation	Title of Standards	Original Title in Chinese
9	Bamboo pulp	GB/T 24322-2009	Bleached sulphate bamboo pulp	漂白硫酸盐竹浆
10	Bamboo charcoal	GB/T 26900-2011	Bamboo charcoal for air-purification	空气净化用竹炭
11	Bamboo charcoal	GB/T 26913-2011	Bamboo charcoal	竹炭
12	Bamboo flooring	GB/T 26912-2011	Acceptance generality for production line of bamboo-wooden compound floor	竹木复合地板生产线验收通则
13	Bamboo plantation	GB/T 27645-2011	Technical regulation for Controlling Ceracris kiangsu Tsai	黄脊竹蝗防治技术规程
14	Bamboo flooring	GB/T 27649-2011	Bamboo and wood laminated composite flooring	竹木复合层积地板
15	Bamboo charcoal	GB/T 28669-2012	Bamboo charcoal for fuel	燃料用竹炭
16	Bamboo articles for daily use	GB/T 28495-2012	General technical requirements for bamboo and wooden toys	竹木玩具通用技术条件
17	Bamboo plantation	GB/T 50920-2013	Code for design of culm-producing bamboo plantation engineering	用材竹林工程设计规范
18	Bamboo fiber	GB/T 30124-2013	Bamboo-charcoal polyester drawn textured yarn	竹炭涤纶低弹丝
19	Bamboo fiber	GB/T 30125-2013	Bamboo-charcoal polyester staple fiber	竹炭涤纶短纤维
20	Bamboo charcoal	GB/T 30365-2013	Bamboo charcoal for home furnishings	寝具竹炭
21	Bamboo food products	GB 30615-2014	National food safety standard. Food additive. Bamboo leaf antioxidant	食品安全国家标准 食品添加剂 竹叶抗氧化物
22	Bamboo food products	GB/T 30762-2014	Quality grading standards of main bamboo shoot	主要竹笋质量分级
23	Others	GB/T 31734-2015	Bamboo pyroligneous liquid	竹醋液
24	Bamboo charcoal	GB/T 31744-2015	Test on the elementary properties of bamboo charcoal for water-purification	水质净化用竹炭基本性能试验方法
25	Bamboo furniture	GB/T 32444-2015	General technical requirements for bamboo furniture	竹制家具通用技术条件
26	Bamboo terminology	GB/T 32770-2016	Bamboo terminology	竹子名词术语
27	Bamboo flooring	GB/T 20240-2017	Glued laminated bamboo flooring	竹集成材地板
28	Bamboo plantation	GB/T 35242-2017	Commercial seedling quality grading of major bamboo species	主要商品竹苗质量分级
29	Bamboo fiber	GB/T 35378-2017	Testing methods for tensile mechanical properties of plant short individual fibers	植物单根短纤维拉伸性能测试方法
30	Bamboo terminology	GB/T 36394-2018	Terminology of bamboo products	竹产品术语
31	Others	GB/T 36773-2018	Technical rule of phytosanitary treatment for bamboo products	竹制品检疫处理技术规程
32	Bamboo construction	GB/T 37805-2019	Bamboo winding composite pipe	竹缠绕复合管
33	Bamboo construction	GB/T 38071-2019	Structural laminated bamboo sliver curtain lumber	结构用竹篾层积材
34	Bamboo articles for daily use	GB/T 38742-2020	Bamboo chopping board	竹砧板
35	Bamboo articles for daily use	GB/T 38780-2020	Bamboo mat	竹席
36	Bamboo articles for daily use	GB/T 39089-2020	Bamboo toothpicks	竹牙签
37	Bamboo articles for daily use	GB/T 23114-2020	Plaited bamboo household products	竹编家居用品
38	Bamboo-based panels	GB/T 40241-2021	Bamboo scrimber outdoor use	户外重组竹

Table A1. *Cont.*

No.	Category	Designation	Title of Standards	Original Title in Chinese
39	Bamboo-based panels	GB/T 40247-2021	Bamboo scrimber	重组竹
40	Bamboo construction	GB/T 40487-2021	Structural bamboo glulam	结构用竹集成材
41	Bamboo food products	GB/T 40632-2021	The determination for polysaccharides in bamboo leaves	竹叶中多糖的检测方法
42	Bamboo-based panels	GB/T 41231-2021	General specification for moulded pallets with bamboo and wood particles	竹木刨花模压成型托盘通用技术条件
43	Bamboo plantation	GB/T 41546-2022	Forest certification in China—Bamboo stand management	中国森林认证 竹林经营
44	Bamboo fiber	GB/T 41553-2022	Bamboo fiber	竹纤维
45	Others	GB/Z 42963-2023	Industrial assistance—Guidance on operation management of bamboo industry project	产业帮扶 竹产业项目运营管理指南
46	Bamboo-based panels	GB/T 43212-2023	Bamboo charcoal composite board	竹炭板
47	Others	GB/T 44420-2024	Method for rapid determination of moisture content of bamboo and wood collection	馆藏竹木器文物含水率快速测定
48	Bamboo flooring	GB/T 30364-2024	Bamboo scrimber flooring	重组竹地板
49	Bamboo charcoal	GB/T 26913-2025	Bamboo charcoal	竹炭

Table A2. National standards on bamboo in India.

