PERCEPTIONS OF ARCHITECTS, BUILDERS, AND CONTRACTORS ABOUT THE ADOPTION OF ECOLABELLED PRODUCTS IN MUMBAI METROPOLITAN REGION

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SUBMITTED BY

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APRIL 2026

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As required by the University Ordinance 770, I wish to state that the work embodied in this thesis titled **"PERCEPTIONS OF ARCHITECTS, BUILDERS, AND CONTRACTORS ABOUT THE ADOPTION OF ECOLABELLED PRODUCTS IN MUMBAI METROPOLITAN REGION"** forms my own contribution to the research work carried out under the guidance of **Dr. Tejashree Deshmukh** at the **PTVA's Institute of Management, Chitrakar Ketkar Marg, behind M L Dahanukar College, Vile Parle East, Vile Parle, Mumbai, Maharashtra 400057.** This research work has not been submitted earlier for any other degree of this or any other University. Wherever references have been made to previous works of others, it has been clearly indicated as such and included in the Bibliography.

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This is to certify that the thesis entitled "**PERCEPTIONS OF ARCHITECTS, BUILDERS, AND CONTRACTORS ABOUT THE ADOPTION OF ECOLABELLED PRODUCTS IN MUMBAI METROPOLITAN REGION** " , is a bonafide documentation of the research work done by **Mr. Sachin Gupte (Ph. D Registration Number - 06/20-03-2025)** under my guidance and supervision for the degree of Ph.D. (COMMERCE AND MANAGEMENT) DEGREE IN MANAGEMENT STUDIES of University of Mumbai, at the Research Centre **PTVA's Institute of Management, Chitrakar Ketkar Marg, Behind M L Dahanukar College, Vile Parle East, Vile Parle, Mumbai, Maharashtra 400057.**

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I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources.

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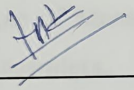

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List Of Abbreviations

Sr. No.	Abbreviation	Full Form
1	AC	Air-Conditioned
2	AMA	American Marketing Association
3	ANOVA	Analysis of Variance
4	ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
5	BEE	Bureau of Energy Efficiency
6	BIM	Building Information Modelling
7	BMS	Building Management System
8	BREEAM	Building Research Establishment Environmental Assessment Method
9	CAGR	Compounded Annual Growth Rate
10	CB	Consumer Behaviour
11	CDP	Carbon Disclosure Project
12	CEN	Comité Européen de Normalisation (European Committee for Standardisation)
13	CII	Confederation of Indian Industries
14	CO2	Carbon Dioxide
15	CO2-eq	Carbon Dioxide Equivalent
16	COP	Coefficient of Performance
17	CPCB	Central Pollution Control Board
18	CSR	Corporate Social Responsibility
19	DfE	Design for Environment
20	EC	Ecolabelled Green Building Products
21	ECSBC	Energy Conservation and Sustainability Building Code
22	EE	Energy Efficiency
23	EIA	Environmental Impact Assessment
24	EP	Ecolabeling Programs
25	EPD	Environmental Product Declaration
26	EPP	Environmental Product Performance
27	EPR	Extended Producer Responsibility

28	ESB	Environmentally Sustainable Behaviour
29	FAR	Floor Space Index / Floor Area Ratio
30	FMCG	Fast Moving Consumer Goods
31	GB	Green Building
32	GBC	Green Building Certification
33	GDP	Gross Domestic Product
34	GHG	Greenhouse Gas
35	GNP	Gross National Product
36	GRI	Green Building Rating Index
37	GRIHA	Green Rating for Integrated Habitat Assessment
38	GWP	Global Warming Potential
39	HVAC	Heating, Ventilation and Air-Conditioning
40	IAQ	Indoor Air Quality
41	IEA	International Energy Agency
42	IEQ	Indoor Environmental Quality
43	IGBC	Indian Green Building Council
44	IPCC	Intergovernmental Panel on Climate Change
45	ISO	International Organisation for Standardisation
46	LCA	Life Cycle Assessment
47	LEED	Leadership in Energy and Environmental Design
48	MM	Mixed-Mode
49	MMR	Mumbai Metropolitan Region
50	MNRE	Ministry of New & Renewable Energy
51	NBC	National Building Code
52	NCLT	National Company Law Tribunal
53	NGO	Non-government Organisations
54	NPD	New Product Development
55	OEM	Original Equipment Manufacturer
56	PBC	Product-based Certification
57	PE	Product Endorsement
58	PEM	Product Environmental Marketing
59	PM	Project Management

60	PPI	Product Price Index
61	PT	Product Transparency
62	QoL	Quality of Life
63	R&D	Research and Development
64	RE	Renewable Energy
65	RH	Relative Humidity
66	RoHS	Restriction of Hazardous Substances
67	ROI	Return on Investment
68	SCM	Sustainable Construction Materials
69	SDGs	Sustainable Development Goals
70	TCO	Total Cost of Ownership
71	UL	Underwriters Laboratory
72	USGBC	United States Green Building Council
73	WER	Water Efficiency Rating
74	°C	Degrees Celsius

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Chapter 1
Introduction

Chapter 1 - Introduction

The construction industry in India is experiencing unprecedented growth, driven by the rapid urbanisation leading to rising demand for residential, commercial, and infrastructure projects. This rapid expansion is contributing significantly to economic growth, creating employment opportunities, and generating substantial government revenue through taxes.

Conversely, the construction sector is also one of the major contributors to environmental degradation. It accounts for approximately 39% of global carbon emissions from energy-related human activities, with 28% originating from building operations, including heating, cooling, and electricity use, and 11% arising from material production and construction processes (World Green Building Council, 2019).

Sustainable construction through usage of responsible materials coupled with green building practices are pivotal in addressing the environmental challenges posed by the construction industry and aligning with global sustainability goals.

1. Introduction to Ecolabelling and Eco Labelled Products

The usage of environmentally responsible products and practices prioritise resource conservation, waste minimisation, and the use of materials with low carbon footprints, such as recycled steel, and low-VOC paints, helping to conserve natural resources. For example, incorporating recycled aggregates in concrete production can reduce CO_2 emissions by up to 30% compared to conventional methods (Althoey et al., 2023).

In India, which is a rapidly growing and constructing economy, the need for sustainable building materials is paramount, given the escalating environmental challenges.

Ecolabelling is a well-defined and structured process of verifying, certifying, promoting and catalysing the environmentally friendly practices across various product categories and industries, culminating into a holistic certification for the product.

Ecolabelling of building materials offers a promising pathway towards greener construction practices, aligning with India's commitment to sustainable development.

(https://www.unep.org/explore-topics/resource-efficiency/what-we-do/responsible-industry/eco-labelling, n.d.)

US EPA emphases that "with Ecolabels, we can select products and services according to specific environmental and social criteria. What this means is that as consumers, Ecolabels guide our purchasing decisions by providing information about the 'world' behind the product.

1.1 Definition of Ecolabelled Products

Global Ecolabelling Network defines Ecolabelling as ~ "Ecolabelling is a voluntary method of environmental performance certification and labelling that is practised around the world. An ecolabel identifies products or services proven to be environmentally preferable within a specific category."

Products that fulfil transparent environmental leadership standards are granted Ecolabels, which provide openness in the manufacturing process and transmit fundamental environmental facts.

To help companies measure and communicate their efforts to minimise their environmental effect, the International Organisation for Standardisation (ISO) developed the worldwide principles and methods for ecological labelling, which are part of the ISO 14020 series (14021, 14024, 14025).

While some labels claim to assess energy consumption or pollution in terms of index scores, others state that the product meets minimal standards for sustainability or reduces environmental impact.

At present, the International Trade Centre ITC Standards Map lists 353 active sustainability standards across 19 industries and 194 countries, while the Ecolabel Index counts 456 ecolabels across 199 nations and 25 industries. For each standard profile, ITC provides a typology that specifies whether the standard is private (i.e., overseen by an organisation or firm rather than an international body) or public (i.e., an international standard).

1.2 Types of Ecolabels and Their Relevance

Ecolabels are classified based on ISO standards into three types, each serving a distinct purpose in promoting sustainability :

a. Type I (ISO 14024): These are the products that are evaluated under a voluntary , multiple criteria based third party program which authorises the use of environmental labels indicating overall environmental preferability of a product within a particular product category based on life cycle considerations. Examples include Green Pro, Green Seal etc.

b. Type II (ISO 14021): These are self-declared environmental claims made by manufacturers, often without third-party verification. While flexible, their reliability depends on the transparency of the manufacturer. Labels like “100% recyclable” often fall under this category.

c. Type III (ISO 14025): Type III environmental declarations provide quantified life cycle information to compare products with similar functions. Based on verified LCA or LCI data per ISO 14040 standards, they may include additional environmental details. Developed using set parameters, they are managed by a programme operator, such as a company, trade association, or scientific body.

Ecolabels through their holistic assessment, address in depth the concerns related to the environmental impact and the subcomponents related to sustainability, energy efficiency, carbon emissions and waste and encourages consumers to choose materials that beneficial to the environment and to human wellness, and which also adds to the Green Quotient of the built environment.

1.3 Major Ecolabelling Certifications in India

In India there are wide range of ecolabels available suitable for various sectors. To name a few ones - Green Pro Certification by IGBC has certified over 12,000+ products across 37 categories, including paints, adhesives, and HVAC systems (GreenPro, 2024).

Similarly, UL GreenGuard Certification, though international, is also widely adopted in India for low-emission building materials and furnishings. In India, Ecolabelling of building materials focusses on promoting sustainable construction practices and

reducing environmental impacts. In India there are around 6 popular Ecolabels such as Green Pro, BEE, Energy Star, UL Green Guard, FSC etc.

1. Green Pro - CII-IGBC's GreenPro Certification Labelling identifies environmentally friendly products which specifically include products used for constructing green buildings. The certification process evaluates three main elements which include resource conservation practices and energy efficiency methods and total emissions reduction results. More than 12,000 products have received certification from over 350 different manufacturers who currently hold certification.

2. Bureau of Energy Efficiency (BEE) - provides star rated appliance labels which help consumers choose energy-saving building materials and products for their energy-efficient home construction projects

3. Eco-Mark 2024 - serves as the Ministry of Environment, Forest, and Climate Change's latest announcement about the Eco-Mark certification program which creates a system for certifying products that meet strict environmental requirements while tracking their pollution and landfill waste. The Eco-Mark program encourages manufacturers to create products through environmentally sustainable manufacturing processes which support environmentally responsible product use. The Eco-Mark program includes fifteen different product groups of products within the building materials industry which include architectural paints and coatings and wood substitutes and fire extinguishing equipment.

4. FSC Certification: Forest Stewardship Council is the world's most trusted mark for sustainable forestry. For wood-based materials, the Forest Stewardship Council (FSC) certification ensures that the products come from responsibly managed forests.

5. Energy Star Label : ENERGY STAR® is the US government-backed symbol for energy efficiency. The blue ENERGY STAR label provides simple, credible, and unbiased information that consumers and businesses rely on to make well-informed decisions. It is administered by the U.S. Environmental Protection Agency. Thousands of organisations—including nearly 40% of the Fortune 500®—partner with ENERGY STAR. Together with EPA, they deliver cost-saving energy efficiency solutions that protect the climate, improve air quality, and protect public health.

6. Green Guard : Acquired in 2011, GREENGUARD Certification is now provided by UL Environment, a division of UL (Underwriters Laboratories). GREENGUARD Certification helps manufacturers create and helps buyers identify, interior products and materials that have low chemical emissions into indoor air during product usage. All certified products must meet stringent emissions standards based on established chemical exposure criteria. Products that earn GREENGUARD Certification have been scientifically proven to meet some of the world's most rigorous, third-party chemical emissions standards, helping to reduce indoor air pollution and the potential health risks of chemical exposure.

Figure 1.01 - Logos of Ecolabels available in India (source : Respective websites)

1.4 Purpose and Importance of Ecolabels

The buzzword in the construction industry is no longer sustainability, but how architecture and design will take a new face forward. Ecolabels is revolutionary

concept, wherein the products are subjected to stern environmental regulation, right from its production process till its final disposal.

Ecolabels are significant for consumers and businesses to make environmentally responsible choices. They guide consumers to identify sustainable products and promote sustainable use and motivate businesses to improve their environmental performance. Sustainability benchmarks and best practices are set through Ecolabels, which shapes the expectations of both consumers and producers. (Diamantis, D. 2018).

Importance of Ecolabels :

i. Ecolabels promote transparency and trust, with which consumers can make ethical decisions, which trigger environmentally responsible behaviour and motivate companies for an environmentally responsible production and brand themselves and gain a loyal customer base.

ii. Ecolabelled products can minimise the environmental effects of construction by increasing energy efficiency, reducing emission, increasing the value of properties, and resource saving. Dodds, R., Ali, A., & Galaski, K. (2016).

iii. Ecolabels function as vital tools which enable consumers and industry experts to select environmentally friendly options. Ecolabels offer stakeholders accurate environmental product data which enables them to identify materials and products that meet sustainability standards.

iv. Ecolabels enable decision-makers to close knowledge gaps because they require decision-makers to design and construct buildings in an environmentally sustainable manner.

v. Ecolabels create market transparency which enables consumers to trust products because they provide certified environmental performance information. The certification process requires organisations to follow strict evaluation standards which use third-party audits for verification purposes to establish certification trustworthiness. Ecolabels establish product accountability which enables customers to trust sustainable products in the market.

vi. Ecolabelled products decrease construction activities which harm the environment because they use resources more efficiently and generate fewer emissions.

vii. Ecolabels are highly transformational agents which have been influential to push the sustainable decisions commensurating with the environmental goals by giving an imperative drive for reducing environmental footprint associated with the usage of energy-conscious, water-wise, and wastes-minimising construction products.

viii. Ecolabels simplify and make a straightforward and accessible way for both consumers and builders to make environment-friendly decisions that reduce the perceived complexity of positive environmental operations. They are considered a stamp that approves products that never ruin the environment or drain our resources too quickly.

To lessen the impact of climate change, it is important to promote items that have earned eco labels. This helps achieve the broader objective of lowering emissions of greenhouse gases and protecting important natural resources.

1.5 Environmental, Economic, and Social benefits of Ecolabelled Products

Ecolabelled products bring in a multitude of environmental, economic and social benefits to the organisations such as resource efficiency, waste reduction, and importantly cutting their carbon footprint. They also act as a guide to the users and buyers on environmental concerns, advice on making smart purchasing decisions, and even educate people on living a more environmentally conscious lifestyle.

Figure 1.02 – Benefits of Ecolabelled Products

(Source – Frimpecks)

A] Environmental Benefits

UN Global Compact initiatives have included Sustainable Development Goals as objectives. Long-term environmental benefits with reduced impact and increased demand provide transparency and the highest standards for sustainability while also boasting global sustainability advantages in the marketplace. (Flood Chavez, D. I., & Niewiadomski, P. 2022.). Consumers are becoming more sensitive towards the environmental effects of conventional construction processes and search for alternatives in sustainable building processes. Gidebo, H. (2019). Advances in green building technologies have improved the possibility of constructing more environmentally friendly structures.

B] Economic Benefits

Energy efficiency and resource conservation results in cost saving and offers health benefits in the long run. Infrastructure and construction projects not only create employment but also gives impetus to the local economy and gives an additional tax revenue, which in turn can be further used to develop more infrastructure. Consumers are also willing to give a premium to Ecofriendly/ Ecolabelled products as they understand they are sensitive to environment cause as they perceive these products positively impacts the environment. (Gurau, C., & Dana, L.-P. (2018).

C] Social Benefits

Health and well-being are critical components for a healthy society and can be enhanced through health promotion, education, and other health determinants. Business, government, and community interests also hinge on the impact of such initiatives on their community. Ecolabels offer holistically environmentally sustainable products considering the process right from manufacturing to disposal (cradle to grave)

Ecolabels serve as powerful tools that help businesses align with sustainability goals while fostering trust and transparency. They enhance a company's public image, offer a competitive edge in eco-conscious markets, and support cost reduction through efficient resource use. By meeting regulatory standards and enabling performance tracking, Ecolabels also help businesses demonstrate accountability. On a community level, they encourage support for local services such as clean water initiatives, education, and job training, reflecting a commitment to social responsibility.

Ultimately, Ecolabelled products promote informed consumer choices and contribute to a more sustainable, environmentally friendly future.

1.6. Product Categories of Ecolabelled Products.

In India, there is a significant rise in adoption of Ecolabelled products, driven though holistic certification methods such as from CII IGBC Green Pro, Ecomark etc playing a pivotal role in the process of validation of increased number categories of products such as cement, solar panels, façade products, cleaning chemicals etc., which also helps in reducing the ecological impact and enhancing healthier indoor and outdoor environments, water efficient fixtures. With the choice available for multiple products by multiple brands, stakeholders have huge choices to puck up the relevant product.

Figure – 1.03 Pictures of Various categories of Ecolabelled products

(Source – Greenpro website)

Ecolabelled products are also gaining traction due to their inherent nature for supporting the conservation of vital natural resources. Ecolabelled products not only align with India's environmental objectives but also encourage the adoption of sustainable practices among consumers and industries. Their widespread use signifies a progressive shift toward environmentally responsible living and working spaces.

1.6.1 Future Outlook

New technologies, organisational methods and marketing solutions and eco-design and recycling methods and regulatory eco-innovation lead to changes in Ecolabelled products. The green building market in India will grow a rate. The building sector is

increasingly adopting green building materials to reduce environmental impact and promote a healthier future.

Biodegradable materials and energy-efficient manufacturing serve as technological advancements which enable organisations to solve multiple challenges between production costs and product availability and distribution difficulties and consumer education needs and regulatory requirements and greenwashing practices. Government policies and incentives including tax incentives and tax breaks promote the development of environmentally friendly products.

The market for eco-friendly products will expand because of rising awareness and ongoing innovation which will establish these products as essential components of the mainstream economy that drive environmental sustainability. The Indian government uses tax incentives and fast-track approvals and subsidies and recognition programs to promote green building practices.

1.7 Benefits of Eco Labelling and its contribution to the Green Buildings

Ecolabelling of building materials holds immense potential to transform the construction sector in India. By encouraging the use of sustainable materials and fostering eco-friendly production practices, ecolabelling can align construction with India's sustainable development goals. The cumulative effect will be a reduced environmental footprint, improved indoor air quality, and a positive influence on public health. As India strives to balance economic growth with environmental responsibility, ecolabelling stands out as a valuable tool for shaping a greener and more sustainable future for the nation.

Positive Impacts of Ecolabelling:

1. Environmental Conservation
2. Consumer Awareness
3. Market Transformation
4. Catalysing Government Initiatives

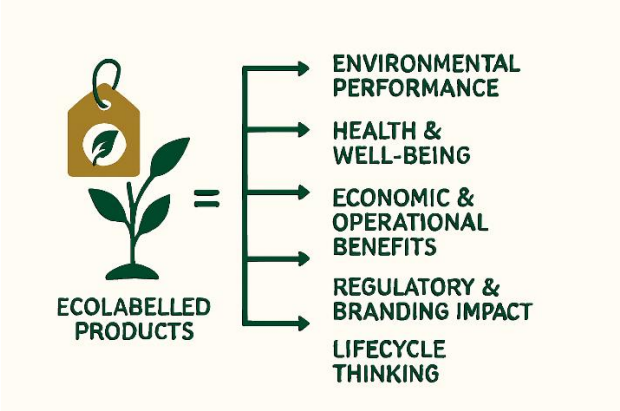


Figure 1.04 – Positive Impact of Ecolabelled Products

Ecolabelled products contribute in a holistic way in metamorphosing-built environments into Green Buildings.

1.8 Introduction to concept of Green Buildings and their need in India

In India, the construction sector is responsible for approximately 25.6% of the country's greenhouse gas emissions, driven by rapid urbanisation and large-scale infrastructure development (SAFARI Report; Kumar et al.). Urbanisation in cities such as Mumbai has led to reduced surface runoff, increased waste generation, and declining air quality, with the Urban Heat Island effect becoming more pronounced.

The construction sector is also responsible for significant deforestation, habitat destruction, and overexploitation of natural resources due to the high demand for materials such as cement, steel, and other non-biodegradable substances.

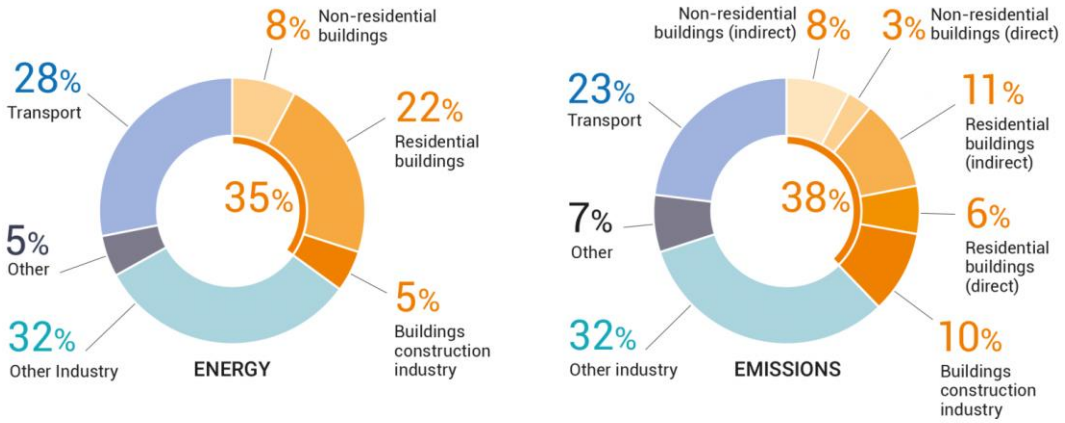


Figure 1.05 – Energy and Carbon Emissions as per building typology

Source: The Global Status Report for Buildings and Construction (5th edition)

As urbanisation accelerates, adopting modular construction techniques and circular economy strategies can enhance the resilience of urban ecosystems, mitigate climate change impacts, and pave the way for sustainable cities and long-term economic growth. The concept of green buildings offers a transformative solution to mitigate the environmental impact of construction. Green buildings integrate sustainable practices across their lifecycle, including material selection, construction methodologies, energy-efficient operations, and waste management strategies. These structures employ renewable energy systems, optimise water consumption, and utilise natural ventilation techniques, significantly reducing operational carbon emissions (World Green Building Council, 2019).

1.8.1 Green Buildings definition

The term "green building" encompasses a wide range of practices that aim to reduce the built environment's negative impact on the environment and natural resources throughout every stage of a building's lifespan, right from initial planning and design through final demolition. At every point during the project, key stakeholders i.e. the architects, builders, contractors must work closely together.

"Green building is a holistic concept that starts with the understanding that the built environment can have profound effects, both positive and negative, on the natural environment, as well as the people who inhabit buildings every day. Green building is an effort to amplify the positive and mitigate the negative of these effects throughout the entire life cycle of a building," as per US Green Building Council (Kriss, 2014). Green Building design principles enable better environmental use through energy efficiency together with waste reduction and improved indoor and outdoor spaces for building users.

Green Buildings have gradually become significant because they provide complete solutions to three major Environmental challenges and Economic challenges and Social challenges. The operational efficiency requirements which accompany rapid urbanisation and industrialisation create a need for built environments to adopt sustainable practices. Green Buildings introduce a modern architectural framework which establishes construction standards for contemporary building designs that minimise environmental damage.

U.S. General Services Administration Report (2011) states that 22 buildings achieved operational cost savings through their advanced energy performance. The occupants showed better satisfaction levels when compared to standard commercial building occupants.

The urgent need to fight climate change serves as a global requirement which centres around green building technology. Buildings worldwide produce approximately 38 percent of yearly carbon emissions which creates a requirement for sustainable building methods (World Green Building Council, 2019). Green buildings have become an essential solution which meets international agreements through its connection to the Paris Agreement and United Nations Sustainable Development Goals (SDGs).

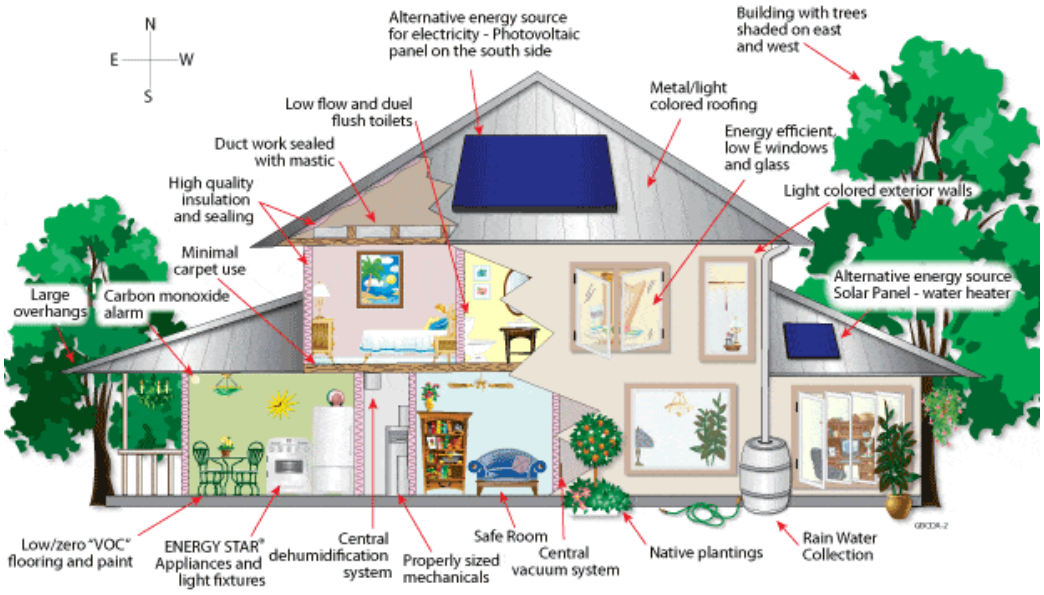


Figure 1.06 - Green Building Concept; Residential Example

(Source: Theconstructor.Org)

Green Buildings stand out as comprehensive solutions for reducing environmental impacts and create efficient, sustainable, and healthier spaces. The following section explores the transformative potential of green buildings in depth.

1.8.2 Green Building Rating Systems and their footprint in India

In India, the relevance of green buildings is even more pronounced. With rapid urbanisation and increasing energy demands, they represent a pathway to balance development with environmental stewardship. India is committed for a sustainable development which can be seen through the rise in growth of Green Buildings across geographies and categories, following the guidelines of IGBC, GRIHA, USGBC or Assocham GEM.

These ratings systems evaluate projects basis their energy efficiency, water management, and waste reduction, and provides the certificates to validate the claims and the level of sustainability.

The total estimated Green Footprint in India has crossed 12 billion Sq. ft.

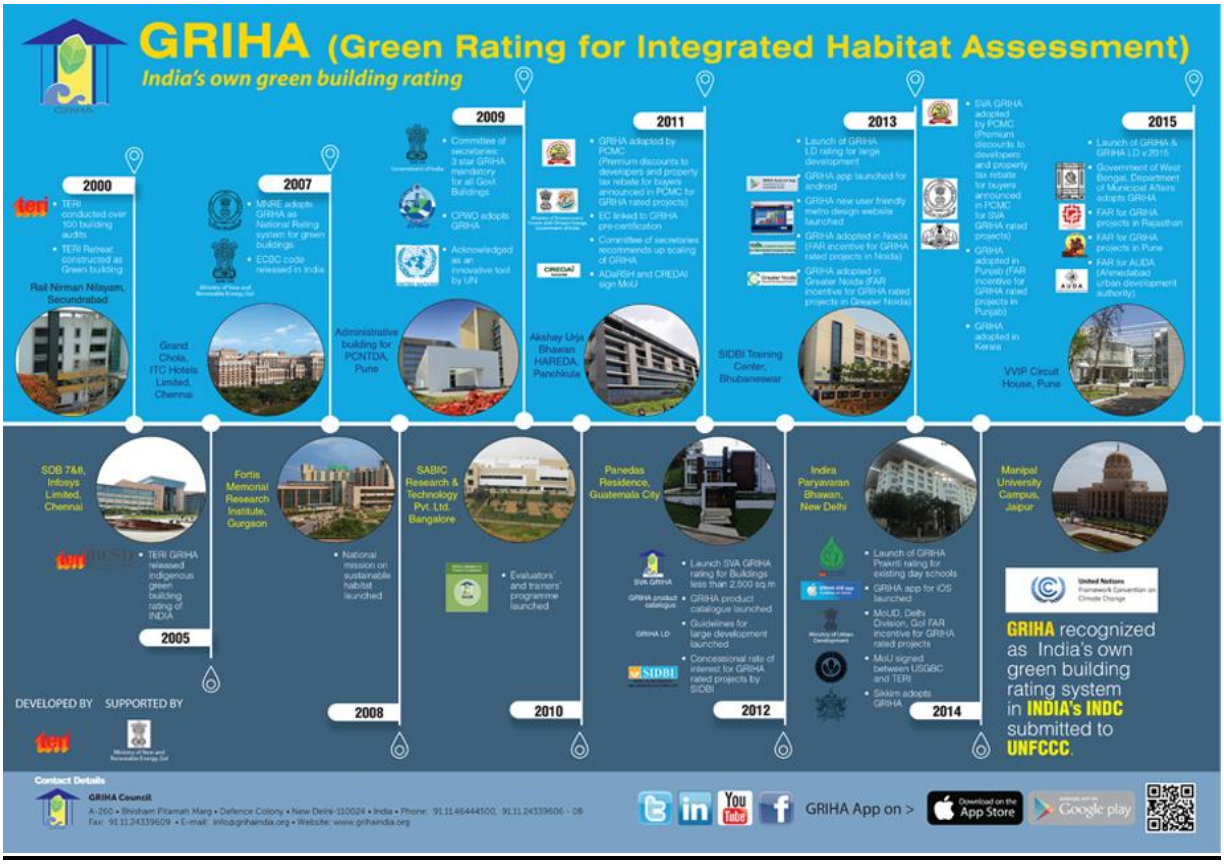


Figure 1.07 - Green Footprint in India as per GRIHA, USGBC and IGBC websites. Above figures are from the respective websites of GRIHA (GRIHA, 2016), IGBC (IGBC, 2023), USGBC (Joseph Crea, 2018)

The Green India growth story is fuelled by the strong support from the government initiatives. Among these are the Energy Conservation and Sustainability Building Code (ECSBC) that calls for energy-efficient designs for the commercial building, which receives assistance from the Sustainable Habitat Programme under the National Action Plan on Climate Change (NAPCC) and which encourages green urban planning (MoEFCC, 2021).

The government further supports these efforts through providing tax relief to green-certified projects and subsidies on solar panels as well as running awareness campaigns for urban construction projects. Through these initiatives, green building technology is further enhanced to make such buildings accessible and affordable in his future green pathway.

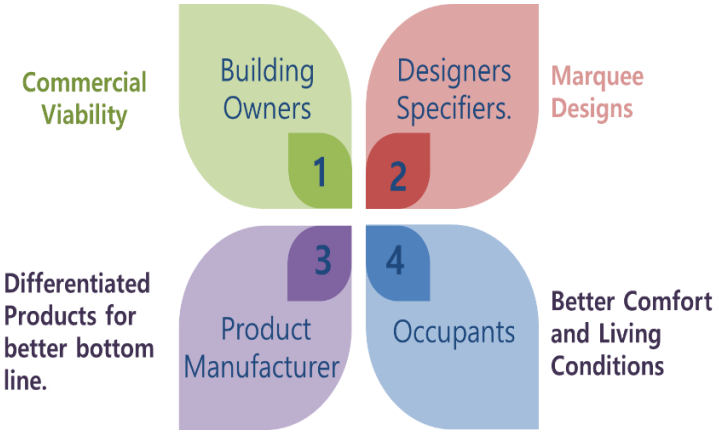


Figure 1.08 – Advantages of Green Buildings to various stakeholders

India's green building market has been thriving due to the combined impetus from greater awareness and policy support. From only 20 million square feet in 2003 the green building footprint of India was expected to surpass the 10 billion square feet mark by 2024 (IGBC, 2024).

Developers are embracing sustainability as a core principle, responding to consumer demand and global trends. Global market for green building materials will increase from $184.1 billion in 2023 to $347.7 billion in 2028, representing a 13.6% CAGR (Business wire 2023) reflecting its potential to revolutionise the construction industry. Each new project adds a chapter to the green building story, transforming skylines and setting benchmarks for the world.

In India, a rapidly growing economy, the need, and usage for sustainable building materials is of paramount importance given the escalating environmental challenges. The usage of certified sustainable products enhances the green quotient of the building and ensures the building is green right till the core. A reliable and certified way is to use products which are not just green but Ecolabelled.

Ecolabelling is a critical tool in promoting and catalysing the environmentally friendly practices across various industries, including the construction sector. Sustainable manufacturing practices are the backbone of many ecolabels, with the goal of reducing

the sector's negative ecological footprint arising from primary production or resource extraction.

1.9 Mumbai Metropolitan Region (MMR) – Geographical and Economical Significance.

Mumbai Metropolitan Region (ISO: Muṁbaī Mahānagara Pradēśa; abbreviated to MMR and previously also known as Greater Bombay Metropolitan Area), is a metropolitan area consisting of Mumbai and its satellite towns in the northern Konkan division of Maharashtra in western India, developed over a [period of 20 years. It comprises of 9 municipal corporations such as of Greater Mumbai, Thane, Kalyan-Dombivli, Navi Mumbai, Ulhasnagar, Bhiwandi-Nizampur, Vasai-Virar, Mira-Bhayandar, and Panvel and adjoining Municipal Councils consisting of Ambarnath, Kulgaon-Badalapur, Matheran, Karjat, Khopoli, Pen, Uran, Alibaug, and Palghar. The region has an area of 6,328 square kilometres (2,443 sq mi) and with a population of over 26 million it is among the most populous metropolitan areas in the world.

The entire area is overseen by the Mumbai Metropolitan Region Development Authority (MMRDA), a state-owned organisation in charge of town planning, development, transportation, and housing in the region.

A] Geographical Significance and Overview

MMR has a tropical climate which means it is extremely hot summers, wet monsoon and relatively mild winter months. With rainfall mostly confined between June to September, averaging 2,500 mm it frequently causes waterlogging and flood situations. Environment issues include the threat of erosion at the coastline, air pollution, and the Urban Heat Island effect, due to over-concentration of constructional activities and reduced open spaces in this region (TERI, 2022). Climate change has worsened these problems, with more frequent extreme weather events like cyclones and unseasonal rainfall that cause disruptions to infrastructure and construction activities.

Climate change has significant implications for the construction sector of MMR. Higher temperatures and increased rainfall aggravate erosion of structures as well as flooding at coasts. Furthermore, increased humidity levels speed up the degradation of materials, thereby increasing maintenance. Ecolabel products such as low-carbon cement,

insulating materials, and water-resistant coatings can reduce these impacts by enhancing the sustainability and resilience of buildings (Althoey et al., 2023). For instance, green roofs and rainwater harvesting systems can address water management issues while reducing the Urban Heat Island effect.

