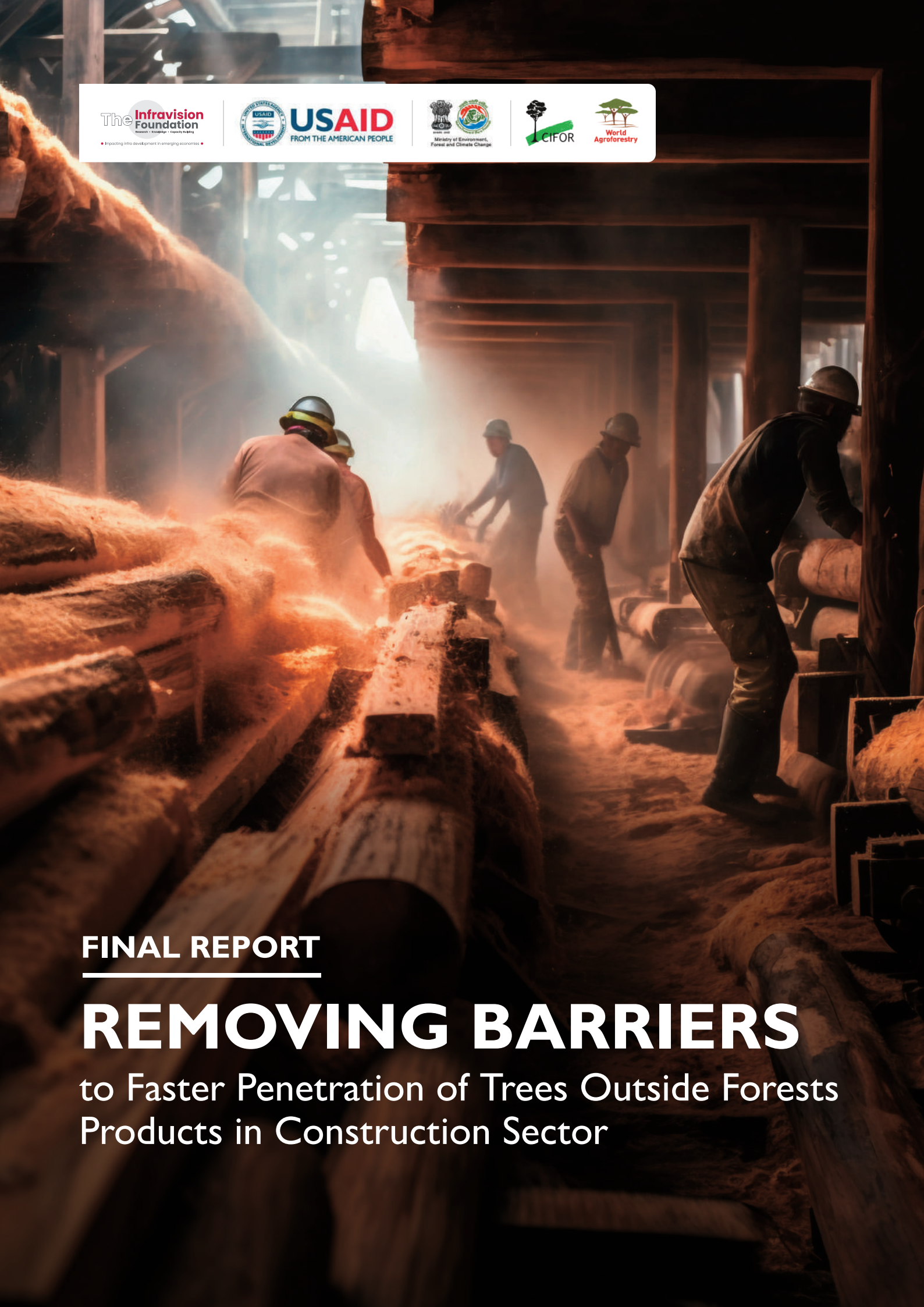

FINAL REPORT

REMOVING BARRIERS

to Faster Penetration of Trees Outside Forests Products in Construction Sector

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January 2025

The Infravision Foundation
Research • Knowledge • Capacity Building
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Ministry of Environment, Forest and Climate Change

CIFOR

World Agroforestry

Trees Outside Forests in India (TOFI) Program

Supporting the Integration of TOF Products into India's Construction Sector

This report was developed under the Trees Outside Forests in India (TOFI) Program, a joint initiative of the United States Agency for International Development (USAID) and the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India aimed at expanding tree coverage outside traditional forests while enhancing livelihoods and ecosystem services across seven Indian states. The report has been developed through extensive research, expert consultations, and stakeholder engagements to support the integration of Trees Outside Forests (TOF) products into India's construction sector.

Prepared by: The Infravision Foundation (TIF) in collaboration with The Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF)

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Stakeholder Engagement

As part of this study, extensive consultations were conducted with key stakeholders, including government agencies, research institutions, industry representatives, and subject matter experts. Their insights and expertise played a crucial role in shaping the analysis and recommendations presented in this report.

We extend our sincere gratitude to the following stakeholders who contributed their valuable time and expertise to this study:

National Consultation Workshop

The project conducted a comprehensive national consultation workshop focusing on revising building codes and developing strategies to enhance demand for TOF-based products in India's construction sector. The workshop brought together participants representing various sectors including representatives from government bodies, industry associations, academic institutions, and research organizations.

This workshop served as a crucial platform for cross-sectoral dialogue, fostering collaborative strategies to advance the adoption of TOF-based products in India's construction sector.

A comprehensive list of workshop participants and their institutional affiliations is provided in Annexure 4.

Key Institutional Stakeholder Consultations

The study encompassed extensive consultations with numerous stakeholder groups:

Government Organizations and Research Institutions

Building Material and Technology Promotion Council (BMTPC) - Shri Pankaj Gupta, Deputy Chief -- I&D and Chief -- Admin (I/C), Delhi

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Industry Engagement

Key industry representatives including Ms. Prachi Kagzi from Megamet Steels Pvt Ltd, Mumbai

A **Perception Survey** was undertaken to evaluate the construction industry's preparedness for incorporating timber-based materials. This assessment captured insights on industry awareness, key concerns, and the openness of stakeholders to integrating TOF products into mainstream construction practices. The findings from this survey have been instrumental in formulating strategies for policy interventions and market development.

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Executive Summary

TOF-based Construction: A Potential Economic Driver

The growing global demand for sustainable construction materials is driving a surge in timber use, particularly in mass timber applications such as cross-laminated timber (CLT) and glued-laminated timber (glulam). Worldwide, the mass timber market, valued at USD 857.1 million in 2021, is projected to reach USD 1.5 billion by 2031. In India, the construction sector—which is expected to hit USD 1.4 trillion by 2025—presents significant opportunities for Trees Outside Forests (TOF)-based timber. Timber offers multiple advantages: reduced carbon footprints, shorter construction times, and renewable sourcing. However, regulatory complexities and policy barriers currently limit its widespread use.

The Wood Market in India

India's wood market is projected to increase from USD 14.77 billion in 2024 to USD 22.5 billion by 2029, at a CAGR of 8.78%. The construction sector remains a major consumer, driving a near 70% rise in wood demand by 2030—from 57 million m^3 in 2020 to 98 million m^3. Despite this surge, domestic production lags demand, necessitating substantial timber imports. High-value species such as teak and Gurjan are primarily sourced from regions with high risks or conflict, compounding supply-chain vulnerabilities.

Major Sectors Using Wood and Timber

Key consumers include:

a. **Construction:** India's mass timber market was valued at around USD 41 million in 2019, expected to grow at a CAGR of ~12% by 2030.

b. **Furniture:** Rapid urbanization and shifting consumer preferences drive significant growth, with a projected 70% rise in roundwood demand by 2030.

c. **Packaging:** Valued at USD 4 billion in 2020, the wooden packaging market in India is growing at a CAGR of 7.5%.

Domestic Wood Production

In 2023–2024, India produced roughly 102 million cubic meters of small-sized wood, plus 37 million cubic meters of medium- and large-sized timber. Yet government-managed forests contribute only 3.35% of total supply. Agroforestry—an essential pillar of TOF—already meets 93% of India's industrial wood needs but remains underutilized. Harnessing TOF resources, particularly teak, could decrease imports, bolster rural economies, and help India emerge as a key timber exporter.

Barriers and Opportunities in TOF Construction

Despite strong growth potential, TOF-based construction in India faces obstacles such as complex felling and transit rules, outdated urban planning norms, and insufficient promotion in public procurement. Nonetheless, the 2020 policy reform by the Ministry of Environment, Forests, and Climate Change (MoEFCC) lifted a 27-year ban on timber in public construction, creating new incentives for sustainable timber use. If supported by consistent regulatory reforms and market-based incentives, TOF can significantly reduce carbon footprints in buildings and diversify local livelihoods.

Need for the Study

With India's construction sector expanding rapidly and timber demand poised to soar, a systematic approach to mainstreaming TOF is essential. Revision of building codes, green procurement policies, and facilitation of domestic timber production are needed to reduce import reliance, support climate goals, and strengthen rural economies.

Scope

The study focuses on revising building codes, public procurement policies, and green procurement guidelines to integrate TOF products across seven states: Andhra Pradesh, Assam, Haryana, Odisha, Rajasthan, Tamil Nadu, and Uttar Pradesh. Recommendations will inform an advisory to promote TOF-based construction practices.

Objectives

Key objectives include reviewing state building codes, developing strategies for embedding TOF in public procurement, facilitating stakeholder engagement, and drafting actionable policy recommendations. Ultimately, the goal is to boost domestic timber use, reduce imports, and align construction with environmental targets.

Approach & Methodology

A mixed-method approach was adopted:

1. **Literature Review** of policies, building codes, and market analyses.
2. **Field Visits** to research institutes and industry bodies to examine timber innovations.
3. **Stakeholder Consultations** with government officials, timber merchants, and experts to identify barriers and opportunities.
4. **Data Collection and Analysis** through surveys and state-level engagements to refine recommendations.
5. **Final Report** consolidating findings and policy advisories and formulation of Draft Advisory for MoEFCC.

Challenges and Barriers

India's efforts to promote TOF wood-based products face multifaceted challenges across both market and regulatory domains. While policies such as the National Forest Policy (1988) and the National Agroforestry Policy (2014) recognize the importance of liberalizing timber production, their implementation remains inconsistent. Bureaucratic inefficiencies, fragmented governance, and low awareness inhibit the wider acceptance of TOF products, which could otherwise support India's sustainability and climate change goals.

Market Barriers

A key market barrier stems from the entrenched reliance on traditional materials like cement, steel, and ceramic tiles. These materials enjoy robust supply chains, large-scale production, and strong consumer confidence due to their cost-effectiveness and proven reliability. In contrast, TOF wood products, although growing in market share, remain comparatively small and face challenges related to high initial costs and limited manufacturing capacity. The elevated upfront expense of wooden houses, further compounded by maintenance considerations and import duties on prefabricated wood, dissuades many potential buyers, especially in the affordable housing segment.

Another critical obstacle is the inadequate supply chain infrastructure. Despite the existence of specific industrial clusters for paper, pulp, and plywood, the TOF sector suffers from fragmented distribution networks, insufficient processing facilities, and minimal market linkages. Many sawmills and timber traders operate informally, lacking the modern equipment needed to efficiently handle large volumes or produce consistently high-quality products. Transportation and storage challenges—particularly in rural areas—add further costs and unpredictability.

Low levels of investment in TOF wood-based production compound these issues. Farmers often face significant financial risk when establishing tree plantations, as long gestation periods and uncertain market conditions deter them from investing in agroforestry. Similarly, the sawmilling and processing industry remains dominated by small-scale enterprises, limiting research, development, and technological upgrades necessary for achieving economies of scale.

Awareness and acceptance are also impediments. Misconceptions persist that wood is structurally weak, prone to termites, and environmentally harmful, even though modern treatments and certifications can ensure durability and sustainability. Many architects and builders lack familiarity with advanced wood-based construction methods. Consequently, TOF products are often overlooked in favour of more familiar, conventional materials.

Regulatory and Policy Challenges

Regulatory inconsistency in tree felling and transit rules across states stands out as a major hurdle. Each state prescribes unique procedures, permits, and exempted species, creating a complex and sometimes contradictory environment for growers and traders. Licensing for sawmills and wood processing units further increases the complexity, as no uniform framework exists to streamline approvals or encourage new investments.

Although India's building codes (NBC, MBBL) have promoted timber in certain public buildings, they still impose stringent fire safety regulations that restrict wider use of wood. These codes rarely distinguish between TOF timber and conventional forest timber, limiting recognition of sustainably sourced materials. Government procurement policies, including the General Financial Rules (GFR) and the Government e-Marketplace (GeM), do not adequately incentivize the inclusion of TOF products, focusing instead on lowest-cost procurement and established materials.

Furthermore, high Goods and Services Tax (GST) rates—18% on timber and plywood—place TOF products at a price disadvantage compared to lower-taxed materials like bricks and sand. Certification standards remain underdeveloped, with no clear mechanism for verifying the quality of processed TOF wood. Judicial interventions by bodies like the National Green Tribunal (NGT) and the Supreme Court, while crucial for curbing illegal logging, often create additional uncertainties for new TOF-based ventures.

Overall, these market and policy barriers underscore the need for more coherent governance, targeted financial incentives, streamlined regulations, and improved industry-wide awareness to unlock the potential of TOF wood-based products as a sustainable alternative in India's construction sector.

Strategy for Promoting TOF in Construction

Trees outside forests (TOF) present a significant opportunity to enhance sustainability, reduce reliance on imported timber, and strengthen India's climate resilience. To foster the integration of TOF wood-based products in construction, a multifaceted strategy is needed. This involves creating incentives that encourage the use of TOF materials, developing robust markets to ensure their acceptance and competitiveness, increasing public awareness through targeted branding, and fortifying the supply chain. By implementing the recommendations outlined below, India can accelerate the adoption of sustainable wood products, drive economic growth in rural areas, and meet its broader environmental objectives.

Incentives to Key Players

1. **Green Building Certifications and Financial Benefits**

   Recognizing or rewarding the use of TOF products in green building certifications (e.g., GRIHA, IGBC) is a powerful way to promote sustainable construction. Adding credits specifically for TOF materials encourages architects, developers, and contractors to incorporate wood sourced from agroforestry or other sustainable systems. These incentives can be complemented by financial measures such as tax rebates, subsidies, or reduced registration fees that lower the cost difference between TOF products and conventional materials.

2. **Harmonized Building Codes**

   A major hurdle for TOF adoption lies in inconsistent regulations across states. Standardizing building codes at the national level, with explicit provisions for TOF-based materials, would simplify compliance and ensure that wood from agroforestry is recognized as a viable construction resource. Clear references to structural safety, fire-resistance, and durability standards in the National Building Code (NBC) would streamline the approval process and promote widespread acceptance of TOF timber.

3. **Preferential Government Procurement**

Government-led procurement policies can catalyse market growth by guaranteeing a baseline demand for TOF products. Requiring a minimum percentage of TOF materials in public sector projects for a defined period—accompanied by benefits such as lowered GST rates or faster approvals—will create a stable, sizeable market. This, in turn, encourages private players to invest in scaling operations and refining TOF product quality, further driving adoption in the broader construction sector.

Market Maturation

1. **Establish Export Channels**

With global demand for sustainably sourced timber on the rise, India can position itself as a key exporter of TOF-based construction materials. Developing export-oriented standards and certification systems that align with international eco-labels (e.g., FSC, PEFC) will bolster the global credibility of India's TOF products. Active engagement with international trade bodies and the strategic use of digital platforms like GeM can help broaden the market reach and attract foreign buyers.

2. **Adopting Modular and Factory-Made Timber Products**

Emulating successful models in the US, Indonesia, and China, India can scale up production of prefabricated wood components such as Cross Laminated Timber (CLT) and Glued Laminated Timber (GLT). Investment in advanced manufacturing facilities, standardized production processes, and quality control systems will ensure reliability and competitiveness. Aligning domestic regulations with international codes for engineered wood products will further enhance India's capacity to supply both domestic and international construction markets with high-quality, factory-produced timber materials.

3. **Community Participation and Registered Tree Farming**

Encouraging farmers to engage in registered tree farming initiatives, supported by agroforestry training and secure land tenure, can bolster local economies while providing a steady supply of timber. Incentivizing tree cultivation outside forests diversifies farmers' incomes, promotes biodiversity, and sequesters carbon. Partnerships between government entities, industry, and community groups can streamline market access, ensuring farmers receive fair compensation and forging stronger links between producers and end users.

4. **SMEs and Job Creation**

Small and medium-sized enterprises (SMEs) can play a pivotal role in processing and distributing TOF products. By offering targeted financial support—such as low-interest loans, grants, or tax breaks—the government can foster innovation in wood-based manufacturing and encourage entrepreneurial growth in rural areas. This, in turn, creates employment opportunities and helps balance regional economic development with environmental stewardship.

Branding and Awareness

1. **Sustainability and Carbon Sequestration**

   Positioning TOF wood as a low-carbon, climate-resilient material is crucial for market appeal. Highlighting the natural carbon sequestration process of trees and the reduced energy footprint of wooden materials (compared to concrete and steel) resonates strongly with eco-conscious developers, policymakers, and end-users. Quantifying the carbon benefits of TOF products in promotional materials and certifications can differentiate them in the competitive green building marketplace.

2. **National Marketing Campaigns**

   Raising awareness through nationwide promotions—via digital media, case studies, and demonstration projects—can rapidly boost demand. Partnerships with influential construction and real estate associations (e.g., CREDAI, BAI) lend credibility and help integrate TOF products into mainstream practices. Concurrent policy advocacy ensures that positive public perception is reinforced by supportive regulations, tax incentives, and streamlined certification processes.

3. **Collaboration with Industry Associations**

   Industry associations can champion TOF by advocating for regulatory reforms, organizing training programs, and curating best practices. Jointly spearheading pilot projects in partnership with public agencies or private developers provides tangible examples of TOF's advantages, further validating its place in modern construction. Such collaborations also facilitate knowledge exchange, enabling members to collectively overcome technical, financial, and regulatory hurdles.

Supply Chain Improvements

1. **Storage Facilities**

   Efficient storage and warehousing are vital for preserving the quality of TOF-based materials and ensuring a reliable supply. Establishing regional storage hubs, especially near agroforestry regions, will reduce transportation bottlenecks and maintain product integrity. Government-backed incentives—subsidized loans, tax exemptions, and Special Economic Zones—encourage private investment in these facilities, thus bridging gaps in the rural-to-urban supply network.

2. **Skill Development**

   Workforce training in agroforestry, wood processing, and TOF-centric construction techniques is indispensable for building a robust sector. Modular courses, hands-on workshops, and formal certification programs can equip labourers, architects, and engineers with specialized knowledge about TOF products' structural and environmental attributes. Strategic collaborations with academic institutions and digital learning platforms ensure broad reach and sustained capacity-building efforts.

By blending targeted incentives, a conducive market ecosystem, strong branding, and resilient supply chains, India can significantly elevate TOF usage in construction. Successful implementation of these measures will reduce dependence on imported timber, strengthen rural livelihoods, and position India as a global leader in sustainable building practices—all while advancing national climate mitigation goals. The draft Advisory for the MoEFCC is enclosed at Annexure 1. Salient feature of the Draft Advisory are as follows.

Salient Features of the Advisory for Promotion of Trees Outside Forests (TOF) Materials in Construction Sector

I. Preamble & Overall Rationale

1. **Sustainability & Climate Goals:** The Ministry of Environment, Forest and Climate Change (MoEFCC) underscores the role of TOF-based materials (timber, bamboo, etc.) in achieving national climate targets and sustainable development objectives.

2. **Key Benefits**

   a. **Climate Mitigation:** Lower carbon footprint compared to conventional materials.

   b. **Biodiversity Conservation:** Enhances green cover and ecosystem restoration.

   c. **Sustainable Livelihoods:** Creates economic opportunities for rural and marginalized communities.

   d. **Circular Economy:** Encourages resource efficiency and renewable material use.

3. **Integration of TOF Materials**: The advisory directs Central and State agencies to update procurement policies, building standards, and codes to facilitate widespread use of TOF wood-based materials in construction.

II. Directives for Central Government Agencies

1. **Central Public Works Department (CPWD), MoHUA**

   i. **Revise Manuals & Schedules**: Update CPWD Manuals/Schedule of Rates to explicitly include and promote TOF wood-based materials.

   ii. **Align State PWD Manuals**: Guide State PWDs to adopt CPWD specifications on TOF products.

2. **Building Materials and Technology Promotion Council (BMTPC), MoHUA**

   i. **Technical Workshops & Education**: Conduct workshops, webinars, and demonstrations on performance, durability, and cost-effectiveness of TOF materials.

   ii. **Demonstrations & Awareness**: Develop case studies, compendiums, and best-practice guides for industry stakeholders.

   iii. **Certification Courses**: Integrate TOF modules in NAVRITIH and promote modular TOF elements for uniform design specifications.

   iv. **Collaboration with Green Certifications**: Work with GRIHA, LEED and similar organizations to include PRAMAAN and TOF wood-based materials as a key criterion for to award higher ratings for projects using TOF-based materials.

   v. **Pilot Projects**: Disseminate standardized guidelines specifying modular TOF products in government buildings to demonstrate feasibility and scalability.

3. **Bureau of Indian Standards (BIS)**

   i. **Standardized Certification & Labelling**: Develop PRAMAAN-aligned certification systems and clear labeling guidelines to boost market confidence in TOF materials.

4. **National Building Codes**: Update the National Building Codes to reflect TOF-specific standards and ensure alignment with international best practices.

5. **Ministry of Housing and Urban Affairs (MoHUA)**

   i. **National Guidelines**: Formulate and implement guidelines for TOF-based buildings, aligning with government housing schemes (e.g., PMAY-U).

   ii. **Promote Timber Use**: Partner with BMTPC to scale timber adoption in housing projects, ensuring TOF is integrated into urban infrastructure.

6. **Ministry of Rural Development (MoRD)**

   i. **Rural Building Guidelines**: Develop standardized TOF-based construction guidelines for rural housing (e.g., PMAY-G).

   ii. **Affordable Housing**: Collaborate with states to integrate TOF materials in 2 crore upcoming rural housing projects.

7. **Town and Country Planning Organisation (TCPO), MoHUA**

   i. **Urban Planning & Zoning**: Incorporate TOF provisions (plantation, warehousing, special zones) into urban master plans and regulations.

8. **Ministry of Finance (MoF)**

   i. **Tax Incentives**: Advocate reduced GST rates on certified TOF materials; offer tax rebates for stakeholders using TOF in projects.

   ii. **Incentivising Procurement**: Recommend incentivising procurement of at least 15-20% for TOF- wood based materials use in public construction over five years on GeM portal.

   iii. **General Financial Rules (GFR) Update**: Include green procurement clauses and promote life cycle costing for long-term sustainability.

9. **Ministry of Expenditure**

   i. **Definition and Criteria:** Include criteria for “green products” and “green services” based on lifecycle assessments, carbon footprints, and certification standards like Ecomark or global equivalents.

   ii. **Green Procurement Clause**: Mandate government entities to prioritize eco-friendly, energy-efficient, and sustainable products and services in procurement processes.

   iii. **Life-Cycle Costing (LCC)**: Replace “lowest-cost procurement” with Life-Cycle Costing to account for long-term environmental and operational benefits over just upfront prices.

   iv. **Supplier Eco-Compliance**: Introduce rules requiring suppliers to adhere to environmental standards and submit relevant certifications to ensure sustainable sourcing and compliance.

10. **Ministry of Commerce and Industry & Export Promotion Council of India**

    i. **SME Clusters & Processing Hubs**: Provide shared infrastructure for TOF-based manufacturing; set up processing hubs near production areas.

    ii. **Industrial Policy Alignment**: Prioritize TOF production with R&D grants, subsidies, and streamlined approvals.

    iii. **GeM Platform Visibility**: Feature certified TOF products prominently to boost public-sector procurement.

    iv. **Export Promotion**: Organize trade missions, adopt global standards (FSC, PEFC), and expand international partnerships for modular timber expertise.

    v. **Develop International Partnerships for Modular Timber Expertise**: Collaborate with global companies specializing in modular timber technologies; facilitate knowledge transfer and adoption of cutting edge manufacturing practices to meet international standards.

    vi. **Export Promotion Council of India**:

        a. **Standardization of Quality Parameters:** Define and implement export quality standards for TOF wood products, addressing durability, finish moisture content, and environmental sustainability.

        b. **Certification and Labelling Program:** Introduce PRAMAAN- aligned certification programs to enhance market credibility for exporters.

        c. **Capacity Building for Producers:** Train domestic TOF producers in best practices for harvesting, processing, and quality control to meet export-quality benchmarks.

        d. **Establish Export Networks:** Create platforms and trade missions to connect domestic producers with international buyers, enabling direct trade relationships and showcasing TOF products' benefits.

11. **Ministry of MSMEs**

    i. **Financial Assistance**: Offer grants, low-interest loans, and start-up incentives for TOF-based SMEs to promote innovation and sustainability.

12. **Ministry of Skill Development and Entrepreneurship**

    i. **Vocational Training**: Develop specialized courses for workers, including processing, handling, and certifying TOF timber for construction.

13. **Ministry of Road Transport and Highways**

    i. **Streamlined Transport**: Integrate PRAMAN (National Transit Pass) to unify certification and simplify transport regulations for TOF materials.

14. **National Highway Authority of India (NHAI) / Indian Railways**

    i. **Pilot Projects**: Use TOF wood-based products for sound barriers, street furniture, or landscaping to assess performance.

    ii. **Procurement Documents**: Revise standards and RFPs to specify TOF materials; incentivise a 15-20% minimum target over five years.

