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SUMMARY REPORT OF THE FEASIBILITY STUDY ON THE PROMOTION OF USE OF TIMBER IN CONSTRUCTION

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EXECUTIVE SUMMARY

This collaboration between Trade & Industrial Policy Strategies (TIPS) and the Department of Trade, Industry and Competition (the dtic) signified a pivotal initiative to conduct a comprehensive feasibility study on promoting timber use in South African construction. The study, rooted in the dispelling of myths, accentuating benefits, and bridging knowledge gaps among professionals, aimed to contribute significantly to the growth of a sustainable construction industry.

Timber, which has historical significance in South African construction, faces perceptions such as availability, cost, durability, and fire resistance, limiting its widespread use. The feasibility study addressed these challenges, advocated for timber adoption, and aligned with global sustainability trends. Timber's renewability, carbon sequestration, and prefabrication potential make it an attractive and environmentally conscious alternative. Despite recognition from the South African Government, misconceptions about durability and fire resistance persist, requiring dispelling for widespread adoption.

As early adopters, architects are well-positioned to champion timber construction due to their openness to innovation, sustainability focus, and influence on design trends. According to the diffusion of innovations theory, developed by Everett Rogers in 1962, architects' endorsement can encourage more cautious property developers to adopt timber. Private property developers dominate 70% of the South African property market and are primarily motivated by profitability. However, timber's benefits – such as reduced construction time, cost savings, and eco-friendly appeal – could eventually attract them, particularly in residential estate developments. Engaging architects early through successful timber projects and training is crucial to accelerating timber construction adoption in South Africa.

The feasibility study adopted a mixed-method research approach, combining literature surveys, stakeholder engagement, interviews, specialist reports, and action research. These methodologies facilitated a comprehensive understanding of challenges and opportunities in promoting timber in South African construction. The study amalgamated existing knowledge, stakeholder insights, and practical testing through action research to formulate a strategy for enhancing timber usage in construction.

The Capacity Building Deliverable focused on training programmes to promote timber construction, emphasising collaboration between industry and academia. Initiatives like the Wood App, Talking Timber Webinars, and various courses aim to cultivate a wood-building culture aligned with sustainability goals. Universities that provide programmes for Civil Engineering, Architecture, Wood Science, Engineering Management and Construction Management can already provide postgraduate qualifications to students that focus their research on timber construction related topics. The report also delineated a structured approach for creating South African Qualifications Authority (SAQA) approved timber design and construction training programmes in the long term. However, it is recommended that this should be considered as a long-term initiative since South Africa has existing graduate and postgraduate programmes that can be leveraged. TVET (Technical and Vocational Education and Training) colleges can play a pivotal role in promoting timber construction in South Africa. It is important to note that most TVET colleges in South Africa already include timber construction elements in their carpentry and construction programmes. This means that the foundational training infrastructure is in place, and there is no immediate need to develop entirely new programmes. Instead, the focus should be on enhancing and expanding existing programmes.

A survey involving over 1 100 stakeholders assessed perceptions of timber construction, revealing a positive bias but identifying perceived barriers such as cost and safety standards. The survey also

illustrated that people with timber construction experience, or who are connected to someone with timber construction experience, has a more positive perception towards timber construction.

The Demand Creation Deliverable argues that increasing the demand for timber construction is a multi-faceted problem that can be solved through various activities. However, the diffusion of innovations theory proposes that efforts should be focused on influencing the influencers (or the "Visionaries"). Architects and specifically the architectural schools and institutes have been identified as critical partners. Furthermore, the Demand Creation Deliverable outlined strategies, including an Awareness Campaign and Communication Model through social media and the Timber Construction Conference. Recommendations included making the conference an annual event and leveraging social media platforms for targeted audience engagement and community building. The report also explains how the Environmental Impact Assessment regulations can be used to promote timber construction.

Sections of the study focused on timber's potential in addressing South Africa's housing challenges, reviewing structural design codes and regulations, assessing carbon emissions tax implications, examining fibre supply, and exploring debt financing and cost competitiveness. The findings underlined the role of timber in providing sustainable, cost-effective housing solutions and its competitive edge in construction.

A detailed outline of short- to medium-term actions highlighted initiatives like the Timber Design Competition, Timber Construction Conference, Timber Research Colloquium, Wood App development, practical training courses, webinars, and social media activities. Budget allocations, current statuses, and outcomes were provided for each action, emphasising ongoing progress and planning. It is proposed that initial efforts should focus on Architects since they will most likely be the "Visionaries" required to bring about the change.

Strategic long-term actions encompassed revising regulations, harmonising building by-laws, workforce re-education, innovation promotion, leveraging Government buying power, supporting local industries, aligning with sustainability goals, public awareness, environmental considerations, regular review of by-laws, enforcement, education, skills development, material sourcing, streamlined regulations, valuation standards, government support, insurance tailoring, and technical guidance. These actions aim to create an environment conducive to timber use through policy changes, education, and collaboration.

A comprehensive approach is necessary to address South Africa's housing shortage while promoting sustainable development. This involves boosting the demand for timber construction, strengthening timber supply chains, and integrating lessons from global practices, as outlined in the Confederation of Timber Industries (2023) report on barriers and incentives to timber construction. Together, these strategies can transform the housing sector and contribute to South Africa's long-term sustainability goals.

To increase the demand for timber construction, various challenges must be overcome, including resistance within the construction industry and misconceptions about timber's suitability. Encouraging innovation and research is key to countering this resistance, alongside educating the public on timber's cost-effectiveness, safety, and environmental benefits. Highlighting the cost-competitiveness of timber systems in comparison to traditional materials can address financial concerns, while accurate information on timber's fire safety and structural integrity can shift perceptions in its favour.

Equally important is ensuring a sustainable and steady timber supply. Expanding productive forestry through streamlined processes and sustainable management practices will enhance domestic supply. Promoting a circular economy in wood products further supports sustainability by reducing waste and

sequestering carbon. Collaborating with international timber-producing nations such as Sweden and Finland can also mitigate supply risks through diversification.

Lessons from countries such as the United Kingdom (UK) provide valuable insights into refining timber construction practices in South Africa. Tailoring regulations to specific timber systems, distinguishing between structural elements and cladding materials, and adopting a systems-led approach to building safety are all critical measures. Emphasising timber's proven fire safety record will also help solidify its role in the construction sector.

By adopting these strategies, South Africa can transition towards sustainable construction, reducing carbon emissions, enhancing resource efficiency, creating jobs, and aligning with environmental goals, ultimately addressing the housing crisis and building a resilient future.

In conclusion, the feasibility study represents a multifaceted and collaborative effort towards advancing timber construction in South Africa. It emphasises the significance of training programmes, collaboration between industry and academia, and various initiatives to promote timber construction. The report showcases innovative initiatives such as the 2023 Timber Design Competition and Engineered Wood Products research collaboration. The journey encompasses training, research, awareness, and financial strategies with the overarching goal of fostering a sustainable and innovative construction industry with timber at its core.

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ABBREVIATIONS

ABT	Alternative Building Technologies
CAHF	Centre for Affordable Housing Finance in Africa
CSIR	Council for Scientific and Industrial Research
DPW	Department of Public Works
EIA	Environmental Impact Assessment
EWP	Engineered Wood Products
FBIC	Forestry Bioeconomy Innovation Cluster
FP&M SETA	Fibre Processing and Manufacturing Education and Training Authority
GBCSA	Green Building Council of South Africa
GDP	Gross Domestic Product
I&APs	Interested and Affected Parties
IF	Infrastructure Fund
ISA	Infrastructure South Africa
ITC-SA	Institute for Timber Construction South Africa
KPIs	Key Performance Indicators
NEMA	National Environmental Management Act
NHBRC	National Home Builders Registration Council
PPP	Purchase Power Parity
the dtic	Department of Trade, Industry and Competition (the dtic)
R&D	Research and Development
SABS	South African Bureau of Standards
SANS	South African National Standards
SAQA	South African Qualifications Authority
SAWPA	South African Wood Preservers Association
SDGs	Sustainable Development Goals
TIPS	Trade & Industrial Policy Strategies
TVET	Technical and Vocational Education and Training
UK	United Kingdom
UP	University of Pretoria
WEPs	Wood Encouragement Policies

1. INTRODUCTION

Timber has a rich historical presence in South African construction dating back to the 17th century. However, its broader use has been constrained by factors such as availability, cost, durability concerns, and fire resistance issues. To address these challenges and promote timber as a sustainable building material, this feasibility study aims to contribute to the evolution of the local construction industry by fostering informed decision-making and advocating for timber adoption.