Figure 1.09 - Map of MMR (Picture Source – Assetzilla.com)

B] Economic Significance and Overview

The Mumbai Metropolitan Region (MMR) is a significant contributor to India's economy. As of 2015, the region's Gross Domestic Product (GDP) based on Purchasing Power Parity (PPP) was estimated at $368 billion (Wikipedia). This substantial economic output underscores MMR's role as a central hub for finance, commerce, and industry in India.

Within MMR, Greater Mumbai holds a dominant position, accounting for approximately 59% of the region's GDP as of 2008 (Mumbai First 2021) . This concentration of economic activity is supported by a diverse industrial base, including sectors such as manufacturing, services, and entertainment. The region's economic landscape is further bolstered by the presence of major financial institutions, corporate headquarters, and a skilled workforce, all contributing to its robust GDP figures.

1.9.1 Urbanisation Trends in MMR

MMR is highly urbanising with rapid expansion of population due to economic development and infrastructure establishment. The total population of MMR has increased from 18.4 million in 2001 to 23.7 million in 2021, in which the expansion in the cities has been substantial.

Table 1.01 – MMR Urbanisation Trend

(Source: Census of India, 2021; MMRDA, 2023)

Year	Population (in millions)	Urban Area (sq. km)	Urbanisation Rate (%)
2001	18.4	2,478	62
2011	20.7	3,015	69
2021	23.7	3,780	74

Due to urbanisation, MMR has seen surge in construction activity. Here, demand for residential, commercial, and industrial space is on the rise in a constant way. The works being carried are of Mumbai Metro, Navi Mumbai International Airport, and Trans-Harbour Link. Such infrastructure development goes to its ultimate extent to overstretch the resource, and the resultant outcome can be the case of all kinds of environmental concerns like deforestation, water shortage, and more waste generation (TERI, 2022).

Urbanisation brings in its wake, challenges and opportunities that shape the prospects of sustainable construction. The building and infrastructure boom can be fulfilled by green practice such as the energy-efficient designs, Ecolabels, and renewable energy system.

1.9.2 Overview of the Construction Industry in MMR

The construction sector in the Mumbai Metropolitan Region (MMR) has dominated its growth and transformation over many centuries. By the pre-independence period, Mumbai had emerged as a major centre of trade and commerce under the British colonial dispensation. In the early half of the century, structures such as the Gateway of India, completed in 1924, and Victoria Terminus-VT, now Chhatrapati Shivaji Maharaj Terminus, demonstrated early expressions of engineering marvels and communicated the strategic place of the city in maritime trade.

The Indian economy liberalised in 1990s, ushering the entire construction industry into a new phase. FDI backed by privatisation, started transforming Mumbai's skyline into a glittery High Rise Commercial and luxury built environment. Game changing projects such as the Mumbai Pune Expressway and the Bandra Worli sea link, showcased a modern infrastructure paving a way for a more such infrastructure and allied developments.

The construction workflow is essential to the economy of MMR contributing close to 6% to the GDP of the region (ISEG Foundation Report). From housing and business hubs, transport networks, and public amenities, this sector has played a key role in defining the area. The construction industry drives the growth of MMR's physical landscape and contributes to creating jobs and developing ancillary industries, thus ensuring the economic development of the region.

MMR has recently incorporated sustainable and massive urban infrastructure from the 2010s onwards. Such projects include the Mumbai Metro, Coastal Road Project, and the Navi Mumbai International Airport, which reflect this change with proper connectivity, less congestion, and more eco-friendly practices (MMRDA, 2023).

A mix of private companies and government bodies drive the construction industry in MMR. Together they play a very significant role in shaping the urban landscape of this place.

1. Large Construction Companies

a) Larsen & Toubro (L&T): Mega infrastructural projects such as Metro corridors and airport terminals; leader in green and technologically advanced constructions
b) Shapoorji Pallonji Group: Iconic residential and commercial high-rise constructions; includes Mumbai's Imperial Towers.
c) Hiranandani Group: Integrated township developments, such as Hiranandani Gardens in Powai.
d) Tata Projects Ltd – Large Infra projects such as Metro, Airports, Data Centres.

2. Real Estate Developers:

a) Godrej Properties: Luxury and green-certified residential complexes.

b) Oberoi Realty: Premium housing and commercial spaces in high-demand areas like Goregaon and Borivali.

3. Government Bodies:

a) MMRDA (Mumbai Metropolitan Region Development Authority): Responsible for large-scale infrastructure projects, including Metro rail and road networks.
b) CIDCO (City and Industrial Development Corporation): Focuses on urban planning and development, particularly in Navi Mumbai.
c) BMC (Brihanmumbai Municipal Corporation): Plays a key role in regulating construction activities and implementing sustainable urban practices.

MMR is witnessing a construction boom with several ambitious projects under development:

a) Mumbai Metro: The Metro project is expanding rapidly, with multiple lines under construction to improve urban connectivity and reduce road congestion.
b) Navi Mumbai International Airport: The new airport is slated to be started in 2025 , which will considerably reduce air traffic pressure on the existing airport and catalyse the development around new airport vicinity making Navi Mumbai as a new business hub.
c) Mumbai Trans-Harbour Link (MTHL): The new state of the connector to Navi Mumbai and Mumbai will offer seamless connectivity and pave the way for new development.

It’s important to integrate sustainable practices in the current ongoing and future proposed projects. Ratings such as IGBC, GRIHA, LEED promote the usage of Ecolabelled products, energy efficient HVAC and lighting systems and them on holistically rate based on they meet the criteria. The rapid quantum of construction warrants a positive contribution in MMR to prevent any damage to the fragile ecosystem and further elevate the life quality of the residents.

1.9.3 Policy Landscape for Sustainable Construction in Mumbai Metropolitan Region

The National Action Plan on Climate Change (NAPCC) was released by the Prime Minister on 30th June 2008. It outlines a national strategy that aims to enable the country to adapt to climate change and enhance the ecological sustainability of India‘s development path. MCGM's Development Control Regulations (DCR): The DCR mandates provisions for rainwater harvesting, waste segregation, and solar water heating in new developments. These guidelines are designed to ensure resource efficiency and environmental conservation in urban projects.

1.9.3.1 Specific Policies and Their Impacts

a. MCGM Rainwater Harvesting Policy MCGM made it mandatory from 2007 to install rainwater harvesting systems in buildings over 1,000 square meters. This has led to enhanced water conservation as the municipal supply is not much burdened by such buildings.
b. Maharashtra State Energy Policy: The state’s energy policy promotes the adoption of renewable energy technologies in buildings, such as solar rooftop systems, by offering subsidies of up to 40% for residential projects and financial incentives for commercial developments.
c. Maharashtra's affordable housing policy achieves sustainability through its requirement that low-income housing projects use energy-efficient construction materials and renewable energy systems. The Maharashtra government established a single window clearance system which enables developers to complete all green-certified project requirements without any delays which motivates developers to implement sustainable project methods.
d. Private developers receive financial incentives through these policies which enable them to engage in environmentally friendly building practices. Sustainable building methods become financially beneficial for construction projects because IGBC or GRIHA certification enables builders to reduce their construction costs.

The government uses national sustainability regulations together with local construction standards to make sure that MMR construction works follow international environmental sustainability requirements. These policies serve as the essential

framework which enables MMR to develop into a sustainable urban development model that protects the environment while enabling economic progress.

1.9.4 Trends in Sustainable Construction in MMR

In MMR, acceptability of green practices through IGBC, GRIHA or LEED has gained popularity. Increased awareness on environmental issues, supporting regulatory frameworks and growth in demand of ecofriendly abodes has promulgated the shift towards green construction. IGBC, GRIHA or LEED are now non optional benchmarks to be achieved. Basis the IGBC report there are more than 15,000 green buildings in India with MMR having a staggering 20 % share, which warrants that MMR has become very important (IGBC 2023). Installation of solar panels, rainwater harvesting systems, and energy-efficient HVAC systems are likewise turning popular for existing buildings because it is one of the cost-effective ways to achieve the green building standards rating.

Multiple projects in MMR demonstrate the region's commitment to sustainable construction.

Table 1.02: Notable Green projects in Mumbai and their sustainable features

Project Name	**Location**	**Sustainable Features**	**Certification**
One Avighna Park	Lower Parel	Energy-efficient lighting, water recycling, and waste management	LEED Platinum
Lodha World Towers	Lower Parel	Rainwater harvesting, green roofs, and renewable energy systems	IGBC Platinum
Hiranandani Gardens	Powai	Integrated township with green spaces, solar energy, and smart grid	IGBC Gold
Mumbai International Airport T2	Andheri	Energy-efficient cooling systems, sustainable materials	GRIHA 4-Star

Godrej Platinum	Vikhroli	Low-VOC materials, high indoor air quality, and energy conservation	IGBC Platinum

The adoption of green building practices and the execution of notable sustainable construction projects mark the leadership of MMR in sustainable urban development. These projects, besides contributing to environmental preservation, provide benchmarks for integration into the construction sector. The demand for green buildings is increasing by the day; hence, MMR is set to play a crucial role in advancing sustainable construction in India.

The government acts as a primary facilitator by making regulations and providing incentives and frameworks of policies. This will directly impact the construction industry in Mumbai Metropolitan Region (MMR) while helping to solve the environmental challenges brought about by urbanisation and resource-efficient construction methods, thereby aiding the broader agenda of sustainability.

1.10 Challenges Faced by the Construction Industry in MMR

The major environmental issues the Mumbai Metropolitan Region is facing are improper waste management, air and water pollution, and noise pollution. Fast urbanisation and industrialisation are harming marine life as well as public health. Encroachment and flooding jeopardising mangroves. Ecolabelled products may save energy and enhance property value and consumer awareness. (Kuchta, D., & Mrzygłocka-Chojnacka, J. 2020) Social challenges include resistance to change and a general lack of awareness that could impede widespread adoption.

- **Environmental Concerns**

  The MMR region experiences multiple environmental challenges which make it impossible to implement sustainable building methods.

a. The construction and demolition waste creates substantial environmental problems constituting to approx. 25 to 30 percent of the overall waste generated by Indian cities according to the expert assessment from TERI in 2022. In MMR, the common practice involves dumping waste materials into landfills which results in

two problems, namely landfill overcapacity and damage to the surrounding environment.

b. The construction activities above ground produce excessive air pollution and noise pollution which extends into the nearby regions. The construction sites experience heavy vehicle operations which create dust emissions that result in poor air quality. The machinery operations at construction sites produce noise which creates disturbances for people who live in urban areas. The construction sites introduce water pollution because their runoff water carries construction materials to nearby water bodies.
c. The MMR region comprises of coastal area, makes it vulnerable to both rising sea levels and flooding because of its coastal location. The MMRDA found that uncontrolled building projects together with mangrove deforestation present dangerous conditions which threaten building stability and human security in 2015.

• **Economic Issues**

Developers face economic difficulties when trying to implement sustainable construction methods which involve Ecolabelled products that require expensive upfront investments. Ecolabelled products and low-carbon cement products and insulated panels and renewable energy systems both represent higher expenses than traditional products. The initial expenses for a LEED certification building exceed its non-certified equivalent by not more than 5 %, according to industry standards.

Access to Green Financing: Although the government offers incentives for green projects, access to adequate funding is still limited, particularly for small and medium-scale developers. The additional financial impact desists the builders from implementing the sustainable measures.

- **Social Challenges**

The sustainable construction work in MMR region fails to reach higher employment rates because social factors obstructing the process. Developers and contractors tend to delay sustainable practice implementation because they perceive the practices to be complicated, costly and time-consuming. The public remains unaware of green construction advantages which extend to stakeholders and consumers and their long-term advantages. A TERI study in 2021 showed that in India, only 40% of urban

respondents were aware of green building concepts which is a further restriction on demand.

The construction industry in Mumbai Metropolitan Region still struggles with sustainable construction despite increased awareness and existing policies. The process of solving problems requires complete strategic compatibility with current sustainability frameworks used by the organisation. Sustainable Development Goals offers a clear roadmap for transforming the construction sector. The following subchapter explored how SDG 12 aligns with the goals and how it can overcome the challenges.

1.11 Alignment with SDG 12 – Responsible Consumption and Production

SDG 12 focuses on ensuring that consumption and production are sustainable. It involves a large spectrum of targets based on resource efficiency, reduction of waste, and environmental responsibility in production and consumption (United Nations, 2015). SDG 12 is the most relevant for the construction industry, as such a sector significantly impacts the environment.

The construction industry consumes vast amounts of raw materials, generates considerable waste, and contributes to pollution (Construction Times, 2024). By aligning with SDG 12, the construction sector can adopt more sustainable practices that minimise its environmental footprint.

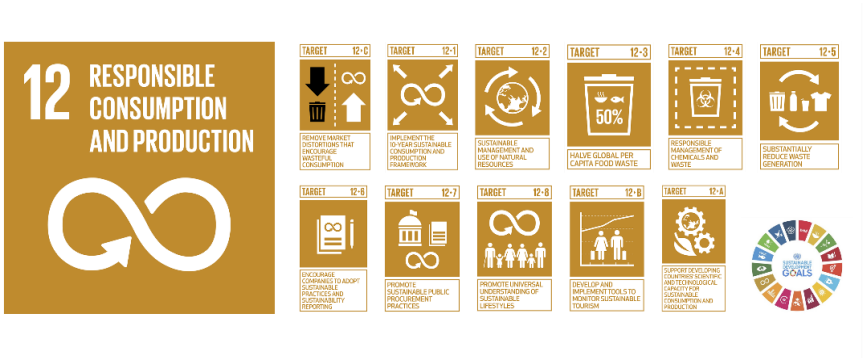


Figure 1.10 – SDG 12 (Picture Source – globalacademy.ac)

Key targets of SDG 12 relevant to the construction industry include:

Target 12.2: Achieve sustainable management and efficient use of natural resources by 2030.

Target 12.4: Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle by 2020.
Target 12.5: Substantially reduce waste generation through prevention, reduction, recycling, and reuse by 2030.
Target 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.
Target 12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

These targets emphasise the need for sustainable resource management, waste reduction, and the adoption of eco-friendly practices in the construction industry. By focusing on these areas, the construction sector in India can contribute to achieving SDG 12 and promote responsible consumption and production (United Nations, 2015).

Achieving the targets prescribed in SDG 12 requires policy intervention, tangible shift in construction practices and choosing the right material and its usage. One of the effective options for implementing responsible consumption for the built environment is to adopt Ecolabelled products.

1.11.1 Role of Ecolabelled Building Materials in Promoting SDG 12 in India

Ecolabelled Building Materials play an important role in promoting SDG 12 in India, by influencing various aspects such as,

A] Consumer Behavior

Ecolabels are known to influence the consumer behaviour in India, primarily because they are equated to Sustainability and quality. Ecolabels are also indicators of environmentally responsible products, which enhance consumer confidence and influence the purchase decisions. In the built environment segment, key stakeholders such as Architects, Builder and Contractors are adopting Ecolabelled products due to increase preference from the end clients triggered by the environment awareness.

B] Sustainable Sourcing and Resource Efficiency

Ecolabelled products encourages and promotes sustainable sourcing and resource efficiency across the construction industry. Various examples can be shared such as Ecolabelled Timber products ensures forest regeneration and biodiversity conservation, aligning with the principles of responsible consumption and production (GreenPro Council, 2020). Categories such as Steel, Plastic, glass etc have seen an increase in consumption in construction in thereby conserving the natural resources and reducing the landfills waste. Recycled materials such as steel (for load bearing and structural purpose) , plastics (flooring and insulation) , and glass are increasingly used in construction to conserve natural resources, reduce landfill waste and promote circular economy goals by diverting waste from landfills and supporting SDG 12 by minimising environmental impact through sustainable production and waste reduction.

C] Carbon Footprint Reduction

Ecolabelled building materials help reduce the carbon footprint in the construction process. High usage conventional building materials comprising of Steel and Cement are known energy guzzlers and emit high amounts of carbon (Ahn, Kwon, & Pearce, 2009). Ecolabelled products are produced in a manner to minimise environmental impact through the entire lifecycle.

D] Impact Assessment

Ecolabelled products are proven and effective in attaining the SDG 12 targets, due to the reduction in resource consumption, waste reduction, production methodology and reducing landfill dumping thereby also aiding in improving healthier built environments. Increased use of Ecolabelled products and green building certification is one possible approach which can promise a way out from these challenges. It gives reduction in the environmental impact side along with creating opportunities for innovative and economic growth.

1.12 Roles of Architects, Builders, and Contractors.

1.12.1 Architects

Architects function as spatial poets who receive complete trust from Builders and Asset owners. They create physical structures which transform the ideas that buyers and built owners have into actual solutions. The team members establish building material

specifications, and they choose building material types through their work. The way people understand things together with their existing knowledge base determines which project materials they will select and use as well as their adoption process. The organisation has significant power to determine which materials asset owners will choose for their project needs.

Architects work together with Green and HVAC Consultants because they need assistance to complete their projects through detailed designing and engineering work which requires Green Consultants and HVAC consultants to join the group of respondents. Green consultants provide product recommendations for Ecolabelled products while they support organisations to obtain IGBC and LEED and GRIHA certification and HVAC consultants develop energy-saving systems for climate control.

Architects function as essential decision makers because they determine material selection through their work which includes recommending Ecolabelled materials based on recycled steel and sustainable concrete during initial design development. They maintain sustainable practices from project foundation until project completion through this method which affects every stage of project execution.

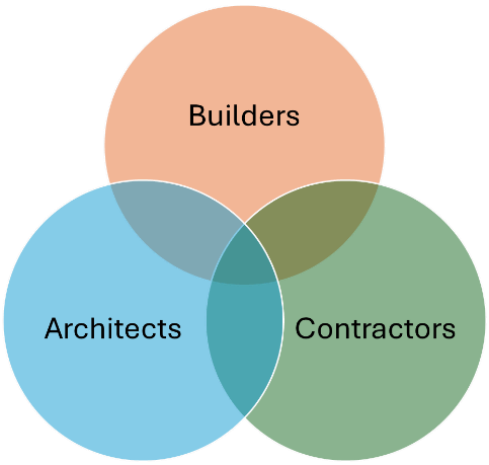


Figure 1.11 – Interconnectivity and Interdependence of Architects, Builders and Contractors.

1.12.2 Builders

Builders include developers, organisations, and individuals who oversee construction for self-consumption, leasing, or sale. They handle all project activities from resource management to contractor hiring and project execution.

Material acquisition decisions rest with builders as their primary responsibility. They assess Ecolabel products by examining their expenses and performance and product availability. Builders of the Lodha World Towers project selected sustainable materials to obtain IGBC certification which enabled them to balance their environmental goals with their business needs.

Builders encounter problems because their work has significant effects on construction projects.

• Higher Costs: Ecolabelled products create budget problems because people see them as expensive items which results in premium product costs.

• Limited Supply Chains: The unreliable distribution network for certified materials leads to project delivery delays.

• Knowledge Gaps: Builders may lack awareness of the long-term benefits of sustainable materials.

1.12.3 Contractors

MMR has a huge contractor base of thousands of active professionals spread across multiple building products categories. These set of contractors, execute all construction work right from foundation installation to the interior completion. The contractors ensure that sustainable building methods receive actual implementation from construction plans through to physical construction.

Contractors have different construction specialties which include the following work areas:

•**EPC Contractors**: These contractors handle all engineering and procurement and construction activities for big projects.

•**Turnkey Interior Contractors**: They provide complete interior design and construction services.

•**Specialised Contractors**: These contractors perform specific work functions through HVAC and tiling and painting and flooring installation services.

The contractors serve as material procurement experts who verify proper material usage throughout the project. As an example, the HVAC contractor will implement energy-

efficient systems which architects designated for installation while as the painting contractor chooses low-VOC paints which enhance indoor air quality.

The construction industry operates as a connected system which architects and builders and contractors maintain through their combined efforts to use Ecolabelled products. Architects create designs which include sustainable elements while builders choose materials and construction methods and contractors construct the project according to the design.

The environmental effects will experience a major transformation when a large of stakeholders start using Ecolabelled products, however the pivotal aspect is the perceptions which are carried by the concerned stakeholders.

1.13 Perception - Behavioural and Marketing Contexts

Perception is the process by which individuals interpret sensory information and construct meaning from their environment.

Robbins and Judge (2010) , in their study defines perception as the process through which people structure their sensory experiences to interpret their surroundings according to personal experiences, because they argue that personal interpretation leads to decision-making instead of factual evidence.

Perception serves as the fundamental element through which consumers assess products and brands and new product developments in marketing. Jennifer Aaker (1997) introduced the concept of brand personality which shows that consumers perceive brands as having human-like traits (e.g., sincerity, excitement) that influence their emotional attachment and behavioural intentions toward the brand.

Chatterjee and Kar (2020) studied digital touchpoints to understand their effect on customer trust and product evaluation while showing that emotional connection and transparent user experience determine how products get evaluated in online settings. Pellegrino (2024) explained that digital marketing now allows consumers to process brand information more easily which leads to better brand recognition through online channels.

People perceive things through their senses, but they also experience cognitive and emotional interpretation which creates a complete understanding of perception. Stakeholders assess sustainability in Ecolabelled products by examining technical details and assessing perceived credibility and social standards and emotional impact.

Ecolabelled products require a framework study since the success depends on both emotional and ethical aspects which drive customers to choose their products.

1.13.1 Relevance of Perception to Ecolabelled Product Adoption

In the Mumbai Metropolitan Region (MMR), the adoption of Ecolabelled products in construction is deeply influenced by stakeholder perception. These products—certified for their environmental benefits—often face resistance not due to technical limitations but because of how they are perceived by architects, builders, and contractors.

Ajzen's (1991) Theory of Planned Behavior remains a foundational framework, suggesting that adoption is influenced by attitudes, subjective norms, and perceived behavioural control—all rooted in perception. Thøgersen (2000) found that consumer attention to Ecolabels is driven by trust, relevance, and perceived credibility. Biswas and Roy (2015), in their study established that environmental concern, perceived product effectiveness, and brand reputation create green product perception in India because these factors operate as fundamental determinants in developing markets.

Organisations uses perception to achieve their strategic goals. The adoption rate increases when stakeholders consider Ecolabelled products to be trustworthy and affordable and matching the customer needs. The end users or buyers needs to understand Ecolabelled products because they perceive these products as expensive, unreliable and suitable for specific markets only.

Ecolabelled products create a sustainable environment which enables businesses to achieve green certification that mitigates climate change. MMR can lead the sustainable environment development by ensuring the stakeholders are made aware of the techno commercial advantages, incentives and the support from regulatory framework. The initiative will establish an ideal model for other areas and developing metropolitan areas

while establishing shared accountability for constructing an environmentally sustainable future.

Stakeholder perceptions are crucial for driving the adoption of newer technologies especially related to Green products for the usage in the projects. The construction sector at MMR needs perception management because it serves as a central element for achieving sustainable industrial development, moreover that the construction activities in the Mumbai Metropolitan Region (MMR) are increasing which creates more difficulties for maintaining sustainable practices in those construction projects.

Architects and builders and contractors function as a cohesive unit to construct significant structures which depend on their product selection and technology choice and design selection. A more positive perception of Ecolabelled products leads all of them to unison movements which drive their product selection. The perceptions these important stakeholders carry will be instrumental in shaping the adoption of Ecolabelled products in MMR.

- **Creating Awareness**: The architects and builders and contractors establish their main role to inform clients and industry professionals about Ecolabelled products and their advantages. The architect's recommendation of insulated roofing materials creates an impact on builders while giving clients confidence about the sustainable options long-term value.
- **Building Trust**: Stakeholders must develop strategies to eliminate doubts about Ecolabelled products which include their performance and price. The contractors can demonstrate the effectiveness of eco-friendly paints and energy-efficient HVAC systems by showing on-site demonstrations revealing the real time data to developers, thereby establishing the trust.
- **Advocacy of Change**: These specialised entities execute their services according to international best practices and accreditation standards which allows them to become strong supporters of sustainability. A construction company that uses Ecolabelled building materials demonstrates to the public that green construction practices constitute an essential part of its operations. The construction industry receives this message as an appropriate standard.

The market demand needs to be shaped by Architects, Builders and Contractors because their continuous use of products creates demand for these Ecolabelled products which forces manufacturers to develop more cost-effective and efficient solutions.

The Architects, Builders and Contractors influence on how projects achieve their sustainability objectives. They also influence how much Ecolabelled products should be used by customers and also thereby establish environmentally friendly construction.

1.13.2 Key Factors Influencing Perceptions

Based on the extensive review of academic literature together with industry reports and sustainability frameworks - the study focussed on three primary factors—Awareness, Availability, and Cost Benefits—that shape stakeholder perceptions and influence the adoption of Ecolabelled products in the Mumbai Metropolitan Region (MMR).

The literature review demonstrated that these three significant factors function primarily as fundamental components which either support or hinder adoption throughout all professional roles and experience levels.

The review revealed that Awareness, is the primary factor because it functions as the cognitive pathway that leads to adoption. Stakeholders need product awareness to understand Ecolabelled products because they need to know what these products are and, how they work and what advantages they provide. The literature on sustainable consumption and innovation diffusion states that awareness needs to become established before people will trust others and perceive credibility and accept changes.

In construction sector related decision-making processes, which requires decision-makers to evaluate multiple factors including risk, regulation, and reputation, awareness determines both the assessment of products and the degree of confidence in their specifications and recommendations. All other perception drivers depend on this foundation.

The review also found that availability serves as an essential element because it decides if adoption becomes practically possible. The research establishes that stakeholders who have good intentions to adopt Ecolabelled products can do so if they have lack

access to it. The concept of availability includes market entry together with supply chain dependability and vendor relationships and product availability across multiple categories. The constant presence of Ecolabelled products in urban construction systems enables construction professionals to assess their operational value during project implementation. The stakeholders may shift to standard materials only because they cannot access Ecolabelled materials, although they want to explore new options.

The construction industry uses cost economics metrics to be viable for their operations. Research on sustainable building methods together with behavioural economics shows that material selection depends on cost which stands as one of the most powerful factor. Ecolabelled products need to deliver measurable economic advantages through their full product lifecycle, energy savings, lower maintenance costs, and government funding options. The absence of a solid cost-benefit framework prevents organisations from considering environmentally friendly products, which possess technical advantages, as unworkable items. Cost considerations shape both perception and procurement, making this factor indispensable to any adoption framework.

The literature review evaluated technical performance, regulatory pressure, peer influence, and aesthetic appeal as additional parameters, but these elements did not serve as main factors driving adoption.

Technical performance, while important, is typically assumed to be adequate because a product possesses a credible Ecolabel. Perception barriers only emerged when people experienced product failures.

Regulatory pressure exists as a relevant force, yet it operates mainly through external compliance requirements. The external pressure makes people change their behavior, but it does not affect their internal understanding of things unless they become aware of it with corresponding rewards.

The study measured peer influence through the questionnaire which showed that this factor helped people, but its effect differed between different social positions. The most important factors for people were product expenses and product availability.

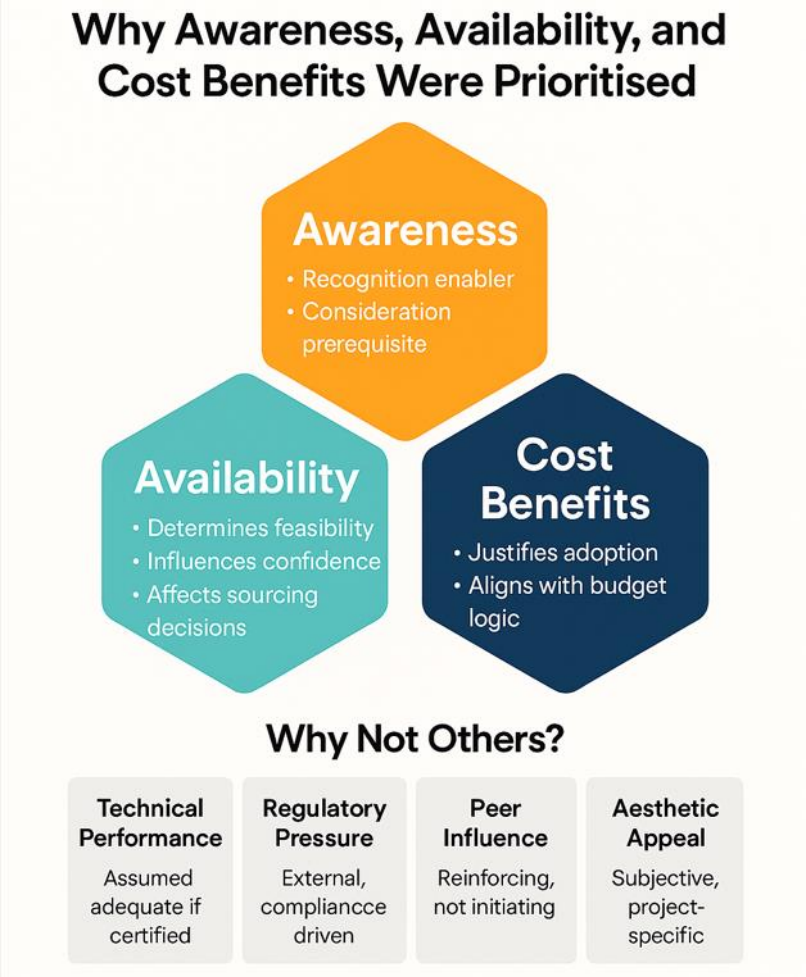


Figure 1.12 – Matrix for prioritisation of Awareness, Availability and Cost Factors.

Aesthetic appeal, particularly relevant to architects who often prioritise visual harmony and design coherence, was considered during the literature review. While visual characteristics can influence product selection in design-centric contexts, they tend to be highly project-specific and subjective. In the case of Ecolabelled products, adoption is typically driven by functional performance, environmental credentials, and cost-effectiveness rather than appearance.

Thus , Awareness, Availability, and Cost Benefits were selected not in isolation, but because they represent the most direct, consistent, and actionable levers for shaping stakeholder perception and driving adoption of Ecolabelled products in MMR. They are grounded in literature, validated through stakeholder responses, and responsive to strategic interventions—making them the most practical focus for this study.

All these factors will be understood in detail and various ways to strategically improve the perception of various stakeholders shall be explored.

1.13.3 Awareness and Its Role in Shaping Perception

Awareness is an important in shaping stakeholder perceptions and influencing the adoption of sustainable practices and products in the construction industry. The degree to which people and organisations comprehend, appreciate and choose sustainable construction solutions which includes Ecolabelled products determines sustainable construction solutions. The process of decision-making begins with awareness which motivates stakeholders to adopt environmentally friendly methods instead of their existing practices.

People who understand Ecolabelled products better show greater adoption because they believe these products provide environmental and economic advantages. The way people perceive products and decide to use them depends on multiple factors which include education, marketing strategies , government programs, industry leadership and customer preferences. Environmental awareness functions as a primary driver for all transformations because environmental knowledge leads to changes from scepticism to advocacy which results in wider adoption of Ecolabelled products and establishment of construction sustainability practices.

1.13.4 Availability and Its Impact on Perception

The availability of Ecolabelled products in construction, significantly dictates the perceptions by stakeholders towards their adoption in the construction sector. Easy access enhances the reduction of supply chain logistics-related barriers and faster site completion, while strengthening trust and boosting confidence levels, making sustainability and green building affordable to architects, builders, and contractors, but scepticism related to the unstable supply chain system and reduced availability can deter the utilisation of such products.

Easy access for procuring Ecolabelled products leads to higher product usage because it allows organisations to acquire needed items without experiencing any delays in their work activities. Sustainable materials become more acceptable to stakeholders when they have immediate access to these materials. An architect will choose nearby

suppliers who provide low-VOC paints and recycled steel materials because they want to use these materials in their architectural designs according to Felin et al. (2017).

Builders and contractors select materials which they can find in their immediate vicinity because this approach prevents any interruptions to project schedules and helps them maintain budgetary efficiency. The availability of local suppliers who provide Ecolabelled products enables businesses to reduce their shipping expenses while remaining sustainable because it cuts down on emissions linked with their extensive transportation needs according to Malle (2008). Positive perception and actual implementation depend primarily on whether resources remain accessible.

The construction sector requires Ecolabelled products to establish a dependable supply chain which assures stakeholders about their credibility. The products develop a negative image because supply interruptions and stock shortages result in delivery delays which increase expenses and create user complaints. A contractor will stop using green-certified cement for his future projects after he experiences its delivery delays which lead to his distrust of its availability.

The supply chain process operating efficiently, assures Architects, Builders and Contractors can trust that Ecolabelled products will not impede their project's execution. The system provides companies with assurance because they supply their products reliably which helps develop enduring relationships between companies and their suppliers and all their business partners. The assured supply system makes it easier for businesses to handle production disruptions because it provides them with peace of mind about meeting all project deadlines.

Availability of Ecolabelled products deeply influences perception as well the adoption inturn. Ease of availability reduces the resistance for changeover and builds trust and reliability perception. Improving supply chain, can foster a positive perception among the key stake holders – Architects, Builders and Contractors, which further will integrate into sustainable construction practices.

1.13.5 Cost Benefit, Economic Factors, and Its Impact on Perception

The cost is one of the major determinants of stakeholder perceptions toward Ecolabelled products in the construction industry. Higher initial costs of Ecolabelled product, such as low-carbon cement or energy-efficient HVAC systems, creates resistance among architects, builders, and contractors. Stakeholders will then perceive these materials as more expensive than the traditional ones and focus on immediate expenses rather than long-term value (Felin et al., 2017).

For example, a contractor working with limited budget is likely to choose low-cost materials as opposed to materials with better environmental value and better long-term performance. Perception of premium or costly products often is considered as cost overrun risk. This perception has to be countered successfully by demonstrating a overall value benefit and not just a cost benefit of the Ecolabelled product.

There is shift of perception and resistance immediately when understands there is return on investment (ROI) as well as the long-term benefit of using the Ecolabelled product. The key driver to adoption of Ecolabelled products are awareness levels, cost benefits and availability as these factors touch base knowledge, affordability and practicality concerns directly.

Awareness ushers the stakeholders on the value of environment and economic aspects, availability enhances accessibility and thus reliability and cost benefit shows ROI and long-term advantages due to the lifecycle savings and reduced energy consumption, inspite of the initial costs may be higher (Malle, 2008).

By focussing on these three ley parameters the entire construction industry can build a strong foundation for enhanced adoption.

1.14 Benefits in Adopting Ecolabelled Products for the stakeholders

Ecolabeling certification and logo on product packaging convey that the concerned product meets the prescribed certification requirements and indicator of environmental leadership. The ecolabels help users to identify products which have less environmental degradation effects, as they need fewer resources, produce fewer emissions and use socially responsible procurement methods.

a. Architects

The work of architects involves creating building plans and managing their execution. The architect performs multiple tasks related to a built environment right from planning, designing, till the construction of structures or use, as well as the landscapes surrounding those structures.