No.	Category	Designation	Title of Standards
1	Bamboo construction	SP 7: 2016	National building code of India 2016, Section 3 Timber and bamboo: 3B
2	Woven bamboo products	IS 14588: 1999 (2018)	Bamboo mat veneer composite for general purposes—Specification
3	Bamboo food products	IS 15688: 2006 (2018)	Canned bamboo shoot—Specification
4	Bamboo food products	IS 15689: 2006 (2018)	Bamboo shoot in brine—Specification
5	Bamboo food products	IS 15690: 2006 (2018)	Dry salted bamboo shoot—Specification
6	Bamboo food products	IS 15691: 2006 (2018)	Guidelines for storage and transportation of bamboo shoot
7	Bamboo food products	IS 15698: 2006 (2018)	Dehydrated bamboo shoots—Specification
8	Bamboo-based panels	IS 16096: 2013 (2018)	Bamboo—Jute composite hollow core door shutter—Specification
9	Bamboo-based panels	IS 16073: 2013 (2018)	Bamboo—Jute composite panel door shutter—Specification
10	Bamboo construction	IS 15912: 2018	Structural design using bamboo—Code of practice
11	Bamboo-based panels	IS 13958: 1994 (2019)	Bamboo mat board for general purposes —Specification
12	Bamboo-based panels	IS 15476: 2004 (2019)	Bamboo mat corrugated sheets—Specification
13	Bamboo construction	IS 6874: 2008 (2019)	Method of tests for bamboo
14	Bamboo construction	IS 10145: 1982 (2020)	Bamboo supports for camouflaging equipment
15	Bamboo construction	IS 7344: 1974 (2020)	Bamboo tent poles
16	Bamboo construction	IS 8242: 1976 (2020)	Methods of tests for split bamboos
17	Bamboo preservation	IS 1902: 2006 (2021)	Preservation of bamboo and cane for non—structural purposes—Code of practice
18	Bamboo preservation	IS 9096: 2006 (2021)	Preservation of bamboo for structural purposes—Code of practice
19	Bamboo terminology	IS 707: 2011 (2021)	Timber technology and utilization of wood, bamboo and cane—Glossary of terms
20	Bamboo preservation	IS 4873: Part 2: 2021	Methods of laboratory testing of wood preservatives against fungi and borers (powder post beetles) part 2 determination of threshold values of wood preservatives against borers (powder post beetles) in wood and bamboo

Table A2. *Cont.*

No.	Category	Designation	Title of Standards
21	Bamboo-based panels	IS 17571: 2021	Flattened bamboo board—Specification
22	Bamboo-based panels	IS 17573: 2021	BWP grade bamboo mat board specification
23	Bamboo-based panels	IS 15972: 2012 (2022)	Bamboo—Jute composite corrugated and semi—Corrugated sheets—Specification
24	Woven bamboo products	IS 8295 (Part 1):2023	Bamboo Chicks—Specification Part 1 Fine
25	Woven bamboo products	IS 8295 (Part 2):2023	Bamboo Chicks—Specification Part 2 Coarse (First Revision)

Table A3. National standards on bamboo in Colombia.

No.	Category	Designation	Title of Standards	Original Title in Spanish
1	Bamboo plantation	GTC 270:2016	Guide selection criteria for commercialization of *Guadua angustifolia Kunth*	Guía de criterios de selección para la comercialización de *Guadua angustifolia Kunth*
2	Bamboo charcoal	GTC 269:2016	Guide for biomass production from bamboo culms for power generation	Guía para la producción de biomasa a partir de culmos de bambúes para la generación de energía
3	Bamboo articles for daily use	NTC 6191:2016	Caulinar leaves of *Guadua angustifolia Kunth* and crafts products made from them	Hojas caulinares de *Guadua angustifolia Kunth* y productos artesanales elaborados a partir de ellas
4	Bamboo construction	NTC 5407:2018	Structural joints with *Guadua angustifolia Kunth*	Uniones de estructuras con *Guadua angustifolia Kunth*
5	Bamboo preservation	NTC 5301:2018	Preservation and drying of *Guadua angustifolia Kunth*	Preservación y secado del culmo de *Guadua angustifolia Kunth*
6	Bamboo furniture	NTC 5458:2019	Manufacture of furniture with mature culms of *Guadua angustifolia Kunth*	Elaboración de muebles con culmos maduros de *guadua angustifolia Kunth*
7	Bamboo construction	NTC 6338:2019	Coffers with *Guadua angustifolia Kunth*	Casetones con *Guadua angustifolia Kunth*
8	Bamboo articles for daily use	GTC 307:2019	Guide for the elaboration of crafts from *Guadua angustifolia Kunth* and other bamboos	Guía para la elaboración de artesanías de *Guadua angustifolia Kunth* y otros bambúes
9	Bamboo-based panels	GTC 303:2019	Guide for the manufacture of esterilla boards of *Guadua angustifolia Kunth*	Guía para la elaboración de tableros de esterilla de *Guadua angustifolia Kunth*
10	Bamboo plantation	NTC 6389:2020	Identification and qualification of ecosystem services of natural and planted guadals (*Guadua angustifolia Kunth*)	Identificación y cualificación de servicios eco sistémicos de guaduales naturales y plantados (*Guadua angustifolia Kunth*)
11	Bamboo processing	NTC 5300: 2020	Harvesting and post-harvesting of *Guadua angustifolia Kunth* culms	Cosecha y poscosecha de los culmos de *Guadua angustifolia Kunth*
12	Bamboo construction	NTC 6413:2020	Bamboo structures. Grading of bamboo culms. Basic principles and procedures	Estructuras de bambú. Clasificación de culmos de bambú. Principios básicos y procedimientos
13	Bamboo construction	NTC 5525: 2021	Bamboo structures. Determination of physical and mechanical properties of bamboo culms. Test methods	Estructuras de bambú. Determinación de las propiedades físicas y mecánicas de los culmos de bambú. Métodos de ensayo
14	Bamboo processing	NTC 5829:2021	Obtention of “latas” and splints of *Guadua angustifolia Kunth*	Obtención de latas y tablillas de *Guadua angustifolia Kunth*