15. **Curriculum and Capacity Building Initiatives for Council of Architecture (COA), All India Council for Technical Education (AICTE), and Institute of Town Planners India (ITPI)**

    i. **Revise Curricula for Technical and Professional Education:**

        a. Integrate TOF wood-based materials into the curricula of architecture, engineering, and urban planning courses.

        b. Develop modules focusing on the applications of TOF products such as timber and bamboo, with an emphasis on mass timber for sustainable construction and urban development.

    ii. **Develop Elective and Certification Courses**:

        a. Introduce elective courses and certifications on TOF-related sustainable practices through institutions affiliated with COA, ITPI, and AICTE.

        b. Emphasize the role of TOF materials in achieving certifications like GRIHA, LEED, and IGBC.

    iii. **Faculty Training Programs**:

        a. Collaborate with the Building Materials and Technology Promotion Council (BMTPC) to conduct training sessions for faculty members, enhancing their expertise in TOF-based construction practices.

        b. Partner with the National Institute of Technical Teachers' Training and Research (NITTTR) to develop specialized teacher training modules focused on TOF-related topics.

    iv. **Promote Research and Innovation**:

        a. Encourage interdisciplinary research within architecture and engineering institutions on TOF-based materials and their potential to contribute to climate-resilient infrastructure.

    v. **Knowledge Dissemination**:

        a. Partner with BMTPC to develop and distribute educational resources, such as manuals, case studies, and instructional videos, for use across technical and professional institutions.

III. Directives for State Governments

1. **State Public Works Departments (PWDs)**

    i. **Adopt CPWD Specifications**: Align state manuals with updated CPWD guidelines to ensure uniformity and confidence in TOF usage.

    ii. **Pilot & Procurement**: Launch pilot projects in state-funded buildings and mandate a minimum percentage of TOF materials; update GeM to prioritize certified TOF.

    iii. **Traceability & Quotas**: Require barcoding for product origin and implement quotas for TOF use in construction projects.

2. **State Finance Departments**

   i. **Tax Holidays**: Provide tax holidays or reduced rates for SMEs in TOF processing and manufacturing to spur sector investment.

3. **State Industrial Development Corporations**

   i. **Special Industrial Zones**: Establish industrial clusters dedicated to TOF processing, offering subsidized utilities, centralized storage, and streamlined logistics.

   ii. **Financial Incentives**: Offer low-interest rates and fast approvals to attract large-scale investments in TOF-based industries.

4. **State Urban Development Departments**

   i. **Harmonize Regulations**: Revise codes, byelaws, and master plans to align with the national framework for TOF integration in urban environments.

5. **State Forest Departments**

   i. **Traceability & Certification**: Implement barcoding to confirm non-forest origin and sustainability of TOF products.

   ii. **Registered Tree Farming**: Support community-based TOF farming with financial incentives, training, and streamlined verification processes.

IV. Initiatives by the Ministry of Environment, Forest and Climate Change (MoEFCC)

1. **Centralized Secretariat**: Establish a dedicated unit to fast-track the adoption of TOF wood-based products in construction, reducing transaction points in the supply chain.
2. **National Agriculture Market (eNAM)**: Expand eNAM to cover TOF wood-based products for transparent pricing and efficient producer-buyer linkages.
3. **Promotion of Mass Timber**: MoEFCC to collaborate with BIS, MoHUA, MoRD, NABARD, and FRI to mainstream mass timber in sustainable construction.
4. **Branding "Wood is Good"**: Launch a nationwide campaign to position timber from TOF as an aspirational, eco-friendly building material.
5. **Carbon Mechanisms**: Work with BEE, ICFRE, and others on carbon bonds, carbon currency, and certification to monetize carbon sequestration benefits of TOF products.
6. **Centre of Excellence**: Create a national hub for research, innovation, and capacity building in timber construction, partnering with MoHUA, MoRD, BIS, IWST, and other stakeholders.

Chapter 1

TOF-based construction: A potential economic driver

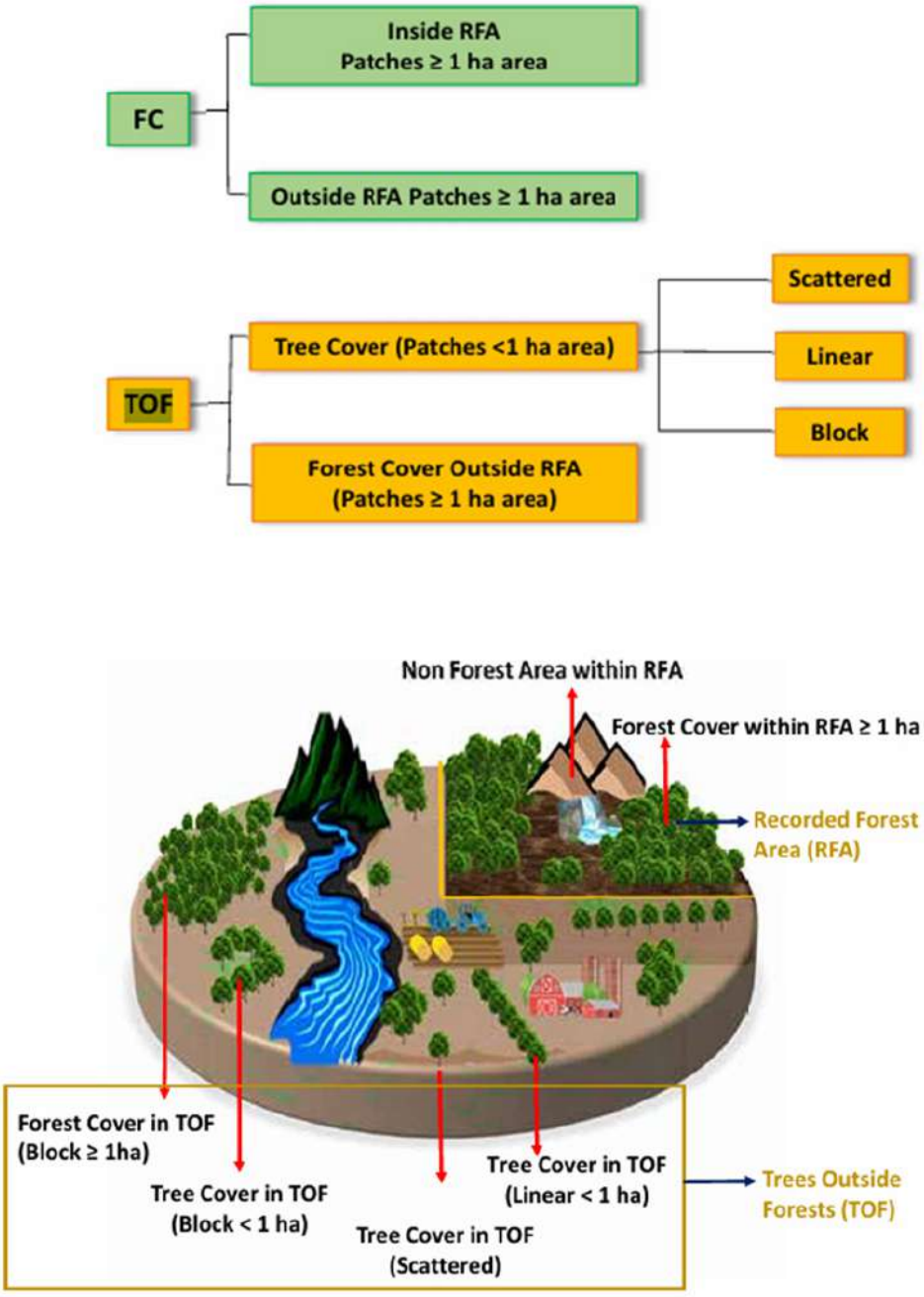
The demand for wood and timber in the construction sector is experiencing significant growth, driven by a combination of sustainability concerns, technological advancements, and changing market dynamics. This trend is particularly evident in various regions around the globe, including North America, Europe, and India. Globally, **Mass Timber construction** is at the forefront of this shift. Valued at approximately **$857.1 million in 2021**, this market is projected to reach **$1.5 billion by 2031**, growing at a compound annual growth rate (CAGR) of **6%.**[1] Mass timber is a **sustainable and cost-efficient alternative** to steel and concrete, reducing construction carbon footprints while offering comparable strength and durability for high-rise buildings. Its prefabrication capabilities also enable faster building times and lower costs.[2] [3]

India's construction sector, poised to reach $1.4 trillion by 2025, plays a pivotal role in the country's economy, contributing approximately 9% to the national GDP.[4] As the sector expands, there is an increasing shift toward sustainable materials, with timber emerging as a key alternative to conventional construction materials such as concrete and steel. Timber, especially from Trees Outside Forests (TOF), offers a renewable and eco-friendly solution that aligns with India's climate targets, promoting carbon sequestration and energy-efficient construction practices. However, despite its potential, the widespread use of TOF products in India's construction industry remains hindered by various regulatory, policy, and supply chain barriers.

Understanding TOF: Definitions and Production Potential

Trees Outside Forests (TOF) encompass all trees growing outside **recorded forest areas (RFA)**, regardless of their size or distribution. While often used interchangeably, **TOF and tree cover** are distinct concepts. TOF includes all trees outside designated forest lands, whereas tree cover specifically refers to **tree patches and isolated trees under one hectare in size**. In essence, **tree cover is a subset of TOF**, contributing to India's overall green landscape.

Fig 1. Concept of Forest, TOF and Tree Cover

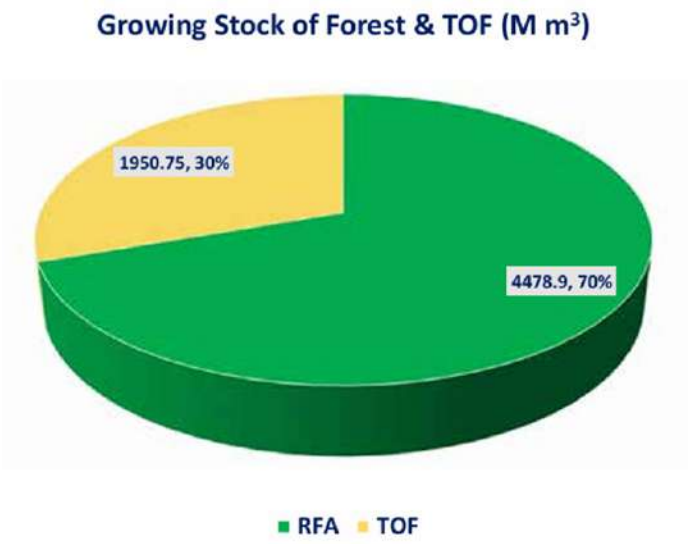


Source: India State of Forest Report 2023

According to the **India State of Forest Report (ISFR)**, TOF plays a crucial role in India's timber supply and environmental sustainability. The total TOF area, including forest cover outside **Recorded Forest Areas (RFA) and Green Wash (GW)**, is estimated at **30.70 million hectares**, accounting for **37.11% of India's total forest and tree cover**. This vast resource holds significant potential for meeting industrial wood demand while alleviating pressure on natural forests.

The **growing stock of wood** in India is approximately **6,429.64 million cubic meters (M m³)**, with **1,950.75 M m³ (about 30%) sourced from TOF** . Notably, TOF-based wood reserves have grown by **171.40 M m³ (9.63%)** since ISFR 2021, surpassing the **90.92 M m³ (2.07%)** growth observed within forested areas. This highlights TOF's increasing importance in timber production, making it a valuable alternative to forest-derived wood.

Fig 2. Growing Stock of RFA & Trees Outside Forests



Source: India State of Forest Report 2023

One of the most significant contributions of TOF is its **industrial wood production potential**, estimated at **91.51 M m³ per year**. This marks an increase of **22.47 M m³** since ISFR 2017, reflecting **positive trends in agroforestry and sustainable timber sourcing**. Over the past decade (2013–2023), India's **total growing stock of TOF has expanded by 466.07 M m³**, further demonstrating its untapped potential.

To effectively quantify and manage TOF resources, the **Forest Survey of India (FSI)** conducts periodic **National Forest Inventories (NFI)**, covering both forested and non-forested areas. Since 2002, approximately **10,000 sample plots** have been surveyed annually outside recorded forests, generating data on **tree biomass, carbon storage, and industrial wood availability**. The TOF inventory is further divided into **Rural and Urban TOF categories**, ensuring precise estimates for sustainable planning and policymaking.

Table 1 highlights the State/ UTs wise annual potential of industrial wood from TOF area with % standard error.

These statistics underscore TOF's role as a **critical supply source** for India's construction sector. With strategic policy interventions, TOF-based wood can **reduce dependency on imports, support domestic timber markets, and contribute to India's climate and sustainability goals**. The subsequent sections will explore the barriers and opportunities associated with integrating TOF products into mainstream construction.

Table 1: State/UTs wise Annual Potential Production of Industrial Wood from TOF Area with % Standard Error

Sl.No.	State/UTs	Annual potential production of Industrial wood (M m3)	Standard Error
1	Andhra Pradesh	2.77	3.67
2	Arunachal Pradesh*	0.76	11.69
3	Assam	1.13	5.67
4	Bihar	2.07	4.24
5	Chhattisgarh	5.71	3.02
6	Delhi	0.15	6.27
7	Goa	0.16	6.12
8	Gujarat	4.72	5.5
9	Haryana	2.62	3.82
10	Himachal Pradesh	1.62	5.86
11	Jharkhand	3.71	4.19
12	Karnataka	6.22	4.92
13	Kerala	2.52	8.59
14	Madhya Pradesh	7.07	2.38
15	Maharashtra	12.38	2.3
16	Manipur*	0.19	10.16
17	Meghalaya	0.78	7.09
18	Mizoram*	1.47	10.2
19	Nagaland	0.81	9.54
20	Odisha	5.11	6.15
21	Punjab	2.79	4.15
22	Rajasthan	6.05	2.49
23	Sikkim	0.08	6.96
24	Tamil Nadu	3.18	3.98
25	Telangana	2.26	4.94
26	Tripura	0.37	5.44
27	Uttar Pradesh	8.56	2.23
28	Uttarakhand	1.13	4.85
29	West Bengal	2.27	4.77
30	A & N Islands*	0.09	23.21
31	Chandigarh	0.02	8.09
32	Dadra & Nagar Haveli Daman & Diu***	0.03	12.48
33	Jammu& Kashmir * (Shape file area = 52,633#)	2.44	9.13
34	Ladakh** (Shape file area = 1,68,055#)	0.25	18.17
35	Lakshadweep***	0	17.17
36	Puducherry	0.02	8.51
	Total	**91.51**	**3.7**

* Inadequate data due to terrain and other issues in these states
** Inventory has been done only for two years due to Covid restrictions
***Due to inadequate data, standard error is high.

Source: India State of Forest Report 2023

1.1. The Wood Market in India

In India, the demand for wood is expected to surge by nearly **70% by 2030**, driven largely by the construction sector. This increase will raise the demand for roundwood from **57 million m³ in 2020 to 98 million m³ by 2030**. However, this growth has led to increased reliance on imports due to insufficient domestic production levels.[5] The **India Wood Market** is projected to grow from **USD 14.77 billion in 2024** to **USD 22.5 billion by 2029**, reflecting a **compound annual growth rate (CAGR) of 8.78%** during this period.[6]

1.1.1 Import and Export Dynamics

India is one of the largest importers of timber globally, with wood imports valued at over **581 billion Indian rupees (approximately USD 7 billion)** at the end of fiscal year 2023.[7] Wood exports from India have increased significantly, growing from **USD 246 million in 2013–14 to USD 623 million in 2022–23.[8]**

India is heavily reliant on imported timber, with imports valued at over 581 billion Indian rupees by the end of fiscal year 2023. In particular, high-value timber species such as teak and Gurjan, which are used in furniture and construction, account for a significant portion of these imports. Between 2010 and 2019, 42% of India's total timber imports came from at-risk countries, with 80% of teak and more than 70% of Gurjan sourced from high-risk or conflict-affected regions. This growing dependence on imports, coupled with an increasing demand in industries such as furniture, packaging, plywood, and construction, presents a challenge to the country's timber supply chain. The plywood industry alone is expected to witness a near four-fold increase in timber demand by 2030.[9]

1.1.2 Major sectors using wood and timber

a. **Construction:** The mass timber market in India was valued at approximately **USD 41 million in 2019** and is projected to grow at a compound annual growth rate (CAGR) of around **12%** from **2024 to 2030**.[10] Mass timber includes products such as **cross-laminated timber (CLT)** and **glued laminated timber (glulam)**, which are recognized for their renewable nature and lower carbon footprints compared to conventional materials.[11]

b. **Furniture:** The furniture sector in India is experiencing significant growth, driven by urbanization, rising disposable incomes, and changing consumer preferences. The demand for roundwood is expected to surge by nearly **70%** by 2030, from **57 million m³ in 2020 to 98 million m³**.[12]

c. **Packaging:** The **Indian wooden packaging market** was valued at approximately **USD 4 billion in 2020** and is projected to grow at a **CAGR of 7.5%** during the forecast period from 2024 to 2030.[13] The overall wood packaging market size is expected to reach around **USD 4.21 billion by 2025**, reflecting a growth rate of **5.39%** from 2020 to 2025.[14]

1.1.3 Domestic Wood Production

In the fiscal year **2023-2024**, India produced around **102 million cubic meters of small-sized wood**, valued at approximately **INR 482 billion**. Additionally, about **37 billion cubic meters** of medium- and large-sized timber were produced, worth around **INR 359 billion.**[15] The country is expected to see a rise in roundwood production from **57 million cubic meters in 2020** to an estimated **98 million cubic meters by 2030**, primarily driven by construction activities.[16] Timber production from government-managed forests is notably low, contributing only about **3.35%** of the total demand.

While Indian forests cannot meet the growing domestic demand for timber, the country has an untapped resource in the form of agroforestry, which can significantly reduce its dependence on imported timber. Teak, one of India's most abundant native species, presents an opportunity for India to transition from being a timber-importing nation to an export leader in the global teak market. The global demand for teak is currently valued **at USD 43.26 billion**, with a projected compound annual growth rate (CAGR) of 10.9% in the domestic market and **8.6% globally**. By scaling up domestic teak production through agroforestry, India stands to reduce imports worth approximately USD 350 million per year and create new economic opportunities for farmers, artisans, and manufacturers.[17] Recent trends indicate a decline in timber imports by about **37%** during early 2024 compared to the previous year, highlighting potential market fluctuations influenced by economic conditions.[18]

Agroforestry, a critical component of TOF, has already demonstrated its value in meeting **93% of India's industrial wood demand**. **Trees Outside Forests (TOFs)** have a potential production capacity of approximately **42.77 million m³**, which remains largely untapped. [19] It plays an essential role in providing timber and biomass for both industrial and domestic use, while also enhancing biodiversity, sequestering carbon, and stabilizing rural livelihoods. Despite these benefits, several challenges remain. Regulatory complexities, including inconsistent felling and transit rules, complex licensing procedures, and outdated urban planning norms, continue to impede the growth of agroforestry and the broader use of TOF products. Furthermore, public procurement practices including green procurement policy and building codes, such as the National Building Code and CPWD manuals, often fail to adequately promote the use of TOF-based materials in construction.[20]

The 2020 policy reform by the Ministry of Environment, Forests, and Climate Change (MoEFCC) lifted a 27-year ban on timber use in public building construction, opening new opportunities for TOF products. This reform aims to reduce India's dependency on wood imports by encouraging the cultivation of trees in non-forested areas such as farms, open spaces, and road verges. This shift not only supports environmental sustainability but also fosters new livelihoods and enhances domestic wood production. However, to fully realize the potential of TOF, significant regulatory reforms are required. Simplifying felling and transit rules, streamlining land-use policies, and providing market-based incentives will encourage farmers to engage in agroforestry. Strengthening state-level building codes and integrating TOF products into public procurement policies including green public procurement policy will also help create demand and reduce reliance on imports.

This report explores the need to revise building codes and evolve strategies to enhance the demand for TOF-based products in India's construction sector. It delves into the regulatory and policy challenges hindering the adoption of TOF products, while providing recommendations for overcoming these obstacles. By addressing the barriers through policy harmonization, regulatory reforms, and market development, India can not only meet its growing timber demands but also build a more sustainable, resource-efficient, and climate-resilient built environment. This approach will align with India's evolving economic growth strategies and climate goals, contributing to a greener and more prosperous future.

1.2 Study of barriers and opportunities in TOF for construction

The Trees Outside Forests in India (TOFI) program is a five-year initiative (2021 to 2026) funded by the United States Agency for International Development (USAID) and the Ministry of Environment, Forests, and Climate Change (MoEFCC) of the Government of India. The program is being implemented by a consortium led by CIFOR-ICRAF.

Growing trees outside forests holds significant potential for generating multiple environmental, economic, and social benefits. By scaling up trees outside forests, India can make substantial progress towards fulfilling several national and international commitments. These include increasing the country's forest and tree cover to 33%, as envisioned in the National Forest Policy; sequestering an additional 2.5 to 3 billion tons of carbon dioxide equivalent (CO2e) as part of its Nationally Determined Contribution (NDC) to the Paris Agreement; and restoring 26 million hectares of degraded land under the Bonn Challenge. Despite these opportunities, various policy, economic, capacity, and information-related barriers hinder the full uptake of trees outside forests. TOFI is designed to address these challenges while exploring opportunities to expand the use of trees outside forests in India.

As part of this broader initiative, The Infravision Foundation is focusing on one key aspect of the project: **Revising Building Codes and Evolving Strategies to Enhance Demand for TOF-based Products in India's Construction Sector**. This specific focus aims to increase the use of sustainable, locally sourced wood products in construction, reduce reliance on imports, and foster the adoption of environmentally friendly building practices. By addressing the regulatory and policy barriers that currently limit the use of trees outside forests in the construction industry, this initiative seeks to drive the demand for TOF-based products and contribute to the sustainable development of India's construction sector.

The project is focused on seven key states—Andhra Pradesh, Assam, Haryana, Odisha, Rajasthan, Tamil Nadu, and Uttar Pradesh. The primary goal is to increase the demand for wood products in the construction sector, with a particular emphasis on reducing reliance on timber imports and bolstering domestic production. As part of this effort, necessary policy amendments and regulatory innovations were identified at the state level to encourage the adoption of TOF products in construction.

The draft recommendations arising from this initiative will be submitted for further consideration and action.

1.3 Need for the Study

The increasing demand for sustainable construction materials globally, coupled with India's projected $1.4 trillion construction sector by 2025, highlights the need for a shift toward renewable alternatives like timber from Trees Outside Forests (TOF). Despite TOF's potential to meet 93% of India's industrial wood demand, regulatory barriers, outdated building codes, and policy gaps limit its adoption in construction, necessitating a comprehensive study to revise building codes and develop strategies to enhance the demand for TOF-based products, aligning with India's climate goals and reducing reliance on timber imports.

The construction industry plays a pivotal role in the economic development of a nation, serving as a key driver of employment and growth. In India, the construction sector employs around 32 million people and contributes significantly to the national economy, with a market size valued at approximately Rs. 2,48,000 crores. It is the second-largest contributor to the country's GDP, just after agriculture. As a service industry, the construction

sector generates substantial employment opportunities and stimulates the growth of other critical manufacturing industries, such as cement, steel, chemicals, bitumen, tiles, paints, and bricks, whose combined annual value is Rs. 1,92,000 crores. Furthermore, the construction equipment market is valued at Rs. 1,05,000 crores, underscoring the industry's importance.[21]

As India continues to grow, the demand for wood in construction is expected to surge significantly by 2030, exacerbating the existing gap between domestic timber production and consumption. The demand for roundwood in India is forecasted to increase by nearly 70% in the next decade, rising from 57 million cubic meters (m^3) in 2020 to 98 million m^3 by 2030.[22] This surge is largely driven by the construction sector, which remains one of the largest consumers of timber. However, India's forest policy, which prioritizes conservation, limits domestic timber production, necessitating a reliance on imports to meet the rising demand. Without significant policy changes, India will continue to depend heavily on wood imports, creating a strain on the supply chain and highlighting the need for sustainable timber sourcing from alternative sources such as Trees Outside Forests (TOF).

Wood has a unique advantage as a building material due to its ability to store carbon dioxide (CO2). Each cubic meter of wood sequesters approximately one ton of CO2, which helps reduce the carbon footprint of construction activities. Wooden buildings are characterized by a lower carbon construction concept than non-wood buildings and timber construction represents a lower embodied energy consumption compared with steel and concrete production[23]. This highlights wood's potential to play an essential role in the bioeconomy, contributing to both sustainability and climate change mitigation. In fact, timber buildings act as carbon sinks, storing CO2 for decades, thus supporting a circular economy.

Furthermore, wood is a highly recyclable material. Unlike conventional building materials such as concrete and steel, which have high carbon footprints due to their energy-intensive production processes, wood can be easily recycled and repurposed, contributing to the efficient use of resources. This recyclability makes wood a more sustainable option compared to other non-renewable building materials.

The environmental benefits of using wood extend beyond just its carbon storage capacity; it also helps to reduce the carbon emissions associated with other building materials, such as bricks and concrete. For example, one cubic meter of wood used in construction results in significantly lower CO2 emissions compared to using bricks or concrete for the same application. By choosing wood over traditional materials, the construction industry can significantly reduce its environmental impact and contribute to a more sustainable built environment. The benefits of using wood in construction can be clearly demonstrated by comparing its carbon footprint with that of traditional materials like bricks and concrete. The table below illustrates the CO2 emissions associated with different materials used in constructing exterior walls:[24]

Table 2: Comparison of CO2 Emissions for Materials Used in Exterior Wall Construction

Material	**CO2 Emissions (kg/m^3)**
Solid wood	-88 kg CO2
Wooden frame	-45 kg CO2
Bricks	+57 kg CO2
Concrete	+82 kg CO2

Source: Wooddays. (n.d.). Wood & Climate. https://www.wooddays.eu/en/woodclimate/index.html

a. **Solid Wood:** The use of solid wood in constructing an exterior wall, results in a net reduction of **88 kg of CO2** per cubic meter. This negative value indicates that solid wood absorbs more CO2 during its growth process than is emitted during its production, transportation, and installation in construction. Therefore, solid wood contributes to carbon sequestration, helping to mitigate climate change.

b. **Wooden Frame**: Using a wooden frame (often with engineered wood products like cross-laminated timber) for construction results in a reduction of **45 kg of CO2** per cubic meter. Like solid wood, wooden frames store carbon, but the reduction is less than that of solid wood due to the nature of the framing materials and construction methods used. Nonetheless, it still represents a significant reduction in CO2 emissions compared to traditional materials.

c. **Bricks:** On the other hand, bricks used in exterior walls emit **+57 kg of CO2** per cubic meter, reflecting the carbon-intensive production process associated with manufacturing bricks. The high energy required for firing bricks, often using fossil fuels, contributes to this higher carbon footprint.

d. **Concrete:** Concrete emits **+82 kg of CO2** per cubic meter, primarily due to the high energy requirements of cement production, which is one of the largest contributors to CO2 emissions in the construction industry. Concrete production involves significant use of fossil fuels, making it a highly carbon-intensive material.