Architects who adopt Ecolabelling products achieve both environmental sustainability and strategic advantages. This is because, in the current wave of sustainable construction, such products are aligned to global trends; hence, through them, people can create buildings that are both ecologically responsible and economically viable. In addition, they upgrade an architect's reputation as a forward-thinking professional, committed to innovation and environmental stewardship (USGBC, 2021).

Sustainable design solutions and artistic expression can be explored by designers because Ecolabelled products provide multiple environmentally friendly material options in addition to the following benefits :

- **Improved Design Elasticity**

  The architect can create original designs through Eco-friendly materials which include bamboo and recycled metal and low-carbon cement. The system allows for innovative developments which include creating natural elements in urban spaces and developing buildings with high thermal performance (Felin et al., 2017).
- **Enhanced Project Sustainability Ratings**

  The sustainability ratings of a project depend on its Ecolabelling which determines its eligibility for LEED and GRIHA certifications. The project achieves its green building score through its implementation of energy-efficient windows and renewable materials plus rainwater harvesting systems.
- **Improved Client Satisfaction**

  Modern clients who care about the environment now select eco-friendly design options as their preferred choice. Clients experience higher satisfaction with Ecolabelled products because projects achieve sustainability goals while maintaining visual appeal.

- **Environmental Conservation and Carbon Footprint Reduction**

  Architects help protect the environment by selecting building materials which need less energy to produce and emit fewer greenhouse gases. The use of low-VOC paints and renewable flooring options will reduce the project's carbon emissions which will support the worldwide climate objectives established by Malle (2008).
- **Recognition and Awards**

  Architects who use sustainable methods in their work receive increased professional recognition throughout their industry. The Green Building Award and IGBC certifications represent the many national and international awards available to recognise innovative sustainable designs that use Ecolabelled products.

The field of architecture stands as the ideal profession to lead society toward sustainable design practices. Architects establish the environmental standards for construction through their adoption of Ecolabelled products which drive innovation in the industry. Architects can work together with manufacturers to design custom sustainable products whilst they conduct educational initiatives and policy campaigns to advocate for mandatory green certification.

International Examples

- Norman Foster (Foster + Partners) : Foster's designs use Ecolabelled products which include renewable materials and energy-efficient systems. The Hearst Tower in New York achieves its LEED Gold rating through the use of sustainable steel and advanced HVAC technologies.
- Shigeru Ban : He has been using renewable and recyclable materials. He used Ecolabelled products in the Cardboard Cathedral in New Zealand in an example of sustainable design innovation.

National Examples (India)

- Hafeez Contractor : One of India’s leading architects, Contractor integrates Ecolabelled products into projects like ONGC Mumbai, Minerva Residential Towers, Mahindra Splendour.
- Morphogenesis : This architecture firm adopts Ecolabelled products in designs such as the Pearl Academy Jaipur campus, which features passive cooling systems and renewable materials.

- RKA Architects Delhi : This renowned firm has designed and executed top project such as ITC Gardenia, ITC Green Centre Gurgaon a LEED Platinum rated building.

To architects, an Ecolabelled product is more of a necessity in line with the future of construction. More than creating creativity and sustainability in a project, these products enhance environmental conservation, satisfy a particular client, or might bring professional recognition.

b. Builders

The adoption of Ecolabelled products by builders is useful in saving cost, earning market competitiveness, ensuring regulatory compliance, minimising environmental impact, enhancing brand reputation, and complying to corporate social responsibility goals. In the long run, their usage results in savings, increased demand, higher value property realisations, and compliance to sustainability and green building practices.

Builders who emphasise sustainability can strengthen their brand image, attract environmentally concerned customers, and comply with corporate social responsibility. Builders play a crucial role in increasing Ecolabelled product usage because they receive significant advantages that extend beyond their ecological duties. Ecolabelled products enable builders to develop their projects while establishing market presence, increasing property value, and achieving environmentally friendly targets.

Benefits of Using Ecolabelled Products

- Green rated projects, distinguish the builders in the increasingly competitive market. Green certified buildings now attract higher demand because sustainability has become essential to modern society. For example, buildings certified by IGBC or GRIHA often stand out in listings because of their environmental credentials (IGBC, 2023).
- Properties with sustainable features command higher prices and rental yields. Building value increases when energy-efficient HVAC systems and renewable materials and Ecolabelled paints combine to decrease operational expenses while enhancing indoor air quality. ITC Green Centre builders have documented property

value increases that resulted from their sustainable certification achievements (ITC, 2022).

- Early Ecolabelled product adoption guarantees businesses will meet upcoming compliance standards because sustainability has emerged as a key governmental focus.
- Builders who use Ecolabelled products achieve their corporate social responsibility goals which results in better brand recognition. The Lodha World Towers project in Mumbai demonstrates sustainable techniques which create a better market presence for its developer.
- Builders who utilise energy-efficient materials such as insulated concrete forms together with low-carbon cement achieve reduced maintenance expenses and lower utility expenses for their customers. The cost savings from this approach prove especially valuable to extensive projects such as IT parks and hotels.
- The green building market in India which currently experiences a 9.5% CAGR (Market Research Future) enables builders to fulfil increasing market demand through their use of Ecolabelled products. The commercial and residential sectors increasingly prioritise sustainability which makes Ecolabelled materials an essential component of modern construction.

Builders of self-consuming-built environments, such as self -owned self-consumed IT parks, hotels, and healthcare facilities, see compounded benefits from Ecolabelled products.

- Higher ROI: Energy savings from features like solar panels or efficient HVAC systems can achieve ROI in less than three years.
- Premiumisation: Sustainable buildings attract higher rents and occupancy rates. For example, LEED Platinum-rated IT parks have shown rental yields up to 20% higher than conventional buildings.

Examples of Builders Championing Green Construction

a. Lodha Group (MMR): The company launched its first green construction project at Lodha World Towers through the implementation of energy-efficient designs along with water harvesting systems and Ecolabelled materials.

b. Hiranandani Group (MMR): The company developed its first integrated township project dedicated to solar energy through the installation of solar PV systems at Hiranandani Powai which serves all its residential buildings.
c. Infosys (Pan-India): The organisation implemented sustainable practices by adopting environmentally friendly materials and using renewable energy and collecting rainwater on its campuses.
d. TCS (Pan-India): The TCS campuses utilise environmentally friendly certified products together with modern energy control technologies which demonstrate the organisation's dedication to sustainable practices.
e. ITC Hotels (Pan-India): ITC Grand Chola Chennai stands as a LEED-certified ITC Luxury hotel that uses Ecolabelled products to show its excellence in the hospitality industry.

The builders make a strategic investment that offers them environmental, financial, and reputational benefits. The builders use these products to improve project value because the products help them achieve market demand and sustainability requirements. Companies like The Lodha Group alongside Infosys and ITC have set standards demonstrating how Ecolabelled products lead to profitability while helping achieve worldwide sustainability targets. The developers who use these strategies will create a sustainable built environment which will help them succeed in future business operations.

c. Contractors

Contractors serve as the main link which connects designs with actual construction work. Ecolabelled materials benefit contractors because these materials support environmental sustainability while they help contractors develop their skills and make their products more appealing to customers and create new business opportunities.

Contractors need to acquire new skills because they must learn new techniques to use Ecolabelled products. Contractors receive training in sustainable construction methods which includes learning to use green-certified materials and energy-efficient systems IGBC (2023). The rising demand for contractors who specialise in sustainable project delivery is triggered because of the worldwide increase in Green Projects. Eco sensitive

end clients and developers, prefer contractors who are adept in using Ecolabelled products and executing LEED, IGBC or GRIHA certified projects (Felin et al., 2017)

The use of Ecolabelled products by contractors in their projects leads to a decrease in carbon emissions generated during construction activities. Recycled aggregates decrease the need for virgin resources while low VOC paints enhance indoor air quality. The process establishes contracting credibility while all sustainable objectives get accomplished.

Ecolabeled product usage by contractors who pursue sustainability creates deep connections with clients who share their environmental values. This connection results in continuous business together with recognition which provides contractors the chance to handle major projects and expand their market presence.

The industry views contractors who use Ecolabelled products with sustainable practices as leaders in both their field and technological implementations. Their sustainability efforts establish their ability to command higher prices than competitors while they receive assignments for environmentally friendly projects as experts in their field.

1.15 Significance of the Study

The study holds immense importance for both industry professionals and academic researchers. By delving into the topic revolving around the perceptions of Architects, Builders, and Contractors towards the adoption of Ecolabelled products in the Mumbai Metropolitan Region, this research addresses an important gap which has not yet been addressed by the existing literature.

This study will help manufacturers understand the key factors that influences the adoption of Ecolabelled products, by which they can improve their strategies to promote sustainable materials. The findings assist organisations in creating specific strategies that will boost Ecolabelled product adoption which leads to their sustainable practices. Organisations that use essential enablers to overcome adoption barriers will achieve better sustainability results which will decrease their environmental footprint while delivering advantages to all stakeholders.

The findings from the present study will benefit future academic research. The designed questionnaire can easily be adapted for use in other geographies and also sectors thereby furnishing a firm framework for an investigation into adoption of Ecolabelled products. The current study results provide a foundation for research that examines marketing strategies and professional expertise while helping governments formulate sustainable development policies. This research enhances academic knowledge about Ecolabelled products and provides practical solutions that promote sustainable development in the construction sector which leads to environmentally responsible practices.

1.16 Structure of the Thesis

The entire thesis is subdivided into the following chapters:

Chapter 1 Introduction

The content of this chapter answers the following questions: Introduction to Ecolabelling and Ecolabelled products, Definition, Benefits of Ecolabelled products, What is Ecolabelling? Why is Eco labelled product and its relevance and contribution to enhancing the sustainability? What is Green Building? Why Green Buildings are important? Roles of Key Stakeholders And so on. This Chapter also clarifies significance of the study.

Chapter 2 Literature Review

This chapter includes the substance of research done earlier on the similar topic by research scholars. The chapter reviews literature from various sources such as Research papers, articles published earlier on the similar topics, Industry reports, web articles.

Chapter 3 Research Methodology

This chapters covers the Research Methodology, which comprises of conducting mixed method study by collecting primary and secondary data , which is both qualitative and quantitative. Research is also conducted referring secondary data like white papers, press releases, government, or trade body notifications, acts, and Professional and Business Journals.

Chapter 4 Data Analysis and Interpretation

This Chapter has covered aspects like data collection and collation, scientific data analysis, data description, analysis validation, interpretation, and discussion.

Chapter 5 Findings

The major findings from the study are discussed in detail in this chapter.

Chapter 6 Recommendations and Suggestions

This chapter provides the recommendations and suggestions to the reader and various stakeholders for formulating strategies based on post study outcomes , which reveals the factors influencing the adoption of Ecolabelled products.

Chapter 7: Limitations of the Study

This chapter has captured the key limitations of the study.

Chapter 8: Scope for Further Study:

This chapter ushers us into areas which are unexplored and can be worth for further examination.

Chapter 9 : Conclusion :

This chapter gives a conclusion of the study based on the previous chapters.

1.17 Summary

Ecolabels are emerging as a sustainable solution for mitigating the construction sector's environmental, economic and social challenges which are grappling with high carbon emissions, resource depletion and increase in the pollution.

With the increase in acceptance of green building certifications such as IGBC,GRIHA, USGBC etc., triggered by government sponsored incentives and statutory guidelines, Ecolabeled products are getting integrated more into mainstream construction practices like never before. Mega projects such as Mumbai Metro and Navi Mumbai International Airport are examples of demonstration of real-world tangible benefits of sustainable construction addressing the urbanisation and simultaneously contributing to global climate goals.

The undertaken research focusses on the important role of the key stake holders ~ Architects, Builders and Contractors in driving the adoption of Ecolabelled products in Mumbai Metropolitan Region. The study emphasises that the key drivers ~ Awareness, Availability and Cost Benefits, are foundational in driving and influencing stakeholders' decision on adoption of Ecolabelled products.

Every factor plays an important role such as Awareness bridges the knowledge gaps, Reliability is ensured by Availability, and the long-term value proposition is driven by Cost benefit.

MMR has a strong opportunity to position itself as a leader in sustainable urban development, which can be done by fostering the collaboration between Architects, Builders and contractors in tandem with the regulatory framework and setting benchmarks for higher adoption for Ecolabelled products in India.

Chapter 2

Literature Review

Chapter 2. Literature Review

The chapter covers important aspects related to the research topic undertaken and delves deep into the available literature, sourced from academic papers, books, websites, blogs etc., related to the field of study.

This literature review explored various key aspects related to the study topic, focusing on how the perceptions of Architects , Builders and Contractors influence the adoption of ecolabeled products. The literature review has focused how these perceptions are shaped by factors such as Awareness, Cost benefit and availability of the Ecolabelled products

For the purpose of this study , an extensive literature review was undertaken wherein around 237 literatures were examined across various sources such as websites, blogs, articles, papers. 176 of these literatures were included in the thesis supporting/ justifying/ rejecting various premises, assumptions and facts throughout this research. Through a systematic screening, 75 literature sources specific to the variables were identified. In addition to these 12 sources related to the perception theories, which are not linked to the variables were also included in the study which helped to establish the conceptual foundation for the study. Thus, a total of 87 nos of relevant sources were selected for the detailed review. They comprise of 70 nos of Academic Papers and Research, 6 nos of Blog/Media/News Article and 11 nos of Reports/Industry Document.

The Literature Reviews conducted per variable are as follows,

a. Dependent Variable : 10 nos (There is one dependent variable)
b. Independent Variables : 34 nos (IV1 – 12 nos, IV 2 - 10 nos , IV3 - 12 nos)
c. Moderating Variables : 31 nos (MV1 – 10 nos, MV2 - 11 nos, MV3 - 10 nos)

2.1 Dependent Variable - Adoption of Ecolabelled products.

1. Riskos et al. (2021), in their paper Ecolabels And The Attitude–Behavior Relationship Towards Green Product Purchase: A Multiple Mediation Model, states that people's trust in the eco-label is important because it affects their attitude towards buying green products as well as involvement with eco-labels. This finding

is central to understanding the dependent variable, as trust operates as a foundational element that bridges awareness and action. The study's emphasis on the attitude–behavior relationship highlights that even when consumers are aware of eco-labels, their actual adoption depends on the credibility and perceived reliability of such labels. In this context, trust enhances consumer confidence and reduces perceived risk, thereby increasing the likelihood of purchase. Consequently, the study substantiates the variable by demonstrating that adoption is not merely a function of awareness but is significantly mediated by trust and attitudinal alignment.

2. Sharma and Kushwaha (2019), in their paper Eco-Labels: A Tool For Green Marketing Or Just A Blind Mirror For Consumers, explored the effects of eco-labels on consumer behaviour and trust as well as the adoption of green products using a sample that represented 506 Indian consumers. They also briefly discussed the significance of eco-label impact in green marketing and advertisement. The study provides empirical support from an Indian context, which is particularly relevant for the present research. By linking eco-labels with both trust and behavioural outcomes, it underscores the dual role of eco-labels as informational as well as persuasive tools. Furthermore, the integration of marketing and consumer behaviour perspectives indicates that adoption is influenced by both communication strategies and individual perceptions. Thus, the research reinforces the dependent variable by situating adoption within a framework that combines trust-building and effective marketing communication.

3. Mohamadi (2021), in the paper Does Companies' Green Values Effect On Consumers Attitude And Behavior Toward Purchasing The Green Product?, undertook a study which found out that one of the factors that affect consumer behaviour when purchasing building materials which are Ecolabelled is value attached to such goods by marketers who present them as being "green;" moreover another finding was about perception on these items where buyers feel they are more likely going to save environment through this purchase than any other type. This perspective highlights the role of perceived value and moral satisfaction in shaping purchase decisions. When products are positioned as environmentally responsible, they appeal not only to functional needs but also to ethical

considerations. In relation to the dependent variable, this indicates that adoption is influenced by both cognitive evaluation and emotional engagement. The study therefore adds depth by showing that Ecolabelled product adoption is driven by a combination of perceived environmental impact and value communication.

4. Chandak (2018), in her paper Green Marketing: Change Leading To Sustainability, in her research was geared towards establishing how consumers' behaviour can be influenced by what they think and know about products bearing environmental labels; she also looked into different aspects concerning this area, among them are challenges faced when trying to convince people to go green. She found out that majority if not all companies do not invest enough effort in making their products appear green thus leading low knowledge level among customers at end use stage. This finding draws attention to the critical gap between product positioning and consumer understanding. Without adequate communication and visibility, even environmentally beneficial products may fail to gain traction in the market. From the standpoint of the dependent variable, this suggests that adoption is contingent upon effective knowledge dissemination and marketing effort. The study thereby reinforces that insufficient promotion and lack of clarity can significantly hinder the adoption of eco-labelled products.

5. White et al. (2019), in their paper The Elusive Green Consumer, publish an article in Harvard Business Review describing problems with consumer spending patterns, sentiment indicators versus actual purchase behaviours gaps. The study also looked at whether peer pressure also contributes to consumer behaviour. The concept of the attitude–behaviour gap is particularly relevant in the context of eco-labelled products, where positive intent does not always translate into actual purchase. The study's exploration of social influence further indicates that external factors, such as peer behaviour and societal norms, can shape individual decisions. In relation to the dependent variable, this highlights the complexity of adoption, which is influenced by both internal attitudes and external pressures. As such, the research provides a nuanced understanding of why adoption levels may remain low despite high awareness.

6. Arsyistawa and Hartono (2015), in their paper The Effect Of Eco-Label And Perceived Consumer Effectiveness Toward Green Purchase, in their study demonstrated through the PLS-SEM approach the positive impact of ecolabels on product acceptance. While it analyses the relationships effectively, the area where this study falls short is not having that wide reach to the overall consumer market connect. The research content: eco-labelling, product features, usability and environmental issues. The study's methodological rigor strengthens the causal link between eco-labels and consumer acceptance, thereby offering quantitative validation for the dependent variable. However, the limitation in scope suggests that findings may not be universally generalisable. Despite this, the emphasis on perceived consumer effectiveness indicates that individuals are more likely to adopt eco-labelled products when they believe their actions can make a difference. This insight adds a psychological dimension to the understanding of adoption behaviour.

7. Sharma et al. (2022), in their paper Factors Affecting Green Purchase Behavior: A Systematic Literature Review, investigated what are some factors which influence the purchase of Green Products based on previous work (151 studies from different years ranging between 2000-2021,) conducted by other researchers around the world. They note that a number of them have reported inconsistent results while others had limited inclusion criteria hence this study was undertaken to fill gaps left behind by those studies. Key areas for research include customer characteristics, intentions towards purchasing environmentally friendly brands or products as well marketing strategies employed during such campaigns among others. This comprehensive synthesis provides a macro-level understanding of the determinants of green purchase behaviour. By consolidating diverse findings, the study highlights the multifaceted nature of adoption, encompassing demographic, psychological, and marketing-related factors. In relation to the dependent variable, it underscores that adoption cannot be explained by a single factor but requires an integrated approach that considers multiple influences simultaneously.

8. Tan (2011), in the paper The Roles Of Knowledge, Threat, And PCE On Green Purchase Behaviour, is his article examines factors affecting green purchase behavior with a focus on perceived consumer effectiveness, environmental knowledge and threat. He states that PCE significantly influences information

search and predicts environmentally conscious behaviour but also notes attitude-behaviour relationships may not always be consistent. The inclusion of perceived threat and knowledge adds further depth to the understanding of consumer motivation. When individuals perceive environmental risks as significant, they may be more inclined to adopt eco-labelled products as a preventive measure. However, the inconsistency in attitude–behaviour relationships suggests that awareness alone is insufficient. For the dependent variable, this indicates that adoption is influenced by a combination of awareness, perceived impact, and situational factors, thereby reinforcing its complexity.

9. Asawa-Amnuai (2015), in the paper The Study Of Consumer Behavior And Purchasing Decision Toward Eco-Friendly Building Materials, in the research study suggests that the needs and attitudes depend on such factors as government support, knowledge and approval. This perspective highlights the role of institutional and contextual influences in shaping consumer behaviour. Government policies and endorsements can enhance the credibility of eco-labelled products and encourage adoption. Additionally, knowledge dissemination and social approval further strengthen acceptance. In relation to the dependent variable, the study emphasises that adoption is not solely an individual decision but is also shaped by external support systems and societal validation.

10. Agarwal and Dixit (2021), in their paper A Study On Indian Consumer's Attitude And Their Buying Behavior Towards Green Products, a study on Indian consumers' attitude and their buying behavior towards green products. Their findings conclude that while attitudes are positive, actual adoption is still evolving and requires stronger awareness campaigns. This reinforces the persistent gap between intention and behaviour, particularly in emerging markets like India. The study suggests that awareness campaigns must be more targeted and impactful to drive behavioural change. From the perspective of the dependent variable, it highlights that adoption is a gradual process influenced by sustained communication efforts and increasing familiarity with eco-labelled products.

Table 2.01 – An Overview of the Literature review pertaining to Adoption of Ecolabelled products.

Author	Area of Research	Gaps
Kyriakos Riskos ,Orcid,Paraskevi (Evi) Dekoulou, Naoum Mylonas And George Tsourvakas	Consumer Behaviour Ecolabel Credibility	Relationship between awareness and experience
Nagendra Kumar Sharma And Gyaneshwar Singh Kushwaha	Perception Competitive Advantage	Lack of industry specific guidelines on Ecolabelling
Mihat Mohammadi	Consumer Behaviour and Perception	Professional Background, Experience and Demographics
Anjali Chandak	Green Marketing Awareness Drives	Awareness Campaigns Green Myopia
Katherine White, David J. Hardisty and Rishad Habib	Peer Influence Pride and Guilt drives Sustainable consumerism	Intention Action gap
Srishti Agarwal and Aparna Dixit	Green Marketing, Consumer Behavior	Attitude–Behavior Gap, Awareness–Knowledge Gap and India-Specific Evidence Gap
Ulva Arsyistawa, Arif Hartono	Product Attributes influencing the Ecolabel adoption	Drawbacks of Ecolabel understanding.
Kavita Sharma, Chandni Aswal, Justin Paul	Marketing Strategies for Green Purchase Behaviour	Awareness–Knowledge Gap
Booi-Chen Tan	Perceived Customer Expectations	Inconsistency in attitude and behaviour relationship

Apichart Asawa-Amnuai	Consumer Behaviour Perceived benefits	India-Specific Evidence Gap

The literature review does not specifically provide context specific information related to the understanding of the factors which influence the adoption of eco-labelled products within the MMR, by Architects, Builders and Contractors. An in depth study will provide key insights on the identified gap.

2.2 Independent Variable

2.2.1 - IV 1 - Awareness levels about Eco-labelled Products.

1. Mokha (2017) explored the role of eco-labels, environmental advertising, and eco-branding as key tools of green marketing. The findings indicate that while information dissemination positively influences consumer behaviour, its impact depends heavily on the credibility attributed to eco-labels. In situations where such trust is weak, consumers may still make suboptimal purchasing decisions despite being informed. The study, Impact of Green Marketing Tools on Consumer Buying Behaviour, thus underlines that awareness alone is insufficient; belief in eco-label authenticity plays a decisive role. This brings out an important behavioural insight, where scepticism can significantly weaken the effectiveness of green marketing efforts. Extending this argument, the study directly informs the present variable by demonstrating that awareness must be accompanied by perceived credibility to translate into meaningful engagement with eco-labelled products. In this sense, awareness is not a static construct but one that is filtered through trust, thereby shaping the depth and quality of consumer understanding.

2. Bhattacharjee and Mukherjee (2015) examined green marketing trends in India, focusing on consumer perceptions and the challenges associated with adoption. Their analysis highlights the importance of fostering consumer confidence, particularly as eco-friendly products are often evaluated in terms of both cost and environmental benefit. The study also points to the absence of segment-specific insights, suggesting that awareness levels vary across consumer groups. In A Descriptive Study on Green Marketing Trends in India, the authors position awareness and trust as key mediating factors, while also drawing attention to methodological gaps that call for more targeted and context-sensitive research

approaches. Building on this, the study contributes to the present variable by indicating that awareness is heterogeneous rather than uniform across populations. Such variation necessitates differentiated communication strategies, thereby reinforcing that awareness-building efforts must be tailored to specific consumer segments for effective eco-label adoption.

3. Veena and Ajith (2020) discussed the evolving landscape of green business in India, outlining both opportunities and constraints. Their work highlights how consumer awareness and perception interact with cost considerations, often leading to dissatisfaction when eco-friendly alternatives are perceived as expensive. The paper, Green Marketing: Forces, Challenges and Future Scope in India, Amidst the COVID-19 Pandemic, illustrates how affordability and awareness operate simultaneously as barriers. This dual constraint reflects the realities of emerging markets, where economic and informational limitations intersect, thereby adding important contextual depth to the understanding of eco-label adoption. From the perspective of the present variable, the study suggests that awareness cannot be viewed in isolation from economic capability. Instead, it must be interpreted within a broader framework where financial considerations influence how awareness is processed and acted upon.

4. Rochikashvili and Bingaerts (2018) investigated the influence of eco-labelling on product development, comparing perspectives of end users and experts. The study emphasises the role of Environmental Product Declarations (EPDs) in enhancing transparency yet also notes that tools such as Life Cycle Assessments (LCAs) are often perceived as complex by end users. This complexity can limit comprehension and, in turn, affect satisfaction and adoption. In How Eco Labelling Influences Environmentally Conscious Consumption of Construction Products, the authors highlight a critical tension between transparency and usability, suggesting that awareness must be accompanied by simplicity for effective decision-making. This insight is particularly relevant to the variable, as it demonstrates that excessive technicality may hinder awareness despite the availability of detailed information. Therefore, simplifying communication without diluting content becomes essential in enhancing awareness levels.

5. Nair and Maram (2015) analysed green consumer behaviour with a focus on strategies to enhance awareness and promote sustainable consumption. Their findings suggest that while marketing initiatives can address behavioural barriers, challenges such as high costs and limited institutional support continue to hinder adoption. The study, Towards Sustainable Consumption: Analysing Green Consumer Behaviour, links awareness-building efforts with behavioural outcomes, but also underscores the role of policy and affordability. This perspective situates eco-label adoption within a broader socio-economic and institutional framework. In relation to the variable, it indicates that awareness is shaped not only by marketing but also by systemic enablers. As such, awareness becomes an outcome of both informational efforts and structural support mechanisms.

6. A report by TNN (2007) highlights the challenges associated with eco-labelling initiatives in India, particularly the low levels of consumer awareness. It notes that eco-labelled products are often perceived as expensive, while limited incentives reduce manufacturer participation. The article, Lack of Awareness Major Hurdle, points to a combination of consumer scepticism and systemic inertia. This interplay between demand-side and supply-side constraints reflects the structural challenges that impede wider adoption. From the standpoint of the present variable, the study underscores that awareness deficits are deeply embedded within market structures. Addressing these gaps requires coordinated efforts involving policy support, pricing strategies, and awareness campaigns, thereby reinforcing the multi-dimensional nature of awareness.

7. Eze et al. (2020) examined the adoption of green building materials in Nigeria, identifying both environmental benefits and systemic barriers. While awareness and knowledge levels were found to be relatively high, actual adoption remained limited due to the absence of certified green buildings and weak institutional coordination. In Green Building Materials Products And Service Market In The Construction Industry, the authors demonstrate that awareness, although necessary, does not automatically translate into practice. Instead, the presence of supporting frameworks and certification systems becomes crucial, adding a governance dimension to the discussion. This directly strengthens the present variable by

illustrating that awareness must be complemented by enabling infrastructure to achieve meaningful adoption outcomes.

8. Golden et al. (2020) provided an overview of sustainability initiatives at Duke University, focusing on eco-labelling, certification systems, and communication strategies. The study highlights that while consumer awareness can be enhanced through effective communication, fragmented standards create confusion in the marketplace. In An Overview of Ecolabels and Sustainability Certifications in the Global Marketplace, the authors show how competing labels and inconsistent messaging can dilute the impact of awareness efforts. This positions eco-label adoption within a complex global landscape shaped by multiple standards and actors. For the present variable, this implies that clarity and standardisation are essential for strengthening awareness and preventing cognitive overload among consumers.

9. Weniger et al. (2023) explored sustainability-related behaviour among construction professionals in Germany. Although there is a clear interest in environmentally friendly products, the study finds that a comprehensive understanding of sustainability remains limited. Eco-labels serve as useful decision-making aids, yet their effectiveness is constrained by gaps in holistic awareness and insufficient demographic analysis. In Consumer Behaviour and Sustainability in the Construction Industry—Relevance of Sustainability-Related Criteria in Purchasing Decision, the authors highlight the need for deeper engagement with professional users, thereby adding a sector-specific dimension to the variable. This suggests that awareness among professionals requires continuous education and contextualisation to translate into informed decision-making.

10. Aruna Singh (2017) investigated consumer perceptions of eco-labelled building products, focusing on their ethical, functional, and practical attributes. The study emphasises the role of consumer knowledge in shaping adoption decisions, while also reflecting changing preferences towards eco-friendly consumption. In Eco Labelled Building Products Perceptions, awareness emerges as a dynamic construct that evolves alongside market trends and consumer expectations, thereby introducing a temporal dimension to the analysis. In relation to the present variable,

this highlights that awareness is not static but continuously shaped by evolving consumer experiences and market innovations.

11. D'Souza et al. (2007) examined consumer responses to environmental labels, with particular attention to demographic influences. The findings indicate that satisfaction with eco-labels varies across age groups, with older consumers expressing greater levels of dissatisfaction. The study, Green Decisions: Demographics and Consumer Understanding of Environmental Labels, underscores the importance of credibility and clarity in labelling strategies. It also highlights how demographic characteristics shape both awareness and acceptance, adding an important layer of differentiation. This reinforces the present variable by indicating that awareness is influenced by demographic diversity, necessitating tailored communication strategies.

12. Isaacs (2015) analysed consumer mindsets in relation to eco-labelled products, focusing on preferences, willingness to pay, and perception. The study also considered related aspects such as e-waste recycling, along with the influence of income and age on consumer sentiment and purchase intentions. In Consumer Perceptions of Eco-Friendly Products, the findings suggest that while awareness is influenced by individual preferences and economic capacity, it does not always translate into action. Social desirability bias further complicates this relationship, weakening the link between stated intentions and actual behaviour. This reinforces the idea that eco-label adoption is shaped not only by knowledge but also by broader socio-economic and psychological factors. In relation to the variable, the study highlights that awareness must be interpreted within a behavioural context where intention and action may diverge.

Table 2.02 – An Overview of the Literature review pertaining to Awareness levels about Eco-labelled Products.

Author	Area of Research	Gaps
Anupreet Kaur Mokha	Eco Marketing	Brand building for trust building

Dr. Soumendra Bhattacharjee, Subhadeep Mukherjee	Challenges in green product marketing	Robust segment specific study
Veena M and Dr. N Ajith Kumar	Product Awareness	Willingness to spend inspite being green aware
Mariia Rochikashvili and Jan C. Bongaerts	Environmental Product Declarations LCA	Limited Category of products studied
Suja R. Nair	Environmental Consciousness	Lack of awareness Govt Policy
TNN	Ecolabeling awareness	Manufacturers apathy due to lack of incentives
Chidiebere Emmanuel Eze, Rex Asibuodu Ugulu, Samuel Ikechukwu Egwunatum and Imoleayo Abraham Awodele	Benefits of Ecolabelled products used	Standards Implementation
Jay S. Golden, Dan Vermeer, Bob Clemen, Alexandra Michalko, / Davie Nguyen, Catherine Noyes, Anita Akella, Julia Bunting, /	Ecological Effectiveness Communication strategies	Multiple and fragmented standards
AlexandraWeniger, Pamela Del Rosario , Jana Gerta Backes and Marzia Traverso	Purchase decision criteria	Lack of holistic view of Sustainability
Aruna Singh	Perception and Product offtake	Government Policy to drive Eco consumption
Clare D'Souza, Mehdi Taghian, Peter Lamb, Roman Peretiatko	Demographic profiles and their attitudes towards Ecolabelling	Need for comprehensive understanding beyond demographics

Sheik M. Isaacs	Perception Theories	Social desirability bias

The literature review does not specifically provide context specific information related to the awareness and the correlation it has on the adoption of eco-labelled products within the MMR, by Architects, Builders and Contractors. An in depth study will provide key insights on the identified gap.

2.2.2 - IV 2 - Cost Benefits of Eco-labelled Products.

1. Jain and Verma (2019) explored eco-labelling awareness and consumer behaviour in Delhi NCR, India, highlighting the influence of pricing on green purchasing decisions. Their work provides insights into consumer attitudes, awareness levels, and motivational drivers. The paper A Study of Consumer Perspective Towards Eco-Labelling in Delhi NCR, India shows how price sensitivity interacts with awareness to shape adoption patterns. It also emphasises the importance of demographic factors and consumer education in strengthening awareness, indicating that motivation alone is insufficient to overcome cost barriers. Overall, the study brings out behavioural, economic, and educational dimensions of the variable. Extending this understanding, the study reinforces that awareness must be interpreted alongside purchasing power, as economic constraints can moderate even well-informed consumer intentions. In this way, awareness emerges as a necessary but not self-sufficient driver of adoption, requiring alignment with affordability and targeted educational efforts.

2. Midha et al. (2013) examined consumer behaviour in relation to green buildings in Delhi NCR, focusing on awareness, motivations, and factors influencing purchase decisions. The findings reflect how choices are shaped by cost implications, environmental benefits, and health considerations. In Buying Behaviour of Consumers Towards Green Buildings in Delhi NCR, the interaction between awareness and financial constraints becomes particularly evident. While long-term advantages are recognised, immediate cost concerns often take precedence, thereby limiting adoption. This highlights the balance between perceived benefits and economic realities. From the perspective of the variable, the study suggests that awareness operates within a decision-making framework where short-term financial

priorities frequently override long-term sustainability considerations, thereby constraining adoption despite informed understanding.

3. Tullani and Dahiya (2018) analysed the role of eco-labelling in influencing consumer behaviour, with emphasis on awareness, trust, and purchase intentions. Their study identifies eco-labels as important tools for promoting green products, although it also notes gaps in empirical validation and implementation clarity. In A Turn in Green Purchase Intentions Through Eco-Labelling, the findings suggest that awareness must be reinforced by trust and supported through stronger empirical grounding. This positions eco-labelling at the intersection of behavioural influence and methodological development. Building on this, the study highlights that awareness gains practical relevance only when supported by credible evidence and consistent implementation, thereby strengthening its role in shaping adoption behaviour.

4. Bonini and Oppenheim (2008) observed that consumers show interest in eco-labelled building materials despite facing challenges such as high costs and concerns over authenticity. They argue that organisations need to clearly communicate benefits and ensure product quality to align intentions with actual behaviour. In Cultivating the Green Consumer, the interplay between awareness, trust, and affordability becomes central. The study highlights the persistent gap between interest and adoption, underscoring credibility as a key determinant. In relation to the variable, this suggests that awareness must be supported by transparent communication and consistent product quality, as any mismatch between claims and reality can weaken consumer confidence and hinder adoption.