Table A3. *Cont.*

No.	Category	Designation	Title of Standards	Original Title in Spanish
15	Bamboo terminology	NTC 5727:2021	Terminology applied to bamboo/guadua, its processes and its products	Terminología aplicada al bambú/guadua, sus procesos y sus productos
16	Woven bamboo products	GTC 220:2021	Planks from "esterilla" of *Guadua angustifolia Kunth*	Tablas a partir de esterilla (tablerilla) de *Guadua angustifolia Kunth*
17	Others	GTC 346:2022	Guide for collecting of botanical samples of bamboos	Guía para la recolección de muestras botánicas de bambúes
18	Bamboo charcoal	NTC 6590-1:2022	Bamboo charcoal. Part 1: Generalities	Carbón de bambú. Parte 1: Generalidades
19	Bamboo charcoal	NTC 6590-2:2022	Bamboo charcoal. Part 2: Fuel applications	Carbón de bambú. Parte 2: Aplicaciones de combustible
20	Bamboo charcoal	NTC 6590-3:2022	Bamboo charcoal. Part 3: Purification applications	Carbón de bambú. Parte 3: Aplicaciones de purificación
21	Bamboo furniture	NTC 6713:2024	Laminated products made of bamboo strips for indoor furniture purposes. Requirements and test methods	Productos laminados elaborados de latas de bambú para muebles interiores. Requisitos y métodos de ensayo
22	Bamboo plantation	NTC 6724:2024	Temporary nurseries for the production of bamboo	Viveros temporales para la producción de bambú
23	Bamboo construction	NTC 6752:2024	Bamboo structures. Engineered bamboo products. Test methods to determine the mechanical properties using small size specimens	Estructuras de bambú. Productos de bambú de ingeniería. Métodos de ensayo para determinar propiedades mecánicas con probetas de tamaño pequeño
24	Bamboo plantation	NTC 5405:2025	Vegetative propagation of *Guadua angustifolia Kunth*	Propagación vegetativa de *Guadua angustifolia Kunth*

Table A4. National standards on bamboo in Kenya.

No.	Category	Designation	Title of Standards
1	Bamboo construction	KS ISO 19624:2018	Bamboo structures—Grading of bamboo culms—Basic principles and procedures
2	Bamboo terminology	KS 2854:2019	Bamboo and bamboo-based products—Terminology
3	Bamboo construction	KS ISO 22157:2019	Bamboo structures—Determination of physical and mechanical properties of bamboo culms-Test methods
4	Bamboo preservation	KS 2855:2019	Preservation of bamboo for non-structural purpose—Code of practice
5	Bamboo preservation	KS 2856:2019	Preservation of bamboo for structural purpose—Code of practice
6	Bamboo plantation	KS 2877:2019	Sustainable management and harvesting of bamboo species—Guidelines
7	Bamboo charcoal	KS ISO 21626-1:2020	Bamboo charcoal—Part 1: Generalities
8	Bamboo charcoal	KS ISO 21626-2:2020	Bamboo charcoal—Part 2: Fuel applications
9	Bamboo charcoal	KS ISO 21626-3:2020	Bamboo charcoal—Part 3: Purification applications
10	Bamboo flooring	KS 2929:2021	Bamboo flooring—General requirements
11	Bamboo construction	KS ISO 22156:2021	Bamboo structures—Bamboo culms—Structural design
12	Bamboo furniture	KS 2930:2021	Bamboo-culm furniture—General technical requirements
13	Bamboo construction	KS ISO 23478:2022	Bamboo structures—Engineered bamboo products—Test methods for determination of physical and mechanical properties
14	Bamboo charcoal	KS ISO 5946:2022	Bamboo-based activated carbon—General specifications
15	Bamboo-based panels	KS 2973:2023	Bamboo particle board—Specification

Table A4. *Cont.*

No.	Category	Designation	Title of Standards
16	Bamboo construction	KS ISO 5257:2023	Bamboo structures—Engineered bamboo products—Test methods for determination of mechanical properties using small size specimens
17	Bamboo articles for daily use	KS 2980:2023	Bamboo toothpicks and skewers—Specification
18	Bamboo articles for daily use	KS 2974:2023	Disposable bamboo tableware—Specification
19	Bamboo furniture	KS ISO 6128:2023	Laminated products made of bamboo strips for indoor furniture purposes—Requirements and test methods
20	Bamboo construction	KS ISO 7567:2024	Bamboo structures—Glued laminated bamboo—Product specifications
21	Bamboo flooring	KS ISO 5942:2024	Bamboo-wood composite for container flooring
22	Bamboo articles for daily use	KS ISO 16830:2025	Specification of bamboo drinking straws

Table A5. National standards on bamboo in Indonesia.