This comparison clearly demonstrates the environmental advantages of using wood—both solid wood and wooden frames—over traditional materials like bricks and concrete. The lower carbon footprint of wood-based materials not only contributes to reducing the construction industry's overall emissions but also helps to lower the embodied carbon in buildings. The ability of wood to sequester carbon, while replacing more carbon-intensive materials, makes it a key material in the transition toward more sustainable construction practices.

By choosing wood as a primary material for construction, India can contribute to mitigating climate change, reduce dependence on imported timber, and support local economies through agroforestry and sustainable land-use practices. For these benefits to be fully realized, however, India needs to overcome barriers related to policy, infrastructure, and market development, promoting the widespread use of wood-based materials in construction.

As demand for sustainable and eco-friendly building materials rises globally, India could tap into the growing market for timber, especially from sustainable sources like TOF. This shift will not only reduce India's reliance on imported timber but also support local economies by promoting agroforestry and sustainable land-use practices, all while contributing to the country's climate goals. The growing recognition of wood's environmental and economic benefits underscores the need for policy reforms and infrastructure development to support the increased use of TOF products in the construction sector.

1.4 Scope of the Study

The scope of this project is to review and assess the building codes and revising public procurement policies and incorporation of green procurement policy to promote the use of Trees Outside Forests (TOF) products in the building and construction sectors across seven Indian states. This initiative aligns with the Ministry of

Environment, Forestry, and Climate Change's (MoEFCC) policy reform, which seeks to reduce reliance on wood imports by increasing domestic wood production through tree cultivation in non-forested landscapes, including farms, pastures, meadows, parks, open spaces, road verges, and riverbanks. Additionally, the project will develop an advisory for the MoEFCC, providing updated guidelines and recommendations to support the effective integration of TOF products in construction practices, further advancing sustainable development and environmental conservation.

1.5 Objectives

The TOFI project aims to enhance the adoption and integration of Trees Outside Forests (TOF) products within the building and construction sectors across seven Indian states—Andhra Pradesh, Assam, Haryana, Odisha, Rajasthan, Tamil Nadu, and Uttar Pradesh. This initiative aligns with the 2020 policy reform of the Ministry of Environment, Forestry, and Climate Change (MoEFCC), which seeks to reduce the country's dependence on wood imports and boost domestic wood production by encouraging tree cultivation in non-forested landscapes.

A significant component of the TOFI project is to promote TOF in the construction industry. The present study aims to address the multifaceted challenges in promoting TOF utilization in India's construction sector, aligning with the country's goals for sustainable development, climate change mitigation, and reduced dependence on imported wood products. The study is a focused examination of the barriers and opportunities for mainstreaming TOF in the construction industry in India.

1. **Review of Literature related to TOF and in-depth research on the State Building Codes and Planning Guidelines**: Conduct a detailed assessment of state-level building codes and planning guidelines and provide strategies to promote the use of TOF products in construction. It will identify existing constraints within planning frameworks, regulations, and rules that limit the cultivation and use of TOF materials and recommend practical solutions to overcome these barriers.

2. **Review of Public Procurement Plans and Practices**: Review existing government procurement processes to enable the inclusion of TOF products in government purchasing. It will develop strategies to embed TOF materials into procurement policies, incorporating green procurement policy and practices to support sustainable construction at the state and national levels.

3. **Stakeholder Engagement**: Engagement with stakeholders to understand the challenges and issues—including government officials, timber merchants, practitioners and industry experts, subject matter experts and academia— to ensure the smooth implementation of policy changes and adoption of the strategic recommendations.

4. **Policy Recommendations**: Prepare a Final Report with appropriate assessment of the ecosystem for promotion of use of wood-based TOF products in construction sector.

5. **Advisory for MoEFCC**: The final report will consist of a comprehensive advisory for the MoEFCC with an objective to promote the use of TOF products in construction sector. This advisory will include actionable to various agencies like Central Ministries, State Departments and other relevant institutions associated with the wood/ timber-based research or technology-based organisations, that support the integration of TOF products in construction practices.

1.6 Approach & Methodology

To achieve the objectives of the TOFI project, the approach and methodology are structured to address key challenges and opportunities for promoting the integration of TOF wood-based products in the construction sector. The approach combines literature review, field visits, consultations, and data collection to assess the current landscape and propose actionable strategies for overcoming barriers and encouraging the use of TOF products. Below is the modified content, aligned with the project's core objectives:

1.6.1 Literature review

A comprehensive literature review was undertaken to assess existing knowledge, policies, and guidelines. Key areas of focus included:

a. **Building Codes and Planning Guidelines**: A detailed assessment of state-level building codes, planning guidelines, and zoning laws across the seven focus states (Andhra Pradesh, Assam, Haryana, Odisha, Rajasthan, Tamil Nadu, and Uttar Pradesh). This identified existing constraints within planning frameworks and regulations that limit the utilization of TOF materials in construction.

b. **Public Procurement Policies**: Review of existing government procurement plans and public purchasing practices to understand how TOF products can be integrated into government construction projects, ensuring alignment with green procurement policies.

c. **Barriers in Knowledge and Market Dynamics**: The review also included an exploration of the challenges in promoting TOF within the construction industry, identifying knowledge gaps, market inefficiencies, and existing perceptions that hinder the uptake of sustainable wood products.

Following were the literature reviewed for the study:

1. **Review of Climate Change and Sustainability Policies**
    a. Nationally Determined Contributions (NDCs)
    b. National Action Plan on Climate Change (NAPCC)
    c. National Resource Efficiency Policy (NREP), 2019

2. **Review of Forestry and TOF Policies**
    a. National Forest Policy, 1988
    b. A.K. Bansal Committee Report
    c. Guidelines for Liberalizing Felling and Transit Regime for Tree Species Grown on Non-Forest/ Private Land
    d. National Agroforestry Policy, 2014
    e. Sub-Mission on Agroforestry

3. **Urban and Regional Development Guidelines**

   a. National Urban Policy Framework, 2018

   b. Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines, 2014

   c. AMRUT (Atal Mission for Rejuvenation and Urban Transformation) Guidelines

   d. Smart Cities Mission Guidelines

   e. Pradhan Mantri Awas Yojana

4. **Building Codes and Standards**

   a. National Building Code

   b. Model Building Byelaws, 2016

   c. The Bureau of Indian Standards (BIS)

   d. State Building Bye Laws

5. **Government Procurement Systems**

   a. The Public Procurement (Preference to Make in India) Order, 2017

   b. General Financial Rules, 2017

   c. Government e-Marketplace (GeM) portal

   d. Manual for Procurement of Goods, 2017

   e. GST for Wood on government website

   f. Green Public Procurement for Advancing Sustainable Development in India Policy Nudges for Promoting Sustainable Consumption and Production, a study by TERI

6. **Green Building Rating and Certifications Frameworks in India**

   a. Green Rating for Integrated Habitat Assessment (GRIHA)

   b. IGBC Green New Buildings Rating System

   c. CPWD Green Rating Manual (GHAR)

   d. EDGE Green Building Certification

7. **National Green Tribunal Judgements Relevant to 'Trees Outside Forest'**

8. **Other Relevant Initiatives**

   a. Green Highway Policy, 2015

   b. National Bamboo Mission (NBM)

   c. Wood Based Industries (Establishment and Regulation) Guidelines, 2016

   d. National Mission on Sustainable Habitat, 2021-2030

   e. Construction and Demolition Waste Management Rules, 2016

   f. Solid Waste Management Rules, 2016

   g. Urban Greening Guidelines, 2014

   h. India's Long-Term Low-Carbon Development Strategy, 2022

i. Indian Forest & Wood Certification Scheme (2023) to Promote Sustainable Management of Forests and Agroforestry

j. Network for Certification of Conservation of Forest (NCCF)

9. **State-Level Provisions for TOF**

a. The relevant documents reviewed and analysis for the state level literature study are enclosed at **Annexure 2**.

10. **Research Reports and Case Studies**

a. Trees Workshop Report - Information and Analysis of Outside Forests in India

b. Towards the Assessment of Trees Outside Forests

c. Urban Forestry in India: A Review of Policies, Programs, and Institutions

d. Sustaining Forests: A Development Strategy

e. China's Transition from a Net Importer to a Net Exporter of Wood Products

f. China's Agroforestry Programme

g. Case Study: Canada's Use of Wood in Construction

h. Agroforestry: Missing Trees for the Forest, Economic Advisory Council to the PM

i. State-wise status regarding felling & transit rules of tree species for promotion of Agroforestry, Ministry of Agriculture & Farmers' Welfare, Govt. of India

j. Wood is Good, but is India doing enough to meet its present and future needs? A status report by Centre for Science and Environment

k. Document of MoEFCC related to National Transit Pass System

1.6.2 Field Visits and Academic Institution Engagement

Field visits to leading institutions and research centers, including the Forest Research Institute (FRI), Bureau of Indian Standards (BIS), Building Materials and Technology Promotion Council (BMTPC), and IIT Roorkee, were conducted to:

1. **Research and Innovations**: Engaging with institutions such as Forest Research Institutes, BIS, BMTPC, and IIT Roorkee to understand current research and innovations in timber-based construction, particularly those focused on modular structural elements, frames, and non-structural elements.

2. **Collaboration Opportunities**: Identifying opportunities for collaboration with academic experts and researchers to address technical barriers and to promote the adoption of TOF-based construction products.

3. **Export and Market Potential**: Assessing the barriers related to the export potential of timber and exploring ways to enhance the commercial viability of TOF products in the domestic and international markets.

1.6.3 Stakeholder Consultations

A series of consultations were held with **national and state-level stakeholders**, subject matter experts, including government representatives, independent consultants, private timber merchants, architects, and industry experts. The consultations were designed to:

1. **Barriers to TOF Adoption**: Collected insights on the key barriers to the widespread adoption of TOF products in the construction industry, including regulatory, financial, and market-related constraints.
2. **Policy Reforms and Strategies**: Discuss potential policy reforms and strategies that could be implemented at both the national and state levels to promote the use of TOF materials in construction.
3. **Industry Readiness**: A perception survey was conducted to assess the readiness of the construction industry to adopt timber-based construction materials. This helped gather feedback on the awareness, concerns, and willingness of industry players to embrace TOF products.

1.6.3.1 State-Level Analysis

In-depth consultations and analysis were undertaken for the seven participating states (Andhra Pradesh, Assam, Haryana, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh). The methodology for state-level engagement included:

1. **Understanding State-Specific Barriers and Opportunities**: Identifying local barriers and opportunities for the promotion of TOF-based construction, with a focus on region-specific building codes, regulations, and market dynamics.
2. **Local Policy Amendments**: Analysing and identifying existing local policies that can be amended to support the adoption of TOF-based products in the construction industry.
3. **Engagement with Local Stakeholders**: Engaging with state-level stakeholders, including forest department officials, construction industry leaders, and academic experts, to align project goals with state-level initiatives for TOF promotion.
4. **Documentation of Best Practices**: Documenting and sharing best practices and successful case studies from various states to promote the benefits and opportunities of TOF in the construction sector.

The state-level analysis was based on secondary research, email correspondence with state government agencies, and a video conference held with the Government of Assam on 30th September 2024. Following this, questionnaires were distributed to the remaining six states, with responses incorporated into the identification of market and regulatory barriers for TOF promotion.

1.6.3.2 National Consultation Workshop

The **National Consultation Workshop** on "Revising Building Codes and Evolving Strategies to Enhance Demand for TOF-based Products in India's Construction Sector" was held on December 16, 2024, at the India International Centre (IIC), New Delhi. This workshop will:

1. **Brought Together Stakeholders**: Facilitate a dialogue between key stakeholders, industry experts, policymakers, and researchers to address the challenges and opportunities for integrating TOF products into India's construction industry.

2. **Promote Policy Reforms**: Discuss and refine policy reforms aimed at overcoming the barriers to the adoption of TOF in construction, with a focus on building codes, procurement practices, and regulatory frameworks.

3. **Technical Innovations and Practical Experiences**: Showcase technical innovations in TOF-based products and share practical experiences from industry leaders to help overcome the challenges of mainstreaming TOF in construction.

4. **Advisory for MoEFCC**: Review and refine a draft advisory for the Ministry of Environment, Forests, and Climate Change (MoEFCC), outlining actionable recommendations for promoting TOF in the construction sector.

1.6.3.3 Data Collection and Analysis

Data collection will involve both qualitative and quantitative methods to inform the development of policy recommendations:

1. **Desk Research and Stakeholder Consultations**: Systematic collection and analysis of data from desk research, field visits, and stakeholder consultations to identify the key barriers and opportunities for promoting TOF in the construction sector.

2. **Building Codes, Procurement Practices, and Industry Standards**: Special attention was given to analysing gaps in building codes, procurement practices, and industry standards that hinder the adoption of TOF products.

3. **Online Surveys and Interviews**: An online survey was conducted to assess stakeholder perceptions regarding timber-based construction, including awareness, concerns, and the willingness of industry players to adopt sustainable wood products. This was complemented by individual interviews with key stakeholders. A report of the perception survey stands submitted to World Agroforestry.

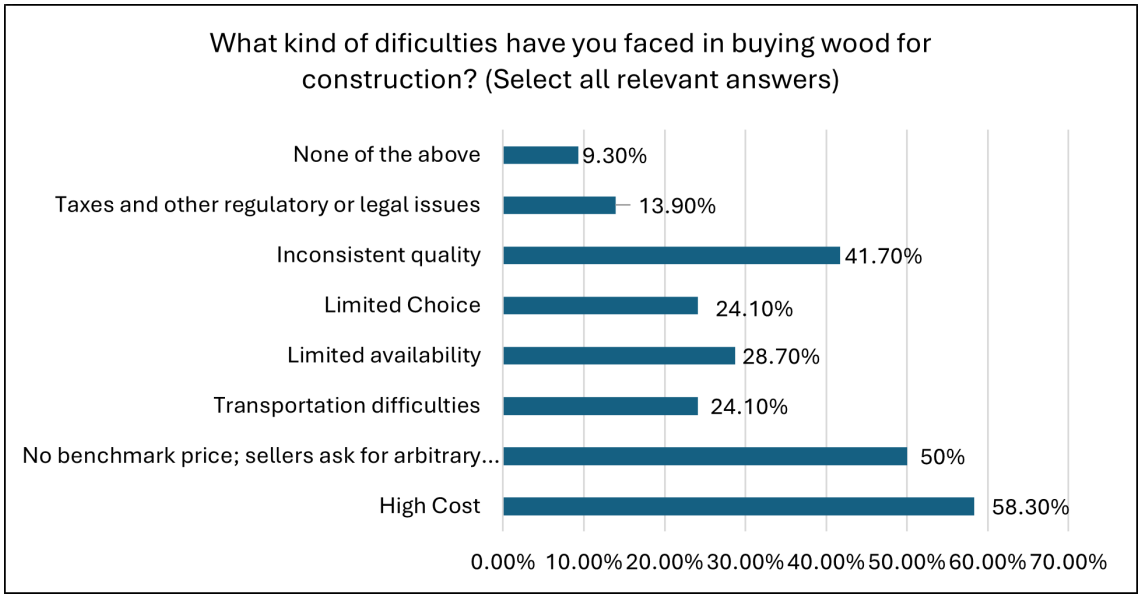
Overall Outcome of the Survey

The survey of more than 100 respondents provided nuanced insights into consumer preferences, challenges, and behaviours regarding the use of timber and wood from *Trees Outside Forests (TOF)* in the construction industry. While there is interest in sustainable wood products, several barriers—ranging from cost to quality concerns—hinder broader adoption. The following sections detail the key outcomes based on consumer feedback.

1. Cost and Quality Challenges

Respondents expressed significant concerns about the high cost of wood, with 58.3% identifying it as a challenge. Additionally, 41.7% reported inconsistent quality, highlighting the need for better market standards. The absence of standardized pricing, with sellers often charging arbitrary amounts, creates uncertainty, deterring consumers from choosing wood for construction. The results indicate that consumers require both affordability and reliability before fully committing to wood as a construction material.

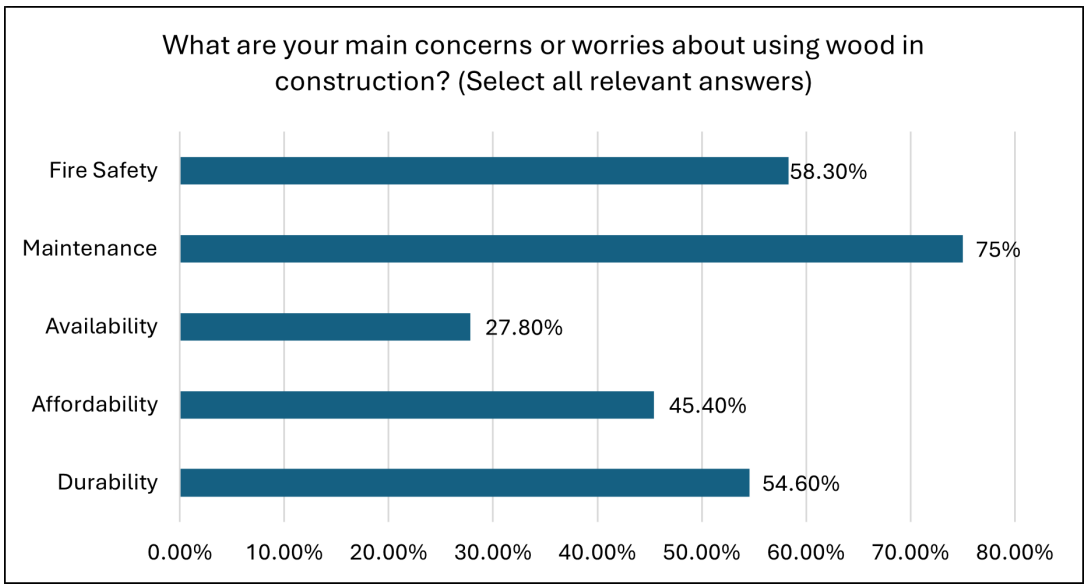
Fig 3: Difficulties faced in buying wood for construction



2. Major Concerns: Durability, Fire Safety, and Maintenance

The survey revealed key worries about using wood, with 75% of respondents citing maintenance as a top concern. Issues related to durability (54.6%) and fire safety (58.3%) also emerged prominently, showing that many consumers perceive wood as requiring high upkeep and prone to damage. These concerns likely stem from limited awareness of modern wood treatment technologies, such as fire-resistant coatings and moisture-resistant finishes, which can enhance the durability and safety of wood products.

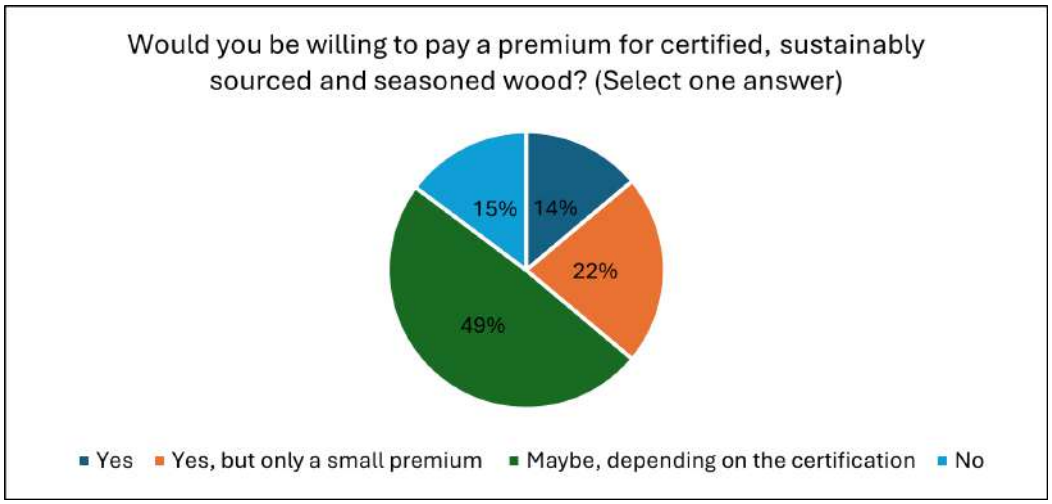
Fig 4: Main concerns about using wood in construction



3. Certification and Willingness to Pay

While 14% of respondents were fully willing to pay a premium for certified, sustainably sourced wood, 49% expressed conditional willingness, depending on the credibility of certifications. This highlights the importance of building consumer trust through well-recognized certification schemes. However, price sensitivity remains an issue, with many respondents indicating that they would pay only a small premium, suggesting a need for balancing affordability with sustainability.

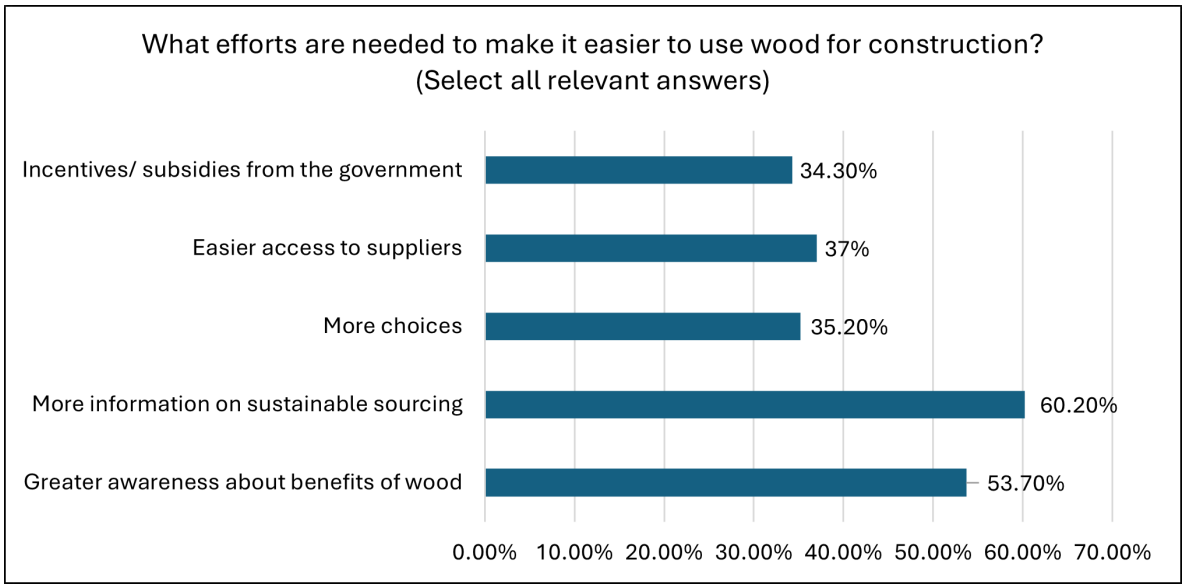
Fig 5: Willingness to pay a premium for certified, sustainably sourced and seasoned wood



4. Need for Improved Access and Variety

Limited product variety and access to suppliers emerged as significant challenges, with 35% of respondents seeking more product choices. Additionally, 37% indicated difficulties in accessing reliable suppliers. The low adoption of e-commerce platforms for wood procurement further underscores the need to expand digital channels, ensuring that consumers can easily access high-quality wood products with transparent pricing and certification.

Fig 6: Efforts Needed to make the use of wood in construction easier



5. Wood Procurement Challenges

A majority (56.5%) of respondents procure wood from local suppliers, followed by 38% who rely on contractors. The preference for traditional procurement methods reflects the importance of trust and convenience in wood purchasing decisions. However, transportation difficulties (24.1%) and regulatory barriers (13.9%) were also noted, indicating that logistical challenges and compliance issues complicate the procurement process. This creates opportunities for improving both offline and online procurement systems.