5. Das and Sharma (2022) investigated the impact of sustainability certifications in India's office real estate market, noting that inventory uptake is closely linked to rental premiums. Their work underscores the growing relevance of certified green buildings in shaping market behaviour. In Tracking the Green Footprint in India's Office Market, awareness of certifications is shown to translate into measurable economic outcomes. This demonstrates how financial incentives can reinforce adoption, adding an institutional and market-oriented perspective. The study further indicates that awareness becomes more actionable when linked to tangible financial

benefits, thereby bridging the gap between environmental consciousness and economic rationality.

6. Yoganandan and Sivasamy (2017) highlighted the increasing importance of green marketing in response to rising environmental concerns. Their research spans consumer behaviour, organisational strategies, and policy initiatives. In A Study on Green Products Buying Behaviour in Indian Market, awareness is positioned as a product of both corporate and governmental efforts. At the same time, the study notes instances of consumer resistance when products are perceived as overpriced or lacking genuine eco-value, indicating the need for credibility alongside promotion. This reinforces the idea that awareness-building must be accompanied by authenticity and fair pricing to ensure meaningful adoption outcomes.

7. Rao (2023) analysed the growth of the construction sector in India, linking it to urbanisation, innovation, and competitive dynamics. The study also identifies supply chain inefficiencies as a significant challenge. In The Ascending Trajectory: Unveiling the Swift Growth of the Building Products Market in India, awareness of sustainable solutions is present but often constrained by infrastructural limitations. Competitive pressures and inconsistent supply further shape adoption patterns, pointing to the importance of operational readiness. This suggests that awareness must be complemented by reliable availability and efficient logistics, without which informed demand may not translate into actual adoption.

8. Yadav et al. (2022) explored the expansion of green building practices in India and their role in mitigating environmental degradation. The study highlights the importance of public awareness in encouraging eco-friendly construction. In Introduction to Green Building Construction in India, awareness campaigns are shown to play a key role in driving adoption. However, gaps in cost–benefit analysis, lifecycle costing, and return on investment evidence limit wider acceptance, indicating the need for stronger economic validation. Thus, awareness must be supported by robust financial evidence to sustain long-term adoption decisions.

9. Mojumder et al. (2022) examined barriers to green procurement in the Indian construction industry, focusing on access constraints and organisational challenges. Their findings indicate that high perceived costs, lack of managerial support, and supply limitations collectively restrict adoption. In Mitigating the Barriers to Green Procurement Adoption: An Exploratory Study of the Indian Construction Industry, the importance of strengthening procurement systems and institutional backing becomes evident. This situates eco-label adoption within a broader structural and managerial context. The study further highlights that awareness at the organisational level must be aligned with internal capabilities and supply chain readiness to ensure effective implementation.

10. Zohbi et al. (2024) addressed the limited availability of comparative economic analyses between eco-labelled and conventional construction materials. Their work seeks to bridge the gap between environmental responsibility and cost efficiency. In Sustainable Building Materials for Eco-Friendly Construction, awareness of cost implications is identified as a critical factor in adoption decisions. The study highlights the need for long-term comparative evidence to support informed choices, thereby reinforcing both economic and methodological considerations. This indicates that awareness becomes more impactful when supported by clear comparative data, enabling consumers and professionals to make rational and evidence-based decisions.

Table 2.03 – An Overview of the Literature review pertaining to Cost Benefits of Eco-labelled Products.

Author	Area of Research	Gaps
Shruti Jain, Manisha Raj Verma	Influence of price on purchasing decisions	Demographic analysis and the need for increased consumer education.
Ms. Aditi Midha, Dr. Shuchi Midha , Ms. Sanjeela Mathur	Factors influencing purchases	Prioritisation of long-term benefits

Ms. Harsh Tullani, Dr. Richa Dahiya	Eco-labelling impact on consumer behavior	Absence of specific implementation challenges
Sheila Bonini & Jeremy Oppenheim	Consumer education, Product performance, and Market growth potential	Lack of consumer awareness and product claims
Samantak Das , Rohan Sharma	Financial advantages of green buildings	Potential gaps in addressing broader sustainability issues
Yoganandan G , G. Sivasamy	Factors influencing consumer decision on green products	Purchase rejection due to perception of products lacking eco-responsibility coming at inflated premium
Sailesh Rao	Market Growth and Development Trends, Construction Industry and Consumer Demand Dynamics	Inconsistent Delivery schedules affecting the offtake
Ankit Yadav, Adarsh Singh, Arun Kumar Verma, Ashok Kumar Verma, Ashutosh Kumar,Shubhendu Mishra, Om Prakash Pal	Sustainable construction practices, Importance of Green building, Awareness Creation on using ecofriendly products	Lack of cost benefit study of Ecolabelled products, Insufficient data on LCCA and ROI in sustainable construction, Limited proof of customer paying premium for Ecolabelled products
Abhishek Mojumder, Amol Singh, Ashwani Kumar, Yang Liu	Supply chain constraints	Limited procurement channels and weak supply chains restrict consistent availability of eco-labelled products.

Gaydaa Al Zohbi; Shahad Al Askar; Ajay Kumar; Parveen Kumar; Mamta Dahiya; Sangeeta Rani	Sustainable practices to curb climate impact, Eco-friendly materials for responsibility, Innovative materials for efficiency & cost savings	No detailed cost-benefit quantification, Limited comparative data vs conventional materials, Need for long-term economic evidence

The literature reviews indicate a need for delving more into cost benefit aspect of the Ecolabelled products and its correlation to the adoption by Architects, Builders and Contractors in MMR. A better understanding on the cost benefit perspective is crucial so that the concerns can be addressed, and which will positively impact the adoption of ecolabeled products and enhance the sustainable building practices in MMR.

2.2.3 - IV 3 - Availability of Eco-labelled Products

1. Gallastegui (2002) reviewed the eco-labelling literature and noted the diversity of perspectives across studies. Different strands of research have examined demand- and supply-side dynamics, market implications, and certification mechanisms. In The Use of Eco-Labels: A Review of the Literature, the author brings out the fragmented nature of existing work, suggesting that eco-labelling is a complex and multi-dimensional domain. The review also points to gaps in integrating supply chain considerations with consumer behaviour, thereby indicating the need for a more holistic analytical approach. This study contributes conceptual and methodological depth to the understanding of the variable. Building on this, the study implicitly positions eco-labelling as an interdisciplinary construct that cannot be fully understood through isolated analytical lenses. By drawing attention to fragmentation, it highlights the necessity of synthesising behavioural, institutional, and market-based perspectives. This integration becomes particularly relevant for examining adoption, as it underscores that consumer awareness must align with supply-side readiness and certification credibility. Thus, the study strengthens the theoretical foundation of the variable by framing eco-labelling within a systems-oriented perspective.

2. Saini et al. (2017) examined the historical evolution of green building concepts in India, with particular attention to energy efficiency, sustainability, and cost

implications. Their work highlights the role of professionals—especially architects, builders, and contractors—in influencing the adoption of eco-labelled materials. In Historical Perspective and Concept of Green Building in India – A Review, the authors also point to gaps in awareness, cost benchmarking, and availability of skilled service providers. These insights situate eco-labelling within a broader professional and historical context, adding important depth to the variable. Furthermore, the study indicates that professional expertise acts as a critical intermediary between awareness and implementation. Even when eco-labelled products are available, their adoption depends on the knowledge and advocacy of key stakeholders within the construction ecosystem. This highlights the importance of capacity building and training in bridging the gap between theoretical awareness and practical application. Consequently, the study enriches the variable by incorporating a professional competency dimension.

3. Amoako et al. (2020) explored consumer responses to sustainable marketing strategies in an emerging market context, focusing on trust and purchasing behaviour. In Green Marketing and the SDGs: Emerging Market Perspective, the study highlights how pricing strategies and product accessibility shape adoption decisions. It also raises questions around equity in pricing and the role of policy in supporting demand creation. By linking consumer behaviour with broader market and policy dynamics, the study adds a valuable layer of interpretation to the variable. In addition, the research suggests that adoption is not merely an outcome of awareness but is contingent upon inclusive market structures that enable access across different income groups. The emphasis on pricing equity reinforces the idea that eco-labelling must be supported by affordability to achieve scale. This perspective situates the variable within a socio-economic framework, thereby expanding its analytical scope beyond individual consumer behaviour.

4. Abuamer and Boolaky (2015) investigated consumer behaviour towards green buildings in Abu Dhabi, emphasising the role of perceived value in shaping adoption. Their study, Consumer Behaviour Towards Green Building: A Study in Abu Dhabi, shows that even relatively minor attributes of green buildings can positively influence consumer decisions. At the same time, the authors stress the importance of sustained communication efforts to reinforce these benefits over

time. This positions awareness not as a one-time trigger but as an ongoing process, adding a communication and marketability dimension to the variable. Expanding on this, the study highlights that repeated exposure and reinforcement play a critical role in shaping long-term consumer preferences. Awareness, therefore, evolves through continuous engagement rather than isolated interventions. This insight is particularly relevant for eco-labelled products, where sustained communication strategies can gradually build trust and familiarity, thereby enhancing adoption over time.

5. Singh (2017) analysed customer perceptions of eco-labelled products, particularly in terms of their ethical, practical, and functional appeal. In An Empirical Study on Consumer Perception Towards Green Consumption, the findings indicate that consumer knowledge and perception play a direct role in shaping adoption behaviour. The study also reflects evolving trends in eco-friendly consumption and points to the supporting role of government policies in strengthening such behaviour. This adds both perceptual and policy-related nuance to the variable. Moreover, the study demonstrates that perception is not static but evolves with increasing exposure to sustainability narratives and policy interventions. As consumer awareness deepens, the evaluation criteria for eco-labelled products also become more sophisticated, incorporating ethical considerations alongside functional benefits. This dynamic interplay enhances the explanatory power of the variable.

6. Chandra (2020) assessed the feasibility of ecolabelling programmes in India, with a specific focus on cooling appliances. In A Study on Feasibility of Ecolabelling Program in India, the research highlights the potential of ecolabelling to influence consumer choice and drive market transformation. However, it also notes that limited awareness and restricted product availability have constrained its effectiveness in the Indian context. These findings bring out programmatic and availability-related dimensions of the variable. Additionally, the study suggests that successful implementation of ecolabelling requires alignment between policy design, industry participation, and consumer awareness. Without adequate product availability, awareness initiatives may fail to translate into actual adoption. This

reinforces the importance of coordinated ecosystem development in enhancing the effectiveness of eco-labelling programmes.

7. Rais and Suzianti (2018) examined the factors that motivate companies to adopt ecolabel certification, particularly in terms of value creation and brand positioning. Their study, Building Products and Materials Certification with Ecolabel, suggests that certification can enhance both consumption and corporate image. At the same time, the authors highlight the limited number of certified products and the need for broader market coverage. This introduces a corporate and strategic perspective to the variable. From a strategic standpoint, the study indicates that firms perceive ecolabelling not only as a compliance requirement but also as a competitive differentiator. However, limited adoption among firms restricts market visibility and consumer familiarity. This creates a feedback loop where low availability dampens demand, thereby constraining broader adoption. Such insights add depth to the corporate dimension of the variable.

8. Silintowe and Sukresna (2023) focused on the factors that inhibit green purchasing behaviour, particularly the roles of knowledge and product availability. In The Inhibiting Factors of Green Product Purchasing Behavior, the study demonstrates that lack of access to eco-labelled products significantly constrains consumer action, even when awareness exists. It also underscores the importance of education in strengthening green knowledge. Together, these insights add behavioural and availability-related nuance to the variable. Further, the study highlights that knowledge acts as a moderating variable, influencing the extent to which awareness translates into action. Even when consumers are aware, insufficient understanding of product attributes can limit confidence in decision-making. This underscores the need for both informational clarity and product accessibility in driving adoption.

9. Kumaim et al. (2021) explored the relationship between purchase intention and ecological behaviour in the context of ecolabels. In Fostering a Clean and Sustainable Environment Through Green Product Purchasing Behavior, the authors find that environmental concern, government support, and access to information all play reinforcing roles in shaping adoption. The study also points to the influence of economic conditions, such as inflation, on consumer decision-making. This adds

both behavioural and policy dimensions to the variable. In addition, the research illustrates that external macroeconomic factors can significantly moderate environmentally driven intentions. Even when consumers express strong ecological concerns, economic pressures may limit their ability to act on these intentions. This reinforces the complexity of the adoption process and situates the variable within a broader economic context.

10. Zhang et al. (2023) analysed the impact of ecolabel policies on supply chain decisions and coordination. Their study, Effect and Formulation of Ecolabel Policy, shows that certification mechanisms and supply chain alignment are critical for ensuring product availability. A lack of coordination, on the other hand, can significantly limit market penetration. This highlights the importance of supply-side strategies in supporting eco-label adoption. Moreover, the study suggests that policy effectiveness depends on the extent to which it facilitates coordination among stakeholders. Fragmented supply chains can undermine the potential benefits of ecolabelling, even when consumer awareness is high. This adds a strong supply chain and policy integration dimension to the variable.

11. Sui et al. (2025) examined how demand information sharing affects supply chain efficiency in the context of green building materials. In Demand Information Sharing in Building Material Supply Chain, the study demonstrates that better information flows can enhance availability and improve adoption outcomes. Conversely, limited demand visibility can constrain supply responsiveness. These findings add an informational and supply chain dimension to the variable. This perspective highlights the role of transparency and data exchange in bridging demand–supply gaps. When manufacturers have better visibility into consumer preferences, they can align production, accordingly, thereby improving availability. Such mechanisms strengthen the link between awareness and adoption.

12. Erizaputri and Bechauf (2024) analysed the status of green public procurement in India, identifying product availability as a key challenge. In Green Public Procurement in India: Progress, Challenges, and Opportunities, the authors highlight the need for stronger policy frameworks and supply chain support to improve market penetration of eco-labelled products. Their work situates

availability within a broader institutional context, adding procurement and policy depth to the variable. Furthermore, the study underscores that public procurement can act as a catalyst for market transformation by creating stable demand for eco-labelled products. However, this potential can only be realised when institutional mechanisms are robust and aligned with market capabilities. This reinforces the importance of governance structures in shaping adoption outcomes.

Table 2.04 – An Overview of the Literature review pertaining to Availability of Eco-labelled Products.

Author	Area of Research	Gaps
Ibon Galarraga Gallastegui	Supply Chain & Consumer behaviour	Research inadequacy
Krishna Kumar Saini, Dr. Suresh Singh Sankhla, Pankaj Saini	Professional expertise and role of architects, builders, and contractors in adopting eco-labelled/green materials	Awareness of principles, lack of cost baselines, shortage of professional expertise/service providers.
George Amoako, Robert Dzogbenuku, Joshua Doe and Geoffrey Kwasi Adjaison	Material Accessibility influence on purchase	Pricing and Marketing strategies role in driving demand
Emadeldin Abuamer, Mehraz Boolaky	Minute attributes of Green building resulting into positive consumption	Continuity on campaigns for reiterating the benefits
Aruna Singh	Perception and Product offtake	Government Policy to drive Eco consumption
Moumita Chandra	Various ecolabelling programs in India, Global best practises, Role of ecolabelling in	Limited availability affects the adoption, professionals view missing, Focus only on

	influencing the consumer awareness and adoption.	cooling appliances missing on other building materials.
Aristyo R Rais and Amalia Suzianti	FAB penetration drives the consumption	Low number of certified Ecolabelled Products
Yunita Budi Rahayu Silintowe, I Made Sukresna	Lack of availability inhibits the purchase	Insufficient knowledge undermines the offtakes
Nabil Hasan Al-Kumaim , Muhammad Salman Shabbir, Salman Alfarisi, Siti Hasnah Hassan, Abdulsalam K. Alhazmi, Sanil S. Hishan, Samer Al-Shami, Nadhmi A. Gazem, Fathey Mohammed and Hussein Mohammed Abu Al-Rejal	Accessibility to knowledge and products influences the purchase decision	Inflation and Dynamism in preferences affect the purchase intent
Zhang, H., Li, Q., & Jiang, J.	Supply chain strategy and eco-labels	Lack of coordinated eco-label strategies reduces product availability
Sui, T., Zhang, H., & He, Q.	Building material supply chain	Limited demand information sharing reduces eco-labelled product availability
Erizaputri, S., & Bechauf, R.	Green public procurement	Limited market penetration and availability of certified products

The literature review reveals a need to understand more about the practical challenges faced by the Architects, Builders and Contractors in the MMR related to availability, accessibility and overall sourcing of Ecolabelled products. By gaining insights and understanding of any specific limitation, the study addresses these challenges to improve the availability and accessibility in MMR, leading to better adoption of the ecolabeled products.

2.3 Moderating Variable

2.3.1 MV 1 - Government Regulatory Policies and Incentives.

1. Dhingra (2020) in her study measures the possible impacts of the air conditioners ecolabeling criteria on consumer behavior up to market transformation where she recommends for more standardisation and financial assistance. In Ecolabeling for air conditioners would support India's cooling policy goals, the study demonstrates how regulatory criteria embedded within ecolabelling frameworks influence consumer awareness as well as market-level transformation. The findings suggest that strengthened standardisation and financial assistance mechanisms can enhance structured participation. This indicates that awareness alone may not be sufficient unless supported by economic instruments. The study therefore links policy design with behavioural outcomes, showing how regulatory clarity and financial support can accelerate adoption pathways.

2. Mattsson (2009) outlines the problem of environmental labels in UN procurement and the necessity of rendering consumer demand more appropriate and conscious of environmental consequences. The principal difficulties here revolve around the conversion of labels into technical specifications on account of their great quantity that makes them determine for consumers as well as UNSM to promote eco-friendly practices. In A guide to environmental labels – For procurement practitioners of the United Nations system, the study situates eco-labels within institutional procurement frameworks, highlighting the complexity arising from label proliferation. It shows that unless labels are translated into actionable technical specifications, their effectiveness remains limited. This adds a procurement dimension to the variable, demonstrating that awareness must be operationalised through structured systems.

3. Simi (2001) in his research talks about the double-edged nature of eco-labels concerning trade within the World Trade Organisation (WTO) and major controversies involving them: protectionist measures and trade facilitation. The detrimental reason for adoption of ecolabels by developing nations, in the lack of long-term value benefits that ecolabels bring. In Eco-labels: Trade barriers or trade facilitators?, the study examines how regulatory frameworks can both enable and constrain market participation. It highlights that eco-labels may act as non-tariff barriers for developing economies with limited institutional capacity. The lack of awareness and long-term value visibility further constrains adoption, adding a trade-policy dimension to the variable.

4. Patel (2013) is his study comments that eco-labelling introduced green consumerism to a sustainable development with success since 1970s, but with major challenges related to costs and discomforts associated with adherence to industrial standards. WTO deals with key environmental trade issues that advance sustainability and use of market-oriented instruments. In Eco label and trade, the study connects historical evolution with contemporary regulatory challenges, particularly in aligning sustainability goals with industrial compliance. It highlights that cost pressures and compliance burdens continue to act as barriers, thereby introducing a policy-oriented perspective to the variable.

5. Aasmäe (2021) trust in eco-labels and its relation to the way people buy things has been underlined her recent study. The research paper found out the reasons that influences the consumer needs and will employ different methods for data analysis. The results from this study stress that more information about ecolabels is needed to make informed decisions. In Consumer awareness of greenwashing and the reliability of eco-labels, the study examines how trust deficits, particularly due to greenwashing, weaken consumer confidence. It emphasises transparency and credible information as essential for informed decision-making, thereby adding a behavioural and credibility dimension to the variable.

6. Chen et al. (2022) states that the government regulation is the principal means by which manufacturers can be encouraged to produce environmentally friendly items. Despite incentives for different production pricing mechanisms and environmental

consciousness, behavioural disparities are very alluring. Research does not consider joint actions as a factor influencing them. Moreover, we do not know exactly why regulation does not matter. In How does environmental regulation affect green innovation?, the study further explores how regulatory heterogeneity influences innovation outcomes. It highlights that effectiveness varies based on enforcement and coordination, adding an innovation and policy coordination dimension to the variable.

7. Yuan et al. (2021) studied how environmental regulations impact innovation, in China focusing on market driven incentives, public involvement and command and control policies. Their findings suggest that market driven incentives and public engagement regulations have an influence while the effect of command-and-control measures is limited. In How government regulations and consumer behavior influence manufacturers' product green degree decision-making, the study demonstrates that participatory and incentive-based approaches are more effective in driving adoption. This adds a behavioural-policy interaction dimension to the variable.

8. Cohen et al. (2019) in his study finds on how firms make decisions about ecofriendly products with government support. This study highlights the effects on product design and environmental outcomes considering factors like capabilities, consumer awareness and government policies such as research and development support and sales subsidies. Key areas for improvement include inconsistencies in the impacts of government support and a lack of consideration for market dynamics. In The effect of government support on green product design and environmental impact, the study further shows how subsidies and R&D incentives shape firm-level decisions. It introduces an institutional and design-oriented dimension to the variable.

9. Ponzi and Bowyer (2018) work emphasises the importance of policies in aligning economies toward sustainability using market-based tools and regulations. Despite progress challenges remain due to resistance to tax hikes and limitations of market-oriented approaches. Research areas cover policy efficacy creating markets and self-regulation for protection. In How can policy makers promote green business?,

the study highlights how effective policies create enabling environments for sustainable markets. This adds a policy effectiveness dimension to the variable.

10. Atalla et al. (2022) reveals the importance of government involvement in promoting eco transitions through innovative policies and financial strategies was emphasised. Despite these challenges remain, such as the participation and awareness of issues, among the public. It is essential for the private sector and non-governmental organisations to work together for development and positive environmental outcomes. In Six ways that governments can drive the green transition, the study highlights the importance of multi-stakeholder collaboration. It links awareness with collective action, adding a strategic and participatory dimension to the variable.

Table 2.05 – An Overview of the Literature review pertaining to Government Regulatory Policies and Incentives.

Author	Area of Research	Gaps
Neha Dhingra	Ecolabeling criteria	Transition to mandatory participation
Jan Mattsson UNOPS Executive Director	Role of environmental labels in UN procurement	Label translation into technical specs
Simi T B	Trade Barriers and Trade Facilitators,	Adverse effects due to lack of knowledge about eco-label programs
DR V G Patel	Eco-labelling and Green Consumerism, Sustainable Development and Trade Policy, Cost and Industrial Standards Challenges	Integration of trade and environmental policies
Sandra Aasmäe	Developing Countries	Effects of green washing

Zhenling Chen, Xiaoyan Niu, Xiaofang Gao and Huihui Chen	Government regulations	Lack of explanation on regulatory impact
Pengwei Yuan , Xiaoqing Dong , Jia Xu and Xiaofei Lin	Environmental regulations' impact on green innovation	Narrow focus on the mechanism between regulations and green innovation
Morris Cohen, Shiliang Cui , and Fei Gao	Government support effects	Inconsistent impacts of government support
Daniele Ponzi, Jeffry Bowyer	Policy effectiveness	Political resistance
George Atalla, Meghan Mills, Julie Mc Queen	Government policies for green transition	Challenges in realising sustainability ambitions

There is limited literature on the impact of government policies and its effect on the adoption of the Ecolabelled products by the Architects, Builders and Contractors and also in the context of MMR. A detailed study will help us in understanding the correlation and establishing strategies for promotion of Ecolabelled products.

2.3.2 MV 2 Professional Experience and Expertise

1. Sagheb et al. (2011) carried out research which looked at some important factors, encompassing embodied energy, CO2 emissions, and the need to cut down on carbon footprint. His paper areas delve into the use of materials that are friendly to the environment over time (sustainable materials), saving energy in ways which conserve it as well as traditional methods of construction. In The role of building construction materials on global warming: Lessons for architects, the study further situates material selection within a lifecycle perspective, demonstrating how embodied energy and emissions directly influence environmental outcomes. It highlights the role of professional expertise, particularly among architects, in integrating sustainable materials into design decisions. This establishes a clear link

between technical knowledge and environmentally responsible practices, thereby reinforcing the importance of professional competence in shaping adoption.

2. Samarasinghe (2011) research focuses on the attitude towards green product development in Sri Lanka looking at variables such as top management's endorsement as well as environmental education among others. In essence, key problems faced here are denial of use of green concepts because of poor technology application and absence of appropriate training among many others. For example, areas of interest include identification of forces that influence perception and practice of green product development. In Factors affecting green product design: Marketing professionals perspective, the study further emphasises how organisational culture and leadership commitment shape adoption outcomes. It highlights that lack of training and technological readiness constrains implementation despite favourable attitudes. This adds an organisational and capability dimension to the variable, linking professional expertise with practical execution challenges.

3. Abraham and Gundimeda (2018) in his paper identified the barriers of green building adoption in India and then ranked them with Analytic Hierarchy Process (AHP). In this case, lack of knowledge, information about ecolabelling and infrastructure rank as key examples of such barriers. To reduce the lack of expertise, training on life cycle costs to barriers involve policy, finance, data and management aspects. In 'Greening' the buildings – An analysis of barriers to adoption in India, the study systematically prioritises these barriers, showing how knowledge gaps and infrastructural deficiencies significantly impede adoption. It further underscores the importance of professional training in lifecycle costing as a means to bridge expertise deficits. This positions professional capability and technical awareness as critical drivers in overcoming structural and informational barriers.

4. Ng and Wong (2015) explored a scheme where green building products were labelled in Hong Kong in order to improve its environmental credentials, they discussed three things such as how construction materials are classified which are essential issues or requirements; distinguishing levels of greenness; as well as having everything covered correctly or thoroughly enough. Some of the outcomes

they wanted to achieve involved undertaking studies regarding how structures affect nature; making distinctions among various kinds of commodities; and coming up with strategies that would help in putting things into practice. In Improving the environmental performance of building facilities through a green building product labelling scheme, the study further demonstrates how structured classification systems enhance clarity for stakeholders. It highlights the importance of standardisation and evaluation frameworks in guiding professional decision-making. This adds a technical and implementation-oriented dimension to the variable.

5. Vatalis et al. (2013) in their study on influencing factors in green building by Greek stakeholders, put a special emphasis on energy consumption minimisation, reducing toxics, reducing indoor pollution and saving water. However, it is notable that these details are lacking in specificity. In Sustainability components affecting decisions for green building projects, the study further contextualises these factors within stakeholder-driven decision-making processes. It suggests that while awareness of sustainability components exists, the absence of detailed metrics limits practical application. This highlights the need for more precise technical guidelines, thereby linking professional expertise with effective implementation.

6. Eze et al. (2020) highlighted the importance of green building materials (GBM) for Nigerian construction industry which include better daylighting, sanitation provision and reduction of emissions among others. On the other hand, despite high levels of knowledge about these materials their adoption rate is still low because there are no internationally certified green buildings and lack coordination in their use. In Green building materials products and service market in the construction industry, the study further explains how systemic gaps, including lack of certification and coordination, weaken the translation of knowledge into practice. It underscores the role of institutional frameworks and professional alignment in ensuring adoption. This adds a structural and coordination dimension to the variable.

7. Rajendra and Mohanasundaram (2023) delves into consumer behaviour and challenges that hinder the embracement of Ecolabelled items; it sheds light on

motivations, views, and impediments. The findings indicated a favourable correlation between adoption competition and interventions— with downstream ramifications for moral sway on the determination. In Influence of consumer motivations and perception on the adoption of smart, green, and sustainable building materials, the study further highlights how behavioural drivers interact with market interventions. It suggests that ethical considerations and competitive dynamics can reinforce adoption when supported by awareness and incentives. This adds a behavioural and motivational dimension to the variable.

8. Srivastava and Bhatnagar (2017) researched into the level of awareness and perspectives of eco-friendly materials in interior and found out that the individuals were more aware of these products in Mumbai than in Gorakhpur. Promotion of sustainable activities, goods that are eco-friendly and creating consciousness on environmental issues within the designing society is of prime importance. In Designers perspective towards ecofriendly materials available in interior designing, the study further demonstrates how geographical and professional exposure influence awareness levels. It highlights the need for targeted awareness initiatives within design communities. This adds a regional and professional awareness dimension to the variable.

9. Agyekum et al. (2019) Barriers to the adoption of green certification of buildings: A thematic analysis of verbatim comments from built environment professionals. The study identifies eight critical barriers including lack of information, incentives, government participation, human resources, awareness, financing, and legal backing, highlighting the professional and systemic challenges in advancing green certification in Ghana. In Barriers to the adoption of green certification of buildings: A thematic analysis of verbatim comments from built environment professionals, the study further elaborates how these barriers are interconnected and reinforce each other. It highlights the need for integrated policy, financial, and professional interventions. This adds a systemic and institutional dimension to the variable.

10. De Beer and Kajimo-Shakantu (2023) highlight that insufficient training and incentives for architects and contractors are key barriers to green building adoption in South Africa. In Key barriers to the adoption of green building in the construction

industry, the study further demonstrates how lack of skill development and inadequate incentive structures constrain professional engagement. It emphasises the need for capacity-building initiatives to enhance adoption. This adds a capability and incentive-based dimension to the variable.

11. Häkkinen and Belloni (2011) explored various facets related to organisational and procedural barriers, inferring that adoption is influenced by awareness and knowledge levels. The study identified the motivational factors for adoption such as the competence of professionals especially the designers and management influence. In Barriers and drivers for sustainable building, the study further highlights how organisational structures and leadership influence sustainability outcomes. It underscores the importance of professional competence and managerial commitment in driving adoption. This adds an organisational and behavioural dimension to the variable.

Table 2.06 – An Overview of the Literature review pertaining to Professional Experience and Expertise.

Author	Area of Research	Gaps
Azadeh Sagheb , Ehsan Vafaeihosseini ,Pradeep Kumar Ramancharla	Substantiator for Architects to use Ecolabelled products	Strategy for knowledge dissemination
Rohini Samarasinghe	Impact of specifiers & top management role and support	Reluctance to implement green initiatives
Pleasa Serin Abraham , Haripriya Gundimeda	Role of specifiers to enhance the green building and ecofriendly products adoption.	Lack of expertise and information leading to lower adoption
S. T. Ng & C. T. C. Wong	Environmental Performance impact assessment done by experts	Lack of guidelines for statutory adoption.

K.I. Vatalis, O. Manoliadisb, G. Charalampidesa, S. Platiasa, S. Savvidisa	Sustainability components influencing green building decisions	Lack of explicit mention of limitations
Chidiebere Emmanuel Eze, Rex Asibuodu Ugulu, Samuel Ikechukwu Egwunatum and Imoleayo Abraham Awodele	Benefits of Ecolabelled products used	Standards Implementation
Rajendra P , Mohanasundaram T	Perception and Consumer behaviour linkage	Lack of focus on specific variables
Harshita Srivastava, A. Bhatnagar	Designers' awareness of eco-friendly materials	Potential gender disparity in the architect profession
Kofi Agyekum, Emmanuel Adinyira, B.K. Baiden, Godslove Ampratwum	Adoption of green building certification in developing countries,	Information Gap - Lack of accessible databases and baseline knowledge on existing certified green buildings. Awareness Gap - Limited professional and public awareness of benefits of certification. Capacity Gap - Inadequate trained human resources among architects, builders, and contractors to implement certification.
De Beer, Y., & Kajimo-Shakantu, K.	Green building adoption barriers	Lack of professional expertise, training, and incentives

Tarja Häkkinen; Kaisa Belloni	Awareness and its effects on adoption, professional expertise of key decisions makers, tools for competency enhancement of professional	Limited evidence of level of intra-professional influence, India centric study is missing.

Existing limited literature review, overlooks the specifics related to any challenges they face while selecting - such as the contribution and importance in enhancing the sustainability of the built environment, insufficient knowledge on the economic, environmental and social benefits of the Ecolabelled products, technical specifications and characteristics, compatibility or even the application of the Ecolabelled products. These gaps, if understood can help the marketers develop strategies to enhance the adoption of Ecolabelled products by the Architects, Builders and contractors and catalysing the creation of environmentally sustainable built environments in the MMR.

2.3.3 MV 3 Marketing Strategies by Product Manufacturers

1. Kumar and Kumar (2014), in their paper Indian Consumers Perception About Green Marketing Concept & Its Applicability In Life, discussed areas of green marketing challenges, consumer perception, and factors affecting buying behaviour. This study contributes to the present variable by situating marketing strategies within the broader framework of consumer cognition and behavioural response. By identifying perception as a critical mediator, the authors implicitly highlight that marketing communication must move beyond awareness creation to influencing perceived value and trust. In the context of eco-labelled products, this reinforces the idea that marketing strategies must address scepticism, price sensitivity, and perceived utility in order to translate environmental messaging into actual purchase behaviour. Thus, the study substantiates the variable by linking strategic marketing interventions with perceptual shifts that ultimately drive adoption.

2. Sehgal and Singh (2010), in their paper Impact Of Eco-Friendly Products On Consumer Behavior, examined eco-labelled materials purchase decisions and post-purchase behaviour for building materials and explored pattern identification in green consumer decision-making, and the impact of environmental labelling on the

purchase and post-purchase behaviour towards building materials. The present study further elaborates on this gap area by delving deeper into post-purchase behaviours and investigating the measures effective in marketing for its brand equity. Building upon this foundation, the study underscores the importance of marketing strategies that extend beyond the point of sale, particularly in shaping satisfaction, repeat purchase, and advocacy. The emphasis on post-purchase behaviour is especially relevant for eco-labelled construction materials, where long-term performance and user experience significantly influence brand perception. Consequently, this research strengthens the variable by demonstrating that effective marketing strategies must integrate pre-purchase communication with post-purchase engagement to sustain brand equity and consumer trust.

3. Jaju (2016), in the paper A Study Of The Impact Of Green Marketing On Consumer Purchasing Patterns And Decision Making In Telangana, India, examined the impact of Green Marketing on consumer behavior in Telangana, India, focusing on green packaging, branding, and pricing. It finds positive correlations between these factors and consumer behavior, but notes hesitancy in purchasing green products. This observation is particularly significant in understanding the limitations of conventional marketing levers when applied to eco-friendly products. While branding and packaging can enhance visibility and appeal, pricing remains a critical barrier, especially in price-sensitive markets. The study therefore reinforces the need for nuanced marketing strategies that balance premium positioning with perceived affordability. In relation to the variable, it highlights that marketing effectiveness is contingent upon aligning product attributes with consumer expectations, thereby bridging the gap between positive attitude and actual purchase behaviour.

4. Gopal et al. (2018), in their paper Impact Of Green Marketing On Companies: A Methodological And Thematic Review, looked at the effects of Green Marketing towards organisations. The encompassing themes and topics are green competitors, finance and eco-labels and stresses that it benefits profit and green objective. By framing green marketing as both an economic and environmental imperative, the study provides a dual perspective that is highly relevant to manufacturers. It suggests that eco-labelling and sustainable positioning are not merely compliance

tools but strategic differentiators in competitive markets. This aligns with the present variable by emphasising that marketing strategies must communicate both ecological benefits and business value. Such positioning enhances stakeholder confidence and supports long-term brand sustainability, thereby reinforcing the role of marketing as a driver of both profitability and environmental responsibility.