Timber is witnessing a resurgence as a sustainable alternative to traditional materials like concrete and steel, offering performance, affordability, and environmental advantages. Its renewability and capacity to sequester carbon make it valuable for reducing the construction sector's carbon footprint. Timber's lightweight and prefabrication-friendly qualities also offer potential for sustainable construction practices in urban areas.

Globally, advancements in engineered timber products, regulatory changes, and government initiatives have facilitated timber's use in construction. In South Africa, the Government recognises the potential of timber as a local construction material and aims to increase the national forest cover. However, misconceptions about timber's durability and fire resistance must be dispelled to foster its widespread adoption.

South Africa is experiencing a growing interest in timber due to environmental awareness and sustainability goals. Timber's renewable nature and reduced greenhouse gas emissions align with sustainable construction practices. Various organisations in South Africa actively promote timber use in construction and offer guidance, training, and information. Compliance with building regulations and standards is crucial for properly using timber in construction.

In conclusion, this feasibility study explored the potential of promoting timber in South African construction by addressing challenges and leveraging benefits. It emphasised Capacity Building and Demand Creation Deliverables to unlock timber's environmental, economic, and social benefits in various construction industries.

2. CONTEXTUAL BACKGROUND

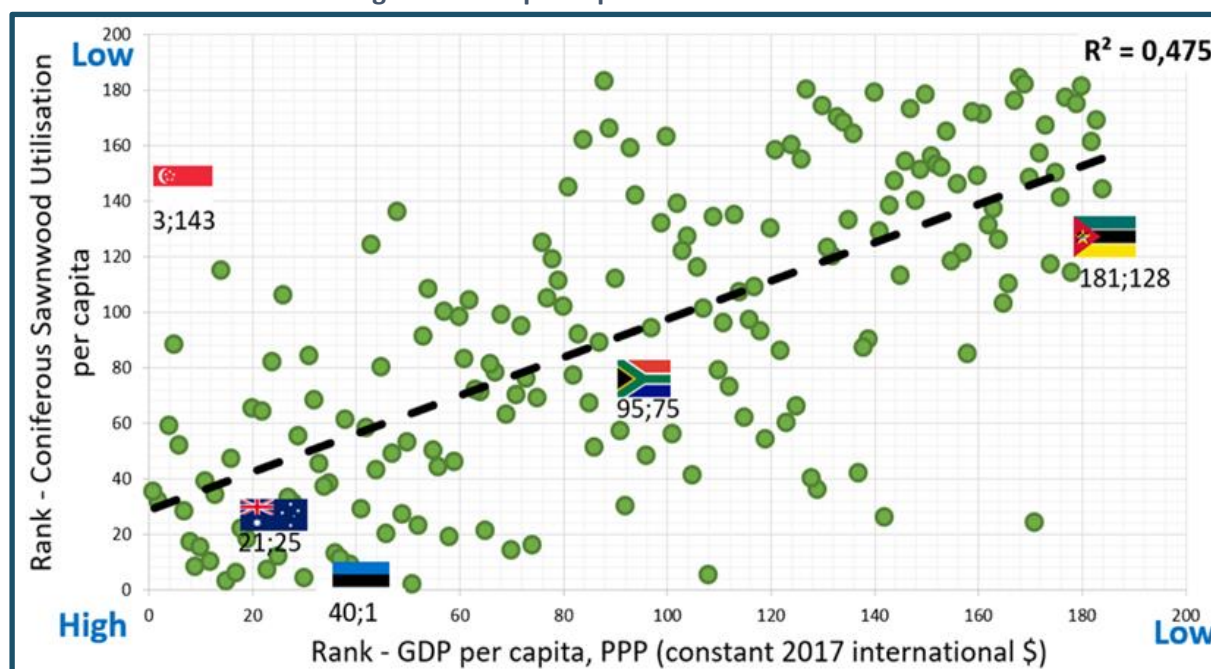
Despite its environmental advantages, the widespread adoption of timber has been hampered by regulatory, economic, and cultural barriers. An analytical approach and datasets are included to effectively frame the study and highlight key trends influencing timber adoption. The following sections discuss the insights derived from a Spearman correlation analysis and the role of architects as early adopters and trendsetters in the construction industry.

Coniferous sawnwood utilisation vs GDP per capita

One critical aspect of understanding timber adoption in South Africa is its economic viability relative to national income. A Spearman correlation test graph is presented to compare the utilisation of coniferous sawnwood against GDP per capita at Purchase Power Parity (PPP) across various countries. This correlation aims to determine whether there is a significant relationship between a country's economic status and its use of timber in construction.

Figure 1 demonstrates that higher GDP per capita often correlates with greater timber usage in construction, particularly in developed economies where timber is considered a premium, sustainable material. Conversely, timber is often underutilised in lower-middle-income countries, including South Africa, primarily due to higher perceived costs and limited awareness of its benefits. This insight supports the need for targeted policy interventions and awareness campaigns to reposition timber as an accessible and attractive material choice for South African builders.

Figure 1: GDP per capita vs wood utilisation



Note: Spearman Correlation; 184 Countries; p-value $+2,9 \times 10^{-27}$, thus p-value $< 0,05$; thus statistically significant.

Source: Data source from The World Bank and FAOSTAT.

Architects as innovators and early adopters in timber construction

Architects are often seen as the driving force of innovation within the construction industry. Their ability to influence design trends and material choices makes them ideal advocates for promoting timber construction. According to Investopedia, early adopters – those who embrace new technologies and innovations ahead of the market—are characterised by their vision, willingness to experiment, and desire to maintain a competitive edge. These qualities align closely with the personality traits typically found in architects (Kenton, 2022).

Rethinking The Future details the characteristics that architects should have, including problem-solving abilities, and strong sense of aesthetics (RTF, n.d.). Knowledge of sustainability and design positions them as key players in advocating for timber as a construction material. Timber's versatility and environmental benefits can align well with architects' professional values, making them suitable partners in any strategy to promote timber adoption.

Everett Rogers' Diffusion of Innovations Theory¹ divides individuals into five groups based on how quickly they adopt new ideas: innovators, early adopters, early majority, late majority, and laggards. When promoting timber construction in South Africa, it is crucial to target architects first, as many of them fall into the early adopter category. These early adopters are often seen as opinion leaders whose choices can significantly influence others in the value chain. Architects, with their creativity and openness to new ideas, are well-positioned to embrace timber as a sustainable and versatile building material.

Architects shape the vision for construction projects and can influence property developers. Their enthusiasm for timber could lead developers to recognise the benefits of this material. Architects are motivated to adopt timber for its environmental advantages, design flexibility, and potential to

¹ How new technological and other advancements spread through societies and cultures (Investopedia <https://www.investopedia.com/terms/d/diffusion-of-innovations-theory.asp>).

improve energy efficiency. These features resonate with their creative drive and commitment to sustainability, making them strong advocates for timber construction.

Table 1: Characteristics of innovators, early adopters and architects

INNOVATORS AND EARLY ADOPTERS	ARCHITECTS
The <u>personality characteristics of visionaries and early adopters</u> are: Innovators Innovators are those who adopt new technology first. They tend to be younger in age, take more risks, are in a higher social class, have greater access to wealth, and have access to scientific resources and other innovators. Early Adopters Early adopters are the class right after innovators in using new technology. Like innovators, early adopters have greater access to wealth, are younger in age, and have higher education. They are more selective in their adoption of new technology and become opinion leaders on the new innovations.	<u>Rethinking The Future</u> details the expected characteristics that architects should have: 1. Excellent Communication Skills 2. Great Planners and Organisers 3. Reasoning and Rational Thinking 4. Problem-Solving 5. Quest for Knowledge 6. Incredible Team Working Abilities 7. Love for Exploration and Traveling 8. Resilient and Adaptive 9. Notably Experimental 10. Empathy for All These characteristics resonate with those of Innovators and Early Adopters. Apart from this, architects are significantly influential in choosing building materials. For these reasons, it is recommended that efforts be focused on them. This does not mean that other potential adopters should be excluded. However, resources are limited, and efforts should focus on those within the population that will most likely bring about social change.