Fig 7: Procurement of Wood for construction

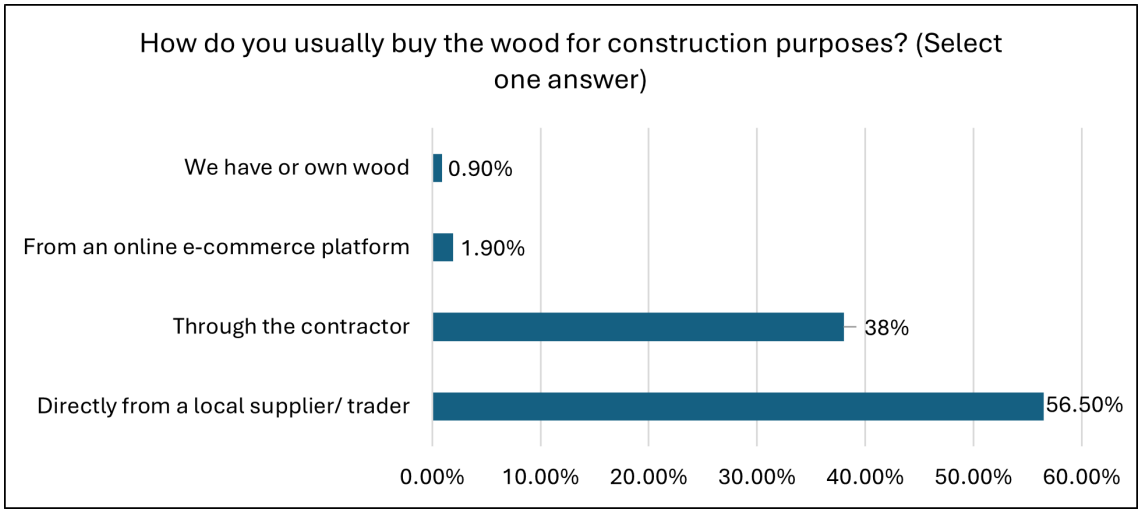
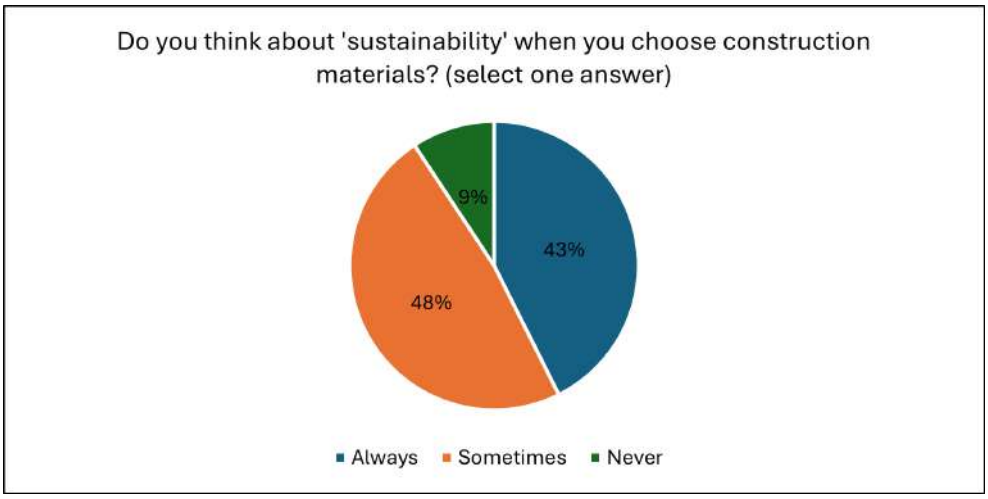


Fig 8. Difficulties in buying wood for construction

6. Sustainability Considerations

Sustainability awareness is relatively high, with 91% of respondents considering sustainability in their material choices, either always (43%) or sometimes (48%). This suggests that consumers are becoming more conscious of environmental impacts. However, the inconsistency in prioritizing sustainability indicates a need for stronger awareness campaigns to promote the environmental benefits of wood, such as its carbon sequestration potential and recyclability.

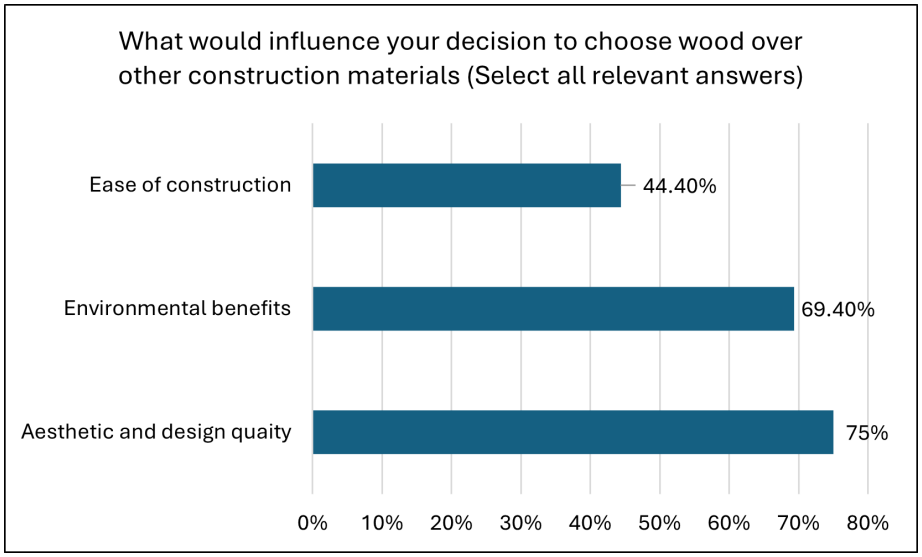
Fig 9: Sustainability consideration when choosing construction material



7. Preference for Aesthetics and Environmental Benefits

The aesthetic appeal of wood is a key factor for 75% of respondents, who value wood's natural beauty and design versatility. Additionally, 69.4% cited environmental benefits as a major influence, showing that consumers are drawn to wood for both its aesthetics and sustainability. These insights suggest that promoting wood as a material that combines design elegance with environmental responsibility can resonate well with potential users, including architects and homeowners.

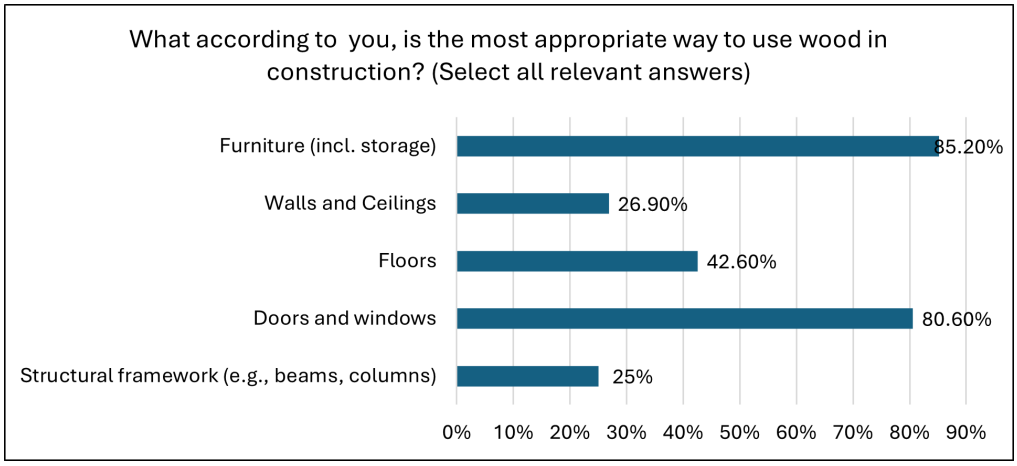
Fig 10: Factors influencing the decision to choose wood over other construction material



8. Structural Use versus Decorative Applications

Respondents prefer using wood for decorative purposes like furniture (85.2%) and doors/windows (80.6%), while fewer are inclined to use it for structural components like beams or columns (25%). This indicates a perception that wood is more suitable for interior design and finishings rather than load-bearing applications. Promoting engineered wood products, which enhance the structural capabilities of wood, could help address these limitations and expand wood's use in construction.

Fig 11: Most appropriate way to use wood in construction



1.6.3.4 Final Report

The culmination of the study will be the production of a **Final Report**, which will consolidate the findings and insights from all stages of the project. This comprehensive report will integrate the outcomes of desk research, field visits, stakeholder consultations, and workshops, along with the data collected through surveys and state-level analysis. It will provide a detailed and actionable roadmap to overcome the challenges hindering the integration of **Trees Outside Forests (TOF)** products into India's construction sector.

This Final Report will serve as a crucial resource for policymakers, industry stakeholders, and environmental advocates, providing them with the knowledge and mechanisms to transform the construction sector by promoting the use of TOF products. Through this initiative, the report aims to contribute to India's long-term goals of reducing dependency on imported timber, fostering sustainability, and supporting climate change mitigation efforts.

This mixed-method approach ensures that the project captures a holistic view of the challenges and opportunities for incorporating and portion of use of wood-based TOF products into India's construction sector, while aligning with the broader goals of **sustainability and climate change mitigation**.

The approach and methodology outlined above are designed to achieve the primary objectives of the TOFI project—enhancing the adoption and integration of TOF products in India's construction sector. By conducting a comprehensive review of building codes, procurement policies, stakeholder consultations, and national and state-level workshops, this study will provide actionable recommendations to the Ministry of Environment, Forests, and Climate Change (MoEFCC) and other key agencies. The goal is to foster a conducive policy environment and market readiness for the increased use of sustainable TOF products in construction, aligning with India's sustainability and climate resilience goals.

Chapter 2

Major Challenges and Barriers in Promoting TOF Products

2.1 Major Challenges in Promoting TOF Products

India's climate change policies, including the **Nationally Determined Contributions (NDCs)** and the **National Action Plan on Climate Change (NAPCC)**, provide a broad environmental sustainability framework. While the NDCs focus on emission reductions and promoting renewable energy, they overlook the potential role of TOF wood-based products as a building material. Similarly, the NAPCC includes missions such as the **National Mission for a Green India** and the **National Mission on Sustainable Habitat**, which aim to increase tree cover and promote sustainable urban development. However, these missions do not offer concrete strategies for the adoption of TOF wood-based materials in construction projects.

Despite efforts to encourage tree farming and the liberalization of timber production, the implementation of forestry and TOF policies has been hindered by bureaucratic inefficiencies and lack of coordination between various regulatory bodies. Key policies such as the **National Forest Policy (1988)** and the **A.K. Bansal Committee Report** advocate for relaxing felling and transit regulations for certain tree species. However, these recommendations have not been fully implemented due to inconsistent enforcement and the complex regulatory environment. The **National Agroforestry Policy (2014)** and the **Sub-Mission on Agroforestry (SMAF)** have been instrumental in advancing agroforestry, yet fragmented governance and lack of coherent policy execution across Ministries such as the MoEFCC, Ministry of Agriculture, and Ministry of Commerce and other Ministries directly or indirectly related to the eco-system of promoting TOF wood-based products, have led to inefficiencies, inhibiting investment in TOF practices. Furthermore, unclear land tenure rights and the exemption of certain native species from felling and transit regulations further discourage large-scale TOF plantation initiatives. Tree farming is not an attractive investment for farmers as it has a long gestation period compared to the other crops.

Urban and regional development guidelines also fall short in promoting the allocation of spatial zones and plantation related to promoting TOF wood-based products. The societal perception that trees should primarily be protected and not used for commercial purposes undermines the potential of TOF as a sustainable resource, particularly the concept that trees can be grown as a crop and harvested for the larger good. Urban planning frameworks do not include specific provisions to encourage the use of wood-based products derived from TOF. In fact, urban development policies fail to recognize **TOF Plantations** as a legitimate land use category within statutory documents like **Master Plans** and **Development Plans**. This oversight limits the ability to incorporate TOF products into urban infrastructure projects. Moreover, there are no dedicated financing mechanisms for TOF plantations as commercial operations, and urban development schemes such as the **Pradhan Mantri Awas Yojana (PMAY)** and the **Building Materials and Technology Promotion Council (BMTPC)** initiative focus primarily on traditional building materials like steel and concrete, further sidelining TOF products.

In terms of building codes, India's **National Building Code (NBC)** and **Model Building Byelaws (MBBL)** have yet to fully embrace the potential of TOF wood-based products. While there has been some progress in allowing timber in public buildings, building codes remain largely restrictive. These codes impose stringent fire safety regulations that hinder the use of wood for structural elements such as roof beams, columns, and non-structural elements like cladding and flooring. While some states, including **Assam**, **Haryana**, and **Odisha**, allow the use of timber under specific conditions, these regulations are not uniformly applied across the country. The **Model Building Byelaws (MBBL)** 2016 do not mention TOF products or provide clear guidelines for their use, and the green building certification systems, such as **IGBC** and **GRIHA**, fail to specifically reward TOF materials, despite their environmental benefits.

Government procurement practices present another significant challenge. Current policies tend to favour conventional materials over sustainable alternatives, creating a barrier to the widespread use of TOF products. There is no clear directive or provision for the inclusion of TOF products in the **Public Procurement (Preference to Make in India) Order, 2017**, or the **Government e-Marketplace (GeM)** platform, which hinders the market visibility of TOF products. Additionally, **General Financial Rules (GFR)** 2017 do not incorporate specific environmental criteria for evaluating bids, limiting the market incentives for sustainable materials. Integration of the green public procurement policies in government procurement system.

Despite the potential of **TOF wood-based products**, there are several regulatory barriers stemming from the **National Green Tribunal (NGT)** judgments. These have led to complex licensing procedures for sawmills, plywood mills, and veneer units, which discourage the establishment of new wood-based industries. Regulations focus primarily on forest timber and do not adequately support the development of the TOF sector. The NGT's stringent rules on sawmill licensing and timber transit further restrict the growth of the TOF industry, despite its significant potential in supporting India's timber demand. In addition to these legal challenges, there is the Supreme Court order of the transportation restriction of the timber from the Northeastern States to other States of India, these timber from the Northeastern States can be transported within the Northeastern States only.

2.2 Key Barriers for TOF Products in construction Industry

MARKET BARRIERS

2.2.1 High- level dependence on masonry and other building materials

Table 3: Market Size and Growth Projections for Key Building Materials (2023-2030)

Building Material	Market Size 2023/2024 (By either value or volume)	Projected Market Size (2030)	CAGR (2024-2030)
Cement	413.95 million tons	602.68 million tons	6.46% (by volume)
Ceramic Tile	USD 5.8 Billion (2023)	USD 9.54 Billion	9.1% (by value)
Steel	USD 187.2 billion (2023) Volume- 123 million tons (2024)	USD 285.19 billion 187.3 million tons (by volume)	9.3% (by value) 7.2% (by volume)
Concrete Block and Brick	US $ 2.53 Bn. (2023)	US $ 3.68 Bn.	3.45% (2024-2030) (by value)
Wood	USD 14.77 billion (2024)	USD 22.5 billion (2029)	8.78 % (2024-2029) (by value)

Source: Compiled from various literature as mentioned in the endnote.

The data from the chart above reveals the substantial market sizes of traditional building materials such as cement, steel, ceramic tiles, and concrete blocks and bricks, and the projected growth rates for each of these materials in India's construction sector.

The cement market is one of the largest in India, with a market size of **413.95 million tons** in 2023-2024, and it is expected to grow to **602.68 million tons** by 2030. This represents a compound annual growth rate (CAGR) of **6.46%**. Cement is fundamental to India's construction industry, particularly for building infrastructure, residential, and commercial structures. Its widespread use highlights the heavy reliance on masonry and concrete in construction.[25]

The steel market is valued at **USD 187.2 billion** in 2023, with projections to increase to **USD 285.19 billion** by 2030, a growth rate of **9.3%** in value and **7.2%** in volume. Steel is essential for reinforcement in construction, particularly in high-rise buildings, bridges, and infrastructure projects. Steel's reliance in structural applications reinforces India's dependence on traditional building materials.[26]

With a market size of **USD 5.8 billion** in 2023, projected to grow to **USD 9.54 billion** by 2030 (**CAGR of 9.1%**), ceramic tiles are another commonly used building material in residential and commercial spaces, especially in flooring and wall cladding.[27]

Concrete Block and Brick has a market size of **USD 2.53 billion** in 2023, projected to grow to **USD 3.68 billion** by 2030, reflecting a **3.45% CAGR**. Concrete blocks and bricks are primarily used for wall construction and demonstrate the continued heavy dependence on masonry materials for the construction of buildings.[28]

The wood market, although smaller compared to cement and steel, is growing rapidly. The current market size is **USD 14.77 billion**, and it is expected to reach **USD 22.5 billion** by 2029, with an **8.78% CAGR**. The growth in wood usage, particularly in construction, indicates a shift towards more sustainable materials, but the scale is still considerably lower than conventional materials like cement and steel.[29]

Cement, steel, and concrete blocks/brick dominate the construction sector in India. These materials are deeply ingrained in the construction culture due to their proven reliability, cost-effectiveness, and familiarity in structural applications.

While the wood market is projected to grow significantly (**8.78% CAGR**), it still represents a smaller portion of the market compared to cement or steel. The growing CAGR for wood products suggests a potential for expanding the use of Trees Outside Forest (TOF) based materials, but overcoming barriers like supply chain infrastructure, awareness, and policy frameworks remains a challenge.

While the traditional materials are expected to grow, with cement and steel leading the way, the wood sector's growth indicates a burgeoning interest in sustainable materials. To address India's carbon footprint and sustainability goals, there is significant potential for increasing the market share of wood-based products, especially considering the increasing demand for green and energy-efficient buildings.

This analysis underscores the need for targeted policy interventions to encourage the adoption of TOF-based materials in construction to reduce dependence on masonry and steel and promote a more sustainable building material ecosystem.

2.2.2 Barrier to Using Wood in Construction: High Initial and Maintenance Costs

The adoption of sustainable materials, such as TOF wood-based products, is often hindered by their high initial costs. Despite their environmental benefits, the lack of economies of scale, limited production capacity, and inefficient supply chains drives up the price of TOF products compared to traditional materials.

Table 4: Comparative Analysis of Costs: Wooden vs. Concrete Houses

	Wooden House	Concrete House
Upfront Cost	Rs 10 lakh*	Rs. 6 lakhs#
Rental cost during construction period	Rs 10,000 for one month	Rs 100,000 for 10 months
AC Cost	Rs 600 a month	Rs. 1,000 a month
Painting/ Polishing	3,000 every three years	Rs. 5,000 one time/ Rs 2,000 every two years
* For a 500-sq-ft room at Rs 2,000 per sq ft; # For a 500-sq-ft room at Rs 1,200 per sq ft the cost of constructing a plinth is higher for concrete structures.		

Source: Homing in on the Wood, Business Today, August 7, 2008.

The use of wood in construction, particularly for residential houses, faces significant barriers due to **high upfront costs** and **maintenance challenges**. While wooden houses offer several advantages in terms of energy efficiency, construction time, and long-term operational savings, the **initial cost** and **maintenance requirements** continue to make them less attractive compared to traditional construction materials like concrete.

Wooden houses, especially those sourced from **Canadian companies as stated in the above table**, cost significantly more upfront. A basic wooden house (500 sq ft) can cost **Rs. 10 lakh**, whereas a concrete house of the same size costs around **Rs. 6 lakh**. The **higher construction cost** for wooden houses is primarily attributed to the **import duty** (37%) on prefabricated wood, making them 30-40% more expensive than conventional concrete houses. This price disparity poses a significant barrier for the wider adoption of wood in construction, particularly in the affordable housing sector.

The **rental cost during construction** is a financial consideration for homeowners, particularly for **concrete houses**, which generally have a longer construction period. For a **wooden house**, the construction time is typically shorter (7-30 working days), so the rental cost during construction is lower. For instance, the **rental cost for a wooden house** during construction is around **Rs. 10,000 for one month**. In contrast, the construction of a **concrete house** takes longer (8-10 months), resulting in a significantly higher rental cost, with an average cost of **Rs. 100,000 for 10 months**. Thus, while the rental cost for wooden houses is lower, it is a larger financial burden for concrete house owners due to the extended construction timeline.

Maintenance costs for wooden houses also contribute to their **higher long-term costs**. Although wooden houses are marketed as **termite- and moth-resistant** and suitable for **high temperatures**, the **plinth** (foundation) needs regular treatment to prevent termite damage. The treatment cost is **Rs. 1,000 every two years** for a 225-sq-ft room. This additional cost for wood maintenance may deter potential buyers who prefer the lower maintenance demands of concrete houses.

Despite offering a **50-year warranty** against manufacturing defects, wood panels may require replacement over time, which could lead to **unexpected expenses**. While the companies provide an additional **10% extra wood** for replacements, the unpredictability of maintenance and the costs involved remain a concern.

This financial barrier is compounded by the competitive nature of the Indian construction market, where cost is a critical factor in decision-making. Builders and contractors, often operating within strict budget constraints,

prioritize low-cost materials that can minimize project expenses. The absence of financial incentives such as tax breaks, subsidies, or government support further exacerbates the reluctance to adopt alternative materials.

The high initial construction costs, coupled with ongoing maintenance requirements, create a **financial barrier** to the widespread adoption of **wooden houses** in the Indian market. Despite the advantages of shorter construction times and lower operational costs, the **import duties**, **higher upfront investment**, and **long-term maintenance** challenges significantly reduce the appeal of wood as a building material. These factors continue to limit the use of wood in mainstream housing, especially in the middle-income housing segment.

2.2.3 Inadequate Supply Chain Infrastructure- wholesale retail and market outlets

In India, Trees Outside Forest (TOF) wood-based products or Agroforestry products among various sectors has historically expanded in the markets whenever it got the assured market for the growers. Like for instance the paper & pulp industries in Tamil Nadu, Gujarat, Andhra Pradesh, and Uttar Pradesh or plywood industries in Haryana, Punjab, and Uttarakhand. This needs a strong linkage between different institutions and a complete value chain of the Trees Outside Forest produce.

One of the important barriers in use of timber and wood products (especially from locally sourced from TOF) is the market linkages due to inadequate supply chain infrastructure like limited wholesale network and retail market outlets in the whole value chain, leading to the dependence on imported products. The wholesale distribution network for TOF products in India is notably underdeveloped and varies significantly across states. Reports highlighted that many regions lack established wholesale networks for distributing TOF wood-based products, which lead to a fragmented supply chain where the producer depends mainly on local traders and informal networks for the sale of TOF produce (WRI, 2022). The recent findings state that the sawmilling & planning industry is the largest consumer of timber consumes around 29 million cu m of wood annually with **62% of production used by the construction sector** (mainly housing) alone. But, due to the absence of a reliable network of wholesalers and retailers, the whole sector is relied on an unorganized & informal network.

Some of the challenges and solutions in Supply Chain Infrastructure for Timber in India's Construction Sector:

1. **Fragmented Supply Chain.** Small-scale producers dominate the market, leading to inefficiencies and inconsistent quality standards.
2. **Insufficient Processing Facilities.** Limited availability of modern sawmills and treatment plants affects durability and quality.
3. **Inadequate Transportation and Logistics.** Poor road connectivity in rural timber-sourcing areas leads to high transportation costs.
4. **Storage and Warehousing Issues.** Lack of climate-controlled warehousing results in losses due to spoilage and pest infestation.
5. **Limited Market Linkages.** Lack of organized marketplaces results in inefficiencies and exploitation by middlemen.
6. **Regulatory Barriers.** Complex and inconsistent regulations delay harvesting, transportation, and trade.

7. **Lack of Certification and Standardization.** Absence of robust certification mechanisms leads to inconsistent quality and undermines consumer confidence.

8. **Dependency on Imports.** Preference for imported timber affects demand for domestic production.

9. **Awareness and Demand Gap.** Builders and architects lack awareness about the environmental benefits and utility of locally sourced TOF timber.

10. **Insufficient Access to Finance.** Small-scale growers and processors struggle to access affordable finance for modernization.

11. **Storage and Preservation Challenges.** Timber often deteriorates due to improper handling and lack of treatment facilities.

12. **Lack of Research and Development (R&D).** Limited innovation in fast-growing or pest-resistant timber species reduces competitiveness.

2.2.4 Low-level investment in TOF wood-based production

In India, the adoption of the TOF based products for the construction sector is quite low among the emerging economies due to multiple barriers at different level of the supply chain of the TOF based products.

The foundation of a Trees Outside Forest (TOF)-based product supply chain relies on the sustainable sourcing of timber, critical for supporting the processing industry. However, India's current annual production of wood—around 30 million cubic meters—falls significantly short of the 63 million cubic meters demanded, underscoring a need to address specific barriers. Establishing tree-based systems requires substantial upfront investment in land preparation, saplings, and maintenance. For many farmers, limited initial capital, coupled with unregulated nursery practices and lack of scientifically developed planting material, poses a significant challenge to adopt agroforestry. Additionally, market-driven preferences for fast-growing species often overshadow native varieties, disincentivizing farmers from maintaining or restoring native TOF systems. While fast growing species like eucalyptus or poplar are often favoured in the wood product industry for their economic advantages like rapid growth rates and high biomass yield, yet they often do not match the quality of native timber in terms of durability and aesthetic appeal. The native species like teak and mahogany are renowned for their strength, durability, and resistance to pests. In contrast, many fast-growing species may not provide the same level of quality required for high-end construction applications. Thus, this discrepancy can lead builders to seek alternative materials, further marginalizing native timber in the market. It is essential to recognise that both fast-growing and native species play a critical role in the construction sector and sustainable forestry practices. Other factors, such as delayed returns on TOF investments and inadequate extension services to support farmers through stages like land development, planting, maintenance, harvesting, processing, and market connection, contribute to a widespread reluctance among farmers to invest in agroforestry. Lastly, land and tree tenure issues present another barrier, particularly for tenant farmers, further complicating the expansion of TOF production. Due to the longer gestation period of trees relative to other kind of agriculture system, the security of tenure rights becomes a necessary condition for farmers to take up agroforestry. Tree tenure consists of a bundle of rights over trees and their produce, which may be held by different people at different times. In India, various estimates show that almost 35 percent of India's agriculture land is cultivated by tenant farmers, who comprises of approximately 25 million rural households. These chunk of people lacks all kind of legal rights or ownership over the trees due to unavailability of institutional mechanisms for securing their tree tenure rights. Thus, limiting the tenant farmers to further expanding the tree outside forest production.

At the manufacturing stage, India faces a complex challenge of low level of investment in the sawmilling and processing units. Indian wood products market is known for high fragmentation and dominance of small and medium size processing units, with approximately 98% of sawmills classified as small enterprises. This has been well established by the fact that as per Herfindahl-Hirschman Index (HHI) for the Indian wood products market, India scores 1737 (2023) down from 3648 (2017), that suggest a movement towards a more competitive market, yet still there is dominance of many small players. These small-scale operations often struggle with economies of scale, making it difficult to attract significant investment compared to larger, more consolidated industries. Furthermore, because of this small and localized nature of the industry, there is a general lack of investment in research and development for innovative and modern technologies. This further reduces attractiveness for potential investors. Adding to this, the industry is suffering from a vicious cycle of ageing population with lack of younger skilled workforce. This is mainly since this wood processing industry is often viewed as low-tech and low wage, discouraging younger talent from pursuing careers. Thus, making the sector less appealing and further deterring investment.