5. Bhoompag et al. (2017), in their paper Emerging Trends In Green Marketing: Challenges, Opportunities And Strategies In Indian Perspective, discussed the history of the Green Marketing evolution in India. Challenges include the unwillingness of consumers to pay higher prices for green products, and difficulty in differentiating between green and sustainability. Research opportunities include consumer behaviour, green marketing strategy, and market adoption. This historical and contextual perspective is critical for understanding the evolution of marketing strategies in emerging markets like India. The identified challenges point toward the necessity for clearer communication and credible differentiation in eco-labelled products. From a variable standpoint, the study highlights that marketing strategies must address ambiguity and build consumer confidence through transparency and education. This ensures that sustainability claims are not only understood but also trusted, thereby facilitating wider market adoption.

6. Bhardwaj (2019), in the paper Green Marketing: The Way Ahead, underscored the significance of consumer behavior in explaining green marketing trends, elucidating the participation of corporate marketing in tackling environmental issues; essential research areas are consumer behavior in relation to green marketing, tastes of consumer, and corporate social responsibilities. The study positions corporate marketing as a key enabler in addressing environmental concerns, thereby linking organisational responsibility with consumer engagement. This is particularly relevant for eco-labelled products, where credibility and ethical positioning play a significant role in influencing purchase decisions. In relation to the variable, the research emphasises that marketing strategies must align with evolving consumer preferences and societal expectations. Such alignment enhances brand authenticity and fosters stronger consumer relationships, ultimately contributing to increased acceptance of green products.

7. Singh (2018), in the paper Green Marketing: Challenges And Opportunities In India, underscored the need for ecolabel marketing but stressed on its challenges and opportunities. It also touched on how the focus by the government should be increased as well as ways that they could increase customer awareness and push for the promotion of ecolabelling. Research areas include consumer awareness, market acceptance, and corporate response. The study brings out the interdependence between policy support and marketing effectiveness, indicating that marketing strategies alone may not suffice without institutional backing. For the present variable, this highlights the importance of integrated approaches where manufacturers collaborate with regulatory bodies to enhance awareness and credibility. Such synergy can amplify the impact of marketing efforts and accelerate the adoption of eco-labelled products in the market.

8. Malik (2016), in the paper Eco Labels: Tools Of Green Marketing, states that the climate change has given focus to the significance of eco-labels for the green economy, and it is important for businesses, governments as well as consumers themselves. Education among these individuals would increase acceptance towards ecolabels while at the same time promoting economic efficiency of such policies. This perspective highlights the role of knowledge dissemination as a core marketing function, extending beyond traditional promotion to awareness-building and stakeholder education. In the context of the variable, it suggests that marketing strategies must incorporate educational elements to improve understanding and acceptance of eco-labels. Such strategies not only enhance consumer confidence but also contribute to the broader objective of sustainable consumption.

9. Song et al. (2020), in their paper Green Marketing To Gen Z Consumers In China: Examining The Mediating Factors Of An Eco-Label–Informed Purchase, examined the impact of eco-labelling on consumer behavior of Gen Z by looking at product attributes as well as environmental awareness and perceived consumer effectiveness. Nonetheless, gaps remain regarding how eco-labels affect older customers and other demographic categories. The study introduces a generational dimension to marketing strategies, emphasising that consumer segments respond differently to eco-labelling initiatives. For the present variable, this indicates the need for targeted marketing approaches that cater to diverse demographic profiles.

By recognising these variations, manufacturers can design more effective communication strategies that resonate with specific consumer groups, thereby enhancing overall adoption rates.

10. Rex and Baumann (2006), in their paper Beyond Ecolabels: What Green Marketing Can Learn From Conventional Marketing, assessed the concept of "ecolabel marketing" for its limited focus on ecolabels and suggests that green marketing be extended to a wider perspective. It compares green marketing with traditional marketing and stresses that proper marketing communications are needed to reach a wider audience. This critical evaluation broadens the scope of marketing strategies by advocating for integration with conventional marketing principles. In relation to the variable, it underscores that eco-labelling should not be treated as a standalone strategy but as part of a comprehensive marketing framework. Such integration ensures consistency in messaging and enhances the effectiveness of communication, thereby supporting the wider acceptance of eco-friendly products.

Table 2.07 – An Overview of the Literature review pertaining to Marketing Strategies by Product Manufacturers.

Author	Area of Research	Gaps
Sunil Kumar , Krishan Kumar	Build-up of consumer sensitivity towards environment	Low awareness on Ecolabels resulting on demand
Ms. Preeti Sehgal, Ms. Neha Singh	Understanding the Halo effect which leads to altruistic purchase behaviour	Post buying behaviour
Aditi Jaju	Positive correlations between pricing and consumer behavior	Hesitancy in purchasing green products
Nidhi Gopal, Palak Bhandari, Smita Mehendale	Ecolabels as tool for marketing	Competition & Green finance

Martin L. Bhoompag, Dr. Smitha Sambrani, Prof. A. Prabhukumar,	Organisational reasons to promote green and the challenges	Maturity in green marketings execution
Kumal Bhardwaj	Green Marketing practices	Green myopia and constant efforts for consumer conviction
Harsimran Singh	Acceptance penetration criteria for green products	Strategies for B2B products
Malik Mohammed Salman	Ecolabel Types, Tool as Communication Strategy	Limited Product Category, Consumer Awareness strategies
Yao Song, Zhenzhen Qin and Zihao Qin	Eco-label impact on Gen Z consumer behavior	Lack of research on eco-label impact across diverse demographic groups
Emma Rex, Henrikke Baumann	Characteristics of green customer	Methods in conventional marketing which are overlooked

The literature review has not adequately addressed the correlation between the marketing strategies deployed by the manufacturers or the dealers and distributors of the Ecolabeled products, influence the adoption of Ecolabelled products by Architects, Builders and Contractors in MMR. A better understanding of the same, can help in understanding the gaps in current marketing approaches and devise refined strategies to enhance the adoption of Ecolabelled products.

2.4 Review of Perception Theories

Perception theories are very important in understanding how individuals and groups respond to the external stimuli for interpretation and evaluation, especially related to Ecolabelled products. The insights received from these theories are invaluable and give a deep understanding of decision making process of Architects, Builders and

Contractors. Perception is not just passive reception of information, but it is an ongoing , active process which shapes the cognitive, emotional and social factors.

In this section of Literature Review, the 7 key theories - Gestalt Theory, Perceptual Defense Theory, Signal Theory, Information Processing Theory, Theory of Planned Behavior, Elaboration Likelihood Model (ELM), and Social Perception Theory were explored to understand how they influence the adoption of Ecolabelled products, purely from a perception perspective.

The above theories address in detail the perceptions among Architects Builders and Contractors related to Ecolabelled products. Every theory gives us a vivid and different view and interpretation of how preferences are formed for the Ecolabelled products over the course of time over conventional materials.

Whilst the above mentioned theories are not exhaustive in nature, certain theories have been deliberately excluded due to their limited applicability in relation to Ecolabeled products. Theories such as Self Determination Theory, focuses on behavioural contexts but refrains on specific decision making process of the Architects, Builders and Contractors. Similarly, the Theory of Consumer Choice, does not capture the considerations at organisaiton or project level, related to intrinsic to Ecolabelled products. The selected theories, have an ability to offer a comprehensive framework integrating key attributes related to understanding in depth and breadth perception and adoption of Ecolabelled products.

2.4.1 Gestalt Theory

Gestalt Theory harps upon the fact that, individuals look at activity, event or a product in a holistic manner and not in bits and pieces. When architects, builders, and contractors look at eco-labelled products, they consider the entire package—right from the design till the message about sustainability. The first that is noticed is the product packaging and the contents thereof.

Figure 2.01 – Pictorial depiction of Gestalt Theory

(Picture Source – Emily Roberts / Very Well)

The visual appearance of product labels has shown a significant grasp and recall of the information deciphered. Information shared and presented in a structured and aesthetically appealing manner engage with the target audience faster and they trust and engage more (Feldman & Tremoulet, 2006). Ecolabelled products which communicate the certifications, EPD, product advantage help in fostering positive perceptions and create a compelling case for adoption. Architects, Builders and Contractors perceive such products as credible and trustworthy resulting in better adoption.

2.4.2 Perceptual Defense Theory

The Perpetual Defense Theory, revolves around the concept that individuals seldom accept information and knowledge other than what is their belief. They tend to subconsciously block it. In respect to Ecolabelled products the blocking of information, inertia on accepting stems out from greenwashing, doubts on the product efficacy or simply going on what is time tested or is traditional in nature. The perception defense thus acts as a psychological barrier in adoption.

Gifford (2011) found multiple psychological barriers to the adoption of the Ecolabelled products such as perceived high costs, limited awareness and overall lack of trust on the certifications itself. The findings indicate that the Architects, Builders and Contractors may These findings suggest that architects, builders, and contractors may ignore or detest the ecolabels as they perceive it to be either irrelevant to their projects or overhyped. unconsciously ignore or devalue eco-labels that they perceive as irrelevant or ambiguous.

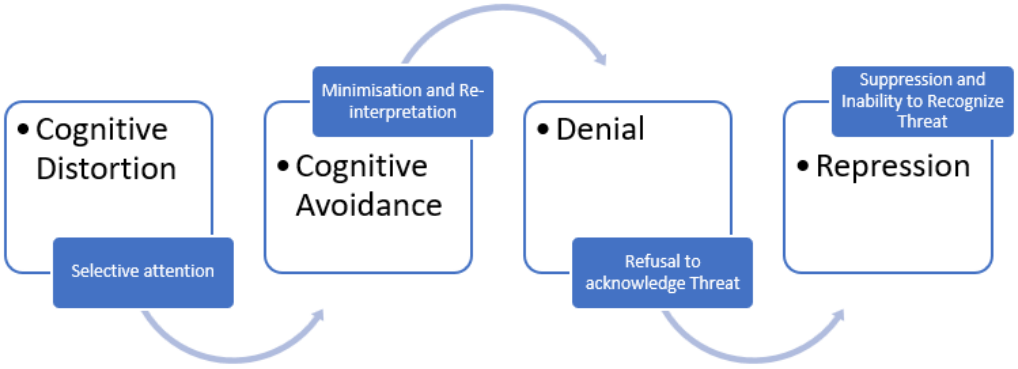


Figure 2.02 – Pictorial depiction of Perpetual Defense Theory

(Pictures sources – Career Shodh.com)

It is thus imperative for the manufacturers to address these concerns with open communication, credible third party certifications and effectively demonstrate the product's efficacy. Marketing campaigns revolving around awareness creation of how the Ecolabelled products can enhance the sustainability quotient and meet the green standards, can help create positive perceptions.

2.4.3 Signal Theory

Signal Theory mentions that the ecolabels are light house of the products environment benefit, quality and compliance to the prescribed sustainability standard. The adoption of ecolabels depends upon the credibility and the clarity of the labels (Connelly et al., 2011).

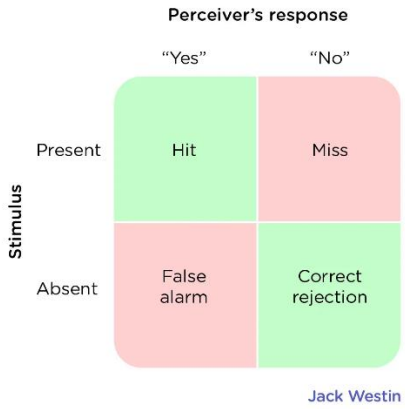


Figure 2.03 – Pictorial depiction of Signal Theory

(Picture Source - Jack Westin.com)

For the Architects, Builders, and Contractors, eco-labels like Green Pro, Green Guard serves as quick guide for evaluating environmental performance, reducing uncertainty (Delmas & Grant, 2014). A strong eco-label can even affect pricing and make people more likely to choose it. But if there are too many similar certifications out there, it can confuse people and weaken trust. To be more effective, eco-labels need to be standardised, concise, clear , verified and should have a simple and direct communication.

2.4.4 Information Processing Theory (IPT)

Information Processing Theory (IPT) describes how architects, builders, and contractors perceive and act on information from eco-labels. Decisions are the processes of encoding, storing, and retrieving information that influence perceptions. Eco-labelled products typically involve complex information regarding sustainability that should be processed within competing demands.

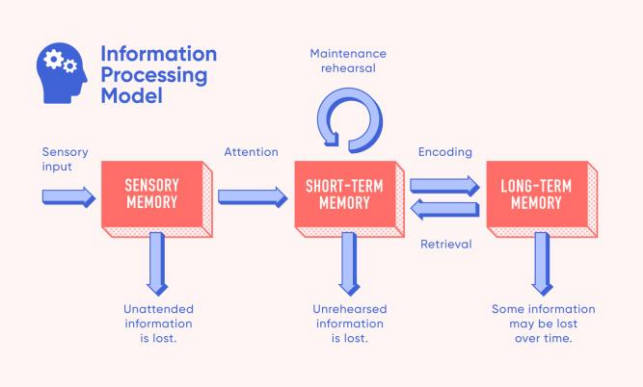


Figure 2.04 – Pictorial Depiction of Information Processing Theory

(Picture Source - Caroline Lawless, Learnupon.com)

Clear and well-structured eco-labels improve cognitive efficiency, making these details easier to understand and allowing decision-makers to focus on core attributes. Research shows that well-designed labelling systems increase adoption by reducing cognitive overload (Henderson et al., 2004; Zeithaml et al., 2002).

IPT further emphasises the role of selective attention in processing information. Stakeholders are more likely to pay attention and emphasise on eco-labels that relate to their values or needs. For instance, architects who would want to reduce environmental footprints will think about attributes of saving energy, but contractors might look for

certification indicating whether the product complies with green building codes. Tailoring of eco-labels to fit priority points enhances accurate perception and positive evaluation (Keller, 2001).

2.4.5. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) focuses on attitudes, subjective norms, and perceived behavioural control in forming intentions and behaviours. Positive attitudes toward environmental and economic benefits enhance the probability of adoption of eco-labelled products by architects, builders, and contractors . Subjective norms are also important for decisions, influenced by peer influence and professional networks. If industry leaders and clients promote the use of eco-labelled products, stakeholders will do the same.

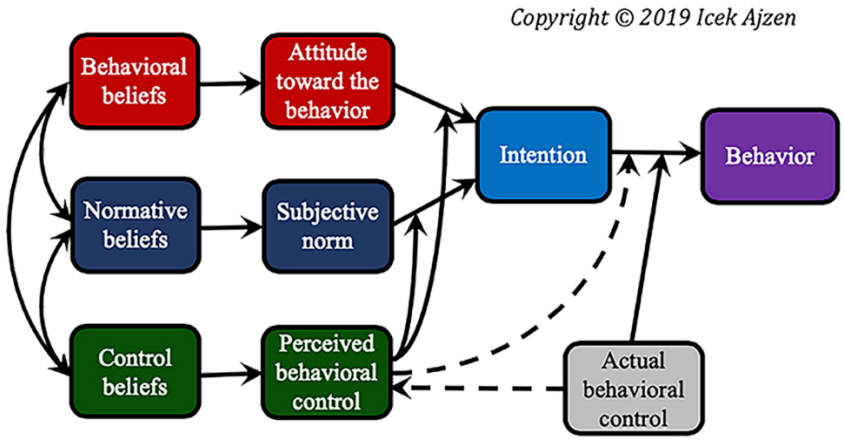


Figure 2.05 – Pictorial depiction of Theory of Planned Behaviour

(Picture Source - https://people.umass.edu/aisen/tpb.diag.html)

The perception of behavioural control is defined as stakeholders' confidence in the ability to actually adopt the product effectively, keeping in mind its availability, cost, and technical compatibility. Nevertheless, TPB also reveals that there is an intention-behavior gap in the case of external barriers. For example, even with favourable attitudes and subjective norms, access to the market or a high price might restrain adoption. These barriers can be removed with the provision of monetary benefits and increased supply chain networks and, therefore, encourage the uptake of green materials (Ajzen, 1991; Fishbein & Ajzen, 2010; Armitage & Conner, 2001; Conner & Sparks, 2005; Bamberg & Möser, 2007).

2.4.6 Social Perception Theory

This theory analyses the formation of impressions and judgments on the basis of social cues, peer behavior, and past experiences. It discusses the influence of social norms, industry standards, and reputational factors in building perceptions (Malle, 2008). In the construction industry, stakeholder perceptions regarding eco-labelled products are shaped by the practices of the leading developers, regulatory guidelines, and expectations from the client. For instance, if major developers persistently use eco-friendly materials, others perceive the practice as normal in the industry, leading to wider acceptance.

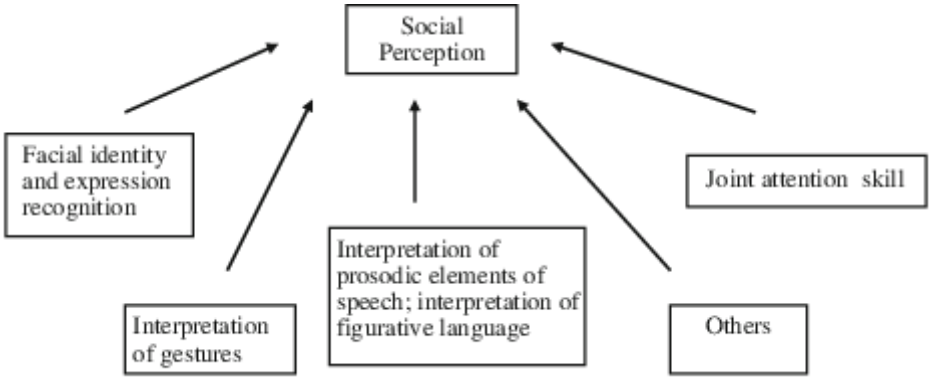


Figure 2.06 – Pictorial depiction of Social Perception Theory

(source - Andres De Los Reyes)

Most often, the perception of eco-labelled products arises from societal influence and industry promotion. Builders and contractors observe their peers and competitors to gauge industry trends. The developer promotes his projects with green certificates to convey to other stakeholders, that materials labelled as "eco-friendly" are essentials for competitiveness in the marketplace. Social proof from the influential players, coupled with the client demand for sustainable buildings, strengthens positive perceptions and drives adoption.

Table 2.08 - Overview of Psychological Theories Related to Eco-Labelled Products

Theory	**Focus**	**Relevance to Eco-labelled Products**
Gestalt Theory	Holistic perception and the role of design coherence	Critical in evaluating eco-labels as unified visual and informational entities

Perceptual Defense Theory	Psychological resistance and biases	Addresses common barriers to the acceptance of sustainable innovations in traditional industries like construction
Signal Theory	Indicators of product quality, environmental compliance, and credibility	Explores how eco-labels act as signals conveying important product information
Information Processing Theory	Managing cognitive load of interpreting complex information	Examines on how stakeholders handle sustainability information
Theory of Planned Behavior	Attitudinal and behavioral shifts based on motivation and persuasion	Pivotal for understanding the motivation behind adopting eco-labelled products
Social Perception Theory	Influence of cultural norms, professional networks, and societal expectations	Captures the macro-level understanding of collective decision-making processes

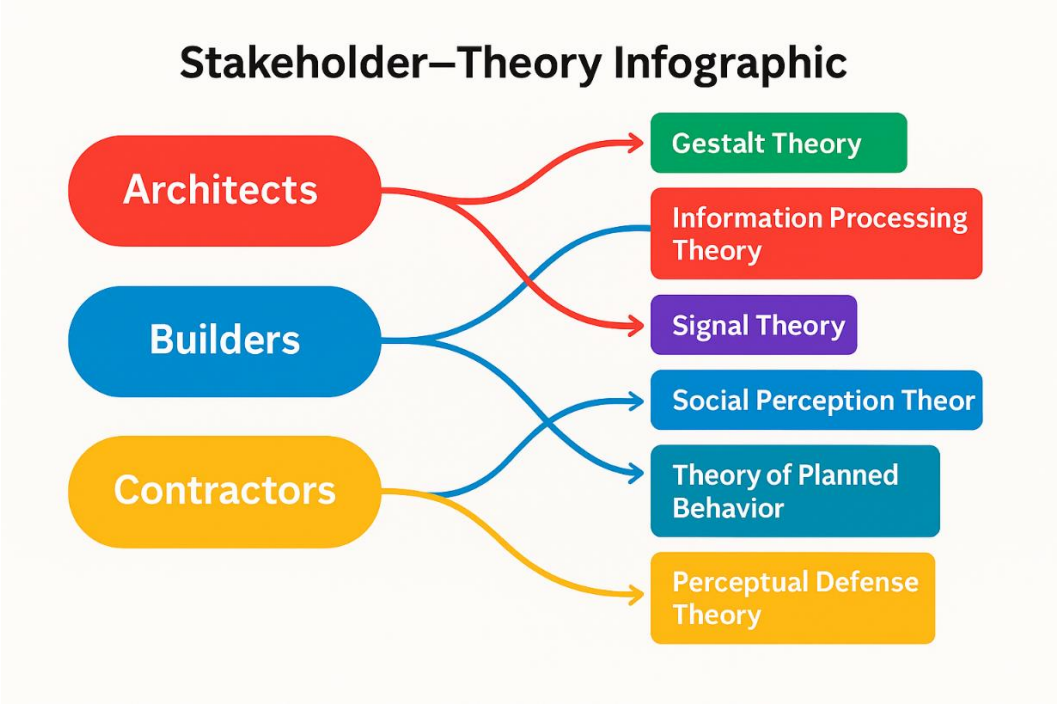


Figure 2.07 – Stakeholders and Psychological Theory alignment

The infographic maps how psychological theories align with the perceptions of Architects, Builders, and Contractors regarding the adoption of eco-labelled products in the Mumbai Metropolitan Region. By visualising stakeholder–theory linkages, it reveals underexplored behavioural drivers and mismatches also helping to formulate research gaps and help to frame the intervention strategies for enhanced ecolabel uptake in the concluding chapters.

2.5 Research Gap

The review of existing literature has revealed four critical research gaps concerning adoption of Ecolabelled products in the Mumbai Metropolitan Region,

Firstly, a significant gap in the existing literature review, reveals the limited understanding on interdependence of the key factors i.e. perceptions about awareness, cost-benefit analysis, and availability on the adoption of the Ecolabelled products. Although a few existing literature reviews have explored them individually, however how these factors collectively affect the adoption by Architects, Builders and Contractors, is still not clear. For example, the perceived cost effectiveness of Ecolabeled products can be influenced by factors such as awareness and availability. If the stakeholders are aware of the long term cost benefits (which can improve the perception of cost effectiveness) and if the products are also easily available, they are more likely to adopt them.

Therefore, it is important to investigate how these factors interact with each other. Thus, there is need for further research , both on factors individually and on their combined influence on adoption. The research gap highlights the need for a systematic understanding on how the selected factors (awareness levels , cost benefits and availability) interact and influence each other in adoption of the ecolabeled products.

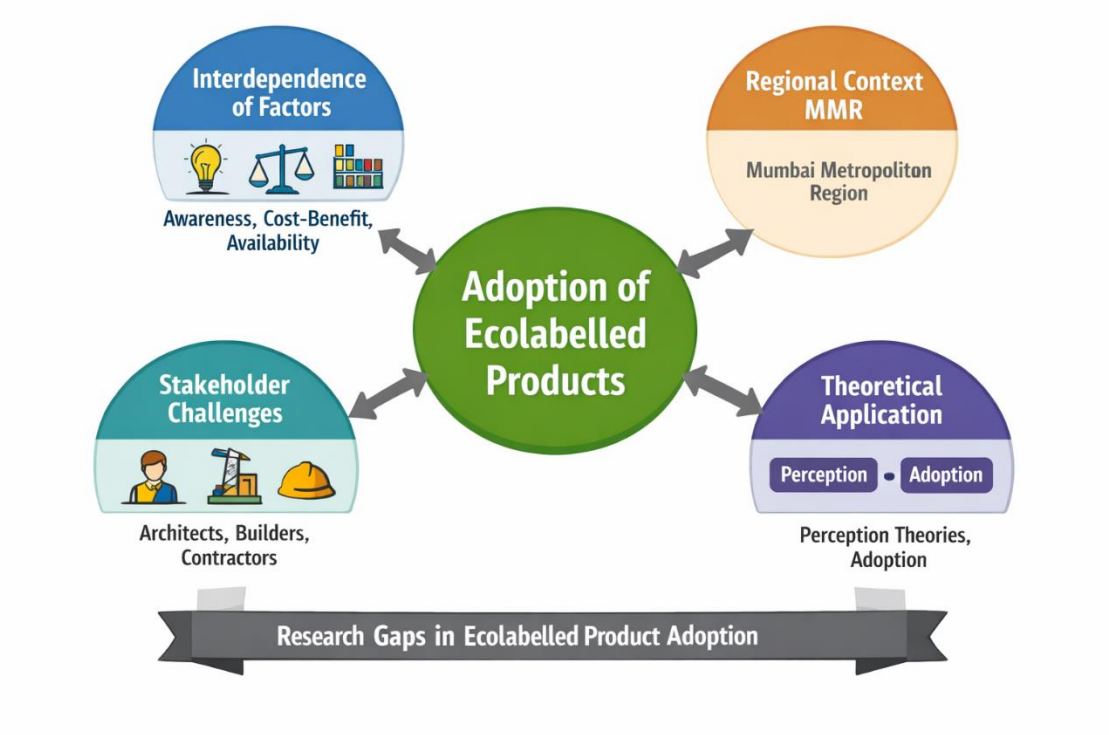


Figure 2.08 – Research Gaps

Secondly, there is no credible research focussing on the Mumbai Metropolitan Region and the key stakeholders such as Architects, Builders and Contractors. Whilst there are studies focussing on the region, however the unique context of MMR driven by its market dynamics, the existing regulatory frameworks, and the aforesaid stakeholders requires an in depth investigation.

Thirdly, the existing research has not adequately captured the specific challenges related to the key stakeholders ~ Architects, Builders and Contractors, which may hamper the adoption of the ecolabeled products in this specific context.

Fourthly, while established theories such as Gestalt Theory, Perceptual Defense Theory, Signal Theory, Information Processing Theory, Theory of Planned Behavior, and Social Perception Theory provide robust frameworks to analyse consumer perception, their application to the specific domain of Ecolabelled products remains underexplored. The theories address aspects related to perception , cognition and decision-making, but do not consider the psychological and contextual factors that influence perception and adoption of Eco labelled Products. This gap underscores the need for investigating the interaction between theoretical perspectives in respect to the

Ecolabelled products and how to bridge the gap between and further enrich academic knowledge and the practical implication related to promoting of Ecolabelled products.

Inspite of the varied insights put forth by these theories, some significant gaps exists.

Firstly, not much significant work has been undertaken on the Mumbai Metropolitan Region inspite of its geographical and economic significance. Secondly, the diversity in professions ranging from Architects (specifiers), Builders (customers) and Contractors (executioners) with varied awareness levels and within the categories also is not touch based atall. Thirdly, the theories lack on explaining and bringing forth the interplay and the role the Government policies play and the availability. And fourthly, which is last but not the least, the impact of new age digital technologies and platforms on the adoption of Ecolabelled products, is still under investigated.

These four research gaps usher us to the need of more comprehensive and context specific research to further understand the factors that influence the adoption of Ecolabelled products in geographically and economically significant Mumbai Metropolitan Region. Therefore , the gaps shall be addressed in the current study through a systematic questionnaire based methodology and empirical research, providing a better understanding on perceptions of the key stakeholders and the adoption of Ecolabelled products, which have an immense potential to enhance the sustainability within the construction industry.

2.6 Statement of Problem

Ecolabelled products play a significant role in enhancing the Green & sustainability quotient of a building. The Mumbai Metropolitan Region's construction sector is growing at an unprecedented rate, driven by demand in both commercial and residential sectors. Whilst Sustainability and Environmental stewardship are discussed and emphasised across multiple forums, the adoption of the Ecolabelled products, which should be at the core, is seldom at seen making strong inroads in terms of adoption.

Inspite of the growth of Green Ratings and penetration of Green Buildings, these products lack recognition and are not fully understood by the key stakeholders – Architects, Builders and Contractors.

Figure 2.09 – Statement of Problem

The existing literature and the preliminary studies indicate three challenges.

1. **Limited Awareness** on advantages and long term environmental and cost benefits of Ecolabelled products.
2. **Lack of Clarity** among the key stakeholders on the performance and credibility of Ecolabelled products.
3. **Perception Barriers** directly influencing and affecting lower adoption .

This gap between the benefits, perception among key stakeholders, the potential and the actual adoption of Ecolabelled products, gets further expanded , especially in MMR due to the sheer humongous scale of construction activity happening in MMR. Moreover, because of the lack of empirical research on perception driven barriers, further grounds the adoption.

2.7 Conceptual Framework

The conceptual framework, built using Structural Equation Modelling (SEM), maps the relationships between independent, moderating, and dependent variables to explain the adoption of eco-labelled building materials in Mumbai. SEM provides an integrated view of how awareness, cost-benefit perception, and availability interact with policy, expertise, and marketing strategies—highlighting the multi-variable nature of adoption behavior in the construction sector.

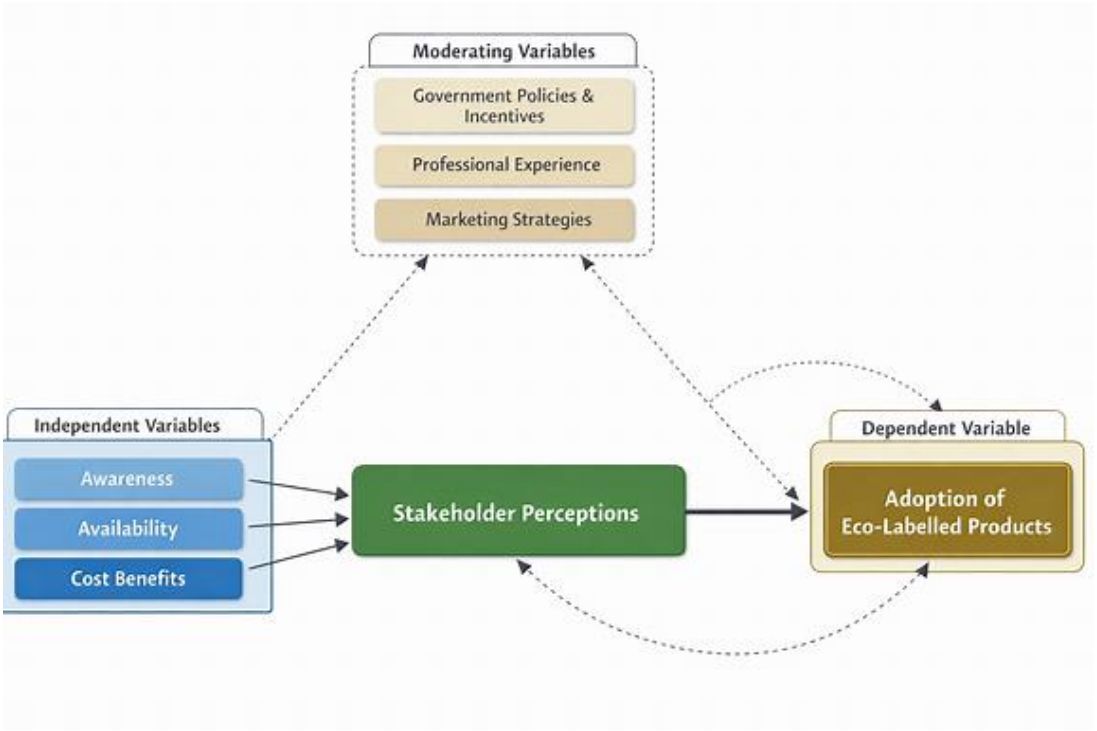


Figure – 2.10- Conceptual Framework for the study

2.8 Need for the Study

The primary aim of the study, is to study the perceptions of architects, builders and contractors regarding the eco-labelled products within the Mumbai Metropolitan Region and how these perceptions influence the adoption.

The study will work towards identifying the primary motivators and deterrents for adoption and, assessing the understanding of/knowledge levels of the architects, builders, and contractors, by getting insights, which can lead to enhanced adoption of the Ecolabelled products.

2.9 Research Questions

Specific research questions were formulated to guide this research on the topic "Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products in Mumbai Metropolitan Region", to understand how the perceptions of these key stakeholders impact the adoption of the Ecolabelled products. The primary aim is to explore how the awareness levels, cost benefits and availability, shape the perceptions and how they further influence the adoption. Additionally, the study has also examined impact of government regulatory policies and incentives, the

professional experience and expertise of these stakeholders, and the marketing strategies employed by product manufacturers, on the adoption.

The questionnaire has incorporated questions to help us in understanding, how well the architects, builders, and contractors are aware about Ecolabelled products, their perception on cost benefits, and the availability of these materials has any interplay on the adoption of the Ecolabelled products. The study aims to identify the key factors influencing the adoption of Ecolabelled products, considering both the independent and moderating variables.

Through the research questions, the study has aimed to identify factors that influence the adoption of Ecolabelled products. The findings will help product manufacturers to devise more effective strategy to promote ecolabeled products which will contribute to a greener and more environmentally responsible construction sector in the Mumbai Metropolitan Region.

2.10 Scope of Study

The current study has been done on the perception of Architects, Builders, and Contractors about the adoption of Ecolabelled Products in Mumbai Metropolitan Region. This research aims at analysing the influence that Architects, Builders and Contractors perceptions might have on Ecolabelled product adoption as perceived through the effects of the high and the low cost differences with their taken-up projects.

We have included the employees working with these set of stakeholders across various functions such as Design, planning, project execution, procurement, sales, after service etc.

Figure 2.11 – Scope of Study

This has been done to consider all the demographic factors which can have an impact on the adoption of Ecolabelled products. It should also be noted that different job positions, qualifications and work experience have been taken into consideration to build a comprehensive picture.

This study would be helpful and crucial for advancing sustainability efforts, guiding market strategies, and shaping policies in the construction industry.

Chapter 3

Research Methodology

Chapter 3 - Research Methodology

In research methodology, the elements of the research process like research design, data collection methods, questionnaire design, sampling design and statistical tools have been discussed.

3.1 Research Design

The research design used in this study included both Exploratory Research Design and Descriptive Research Design.

Exploratory Research Design

Exploratory research design was used for problem identification, defining the research variables and formulating the hypothesis. The data collection methods used in Exploratory Research Design are Literature Survey and Pilot Survey. Exploratory Research design was used since there is limited study on Adoption of Ecolabelled, for which we need a flexible approach for finding the factors and create a framework suiting for MMR context..

3.2 Development of research variables for "Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products in the Mumbai Metropolitan Region"

The dependent variable for this study is

1. Adoption of Eco-labelled Building Materials

The independent variables or exogenous variables for this study are as follows:

1. Awareness of Eco-labelled Products
2. Cost Benefits of Eco-labelled Products
3. Availability of Eco-labelled Products

The moderating variables for this study are as follows:

1. Professional Experience and Expertise
2. Government Regulatory Policies and Incentives
3. Marketing Strategies

Literature has been reviewed from various sources like journals, newspapers, magazines, websites which provided deep insights to the study of aspects related to Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products,

Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials.