No.	Category	Designation	Title of Standards	Original title in Indonesian
1	Bamboo food products	SNI 01-4033-1996	Canned bamboo shoot	Rebung bambu dalam kaleng
2	Bamboo furniture	SNI 7555.22:2011	Furniture—Part 22: Guest chair—Bamboo	Furnitur—Bagian 22: Kursi tamu—Bambu
3	Bamboo-based panels	SNI 7944:2014	General use of laminated bamboo	Bambu lamina penggunaan umum
4	Others	SNI 8020:2014	Uses of bamboo	Kegunaan bambu
5	Others	SNI 8020:2021	Uses of bamboo (non-food)	Kegunaan bamboo (non-pangan)
6	Bamboo preservation	SNI 8909:2020	Bamboo preservation method	Metode pengawetan bambu
7	Bamboo terminology	SNI ISO 21625:2020	Vocabulary related to bamboo and to bamboo products	Kosakata terkait bambu dan produk bambu
8	Bamboo construction	SNI ISO 19624:2018 (2021)	Bamboo structures—Grading of bamboo culms—Basic principles and procedures	Struktur bambu—Pemilahan batang bambu—Prinsip dan prosedur dasar (ISO 19624:2018, IDT, Eng)
9	Bamboo construction	SNI ISO 22157:2019 (2021)	Bamboo structures—Determination of physical and mechanical properties of bamboo culms—Test methods	Struktur bambu—Penentuan sifat fisis dan mekanis batang bambu—Metode uji (ISO 22157:2019, IDT, Eng)
10	Bamboo charcoal	SNI ISO 21626-1:2021 (2021)	Bamboo charcoal—Part 1: Generalities	Arang bambu—Bagian 1: umum (ISO 21626-1:2020, IDT)
11	Bamboo charcoal	SNI ISO 21626-2:2021 (2021)	Bamboo charcoal—Part 2: Fuel applications	Arang bambu—Bagian 2: aplikasi bahan bakar (ISO 21626-2:2020, IDT)
12	Bamboo charcoal	SNI ISO 21626-3:2021 (2021)	Bamboo charcoal—Part 3: Purification applications	Arang bambu—Bagian 3: aplikasi penjernihan (ISO 21626-3:2020, IDT)
13	Bamboo construction	SNI ISO 22156:2021	Bamboo structure—Bamboo stem—Structural design	Struktur bambu—Batang bambu—Desain struktural (ISO 22156:2021, IDT)
14	Bamboo flooring	SNI ISO 21629-1:2021 (2022)	Bamboo flooring— Part 1: Indoor Use	Lantai bambu—Bagian 1: Penggunaan di dalam ruangan
15	Bamboo flooring	SNI ISO 21629-2:2022 (2023)	Bamboo flooring— Part 2: Outdoor Use	Lantai bambu—Bagian 2: Penggunaan di luar ruangan

Table A5. *Cont.*

No.	Category	Designation	Title of Standards	Original title in Indonesian
16	Bamboo furniture	SNI 9277:2024	Bamboo strip laminated products for indoor furniture—Requirements and test methods	Produk laminasi terbuat dari bilah bambu untuk furnitur dalam ruangan—Persyaratan dan metode pengujian (ISO 6128:2023, MOD)
17	Bamboo charcoal	SNI 9301:2025	Bamboo-based activated carbon—General specifications	Karbon aktif berbasis bambu—Spesifikasi umum (ISO 5946:2022, MOD)

Table A6. National standards on bamboo in the Philippines.

No.	Category	Designation	Title of Standards
1	Bamboo Furniture	PNS 2090:2012	Furniture—Engineered bamboo for school furniture—Specification
2	Bamboo-based panels	PNS 2099:2015	Engineered Bamboo for general purpose—Specification
3	Bamboo construction	PNS ISO 19624:2020	Bamboo structures—Grading of bamboo culms—Basic principles and procedures
4	Bamboo construction	PNS ISO 22157:2020	Bamboo structures—Determination of physical and mechanical properties of bamboo culms—Test methods
5	Bamboo terminology	PNS ISO 21625:2021	Vocabulary related to bamboo and bamboo products
6	Bamboo charcoal	PNS ISO 21626-1:2021	Bamboo charcoal—Part 1: Generalities
7	Bamboo charcoal	PNS ISO 21626-2:2021	Bamboo charcoal—Part 2: Fuel applications
8	Bamboo charcoal	PNS ISO 21626-3:2021	Bamboo charcoal—Part 3: Purification applications
9	Bamboo flooring	PNS ISO 21629-1:2021	Bamboo floorings—Part 1: Indoor use
10	Bamboo construction	PNS ISO 22156:2021	Bamboo structures—Bamboo culms—Structural design
11	Bamboo construction	PNS ISO 23478:2022	Bamboo structures—Engineered bamboo products—Test methods for determination of physical and mechanical properties
12	Bamboo flooring	PNS ISO 21629-2:2023	Bamboo floorings—Part 2: Outdoor use
13	Bamboo charcoal	PNS ISO 5946:2023	Bamboo-based activated carbon—General specifications
14	Bamboo furniture	PNS ISO 6128:2023	Laminated products made of bamboo strips for indoor furniture purposes—Requirements and test methods
15	Bamboo construction	PNS ISO 5257:2024	Bamboo structures—Engineered bamboo products—Test methods for determination of mechanical properties using small size specimens
16	Bamboo construction	PNS ISO 7567:2025	Bamboo structures—Glued laminated bamboo—Product specifications
17	Bamboo flooring	PNS ISO 5942:2025	Bamboo-wood composite for container flooring

Table A7. National standards on bamboo in Ethiopia.