In contrast, property developers tend to fall into the early or late majority categories. They are generally more risk averse and are primarily motivated by profitability and financial viability rather than design innovation. While timber construction may eventually appeal to them, developers often face concerns around costs, market demand, and the availability of skilled labour. However, private property developers, which dominate the South African market with around 70% of construction projects compared to the 30% handled by the public sector, are key to the widespread adoption of timber construction.

Table 2: Property ownership in South Africa (private vs government subsidised)

Market Segment	Properties	Market Segment	Properties
Government Subsidy	27%	GSP - Over R3m	0%
		GSP - R1.5m to R3m	0%
		GSP - R1.2m to R1.5m	0%
		GSP - R900 000 to R1.2m	0%
		GSP - R600 000 to R900 000	2%
		GSP - R300 000 to R600 000	12%
		GSP - Under R300 000	12%
Private	73%	Private - Over R3m	5%
		Private - R1.5m to R3m	14%
		Private - R1.2m to R1.5m	7%
		Private - R900 000 to R1.2m	10%
		Private - R600 000 to R900 000	17%
		Private - R300 000 to R600 000	15%
		Private - Under R300 000	5%

Source: CAHF, 2020. Citymark South Africa: Government-subsidised housing at national and provincial level (2012-2021)

For timber construction to gain traction, it is essential that architects first adopt and promote its benefits to developers. Once convinced, developers may see timber's advantages, such as reduced construction time, cost savings, and alignment with sustainability trends – factors that are increasingly important to buyers in urban areas. Over time, residential estate developments could become a significant target for timber construction. Developers in this sector might be particularly drawn to timber for its quick assembly and the potential to market eco-friendly housing to a growing middle class.

In conclusion, the key to promoting timber construction in South Africa lies in convincing architects, as early adopters, to champion its use. Their enthusiasm and ability to demonstrate timber's benefits can influence more cautious developers. As timber construction proves its cost-effectiveness and environmental benefits, property developers – particularly those involved in residential estate developments – are likely to adopt it increasingly.

For the feasibility study, these insights suggest that engaging architects early in policy and promotional efforts is essential. By showcasing successful timber projects and providing specialised training, architects can help overcome initial resistance to timber adoption and accelerate its acceptance in mainstream construction.

3. THE METHODOLOGY

The feasibility study was conducted through a mixed-method research approach, including literature surveys, stakeholder surveys, interviews, specialist reports, and action research.

Stakeholder survey

Purpose: A stakeholder survey was essential for understanding the perceptions, needs, and expectations of various parties involved in the timber construction industry. These stakeholders included architects, builders, regulatory bodies, environmental organisations, and the general public.

Process: The survey was designed to gather insights into stakeholders' attitudes, concerns, and preferences related to timber construction. It was distributed through an online questionnaire.

Interviews

Purpose: Interviews with key industry experts, professionals, and decision-makers provided in-depth insights and qualitative data that complemented the quantitative data from surveys.

Process: Researchers conducted one-on-one or group interviews with stakeholders. These interviews explored challenges, opportunities, and potential strategies for promoting timber in construction.

Specialist reports

Purpose: Specialist reports provide expert analysis and recommendations on specific aspects of timber construction.

Process: Specialist research reports were requested about timber construction regulations in South Africa, the carbon tax in South Africa, and the cost of a timber building vs a brick and mortar building.

Action research

Purpose: Action research involves a practical, problem-solving approach where researchers actively engage with stakeholders to address real-world issues. In this context, it was used to test and implement strategies for promoting timber in construction.

Process: Researchers worked collaboratively with industry partners, government agencies, and other stakeholders to pilot initiatives that promoted timber use. This involved a Timber Construction Conference, a Research Colloquium and Social Media Groups. The results and lessons learned from these actions informed the feasibility study's recommendations.

By combining these research methods, the feasibility study provided a comprehensive and well-rounded understanding of the challenges and opportunities related to promoting timber in construction in South Africa. The study drew on existing knowledge from the literature, gathered data from stakeholders, and incorporated real-world testing and implementation through action research to develop a strategy to enhance the use of timber in construction.

4. CAPACITY BUILDING DELIVERABLE

Training

Training programmes are crucial for promoting timber construction in South Africa. They provide essential skills, safety knowledge, and compliance with regulations, ensuring quality and environmentally responsible building. These programmes may also help professionals stay updated with industry trends, enhance competitiveness, and contribute to the sector's growth. Collaboration between industry and academia is key, with practical training emphasised. Various courses and workshops were developed and presented, with collaboration networks growing. Initiatives like the Wood App offer online educational resources, while Talking Timber Webinars facilitate knowledge-sharing and networking. These efforts aim to foster a wood-building culture in South Africa, aligning with sustainability goals and enhancing timber construction's adoption.

In South Africa, developing SAQA-approved timber design and construction training programmes is a long-term goal, seen as a high-effort, high-impact initiative. To address the current demand, the focus in the short to medium term is on enhancing the existing Wood App, continuing professional training events and courses, and integrating timber design and construction knowledge into existing training programmes.

Long-term skills programmes

Universities that provide programmes for Civil Engineering, Architecture, Wood Science, Engineering Management and Construction Management can already provide postgraduate qualifications to students that focus their research on timber construction related topics. In the long term it might be ideal to develop SAQA-approved timber design and construction training specific programmes in South Africa. However, considering the current demand this should be considered as a long-term intervention.

Technical and Vocational Education and Training (TVET)

TVET colleges can play a pivotal role in promoting timber construction in South Africa. These institutions are instrumental in equipping students with the necessary skills and knowledge to thrive in the timber construction industry.

It is important to note that most TVET colleges in South Africa already include timber construction elements in their carpentry and construction programmes. This means that the foundational training infrastructure is in place, and there is no immediate need to develop entirely new programmes. Instead, the focus should be on enhancing and expanding existing programmes.

Strengthening partnerships between TVET colleges and the timber construction industry can assist in ensuring that training programmes are continuously updated to reflect the latest industry standards and technologies.

Short- to medium-term skills programmes

A variety of training programmes and courses were introduced to promote timber construction in South Africa, reflecting a collaborative effort between academia and industry:

Earthworld Architects Student Courses: These courses are a prime example of industry-academia collaboration. University students participated in five-day training programmes, guiding them through the process of conceptualising, designing, manufacturing, and assembling timber-based structures. Three such courses were conducted, funded by the York Timbers Chair in Wood Structural Engineering at the University of Pretoria.

RAW Modular Student Courses: Similar to the Earthworld Architects courses, RAW Modular Student Courses required university students to engage in a five-day training programme focusing on the complete lifecycle of timber construction projects. These courses were also funded by the York Timbers Chair in Wood Structural Engineering at the University of Pretoria. Videos were created to showcase the approach used during these courses, providing visual insights into the training.

RAW Modular Professionals Courses: These two-day courses follow a similar pattern of development, design, manufacturing, and assembly of timber structures. What sets them apart is that attendees are responsible for funding these courses.

Undergraduate and Postgraduate Timber Design Modules: The University of Pretoria presented well-established training modules in timber design for civil engineering students. The undergraduate module is designed for third-year students and could serve as a blueprint for similar courses at other universities. The postgraduate module, historically offered, will be revamped to enable professionals to enrol for a short course.

Architectural Studios: Universities like the University of Pretoria and Tshwane University of Technology have incorporated timber design and manufacturing courses within their architectural programmes. They have also engaged in assembling Wikihouse prototypes. Collaboration between

these institutions, as well as with Government and industry, is expected to increase the number of studios and practical benefits associated with these courses.

The Wood App: Initiated by Stellenbosch University's Department of Forest and Wood Science, the Wood App aims to support the growth of a South African wood-building culture through online educational resources. Subject experts have developed a variety of online courses, with funding from organisations like Sawmilling South Africa, the South African Wood Preservers Association (SAWPA), and Fibre Processing and Manufacturing Education and Training Authority (FP&M SETA). By September 2023, nine courses were available, with more anticipated.

The Wood App Timber Frame Design & Construction One-Day Workshop: This one-day workshop, conducted in collaboration with Stellenbosch University, offered practical knowledge-sharing and networking opportunities. Two such workshops were presented in 2023.

The Wood App Promotion: During the 2023 Timber Construction Conference, the Wood App's online courses and one-day workshops were promoted. These courses were also recommended to students who had participated in programmes like Earthworld Architects and RAW Modular courses.