3.3 Objectives

Based on the variables and the Literature review, the following objectives have been developed for the study.

1. To examine whether the adoption of Eco-labelled products depends on the level of awareness among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

2. To study whether a favourable cost-benefit perception of Eco-labelled products enhances the chances of adoption by Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

3. To study whether the ease of availability and accessibility of Eco-labelled products significantly influences their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

4. To examine the impact of regulatory policies and incentives deemed favourable on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

5. To explore whether higher levels of professional experience, expertise and exposure to Eco-labelled products leads to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

6. To determine if the marketing strategies related to Eco-labelled products leads to the adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

3.4 Formulation of Hypothesis

The following statements have been formulated to determine the Adoption of Eco-labelled Products in the Mumbai Metropolitan Region :

Hypothesis 1

Null Hypothesis ($H1_0$): The adoption of Eco-labelled products does not depend upon the level of awareness among Architects, Builders, and Contractors in the Mumbai.

Alternative Hypothesis($H1_A$): The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai.

Hypothesis 2

Null Hypothesis ($H2_0$): Favourable cost benefit perception about Eco-labelled products does not enhance the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

Alternative Hypothesis($H2_A$): Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

Hypothesis 3

Null Hypothesis ($H3_0$): The ease of availability and accessibility of Eco-labelled products does not significantly influence the adoption among Architects, Builders, and Contractors.

Alternative Hypothesis($H3_A$): The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors.

Hypothesis 4

Null Hypothesis ($H4_0$): Regulatory policies and incentives deemed favourable do not have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Alternative Hypothesis($H4_A$): Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Hypothesis 5

Null Hypothesis ($H5_0$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products does not lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Alternative Hypothesis($H5_A$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Hypothesis 6

Null Hypothesis ($H6_0$): Marketing strategies related to Eco-labelled products do not lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Alternative Hypothesis($H6_A$): Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

3.5 Descriptive Research Design

Descriptive research design was used to describe the Characteristics/attributes for the respondents with reference to demographic factors like [Professional Experience, Source for getting information on eco-labelled products, Specified or used eco-labelled products in your projects, Aware of any existing government policies, Supportive policies or incentives and Percentage of your total projects have you specified or used eco-labelled products] for Adoption of Eco-labelled Building Materials have been assessed.

Cross sectional research design was used as the type of descriptive research design as the research was conducted only once regarding the Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials.

3.6 Data Collection

Primary Data

The primary data required for the research was collected using the survey method with a detailed self-administered questionnaire among the respondents to study the influence of [Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials].

Secondary Data

Sources of secondary data for the study included the national and international journals, research articles, books, newspapers, research reports by reputed agencies and online data sources related to Adoption of Eco-labelled Building Materials] have been reviewed.

3.7 Questionnaire Design

The questionnaire has been designed by using both measurement and rating scales. The measurement scales include Nominal scale, Interval Scale and Likert rating scale in this study. Likert rating scale was used as a type of rating scale. Nominal scale was used to understand the profile of the respondents like Professional Experience, Source for getting information on eco-labelled products, Specified or used eco-labelled products in your projects, Aware of any existing government policies, Supportive policies or incentives and Percentage of your total projects have you specified or used eco-labelled products.

3.8 Pilot Testing of the Questionnaire

The pilot study was conducted from 60 respondents each through questionnaire to obtain their responses influencing the [Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials]. During the pilot study , reliability has been tested by using Cronbach Alpha (α) and was found to be more than 0.8 for all the research variables included in the research.

Table 3.1 Summary of Pilot Study - Reliability Statistics for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

Variables	Cronbach's Alpha (α)
Awareness of Eco-labelled Products	0.826
Cost Benefits of Eco-labelled Products	0.838
Availability of Eco-labelled Products	0.838
Professional Experience and Expertise	0.831
Government Regulatory Policies and Incentives	0.879
Marketing Strategies	0.877
Adoption of Eco-labelled Building Materials	0.873

Conclusion of Pilot Study

Based on the summary of reliability, it can be inferred that the value of Cronbach's Alpha (α) found to be more than 0.8 which shows the internal consistency for all the variables included in the research consisting of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies and Adoption of Eco-labelled Building Materials.

After the pilot study, questionnaire has been designed and the reliability and validity for the statements related to Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies to determine Adoption of Eco-labelled Building Materials] have been evaluated for internal consistency and accuracy among the variables included in the research.

3.9 Sampling Design

The components like Sample Universe, Sampling Unit, Sample, Sample Size and Sampling Method have been covered under Sampling Design.

3.9.1 Sample Universe: It constitutes the Architects, Builders, and Contractors in the Mumbai Metropolitan Region towards Adoption of Eco-labelled Building Materials.

3.9.2 Sampling Unit

It is the basic unit consisting of all the elements of the sample universe. The sampling unit included the Architects, Builders, and Contractors in the Mumbai Metropolitan Region towards Adoption of Eco-labelled Building Materials. The Geographical area covered is from Mumbai Metropolitan Region, which comprises of 9 municipal corporations such as Municipal Corporation of Greater Mumbai, Thane, Kalyan-Dombivli, Navi Mumbai, Ulhasnagar, Bhiwandi-Nizamapur, Vasai-Virar, Mira-Bhayandar and Panvel.

3.9.3 Sample

The sample includes a proportion of the Architects, Builders, and Contractors in the Mumbai Metropolitan Region, it is the subgroup of the universe who either specify, buy or use the ecolabeled products are only included in the study.

3.9.4 Sample Size

The target population is the Architects, Builders, and Contractors in the Mumbai Metropolitan Region towards Adoption of Eco-labelled Building Materials, which has been selected by using Cochran's (1977) formula of variability.

3.9.5 Determination of Sample Size

The professional universe of Architects, Builders, and Contractors in the Mumbai Metropolitan Region is sizeable and engages at varying levels—either as specifiers, buyers, or users—with eco-labelled building products. Given this situation of non-definitive size and varied composition, Cochran's (1977) formula of variability was applied to determine the required sample size.

The following formula was used to determine the sample size when the population is having high degree of variability:

$n = [z^2pq]/[e^2]$

where, n is the sample size, z is the selected critical value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, $q = 1- p$ and e is the desired level of precision or tolerable error

Since no prior data was available on the number of Architects, Builders and Contractors using Ecolabelled products, the study considered the population's degree of variability as unknown and hence the Cochran's formula was used with the assumption of maximum variability, which is equal to 50% (p =0.5) and taking 95% confidence level with ±5% precision. The calculation for required sample size based on the above assumptions was as follows :

p = 0.5 and hence q =1-0.5 = 0.5; e = 0.05; z =1.96

$n = [z^2pq]/[e^2]$

$n = [(1.96)^2 (0.5) (0.5)]/[(0.05)^2]$

n = [(3.8416) (0.25)/[0.025]

n = [0.9604] / [0.025]

n = 384.16

The sample size of 400 has been classified as follows.

The sample size calculated using the Cochran formula was 384.16. To ensure robustness and adequacy, 428 nos of samples were collected. Upon review, a few responses were found to be improperly filled or incomplete and hence were excluded. The sample size was finalised to 400 nos, as per the details below, which exceeds the minimum requirement.

Whilst the Cochran formula calculated the 384 nos and the sample size was further finalised the to 400 nos, however the following stakeholder wise distribution was not pre-determined or proportional. Convenience and Snowball sampling techniques were employed, with a minor round off, maintaining the total overall representation.

The sample size of 400 has been distributed as follows

Table 3.2 Distribution Summary of Sample Size

Sampling Unit	No. of Respondents
Architects	125
Builders	75
Contractors	200

3.9.6 Sampling Method

The sampling Method used to select the sample of 400 Architects, Builders, and Contractors in the Mumbai Metropolitan Region to determine the impact of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies on Adoption of Eco-labelled Building Materials by using **Snowball Sampling and Convenience sampling method**. Both are the types of Non-Probability sampling.

The study employed non-probability sampling techniques specifically the Snowball and Convenience, for obtaining the sample of 400 nos comprising cumulatively of Architects, Builders and Contractors from Mumbai Metropolitan Region. The Snowball sampling helped to initially identify the respondents through professional networks and ensured an access to the participants within the respective stakeholder community. Convenience sampling was further deployed to include respondents who were willing to participate and fill the questionnaire, reducing the non-response errors.

The data was thus collected from those respondents who were knowledgeable and ready to share information about the effect of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies on Adoption of Eco-labelled Building Materials.

3.10 Type of Statistics used

The present research work is to test the effect of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies on Adoption of Eco-labelled Building Materials.

Both Descriptive Statistics & Inferential Statistics are used for data analysis and interpretation.

Descriptive Statistics and Inferential Statistics are used in data analysis.

Descriptive Statistics

Descriptive Statistics are used to tabulate the data, calculating the frequencies and generating the summary tables in the form of both bar chart and pie chart.

Inferential analysis

Inferential analysis was used to derive the logical conclusions of the samples.

The following techniques have been used in the inferential analysis:

Simple percentage method, Chi-Square test, Kolmogorov Smirnov Test, Reliability Analysis, Multiple Regression, Factor Analysis and Structural Equation Modelling [SEM].

Chapter 4

Data Analysis and Interpretation

Chapter 4 - Data Analysis And Interpretation/Results

The data analysis has been classified into Descriptive analysis & Inferential Analysis. The data has been analysed by using IBM SPSS Statistics 30.

A] Descriptive analysis

For doing descriptive analysis, the simple percentage method has been used to calculate the frequencies and has been represented by using both Bar Chart and Pie Chart.

B] Inferential analysis

Inferential analysis has been used to derive the logical conclusions of the samples. The following techniques has been used in the inferential analysis

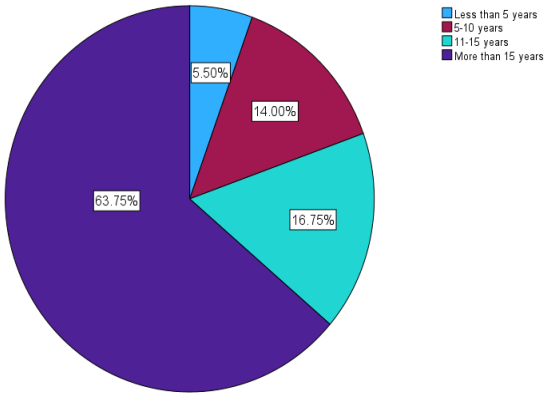
- Kolmogorov Smirnov Test,
- Chi-Square test,
- Reliability Analysis, Multiple Regression,
- Factor Analysis and,
- Structural Equation Modelling(SEM)

4.1 Descriptive Analysis for "Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products in the Mumbai Metropolitan Region

Table 4.01: Professional Experience

Professional Experience	Frequency	Percent
Less than 5 years	22	5.5
5-10 years	56	14.0
11-15 years	67	16.8
More than 15 years	255	63.7
Total	400	100.0

Chart 4.01: Professional Experience

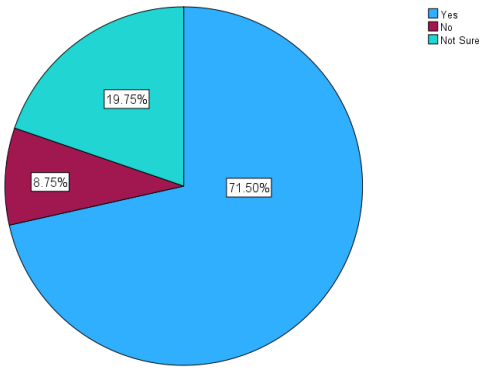


Inference : Table 4.01 and Chart 4.01 show that out of 400 respondents, a dominant 64% have more than 15 years of professional experience, while comparatively smaller proportions are distributed across lower experience brackets. This clearly indicates that the respondent base is largely composed of seasoned professionals, thereby strengthening the reliability and depth of insights gathered in the study.

Table 4.02 : Specified or used eco-labelled products in your projects

Specified or used eco-labelled products in your projects	Frequency	Percent
Yes	286	71.5
No	35	8.8
Not Sure	79	19.8
Total	400	100.0

Chart 4.02 : Specified or used eco-labelled products in your projects



Inference : Table 4.02 and Chart 4.02 show that out of 400 respondents, a significant 71.5% have specified or used eco-labelled products in their projects, while

comparatively smaller proportions have either not used them or remain unsure. This suggests that eco-labelled products have achieved a considerable level of acceptance and integration within professional practice among the respondents.

Weighted average mean for Awareness of Eco-labelled Products

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

WAM = Weighted Average Mean

Table 4.03 - Weighted average mean for Awareness of Eco-labelled Products

Sr. No.	Factors influential	SD	D	N	A	SA	WAM
1.	Specifying or using eco-labelled products provides a competitive advantage to my organisation.	24	28	10	115	223	4.21
		6	7	2.5	28.7	55.8	
2.	Eco-labelled products improve my project's sustainability profile.	32	20	39	142	167	3.98
		8	5	9.8	35.5	41.8	
3.	Eco-labelled products are essential for achieving my project's sustainability goals.	16	12	66	100	206	4.17
		4	3	16.5	25	51.5	

Inference : The findings indicate that the highest weighted average mean scores are observed for statements related to specifying and competitive advantage (4.21), achieving sustainability goals (4.17), and improving project sustainability profile (3.98). This highlights that respondents strongly perceive eco-labelled products not only as environmentally beneficial but also as strategically valuable in enhancing organisational positioning and project outcomes.

From the above weighted average mean, Awareness of Eco-labelled Products can be summarised as Specifying or using eco-labelled products provides a competitive advantage to my organisation, Eco-labelled products improve my project's SEMsustainability profile and Eco-labelled products are essential for achieving my project's sustainability goals.

Weighted average mean for Cost Benefits of Eco-labelled Products

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

WAM = Weighted Average Mean

Table 4.04 - Weighted average mean for Cost Benefits of Eco-labelled Products

Sr. No.	Factors influential	SD	D	N	A	SA	WAM
1.	Eco-labelled products have high initial costs.	16	19	75	129	161	
		4	4.8	18.8	32.3	40.3	4.00
2.	Higher initial cost is a significant barrier to adoption of eco-labelled products.	20	42	58	140	140	
		5	10.5	14.5	35	35	3.85
3.	Operational cost savings of eco-labelled products outweigh the initial costs.	16	35	86	106	157	
		4	8.8	21.5	26.5	39.3	3.88
4.	Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.	20	36	82	139	123	3.77

		5	9	20.5	34.8	30.8	
5.	Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.	28	36	50	156	130	3.81
		7	9	12.5	39	32.5	

Inference : The results show that the highest weighted average mean scores are associated with high initial costs (4.00), followed by perceptions of operational cost savings (3.88) and cost barriers to adoption (3.85). This indicates that while respondents acknowledge the long-term economic benefits of eco-labelled products, the concern around higher upfront costs continues to remain a critical consideration in decision-making.

From the above weighted average mean, Cost Benefits of Eco-labelled Products can be summarised as Eco-labelled products have high initial costs, Operational cost savings of eco-labelled products outweigh the initial costs, and Higher initial cost is a significant barrier to adoption of eco-labelled products.

Weighted average mean for Availability of Eco-labelled Products

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

WAM = Weighted Average Mean

Table 4.05 - Weighted average mean for Availability of Eco-labelled Products

Sr. No.	**Factors influential**	**SD**	**D**	**N**	**A**	**SA**	**WAM**
1.	Eco-labelled products are as readily available as non-eco-labelled alternatives.	19	32	31	121	197	4.11
		4.8	8	7.8	30.3	49.3	

2.	Availability of eco-labelled products significantly influences my decision to specify or use them.	24	15	54	112	195	4.10
		6	3.8	13.5	28	48.8	
3.	I am confident that eco-labelled products will be consistently available for my projects.	20	38	67	61	214	4.03
		5	9.5	16.8	15.3	53.5	
4.	Improved availability of eco-labelled products would increase their adoption in my projects.	28	20	35	216	101	3.86
		7	5	8.8	54	25.3	

Inference : The findings reveal that the highest weighted average mean scores are observed for factors related to availability, including ease of access (4.11), influence on specification decisions (4.10), and confidence in consistent supply (4.03). This suggests that the availability of eco-labelled products plays a crucial role in influencing their adoption and continued usage in projects.

From the above weighted average mean, Availability of Eco-labelled Products can be summarised as Eco-labelled products are as readily available as non-eco-labelled alternatives, Availability of eco-labelled products significantly influences my decision to specify or use them, and I am confident that eco-labelled products will be consistently available for my projects.

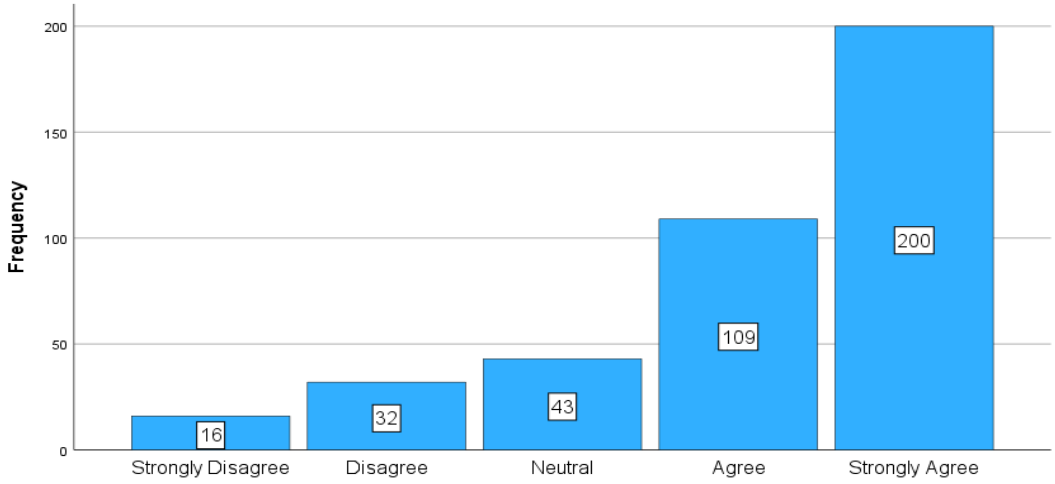
4.1.1 Professional Experience and Expertise

Table 4.06 : My professional background helps me make informed decisions about specifying or using eco-labelled products

My professional background helps me make informed decisions about specifying or using eco-labelled products	**Frequency**	**Percent**
Strongly Disagree	16	4.0
Disagree	32	8.0

Neutral	43	10.8
Agree	109	27.3
Strongly Agree	200	50.0
Total	400	100.0

Chart 4.03 : My professional background helps me make informed decisions about specifying or using eco-labelled products



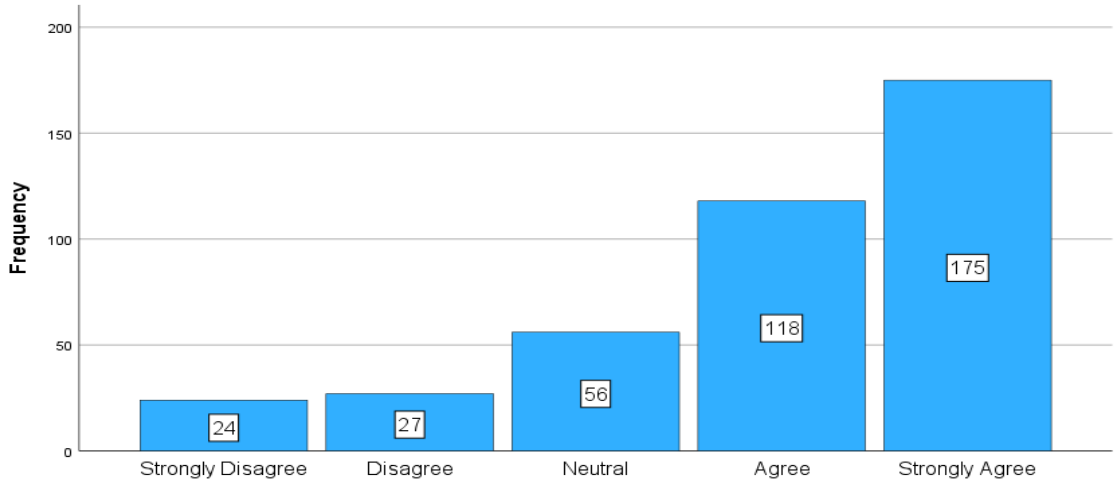
Inference : Table 4.06 and Chart 4.03 show that out of 400 respondents, a dominant 50% strongly agree that their professional background helps them make informed decisions regarding eco-labelled products, while comparatively smaller proportions express disagreement or neutrality. This reflects a high level of confidence among respondents in their professional expertise and decision-making capabilities.

Table 4.07: I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.

I regularly collaborate or consult with other professionals before specifying or using eco-labelled products	**Frequency**	**Percent**
Strongly Disagree	24	6.0
Disagree	27	6.8
Neutral	56	14.0
Agree	118	29.5

Strongly Agree	175	43.8
Total	400	100.0

Chart 4.04 : I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.

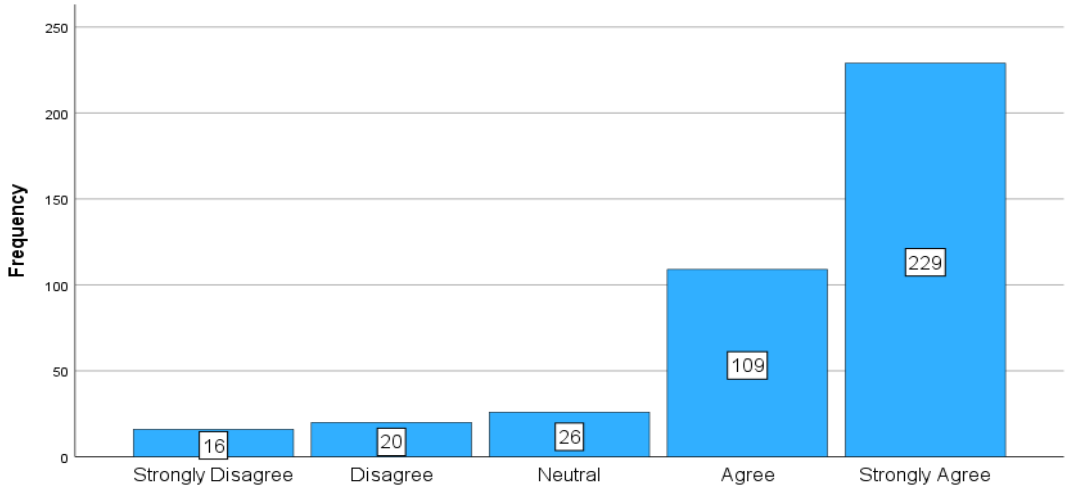


Inference : Table 4.07 and Chart 4.04 show that out of 400 respondents, a significant 44% strongly agree that they regularly collaborate or consult with other professionals before specifying eco-labelled products, while smaller proportions fall across other categories. This indicates a collaborative and consultative approach in professional decision-making related to eco-labelled product adoption.

Table 4.08 : Trainings or workshops on eco-labelled products helps me specify or use them more effectively

Trainings or workshops on eco-labelled products helps me specify or use them more effectively	**Frequency**	**Percent**
Strongly Disagree	16	4.0
Disagree	20	5.0
Neutral	26	6.5
Agree	109	27.3
Strongly Agree	229	57.3
Total	400	100.0

Chart 4.05 : Trainings or workshops on eco-labelled products helps me specify or use them more effectively

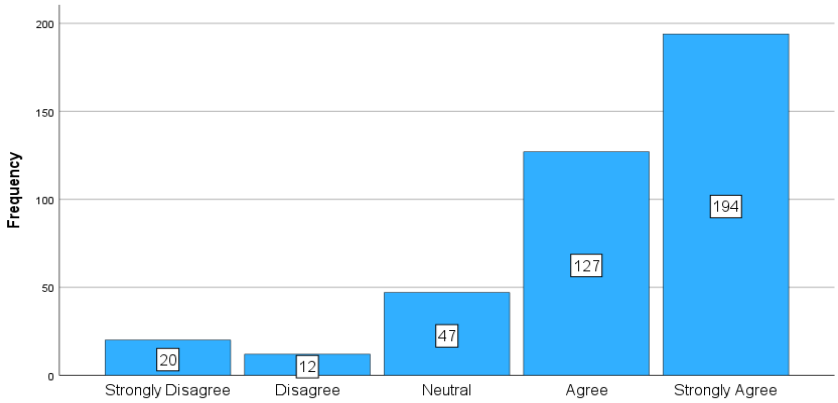


Inference : Table 4.08 and Chart 4.05 show that out of 400 respondents, a dominant 57% strongly agree that trainings or workshops on eco-labelled products help them specify or use these products more effectively, while comparatively smaller proportions express neutral or negative views. This highlights the critical role of structured training and knowledge dissemination in enhancing the effective adoption of eco-labelled products.

Table 4.09 : I actively re-evaluate new options when specifying or using new categories of eco-labelled products

I actively re-evaluate new options when specifying or using new categories of eco-labelled products	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	12	3.0
Neutral	47	11.8
Agree	127	31.8
Strongly Agree	194	48.5
Total	400	100.0

Chart 4.06 : I actively re-evaluate new options when specifying or using new categories of eco-labelled products

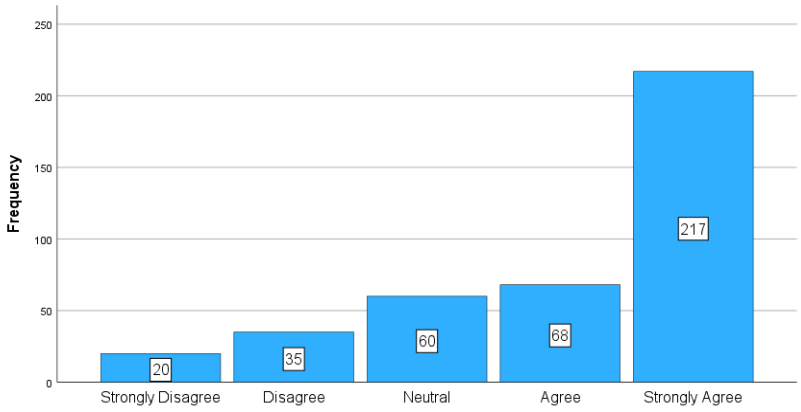


Inference : Table 4.09 and Chart 4.06 show that out of 400 respondents, a significant 48.5% strongly agree that they actively re-evaluate new options when specifying eco-labelled products, while smaller proportions fall across other response categories. This suggests a proactive and adaptive mindset among respondents, reflecting openness to innovation and evolving product choices.

Table 4.10 : My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders

My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	35	8.8
Neutral	60	15.0
Agree	68	17.0
Strongly Agree	217	54.3
Total	400	100.0

Chart 4.07 : My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders



Inference : Table 4.10 and Chart 4.07 show that out of 400 respondents, a dominant 54% strongly agree that their decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders, while comparatively fewer respondents express neutral or opposing views. This indicates the significant influence of external stakeholders in shaping specification decisions.

Weighted average mean for Professional Experience and Expertise

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

WAM = Weighted Average Mean

Table 4.11 - Weighted average mean for Professional Experience and Expertise

Sr. No.	Factors influential	SD	D	N	A	SA	WAM
1	My professional background helps me make informed decisions about specifying or using eco-labelled products.	16	32	43	109	200	4.11
		4	8	10.8	27.3	50	

2	I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.	24	27	56	118	175	3.98
		6	6.8	14	29.5	43.8	
3	Trainings or workshops on eco-labelled products helps me specify or use them more effectively.	16	20	26	109	229	4.29
		4	5	6.5	27.3	57.3	
4	I actively re-evaluate new options when specifying or using new categories of eco-labelled products.	20	12	47	127	194	4.16
		5	3	11.8	31.8	48.5	
5	My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.	20	35	60	68	217	4.07
		5	8.8	15	17	54.3	

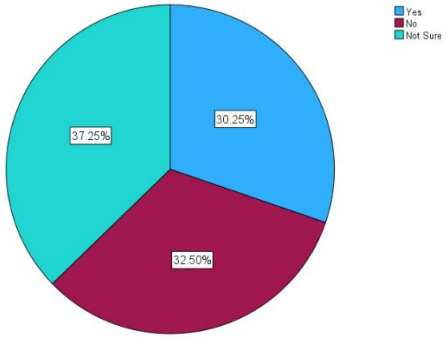
Inference : The findings indicate that the highest weighted average mean scores are observed for training effectiveness (4.29), re-evaluation of new options (4.16), and professional expertise (4.11). This suggests that knowledge enhancement, continuous learning, and professional experience are key enablers in facilitating informed decision-making and adoption of eco-labelled products.

From the above weighted average mean, Professional Experience and Expertise can be summarised as Trainings or workshops on eco-labelled products helps me specify or use them more effectively, I actively re-evaluate new options when specifying or using new categories of eco-labelled products and My professional background helps me make informed decisions about specifying or using eco-labelled products.

Table 4.12 : Aware of any existing government policies that promote the usage of eco-labelled products

Aware	Frequency	Percent
Yes	121	30.3
No	130	32.5
Not Sure	149	37.3
Total	400	100.0

Chart 4.08 : Aware of any existing government policies that promote the usage of eco-labelled products



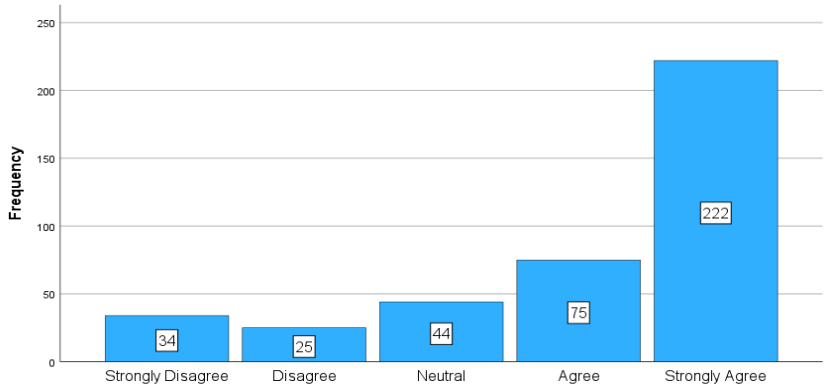
Inference : Table 4.12 and Chart 4.08 show that out of 400 respondents, the largest proportion (37%) are not sure about existing government policies promoting eco-labelled products, while smaller proportions report awareness or lack of awareness. This indicates a noticeable gap in policy awareness among respondents, suggesting the need for improved communication and outreach.

4.1.2 Government Regulatory Policies and Incentives

Table 4.13 : Presence or absence of government policies influences my decision to specify or use eco-labelled products

Presence or absence of government policies	Frequency	Percent
Strongly Disagree	34	8.5
Disagree	25	6.3
Neutral	44	11.0
Agree	75	18.8
Strongly Agree	222	55.5
Total	400	100.0

Chart 4.09 : Presence or absence of government policies influences my decision to specify or use eco-labelled products

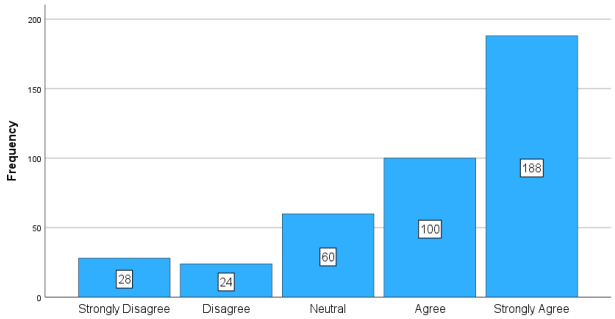


Inference : Table 4.13 and Chart 4.09 show that out of 400 respondents, a dominant 55.5% strongly agree that the presence or absence of government policies influences their decision to specify or use eco-labelled products. This highlights the strong role of regulatory frameworks in shaping professional choices and adoption behaviour.

Table 4.14 : Supportive policies or incentives can increase the adoption of eco-labelled products

Supportive policies or incentives	Frequency	Percent
Strongly Disagree	28	7.0
Disagree	24	6.0
Neutral	60	15.0
Agree	100	25.0
Strongly Agree	188	47.0
Total	400	100.0

Chart 4.10 : Supportive policies or incentives can increase the adoption of eco-labelled products

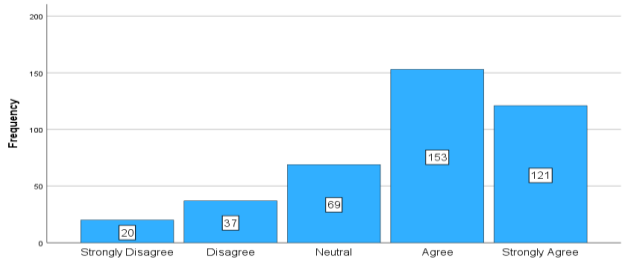


Inference : Table 4.14 and Chart 4.10 show that out of 400 respondents, a significant 47% strongly agree that supportive policies or incentives can increase the adoption of eco-labelled products. This reflects a strong belief among respondents that policy-driven incentives can act as effective catalysts for adoption.

Table 4.15 : Current Government policies are effective in promoting the adoption of eco-labelled products

Current Government policies	Frequency	Percent
Strongly Disagree	20	5.0
Disagree	37	9.3
Neutral	69	17.3
Agree	153	38.3
Strongly Agree	121	30.3
Total	400	100.0

Chart 4.11: Current Government policies are effective in promoting the adoption of eco-labelled products

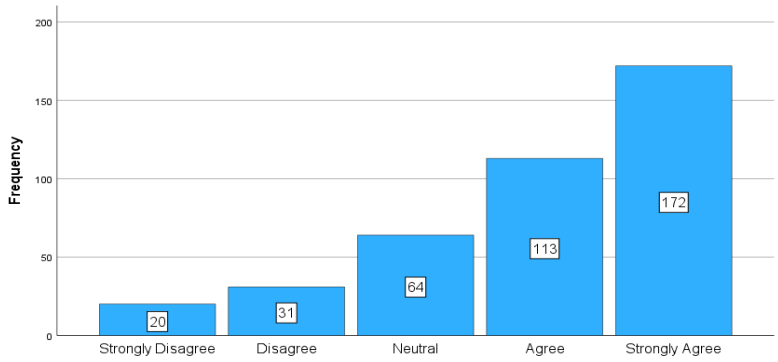


Inference : Table 4.15 and Chart 4.11 show that out of 400 respondents, the largest proportion (38%) agree that current government policies are effective in promoting the adoption of eco-labelled products, while a substantial share also strongly agrees. This indicates a generally positive, though not overwhelming, perception of policy effectiveness.