No.	Category	Designation	Title of Standards
1	Bamboo charcoal	ES ISO 21626-1: 2021	Bamboo charcoal—Part 1: generalities
2	Bamboo preservation	ES 6418: 2021	Preservation of bamboo for non-construction purpose
3	Bamboo preservation	ES 6417: 2021	Preservation of bamboo for construction purpose
4	Bamboo construction	ES 6416: 2021	Design of bamboo structures
5	Bamboo charcoal	ES ISO 21626-3: 2022	Bamboo charcoal—Part 3: purification applications
6	Bamboo articles for daily use	ES 6974: 2022	Bamboo incense sticks—specification
7	Bamboo charcoal	ES ISO 21626-2: 2022	Bamboo charcoal—Part 2: fuel applications
8	Others	ES 6972: 2022	Bamboo bicycle frames—Specification
9	Bamboo charcoal	ES ISO 5946: 2022	Bamboo-based activated carbon—General specifications

Table A7. *Cont.*

10	Bamboo terminology	ES ISO 21625: 2022	Vocabulary related to bamboo and bamboo products
11	Bamboo construction	ES ISO 22157: 2022	Bamboo structures—Determination of physical and mechanical properties of bamboo culms—Test methods
12	Bamboo construction	ES ISO 19624: 2022	Bamboo structures—Grading of bamboo culms—Basic principles and procedures
13	Bamboo furniture	ES 6971: 2022	Bamboo-based furniture—specification
14	Bamboo flooring	ES ISO 21629-1: 2022	Bamboo floorings—Part 1: indoor use
15	Bamboo construction	ES 6973: 2022	Bamboo scaffolding—Requirements
16	Bamboo furniture	ES 6925: 2022	Bamboo curtain

Table A8. National standards on bamboo in the Netherlands.

No.	Category	Designation	Title of Standards	Original Title in Dutch
1	Bamboo construction	NEN-ISO 19624:2018 en	Bamboo structures—Grading of bamboo culms—Basic principles and procedures	/
2	Bamboo construction	NEN-ISO 22157:2019 en	Bamboo structures—Determination of physical and mechanical properties of bamboo culms—Test methods	Bamboe—Bepaling van de fysische en mechanische eigenschappen van bamboe stengels—Beproevingsmethoden
3	Bamboo terminology	NEN-ISO 21625:2020 en	Vocabulary related to bamboo and bamboo products	Terminologie van bamboe en bamboe producten
4	Bamboo construction	NEN-ISO 22156:2021 en	Bamboo structures—Bamboo culms—Structural design	Bamboe—Constructief ontwerp
5	Bamboo flooring	NEN-ISO 21629-1:2021 en	Bamboo floorings—Part 1: Indoor use	Bamboevloeren—Deel 1: Binnentoepassingen
6	Bamboo flooring	NEN-ISO 21629-2:2022 en	Bamboo floorings—Part 2: Outdoor use	Bamboevloeren—Deel 2: Buitentoepassingen
7	Bamboo charcoal	NEN-ISO 5946:2022 en	Bamboo-based activated carbon—General specifications	Op bamboe gebaseerde actieve kool—Algemene eigenschappen
8	Bamboo construction	NEN-ISO 23478:2022 en	Bamboo structures—Engineered bamboo products—Test methods for determination of physical and mechanical properties	/
9	Bamboo construction	NEN-ISO 5257:2023 en	Bamboo structures—Engineered bamboo products—Test methods for determination of mechanical properties using small size specimens	Bamboe constructies—Bewerkte bamboe producten—Beproevingsmethoden voor de bepaling van mechanische eigenschappen met behulp van kleine monsters.
10	Bamboo furniture	NEN-ISO 6128:2023 en	Laminated products made of bamboo strips for indoor furniture purposes—Requirements and test methods	Producten van gelamineerde bamboestrips voor meubilair voor gebruik binnenshuis—Eisen en beproevingsmethoden
11	Bamboo construction	NEN-ISO 7567:2024 en	Bamboo structures—Glued laminated bamboo—Product specifications	/
12	Bamboo articles for daily use	NEN-ISO 16830:2025 en	Specification of bamboo drinking straws	/

Table A9. National standards on bamboo in Vietnam.

No.	Category	Designation	Title of Standards	Original Title in Vietnamese
1	Bamboo pulp	TCVN 3138:1979	Bamboo preservation—Preventive method against wood staining and wood destroying fungi for bamboo used as raw material for paper production	Bảo quản tre nứa. Phương pháp phòng nấm gây mục và biến màu cho tre, nứa dùng làm nguyên liệu giấy
2	Bamboo preservation	TCVN 3139:1979	Bamboo preservation—Preventive method against wood destroying fungi and insects for thin bamboos (*Phyllostachys*)	Bảo quản tre nứa. Phương pháp phòng mọt và mốc cho trúc
3	Bamboo construction	TCVN 8573:2010	Bamboo—Structural design	Tre—Thiết kế kết cấu
4	Bamboo construction	TCVN 8168-2:2010	Bamboo—Determination of physical and mechanical properties. Part 2: Laboratory manual	Tre—Xác định các chỉ tiêu cơ lý—Phần 2: Hướng dẫn thực hành phòng thí nghiệm
5	Bamboo flooring	TCVN 10314:2015	Bamboo flooring	Ván sàn tre
6	Bamboo-based panels	TCVN 10315:2015	Bamboo mat plywood	Ván cót ép
7	Bamboo food products	TCVN 13119:2020	Canned bamboo shoots	Măng đóng hộp
8	Bamboo plantation	TCVN 8761-6:2021	Forest tree cultivar—Testing for value of cultivation and use—Part 6: Bamboo species	Giống cây lâm nghiệp—Khảo nghiệm giá trị canh tác và giá trị sử dụng—Phần 6: Nhóm loài tre nứa
9	Bamboo construction	TCVN 14116:2024	Bamboo structures—Determination of physical and mechanical properties of bamboo culms—Test methods	Kết cấu tre—Xác định tính chất vật lý và cơ học của thân tre—Phương pháp thử
10	Bamboo construction	TCVN 14117:2024	Bamboo and bamboo products—Structural bamboo scrimber	Tre và các sản phẩm từ tre—Tre ép khối chịu lực

Table A10. National standards on bamboo in the UK.