Some of the challenges in inadequate Supply Chain Infrastructure for Timber in the Construction Sector in India are as follows:

1. **Fragmented Supply Chain.** The timber supply chain in India is highly fragmented, with multiple intermediaries leading to inefficiencies and inflated costs. This results in delays and uneven quality standards.
2. **Lack of Standardized Processing Facilities.** Inadequate and outdated processing facilities result in inconsistent quality of timber products, making them less competitive compared to imported alternatives.
3. **Limited Storage and Transportation Infrastructure.** Timber storage facilities and transportation networks are poorly developed, leading to wastage due to improper storage and high logistical costs.
4. **Low Adoption of Digital Tools.** The absence of digital tracking and management tools in the supply chain hampers visibility, making it difficult to track timber from source to final use.
5. **Regulatory and Compliance Bottlenecks.** Stringent regulations and unclear policies on the movement of timber often create delays and increase costs for suppliers and manufacturers.
6. **Lack of Skilled Workforce.** The timber industry lacks a skilled workforce for efficient processing and management of the supply chain, affecting productivity and quality.
7. **Inadequate Financial Support.** Small and medium enterprises (SMEs) in the timber supply chain often face difficulties accessing finance for upgrading infrastructure or expanding operations.
8. **Unreliable Data and Market Intelligence.** The lack of reliable data on timber supply, demand, and pricing impedes decision-making and long-term planning for stakeholders.

2.2.5 Limited awareness and acceptance- among consumers and industry players (architects, builders)

In India, the use of wood as a construction material faces several challenges, largely due to widespread misconceptions. These challenges have been highlighted by Wood Barn India, who was the first to introduce wooden houses in the country.[30] One major misconception is that wood lacks the strength of concrete or steel. While wood is lightweight, engineered wood products such as Laminated Veneer Lumber (LVL) and Glued Laminated Timber (Glulam) are not only as strong as, but sometimes stronger than, certain types of steel and

concrete. This development in wood technology ensures that wood can perform at par with traditional building materials in terms of strength and durability.

Another common belief is that wood is highly susceptible to termites and decay. While untreated wood is vulnerable, modern treatment techniques like pressure treatment and chemical coatings enhance its resistance to termites, fungi, and rot, making it much more durable in construction applications.

The idea that wood is a major fire hazard also persists. While wood is combustible, it doesn't mean that wooden structures are unsafe. Fire-resistant treatments and coatings can be applied to wood, and in certain cases, heavy timber construction can provide better fire resistance, offering more time for evacuation during a fire.

Environmental concerns regarding wood use often stem from the belief that it leads to deforestation. However, sustainable forestry practices and certifications like the Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) ensure that wood is sourced responsibly, promoting the growth of new trees outside forests and maintaining ecological balance.

Maintenance is another concern, as some believe wood requires extensive upkeep. While wood does require care, modern finishes and treatments have significantly reduced the maintenance needs. Regular inspections and minor repairs can keep wooden structures in excellent condition for years.

There is also a misconception that wood is more expensive than other materials. While the initial cost may vary, wood can prove to be cost-effective in the long term. The speed of construction and ease of handling wood can lower labour costs, making it competitive with traditional materials.

Lastly, some believe that wood restricts design possibilities. However, modern engineering techniques have greatly expanded the possibilities for wooden construction. Wood can be shaped, bent, and combined with other materials to create complex and innovative structures, dispelling the myth of limited design flexibility.

To overcome these challenges, there is a need for increased awareness and education about the advancements in wood technology, sustainable forestry practices, and modern construction techniques. By addressing these misconceptions, India can unlock the full potential of wood in the construction sector, paving the way for more sustainable building practices.

Some of the challenges in limited awareness and acceptance among consumers and industry players in India are as follows:

1. **Consumers lack awareness**
    i. Low consumer awareness of the environmental benefits and structural properties of timber and wood from Trees Outside Forests (TOF).
    ii. Perceived cost of wood-based construction as being higher compared to alternatives like concrete and steel.
    iii. Concerns over maintenance and durability of wood in the Indian climate.
2. **Architects as the consumer face challenges**
    i. Lack of knowledge about wood-based designs and modern timber technologies among architects.
    ii. Limited access to case studies and successful examples of timber construction projects in India.

3. **Builders and Developers' challenges**
    i. Skepticism about the structural strength of timber for multi-story buildings.
    ii. Perceived longer timelines for wood-based construction compared to conventional methods.
    iii. Unfamiliarity with the supply chain of certified TOF timber products.
4. **Policy and Market Framework gaps**
    i. Absence of policy incentives for using TOF timber in construction.
    ii. Inadequate green building certification systems recognizing TOF timber usage.
    iii. Dominance of imported timber over domestic TOF timber due to established trade networks.

REGULATORY AND POLICY CHALLENGES

2.2.6 Tree felling and transportation of wood, license to wood processing units/ sawmills, storage or warehousing facilities, etc.

The most significant challenge lies in the inconsistent regulations governing tree felling and transportation across different states. These variations create complexities for wood producers and traders who wish to move TOF products across state borders.

Various states have different rules regarding which tree species can be felled and which species can be transported without a permit. In some states, species such as Eucalyptus, Poplar, and Acacia, which are commonly grown under agroforestry systems, are exempt from felling restrictions. However, in other states, such species may still require permits for felling, creating barriers for farmers and industries in regions with more stringent regulations. This lack of uniformity between states complicates the movement of TOF products across state lines and creates delays in production and trade.

The **interstate transportation of timber** is a major issue due to the lack of a unified regulatory framework. Each state has its own rules regarding the issuance of **transit permits** for timber, including in the variation of the species of timber to be transported, which make the whole operation very cumbersome. In **Odisha**, for example, the **Orissa Timber and Other Forest Produce Transit Rules (1980)** require strict permits for the transportation of timber within the state and to other regions. On the other hand, **Haryana** allows for the movement of agroforestry timber species without significant bureaucratic delay, which fosters smoother trade. This creates a situation where traders and processors may find it difficult to move products across state borders, as different states have different requirements for permits and documentation. This not only affects the movement of timber but also increases costs and delays for businesses.

Inadequate implementation and enforcement of National Transit Pass Systems hinders the efficient use of TOF. Assam faces logistical challenges due to restrictions under the National Transit Pass System (NTPS) as per the directions of the Hon'ble Supreme Court of India issued in WP(C)202/1995; 171/1996, which complicate the movement of timber across the state and other regions. In addition to these legal challenges, the Supreme Court has imposed restrictions on the transportation of timber from the Northeastern States. According to the order, timber from these states can only be transported within the Northeastern region and not to other parts of India.

Despite progressive policies, the state remains a net importer of wood, reflecting the need for public acceptance of TOF products as viable alternatives to traditional forest timber. Licensing for wood processing units, such as sawmills and veneer mills, presents another regulatory challenge. Each state has different criteria and processes for granting licenses to such industries. The licensing process can be lengthy and cumbersome. These are not universal across the country.

The complexity of obtaining a license can deter investment in wood processing facilities, particularly those focusing on TOF products. Additionally, the absence of standardized regulations for certification and quality control of TOF products means that the wood produced in one state may not always meet the requirements of another state's building codes or industry standards, making cross-state business difficult.

Storage and warehousing of TOF products, especially timber, are not governed by a unified set of guidelines. Without standard regulations on how timber should be stored and handled, quality control becomes an issue, and businesses can face logistical challenges. The infrastructure for wood storage in India is often insufficient. Many warehouses lack proper connectivity to major transportation networks, such as highways and railways, leading to increased transportation costs and delays. Inconsistent moisture levels due to varying temperatures during transit also leads to defaults, non-compliance and detention at the ports.[31]

Acquiring land for warehousing purposes is particularly challenging due to high costs, especially in urban areas where demand is high. This financial burden can deter investment in new facilities or expansions of existing ones, limiting the overall capacity for wood storage and impacting supply chain efficiency

Wood is highly susceptible to moisture, which can lead to warping, mould growth, or other forms of damage if not properly managed. However, many warehouses lack the necessary climate control systems to maintain optimal conditions for wood storage. This can result in significant losses and affect product quality

2.2.7 Procurement policies, GeM – quality controls

Government Procurement policies prioritize the use of domestically produced materials. While this could theoretically benefit TOF products, in practice, many procurement frameworks are still focused on conventional materials. For instance, government procurement through platforms like Government e-Marketplace (GeM) does not sufficiently emphasize TOF products, leaving them out of consideration for public construction projects.

The **General Financial Rules (GFR)** are a set of rules formulated by the **Ministry of Finance, Government of India**, that provide a framework for managing public finances. These rules govern the financial administration in India, specifying how public funds should be allocated, spent, and monitored. The GFR includes provisions for the procurement of goods and services, the maintenance of accounts, and the management of government spending to ensure accountability, transparency, and efficiency in the use of public resources.

The current GFR primarily focuses on financial prudence, emphasizing the **lowest-cost procurement** without considering the broader environmental or long-term operational impacts of the products and services being procured. This has led to a **gap in sustainable procurement practices**, where environmental factors such as energy efficiency, carbon footprints, and lifecycle costs are not adequately factored into decision-making.

To embed a green public procurement (GPP) policy into India's public procurement framework, the General Financial Rules (GFR) and platforms like the Government e-Marketplace (GeM) must be restructured to include sustainability criteria. First, the GFR should be amended to mandate the consideration of environmental

and lifecycle impacts, alongside cost, in procurement decisions. This would shift the focus from lowest-cost procurement to value-based procurement, emphasizing energy efficiency, carbon footprint, and sustainability. Second, GeM should be updated to include a dedicated category for TOF-based products, supported by quality controls and certification mechanisms to ensure compliance with environmental standards. Additionally, the government can incentivize the use of TOF products by providing preferential procurement clauses or additional scoring for tenders that incorporate these materials. Training programs for procurement officials should also be implemented to build capacity and awareness about GPP principles. These strategies will not only promote the use of sustainable materials but also position India as a leader in green procurement practices.

2.2.8 GST rationalization/ comparative PVC or replacement materials and Competition from Conventional Materials

Table 5: GST Rates for Construction Materials

Material Type	GST Rate (%)
Cement	28
Steel and Iron	18 (varies)
Bricks	5
Sand and Aggregates	5
Timber and Wood	18
Tiles and Ceramics	18
Paints and Varnishes	18
Concrete Blocks	5
Plywood and MDF	18
Granite and Marble	18
Pebbles, Gravel, broken or crushed stone	5

Source: Chauhan, Anirudh Singh. "GST on Construction 2024-25: All You Need to Know." Magicbricks, December 10, 2024. GST on Construction 2024-25: All You Need to Know

The table provides an overview of the **GST rates** applied to various construction materials, highlighting the differences in taxation for materials such as **cement, steel, timber, plywood**, and **bricks**. The **GST rates** vary from **5%** for materials like **bricks, sand, and aggregates** to **28%** for materials like **cement**. Notably, **timber and wood products** are taxed at **18%**, placing them in the same category as materials like **steel**, **tiles**, and **ceramics**, which can make them relatively more expensive compared to other materials taxed at a lower rate. The varying **tax rates** on different construction materials directly impact the **cost structure** of building projects, influencing the choice of materials used, with **wood and wood-based products** facing a higher tax burden in comparison to alternatives like **bricks** and **sand**.

One of the primary issues is the **high upfront cost** of **wood-based materials**, including **timber, plywood**, and **MDF**, which are taxed at **18% GST**. This high tax rate places TOF products at a disadvantage when compared to other materials like **bricks** and **sand**, which are taxed at much lower rates of **5%**. The **higher costs** make TOF wood products less competitive in a market where price is a major determining factor, especially for **affordable housing**. Additionally, the **import duties** on prefabricated wood further increase the cost, making it **more expensive** than conventional materials such as concrete and steel.

While **wooden houses** made from **TOF-based products** can offer numerous advantages, such as shorter construction times and **lower operational costs** for energy efficiency, the **initial investment** remains a significant barrier. This price difference, driven by both **GST** and **import duties**, makes **wooden houses** less accessible, particularly in the low- to mid-income housing segments. Additionally, the **maintenance costs** for wooden structures, especially related to termite protection and wood preservation, add to the long-term financial burden, making them less attractive to potential homeowners who may prefer the **lower maintenance demands** of concrete or steel structures.

Furthermore, the **lack of economies of scale** and **limited production capacity** for TOF-based products exacerbate the issue, driving up prices due to **inefficient supply chains** and **limited availability**. **TOF products** face competition from **more widely produced and established materials** like **cement**, **steel**, and **bricks**, which benefit from **larger-scale production**, more established supply chains, and lower costs. Without significant improvements in production and supply chain efficiency, the higher costs of **TOF products** will continue to hinder their adoption.

2.2.9 CPWD manual- anomalies in Ghar rating system - banning the use of timber products, growing demand for green buildings

The **CPWD Green Rating Manual (GHAR)** currently presents several limitations in promoting **Trees Outside Forests (TOF)-based products** in the construction sector:

1. **Lack of Incentives for TOF-Based Timber**: Criterion 3.2 fails to differentiate between sustainably sourced timber like **TOF-based** or **FSC-certified timber** and conventional timber, missing an opportunity to encourage more sustainable materials in construction.
2. **Exclusion of TOF Materials in Local Procurement**: Criterion 3.4 does not include a sub-criterion for **TOF-based local materials**, hindering the promotion of these eco-friendly materials despite their potential for supporting local economies and sustainability.
3. **Absence of Promotion for TOF-Based Non-Toxic Materials**: Criterion 3.7 does not specifically address **TOF-based non-toxic materials**, which could significantly contribute to the use of environmentally friendly materials in construction.
4. **Underutilization of TOF in Landscape Design**: Criterion 9 does not explicitly encourage the incorporation of **TOF species** in landscape design, overlooking the potential for enhancing urban biodiversity and carbon sequestration.
5. **Lack of Early Integration of TOF in Project Planning**: Criterion 1.4 does not prioritize the integration of **TOF** in site planning, leading to missed opportunities for incorporating **sustainable, eco-friendly materials** from the outset of construction projects.

To fully support sustainable building practices, the GHAR manual should be amended to explicitly promote **TOF-based products**, encouraging their use in timber, local materials, non-toxic materials, landscaping, and project planning.

2.2.10 Certification/ Standardization and Lack of standardization

Certification and **standardization** of **Trees Outside Forests (TOF)** products present significant challenges in promoting their use in the construction sector. The absence of uniform certification standards and the lack of industry-wide standardization for TOF products limit their marketability, scalability, and integration into green building practices.

The certification of TOF-based products is not standardized across regions or industries. While certain certification systems, such as **FSC (Forest Stewardship Council)** certification, exist for timber products, there is no clear, unified system for certifying **TOF products** specifically. As a result, the sustainability and quality of TOF materials are difficult to verify, reducing trust among consumers, contractors, and procurement bodies.

Although there is growing interest in using TOF products in construction, the **absence of a widely accepted certification system** makes it difficult for producers to differentiate their products in the market. Without formal certification, TOF-based materials cannot easily access major procurement platforms like **GeM (Government e-Marketplace)** or participate in government building initiatives that require certified materials, thereby limiting the potential for these products to become mainstream in public construction projects.

The Ministry of Environment, Forests, and Climate Change has introduced **the Indian Forest & Wood Certification Scheme**, a national initiative offering voluntary third-party certification to promote sustainable forest management and agroforestry in India. This scheme includes three main components: forest management certification, tree outside forest management certification, and chain of custody certification. Forest Management Certification under the scheme follows the Indian Forest Management Standard, which comprises 8 criteria, 69 indicators, and 254 verifiers, aligned with the National Working Plan Code 2023 launched earlier this year. A new standard specifically for Trees Outside Forests has also been introduced as part of the certification scheme.

However, it is important to note that the certification scheme **does not focus on the quality of processed wood** available in the market, nor does it directly address the suitability of such wood for use in **construction projects**. The scheme ensures that the raw materials sourced for processing are sustainably managed, but it does not evaluate or certify the **quality** or **standardization** of processed wood products, such as timber used in building construction. This gap could lead to challenges in ensuring that **TOF-based wood products** meet the quality standards required for construction, particularly in terms of **durability**, **strength**, and **safety**.

While the Indian Forest & Wood Certification Scheme makes significant strides in ensuring **sustainable sourcing** of timber, the absence of certification for **processed wood quality** presents a barrier to the widespread adoption of **TOF-based materials** in the construction industry. The construction sector often requires materials that meet specific strength, durability, and safety standards. Without certification for the quality of processed wood, there is a risk that **TOF-based timber** may not be fully integrated into mainstream construction projects or **green building initiatives**.

2.2.11 Building Codes and Identification of gaps that hinder the use of TOF wood products.

Building codes and standards in India, including the National Building Code (NBC) and Model Building Bylaws (MBBL), have not fully integrated the potential of TOF wood-based products. These codes often lag the latest advancements in sustainable construction materials and practices. Although the recent policy shift allowing the

use of timber in public buildings represents is progressive, it requires further refinement to ensure comprehensive adoption and implementation across various construction projects. The existing building codes need significant updates to incorporate TOF products explicitly and support their widespread use in the construction industry. Building bylaws impose stringent fire safety requirements, which discourage the use of timber in partitions, wall panelling, and false ceilings. The Model Building Byelaws (MBBL) 2016 also restrict the use of timber and wood-based materials, with no provisions for their use as structural elements (such as roof structures, beams, and columns) or non-structural elements (such as exterior cladding, façades, door/window frames, flooring, and decorative elements).

While green building practices are promoted in the MBBL, there is no specific recommendation for the use of 'TOF products' or 'TOF plantations.' The green building rating system uses terms such as 'alternative material,' 'life cycle assessment,' 'recycled content,' 'local material,' and 'energy efficiency' without explicitly mentioning TOF wood-based products. Additionally, the distinction between 'conventional' and 'TOF-sourced' timber is not considered in the rating system. The co-benefits of using TOF products, such as energy efficiency, disaster resilience, water management, and carbon sequestration, are not clearly spelled out.

2.2.12 Judicial interventions: Barriers from NGT Judgements in promoting TOF wood products and Regulatory Uncertainties (as in case of court cases, NGT, etc.)

The **National Green Tribunal (NGT)** plays a crucial role in environmental protection and conservation, particularly in addressing issues related to **trees outside forests (TOF)**. However, its rulings, while necessary for environmental safeguards, create certain barriers for the promotion of **TOF wood products** in the construction industry. The judicial interventions, regulatory uncertainties, and the evolving legal landscape significantly impact the use of **TOF-based timber** and its integration into mainstream markets.

The NGT's jurisdiction includes civil cases that focus on environmental protection, and its proactive role in safeguarding **green cover** has led to judicial interventions that sometimes act as barriers for **TOF-based products** in the timber industry. These rulings are often based on concerns about **sustainability**, **illegal logging**, and **environmental degradation**.

For instance, in the case of **T.N. Godavarman** (1996), the NGT mandated that every state government must report on the number of sawmills, veneer, and plywood mills, along with the source of their timber. This order was aimed at regulating the timber industry and ensuring sustainable harvesting practices. However, the stringent measures and **compliance checks** that followed the ruling, including the **prohibition on unlicensed sawmills** (as per the order dated October 29, 2002), have made it difficult for new wood-based industries, including those focused on **TOF products**, to be established. As a result, **TOF wood products** face restrictions when it comes to gaining access to the timber market, especially in states where regulations are strict.

In several other cases, such as **Amit Kumar vs. Haryana** (2017) and **Goa Foundation vs. Union of India** (2014), the NGT has imposed bans on **illegal tree felling**, restricted the use of **non-certified timber**, and emphasized that only **sustainably sourced** timber should be allowed for use. These rulings, although crucial for environmental protection, have added **regulatory uncertainties** for TOF-based timber. The lack of clear policies on the **sustainable sourcing** of TOF timber, as compared to conventional timber from forest areas, creates ambiguity for producers and industries wishing to use TOF products in construction.

One of the major barriers created by the NGT's judicial rulings is the regulatory uncertainty surrounding the use of TOF-based timber. For example, the 2016 NGT guidelines for State Level Committees (SLCs) outlined procedures for assessing timber availability for wood-based industries. While these guidelines are essential for ensuring that timber is sourced sustainably, they fail to distinguish between TOF-based timber and conventional timber. This lack of specificity leads to confusion about the acceptability of TOF timber in official procurement and construction projects, even if the timber is sourced responsibly from agroforestry or other non-forest lands.

Moreover, rulings on tree felling permissions (such as in Uttar Pradesh) require that certain tree species be protected or have special permission for felling, including those outside the traditional forest boundaries. These limitations hinder the use of TOF timber in some regions and add further regulatory complexity for businesses that wish to use TOF wood products. Such cases create a fragmented regulatory environment, where different regions enforce varying standards and rules for TOF timber, leading to challenges in establishing a cohesive market for these materials.

Additionally, the licensing restrictions and the prohibition of new sawmills (as seen in multiple NGT orders) restrict the development of industries that could process TOF timber, further exacerbating the problem. This regulatory ambiguity impacts the ability of TOF-based products to enter the mainstream timber market, especially in large construction and infrastructure projects.

While the **NGT's judicial interventions** are critical for environmental conservation, they present significant barriers for the promotion of **TOF wood products**. The **regulatory uncertainties** arising from judicial rulings on **timber sourcing**, **sawmill licenses**, and **tree felling restrictions** complicate the legal landscape for **TOF-based timber** and create difficulties for producers and businesses in navigating the market. To foster the growth of **TOF products**, it is essential to streamline these regulations and create clear, consistent policies that encourage the use of **sustainably sourced TOF timber** in construction, while still upholding environmental standards.

Chapter 3

Strategy for Promoting TOF in Construction

Recommendations for Promoting TOF Integration

To overcome these challenges, several key actions are recommended. First, **clear national targets** should be set for the integration of TOF wood-based products in construction, supported by a unified governance structure to streamline coordination among various ministries and departments. Establishing specific targets will help reduce bureaucratic barriers and align policy implementation efforts.

Secondly, it is critical to **develop and invest in market development** for TOF products by establishing quality standards, certification processes, and increasing awareness among stakeholders. Securing land tenure for farmers growing trees outside forests and investing in capacity-building initiatives will support the sustainable growth of the TOF sector and attract private investment.

A significant update is needed for **building codes and standards** to reflect sustainable construction practices. Building codes and **Model Building Byelaws** should explicitly include TOF products in both structural and non-structural elements. Additionally, **green building standards** should be revised to recognize the environmental co-benefits of TOF materials, such as energy efficiency, disaster resilience, and carbon sequestration.

The **government procurement systems** must be reformed to be more inclusive of sustainable materials like TOF. Specific directives should be issued to integrate TOF products into government housing projects, including those under PMAY, and recognized as certified technologies under BMTPC. Additionally, the **GeM platform** should include dedicated categories for TOF products and establish green product tags to increase market access.

To address **financial and regulatory barriers**, new **financing mechanisms** like **climate financing** and **Viability Gap Funding (VGF)** should be introduced to support TOF plantations and products. Simplifying the licensing procedures for new wood-based industries and addressing the high **GST rates** on processed wood will also incentivize the use of TOF materials in construction.

Finally, a **strengthened regulatory framework** is necessary to improve coordination between ministries, streamline responsibilities, and ensure consistent regulations across states. Protecting land tenure security for TOF plantations and promoting the growth of diverse native species will create a stable environment for investment in TOF-based businesses.

In conclusion, the report emphasizes that fostering the integration of TOF products into India's construction sector requires policy reforms, market development, and regulatory improvements. By implementing these recommendations, India can reduce its dependence on imported timber, promote sustainable building practices, and support the country's broader climate change mitigation goals.

3.1 Incentives

3.1.1 Recognize/ Reward use of TOF in construction (like Green Building Certification)

To incentivize the adoption of TOF-based materials, it is crucial to integrate them into existing recognition systems such as Green Building Certifications. These systems, which are already designed to promote sustainability in construction, can provide an essential framework for rewarding the use of sustainable, locally sourced timber. By incorporating TOF products into the scoring criteria for certifications like IGBC (Indian Green Building Council), GRIHA (Green Rating for Integrated Habitat Assessment), or EDGE (Excellence in Design for Greater Efficiencies), the government and private sector can drive demand for these materials.

Such integration could include additional credits for projects that use certified TOF materials or demonstrate the use of timber sourced from agroforestry systems. Recognizing TOF use in green building certifications not only boosts the market appeal of these materials but also encourages developers and builders to align their projects with India's sustainability goals, including climate resilience and carbon sequestration. Following is some of the major strategies:

1. **Integrate TOF into Green Building Rating Systems**

   To encourage the use of TOF materials, it is essential to update existing green building certification systems (IGBC, GRIHA, etc) to include specific credits for the use of certified TOF. This could involve giving additional points for projects using TOF sourced from agroforestry or verified sustainable systems. Incorporating TOF into these rating systems will create a financial incentive for builders and developers to adopt sustainable practices, ensuring alignment with India's broader climate goals.

2. **Create Specific TOF Certifications for Construction Materials**

   In addition to integrating TOF into existing green building certification frameworks, a specific certification for TOF-based construction materials should be established. This would involve creating a unique certification standard that ensures TOF products are sustainably sourced and processed, promoting transparency in the supply chain. Such a certification would also highlight the eco-friendliness and climate resilience of TOF products, making them more attractive to construction firms focused on sustainability.

3. **Offer Financial Incentives for TOF Use in Construction Projects**

   The government could introduce financial incentives for builders who use certified TOF materials in their projects. These incentives could include tax rebates, subsidies, or reduced registration fees for green certifications if TOF materials are utilized. This would make TOF materials more competitive in cost compared to conventional materials and help drive wider adoption in both residential and commercial construction.

4. **Public Awareness and Educational Campaigns on the Benefits of TOF**

   The government and industry bodies should launch awareness campaigns that educate architects, developers, and the public on the benefits of TOF in sustainable construction. These campaigns can highlight how TOF helps reduce deforestation, supports agroforestry systems, and contributes to carbon sequestration. By increasing understanding of the material's environmental and economic advantages, the demand for TOF in construction can be further stimulated.