Table 4.16 : Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials

Presence or absence of price and tax subsidies	Frequency	Percent
Strongly Disagree	20	5.0
Disagree	31	7.8
Neutral	64	16.0
Agree	113	28.2
Strongly Agree	172	43.0
Total	400	100.0

Chart 4.12 : Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials

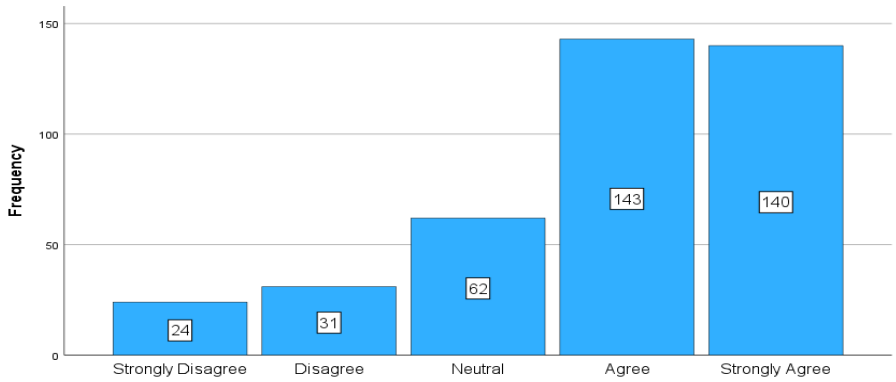


Inference : Table 4.16 and Chart 4.12 show that out of 400 respondents, a dominant 43% strongly agree that price and tax subsidies influence their decision to specify eco-friendly materials. This underscores the importance of financial incentives in driving adoption decisions.

Table 4.17 : Mandatory usage of Ecolabelled products in projects promotes their adoption

Mandatory usage of Ecolabelled products	Frequency	Percent
Strongly Disagree	24	6.0
Disagree	31	7.8
Neutral	62	15.5
Agree	143	35.8
Strongly Agree	140	35.0
Total	400	100.0

Chart 4.13 : Mandatory usage of Ecolabelled products in projects promotes their adoption



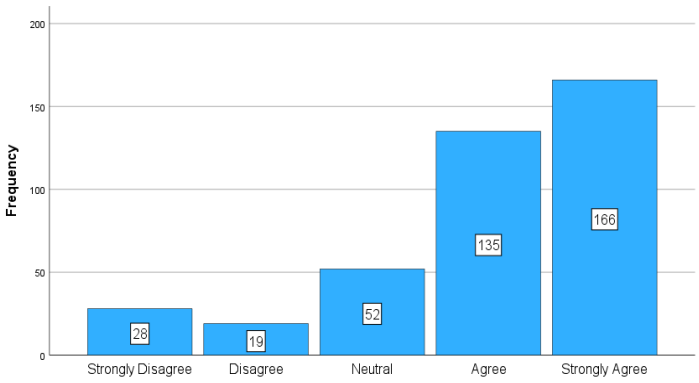
Inference : Table 4.17 and Chart 4.13 show that a majority of respondents agree that mandatory usage of eco-labelled products promotes their adoption, indicating support for regulatory enforcement as a mechanism to drive wider acceptance.

Table 4.18 : Priority in procurement for Ecolabelled products helps increase their usage

Priority in procurement for Ecolabelled products	Frequency	Percent
Strongly Disagree	28	7.0
Disagree	19	4.8
Neutral	52	13.0
Agree	135	33.8
Strongly Agree	166	41.5

Total	400	100.0

Chart 4.14 : Priority in procurement for Ecolabelled products helps increase their usage

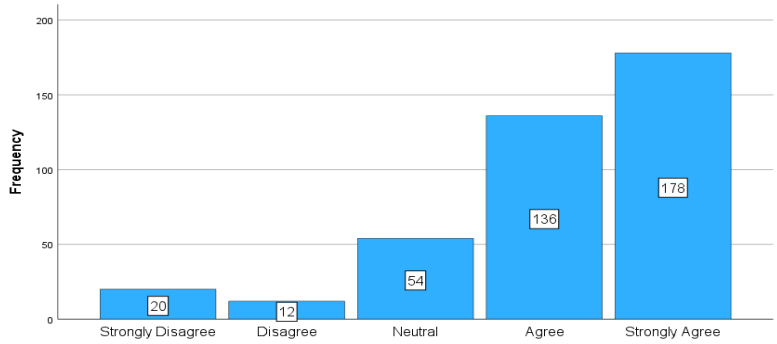


Inference Table 4.18 and Chart 4.14 show that a significant proportion of respondents strongly agree that procurement priority for eco-labelled products increases their usage, highlighting the role of institutional procurement practices in influencing adoption.

Table 4.19 : Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials

Government-led public awareness campaigns /drives	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	12	3.0
Neutral	54	13.5
Agree	136	34.0
Strongly Agree	178	44.5
Total	400	100.0

Chart 4.15 : Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials

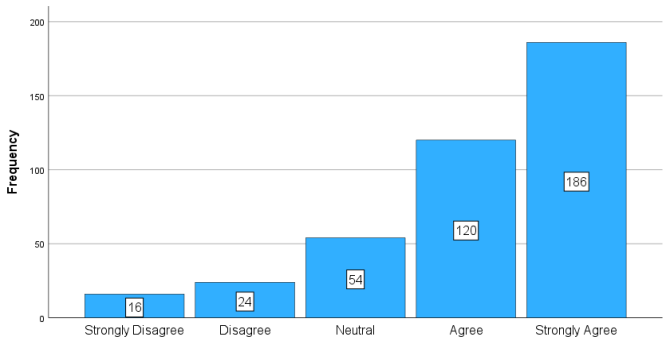


Inference : Table 4.19 and Chart 4.15 show that a dominant share of respondents strongly agree that government-led awareness campaigns promote the benefits of eco-labelled materials, indicating the effectiveness of public outreach initiatives.

Table 4.20 : Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products

Government-backed eco-label certifications	Frequency	Percent
Strongly Disagree	16	4.0
Disagree	24	6.0
Neutral	54	13.5
Agree	120	30.0
Strongly Agree	186	46.5
Total	400	100.0

Chart 4.16 : Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products



Inference : Table 4.20 and Chart 4.16 show that a majority of respondents strongly agree that government-backed certifications enhance the credibility and adoption of eco-labelled products, reinforcing the importance of institutional trust mechanisms.

Weighted average mean for Government Regulatory Policies and Incentives

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

WAM = Weighted Average Mean

Table 4.21 : Weighted Average Mean Government Regulatory Policies and Incentives

Sr. No.	Factors influential	SD	D	N	A	SA	WAM
1	Presence or absence of government policies influences my decision to specify or use eco-labelled products.	34	25	44	75	222	4.07
		8.5	6.3	11	18.8	55.5	
2	Supportive policies or incentives can increase the adoption of eco-labelled products.	28	24	60	100	188	3.99
		7	6	15	25	47	
3	Current Government policies are effective in promoting the adoption of eco-labelled products.	20	37	69	153	121	3.80
		5	9.3	17.3	38.3	30.3	
4	Presence or absence of price and tax subsidies influences my	20	31	64	113	172	3.97

	decision to specify or use eco-friendly building materials.						
		5	7.8	16	28.2	43	
5	Mandatory usage of Ecolabelled products in projects promotes their adoption.	24	31	62	143	140	3.86
		6	7.8	15.5	35.8	35	
6	Priority in procurement for Ecolabelled products helps increase their usage.	28	19	52	135	166	3.98
		7	4.8	13	33.8	41.5	
7	Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.	20	12	54	136	178	4.1
		5	3	13.5	34	44.5	
8	Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.	16	24	54	120	186	4.09
		4	6	13.5	30	46.5	

Inference : The findings indicate that the highest weighted average mean scores are observed for government-led awareness campaigns (4.10), government-backed certifications (4.09), and the influence of policies (4.07). This suggests that institutional mechanisms and policy interventions play a pivotal role in promoting awareness, building credibility, and influencing the adoption of eco-labelled products.

From the above weighted average mean, Government Regulatory Policies and Incentives can be summarised as Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials, Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products

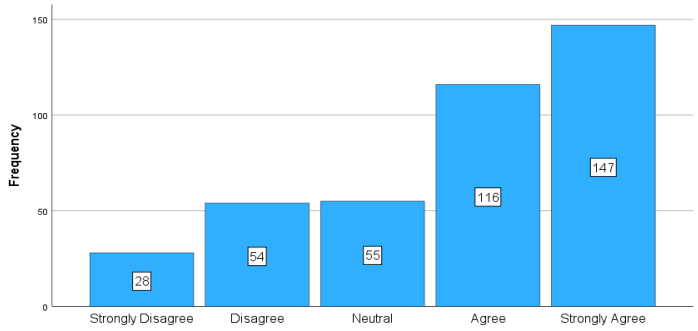
and Presence, or absence of government policies influences my decision to specify or use eco-labelled products.

4.1.3 Marketing Strategies

Table 4.22 : I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials

I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials	Frequency	Percent
Strongly Disagree	28	7.0
Disagree	54	13.5
Neutral	55	13.8
Agree	116	29.0
Strongly Agree	147	36.8
Total	400	100.0

Chart 4.17 : I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials



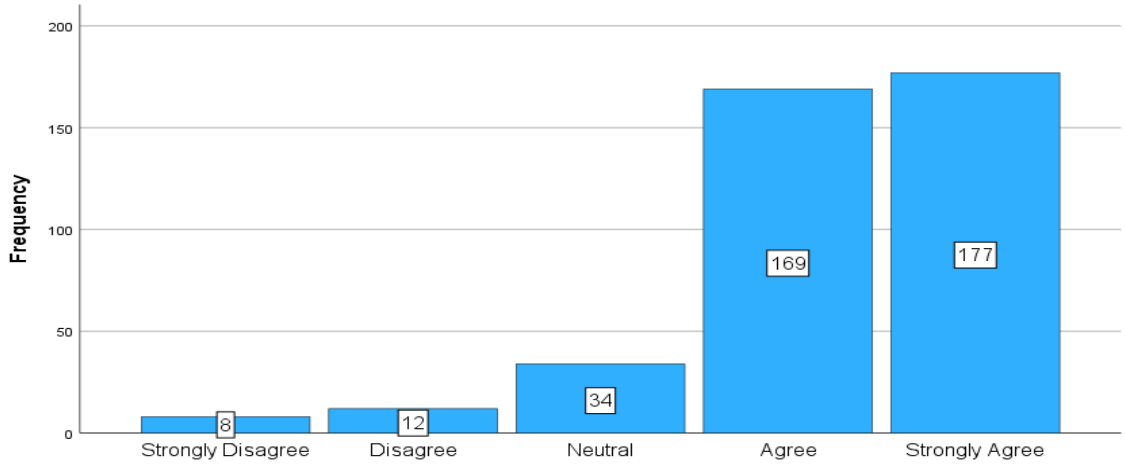
Inference : Table 4.22 and Chart 4.17 show that a significant proportion of respondents (37%) strongly agree that marketing campaigns influence their decision to specify or use eco-labelled materials, while comparatively fewer respondents express

disagreement. This indicates that promotional and outreach efforts play an important role in shaping adoption decisions.

Table 4.23 : I consider testimonials or reviews before specifying or using any eco-labelled products

I consider testimonials or reviews before specifying or using any eco-labelled products	Frequency	Percent
Strongly Disagree	8	2.0
Disagree	12	3.0
Neutral	34	8.5
Agree	169	42.3
Strongly Agree	177	44.3
Total	400	100.0

Chart 4.18 : I consider testimonials or reviews before specifying or using any eco-labelled products

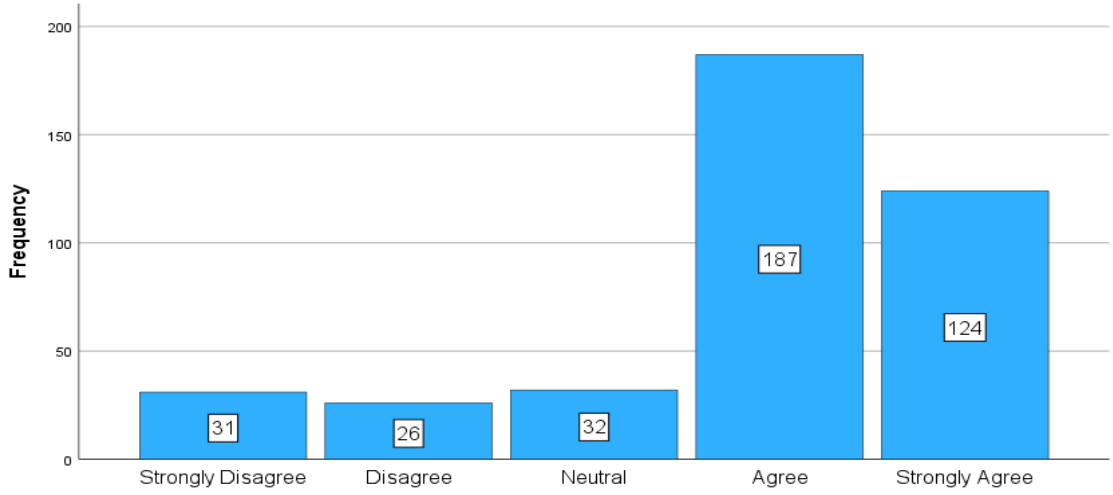


Inference : Table 4.23 and Chart 4.18 show that a dominant 44% of respondents strongly agree that testimonials or reviews influence their decision to specify eco-labelled products. This reflects a strong reliance on peer validation and experiential feedback in professional decision-making.

Table 4.24 : I have specified or used/purchased eco-labelled products because of marketing campaigns

I have specified or used/purchased eco-labelled products because of marketing campaigns	Frequency	Percent
Strongly Disagree	31	7.8
Disagree	26	6.5
Neutral	32	8.0
Agree	187	46.8
Strongly Agree	124	31.0
Total	400	100.0

Chart 4.19 : I have specified or used/purchased eco-labelled products because of marketing campaigns

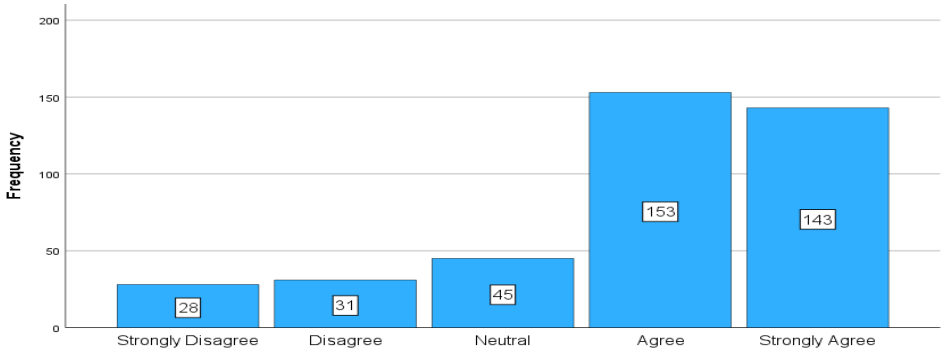


Inference : Table 4.24 and Chart 4.19 show that the largest proportion of respondents (47%) agree that marketing campaigns have influenced their decision to specify or use eco-labelled products. This suggests that marketing efforts have a tangible, though moderate, impact on adoption behaviour.

Table 4.25 : I am confident about the claims made by manufacturers regarding eco-labelled products

I am confident about the claims made by manufacturers regarding eco-labelled products	Frequency	Percent
Strongly Disagree	28	7.0
Disagree	31	7.8
Neutral	45	11.3
Agree	153	38.3
Strongly Agree	143	35.8
Total	400	100.0

Chart 4.20 : I am confident about the claims made by manufacturers regarding eco-labelled products



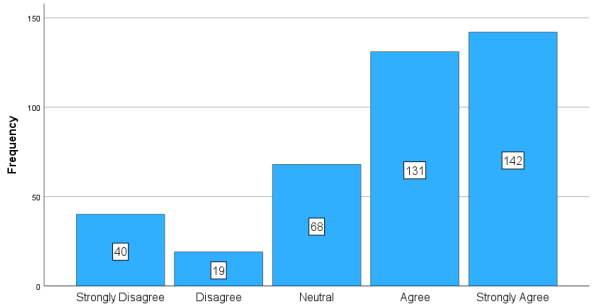
Inference : Table 4.25 and Chart 4.20 show that a majority of respondents (38%) agree that they are confident about the claims made by manufacturers regarding eco-labelled products. This indicates a reasonable level of trust, although there remains scope for strengthening credibility.

Table 4.26 : I feel product manufacturers effectively communicate the benefits of eco-labelled products

I feel product manufacturers effectively communicate the benefits of eco-labelled products	Frequency	Percent
Strongly Disagree	40	10.0

Disagree	19	4.8
Neutral	68	17.0
Agree	131	32.8
Strongly Agree	142	35.5
Total	400	100.0

Chart 4.21 : I feel product manufacturers effectively communicate the benefits of eco-labelled products



Inference : Table 4.26 and Chart 4.21 show that a significant proportion of respondents (35.5%) strongly agree that manufacturers effectively communicate the benefits of eco-labelled products. This highlights a generally positive perception of communication efforts by manufacturers.

Weighted average mean for Marketing Strategies

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

WAM = Weighted Average Mean

Table – 4.27 Weighted Average Mean for Marketing Strategies

Sr. No.	Factors influential	SD	D	N	A	SA	WAM
1	I consider marketing campaigns (advertisements, promotional	28	54	55	116	147	

	offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials.						3.75
		7	13.5	13.8	29	36.8	
2	I consider testimonials or reviews before specifying or using any eco-labelled products.	8	12	34	169	177	4.24
		2	3	8.5	42.3	44.3	
3	I have specified or used/purchased eco-labelled products because of marketing campaigns.	31	26	32	187	124	3.87
		7.8	6.5	8	46.8	31	
4	I am confident about the claims made by manufacturers regarding eco-labelled products.	28	31	45	153	143	3.88
		7	7.8	11.3	38.3	35.8	
5	I feel product manufacturers effectively communicate the benefits of eco-labelled products.	40	19	68	131	142	3.79
		10	4.8	17	32.8	35.5	

Inference :

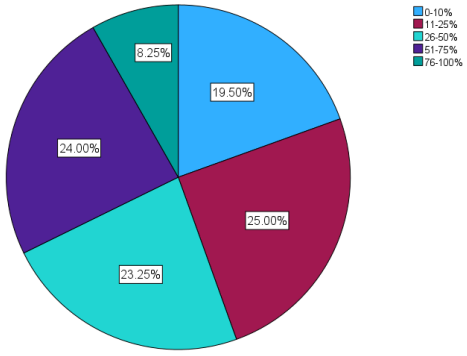
The findings indicate that the highest weighted average mean scores are observed for reliance on testimonials (4.24), confidence in manufacturer claims (3.88), and influence of marketing campaigns (3.87). This suggests that credibility, communication, and peer validation collectively shape adoption behaviour.

From the above weighted average mean, Marketing Strategies can be summarised as I consider testimonials or reviews before specifying or using any eco-labelled products, I am confident about the claims made by manufacturers regarding eco-labelled products. and I have specified or used/purchased eco-labelled products because of marketing campaigns.

Table 4.28 : Percentage of total projects specified or used eco-labelled products

Percentage of total projects specified or used eco-labelled products	Frequency	Percent
0-10%	78	19.5
11-25%	100	25.0
26-50%	93	23.3
51-75%	96	24.0
76-100%	33	8.3
Total	400	100.0

Chart 4.22 : Classification of Percentage of total projects specified or used eco-labelled products



Inference : Table 4.28 and Chart 4.22 show that the largest proportion of respondents (25%) report using eco-labelled products in 11–25% of their projects, while smaller proportions fall in higher usage brackets. This indicates that while adoption exists, it is currently moderate in scale across projects.

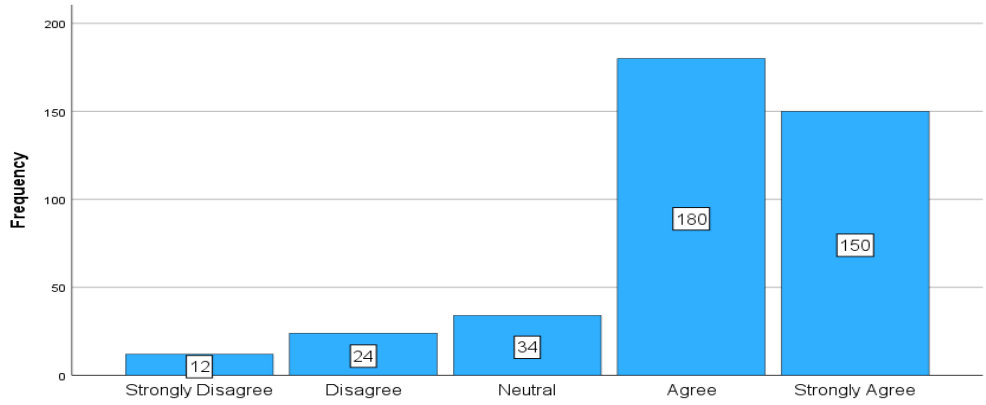
4.1.4 Adoption of Eco-labelled Building Materials

Table 4.29 : Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products

Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products	Frequency	Percent
Strongly Disagree	12	3.0
Disagree	24	6.0

Neutral	34	8.5
Agree	180	45.0
Strongly Agree	150	37.5
Total	400	100.0

Chart 4.23 : Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products

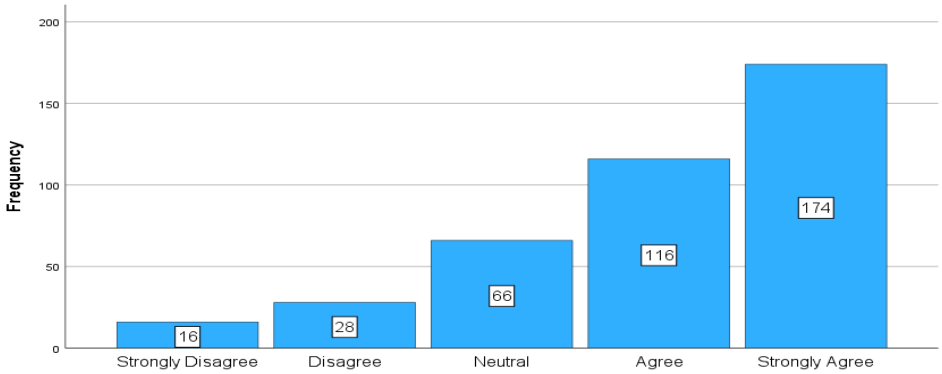


Inference : Table 4.29 and Chart 4.23 show that a majority of respondents (45%) agree that specialised training programs improve the rate of adoption of eco-labelled products. This reinforces the importance of skill development and targeted capacity-building initiatives.

Table 4.30 : Public outreach through marketing campaigns influences the adoption of eco-labelled materials

Public outreach through marketing campaigns influences the adoption of eco-labelled materials	**Frequency**	**Percent**
Strongly Disagree	16	4.0
Disagree	28	7.0
Neutral	66	16.5
Agree	116	29.0
Strongly Agree	174	43.5
Total	400	100.0

Chart 4.24 : Public outreach through marketing campaigns influences the adoption of eco-labelled materials

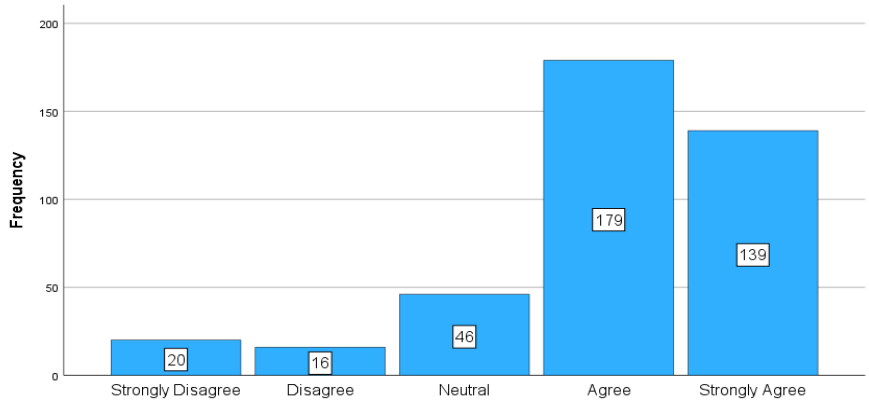


Inference : Table 4.30 and Chart 4.24 show that a dominant 43.5% strongly agree that public outreach through marketing campaigns influences adoption. This highlights the effectiveness of broader awareness initiatives in driving acceptance.

Table 4.31 : Effective demand-supply management enhances the availability and usage of eco-labelled products

Effective demand-supply management enhances the availability and usage of eco-labelled products	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	16	4.0
Neutral	46	11.5
Agree	179	44.8
Strongly Agree	139	34.8
Total	400	100.0

Chart 4.25 : Effective demand-supply management enhances the availability and usage of eco-labelled products

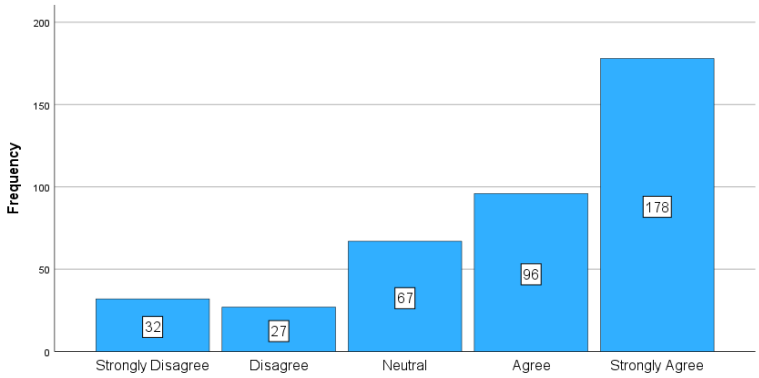


Inference : Table 4.31 and Chart 4.25 show that a majority of respondents (45%) agree that effective demand-supply management enhances availability and usage of eco-labelled products. This underscores the operational importance of supply chain efficiency.

Table 4.32 : Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials

Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials	**Frequency**	**Percent**
Strongly Disagree	32	8.0
Disagree	27	6.8
Neutral	67	16.8
Agree	96	24.0
Strongly Agree	178	44.5
Total	400	100.0

Chart 4.26 : Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials

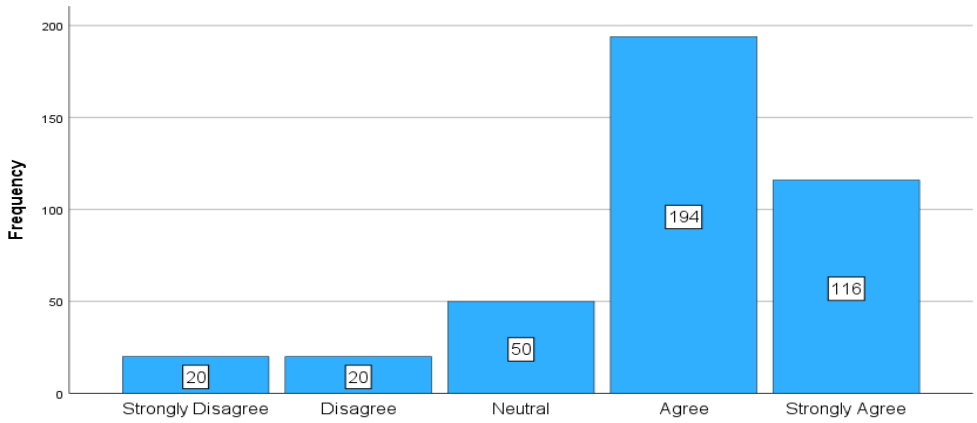


Inference : Table 4.32 and Chart 4.26 show that a dominant 44.5% strongly agree that celebrity testimonials increase awareness and purchasing frequency. This suggests that influencer-led communication can significantly impact adoption.

Table 4.33 : Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials

Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	20	5.0
Neutral	50	12.5
Agree	194	48.5
Strongly Agree	116	29.0
Total	400	100.0

Chart 4.27 : Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials

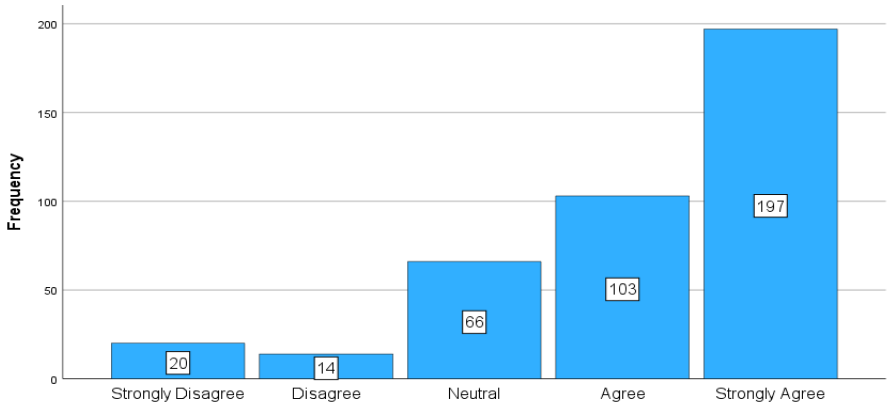


Inference : Table 4.33 and Chart 4.27 show that a majority of respondents (48.5%) agree that communication of product benefits by manufacturers enhances adoption. This highlights the importance of clear and effective communication strategies.

Table 4.34 : Technological innovations in eco-labelled products reveal substantial cost savings

Technological innovations in eco-labelled products reveal substantial cost savings	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	14	3.5
Neutral	66	16.5
Agree	103	25.8
Strongly Agree	197	49.3
Total	400	100.0

Chart 4.28 : Technological innovations in eco-labelled products reveal substantial cost savings

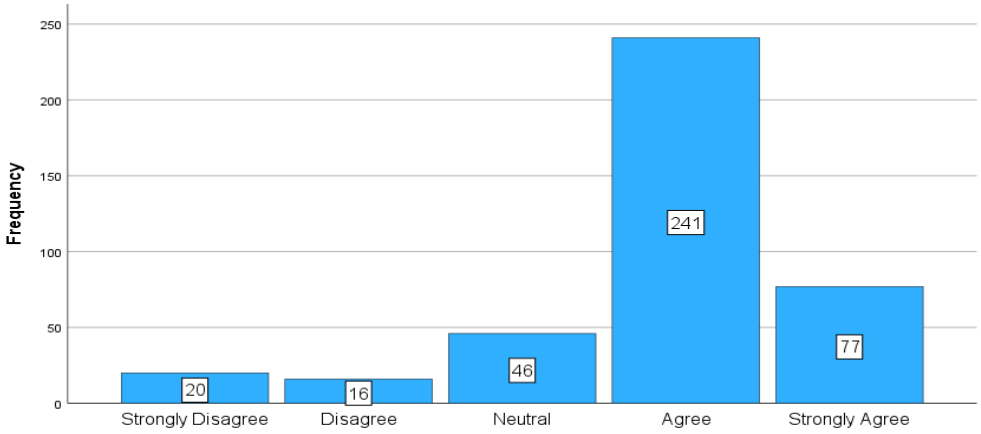


Inference : Table 4.34 and Chart 4.28 show that a dominant 49% strongly agree that technological innovations in eco-labelled products result in substantial cost savings. This indicates strong confidence in innovation-driven value.

Table 4.35 : Highlighting the environmental benefits makes eco-labelled products more attractive

Highlighting the environmental benefits makes eco-labelled products more attractive	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	16	4.0
Neutral	46	11.5
Agree	241	60.3
Strongly Agree	77	19.3
Total	400	100.0

Chart 4.29 : Highlighting the environmental benefits makes eco-labelled products more attractive

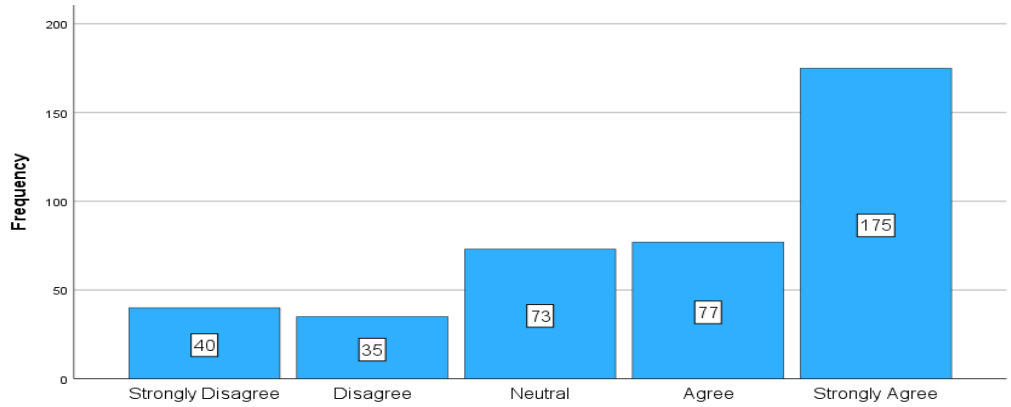


Inference : Table 4.35 and Chart 4.29 show that a majority of respondents (60%) agree that highlighting environmental benefits makes eco-labelled products more attractive. This reflects the importance of sustainability messaging in influencing perception.

Table 4.36: Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products

Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products	**Frequency**	**Percent**
Strongly Disagree	40	10.0
Disagree	35	8.8
Neutral	73	18.3
Agree	77	19.3
Strongly Agree	175	43.8
Total	400	100.0

Chart 4.30 : Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products

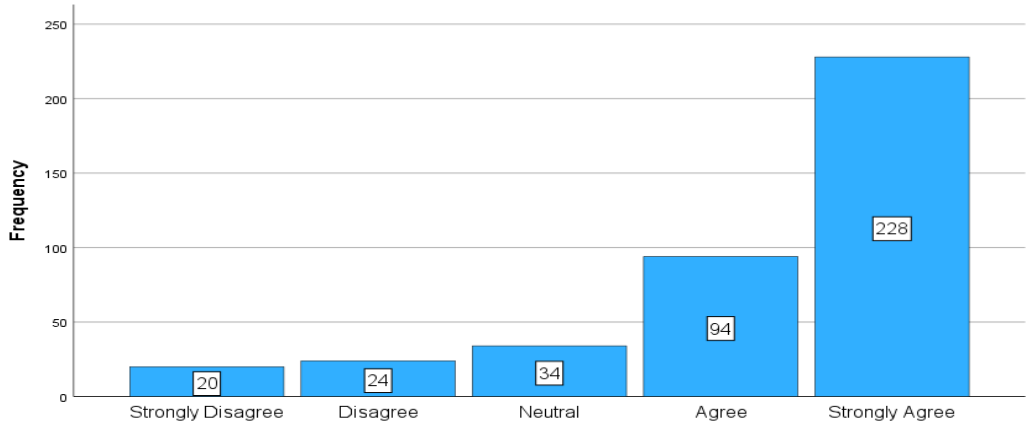


Inference : Table 4.36 and Chart 4.30 show that a significant proportion (44%) strongly agree that rating manufacturers based on their promotional efforts increases adoption. This suggests that transparency and benchmarking can influence decision-making.