No.	Category	Designation	Title of Standards
1	Bamboo articles for daily use	BS ISO 16830:2025	Specification of bamboo drinking straws
2	Bamboo construction	BS ISO 5257:2023	Bamboo structures—Engineered bamboo products—Test methods for determination of mechanical properties using small size specimens
3	Bamboo charcoal	BS ISO 5946:2022	Bamboo-based activated carbon—General specifications
4	Bamboo flooring	BS ISO 21629-2:2022	Bamboo floorings—Outdoor use
5	Bamboo construction	BS ISO 23478:2022	Bamboo structures—Engineered bamboo products—Test methods for determination of physical and mechanical properties
6	Bamboo construction	BS ISO 22156:2021	Bamboo structures—Bamboo culms—Structural design
7	Bamboo construction	BS ISO 22157:2019	Bamboo structures—Determination of physical and mechanical properties of bamboo culms—Test methods
8	Bamboo construction	BS ISO 19624:2018	Bamboo structures—Grading of bamboo culms—Basic principles and procedures

Appendix B. Checklist of National Standards on Bamboo in Other 21 Countries (Access to National Standards Websites as of 30 September 2025)

Table A11. National standards on bamboo published by other 21 countries.

No.	Country	Category	Designation	Title of Standards	Language	Original Title in Local Language
1	Bangladesh	Bamboo pulp	BDS 907:1980	Pulp, bamboo (soda) flash-dried	-	-
2	Bangladesh	Bamboo food products	BDS 1854:2012	Canned bamboo shoot	-	-
3	Bhutan	Bamboo articles for daily use	BTS 341:2021	Specifications and process of making Bangchung (Bamboo Bowl)	-	-
4	Brazil	Bamboo construction	ABNT NBR 16828-1 (2020)	Bamboo structures. Part 1: Design	Portuguese	Estruturas de bambu Parte 1: Projeto
5	Brazil	Bamboo construction	ABNT NBR 16828-2 (2020)	Bamboo structures. Part 2: Determination of physical and mechanical properties of bamboo	Portuguese	Estruturas de bambu Parte 2: Determinação das propriedades físicas e mecânicas do bambu
6	Brazil	Bamboo construction	ABNT NBR 17043 (2023)	Bamboo sticks for structural use—Harvesting, preservative treatment, classification by diameter	Portuguese	Varas de bambu para uso estrutural—Colheita, tratamento preservativo e classificação pelo diâmetro
7	Cambodia	Bamboo food products	CS 331:2014 CODEX STAN 241-2003	Standard for canned bamboo shoots	-	-
8	Cambodia	Bamboo flooring	CS ISO 21629-1:2023 (IDT/ED 2021)	Bamboo floorings—Part 1: Indoor use	-	-
9	Cambodia	Bamboo flooring	CS ISO 21629-2:2023 (IDT/ED 2022)	Bamboo floorings—Part 2: Outdoor use	-	-
10	Cambodia	Bamboo charcoal	CS ISO 21626-1:2024 (IDT/ED 2020)	Bamboo charcoal—Part 1: Generalities	-	-
11	Cambodia	Bamboo charcoal	CS ISO 21626-2:2024 (IDT/ED 2020)	Bamboo charcoal—Part 2: Fuel application	-	-
12	Cambodia	Bamboo charcoal	CS ISO 21626-3:2024 (IDT/ED 2020)	Bamboo charcoal—Part 3: Purification application	-	-
13	Cameroon	Bamboo food products	NC 351: 2014	Standard for preserved bamboo shoots	French	Norme pour les pousses de bambou en conserve
14	Chile	Others	NCh2834: 2003	Bamboo (colihue)—Requirements	Spanish	Bambú colihue—Requisitos
15	Ecuador	Bamboo construction	GPE INEN 20 (1987)	Practice guide. Scaffolding. Round wood and bamboo	Spanish	Guía de práctica. Andamiajes. Madera redonda y bambú
16	Ecuador	Bamboo food products	NTE INEN 2815 (2013)	Standard for canned bamboo shoots (Codex Stan 241-2003, MOD)	Spanish	Norma para los brotes de bambú en conserva (Codex Stan 241-2003, MOD)
17	Ecuador	Bamboo construction	NTE INEN-ISO 22156 (2017)	Bamboo structure design (ISO 22156:2004, IDT)	Spanish	Diseño estructural en bambú (ISO 22156:2004, IDT)