5. **Establish a Certification and Tracking System for TOF Supply Chains**

   To ensure the sustainable sourcing of TOF materials, a robust certification and tracking system should be implemented. This would include clear documentation regarding the sourcing, processing, and use of TOF timber. With transparent tracking systems in place, builders and developers would be more confident in the provenance of the materials they use, increasing the reliability and appeal of TOF for construction purposes.

3.1.2 Harmonize Building Codes Across States

A significant barrier to the widespread use of TOF materials is the inconsistency in building codes across India's states. Each state has its own regulations and guidelines, often with varying levels of restriction and complexity regarding the use of timber in construction. Harmonizing building codes at the national level will create a unified framework, simplifying the process for architects, builders, and developers.

This harmonization should focus on ensuring that TOF-based materials, such as timber from agroforestry, are recognized as suitable alternatives to conventional building materials. By standardizing these codes and promoting

a consistent approach to sustainable construction, states can encourage the adoption of TOF products while aligning their policies with national environmental and economic objectives. Some major strategic recommendation for harmonizing building codes across states are as follows:

1. **Integrate TOF wood-based products in the National Building Code for Timber Use in Construction**

   Integrate TOF wood-based products in the National Building Code (NBC) with specific provisions for the use of TOF wood-based materials in construction. This code should emphasize structural safety, fire resistance, and durability standards for TOF timber, ensuring its acceptability across diverse climatic and geological conditions. States can adopt or adapt this code, ensuring consistency while allowing flexibility for regional requirements.

2. **Incorporate TOF Timber in Green Building Certifications**

   Revise green building certification frameworks (e.g., GRIHA, IGBC, etc.) to prioritize and incentivize the use of TOF timber in construction. Linking harmonized building codes with green certification programs will motivate developers and builders to align with national sustainable construction goals while also reducing compliance confusion across states.

3. **Establish a Central Accreditation and Training Program**

   Set up a centralized body under the Bureau of Indian Standards (BIS) to accredit TOF timber products and BMTPC to provide training for architects, builders, and code enforcers. This body should develop a national database of approved TOF materials and suppliers to streamline compliance with harmonized building codes.

4. **Offer Financial Incentives for Early Adopters**

   Introduce fiscal benefits such as tax rebates, low-interest loans, or subsidies for construction projects that integrate TOF timber as per the harmonized building codes. These incentives can accelerate adoption, encourage state alignment with national policies, and demonstrate the viability of TOF materials in mainstream construction.

3.1.3 Introduce Preferential Government Procurement Policies for a specific time

One of the most effective ways to jumpstart the market for TOF-based products is through targeted government procurement policies. These policies should prioritize the use of TOF materials in government-funded projects, including infrastructure, housing, and public buildings. By mandating a minimum percentage of TOF products in government procurement for a specific period, the government can create a reliable market for these materials and incentivize producers to scale up their operations.

Preferential procurement could include benefits such as lower taxes, GST rates or faster approval processes for projects using TOF materials, making them more competitive compared to traditional building materials. This initiative would not only promote TOF adoption but also support local economies by encouraging sustainable land-use practices and the growth of the timber processing industry.

1. **Mandate Minimum TOF Material Usage in Public Projects**

   Establish a government policy that requires a minimum percentage of TOF (Timber from Optimized Forests) materials to be used in all government-funded infrastructure projects (e.g., public buildings, roads, housing, etc.) for a defined period, such as 5-10 years. This will create a guaranteed demand for TOF products, helping to establish a stable market for these materials and incentivize producers to invest in scaling their operations.

   It will promote the growth of the local timber industry, encourages the use of sustainable materials, and accelerates the adoption of environmentally friendly construction practices.

2. **Provide Financial Incentives for TOF Material Use**

   Offer financial benefits such as tax reductions, GST rebates, or subsidies to construction companies and contractors that use TOF products in eligible public sector projects. Lower the cost of using TOF products compared to traditional materials, making them more competitive in the market.

   It will reduce the price barrier for using sustainable materials, boosting adoption among businesses that may otherwise be hesitant due to cost concerns.

3. **Streamline Approval and Certification Processes for TOF-Based Projects**

   Create an expedited and simplified approval process for construction projects that use TOF materials, including faster environmental and safety certifications. Make it easier for developers to choose TOF wood-based products by reducing administrative hurdles, thereby accelerating the deployment of these materials in the construction sector.

   It will encourage more developers to consider and adopt TOF wood-based materials by offering quicker turnaround times for project approvals and reducing bureaucratic delays.

4. **Set Up a Government-Backed TOF Certification and Standardization Program**

   Establish a government-supported certification system that recognizes high-quality TOF materials and ensures they meet necessary environmental, safety, and durability standards. Provide assurance to contractors, architects, and developers that TOF materials are of the same or better quality than traditional building materials. Additionally, promote transparency and trust in TOF products.

   It will encourage the growth of the TOF wood-based industry by ensuring consistent product quality, making it easier for builders to confidently specify these materials in their designs and procurement decisions.

3.2 Market Development

3.2.1 Establish Export Channels

As demand for sustainable building materials grows globally, establishing export channels for TOF products presents a major opportunity for India. International markets, particularly in Europe and North America, are increasingly seeking sustainably sourced timber and eco-friendly construction materials. To tap into this demand, India must focus on developing robust export channels for TOF products.

This involves creating export-quality standards for TOF timber, improving certification systems, and fostering relationships with international trade bodies. Additionally, the government can support exporters by negotiating trade agreements that favour sustainable timber products, providing financial incentives such as export subsidies, and facilitating market access through digital platforms like the Government e-Marketplace (GeM).

1. **Develop Export-Quality Standards and Certification Systems**

   India must focus on developing and implementing internationally recognized standards for TOF timber products. This includes creating quality benchmarks for sustainable sourcing, processing, and product performance. Establishing certification systems that align with global eco-labels (e.g., FSC or PEFC) will enhance the credibility and marketability of Indian TOF products in international markets, particularly in Europe and North America, where consumers and businesses increasingly prioritize sustainability.

2. **Build Strategic Relationships with International Trade Bodies**

   India should proactively foster relationships with global trade organizations, sustainability-focused industry groups, and regulatory bodies. Active participation in international trade forums, including those focused on sustainable building materials, can help ensure that India's TOF products are recognized and promoted in key markets. By engaging with trade bodies, India can gain insights into market trends, establish trust in the global marketplace, and advocate for favourable trade conditions.

3. **Leverage Digital Platforms for Market Access**

   To expand reach and streamline export processes, India should leverage digital platforms such as the Government e-Marketplace (GeM) to promote TOF products internationally. These platforms can facilitate direct access to buyers in foreign markets, reduce transaction costs, and provide transparent, efficient procurement channels. By showcasing India's sustainable timber offerings on these platforms, exporters can tap into global demand more effectively and ensure that their products are visible to international construction companies, architects, and buyers.

3.2.2 Modular/ Factory made timber products- international systems- US (products and standardization), Indonesia and China

The modular and factory-made timber products market presents significant growth potential. Countries like the US, Indonesia, and China have developed successful models for producing high-quality, standardized timber products for construction. These products, including prefabricated wood panels, engineered wood components like Cross Laminated Timber (CLT), and Glued Laminated Timber (GLT), have become integral to sustainable building practices globally.

India can adopt similar systems by investing in technology and infrastructure to support the production of factory-made timber products. This would involve establishing standardized production processes, ensuring quality control, and creating a regulatory framework that meets international standards. By fostering innovation in modular timber production, India can reduce costs, improve efficiency, and create a competitive edge in both domestic and international markets.

1. **Invest in Advanced Technology and Production Infrastructure**

   India should invest in state-of-the-art manufacturing technologies and infrastructure to support the production of modular and factory-made timber products. This includes adopting automation, robotics, and precision manufacturing processes used in leading markets like the US, Indonesia, and China.

2. **Develop Standardized Production Processes and Quality Control Systems**

   To ensure that Indian products meet international market expectations, it is crucial to establish standardized production processes for modular timber products. This includes implementing strict quality control systems to guarantee the durability, safety, and performance of products like CLT and GLT.

3. **Align Regulatory Frameworks with International Standards**

   India must create a regulatory framework for modular and factory-made timber products that aligns with international construction and sustainability standards. This includes ensuring compliance with building codes, environmental regulations, and certifications like FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forest Certification).

4. **Encourage Innovation in Timber Product Design and Manufacturing**

   India should foster innovation in the design and manufacturing of modular timber products. This can be achieved by encouraging research and development in sustainable materials, energy-efficient manufacturing processes, and product design. Collaborations with universities, research institutions, and global industry leaders can help India introduce new and improved timber products that meet the evolving needs of modern construction.

3.2.3 Community Participation and registered tree farming

Encouraging community participation in TOF initiatives can significantly enhance the sustainability of the wood supply chain. Registered tree farming, where local farmers are incentivized to grow and manage trees outside traditional forest areas, creates a sustainable source of timber while improving rural livelihoods.

Government and industry partnerships can support these efforts by providing farmers with training on agroforestry practices, financial incentives for planting and maintaining trees, and access to markets for their timber products. This participatory model not only boosts local economies but also promotes biodiversity and carbon sequestration, aligning with India's environmental goals.

1. **Promote Registered Tree Farming and Agroforestry Practices**

   Encouraging local farmers to engage in registered tree farming can create a sustainable, decentralized source of timber. The government can incentivize farmers to adopt agroforestry practices, where trees are planted alongside crops to diversify income streams.

2. **Offer Financial Incentives and Support for Tree Farming**

   The government can offer financial incentives to encourage local farmers to participate in registered tree farming initiatives. This could include subsidies for planting trees, tax breaks, low-interest loans, and grants for land preparation and maintenance. Additionally, providing direct payments or compensation for carbon sequestration services can further incentivize farmers to adopt sustainable practices.

4. **Create Market Access and Facilitate Supply Chain Integration**

   To ensure that farmers have a viable market for their timber products, the government and industry can work together to create direct market access. This could involve establishing cooperatives, certification schemes, and partnerships with timber processing companies.

3.2.4 Potential of SMEs and job creation

Small and medium-sized enterprises (SMEs) have a critical role to play in the TOF industry, especially in areas like timber processing, manufacturing of wood products, and sustainable forestry management. These enterprises can help drive innovation and create jobs, particularly in rural areas where agroforestry and wood production can become key drivers of economic growth. To support the growth of SMEs, the government should provide targeted financial assistance, such as grants, low-interest loans, and tax relief, to businesses involved in the TOF supply chain.

3.3 Branding And Promotion

3.3.1 Sustainability and Carbon Sequestration

TOF-based products offer significant environmental benefits, particularly in terms of carbon sequestration. Promoting these materials as a sustainable alternative to conventional building products like concrete and steel can enhance their appeal in the growing green building market.

Branding campaigns should emphasize the environmental advantages of TOF products, particularly their role in reducing the carbon footprint of the construction industry. This includes highlighting the ability of trees to sequester carbon during their growth and the lower energy consumption associated with the production of wood-based materials compared to traditional building materials.

1. **Emphasize the Environmental Benefits of Carbon Sequestration**

   Branding campaigns should centre on the environmental advantages of TOF-based products, particularly their role in carbon sequestration. Highlight the fact that trees absorb and store carbon dioxide during their growth, which helps mitigate climate change. Marketing materials should provide data on the carbon storage capacity of timber products compared to other building materials like concrete and steel. This messaging can resonate strongly with eco-conscious consumers, developers, and regulatory bodies, positioning TOF products as an integral part of sustainable construction.

2. **Promote Lower Carbon Footprint and Energy Efficiency**

   TOF-based products should be branded as a greener, more energy-efficient alternative to conventional building materials. Campaigns can highlight that the production of wood-based materials, such as Cross Laminated Timber (CLT) and Glued Laminated Timber (GLT), consumes significantly less energy compared to the manufacturing of concrete or steel. By focusing on the lower embodied carbon and reduced energy consumption in the production process, these products can appeal to builders and architects looking for low-carbon solutions for green buildings.

3. **Target Green Building and Sustainable Architecture Markets**

   Targeted branding campaigns should focus on the growing green building and sustainable architecture sectors. These campaigns can highlight how TOF products meet the needs of developers and architects who prioritize eco-friendly materials for projects seeking green certifications (e.g., LEED, BREEAM). Collaboration with industry associations, green building councils, and sustainable construction forums can enhance visibility and credibility.

3.3.2 Launch National Marketing Campaigns

To create widespread awareness and demand for TOF products, a national marketing campaign should be launched. This campaign should focus on educating the public and industry stakeholders about the environmental, economic, and social benefits of using TOF materials in construction. The campaign can include media outreach, digital marketing, workshops, and case studies of successful projects that have incorporated TOF products.

By promoting TOF materials as a sustainable and cost-effective alternative to traditional building materials, the campaign will help drive consumer and industry acceptance, leading to greater adoption in both the private and public sectors.

1. **Strategic Partnerships with Industry Leaders and Associations**

   To amplify the impact of the national marketing campaign, strategic partnerships should be established with key industry leaders and associations such as CREDAI (Confederation of Real Estate Developers' Associations of India), Builders' Association of India (BAI), and CII (Confederation of Indian Industry). These organizations have strong influence within the construction and real estate sectors and can help integrate TOF products into mainstream practices.

2. **Policy Advocacy for Incentivizing TOF Material Use**

   To ensure sustained demand, the marketing campaign should be supported by policy advocacy targeting both state and central governments. This advocacy can aim to establish favourable policies and incentives to encourage the use of TOF products in the construction sector.

3.3.3 Collaboration with Industry Associations

Collaborating with industry associations, such as the Builders Association of India (BAI), the Confederation of Indian Industry (CII), and the Indian Green Building Council (IGBC), is critical to expanding the market for TOF products. These organizations can help advocate for policy changes, organize training sessions, and promote best practices for using TOF in construction.

Industry associations can also facilitate partnerships between the public and private sectors, create networking opportunities, and support the development of new business models that integrate TOF products into mainstream construction practices.

1. **Joint Advocacy for Policy Reforms**

   Collaborate with industry associations to advocate for policy reforms that encourage the adoption of TOF products. By presenting a united front, these associations can influence policymakers at both state and national levels to:

   a. Include TOF materials in government procurement policies and incorporate the green public procurement policy.

   b. Provide tax incentives and subsidies for projects that incorporate TOF materials.

   c. Simplify certification and regulatory processes for TOF products.

2. **Capacity Building and Knowledge Dissemination**

   Work with industry associations to organize capacity-building initiatives, such as training programs, workshops, and conferences, targeting architects, builders, contractors, and other stakeholders.

   a. **Training Programs**: Develop modules that educate stakeholders about the technical and economic advantages of TOF products, including case studies of successful implementation.

   b. **Knowledge Hubs**: Establish centralized repositories of information, guidelines, and standards for TOF material usage in collaboration with associations like CII and IGBC.

   c. **Showcase Events**: Partner to host expos and exhibitions that highlight innovative projects utilizing TOF materials, fostering greater awareness and trust among industry stakeholders.

3. **Creating Industry-Led Pilot Projects**

   Collaborate with industry associations to initiate pilot projects that showcase the viability and benefits of TOF materials in real-world applications.

   a. **Public-Private Partnerships (PPPs)**: Facilitate PPP projects where TOF materials are used in government-backed infrastructure and housing projects.

   b. **Flagship Developments**: Partner with leading developers and builders to construct landmark projects that prominently feature TOF materials, setting examples for the industry.

   c. **Monitoring and Documentation**: Use these projects as case studies to monitor performance, gather data, and create compelling evidence to further promote TOF adoption.

3.4 Supply Chain Strengthening

3.4.1 Storage facilities

To support the efficient distribution of TOF products, it is essential to establish storage and warehousing facilities that are strategically located across key timber-producing regions. These facilities will serve as hubs for

processing, storing, and distributing TOF-based materials to construction projects nationwide. Proper storage infrastructure will also help maintain the quality of the materials, preventing degradation due to improper handling or environmental factors.

The government can support the development of these facilities by offering financial incentives for businesses to invest in them, particularly in rural areas where agroforestry is most prevalent. This infrastructure investment will streamline the supply chain and reduce logistical challenges, ensuring that TOF products are available where they are needed.

1. **Development of Regional Storage Hubs**

   Establish a network of regional storage hubs in key timber-producing and agroforestry regions to serve as centralized facilities for processing, storing, and distributing TOF products.

   a. **Strategic Location Selection**: Identify regions with high agroforestry activity and timber production to ensure proximity to supply sources and reduce transportation costs.

   b. **Integrated Facilities**: Design these hubs to include value-added services such as drying, grading, and quality testing to ensure materials meet construction standards.

   c. **Public-Private Partnerships**: Encourage collaboration between the government and private sector to develop and operate these facilities efficiently, leveraging private sector expertise in logistics and warehousing.

2. **Subsidies and Incentives for Infrastructure Development**

   Encourage investment in storage infrastructure by providing financial incentives to businesses and cooperatives in rural and semi-urban areas.

   a. **Subsidized Loans**: Offer low-interest loans or grants to businesses willing to establish storage and warehousing facilities for TOF products.

   b. **Tax Benefits**: Provide tax exemptions or deductions on investments made in warehousing infrastructure.

   c. **Special Economic Zones (SEZs)**: Designate SEZs in key agroforestry areas where businesses can set up storage facilities with relaxed regulations and additional incentives.

   These measures will attract investment and promote the development of robust storage infrastructure in rural areas, reducing supply chain bottlenecks.

3.4.2 Skill development

Strengthening the skills of the workforce in the TOF sector is critical to the success of these initiatives. Skill development programs should be introduced to train workers in sustainable forestry practices, wood processing, and construction techniques that incorporate TOF-based materials. These programs should target both existing workers in the wood industry and new entrants, providing them with the tools and knowledge to work with TOF products.

Additionally, technical training programs for architects, engineers, and builders should be developed to ensure that the construction industry is equipped to handle the unique characteristics of TOF materials. These programs should focus on the advantages of using wood-based products, the technical specifications of TOF materials, and best practices for integrating them into sustainable construction designs.

1. **Comprehensive Workforce Training Programs**

   Develop targeted skill development programs for workers in the TOF sector, focusing on sustainable forestry practices, wood processing, and construction techniques.

   a. **Modular Training Courses**: Design short-term and modular courses tailored to specific roles, such as tree growers, sawmill operators, and construction laborers, ensuring accessibility and flexibility.

   b. **On-the-Job Training**: Partner with TOF-based product manufacturers and construction firms to provide hands-on training, enabling workers to gain practical experience.

   c. **Certification Programs**: Introduce certification schemes to validate skills and enhance the employability of trained workers, ensuring recognition across the industry.

2. **Specialized Technical Training for Builders, Architects and Engineers**

   Develop technical training programs for architects, engineers, and builders to equip them with the knowledge and skills needed to integrate TOF materials into construction projects effectively.

   a. **Workshops and Seminars**: Conduct workshops and seminars focusing on the structural properties, advantages, and best practices for designing with TOF-based materials.

   b. **Collaboration with Academic Institutions**: Partner with architectural and engineering colleges to include TOF material design principles in their curriculum, ensuring future professionals are well-versed in sustainable construction.

   c. **Digital Learning Platforms**: Create online courses and webinars to provide flexible learning opportunities for professionals across the country.

Conclusion

Based on the findings from the **desk review report**, stakeholder engagement at both the **national and state levels**, consultations with **industry players**, insights from the **perception survey**, discussions during the **consultation workshop**, and the draft report, the final advisory for the **Ministry of Environment, Forests, and Climate Change (MoEFCC)** has been drafted. The advisory is attached in **Annexure I** for reference.

Annexure I

Draft Advisory

GOVERNMENT OF INDIA

Ministry of Environment, Forest And Climate Change

Advisory For Promotion of Trees Outside Forests (TOF) Materials in Construction Sector

Preamble

1. The Ministry of Environment, Forest and Climate Change (MoEFCC), in alignment with the Government of India's commitment to sustainability, climate resilience, and the achievement of national and international climate goals, advocates for the integration of wood-based materials sourced from Trees Outside Forests (TOF) into construction projects across both public and private sectors. This initiative is a key component of India's broader strategy to promote sustainable development, reduce carbon emissions, and foster eco-friendly building practices.

2. The use of TOF-based materials in construction sector such as timber, bamboo, and other wood products provides a range of benefits that are critical to national priorities. These include:

    a. **Climate Mitigation**: TOF-based materials significantly reduce the carbon footprint of construction activities by offering low-emission, renewable alternatives to conventional building materials.

    b. **Biodiversity Conservation**: Supporting TOF enhances green cover, contributes to ecosystem restoration, and fosters greater biodiversity.

    c. **Sustainable Livelihoods**: Promoting TOF-based materials creates economic opportunities for rural and marginalized communities, contributing to livelihood security and inclusive growth.

    d. **Circular Economy and Resource Efficiency**: TOF materials align with the principles of circular economy by encouraging sustainable production and consumption practices.

3. This advisory, therefore, serves as a directive to Central and State Government agencies to integrate TOF wood-based materials into procurement policies, building standards, and construction practices. This will create an ecosystem that stimulates and enhances the demand for such materials. By embedding these measures into existing frameworks, the construction sector can play a pivotal role in India's transition to a greener, more resilient economy. The actionable directives outlined herein aim to ensure that TOF wood-based materials are effectively leveraged to advance sustainable development, fulfil national commitments under the Paris Agreement, and contribute to achieving India's ambitious climate targets.

Directives for Central Government Agencies

4. **Central Public Works Department (CPWD), MoHUA**

i. **Revise CPWD Manuals/ Schedule of Rates and GHAR Green Building Framework to Promote Wood-Based TOF Products**

Update CPWD manuals, the Schedule of Rates and CPWD's GHAR green building framework to include comprehensive guidelines for the use of wood-based materials, including TOF wood-based products, in construction. To effectively use such material as substitutes for conventional alternatives, emphasizing their environmental and economic benefits.

ii. **Align State PWD Manuals and Documents with CPWD Specifications**

Engage and coordinate with State PWDs to adopt the updated CPWD specifications related to wood-based TOF products. Facilitate and handhold State PWDs to ensure these updates are integrated into State PWD construction manuals.

5. Building Materials and Technology Promotion Council (BMTPC), MoHUA

i. **Conduct Targeted Technical Workshops**

Organize a series of interactive technical workshops tailored for **architects, engineers, contractors, and developers**.

Highlight the performance, durability, and environmental benefits of wood-based TOF products compared to traditional construction materials through real-world case studies, material demonstrations, and expert presentations.

ii. **Develop Industry-Focused Educational Content**

Create comprehensive educational materials, including brochures, videos, and case studies, showcasing the advantages of TOF wood-based products in sustainable construction.

Host industry-specific webinars addressing common concerns, such as cost-effectiveness, load-bearing capacity, and environmental impact, to foster greater adoption among professionals. Develop and disperse the knowledge of a "Compendium of Industry Guidelines and Best Practices" for TOF wood-based products to relevant institutions, government agencies, and industry bodies.

iii. **Organize Demonstrations and Awareness Campaigns**

Conduct hands-on technical demonstrations and showcases to illustrate the practical applications of TOF wood-based products.

Launch cost-benefit analysis campaigns to raise awareness about the economic and environmental value of using these materials in construction.

iv. **Integrate TOF wood-based products including Promotion of Modular TOF Elements into Certification Courses**

Introduce a dedicated session on TOF wood-based products and their applications in sustainable construction as part of the ongoing **NAVRITIH certification course**.

Ensure participants gain practical insights into integrating these materials into construction projects.

Disseminate standardized guidelines specifying modular sizes, design specifications, and performance benchmarks of NBC 2016, Part 6, Section 3A to streamline their adoption and maximize their impact in construction and infrastructure projects.

v. **Leverage and Promote Existing Technical Guidelines**

There exists a comprehensive set of established codes, standards, and guidelines addressing technical aspects of TOF materials including fire safety, structural requirements, and protective measures[1]:

BMTPC to:

a) **Create Consolidated Knowledge Repository**

i. Compile existing guidelines into a single, user-friendly handbook.

ii. Develop simplified versions for different stakeholder groups

iii. Create digital versions accessible through a central portal

b) **Establish Knowledge Transfer Framework**

i. Partner with municipalities and development authorities for local-level dissemination

ii. Collaborate with technical institutions to integrate content into curricula

iii. Conduct awareness programs for builders and contractors

vi. **Collaborate with Green Building Certification Bodies**

Partner with green building certification bodies of GRIHA, LEED, IGBC, GeM and EDGE frameworks and similar organizations to include PRAMAAN and TOF wood-based materials as a key criterion for achieving higher ratings in green building certifications. Specific guidelines on use of timber to maximize energy efficiency may be developed.

Promote the role of TOF materials in enhancing energy efficiency and reducing carbon footprints in construction projects.

vii. **Pilot Modular TOF Wood-Based Products in Government Projects**

Facilitate pilot projects using modular TOF wood-based products in government buildings to evaluate their efficiency, cost-effectiveness, and scalability.

Use findings to create evidence-based policy recommendations and promote wider adoption in public infrastructure projects.

1 *Key Available Technical Documents:*
a. BIS Codes: IS 1141:1993, IS 401:2001, IS 1734, IS 5509:2000, IS 3629:1986, IS 4873, IS 12777:1989
b. NBC 2016 Part 6 (Sections 3A & 3B) and Part 4
c. CPWD Specifications 2019 Vol-I Chapter 9
d. FRI Manuals on Wood Seasoning and Preservation
e. ICFRE Technical Guidelines
f. IWST Technical Series

6. Bureau of Indian Standards (BIS), Ministry of Consumer Affairs, Food & Public Distribution

i. **Standardized Certification and Labelling System for TOF Wood-Based Products**

Develop a comprehensive and standardized certification system aligned with Indian Forests and wood certification scheme (PRAMAAN) for TOF wood-based products to enhance market credibility and buyer confidence. Establish clear and uniform labelling guidelines that suppliers must adhere to, enabling easy recognition and comparison of certified products in the market.