Talking Timber Webinars: Hosted on Sawmilling South Africa's YouTube channel, these webinars involve timber experts from industry, academia, and Government. They cover presentations by domain experts and include question-and-answer sessions. By September 2023, eight webinars had been presented, offering a valuable platform for networking and knowledge dissemination.

These training initiatives are pivotal in nurturing a skilled workforce and fostering a culture of timber construction in South Africa, contributing to sustainable, innovative, and safe building practices.

The Timber Design Competition

The 2023 Timber Design Competition for South African architectural students featured 14 participating teams, with winners announced at the Timber Construction Conference. Recommendations for future competitions include securing industry and government sponsorships, involving judges from various institutions, integrating the competition into student curricula, and allowing organic growth until substantial funding is secured. It is suggested that initially the competition focuses on student participation and later expands to include professionals, with project objectives tailored to sponsorship needs.

Engineered Wood Products Research Forum

The proposed Forest Products Research Strategy for South Africa highlighted the importance of an Engineered Wood Products (EWP) strategy, particularly focusing on mass timber, as having substantial global and South African market growth potential. It emphasised the need for extensive research and development (R&D) to bridge the gap between market demand and industry investments in EWPs. Key requirements recommended included setting a strategic goal for the EWP industry, creating an EWP R&D leadership forum, coordinating existing R&D efforts, conducting pilot projects, and developing innovative funding approaches.

The Forest Products Research Strategy initially favoured a centralised command structure with decentralised resources. Following consultations with the Project Steering Committee, represented by various stakeholders, a centralised command structure is recommended.

Considering the Project Steering Committee's preference for a centralised command for the EWP forum the Service Provider will assist with organising a EWP Forum that will be chaired by the Department of Trade Industry and Competition and where Sawmilling South Africa will act as the

secretariat as recommended in the Forest Products Research Strategy for South Africa for two thematic areas (Crafford et al., 2022).

This feasibility study further recommends integrating the EWP Forum into the Forestry Bioeconomy Innovation Cluster (FBIC) to enhance collaboration between Government, academia, and industry in promoting timber construction in South Africa.

To facilitate continued networking and collaboration, the report recommends hosting an annual Timber Research Colloquium and encourages project-based collaboration among Government, academia, and industry. The funding approach suggested is crowdfunding, focusing on project-specific outcomes, until critical mass is achieved to establish a portfolio of projects and programmes under centralised control.

The survey

A survey aimed at assessing perceptions of timber construction and interest in further stakeholder engagement involved more than 1 100 potential stakeholders. The respondents were asked about their likelihood of considering timber for their next construction project and, in general, the response was positive, which may suggest a positive bias toward timber construction among the respondents considering its relatively low adoption in South Africa.

However, various perceived barriers to the adoption of timber construction were identified, including concerns about cost, safety standards, public perception, industry tradition, and a lack of knowledge and skills in the design and construction sectors. These barriers reflect perceptions rather than necessarily supported arguments.

To address these concerns and promote timber construction, the survey suggested potential enablers, which included optimising cost and availability, emphasising the benefits of engineered timber, conducting public showcases, providing education and training, fostering collaboration and knowledge sharing, and encouraging Government and financial support. These enablers would aim to dispel misconceptions and enhance the appeal of timber construction.

The survey also indicated that respondents that were more familiar and had experience with timber construction had a more positive sentiment towards it, emphasising the importance of education and exposure in improving perceptions.

The survey findings underlined the need for a holistic approach to promote timber construction in South Africa, addressing both the barriers and enablers to create a more favourable environment for its adoption.

5. DEMAND CREATION DELIVERABLE

This section focuses on strategies to increase the demand for timber construction in South Africa. The diffusion of innovations theory is used to argue that initial efforts should be focused on Architects. It further proposes an Awareness Campaign and Communication Model to promote timber construction through various channels, including social media and the Timber Construction Conference. In addition, it examines the promotion and feasibility of timber construction in terms of its potential to establish sustainable housing, regulatory frameworks, environmental impacts, and more.

Focusing efforts on architects

Creating increased demand for timber construction is a multi-faceted problem that can be solved through various activities. However, the diffusion of innovations theory proposes that efforts should be focused on influencing the influencers (or the Visionaries). Architects have a significant influence on the materials used in construction. They are also more likely to adopt new innovations and their

social incentives align with the creation of innovative and inspiring architecture. Architectural schools and institutes can be considered hubs within architects' networks. For this reason, they are essential partners in the quest of promoting timber construction in South Africa. The report identifies a number of marketing approaches that can be taken, but it is important that a flexible approach is taken with a primary objective of inspiring architects to build with timber.

Awareness campaigns

To create an effective awareness campaign, the document outlines several key requirements, including identifying the target audience, developing compelling messages, selecting appropriate communication channels, budgeting, setting timelines, creating creative assets, planning content distribution, establishing feedback mechanisms, and conducting testing and optimisation.

The objective of the awareness campaign is to encourage the adoption of timber construction, focusing primarily on the knowledge stage of the Innovation Adoption Decision Process (knowledge, persuasion, decision, implementation, confirmation).

For the marketing theme, Growing Timber Connections was chosen for its emphasis on growth, connection to nature, versatility, community building, and long-term sustainability. This theme aims to align timber construction with principles of sustainability and resource efficiency, resonating with the global interest in eco-friendly building practices.

Social media

The report delves into social media marketing, highlighting the strengths and target audience for platforms such as Facebook, LinkedIn, X (formerly Twitter), Instagram, and TikTok. For South Africa's timber construction promotion, Facebook and LinkedIn Groups are preferred due to their established platforms, targeted audience, professional networking capabilities, content sharing, industry relevance, and the ability to foster community and engagement. Each platform serves unique purposes, with Facebook for community building and engagement and LinkedIn for professional networking and thought leadership.

The Facebook Group and LinkedIn Group provide opportunities for community building, engagement, networking, information sharing, awareness raising, advocacy, collaboration, and support. Links to these groups are provided for future use.

Establishing a Facebook Group and LinkedIn Group dedicated to promoting timber construction offers a range of benefits, including networking, targeted audience engagement, thought leadership, visibility, knowledge sharing, and industry updates, all contributing to the promotion and advancement of timber construction in South Africa. While the feasibility study provides these details, branding and affiliations can be added once organisations receive a mandate to execute the campaign.

Timber Construction Conference

The Timber Construction Conference, held in Pretoria, South Africa in September 2023, aimed to promote the widespread adoption of timber construction throughout the country. It brought together industry experts, government officials, and thought leaders to share knowledge, insights, and experiences in an enlightening and collaborative gathering. The event featured engaging presentations, panel discussions, and an exciting exhibition, providing a platform for networking, knowledge exchange, and exploring the latest developments in timber construction.

The conference, themed Growing Timber Connections, showcased numerous benefits and explored the potential of timber construction. It culminated in announcing the winners of the Timber Design

Competition sponsored by York Timbers, recognising excellence and innovation in timber construction.

The vision of the conference was to promote the use of timber in construction by connecting the ecosystem. Key objectives included sharing innovations in international and local timber construction projects, discussing opportunities for increasing timber construction adoption, providing solutions to challenges associated with adopting timber construction, building networks for collaboration, and inspiring people to build with timber.

The main organisers were the University of Pretoria (UP), the dtic, Enterprises University of Pretoria, and the Pretoria Institute for Architects, with York Timbers as the main sponsor. The conference was held at the Future Africa Main Auditorium, Innovation Africa, Hillcrest Campus, University of Pretoria, on 12 September 2023, and included the conference itself, an exhibition featuring both industry and student projects, the Timber Design Competition Award, and networking opportunities.

The Timber Construction Conference served as a platform for knowledge sharing, networking, and inspiration, aiming to drive the growth and adoption of timber construction in South Africa.

Policies on sustainable construction and wood encouragement

Introduction

The construction industry is undergoing transformative changes due to evolving societal needs and technological advancements, with an increasing focus on sustainability and low-carbon practices. Globally, the sector contributes around 39% of total carbon emissions, highlighting the urgent need for greener building materials and methods. Wood, known for its sustainability and potential to reduce carbon footprints, is gaining recognition, supported by innovations in prefabricated housing and multi-storey wood construction. Consequently, countries worldwide, including South Africa, are reconsidering construction policies to support ecological and sustainable development.