Table A11. *Cont.*

No.	Country	Category	Designation	Title of Standards	Language	Original Title in Local Language
18	Ecuador	Bamboo construction	NTE INEN-ISO 22157-1 (2017)	Bamboo. Determination of physical and mechanical properties Part 1: Requirements (ISO 22157-1:2004, IDT)	Spanish	Bambú. Determinación de las propiedades físicas y mecánicas. Parte 1: requisitos (ISO 22157-1:2004, IDT)
19	Ecuador	Bamboo construction	NTE INEN-ISO 22157-2 (2017)	Bamboo. Determination of physical and mechanical properties Part 2: Laboratory Manual (ISO/TR 22157-2:2004, IDT)	Spanish	Bambú. Determinación de las propiedades físicas y mecánicas. Parte 2: manual de laboratorio (ISO/TR 22157-2:2004, IDT)
20	Ghana	Bamboo construction	GS ISO 22156: 2015	Bamboo—Structural design (ISO 22156: 2004, IDT)	-	-
21	Ghana	Bamboo construction	GS ISO 22157-1: 2015	Bamboo—Determination of physical and Mechanical properties. Part 1: Requirements (ISO 22157-1: 2004, IDT)	-	-
22	Ghana	Bamboo construction	GS ISO 22157-2: 2015	Bamboo—Determination of physical and mechanical properties—Part 2: Laboratory manual (ISO 22157-2:2004, IDT)	-	-
23	Ghana	Bamboo charcoal	GS ISO 21626-1:2022	Bamboo charcoal—Part 1: Generalities	-	-
24	Ghana	Bamboo charcoal	GS ISO 21626-2:2022	Bamboo charcoal—Part 2: Fuel applications	-	-
25	Ghana	Bamboo charcoal	GS ISO 21626-3:2022	Bamboo charcoal—Part 3: Purification applications	-	-
26	Ghana	Bamboo charcoal	GS 1347-2:2024	Biofuels Carbonization—Part 2: Code of Practice for Bamboo Charcoal Manufacturing	-	-
27	Italy	Bamboo construction	UNI 11842:2021	Bamboo—Determination of physical and mechanical properties of bamboo culms	Italian	Bambù—Determinazione delle proprietà fisiche e meccaniche dei culmi di bambù
28	Italy	Bamboo plantation	UNI/PdR 156:2024	Guidelines for the creation of giant bamboo plantations (Phyllostachys edulis or pubescens) for the absorption of CO_2	Italian	Linee guida per la realizzazione di bambuseti di bambù gigante (Phyllostachys edulis o pubescens) per l'assorbimento della CO_2
29	Jamaica	Bamboo furniture	JS CRS 21:2010	Indigenous Furniture (Bamboo, rattan, wicker and nibbi)	-	-
30	Jamaica	Bamboo furniture	JS 106 Part 2:2014	Furniture Part 2: Bamboo and indigenous furniture	-	-
31	Jamaica	Bamboo food products	JS 334:2015	Canned-packaged bamboo shoots	-	-
32	Jamaica	Bamboo charcoal	JS 333:2015	Bamboo charcoal for air purification	-	-
33	Jamaica	Bamboo articles for daily use	JS 348:2020	Bamboo straws	-	-
34	Korea	Bamboo food products	KS H 2125-2021	Bamboo shoots, canned	Korean	죽순 통조림

Table A11. *Cont.*

No.	Country	Category	Designation	Title of Standards	Language	Original Title in Local Language
35	Korea	Bamboo food products	KS H 7112-2021	Bamboo salt	Korean	죽염
36	Malaysia	Bamboo flooring	MS ISO 21629-1:2021	Bamboo floorings—Part 1: Indoor use	-	-
37	Malaysia	Bamboo charcoal	MS ISO 21626-3:2020	Bamboo charcoal—Part 3: Purification applications	-	-
38	Malaysia	Bamboo charcoal	MS ISO 21626-2:2020	Bamboo charcoal—Part 2: Fuel applications	-	-
39	Malaysia	Bamboo charcoal	MS ISO 21626-1:2020	Bamboo charcoal—Part 1: Generalities	-	-
40	Malaysia	Bamboo terminology	MS ISO 21625:2020	Vocabulary related to bamboo and bamboo products	-	-
41	Malaysia	Bamboo-based panels	MS 2693:2020	Laminated bamboo—Specifications for general use	-	-
42	Mexico	Woven bamboo products	NOM-029-SEMARNAT-2003	Sanitary specifications of bamboo, wicker, vine, rattan, cane, reed and raffia, used mainly in basketry and espartoery	Spanish	Especificaciones sanitarias del bambú, mimbre, bejuco, ratán, caña, junco y rafia, utilizados principalmente en la cestería y espartería
43	Nepal	Bamboo construction	NBC 204: 1994	Guidelines for earthquake resistant building construction: earthen building (EB) (part 3 materials 3.4 bamboo; part 9 9.3 bamboo for flooring and roofing; part 10 seismic-resistant components)	-	-
44	Nigeria	Bamboo furniture	NIS 1097: 2019	Standard for furniture (Rattan and bamboo)	-	-
45	Nigeria	Bamboo charcoal	NIS ISO 21626-1: 2024	Bamboo charcoal. Part 1. generalities	-	-
46	Nigeria	Bamboo charcoal	NIS ISO 21626-2: 2024	Bamboo charcoal. Part 2: Fuel applications	-	-
47	Nigeria	Bamboo charcoal	NIS ISO 21626-3: 2024	Bamboo Charcoal. Part 3: Purification applications	-	-
48	Peru	Bamboo construction	Norma Técnica E.100 (2012)	Technical Normative E. 100 Bamboo	Spanish	Norma Técnica E.100 “Bambú”
49	Rwanda	Bamboo construction	RS ISO 19624: 2018	Bamboo structures—Grading of bamboo culms—Basic principles and procedures	-	-
50	Rwanda	Bamboo construction	RS ISO 22156:2021	Bamboo structures—Bamboo culms—Structural design	-	-
51	Rwanda	Bamboo terminology	RS ISO 21625:2020	Vocabulary related to bamboo and bamboo products	-	-
52	Rwanda	Bamboo construction	RS ISO 5257: 2023	Bamboo structures—Engineered bamboo products—Test methods for determination of mechanical properties using small size specimens	-	-