Collaborate with relevant authorities, industry stakeholders, and certification bodies to ensure widespread adoption and alignment with international standards.

ii. **Integrate the standards of TOF wood-based products in the revised National Building Codes.**

Given the extensive existing standards (IS codes) covering TOF materials, focus shall be on:

a. Updating existing standards to reflect current technologies

b. Improving accessibility of standards through digital platforms

c. Creating simplified interpretative guides for practitioners

7. **Ministry of Housing and Urban Affairs (MoHUA)**

i. **Create National Guidelines on TOF Wood-Based Building Construction**

Develop and implement a standardized set of inclusive building guidelines tailored for TOF wood-based construction. These guidelines will provide a cohesive framework to promote sustainable timber use across states and facilitate its integration into government-backed housing initiatives, including the PMAY-Urban Scheme.

Include timber-based technology and construction technique in Global Housing Technology or related technological innovations.

ii. **Partner with BMTPC to Scale Timber Adoption in PMAY 2.0**

Collaborate with the Building Materials and Technology Promotion Council (BMTPC) to advocate the adoption of TOF wood-based products in the construction of 1 crore houses under the Pradhan Mantri Awas Yojana – Urban (PMAY-Urban 2.0). This will drive the demand in affordable urban housing construction.

iii. **Encourage State-Level Adoption of Timber in Urban Schemes**

Engage with state governments to integrate TOF wood-based products into infrastructure projects under **all relevant** schemes managed by **MoHUA**.

8. **Ministry of Rural Development (MoRD)**

i. **Create Standardized Rural Building Guidelines for TOF Wood Use**

Develop inclusive and standardized guidelines for the use of timber/ wood-based products from TOF in rural housing construction and promote its adoption in the Pradhan Mantri Awas Yojana-Gramin (PMAY-G)**.**

ii. **Advocate for TOF wood-based products in Affordable Housing Under MoRD Schemes**

Collaborate with state governments to incorporate TOF wood-based materials in the construction of 2 crore affordable housing projects under PMAY-G and other rural schemes in the next five years. This will drive the demand in affordable rural housing construction.

9. **Town and Country Planning Organisation (TCPO), MoHUA**

i. **Integrate TOF Provisions into Urban Planning and Zoning Regulations**

Engage proactively with urban planning authorities and urban development institutions to incorporate specific provisions for TOF plantation and TOF wood-based products infrastructure like warehousing, storage and special zones into zoning laws, master plans, and planning regulations. Advocate for the inclusion of TOF as a critical component of sustainable urban development into urban landscapes, spatial allocation for industries for TOF based products and its supply chain management- storage, logistics, transportation, etc.

10. **Ministry of Finance (MoF)**

i. **Introduce Tax Incentives for TOF Wood-Based Products**

Advocate for a reduced GST rate (e.g., 0 to 5%) on certified TOF wood-based materials used in construction projects.

Additionally, propose tax rebates or credits for stakeholders such as real estate developers, architects, civil engineers, and government agencies—including CPWD/ PWDs—who utilize certified TOF wood-based products in the construction and infrastructure projects.

ii. **Incentivise TOF Product Procurement for Public Projects in Construction and Infrastructure Sector**

Recommend incentivising procurement of at least 15% to 20% for TOF wood-based materials in public construction and infrastructure projects over the next five years on GeM Portal. This policy will drive demand, establish market confidence, and support the growth of a sustainable TOF wood-based product industry, aligning with national goals for climate action and resource efficiency.

Incorporate the green public procurement targets into tender guidelines, feature certified TOF products on GeM for easy access, and establish monitoring mechanisms. Training procurement officials will ensure effective implementation, supporting India's climate goals and fostering a sustainable TOF market.

iii. **Department of Expenditure**: Modification in the General Financial Rules (GFR) to promote a **Green Procurement Policy.** Modifications in the GFR to include the following:

a. Add definitions and criteria for "**green products**" and "**green services**" based on lifecycle assessments, carbon footprints, and certification standards like **Ecomark** or global equivalents.

b. Incorporate a **Green Procurement Clause** to encourage government entities to prefer eco-friendly, energy-efficient, and sustainable products and services in procurement processes.

c. Introduce Life-Cycle Costing (LCC): Replace "lowest-cost procurement" with **Life Cycle Costing** to account for long-term environmental and operational costs rather than just upfront prices.

d. **Encourage Supplier Eco-Compliance**: Introduce a rule mandating suppliers to adhere to environmental standards and submit relevant certifications

11. Ministry of Commerce and Industry and Export Promotion Council of India

i. Establish SME Clusters with Shared Infrastructure Support

Identify key cluster groups/ beneficiaries of SMEs involved in TOF wood-based product manufacturing and provide targeted infrastructure development support. This includes common facilities for storage, logistics, and quality control to improve efficiency and reduce operational costs.

ii. Create Processing Hubs in Identified Production Areas

Allocate capital investment grants and infrastructure development funds to establish TOF wood-based processing hubs near identified high-production areas. These hubs will serve as focal points for value addition, reducing transportation costs and supporting local economies.

iii. Integrate TOF Wood-Based Production into Industrial Policy

Revise industrial policies to prioritize TOF wood-based production, offering specific incentives such as R&D grants and subsidies for modern technology and machinery adoption. This ensures competitiveness, promotes the adoption of advanced and sustainable processing technologies, and aligns with international quality standards.

iv. Launch Targeted Financial Incentives for New Enterprises

Introduce grants, low-interest loans, or tax credits exclusively for startups and new enterprises focused on TOF wood-based products. This will encourage entrepreneurship and attract investments in this sector.

v. Feature TOF Wood-Based Products on the GeM Platform

Position TOF wood-based products prominently in the Government e-Marketplace (GeM) construction materials category, ensuring visibility and fostering increased procurement by public sector buyers.

vi. Promote TOF Products Internationally

Organize international trade missions to showcase TOF wood-based products and provide export incentives for certified TOF wood products. These initiatives will open new markets and boost global demand.

vii. Develop International Partnerships for Modular Timber Expertise

Facilitate partnerships with global companies specializing in modular timber technologies. These collaborations will enable knowledge transfer, skill development, and adoption of innovative manufacturing techniques to align with global standards.

viii. Export Promotion Council of India

Develop Export-Quality Standards for TOF Wood-Based Products and Facilitate Access to International Markets

a. Standardization of Quality Parameters

Collaborate with relevant authorities, industry experts, and certification bodies to define and implement quality standards specific to TOF wood products, covering aspects such as durability, moisture content, finish, and environmental sustainability.

b. **Certification and Labelling Programs**: Introduce certification programs for TOF wood products that adhere to PRAMAAN for exporters.

c. **Capacity Building for Producers**: Provide training to domestic TOF producers who are in the supply chain of exports on best practices for harvesting, processing, and quality control, ensuring that they can meet export-quality standards and increase their competitiveness in international markets.

d. **Establish Export Networks**: Create platforms and trade missions to connect domestic TOF producers with international buyers, facilitating direct trade relationships and showcasing the quality and environmental benefits of TOF products.

12. **Ministry of MSMEs**

i. **Provide Targeted Financial Assistance**

Introduce specific grants and subsidized loan schemes tailored for TOF wood-based SMEs. These financial incentives will help scale production, promote entrepreneurship, and encourage sustainable practices.

ii. **Facilitate Infrastructure and Modernization**

Establish programs to support the setup of new TOF wood-based SMEs and the upgrading of existing ones. Assistance should focus on modernizing infrastructure, acquiring advanced machinery, and fostering knowledge-sharing networks to enhance productivity and competitiveness.

iii. **Promote Innovation with Start-Up Grants dealing in TOF wood-based products**

Launch start-up grant initiatives emphasizing innovation, product design, and sustainability. These grants should encourage the development of cutting-edge solutions and value-added products within the TOF processing sector, ensuring long-term growth and environmental stewardship.

13. **Ministry of Skill Development and Entrepreneurship**

i. **Establish Vocational Training Programs for TOF Wood-Based Industries- focused on meeting industry standards, certifications and quality**

Collaborate with technical institutes, industry associations, and skill development organizations to design and implement specialized vocational training programs. These programs should focus on handling, processing, and utilizing timber and wood from TOF to meet industry standards, certifications and quality for the market demands.

14. **Ministry of Road Transport and Highways**

i. **Streamline and integration of PRAMAN (National Transit Pass) - Transportation and Regulatory Framework for TOF Products**

Integrate the PRAMAN platform to create a unified and transparent system for certifying and monitoring TOF products. Simultaneously, harmonize and simplify transport regulations across state borders to eliminate bureaucratic bottlenecks. This approach will ensure faster movement of TOF products, reduce compliance costs for suppliers, and enhance market efficiency.

15. National Highway Authority of India (NHAI)/ Indian Railways

i. Pilot Demonstration Projects in Key Infrastructure Sectors

Identify and incorporate TOF wood-based products into specific highway and railway projects. Applications may include sound barriers, street furniture, landscaping elements, and other innovative uses. These pilot projects will serve to validate the structural performance, durability, and cost-effectiveness of TOF-based materials, creating real-world benchmarks for their adoption.

ii. Revise Departmental Standards and Procurement Documents to include TOF wood-based products

Update manuals, Request for Proposals (RFPs), and other standard departmental documents to include provisions for wood-based products, specifically from TOF sources. Establish clear technical specifications, sustainability criteria, and guidelines for incorporating TOF materials into the construction of infrastructure projects.

16. Curriculum and Capacity Building Initiatives for Council of Architecture (COA), All India Council for Technical Education (AICTE), and Institute of Town Planners India (ITPI)

i. Revise Curricula for Technical and Professional Education

Incorporate TOF wood-based materials into the curricula of architecture, engineering, and urban planning courses. Introduce modules covering the applications of TOF products, including timber and bamboo, particularly mass timber in sustainable construction and urban development.

ii. Develop Elective and Certification Courses

Offer elective courses and certifications on TOF-linked sustainable practices through affiliated institutions under COA, ITPI, and AICTE. Highlight the role of TOF materials in achieving green building certifications like GRIHA, LEED, and IGBC.

iii. Faculty Training Programs

a. Organize training sessions for faculty in collaboration with the Building Materials and Technology Promotion Council (BMTPC) to enhance their expertise in TOF-based construction practices.

b. Partner with the National Institute of Technical Teachers' Training and Research (NITTTR) to develop teacher training modules focused on TOF-linked topics.

iv. Promote Research and Innovation

Encourage interdisciplinary research in architecture and engineering institutions on TOF-based materials and their contribution to climate-resilient infrastructure.

v. Knowledge Dissemination

Collaborate with BMTPC to create educational resources, including manuals, case studies, and videos, for wider dissemination across technical and professional institutions.

Directives for State Governments

17. **State Public Works Departments**

i. **Incorporate CPWD Specifications in Construction Manuals**

Revise construction manuals to include the latest CPWD specifications and guidelines related to wood-based products, particularly those derived from TOF. Ensuring standardized adoption and increase confidence in the use of TOF products across the construction sector.

ii. **Launch Pilot Projects Showcasing TOF-Based Construction in government projects**

Initiate pilot projects utilizing TOF wood-based materials in state government buildings and rural-urban infrastructure projects. These projects will serve as demonstrative models for scalability and inspire broader adoption by showcasing the environmental and economic benefits of TOF products.

iii. **Establish Procurement Preferences for TOF Wood Products**

Introduce procurement policies mandating a minimum percentage of TOF wood-based materials in all state-funded construction projects. Institutionalize the demand and provide a strong market signal to local TOF producers. Adoption of Green Public Procurement and its mainstreaming in all government procurement systems.

Tender guidelines and platforms like GeM should be updated to prioritize certified TOF products, ensuring accessibility, quality assurance, and alignment with sustainability goals.

iv. **Ensure Traceability and Quality Assurance Through Barcoding for sustainable sourcing**

Incentivise the use of PRAMAAN for all TOF wood-based products used in state-funded projects. Measures to enhance quality assurance, ensure compliance with sustainable sourcing standards, and promote transparency across the supply chain.

v. Implement Material Quotas for TOF Wood in State-Funded Projects

Provide procurement preference for PRAMAAN and TOF wood-based materials in state-funded buildings. The policy to stimulate steady demand, facilitate local supply chain development, and support the growth of a robust market for TOF products.

18. **State Finance Departments**

i. **Tax Holidays for Processing and Manufacturing Units**

Introduce tax holidays or reduced tax rates for small and medium enterprises (SMEs) involved in the processing and manufacturing of TOF timber and wood-based products. Provide incentives to encourage investment in the sector, enhance the supply chain, and ensure the availability of high-quality wood products for the construction industry.

19. **State Industrial Development Corporations**

i. Develop Special Industrial Zones for TOF-Based Industries

Establish dedicated industrial zones specifically for TOF wood-based processing facilities. These zones should feature subsidized utilities, such as water, electricity, and waste management systems,

to reduce operational costs. Additionally, provide centralized storage infrastructure and streamlined logistical support to optimize supply chain efficiency and attract investors to the sector.

ii. **Prioritize TOF-Based Products Through Policy and Financial Incentives**

Designate TOF-based products as priority items under industrial policies. Introduce measures such as special financing schemes with low-interest rates, expedited regulatory approvals, and dedicated support programs for businesses in this sector. These will enhance the competitiveness of TOF-based industries and encourage large-scale investments, fostering a robust ecosystem for sustainable and locally sourced timber products.

20. **State Urban Development Departments**

Harmonize State Regulations with National Framework to Enable TOF Integration

i. **Standardize State Codes:** Revise state building codes and policies to align with the national framework, ensuring a unified approach to promoting the use of Trees Outside Forests (TOF) wood-based products.

ii. **Update Building Bye Laws and Master Plans:** Modify building bye laws and Master Plans to mandate and prioritize the inclusion of TOF wood-based products.

iii. **Knowledge Dissemination at Local Level**

a. Municipal bodies and development authorities shall incorporate existing technical guidelines into local building permissions process

b. Conduct regular awareness programs for local builders and architects

c. Create help desks to assist in implementation of technical guidelines

21. **State Forest Departments**

i. **Promote Traceability and Certification for TOF Products**

Facilitate the adoption of barcoding systems for TOF wood products to confirm their origin and establish credibility as non-forest sources. Streamline verification processes for legal and sustainable sourcing by developing user-friendly platforms and ensuring compliance with recognized certification standards.

ii. **Barcoding for TOF Products**

State Forest Departments should coordinate with local TOF producers to implement a barcoding system for TOF products to facilitate PRAMAAN. This barcode should confirm the material's origin (outside forest), species, strength, and sustainability status.

iii. **Registered Tree Farming Initiatives**

Departments are encouraged to support registered TOF farming programs, providing resources and training to local communities and ensuring sustainable sourcing practices.

iv. **Support Community-Based TOF Farming with Financial Incentives**

Provide targeted funding and tax rebates to encourage community-based TOF farming programs. These measures will enhance livelihoods, ensure environmental benefits, and boost the availability of sustainable wood products, aligning with national priorities for afforestation and sustainable development.

22. **Initiatives by the Ministry of Environment, Forest and Climate Change (MoEFCC)**

i. **Set up a centralised unit which acts as a Secretariat** to implement and fast track the use of TOF wood-based products in construction sector.

ii. **Strive to streamline and minimize transaction points in the supply chain from farmers to consumers of wood-based products from Trees Outside Forests (TOF)**. Develop a robust supply chain ecosystem by engaging four key stakeholders to reduce transaction costs: (1) producers (maintainers), (2) investors, (3) consumers, and (4) scientific observers (for knowledge development).

iii. **Integrate and develop the National Agriculture Market (eNAM)** for TOF wood-based products so that farmers and producers can access a unified digital marketplace to ensure fair pricing, reduce intermediaries, enhance market reach, and enable transparent and efficient transactions. Develop a system through which investors can directly invest with the farmers (laying the role of producer and maintainers) for the TOF.

iv. **Promotion of Mass Timber as a Sustainable Construction Material**: Ministry of Environment, Forest and Climate Change (MoEF&CC) will serve as the nodal agency for promoting mass timber in collaboration with other stakeholders - Bureau of Indian Standards (BIS), Ministry of Housing and Urban Affairs (MoHUA), Ministry of Rural Development (MoRD), National Bank for Agriculture and Rural Development (NABARD) and Forest Research Institute (FRI).

v. **Branding wood is good**: Launch a national awareness campaign for wide adoption of wood-based TOF product in construction sector by making timber an aspirational product for home builders.

vi. **Carbon Bond, Carbon Currency, and Carbon Certification**: MoEFCC in collaboration with the Bureau of Energy Efficiency (BEE) and the Indian Council of Forestry Research and Education (ICFRE), advocate for the adoption and implementation of carbon bonds, carbon currency, and carbon certification mechanisms including quality assurance to accelerate India's transition towards a low-carbon economy. These instruments are critical to quantifying and monetizing carbon sequestration achieved using wood-based materials from Trees Outside Forests (TOF) in the construction sector.

vii. **Centre for Excellence**: A Centre for Excellence (CoE) for Timber and Wood Use in Construction should be established to serve as a national hub for innovation, research, capacity building, and knowledge dissemination in sustainable construction practices. The Centre will focus on developing advanced technologies for timber and wood-based materials, formulating standards and guidelines, providing technical support to stakeholders, and promoting the adoption of TOF-based products in the construction sector. It will also facilitate partnerships between academia, industry, and government to drive the transition towards low-carbon, eco-friendly building practices, contributing to India's climate goals and sustainable development agenda. The MoEFCC will act as the nodal agency for its establishment, in collaboration with the MoHUA, MoRD, BIS, Institute of Wood Science and Technology (IWST), and other relevant stakeholders.

The CoE to prioritize the dissemination and practical application of existing technical guidelines rather than developing new ones. Focus areas shall include:

a. Creating practical implementation guides

b. Developing case studies of successful applications

c. Providing technical support for implementation

d. Monitoring adoption and gathering feedback for future updates

23. **State Departments of Higher Education, Skill Development, and Urban Planning**

i. **Integrate TOF-Based Curriculum in State-Level Institutions:**

a. Align state university syllabi with national frameworks to include TOF-based materials and sustainable practices in architecture, engineering, and urban planning programs.

b. Promote TOF-based materials in the curriculum of state technical boards and polytechnic institutions.

ii. **Launch Vocational Training Programs:**

a. Collaborate with the Ministry of Skill Development and Entrepreneurship to roll out state-level skill development programs focused on TOF materials handling and processing.

b. Conduct hands-on workshops for students and professionals in partnership with BMTPC and local industry stakeholders.

iii. **Support Faculty and Student Capacity Building:**

a. Provide grants and incentives for faculty to participate in TOF-specific training and workshops.

b. Fund student-led pilot projects that demonstrate the use of TOF products in sustainable construction.

iv. **Promote Adoption through Awareness Campaigns:**

a. Conduct state-level awareness campaigns for local builders, architects, and planners on the environmental and economic benefits of TOF materials.

b. Set up help desks in municipal bodies and development authorities to assist with the integration of TOF-based practices in construction projects.

v. **Encourage State-Specific Research Initiatives:**

a. Establish research grants for state institutions to study the scalability of TOF-based materials in local contexts.

b. Partner with state forest and planning departments to evaluate the impact of TOF materials on sustainable urban and rural development.

Annexure 2

State level policies and relevant documents reviewed with detailed analysis in the seven case study States (Updated as of November 2024)

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Haryana	**Haryana Development of Agroforestry in Community/ Farmlands**: A state-funded scheme aiming to increase tree cover outside forests, encourage agroforestry for crop diversification, and raise woodlots on various lands including Panchayat and private farmlands. It also aims to create shelter belts along highways to reduce pollution and raise seedlings for sale/distribution. **Haryana Forest Policy, 2006**: This policy promotes sustainable wood production and supply for construction, encourages the establishment of Tree Growers Cooperatives, and ensures no restrictions on wood movement within Haryana or neighbouring states. It also emphasizes a focus on TOF products rather than wood from natural forests.	1. Chandigarh Master Plan- Chandigarh Administration- Department of Urban Planning 2. Haryana Building Code- Town and Country Planning Department 3. Felling and Transit Rules- Haryana Forest Department (section-4 of Haryana Land and Preservation Act, 1900 (Punjab Act II of 1900), (Haryana Forest Policy-2006) 4. Wood Based Industries- Haryana Forest Policy-2006- Haryana Forest Department- Deputy Conservator of Forest or Divisional Forest Officer holding the charge of Territorial Forest Division- (verification and licensing), State Level Committee - for registration and licensing,	**Chandigarh Master Plan 2031**: Includes green/ open space land use categorized into organized open space, forest, and agriculture. Mandates a 30-meter-wide plantation and Green Belt along highways to support local agro-biodiversity	**The Haryana Building Code, 2017:** There are no restrictions on the use of timber or wood in construction, adhering to the National Building Code (NBC), 2016, and Haryana Fire Services Act, 2009.	No felling permit is required. However, areas which are governed by Punjab Land Preservation Act (PLPA), 1900 -felling permission is required which is not being done through e-permit. Eucalyptus and Poplar grown under agroforestry in agricultural NO FP required. Eucalyptus and Poplar grown under agroforestry in agricultural- NO FP required	No permit required for timber transit. Eucalyptus and Poplar grown under agroforestry are exempt from regulations under the Punjab Land Preservation Act, 1900. There is no restriction agro-forestry species, and no transit permit is required. Eucalyptus and Poplar grown under agroforestry in agricultural- No TP required. Lands/farmers' fields are exempted from regulations under PLPA 1900. There are no transit regulations for timber in the State and no transit permit is required for transportation.	Wood industries are encouraged to supply certified planting stock and establish buy-back arrangements. Farmers can sell wood in the open market for better prices. Wood industries are encouraged to supply certified planting stock and establish buy-back arrangements. Farmers can sell wood in the open market for better prices. Encourages establishment of regulated timber markets for transparent transactions, benefiting tree growers and wood consumers. Wood from natural forests is not available at concessional rates, focusing industry demand on TOF products instead. Haryana Wood Based Industries (Establishment and Regulation) Rules, 2022. (given in main desk review)

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Odisha	1. Forest Produce Definition: Regulates Forest produce like timber and bamboo from forests; does not specifically address TOF or agroforestry products unless from forest areas. 2. Village and Protected Forests: Allows for the creation and regulation of village and protected forests. 3. Management of Non-Government Forests: Controls private or jointly owned forests for environmental protection. 4. Timber Transit Regulation: Regulates transit and possession of timber, including routes and legal compliance. 5. Protection Measures: Includes prohibitions on land clearing and other protective measures, supporting sustainable forest and TOF use. 6. Acquisition and Management: Government can acquire or manage neglected private forests, potentially.	1. GIS-based Development Plan Bhubaneshwar 2040- Bhubaneshwar Development Authority 2. Odisha Development Authorities (Planning and Building Standards) Rules, 2020- Housing and Urban Development Department-Odisha Development Authority 3. Orissa Timber and Other Forest Produce Transit Rules, 1980 - Forest, Environment and Climate Change Department-The Chief Conservator of Forests (shall notify the routes in the State of Orissa through which forest produce may be imported, exported or moved into from or within the State, Divisional Forest Officer or Assistant Conservator of Forests- issue transit permit 4. THE ORISSA SAWMILLS AND SAW PITS (CONTROL) ACT, 1991 ORISSA ACT- Forest, Environment and Climate Change Department, Divisional Forest Officer or the Licensing Officer	**GIS-based Development Plan Bhubaneshwar 2040** - Emphasizes creating designated green belts, afforestation, and reforestation to enhance urban greenery. Residential zones may permit wood storage yards on special approvals. National Afforestation Programme (NAP) - Focuses on regenerating degraded forests, creating green belts, and enhancing local environmental resilience, particularly in the extended area of Bhubaneswar.	**Odisha Development Authorities (Planning and Building Standards) Rules, 2020** - These rules align with the National Building Code of India, covering structural design and safety for various materials including timber. In specific zones like the Transit Oriented Zone and Mixed-Use Zone, the use of building materials such as timber is regulated to ensure safety and environmental standards.	No clear guidelines on felling permits for trees outside forests were found.	**Orissa Timber and Other Forest Produce Transit Rules, 1980** - These rules govern the transit of forest produce by land, rail, or water, requiring permits issued by authorized forest officials. Exemptions include non-Indian grown timber and specific cut/fashioned timber. Special provisions exist for "Farm Forestry" plantations, except for valuable timber species listed in Schedule II. Regulations also cover import, export, property marks, and checking of forest produce. Penalties for rule violations include imprisonment and fines. All forest produce in transit requires a permit, except for some exemptions. Specific rules for private holdings involve joint verification by Forest and Revenue officials. Special provisions are in place for Farm Forestry plantations, with certain valuable species requiring more stringent transit permits.	**The Orissa Sawmills and Saw Pits (Control) Act, 1991-** 1. The Act requires all sawmills and saw pits to be licensed, regardless of the source of wood they process. 2. It mandates proper accounting of all wood in sawmills and saw pits: all relevant evidence, documents, receipts, order and certificate as are necessary that the wood is legally obtained shall be maintained and made available at the time of inspection." (Section 10(1)) 3. Wood that is not satisfactorily accounted for is presumed to be obtained unlawfully and is liable for confiscation.