South Africa has been committed to green building practices for years, led by organisations like the Council for Scientific and Industrial Research (CSIR) and the South African Property Owners Association. Yet, despite this commitment, the use of timber in construction remains limited. This necessitates developing policies, such as Wood Encouragement Policies (WEPs), to promote timber's acceptance and use in sustainable construction. WEPs are seen as a means to increase wood usage in construction, aligning with sustainable development objectives and enhancing environmental outcomes.

Overview of Wood Encouragement Policies (WEPs)

WEPs are strategies designed to promote using responsibly sourced wood in construction. These policies are often implemented at different government levels, supporting local industries, addressing climate change, and facilitating sustainable development. The main objectives include encouraging the use of locally sourced wood, supporting rural development, and contributing to climate mitigation goals. By promoting timber in construction, these policies align with global climate strategies and sustainable development goals.

South Africa has the potential to benefit significantly from WEPs, given its focus on sustainable construction and the need to address housing shortages. By implementing WEPs, the Government could drive timber adoption, supporting economic and environmental objectives.

Understanding WEPs

WEPs aim to encourage using wood as a primary building material, focusing on its sustainability, availability, and carbon storage properties. These policies often prioritise locally sourced wood, when

suitable and cost-effective. While the emphasis is typically on public sector procurement, some countries also extend WEPs to private construction projects.

Successful WEPs require comprehensive efforts in research, capacity building, and industry training. Demonstration projects and collaborative research are essential to overcoming barriers and showcasing the potential of wood in modern construction. WEPs have been implemented globally in countries like Australia, Canada, Finland, France, Germany, Japan, New Zealand, Sweden, Switzerland, and the UK, often targeting both public and private sectors to increase timber use in construction.

Advantages of adopting WEPs in South Africa

Timber offers numerous benefits, including a high strength-to-weight ratio, thermal insulation, flexibility, and carbon sequestration potential. Implementing WEPs in South Africa could save costs and time, improve indoor air quality, and enhance sustainability. Moreover, using wood aligns with several Sustainable Development Goals (SDGs), promoting sustainable economic growth, responsible consumption, and climate change mitigation.

Adopting WEPs could transform South Africa's construction sector by accelerating the shift towards greener practices, supporting local timber industries, and addressing housing needs. This would position wood as a viable alternative to conventional building materials, promoting a low-carbon economy and supporting sustainable urban development.

Overview of policies and regulations in South Africa's construction sector

South Africa has developed a strong regulatory framework to support sustainable and green building practices in the construction sector. However, various challenges have hampered effective implementation, such as limited financial resources and stakeholder coordination issues. Key policies include the National Development Plan, Integrated Resource Plan, and Industrial Policy Action Plan (IPAP), which all aim to promote sustainability across multiple sectors.

The core legislative instrument is the National Building Regulations and Building Standards Act (Act No. 103 of 1977), administered by the Department of Public Works (DPW) and the National Department of Human Settlements, with regular updates to incorporate modern standards. Complementary standards like SANS 10400 and SANS 10400-XA offer technical guidelines to promote energy efficiency and sustainable construction practices.

Despite this foundation, widespread misconceptions about the cost of green building and limited public awareness have slowed the adoption of sustainable practices. However, initiatives such as the Green Economy Accord of 2011 and tax incentives for energy efficiency investments demonstrate the Government's commitment to sustainable development.

Key policies and regulations in the construction sector

National Building Regulations and Building Standards Act (Act No. 103 of 1977)

This Act provides a comprehensive set of construction guidelines. It was revised in 2011 to incorporate mandatory energy efficiency standards for new and existing buildings, such as the SANS 10400-XA standards, which set minimum energy efficiency requirements and encourage the use of eco-friendly materials like timber.

National Framework for Green Building (2011)

This framework establishes a vision for sustainable development in the built environment, aiming to reduce buildings' thermal energy demands by 80% by 2050. It encourages public sector projects to achieve Green Star SA ratings, supporting the use of sustainable materials, including timber. The DPW,

Department of Environment, and the Green Building Council of South Africa (GBCSA) are key stakeholders.

Innovative Building Technologies Implementation Plan (2013)

Led by the National Home Builders Registration Council (NHBRC), this plan promotes the adoption of innovative and sustainable building techniques to address housing deficits while maintaining quality. It supports the use of efficient and sustainable materials, such as timber, to enhance construction practices and performance.

Green Building Council of South Africa

Founded in 2007, the GBCSA plays a key role in promoting sustainable construction. It offers certification systems such as Green Star, Net Zero, Energy Water Performance, and Excellence in Design for Greater Efficiency, all of which encourage the use of sustainable materials like timber and set resource efficiency benchmarks.

South African National Standards (SANS)

SANS 10400 and its extension, SANS 10400-XA, regulate building practices to ensure compliance with the National Building Regulations. SANS 10400-XA, in particular, addresses energy efficiency, encouraging the use of materials like timber to meet sustainability goals.

Building Plan Approval Process

The NHBRC oversees the home building industry and reviews building plans to ensure compliance with the National Building Regulations. At the municipal level, local authorities enforce these regulations and monitor construction activities, ensuring that sustainable materials, such as timber, are properly incorporated into designs.

Opportunities for Promoting Green Building

The South African Government recognises the potential of Alternative Building Technologies (ABT) for advancing sustainable construction. The CSIR's implementation plan for ABT targeted 60% of the Government's social infrastructure to be constructed using ABT by 2017. This includes off-site fabricated framed panels and other efficient building systems, creating opportunities for incorporating timber into green construction projects.

Market Drivers for Green Building

Several factors are driving the adoption of green building practices in South Africa, including:

- Tax incentives for energy efficiency savings: Encouraging companies to adopt energy-saving measures.
- Increased public awareness and industry events: Enhancing knowledge and interest in sustainable building. Support from industry bodies and associations: Organisations like the GBCSA and the South African Bureau of Standards (SABS) advocate for green building standards.
- These drivers create favourable conditions for the increased use of timber in construction, given its sustainability credentials, carbon sequestration capabilities, and potential for improving buildings' energy efficiency.

Challenges to Implementation

Despite the strong policy framework, the construction sector faces several challenges in adopting sustainable practices. These include misconceptions about the cost of green building, resistance from clients, and limited coordination among stakeholders. Greater alignment among government bodies, industry professionals, and educational institutions is necessary to promote the long-term benefits of sustainable practices.

Promoting Timber in the Construction Sector

To support timber construction, specific design and regulatory factors must be considered. The Institute for Timber Construction South Africa (ITC-SA) provides guidance on the effective use of timber in the sector. In addition, compliance with Agrément South Africa certification ensures that timber-based solutions meet required performance standards, making them viable alternatives to conventional building materials.

Conclusion

The construction industry's shift towards sustainability is critical to addressing climate change and meeting global environmental goals. South Africa has made significant strides in establishing a regulatory framework that supports green building practices; however, the implementation of these policies has been hindered by misconceptions, limited financial resources, and fragmented stakeholder collaboration. Adopting Encouragement Policies could transform the industry by positioning timber as a key sustainable building material, aligning with national and international climate targets.

Implementing WEPs in South Africa presents a strategic opportunity to integrate timber into mainstream construction, promoting its benefits such as carbon sequestration, energy efficiency, and cost-effectiveness. Through targeted policies, public awareness campaigns, and industry partnerships, the construction sector could embrace timber as a viable alternative to traditional building materials, contributing to sustainable urban development and addressing housing needs.

To fully realise the potential of timber, a concerted effort is needed to overcome barriers and misconceptions, supported by research, demonstration projects, and capacity-building initiatives. By advancing the use of timber in construction, South Africa can strengthen its commitment to sustainable development, stimulate the local timber industry, and contribute to a greener, low-carbon future.

Incorporating lessons and overcoming challenges in South Africa

To advance the adoption of WEPs in South Africa, the Government should consider a range of strategies that are informed by global best practices. This involves enhancing collaboration, creating financial incentives, implementing sustainable sourcing, and revising regulations to promote timber construction.

Collaboration and Awareness: The Government, industry, and research institutions should collaborate to share knowledge and best practices for wood construction. Workshops, seminars, and outreach programmes can raise awareness about the benefits of timber use in the construction industry, targeting professionals like architects, engineers, and planners.