Table A11. *Cont.*

No.	Country	Category	Designation	Title of Standards	Language	Original Title in Local Language
53	Rwanda	Bamboo construction	RS ISO 23478:2022	Bamboo structures—Engineered bamboo products—Test methods for determination of physical and mechanical properties	-	-
54	Rwanda	Bamboo construction	RS ISO 22157:2019	Bamboo structures—Determination of physical and mechanical properties of bamboo culms—Test methods	-	-
55	Rwanda	Bamboo articles for daily use	RS 573: 2024	Wooden and bamboo toothpicks—Specification	-	-
56	Sri Lanka	Bamboo terminology	SLS 1729-2021	Vocabulary related to bamboo and bamboo products	-	-
57	Tanzania	Bamboo food products	TZS 1244: 2010 (1st Ed)	Pasteurized ulanzi bamboo alcoholic drink-specification. Specifies requirements and methods of sampling and test for pasteurized ulanzi (bamboo alcoholic drink)	-	-
58	Tanzania	Bamboo articles for daily use	TZS 3450: 2024	Bamboo drinking straw—Specification	-	-
59	Thailand	Bamboo food products	TIS 920 2533-1990	Canned bamboo shoot	Thai	หน่อไม้ในภาชนะบรรจุ
60	Uganda	Bamboo food products	US CODEX STAN 241:2003 (2014)	Standard for canned bamboo shoots	-	-
61	Uganda	Bamboo terminology	US 1622:2017	Glossary of terms in timber technology and utilization of wood, bamboo and cane	-	-
62	Uganda	Bamboo preservation	US 2098:2020	Preservation of bamboo and cane for non-structural purposes—Code of practice	-	-
63	Uganda	Bamboo preservation	US 2114:2020	Preservation of bamboo and cane for structural purposes—Code of practice	-	-

Appendix C. Source Websites

Table A12. Source of international, regional, national and association standards.

No.	Country	Standard Agency	Source Weblinks (accessed as of 30 September 2025)
International standards			
1	/	International Organization for Standardization	https://www.iso.org/committee/53584.html; https://www.iso.org/committee/5819148.html
National standards			
1	Bangladesh	Bangladesh Standards and Testing Institution	https://bsti.portal.gov.bd/
2	Bhutan	Bhutan Standards Bureau	https://bsb.gov.bt/
3	Brazil	Associação Brasileira de Normas Técnicas	https://www.abnt.org.br/
4	Cambodia	Institute of Standards of Cambodia	https://res.cloudinary.com/dgvyfitu8/image/upload/v1756176250/2025_CS_Short_20637e42b0.pdf
5	Cameroon	Agence des Normes et de la Qualité	https://www.anor.cm/sygen
6	Chile	Instituto Nacional de Normalización	http://www.inn.cl/
7	China	National Standardization Administration	http://www.sac.gov.cn/
8	Colombia	Instituto Colombiano de Normas Técnicas y Certificación	https://www.icontec.org/
9	Ecuador	Servicio Ecuatoriano de Normalización	https://www.normalizacion.gob.ec/
10	Ethiopia	Ethiopian Standards Agency	https://www.ethiostandards.org/sites/default/files/2023-04/IES%20ES%202023%20CATALOGUE.pdf
11	Ghana	Ghana Standards Authority	https://gsa.gov.gh/
12	India	Bureau of Indian Standards	http://www.bis.org.in/
13	Indonesia	Badan Standardisasi Nasional	http://www.bsn.go.id/
14	Italy	Ente Nazionale Italiano di Unificazione	https://www.uni.com/
15	Jamaica	Bureau of Standards Jamaica	https://www.bsj.org.jm/
16	Kenya	Kenya Bureau of Standards	https://www.kebs.org/
17	Korea	Korean Agency for Technology and Standards	http://kssn.net/ks/indsearch.do
18	Malaysia	Department of Standards Malaysia	http://www.jsm.gov.my/
19	Mexico	Dirección General de Normas	https://platiica.economia.gob.mx/normalizacion/catalogo-mexicano-de-normaswd_asp-id29/
20	Nepal	Nepal Bureau of Standards and Metrology	http://www.nbsm.gov.np/
21	the Netherlands	Netherlands Standardization Institute	https://www.nen.nl/
22	Nigeria	Standards Organization of Nigeria	https://library.son.gov.ng/
23	Peru	Ministry of Housing, Construction and Sanitation (MVCS)	https://www.gob.pe/institucion/vivienda/informes-publicaciones/2309793-reglamento-nacional-de-edificaciones-rne
24	the Philippines	Bureau of Philippine Standards	https://bps.dti.gov.ph/
25	Rwanda	Rwanda Standards Board	http://www.rsb.gov.rw/
26	Sri Lanka	Sri Lanka Standards Institution	http://www.slsi.lk/
27	Tanzania	Tanzania Bureau of Standards	https://www.tbs.go.tz/catalogues
28	Thailand	Thai Industrial Standards Institute	https://appdb.tisi.go.th/tis_dev/p3_tis/p3tis.php
29	Uganda	Uganda National Bureau of Standards	https://unbs.go.ug//attachments/menus/27/Uganda%20Standards%20Catalogue%20as%20of%2031%20December%202024-Final.pdf
30	United Kingdom	British Standards Institution	https://www.bsigroup.com/
31	Vietnam	Directorate for Standards, Metrology and Quality	https://tcvn.gov.vn/?lang=en

Table A12. *Cont.*

No.	Country	Standard Agency	Source Weblinks (accessed as of 30 September 2025)
Regional standards			
1	/	African Organization for Standardization	https://www.arso-oran.org/
2	/	European Committee for Standardization (CEN)	https://www.en-standard.eu/
Association standards			
1	/	American Society for Testing and Materials	https://www.astm.org/
2	/	China Association for Engineering Construction Standardization	http://www.cecs.org.cn/
3	/	China Bamboo Industry Association	http://www.cbiachina.com/

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