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Rajasthan	Rajasthan Forest Act, 1953 Chapter VI: Allows the State Government to levy duties on timber and forest produce. The duties do not affect the purchase money or royalty on the produce. Rajasthan Forest Policy 2023 Vision to increase vegetation cover to 20% by promoting afforestation, agroforestry, and tree planting. Focus on community participation and enhancing tree cover outside recorded forest areas.	1. Jaipur Master Plan-2025- Jaipur Development Authority (Urban Development and Housing Government of Rajasthan) 2. Nagariya Vikas evang Aavasan Vibhag (Urban Development and Housing Department) 3. Rajasthan Forest Produce (Establishment & Regulation of Saw Mills) Rules, 1983- Rajasthan Forest Department; Licensing Officer; A committee consisting of Additional Principal Chief Conservator of Forests, Representative of Ministry of Environment and Forests, GOI not below the rank of Assistant Inspector General of Forests, A representative of a wood handicraft Association in the State, to be nominated by the State Government and Chief Conservator of Forests- for prior approval before grabting the license; Monitoring Committee to assess the exact requirement of saw mills and take effective steps to stop saw mills operating in illegal manner	**Green Belt Plantations**: Emphasis on developing green belts along rivers to protect against encroachments and contamination. **Urban Green Spaces:** Research on urban forests in cities like Jaipur and proposals for increased green cover. **Detailed Development Plans:** Focus on developing green and heritage areas. **Green Recreational Areas:** Proposals for parks and green zones, including buffer zones along railway tracks.	Available in Hindi	The State Government may make rules to regulate felling and removal of trees from reserved forests	Timber and other forest produce are subject to duties as declared by the State Government. Exempts certain species from transit rules (Notification 28.04.2017) Exempts certain timber species from the said rules Rajasthan (Forest Produce) Transit Rules, 1957 and its related amendments	**Rajasthan Forest Produce (Establishment & Regulation of Sawmills) Rules, 1983** Requires legal permits for sawmills. Sawmills must have valid registration and certification of rightful ownership for timber.

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Uttar Pradesh	**Farming linked with global carbon credit market in Uttar Pradesh:** 1. UP government launched an agroforestry project to link farming with the global carbon credit market and generate rural income. 2. The government has joined hands with TERI to launch 6 agroforestry-based carbon finance projects in 29districts of Meerut, Moradabad, Saharanpur, and Lucknow divisions. 3. The state is targeting to increase its green cover from 9.23 per cent to 15 per cent by 2026-27 by expanding forest/ green area by an additional 1.40 MH by planting 1.75 billion trees and promoting agroforestry by farmers. (https://invest.up.gov.in/wp-content/uploads/2023/04/farming_240423.pdf) **Vision_2030-** **Under the National Agriculture Mission.** The Vision 2030 initiative under the National Agriculture Mission in Uttar Pradesh is part of the state's broader Sustainable Development Goals (SDGs) agenda. This mission aims to promote sustainable agriculture practices to ensure food security, improve livelihoods, and address climate change impacts. Agroforestry- By 2020- 4 Crore seedlings @ 1 crore seedlings to be planted every year; By 2024- 8crore seedlings @ 1 crore seedlings to be planted every year; By 2030- 14crore seedlings @ 1 crore seedlings to be planted every year. Talks about Forest certification to add value and improve marketability of quality timber. Promoting agriculture based industries in order to make landless labour self-dependent and decrease dependency on agriculture. Talks about Raise additional finances through enhanced royalty from sale of timber harvested from certified forest areas and other value additions.	1. Lucknow Master Plan- Under the Department of Housing & Urban Planning, Government of Uttar Pradesh (India) 2. Uttar Pradesh Tree Preservation Act, 1976 and UP Timber and otherForest Produce Transit Rules, 1978- Environment, Forest and Climate Change Department 3. The U.P. Transit of Timber and Other Forest Produce Rules, 1978: Officers Authorized to Issue Passes: a) Government-Owned or Unowned Forest Produce: Conservator of Forest, Divisional Forest Officer, Sub-Divisional Forest Officer, or other authorized officers. b) Forest Produce Owned by Others (Within 80 km of Reserved Forest): Owner or agent with authorization from the Divisional Forest Officer (DFO). c) Requires application (Schedule 'B'), DFO inquiry, transit fees, specified validity period, route, and checkpoints. d) DFO/Conservator may modify or cancel passes. e) Forest Produce Owned by Others (Outside 80 km of Reserved Forest):	Lucknow Master Plan- not accessible- Available in Hindi	Available in Hindi	**Uttar Pradesh Tree Preservation Act, 1976 and UP Timber and other Forest Produce Transit Rules, 1978-** As per the Tree Protection Act 1976, all tree species on arable holdings or intractable except 16 (of which only 10 tree species are found naturally in the state) in 46 districts (excluding the three tehsils) are exempted for cutting IE. There is no need of permission for felling them. In 24 districts and in three tehsils of the state trees located on personal aerable or intractable holdings there is no need to permission for 27 tree species for felling. For felling of trees or for removal of fallen trees the applicant should submit his land ownership (where the tree is located) an application to the competent authority with evidence. Selection of tree species in Agro Forestry should be made keeping in mind the suitability of the soil and the environment. For benefits in short term species like Popplar, Eucalyptus, Acacia, Bamboo, and Kadamb and for	No Transit Permit required (proposed). (Except 5 tree spp. In 62 districts and 7 tree spp. In 13 districts)	Wood- Based Industry Licensing System- Available in Hindi

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Uttar Pradesh	**Social Forestry Schemes:** Funded by State Government- plantation carried out on various type of community land, canals, rail, and on land available on road side to ensure availability of timber , fuel wood, fodder, small forest produce etc., in rural areas of all districts in the state.	Owner or agent with authorization from DFO or Block Development Officer, subject to verification of exempt species. 4. Vision 2030- Planning Department, Government of Uttar Pradesh			benefits in long term species like Teak, Rosewood should be planted.		
Tamil Nadu	**State Forest Policy 2018:** 1. Extension centres will expand to block levels, supporting tree growers' cooperatives and promoting tree farming with multiple key players. 2. State will liberalize restrictions on tree growing, felling, transport, and marketing. 3. Felling and transit rules on private lands will apply only to endangered and valuable species, except in areas under specific Acts. 4. Planting of suitable tree species as road avenues and tree parks will be promoted. 5. Forest-based industries encouraged to promote contract farming on private lands with buy-back agreements involving farmers and bankers. 6. Encourage small and marginal farmers to grow tree species for industries on marginal/ degraded lands and community lands with local consent. **Green Tamil Nadu Mission:** 1. Aims to increase the state's tree and forest cover. 2. It covers land categories such as Fram lands, Coastal areas, Govt lands, Private lands, Fallow lands, Degraded Forest etc.	1. Chennai Master Plan: Chennai Metropolitan Development Authority 2. Chennai Building Byelaws: Chennai Metropolitan Development Authority 3. State Forest Policy 2018: Government of Tamil Nadu- Environment and Forest Department. 4. Green Tamil Nadu Mission: Tamil Nadu Forest Department 5. Tamil Nadu Regulation of Wood Based Industries Rules, 2010- Environment and Forest Department; Licencing Officer" means the District Forest Officer or Wildlife Warden or Deputy Director of Tiger Reserve or Divisional Forest	**Chennai Master Plan 2026 Environment:** Regulations promote green building and increased greenery in all developments. Greening includes tree planting in public/private spaces, tree protection, and biodiversity enhancement through action plans. Local bodies must implement tree planting along public roads and within premises, increasing green cover and open spaces from 2.09% to 5.68%. **Development Plan:**	NBC and BIS standards are used **IS: 883:1994 "Code of Practice for Design of Structural Timber in Building"**	Information not received	36 species exempted. Further Silver oak in Nilgiri & Yercaud hills by coffee grower exempted.	**Tamil Nadu Regulation of Wood Based Industries Rules, 2010:** 1. Licensing Requirement: All wood-based industries must have a license to operate. 2. Exemptions: No license needed for industries using: 3. Sawn timber, cane, bamboo, reed, plywood, veneers, or imported wood from legitimate sources. 4.Products like blackboard, MDF, or similar wood-based items from legitimate sources. 5.Round logs from agroforestry/agricultural crops exempted from felling/transit rules, sourced legally. 6.Special approval allows circular saws up to 60 cm; such industries must register with the Forest Department. State Level Committee Functions: a. Timber Assessment: Study timber demand and supply
Tamil Nadu	3. Community/ peoples programme- NGOs, trusts, and other firms are part of this programme which will give wider publicity and community participation- proper handholding of farmers will be done for proper follow up will be done enabling timber market linkage 4. Carbon credit mechanism and its potential to generate income will be linked to plantations.	Officer having territorial jurisdiction over the area in the district; Any forest officer not below the rank of 'Forester' may, at any time, enter the premises of any Wood based industry unit with a view to ascertain the genuineness of the licence or to check legality of the timber kept in the premises of Wood based industry or to verify the records to be maintained.	15-meter green belts are reserved along National Highways (Poonamallee and Red Hills Bypass Roads), allowing only gate pillars and watchman booths. Wooden and steel furniture are classified as green industries. Designation of public recreational spaces, parks, and playgrounds.				b. Industry Approval: Approve licenses or expansions based on the availability of legal timber, including TOF. c. Afforestation Funding: Ensure funds from industries are used for tree planting and restoration. d. Recommendations: Provide advice on forestry matters referred by the government. 7.Compliance: Licensees must adhere to Tamil Nadu Timber Transit Rules, 1968, ensuring proper transit permits and delivery challans for timber handling.

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Andhra Pradesh	**APWALTA 2002** 1. Tree Felling Permission: Requires replanting of 2 trees within 30 days. 2. Penalties: Imposed for unlawful tree felling. 3. Compulsory Plantation: Local authorities must mandate tree planting in building plans. 4. Public & Private Premises: Must adopt tree plantation and landscaping. 5. Ownership: Urban public area trees owned by local authorities. 6. Felling Restrictions: No tree or branch removal without permission; requires replanting or compensation. 7. Planting Rules: Tree planting requirements based on area size for residential and commercial premises, e.g., 3 trees for under 100 sqm residential; 2 trees for under 200 sqm commercial.	1. Amravati Master Plan: Andhra Pradesh Capital Region Development Authority 2. Model Building Bye Laws 2016 of GoI – Andhra Pradesh Building Rules, 2017 – Orders – Issued: Municipal Administration and Urban Development Department 3. Andhra Pradesh Preservation of Private Forest Rules, 1978: Forests and Rural Department- District Collector may permit cutting of bamboos with	Amravati Master Plan- Talks about open spaces and recreation areas (Not Available)	1. At least 1m greenery/lawn along the site frontage within the front setback. 2. For plots above 300 sq.m: add a 1m green strip along the periphery. 3. For plots above 750 sq.m: develop 5% of the site as organized open space (min. 3m width, 15 sq.m per location) for greenery or landscaping.	**Andhra Pradesh Preservation of Private Forest Rules, 1978:** 1. Private Forest: Forest area on patta land is considered a private forest. 2. Prohibited Trees: No permission to fell 10 species listed in Schedule I. 3. Reserved Trees: Permission required to cut reserved trees only if they exceed 120 cm girth and 1.3 m height.(12 species in Schedule II) 4. Bamboo Cutting: District Collector may permit cutting	1. As per the **Andhra Pradesh Forest Produce Transit Rules, 1970**, no forest produce can be moved into or from or within any area in the State of Andhra Pradesh without a pass issued by the Divisional Forest Officer of that area or any person duly authorised by him. 2. Timber over 25 cm girth and 1 m length (except sawn timber) cannot be moved into, from, or within Andhra Pradesh without	**Andhra Pradesh Sawmill (Regulation) Rules, 1969:** License Required: Must obtain from the Divisional Forest Officer. Application Fees: 1 year: Rs 1000 2 years: Rs 2000 3 years: Rs 3000 Timber Requirements: Must have property marks and transit permits; applies to timber within 5 meters of sawmill premises.

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Andhra Pradesh	**Andhra Pradesh Forest Act 1967-** 1. *Chapter IIIA: Preservation of Private Forests (Sections 28A-28G)*- Prohibits sale, mortgage, lease, or alienation of private forests/forest produce without District Collector's permission. Exempts non-timber produce if customary. Restricts tree cutting or forest denuding without permission, except for domestic/agricultural use with limits. *Chapter IV: Control of Timber and Other Forest Produce in Transit or Possession (Sections 29-31)*- Section 29: Rules for transit and possession of timber and forest produce; Specifies transit routes and permits; Establishes depots, checkpoints, and compliance measures; Regulates timber storage and floating near riverbanks. Section 37:Timber adrift, stranded, or with altered marks is government property until proven otherwise and can be collected by forest officers.	conditions set in consultation with the Divisional Forest Officer; If permission is granted, the Divisional Forest Officer handles cutting, transport, and sale of specified trees as per State Government orders; Proceeds after costs and regeneration charges are deposited in a joint account of the landowner and Project Officer, Integrated Tribal Development Agency, or authorized officer by the District Collector. 4. Patta Lands – removal of timber and other produce from patta lands – consolidated guidelines: Government Of Andhra Pradesh Forest Department; Divisional Forest Officer or [any subordinate officer authorized by him]- inspection and permit; Timber and firewood are physically verified by FSO, FRO, and Sub-DFO/DFO, with checks ranging from 10% to 100% depending on the officer's role and the area size. 5. Andhra Pradesh Sawmill (Regulation) Rules, 1969: Telangana Forest Department- License to be obtained from Divisional Forest Officer.		4. Penalty of 10% additional Property Tax if greenery/ lawns are not maintained. 5. 10% of the site must be organized open space (greenery) beyond mandatory setbacks, accessible to the community. 6. 2m wide green planting strip required on all sides within setbacks. 7. Green Building (Chapter 15) Talks about use of bamboo and rapidly growing plantation timbers- environmental benefits	of bamboos with conditions set in consultation with the Divisional Forest Officer. 5. Tribal Use: No permission needed for local tribals to cut and remove trees (except reserved/ prohibited) for their domestic needs. 6. Permission and Sale: If permission is granted, the Divisional Forest Officer handles cutting, transport, and sale of specified trees as per State Government orders. 7. Revenue Management: Proceeds after costs and regeneration charges are deposited in a joint account of the landowner and Project Officer, Integrated Tribal Development Agency, or authorized officer by the District Collector. **Patta Lands – removal of timber and other produce from patta lands – consolidated guidelines** Felling Rules for Timber from Patta Lands Application Process: •Individuals intending to fell and transport timber from patta lands must apply to the Territorial Divisional Forest Officer (DFO) using the prescribed proforma,	a Government transit mark and accompanying permit. 3. Ownership of non-government timber moved within the state must be indicated by a separate registered property mark with the Divisional Forest Officer. 4. Area wise 20 spp exempted. **Patta Lands – removal of timber and other produce from patta lands – consolidated guidelines** Transit Rules for Timber from Patta Lands Application Process: *Storage and Transport:* 1. Timber and firewood must be stored at the extraction site, with no intermediate depots allowed without special permission. 2. Transit permits are issued by the FSO or Forester once the timber is loaded onto transport vehicles. 3. The FRO submits a completion report to the DFO detailing the produce transported and permits utilized, with copies sent to higher authorities if necessary. *Issuance and Monitoring of Transit Permits* Issuance:	

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Andhra Pradesh					including all relevant information and certification of title to patta produce. Verification and Enumeration: •Upon receipt of the application, the DFO examines the documents, especially the 'MRO's Certificate of Title on Patta Produce,' as required under Rule 5(3) of the A.P. Forest Produce (Transit) Rules 1970. •Field verification is conducted to ensure the patta land's location and extent, confirming it lies outside Reserved Forests (RF). •Tree enumeration is done by the applicant, verified 100% by a Forest Section Officer (FSO), 10% by the Forest Range Officer (FRO), and if the area exceeds 2 hectares, 10% by the Sub-DFO or DFO. Felling and Post-Felling Procedures: •After verification, the DFO grants felling permission, specifying a time limit for execution. •The landowner prepares a list of felled timber, categorizing by species, and submits it to the FRO. •Timber and firewood are physically verified by FSO, FRO, and Sub-DFO/DFO, with checks ranging from 10% to 100% depending on the officer's role and the area size.	Transit permits must be written in triplicate, with original copies accompanying the vehicle, duplicates sent to the DFO within 48 hours, and triplicates retained for records. Permits are issued by the DFO upon recommendation from the FRO, following verification of the materials. The validity period of permits is minimized to ensure proper control. Monitoring: Separate registers are maintained to record the details of transit permits issued, tracking the quantity of produce and other relevant information.	

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Assam	**Assam Trees Outside Forest (Sustainable Management) Rules 2022** **1.** Transparent mechanism – online platform for registration of trees (before 5 years old), trade permit and passes 2. Time bound permissions 3. Convergence of the government agencies 4. Streamlining the process for felling and transportation of identified tree species (70) **The Assam Sale of Forest Produce Coupes and Mahals rules, 1977** Framework for auction, management, and sale of forest produce	1. Master Plan of Guwahati 2025: Guwahati Development Department 2. Assam Trees Outside Forest (Sustainable Management) Rules 2022: Forest and Environment Department- Divisional Forest Officer to issue Certificate of Origin, Plantation Registering Authority or the Divisional Forest Officer. 3. The Assam Sale of Forest Coupes and Mahals rules, 1977: Government Of Assam Environment & Forest Department 4. The Assam Unified Building Construction (Regulation) Bye Laws 2022- Department of Housing and Urban Affairs 5. Assam (Control of Felling and Removal of Trees from Non-Forest Lands) Rules, 2002: Department of Idustries and Commerce- Tree plantation registration and regulation of violation done by the Divisional Forest Officer	No specific mention of promotion of trees in urban land management a. **Mater Plan for Guwahati 2025** Provision of green corridor, green belts, recreational greens and forest basins Forest, Botanical Garden, Green House are permissible activity in Land use - Green Belt (Recreational and Open Space) b. **Master Plan for Dibrugarh 2045** Wood based Industry and its export data Green areas, recreational and agricultural land use identified in both urban and rural Dibrugarh	**The Assam Unified Building Construction (Regulation) Bye Laws 2022 promotes timber and wood-based products** 1. Structural- foundation, truss (wall posts) and roof structure 2. Non- Structural- wattle crate wall, flooring, wall cladding, panelling, ceiling, partition walls, door, windows, etc. (as per BIS and NBC codes referred) 3. Green Building Certification- NBC, 2016; ECBC (commercial) and Eco Niwas Samhita 2018 (residential)	**Assam (Control of Felling and Removal of Trees from Non-Forest Lands) Rules, 2002:** For felling and conversion of trees of the following species from non-forest areas, no felling permission is required from the Forest Department- Aam, Jamun, Kathal, Eucalyptus, Poplar, all species of home grown bamboo, Leteku, Paniol and Madhurian. Permission for felling of trees for self-consumption shall normally be granted within 30 days from the date of receipt of application, complete in all respects, by the Divisional Forest Officer. In such cases no Transit Pass shall be issued against the operated trees. permission for felling trees in other cases shall normally be granted within 60 days from the date of receipt of applications. in case of registered plantations, felling permission shall normally be granted within 30 days. The transit of timber from non-forest land shall be regulated as per the provisions of relevant accts/ rules/ regulations/ guidelines regarding movement of timber or timber products.	1. Transportation of Outturn within the State of Assam may be undertaken on the strength of the Certificate of Origin 2. In case any outturn is required to be moved out of the state, within North-East India, the owner shall have to apply to the Divisional Forest Officer concerned for water-marked Transit Pass. 3. In case any outturn is required to be moved out of the Nort-East India, the same shall be permitted only by the Railways as per the direction or guidelines of the Hon'ble Supreme Court of India and/or any order, notification, guideline as issued by the Ministry of Environment and Forest and Climate Change, Government of Inida time to time. 4. Transit of timber, operated under these rules, to outside the State shall be governed as per the provisions contained under Assam Forest Regulation 1981 or Rules made there under and the directions	**Assam Wood Based Industries (Promotion and Development) Rules 2022**: 1. State Level Committee 2. License (grant, renewal and revocation), estimation of annual wood requirement, location etc.

State	Policies and Description	Institutional Mapping	Master Plans	Building Byelaws	Felling Rules	Transit Rules	Wood-based industries policies
Assam		6. Assam Wood Based Industries (Promotion and Development) Rules 2022:Environment and Forest Department- Divisional Forest Officer or the Licensing Authority; Nodal Officer is the Member- Secretary of the State Level Committe constituted as per these rules; Principal Chief Conservator of Forests and Head of Forest Force means a Forest Officer of the rank of Principal Conservator of Forest designated by Government of Assam; Registration Committee for disposing the application for grant or renewal of registration certificate for Secondary Wood Based Industries.				of the Hon'ble Supreme Court of India issued in WP(C)202/1995; 171/1996 and in any other matter ancillary and incidental thereto and the guidelines/ orders issued by the Ministry of Environment, Forest and Climate Change and Director General Foreign Trade, Government of India in this regard.	

Annexure 3

Best Practices for TOF in the Seven Case Study States

State	Best Practice	Associated Policy
Haryana	Promoting agroforestry for crop diversification and building woodlots on Panchayat and private lands. Buy-back arrangements guarantee farmers competitive prices for agroforestry products.	Haryana Development of Agroforestry in Community/ Farmlands Scheme; Haryana Forest Policy, 2006
Odisha	Integration of green spaces in urban planning and allowing residential zones to permit wood storage yards on special approval through the GIS-based Bhubaneshwar Development Plan 2040, supporting the storage and use of TOF products.	Bhubaneshwar Development Plan 2040
Uttar Pradesh	Agroforestry projects aligned with carbon credit markets to enhance green cover and generate rural income. Ambitious goal of planting 1.75 billion trees by 2026-27 and distributing 14 crore seedlings by 2030 Under the Social Forestry Schemes, funded by the state government, plantations to be carried out on various types of community land, canals, rail, roadside land to ensure availability of timber, fuel wood etc in rural areas of all districts in the state.	Vision 2030 and SDGs for Agroforestry Social Forestry Schemes
Tamil Nadu	Promotion of contract farming models and buy-back arrangements with forest-based industries, fostering rural livelihoods through agroforestry. Round logs from agroforestry exempted from felling/ transit rules, sourced legally	State Forest Policy 2018; Green Tamil Nadu Mission Tamil Nadu Regulation of Wood Based Industries Rules, 2010
Andhra Pradesh	Mandatory replanting under APWALTA 2002 and urban greenery initiatives through the Amravati Master Plan, aligning environmental goals with construction practices.	Andhra Pradesh Water, Land, and Trees Act (APWALTA), 2002; Amravati Master Plan
Rajasthan	Vision to increase vegetation cover to 20% by promoting afforestation, agroforestry, and tree planting. Focus on community participation and enhancing tree cover outside recorded Forest Expansion of green infrastructure through the Jaipur Master Plan 2025 and focus on using materials like timber and bamboo in green belts.	Rajasthan Forest Policy 2023; Jaipur Master Plan 2025
Assam	Streamlined digital platform for tree registration, felling permits, and trade through Assam Trees Outside Forest (Sustainable Management) Rules, 2022.	Assam Trees Outside Forest (Sustainable Management) Rules, 2022

Annexure 4

List of Participants in the Consultation Workshop on Revising Building Codes and Evolving Strategies to Enhance Demand for TOF – based Products in India's Construction Sector

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1	Shri Subhash Yadav	Addl. CEO (Urban Environment)	Gurugram Metropolitan Development Authority, Government of Haryana
2	Dr. Jitendra Das	Consultant	Former Director General, Foundation for Organisational Research and Education, New Delhi (FORE)/ FORE School of Management, New Delhi
3	Dr. T R Manoharan	Visiting Faculty, SPA Delhi Sustainability Professional, Freelance Ex- Senior Advisor Forest Stewardship Council	School of Planning and Architecture, New Delhi
4	Ms. Laia Domenech	Environment Officer	USAID
5	Mr. Autif Sayyed	Project Lead for Green Buildings- South Asia	International Finance Corporation (IFC), Mumbai, India
6	Mr. Jagan Shah	CEO	The Infravision Foundation
7	Mr. Raju Sood	Associate Chief of Party-TOFI Program	CIFOR-ICRAF
8	Dr. Priyanka Kochhar	Project Lead and Green Development Expert	The Infravision Foundation
9	Ms. Sakshi Gaur	Assistant Chief of Party- TOF Program	CIFOR- ICRAG
10	Dr. Mutum Chaobisana	Head Of Programs	The Infravision Foundation
11	Dr. Babita Bohra	Gender Equality and Social Inclusion Coordinator-TOFI Program	CIFOR-ICRAF
12	Dr. Amitava Sil	Scientist	The Institute of Wood Science and Technology (IWST) Kolkata
13	Dr. Naveen Bali	Vice President	IORA Ecological Solutions
14	Mr. Arish Syed	Director- Digital Health & Partnerships	Tattva Foundation
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17	Dr. Pradeep Vasishth	AVP, IBCC	NABCONS
18	Dr. Rashi Gupta	Assistant Professor	University school of Architecture Planning IP University
19	Mr. Kshitij Mehra	Architect / Planner	INSYNC Design, Delhi
20	Prof. Supratic Gupta	Professor, Group: Construction, Engineering & Management	Indian Institute of Technology, Delhi
21	Ms. Prachi Kagzi	Director	Megamet Steels Pvt Ltd, Mumbai
22	Ms. Shikha Gupta	Senior Consultant-Procurement Expert (Government & Infrastructure Advisory)	India Infrastructure Finance Company Limited (IIFCL) Projects Ltd
23	Ms. Deepshikha Sinha	Program Associate	National Institute of Urban Affairs (NIUA), Delhi
24	Mr. Jayesh Bhatia	Managing Director	Intellecap, Delhi
25	Ms. Manisha Kumari	Senior Consultant	PWC
26	Dr. Irina Das Sarkar	Assistant Manager	IORA Ecological Solutions
27	Ms. Alisha Seth	State Associate	CIFOR-ICRAF
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29	Mr. Spandan Chattopadhyay	Consultant	CIFOR-ICRAF
30	Mr. Sushil Kumar	Consultant	CIFOR-ICRAF
31	Mr. Saurabh Kumar	Program Associate	CIFOR-ICRAF
32	Ms. Mudita Shukla	Consultant	CIFOR-ICRAF
33	Ms. Tanushri Sharma	Program Associate	CIFOR-ICRAF
34	Mr. Lawrence Cardoza	Research Associate	The Infravision Foundation
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