Financial Incentives: Introducing specific financial incentives for using timber in construction, particularly in public sector projects, will stimulate demand for wood as a sustainable building material. This could include grants, tax incentives, and subsidies encouraging developers to choose timber over conventional materials.

Sustainable Sourcing: Policies should prioritise sustainable sourcing and responsible procurement practices, ensuring that timber is obtained from sustainably managed forests. This will support local forestry industries, reduce environmental impact, and contribute to a circular economy.

Regulatory Changes: Revising building codes to eliminate barriers and permit the use of timber in a wider range of projects is essential. Updated regulations would support the use of wood in multi-storey and complex structures, making it a viable alternative to concrete and steel.

Tailored WEPs: South Africa needs to develop WEPs specific to its local context, addressing both environmental and economic objectives, including job creation and industry support. Tailored policies would foster a balance between infrastructure needs and sustainability goals.

Embodied Carbon Regulation: The Government could include embodied carbon considerations in building regulations. This would involve assessing, reporting, and minimising the carbon footprint of materials used in construction, positioning timber as a preferred option due to its low embodied carbon.

Affordable Housing: Linking affordable housing initiatives with low-carbon Modern Methods of Construction that utilise timber can create a continuous demand for sustainable materials. This approach would attract private investment and promote research and development in timber-based construction.

Research and Development: Investment in research and development is crucial to overcoming technical and regulatory complexities in wood construction. Support for innovation will drive the growth of the timber industry and advance sustainable building practices.

The South African Government should consider a comprehensive WEP that aligns with the country's SDGs, emphasising local industry support, job creation, and environmental stewardship. Such a policy, combined with targeted incentives, public awareness campaigns, and sustainable sourcing guidelines, would significantly promote timber use in construction.

A thorough analysis of potential WEPs indicates that adopting timber as a primary construction material can yield substantial economic, environmental, and social benefits for South Africa. WEPs can target both public and private sectors, promoting timber use through exemplary projects, incentives, and supportive regulations. Implementing these policies would require capacity building, research, and international collaboration to adapt global practices to local conditions.

By embracing these recommendations and leveraging global experiences, South Africa can establish effective policies that promote timber construction, contributing to sustainable urban development, housing needs, and climate change mitigation. Institutions like ITC-SA and SAWPA can support this transition and address industry challenges. Ultimately, well-designed WEPs will position timber as a sustainable alternative, fostering a thriving timber construction industry and aligning with the country's sustainability objectives.

The potential of timber in addressing South Africa's housing

This section establishes the backdrop for exploring the potential of timber in addressing South Africa's housing backlog and construction challenges. It begins by highlighting the regulatory obligations enshrined in the South African Constitution, emphasising the state's responsibility to provide adequate housing. To fulfil this obligation, the Housing Act (Act No. 107 of 1997) was enacted, which mandates the provision of permanent residential structures with essential amenities and promotes housing development while considering economic, environmental, and social factors. The importance of public engagement in understanding socio-cultural dynamics is underscored.

Despite delivering millions of housing units between 1994 and 2018, South Africa still grapples with a housing backlog of approximately 2.3 million units. Nearly 18% of households live in informal dwellings, indicating the persistent need for formal housing. Various factors contribute to this backlog, including urbanisation, corruption, fiscal constraints, mismanagement, and construction deficiencies.

Construction inadequacies, including defects, material issues, and artisan skill shortages, lead to project delays, increased costs, and fewer completed houses. The prevalent use of labour-intensive

concrete blocks or clay bricks for state-subsidised houses exacerbates these challenges. With a shift towards beneficiaries and private developers taking responsibility for construction, there is a growing demand for cost-effective, high-quality housing solutions tailored to owners' needs.

Given these construction challenges and evolving priorities, there is an urgent need to address the limitations of current building methods and materials in housing developments. The potential of timber as a catalyst for sustainable housing solutions becomes a pertinent consideration in this context.

Government subsidised housing

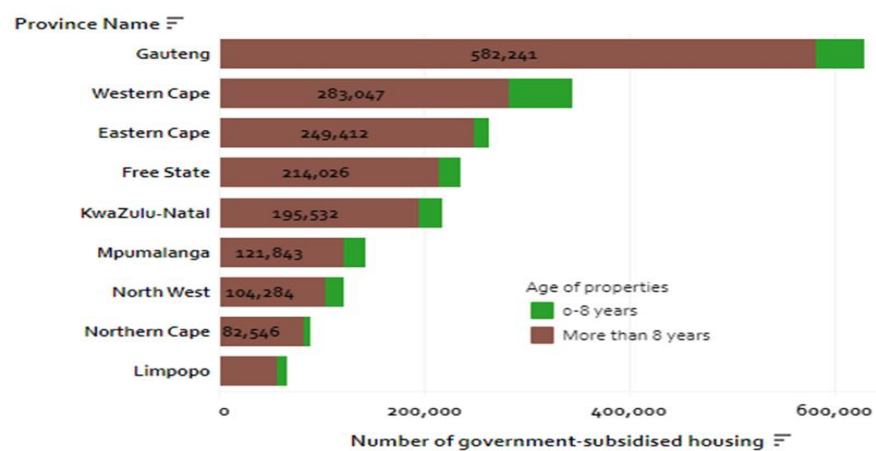
The Centre for Affordable Housing Finance in Africa (CAHF) provides insight into the distribution of government-subsidised properties across South Africa (CAHF, 2020) categorising them by age – either older or younger than eight years. The data shows that most of these properties are over eight years old, indicating a substantial legacy of government intervention in housing delivery and highlighting a recent slowdown. This could suggest that the Government's ability to meet the ongoing demand for housing has weakened, potentially due to financial, logistical, or policy-related challenges.

Figure 2: Number of government-subsidised properties per province by age

Number of government-subsidised properties per province by age

Brown more than 8 years old. Green less than 8 years old

As per the Housing Act 107 of 1997, there are restrictions on selling government-subsidised houses before eight years. However government-subsidised houses over 8 years old can be sold on the resale market without these restrictions, thus providing a sizable potential stock of houses for resale at the lower end of the market.



The imbalance between the need for new housing and the Government's slower pace of delivery underlines the urgency of exploring alternative construction methods. Timber construction, known for its speed and efficiency, could provide a viable solution. Unlike conventional brick-and-mortar methods, timber-based housing can be assembled faster, enabling a quicker response to housing shortages. With proper planning and investment, timber can help the Government deliver more houses in less time, addressing the demand more effectively and sustainably. Furthermore, adopting timber for government-subsidised housing projects could support sustainable development goals and create new opportunities in the timber industry, driving local economic growth and job creation.

The role of the Infrastructure Fund in promoting private-sector investment

South Africa's Infrastructure Fund (IF) plays a pivotal role in maximising private-sector investment in government-led construction projects. It is a portfolio of blended finance projects and programmes managed by Infrastructure South Africa (ISA) and operated by the Development Bank of South Africa through a dedicated division within the bank.

To fulfil its mandate of exploring various blended finance options, the IF relies on the expertise of the Infrastructure Fund Advisory Committee. This advisory body comprises representatives from the public (National Treasury, the Department of Public Works and Infrastructure, and ISA) and private sectors, enabling collaboration and input on financial structuring. This ensures that the IF's activities align with other government initiatives and policies.

Once an agreement is reached with key stakeholders, including National Treasury and private capital providers, the IF can offer financial products such as equity, quasi-equity, debt, guarantees, and standby facilities. Using these tools to attract private investment, the IF aims to significantly boost infrastructure development, accelerate project delivery, and stimulate economic growth across South Africa. Moreover, the IF's involvement will help build trust between the Government and the private sector, reinforcing investor and business confidence. Table 3 outlines the Fund's mechanisms and their impacts on private-sector engagement, focusing on cost-effective participation and facilitating early financial closure. (National Treasury, 2024 – Budget Review Public-Sector Infrastructure and Public-Private Partnerships Update)

Table 3: Blended finance projects

SECTOR	PROJECT NAME	QUANTITY*	CAPITAL COSTS (R MILLION)	APPROVED BFI (R MILLION)	PRIVATE-SECTOR FUNDING (R MILLION)	OTHER GRANTS/ EQUITY (R MILLION)	PROGRESS TO DATE
Human settlements	Hospital Street Social Housing Project	1 056	388	88	–	300	Construction
Human settlements	Goodwood Station Social Housing Project	1 055	457	152	–	305	Construction
Human settlements	Midrand Heights Social Housing Project	305	163	64	–	99	Due diligence
Human settlements	Lufhereng Mixed Use Development Project	11 000	7 700	3 400	2 150	2 150	Construction
Water and sanitation	Phase 1: Olifantspoort and Ebenezer Water Supply Programme	20 075	4 600	1 400	2 000	1 200	Procurement

Water and sanitation	Phase 1: uMkhomazi Water Augmentation Project	300 000	24 000	12 000	12 000	–	Procurement
Water and sanitation	Moretele North Klipvoor Bulk Water Supply Scheme	15 330	5 200	1 900	2 600	700	Procurement
Water and sanitation	Pilanesberg Bulk Water Supply Scheme	45 990	2 900	1 800	1 100	–	Procurement
Water and sanitation	Olifants Management Model Programme Phase 2B and 2B+	95 995	9 400	4 000	4 929	471	Financing
Transport	Ports of entry	6	9 100	–	9 100	–	Procurement
Student housing	Tshwane University of Technology	3 500	1 089	338	210	541	Financing and awaiting ministerial approval
Student housing	University of KwaZulu-Natal	3 000	973	200	188	585	Awaiting council approval
Student housing	Gert Sibande TVET College	1 500	504	188	109	207	Financing and awaiting ministerial approval
Student housing	Majuba TVET College	1 500	477	174	103	200	Financing and awaiting ministerial approval
All sectors	Total		66 950	25 704	34 489	6 757	

Note: *The quantity for human settlements and student accommodation is in units. The quantity for water and sanitation is in megalitres per annum. *Source:* Infrastructure Fund Unit and Project Preparation Division.

The Infrastructure Fund's strategy aims to derisk projects by offering co-funding and guarantees, thereby lowering the perceived risk for private investors. The Fund encourages private companies to invest in innovative building materials by bridging the financial gaps in large-scale infrastructure projects. The early financial closure facilitated by this approach enables faster project execution and reduces capital costs. This aligns with the broader objective of transforming the construction sector towards more sustainable practices.

Review of South Africa's structural design codes and regulations

The report provides a review of South Africa's structural design codes and regulations pertinent to timber structures. It touches on several key aspects, including the significance of adhering to South African National Building Regulations (SANS 10400) and the evolving nature of these regulations to align with changing construction practices. It also outlines the flexibility allowed for designers to choose the code that best suits their needs, provided they can justify their choice.

One crucial focus is the status of SANS 10163, the structural timber design code. It consists of two parts, but the need for an update has been delayed. The review highlights that material resistance factors in South Africa's code are lower than those in other international codes, reflecting perceived timber property variability. However, it suggests that further material testing may lead to adjustments.

The feedback from the ITC-SA underlines its participation in the review of SANS 10163 and its confidence in the current grade strengths of structural timber. Overall, the review underscores the necessity of updating South Africa's timber design code and emphasises the challenges associated with code development and updating.

Using NEMA

The National Environmental Management Act (NEMA) (Act No. 107 of 1998) of South Africa, establishes principles for environmental governance and management in the country, aiming to ensure sustainable development and environmental protection. NEMA emphasises environmental justice, sustainability, and the fair distribution of environmental benefits, advocating for public participation, transparency, and accountability. It introduces the precautionary principle to prevent environmental harm amid uncertainty.

NEMA mandates the use of Environmental Impact Assessments (EIAs) and Strategic Environmental Assessments to evaluate potential impacts of proposed developments. It also requires the creation of Environmental Management Plans and Environmental Management Systems for ongoing environmental performance. The Act grants regulatory authorities the power to enforce environmental laws, issue compliance notices, and take legal action against violators, applying the "polluter pays" principle for remediation costs.

Amendments to NEMA have strengthened its provisions to address climate change, biodiversity conservation, and waste management. The Environmental Impact Regulations under NEMA ensure environmental considerations are integrated into development planning and decision-making. The EIA process involves screening, scoping, preparing an Environmental Impact Report, public participation, and decision-making by authorities.

Activities are categorised into three listing notices, each with specific requirements based on impact levels. Compliance with these regulations is essential for obtaining environmental authorisation. The competent authority, whether the provincial MEC or the Minister of Forestry, Fisheries and the Environment, oversees these processes.

Interested and affected parties (I&APs) include individuals or organisations potentially impacted by development projects. The applicant must notify and consult I&APs, provide access to relevant information, facilitate public participation, consider and address inputs, and keep I&APs informed about the EIA process and decisions. I&APs can use these regulations to promote timber in construction by advocating for its environmental benefits, supporting sustainable forestry, comparing impacts with traditional materials, and encouraging green building standards.

Through active participation, I&APs can influence project outcomes and contribute to sustainable development in South Africa, balancing economic growth with environmental protection.

Carbon emissions tax

This study explores the potential of carbon tax as an incentive for increased timber use in the construction sector. The research is conducted in the context of South Africa, where the carbon tax is currently set at R144/MT of carbon dioxide. However, policy changes are expected to raise this tax significantly by 2030.

The study presents two scenarios. In Scenario One, it considers the costs of a 90m² two-bedroom home constructed using either brick and mortar or timber. The analysis suggests that a carbon tax of US\$291/MT would be required to make timber construction equivalent to the alternative approaches, such as decarbonising cement or steel production. This indicates that policy changes are needed to drive emissions reductions in this scenario.

In Scenario Two, the model incorporates data showing that a 190m² timber home is 20% less costly to construct than its brick and mortar counterpart in South Africa. This suggests that timber construction is not only more cost-effective but also results in carbon savings, making carbon tax unnecessary.

The study underscores that the relative cost of construction is a critical factor determining the impact of carbon tax on home construction. It highlights the potential benefits of timber-based construction, especially in Scenario Two, where carbon tax may not be needed.

However, it also raises concerns about the current tax legislation's applicability and suggests that legislative amendments may be required to fully realise the benefits of carbon tax as an incentive for timber construction. Additionally, it explores the role of carbon sequestration but notes that the cost benefits for construction timber are relatively minor, likely benefiting timber producers more than consumers.

Fibre supply

This section delves into the critical aspect of fibre supply concerning mass timber products in South Africa. It commences by presenting the status of log resources in the country and discusses a pivotal study conducted by Crafford and Wessels in 2020. This study explored the availability of log resources in South Africa and assessed the environmental implications of an expanding wood-based residential building market. The research outlines a sustainable approach that involves using wood resources currently exported as chips and implementing afforestation in designated areas. This strategic shift has the potential to support the construction of 95 000 timber houses annually, which is 1.72 times the previous average of similar new houses being constructed from traditional building materials.

Furthermore, it addresses alternative approaches to bolster timber supply, such as tree genetics enhancement programmes, technological upgrades in sawmilling operations, utilising eucalyptus wood for structural applications, and adopting machine grading for timber strength prediction. These strategies collectively offer a comprehensive solution to cater to the rising demand for timber while fostering sustainability within South Africa's construction industry. However, it is essential to note that short-term supply and demand fluctuations are not within the study's scope, and fully capitalising on these supply potentials may necessitate continuous or substantial investments beyond the study's purview.

Debt financing for timber construction in South Africa

Timber construction, known for its durability and eco-friendly nature, enjoys widespread adoption globally, with over 70% of the developed world's population living in timber homes. However, South Africa faces specific financing challenges for timber construction. Commercial banks often perceive timber as a risky material due to concerns about fire hazards and a lack of familiarity with its intricacies.

Other hurdles include a shortage of skilled timber construction labour and the relatively higher cost of timber compared to alternative building materials. Despite these obstacles, strategies to enhance the financial appeal of timber construction exist. Government incentives, such as tax credits and financial grants, can make timber projects more attractive. Specialised insurance policies can cover potential liabilities arising from timber construction.

Moreover, technical guidance and support from industry organisations, like the ITC-SA, assist developers and contractors, ensuring adherence to standards and safety practices. Timber frame construction aligns with South African regulations and standards, making it a feasible choice for financing. Major South African banks are open to financing timber frame homes constructed in compliance with these standards.

Financing for timber construction involves documentation, compliance with NHBRC regulations, and close collaboration among the client, builder, and bank. Beyond financing, valuing existing timber frame homes may present challenges due to their novelty in the market. Qualified inspectors and industry organisations assist in the valuation process, promoting timber construction's credibility.

Commercial banks evaluate timber construction projects on a case-by-case basis, with criteria such as SABs compliance, NHBRC acceptance, and the oversight of structural engineers. While timber frame construction meets the same standards as conventional methods, it may require additional evaluation. The strict criteria maintained by banks help ensure the integrity and quality of financed timber projects.

In conclusion, South Africa has recognised the potential of timber construction, and there are pathways to overcome financing challenges. With government support, industry regulation adherence, and involvement from commercial banks, timber construction can continue to grow as a sustainable and financially viable building method.

Assessing the cost competitiveness of timber housing

Two international studies shed light on the cost competitiveness of timber houses compared to other construction methods. A Czech study by Hrdlicka et al. (2022) compared investment costs for 1 520 catalogue houses by 38 contractors and found that the median cost of timber houses was only 4.3% higher than that of brick houses. They noted that factors like house size, floor number, roof shape, heating solutions, and cladding influenced these costs. A key takeaway was that wood-based houses, especially timber frame ones, were pricier compared to brick-based houses, but only when considering prefabricated 2x4 panel systems.

In a study by Wrzesiński et al. (2023) in Poland, three construction technologies (traditional brick, reinforced concrete prefabrication, timber frame) were compared. The cost and construction of the brick house were found to be 3%-5% more expensive than the timber house, and the latter took 116%-129% less time to build.

QSB Africa, a South African quantity surveying service provider, performed a like-for-like cost comparison between brick and timber houses. These studies highlighted that the entire project cost must be considered when comparing the two. It emphasised the importance of recognising the

benefits of timber construction when conducting a like-for-like cost comparison. The results for the specific cases confirmed that timber housing can be cheaper than brick and mortar houses when taking a holistic approach.

Kuzman et al. (2013) conducted a study in Slovenia, using the Analytic Hierarchy Process, to assess different construction materials for passive houses. They found that wood construction, including timber, offers various advantages. Besides cost considerations, wood promotes well-being, offers environmental benefits, and has a lower global warming potential and carbon footprint. Wood construction is expected to play an increasingly vital role as energy-efficient building methods gain significance.

Local and international studies highlight the importance of a holistic approach when evaluating the cost competitiveness of timber houses. While timber houses can be cost-competitive when only considering costs, they also offer significant advantages when environmental and well-being aspects are considered.

6. IMPLEMENTATION PLANS

Short- and medium-term actions

The short- to medium-term actions recommended to increase the capacity and the demand for timber construction are provided in Table 4. For each action the Working Group primarily responsible for the activity is also proposed.

Table 4: Short- and medium-term actions

ACTION DESCRIPTION	RESPONSIBILITY	IDEAL BUDGET	BUDGET SECURED	STATUS
The Timber Design Competition	Capacity Building	R 700 000	Sufficient to continue	2023 event took place, and 2024 event is in planning
The Timber Construction Conference	Capacity Building	R 500 000	Sufficient to continue	2023 event took place and 2024 event is in planning
The Timber Research Colloquium	Capacity Building	R 300 000	Sufficient to continue	2023 event took place and 2024 event is in planning
The Wood App	Capacity Building	R 820 000	R 650 000	Website and courses are available. Being developed further.
The Wood App Workshops	Capacity Building	Self-funded	Self-funded	By October 2023, two courses had been presented; one was being planned.
Practical Training Courses for Students	Capacity Building	R 12 402 500	R 500 000	Nine Courses took place during the study.
Practical Training Courses for Professionals	Capacity Building	Self-funded	Self-funded	Two courses took place during the study.
Talking Timber Webinars	Capacity Building	R 28 000	Arranged in collaboration with sponsors	Nine webinars have been presented.

Timber Architectural Chairs	Capacity Building	R 16 000 000	Sufficient for the University of Pretoria	UP has appointed an architect.
Maintain the EWP Forum	Capacity Building	R 50 000 000	R31 million through University of Pretoria and York Timbers R1.2 million through FP&M SETA	Wood Structural Engineering Programme at the University of Pretoria has secured funding from Academia, Industry and Government
Integrate the EWP Forum into the Forestry Bioeconomy Innovation Cluster (FBIC)	Capacity Building	R 5 000 000	Awaiting feedback	Budget proposal submitted. Discussions with the Technology and Innovation Agency and the Department of Science and Innovation will continue.
Social Media	Demand Creation	R 100 000	Sufficient to continue	Facebook and LinkedIn Groups have been established. Groups will be maintained.
Conference Website	Demand Creation	R 200 000	Sufficient to continue	Website has been created.
Register as I&AP for property development EIAs	Demand Creation	To be determined	Not applicable	Proposal discussed.

Long-term actions

The long-term actions recommended to increase the capacity and the demand for timber construction are provided in Table 5. By implementing the short- to medium-term actions, an environment should be created that promotes the implementation of the long-term actions. For example, collaboration with the Department of Human Settlements and the NHBRC in the Conference and Colloquium could increase their familiarity with timber construction and may lead them to promote policies, procedures and regulations that may promote the use of timber in construction.

Table 5: Long-term actions

ACTION	DESCRIPTION	RESPONSIBILITY
Revising and simplifying regulations	Policies and regulations should be revised to promote the use of timber.	Demand Creation
Harmonisation and standardisation	Standardise municipal and provincial building by-laws which promote the use of timber.	Demand Creation
Workforce re-education	Provide training to professionals to up-skill them in terms of timber construction.	Capacity Development
Constructive dialogue	Continuous dialogue between various stakeholders to promote timber construction.	Demand Creation
Promoting innovation	Public sector to promote the use of timber in projects.	Demand Creation
Leveraging buying power	The Government to adopt procurement policies favour timber use in construction.	Demand Creation

Supporting local industries	Support the use of locally produced timber products.	Demand Creation
Aligning with holistic sustainability goals	Government to align timber construction initiatives with national and international sustainability targets.	Demand Creation
Public awareness and engagement	Include stakeholders in the development of by-laws to support sustainable development.	Demand Creation
Environmental considerations	Include sustainability requirements that promote timber construction in municipal by-laws.	Demand Creation
Regular review and updates	Regularly review and update municipal by-laws.	Demand Creation
Enforcement and compliance	Provide sufficient resources to enforce the application of by-laws.	Demand Creation
Education and Awareness	Efforts should be made to educate the public and specifically banks and developers, regarding the benefits of using timber in construction.	Demand Creation
Skills Development	Develop timber construction skills. Collaborate with industry to develop and promote training programmes. This should include various levels, including Universities, Universities of Technology, TVET Colleges, Further Education and Training Colleges, Private Colleges and Institutions, Community Colleges, Trade Schools and Technical Institutes and In-Service Training Programmes.	Capacity Development
Material Sourcing	Encourage responsible forestry practices and forestry growth initiatives.	Demand Creation
Streamlined Regulations	Simplify and streamline regulatory processes for timber construction, for example, building plan approval.	Demand Creation
Valuation Standards	Develop standardised procedures for valuing timber frame homes.	Demand Creation
Government Support	Develop policies, tax incentives, grants, and research funding to increase the financial viability of projects. Embodied carbon in construction should be considered when developing policies and tax incentives.	Demand Creation
Insurance Tailoring	Engage with insurance providers to create specialised timber construction insurance policies.	Demand Creation
Technical Guidance	Industry experts should continue to provide technical guidance in the use of timber construction.	Capacity Development

7. CONCLUSIONS

In conclusion, training programmes, collaboration between industry and academia, and a variety of initiatives will play a vital role in promoting timber construction in South Africa. These efforts will not only impart essential skills and knowledge but will also foster a culture of sustainable, innovative, and safe building practices. South Africans have already initiated projects and there are existing programmes that can be leveraged to promote timber construction in South Africa. Thus, short to medium-term efforts should focus on enhancing existing projects and integrating timber design and construction knowledge in existing programmes. Long-term actions may build on these success to ensure continuous improvement.

To monitor the success of the proposed actions it is proposed that the Capacity Building and Demand Creation Working Groups develop Key Performance Indicators (KPIs). A list of KPIs that may be considered were provided.

In sum, the journey towards advancing timber construction in South Africa will be multifaceted and collaborative. It will encompass training, research, awareness, and financial strategies, all with the ultimate goal of fostering a sustainable and innovative construction industry with timber at its core.

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