Table 4.37 : Favourable government policy promoting eco-labelled products enhances their adoption

Favourable government policy promoting eco-labelled products enhances their adoption	**Frequency**	**Percent**
Strongly Disagree	20	5.0
Disagree	24	6.0
Neutral	34	8.5
Agree	94	23.5
Strongly Agree	228	57.0
Total	400	100.0

Chart 4.31 : Favourable government policy promoting eco-labelled products enhances their adoption

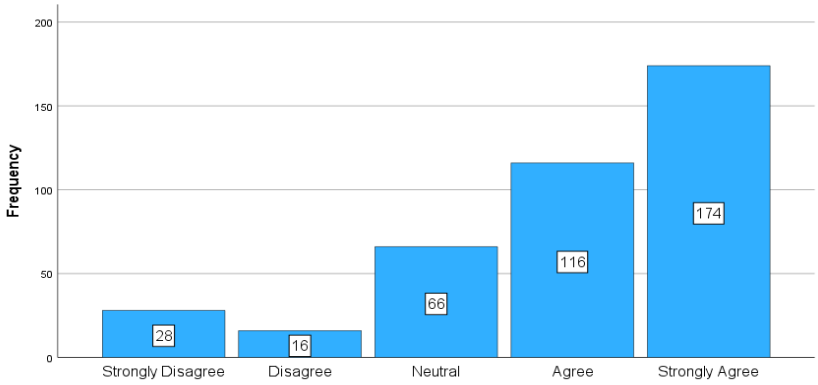


Inference : Table 4.37 and Chart 4.31 show that a dominant 57% strongly agree that favourable government policies enhance the adoption of eco-labelled products. This reinforces the strong influence of policy support.

Table 4.38 : Mechanisms to address specification and application issues increase the adoption of eco-labelled products

Mechanisms to address specification and application issues increase the adoption of eco-labelled products	**Frequency**	**Percent**
Strongly Disagree	28	7.0
Disagree	16	4.0
Neutral	66	16.5
Agree	116	29.0
Strongly Agree	174	43.5
Total	400	100.0

Chart 4.32 : Mechanisms to address specification and application issues increase the adoption of eco-labelled products

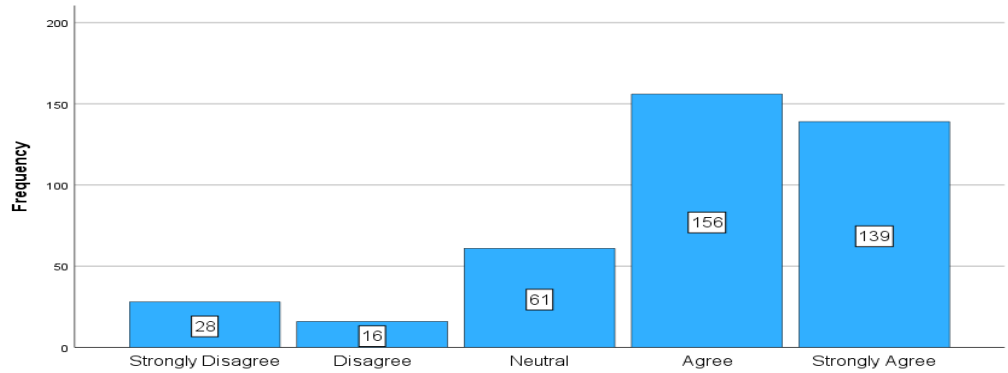


Inference : Table 4.38 and Chart 4.32 show that a majority of respondents agree that mechanisms addressing specification and application issues increase adoption. This highlights the importance of technical support systems.

Table 4.39 : Special incentives for manufacturers can help reduce costs, enhancing the adoption

Special incentives for manufacturers can help reduce costs, enhancing the adoption	**Frequency**	**Percent**
Strongly Disagree	28	7.0
Disagree	16	4.0
Neutral	61	15.3
Agree	156	39.0
Strongly Agree	139	34.8
Total	400	100.0

Chart 4.33 : Special incentives for manufacturers can help reduce costs, enhancing the adoption

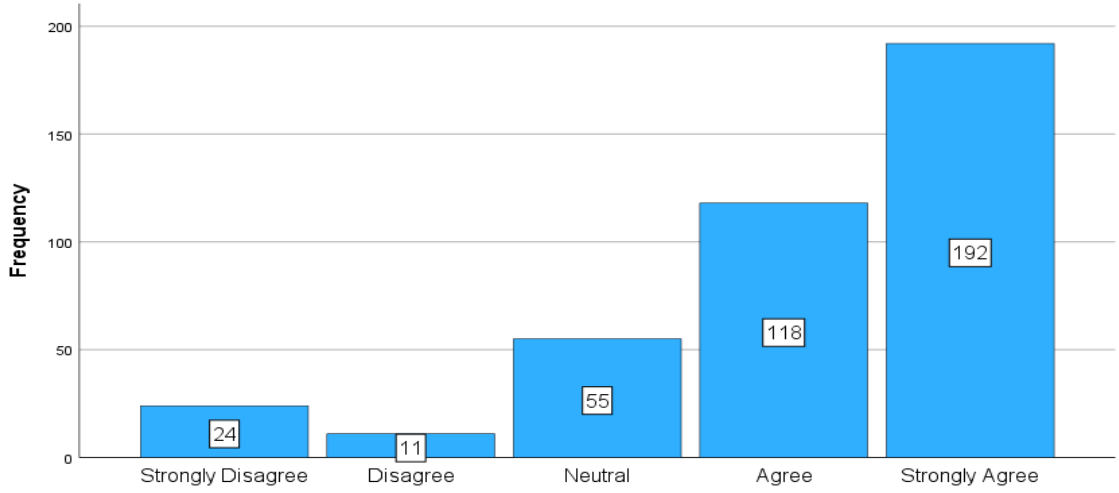


Inference : Table 4.39 and Chart 4.33 show that a majority of respondents agree that incentives for manufacturers help reduce costs and enhance adoption. This indicates the role of upstream support in driving market penetration.

Table 4.40 : Eco-labelled certifications for products enhance their credibility and encourage the adoption

Eco-labelled certifications for products enhance their credibility and encourage the adoption	**Frequency**	**Percent**
Strongly Disagree	24	6.0
Disagree	11	2.8
Neutral	55	13.8
Agree	118	29.5
Strongly Agree	192	48.0
Total	400	100.0

Chart 4.34 : Eco-labelled certifications for products enhance their credibility and encourage the adoption



Inference : Table 4.40 and Chart 4.34 show that a dominant 48% strongly agree that eco-labelled certifications enhance product credibility and encourage adoption. This underscores the importance of certification mechanisms in building trust.

Weighted average mean for Adoption of Eco-labelled Building Materials

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

WAM = Weighted Average Mean

Table – 4.41 Weighted average mean for Adoption of Eco-labelled Building Materials

Sr. No.	Factors influential	SD	D	N	A	SA	WAM
1	Specialised training programs for specifiers, buyers and users	12	24	34	180	150	

	improves the rate of adoption of eco-labelled products.						4.08
		3	6	8.5	45	37.5	
2	Public outreach through marketing campaigns influences the adoption of eco-labelled materials.	16	28	66	116	174	4.01
		4	7	16.5	29	43.5	
3	Effective demand-supply management enhances the availability and usage of eco-labelled products.	20	16	46	179	139	4.00
		5	4	11.5	44.8	34.8	
4	Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.	32	27	67	96	178	3.90
		8	6.8	16.8	24	44.5	
5	Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.	20	20	50	194	116	3.92
		5	5	12.5	48.5	29	
6	Technological innovations in eco-labelled products reveal substantial cost savings.	20	14	66	103	197	4.11
		5	3.5	16.5	25.8	49.3	
7	Highlighting the environmental benefits makes eco-labelled products more attractive.	20	16	46	241	77	3.85
		5	4	11.5	60.3	19.3	
8	Rating of product manufacturers based on their promotion efforts	40	35	73	77	175	3.78

	increases the adoption of eco-labelled products.						
		10	8.8	18.3	19.3	43.8	
9	Favourable government policy promoting eco-labelled products enhances their adoption.	20	24	34	94	228	4.22
		5	6	8.5	23.5	57	
10	Mechanisms to address specification and application issues increase the adoption of eco-labelled products.	28	16	66	116	174	3.98
		7	4	16.5	29	43.5	
11	Special incentives for manufacturers can help reduce costs, enhancing the adoption.	28	16	61	156	139	3.91
		7	4	15.3	39	34.8	
12	Eco-labelled certifications for products enhance their credibility and encourage the adoption.	24	11	55	118	192	4.11
		6	2.8	13.8	29.5	48	

Inference : The highest weighted average mean have been observed for Favourable government policy promoting eco-labelled products enhances their adoption as 4.22, Technological innovations in eco-labelled products reveal substantial cost savings as 4.11, Eco-labelled certifications for products enhance their credibility and encourage the adoption as 4.11 and Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products as 4.08. This highlights a combination of policy, innovation, and capability-building as key drivers of adoption

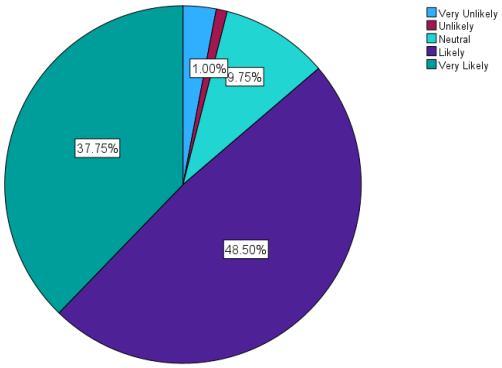
From the above weighted average mean, Continuance usage can be summarised as Favourable government policy promoting eco-labelled products enhances their adoption, Technological innovations in eco-labelled products reveal substantial cost savings, Eco-labelled certifications for products enhance their credibility and encourage

the adoption and Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.

Table 4.42 : Likely to adopt more eco-labelled products in the future

Likely to adopt more eco-labelled products in the future	Frequency	Percent
Very Unlikely	12	3.0
Unlikely	4	1.0
Neutral	39	9.8
Likely	194	48.5
Very Likely	151	37.8
Total	400	100.0

Chart 4.35 : Likely to adopt more eco-labelled products in the future



Inference : Table 4.42 and Chart 4.35 show that a majority of respondents (48.5%) are likely to adopt more eco-labelled products in the future, with a substantial proportion also indicating strong likelihood. This reflects a positive future outlook towards increased adoption.

Conclusion

The Descriptive analysis revealed that most of respondents were highly experienced individuals with more than 15 years of experience and almost 70% were using Ecolabelled products. It was also found that Awareness levels were strong and the respondents perceived that the Ecolabelled products gave them an edge over the competition. High initial costs perception was a dominant barrier and influenced the decision. Professional expertise, Training and collaboration came out as significant

enabler in adoption of Ecolabelled products. Government policies, Incentives and marketing campaigns were observed to influence significantly the adoption, especially the testimonials from users were found to build confidence and thereby enhance adoption.

4.2 Reliability Analysis

The reliability analysis is an effective instrument for testing the internal consistency among the research variables included in the research process. It places more significance in maintaining and developing an upper limit on its validity. A measurement that lacks reliability will also lack validity. If the scale of reliability is close to 1, then it can be concluded that the variables are having high internal consistency and hence they are suitable for conducting factor analysis.

Table 4.43 - Summary of Reliability Statistics for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products.

Variables	Cronbach's Alpha (α)
Awareness of Eco-labelled Products	0.810
Cost Benefits of Eco-labelled Products	0.808
Availability of Eco-labelled Products	0.808
Professional Experience and Expertise	0.815
Government Regulatory Policies and Incentives	0.821
Marketing Strategies	0.824
Adoption of Eco-labelled Building Materials	0.820

4.2.1 Conclusion

Based on the summary of reliability, it can be inferred that the value of Cronbach's Alpha (α) found to be more than 0.8 which shows the internal consistency for all the variables included in the research consisting of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies and Adoption of Eco-labelled Building Materials."

4.2.2 Summary of Findings

Based on the summary of reliability, it can be inferred that the value of Cronbach's Alpha (α) found to be more than 0.8 which shows the internal consistency for all the variables included in the research consisting of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies and Adoption of Eco-labelled Building Materials.

4.3 Factor Analysis

Factor analysis was used to simplify the data, identify the key dimensions, classify them it into simple yet meaningful categories and thus highlight which of these factors are important in shaping perception and thereby the adoption.

4.3.1 Factor Analysis to determine Cost Benefits of Eco-labelled Products

Factor Analysis has been used to classify the components determine Cost Benefits of Eco-labelled Products. Factor analysis was employed to summarize the components that determine Cost Benefits of Eco-labelled Products.

KMO and Bartlett's Test of hypothesis determine Cost Benefits of Eco-labelled Products

KMO and Bartlett's Test of hypothesis is an inbuilt statistical measure in Factor analysis. The value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be always more than 0.5 and the significance level should be less than 5%.

Table 4.44 : KMO and Bartlett's Test of hypothesis (for factor analysis)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.774
Bartlett's Test of Sphericity – Value of Chi-Square	552.567
Df	10
Sig	<.001

Source: Compiled from the questionnaire

(df – degrees of freedom Sig: Significance Level)

Inference: It can be seen from the table 4.44 that the significance (0.00) is less than the assumed value (0.05). The value of KMO measure has been observed as 0.774 which was more than 0.5. Based on this KMO measure, it can be revealed that the factor analysis for data summarisation is effective for identifying the components determine Cost Benefits of Eco-labelled Products. This confirms that the dataset is suitable for factor analysis, enabling reliable identification of components related to cost benefits

Table 4.45 : Communalities determine Cost Benefits of Eco-labelled Products

Item Description	Initial	Extraction
Eco-labelled products have high initial costs.	1.000	0.824
Higher initial cost is a significant barrier to adoption of eco-labelled products.	1.000	0.844
Operational cost savings of eco-labelled products outweigh the initial costs.	1.000	0.588
Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.	1.000	0.714
Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.	1.000	0.705

Source: Compiled by the questionnaire

Communality is the amount of variance a variable share with all the other variables being considered. This is the proportion of variance explained by the common factors

Table 4.46 : Eigen Values explaining the Percentage of Variance determine Cost Benefits of Eco-labelled Products

Item Description	Eigenvalues	% of Variance
Eco-labelled products have high initial costs.	2.05	41.004
Higher initial cost is a significant barrier to adoption of eco-labelled products.	1.636	32.715
Operational cost savings of eco-labelled products outweigh the initial costs.	0.599	11.984
Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.	0.423	8.453

Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.	0.292	5.844

Source: Compiled by the questionnaire

Eigenvalues represents the total variance explained by each factor.

Table 4.47 : Rotated Component Matrix (for deciding the number of factors) determine Cost Benefits of Eco-labelled Products

Item Description	Components	
	1	2
Eco-labelled products have high initial costs.	0.808	
Higher initial cost is a significant barrier to adoption of eco-labelled products.	0.817	
Operational cost savings of eco-labelled products outweigh the initial costs.		0.749
Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.		0.845
Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.		0.825

Source: Compiled by the questionnaire

Inference :

From the Table 4.47 of Rotated Component Matrix determine Cost Benefits of Eco-labelled Products, it can be seen that the two factors can be classified as follows:

Factor 1 :

- Higher initial cost is a significant barrier to adoption of eco-labelled products.
- Eco-labelled products have high initial costs..

Factor 2

- Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.
- Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.
- Operational cost savings of eco-labelled products outweigh the initial costs..

The factors are renamed determine Cost Benefits of Eco-labelled Products as follows:

Factor 1 – Initial Cost Factors

Factor 2 – Savings Factors

From the Factor analysis it states that Initial Cost Factors and Savings Factors are highly significant in contributing to determine Cost Benefits of Eco-labelled Products.

From the Factor analysis it states that Initial Cost Factors and Savings Factors are highly significant in contributing to determine Cost Benefits of Eco-labelled Products.

4.3.2 Factor Analysis to determine Professional Experience and Expertise

Factor Analysis has been used to classify the components determine Professional Experience and Expertise. Factor analysis was employed to summarize the components that determine Professional Experience and Expertise.

KMO and Bartlett's Test of hypothesis determine Professional Experience and Expertise

KMO and Bartlett's Test of hypothesis is an inbuilt statistical measure in Factor analysis. The value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be always more than 0.5 and the significance level should be less than 5%.

Table 4.48 : KMO and Bartlett's Test of hypothesis (for factor analysis)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.619
Bartlett's Test of Sphericity – Value of Chi-Square	633.245
Df	10
Sig	<.001

Source: Compiled from the questionnaire

(df – degrees of freedom Sig: Significance Level)

Inference: It can be seen from the table 4.48 that the significance (0.00) is less than the assumed value (0.05). The value of KMO measure has been observed as 0.619 which was more than 0.5. Based on this KMO measure, it can be revealed that the factor analysis for data summarisation is effective for identifying the components determine

Professional Experience and Expertise.

Table 4.49 : Communalities determine Professional Experience and Expertise

Item Description	Initial	Extraction
My professional background helps me make informed decisions about specifying or using eco-labelled products.	1.000	0.555
I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.	1.000	0.503
Trainings or workshops on eco-labelled products helps me specify or use them more effectively.	1.000	0.523
I actively re-evaluate new options when specifying or using new categories of eco-labelled products.	1.000	0.642
My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.	1.000	0.638

Source: Compiled by the questionnaire

Communality is the amount of variance a variable share with all the other variables being considered. This is the proportion of variance explained by the common factors

Table 4.50 : Eigen Values explaining the Percentage of Variance determine Professional Experience and Expertise

Item Description	Eigenvalues	% of Variance
My professional background helps me make informed decisions about specifying or using eco-labelled products.	2.503	50.058
I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.	0.983	19.656
Trainings or workshops on eco-labelled products helps me specify or use them more effectively.	0.742	14.844

I actively re-evaluate new options when specifying or using new categories of eco-labelled products.	0.581	11.625
My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.	0.191	3.816

Source: Compiled by the questionnaire

Eigenvalues represents the total variance explained by each factor.

Table 4.51 : Rotated Component Matrix (for deciding the number of factors) determine Professional Experience and Expertise

Item Description	Components	
	1	2
My professional background helps me make informed decisions about specifying or using eco-labelled products.	0.759	
I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.	0.721	
Trainings or workshops on eco-labelled products helps me specify or use them more effectively.	0.755	
I actively re-evaluate new options when specifying or using new categories of eco-labelled products.		0.819
My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.		0.832

Source: Compiled by the questionnaire

Inference : From the Table 4.51 of Rotated Component Matrix determine Professional Experience and Expertise, it can be seen that the two factors can be classified as follows:

Factor 1 :

- My professional background helps me make informed decisions about specifying or using eco-labelled products.
- Trainings or workshops on eco-labelled products helps me specify or use them more effectively.
- I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.

Factor 2

- My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.
- I actively re-evaluate new options when specifying or using new categories of eco-labelled products.

The factors are renamed determine Professional Experience and Expertise as follows:

Factor 1 – Usage Factors

Factor 2 – Stakeholders Factors

From the Factor analysis it states that Usage Factors and Stakeholders Factors are highly significant in contributing to determine Professional Experience and Expertise.

4.3.3 Factor Analysis to determine Government Regulatory Policies and Incentives

Factor Analysis has been used to classify the components determine Government Regulatory Policies and Incentives. Factor analysis was employed to summarize the components that determine Government Regulatory Policies and Incentives.

Factor Analysis has been used to classify the components determine Government Regulatory Policies and Incentives. Factor analysis was employed to summarize the components that determine Government Regulatory Policies and Incentives.

KMO and Bartlett's Test of hypothesis determine Government Regulatory Policies and Incentives

KMO and Bartlett's Test of hypothesis is an inbuilt statistical measure in Factor analysis. The value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be always more than 0.5 and the significance level should be less than 5%.

Table 4.52 : KMO and Bartlett's Test of hypothesis (for factor analysis)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.651
Bartlett's Test of Sphericity – Value of Chi-Square	637.282
Df	28
Sig	<.001

Source: Compiled from the questionnaire

(df – degrees of freedom Sig: Significance Level)

Inference: It can be seen from the table 4.52 that the significance (0.00) is less than the assumed value (0.05). The value of KMO measure has been observed as 0.651 which was more than 0.5. Based on this KMO measure, it can be revealed that the factor analysis for data summarisation is effective for identifying the components determine Government Regulatory Policies and Incentives. The results confirm the suitability of the data for factor analysis in identifying components related to government policies and incentives

Table 4.53 : Communalities determine Government Regulatory Policies and Incentives

Item Description	Initial	Extraction
Presence or absence of government policies influences my decision to specify or use eco-labelled products.	1.000	0.555
Supportive policies or incentives can increase the adoption of eco-labelled products.	1.000	0.503
Current Government policies are effective in promoting the adoption of eco-labelled products.	1.000	0.523
Presence or absence of price and tax subsidies	1.000	0.642

influences my decision to specify or use eco-friendly building materials.		
Mandatory usage of Ecolabelled products in projects promotes their adoption.	1.000	0.638
Priority in procurement for Ecolabelled products helps increase their usage.	1.000	0.631
Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.	1.000	0.653
Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.	1.000	0.507

Source: Compiled by the questionnaire

Communality is the amount of variance a variable share with all the other variables being considered. This is the proportion of variance explained by the common factors.

Table 4.54 : Eigen Values explaining the Percentage of Variance determine Government Regulatory Policies and Incentives

Item Description	Eigenvalues	% of Variance
Presence or absence of government policies influences my decision to specify or use eco-labelled products.	2.597	32.467
Supportive policies or incentives can increase the adoption of eco-labelled products.	1.297	16.208
Current Government policies are effective in promoting the adoption of eco-labelled products.	1.148	14.354
Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials.	0.937	11.715
Mandatory usage of Ecolabelled products in projects promotes their adoption.	0.646	8.069

Priority in procurement for Ecolabelled products helps increase their usage.	0.606	7.573
Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.	0.469	5.857
Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.	0.301	3.757

Source: Compiled by the questionnaire

Eigenvalues represents the total variance explained by each factor.

Table 4.55 : Rotated Component Matrix (for deciding the number of factors) determine Government Regulatory Policies and Incentives

Item Description	Components	
	1	2
Presence or absence of government policies influences my decision to specify or use eco-labelled products.	0.766	
Supportive policies or incentives can increase the adoption of eco-labelled products.	0.751	
Current Government policies are effective in promoting the adoption of eco-labelled products.	0.742	
Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials.	0.794	
Mandatory usage of Ecolabelled products in projects promotes their adoption.		0.736
Priority in procurement for Ecolabelled products helps increase their usage.		0.791
Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.		0.796
Government-backed eco-label certifications		0.785

enhance the credibility and adoption of Ecolabelled products.		

Source: Compiled by the questionnaire

Inference :

From the Table 4.55 of Rotated Component Matrix determine Government Regulatory Policies and Incentives, it can be seen that the two factors can be classified as follows:

Factor 1 :

- Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials.
- Presence or absence of government policies influences my decision to specify or use eco-labelled products.
- Supportive policies or incentives can increase the adoption of eco-labelled products.
- Current Government policies are effective in promoting the adoption of eco-labelled products.

Factor 2

- Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.
- Priority in procurement for Ecolabelled products helps increase their usage.
- Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.
- Mandatory usage of Ecolabelled products in projects promotes their adoption.

The factors are renamed determine Government Regulatory Policies and Incentives as follows:

Factor 1 – Subsidy Factors

Factor 2 – Awareness Factors

From the Factor analysis it states that Subsidy Factors and Awareness Factors are highly significant in contributing to determine Government Regulatory Policies and Incentives.

4.3.4 Factor Analysis to determine Marketing Strategies

Factor Analysis has been used to classify the components determine Marketing Strategies. Factor analysis was employed to summarize the components that determine Marketing Strategies.

KMO and Bartlett's Test of hypothesis determine Marketing Strategies

KMO and Bartlett's Test of hypothesis is an inbuilt statistical measure in Factor analysis. The value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be always more than 0.5 and the significance level should be less than 5%.

Table 4.56 : KMO and Bartlett's Test of hypothesis (for factor analysis)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.73
Bartlett's Test of Sphericity – Value of Chi-Square	463.378
Df	10
Sig	<.001

Source: Compiled from the questionnaire

(df – degrees of freedom Sig: Significance Level)

Inference: It can be seen from the table 4.56 that the significance (0.00) is less than the assumed value (0.05). The value of KMO measure has been observed as 0.730 which was more than 0.5. Based on this KMO measure, it can be revealed that the factor analysis for data summarisation is effective for identifying the components determine Marketing Strategies. The findings validate the adequacy of the dataset for factor analysis in identifying components related to marketing strategies

Table 4.57 : Communalities determine Marketing Strategies

Item Description	Initial	Extraction
I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials.	1.000	0.664
I consider testimonials or reviews before specifying or using any eco-labelled products.	1.000	0.745

I have specified or used/purchased eco-labelled products because of marketing campaigns.	1.000	0.734
I am confident about the claims made by manufacturers regarding eco-labelled products.	1.000	0.634
I feel product manufacturers effectively communicate the benefits of eco-labelled products.	1.000	0.622

Source: Compiled by the questionnaire

Communality is the amount of variance a variable share with all the other variables being considered. This is the proportion of variance explained by the common factors

Table 4.58 : Eigen Values explaining the Percentage of Variance determine Marketing Strategies

Item Description	Eigenvalues	% of Variance
I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials.	2.511	50.216
I consider testimonials or reviews before specifying or using any eco-labelled products.	0.888	17.752
I have specified or used/purchased eco-labelled products because of marketing campaigns.	0.671	13.414
I am confident about the claims made by manufacturers regarding eco-labelled products.	0.559	11.177
I feel product manufacturers effectively communicate the benefits of eco-labelled products.	0.372	7.441

Source: Compiled by the questionnaire

Eigenvalues represents the total variance explained by each factor.

Table 4.59 : Rotated Component Matrix (for deciding the number of factors) determine Marketing Strategies

Item Description	Components	
	1	2
I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials.	0.755	
I consider testimonials or reviews before specifying or using any eco-labelled products.	0.862	
I have specified or used/purchased eco-labelled products because of marketing campaigns.	0.855	
I am confident about the claims made by manufacturers regarding eco-labelled products.		0.734
I feel product manufacturers effectively communicate the benefits of eco-labelled products.		0.764

Source: Compiled by the questionnaire

Inference :

From the Table 4.59 of Rotated Component Matrix determine Marketing Strategies, it can be seen that the two factors can be classified as follows:

Factor 1 :

- I consider testimonials or reviews before specifying or using any eco-labelled products.
- I have specified or used/purchased eco-labelled products because of marketing campaigns.
- I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials..

Factor 2

- I feel product manufacturers effectively communicate the benefits of eco-labelled products.
- I am confident about the claims made by manufacturers regarding eco-labelled products..

The factors are renamed determine Marketing Strategies as follows:

Factor 1 – Testimonials Factors

Factor 2 – Benefits Factors

From the Factor analysis it states that Testimonials Factors and Benefits Factors are highly significant in contributing to determine Marketing Strategies.

4.3.5 Factor Analysis for Adoption of Eco-labelled Building Materials and effectiveness

Factor Analysis has been used to classify the components for Adoption of Eco-labelled Building Materials and effectiveness. Factor analysis was employed to summarize the components that determine components for Adoption of Eco-labelled Building Materials and Effectiveness.

Factor Analysis has been used to classify the components for Adoption of Eco-labelled Building Materials and effectiveness. Factor analysis was employed to summarize the components that determine for Adoption of Eco-labelled Building Materials and effectiveness.

KMO and Bartlett's Test of hypothesis for Adoption of Eco-labelled Building Materials

KMO and Bartlett's Test of hypothesis is an inbuilt statistical measure in Factor analysis. The value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be always more than 0.5 and the significance level should be less than 5%.

Table 4.60 : KMO and Bartlett's Test of hypothesis (for factor analysis)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.849
Bartlett's Test of Sphericity – Value of Chi-Square	2431.716
Df	66

Sig	<.001

Source: Compiled from questionnaire (df – degrees of freedom Sig: Significance level)

Inference: It can be seen from the table 4.60 that the significance (0.01) is less than the assumed value (0.05). The value of KMO measure has been observed as 0.849 which was more than 0.5. Based on this KMO measure, it can be revealed that the factor analysis for data summarisation is effective for Adoption of Eco-labelled Building Materials and effectiveness.

Table 4.61 : Communalities for Adoption of Eco-labelled Building Materials and effectiveness

Item Description	Initial	Extraction
Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.	1.000	0.667
Public outreach through marketing campaigns influences the adoption of eco-labelled materials.	1.000	0.576
Effective demand-supply management enhances the availability and usage of eco-labelled products.	1.000	0.646
Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.	1.000	0.866
Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.	1.000	0.616
Technological innovations in eco-labelled products reveal substantial cost savings.	1.000	0.535
Highlighting the environmental benefits makes eco-labelled products more attractive.	1.000	0.629
Rating of product manufacturers based on their promotion efforts increases the adoption of	1.000	0.515

eco-labelled products.		
Favourable government policy promoting eco-labelled products enhances their adoption.	1.000	0.547
Mechanisms to address specification and application issues increase the adoption of eco-labelled products.	1.000	0.577
Special incentives for manufacturers can help reduce costs, enhancing the adoption.	1.000	0.566
Eco-labelled certifications for products enhance their credibility and encourage the adoption.	1.000	0.625

Source: Compiled by the questionnaire

Communality is the amount of variance a variable share with all the other variables being considered. This is the proportion of variance explained by the common factors

Table 4.62 : Eigen Values explaining the Percentage of Variance for Adoption of Eco-labelled Building Materials and effectiveness

Item Description	Eigenvalues	% of Variance
Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.	5.685	47.372
Public outreach through marketing campaigns influences the adoption of eco-labelled materials.	1.196	9.966
Effective demand-supply management enhances the availability and usage of eco-labelled products.	0.948	7.897
Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.	0.861	7.175
Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.	0.71	5.917

Technological innovations in eco-labelled products reveal substantial cost savings.	0.63	5.252
Highlighting the environmental benefits makes eco-labelled products more attractive.	0.475	3.958
Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products.	0.418	3.486
Favourable government policy promoting eco-labelled products enhances their adoption.	0.371	3.088
Mechanisms to address specification and application issues increase the adoption of eco-labelled products.	0.324	2.7
Special incentives for manufacturers can help reduce costs, enhancing the adoption.	0.227	1.89
Eco-labelled certifications for products enhance their credibility and encourage the adoption.	0.156	1.298

Source: Compiled by the questionnaire

Eigenvalues represents the total variance explained by each factor.

Table 4.63 : Rotated Component Matrix (for deciding the number of factors) for Adoption of Eco-labelled Building Materials and effectiveness

Item Description	Components	
	1	2
Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.	0.812	
Public outreach through marketing campaigns influences the adoption of eco-labelled materials.	0.753	
Effective demand-supply management enhances the availability and usage of eco-labelled products.	0.787	

Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.	0.806	
Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.	0.761	
Technological innovations in eco-labelled products reveal substantial cost savings.	0.791	
Highlighting the environmental benefits makes eco-labelled products more attractive.		0.793
Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products.		0.785
Favourable government policy promoting eco-labelled products enhances their adoption.		0.732
Mechanisms to address specification and application issues increase the adoption of eco-labelled products.		0.749
Special incentives for manufacturers can help reduce costs, enhancing the adoption.		0.753
Eco-labelled certifications for products enhance their credibility and encourage the adoption.		0.774

Source: Compiled by the questionnaire

Inference :

From the Table 4.63 of Rotated Component Matrix for Adoption of Eco-labelled Building Materials and effectiveness, it can be seen that the two factors can be classified as follows:

Factor 1 :

- Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.
- Testimonials from celebrities creates awareness and increases the purchasing

frequency of eco-labelled materials.

- Technological innovations in eco-labelled products reveal substantial cost savings.
- Effective demand-supply management enhances the availability and usage of eco-labelled products.
- Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.
- Public outreach through marketing campaigns influences the adoption of eco-labelled materials.

Factor 2

- Highlighting the environmental benefits makes eco-labelled products more attractive.
- Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products.
- Eco-labelled certifications for products enhance their credibility and encourage the adoption.
- Special incentives for manufacturers can help reduce costs, enhancing the adoption.
- Mechanisms to address specification and application issues increase the adoption of eco-labelled products.
- Favourable government policy promoting eco-labelled products enhances their adoption.

The factors are renamed for Adoption of Eco-labelled Building Materials and effectiveness as follows:

Factor 1 – Training Factors

Factor 2 – Environmental Factors

From the Factor analysis it states that Training Factors and Environmental Factors are highly significant in contributing for Adoption of Eco-labelled Building Materials and effectiveness.

Table 4.64 : Summary Table of Factor Analysis for Cost Benefits, Professional Experience, Government Policies, Marketing Strategies, and Adoption of Eco-labelled Building Materials.

Item Description	Factor 1	Factor 2
Cost Benefits of Eco-labelled Products	Initial Cost Factors	Savings Factors
Professional Experience and Expertise	Usage Factors	Stakeholders Factors
Government Regulatory Policies and Incentives	Subsidy Factors	Awareness Factors
Marketing Strategies	Testimonials Factors	Benefits Factors
Adoption of Eco-labelled Building Materials and effectiveness	Training Factors	Environmental Factors

4.3.6 Multiple Regression Analysis for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

In the present study, Multiple Regression Analysis of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies and has been tested as a tool of validity. Collinearity has been used an inbuilt measure to determine the effect of independent variables called as predictors on dependent variable called as criterion.

Table 4.65 : Standardised and Unstandardised Regression Coefficients

	Unstandardised Coefficients		**Standardised Coefficients**				
Variables	**B**	**Std. Error**		**t**	**Sig.**	**Tolerance**	**VIF**
(Constant)	8.192	2.163	**Beta**	3.788	<.001		

Awarenes s of Eco-labelled Products	1.488	0.145	0.426	10.243	<.001	0.631	1.584
Cost Benefits of Eco-labelled Products	-0.068	0.095	-0.028	-0.722	0.031	0.724	1.382
Availabilit y of Eco-labelled Products	-0.727	0.153	-0.2	-4.741	<.001	0.616	1.624
Profession al Experienc e and Expertise	0.565	0.094	0.254	6.011	<.001	0.612	1.635
Governme nt Regulator y Policies and Incentives	0.525	0.081	0.292	6.473	<.001	0.536	1.866
Marketing Strategies	0.312	0.087	0.157	3.61	<.001	0.577	1.734

Inference:

The significance levels less than 5% of the independent variables [Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies] are influential on Adoption of Eco-labelled Building Materials.

The tolerance more than 5% and Variance Inflation Factor(VIF) less than 10 indicates that the effect of independent variables on dependent variable can be determined effectively. VIF is a measure of multicollinearity in the set of multiple regression variables. When VIF less than 10, It can be further revealed as there is no multicollinearity.

4.4 Structural Equation Modelling (SEM) for Adoption of Eco-labelled Building Materials

Structural Equation Modelling (SEM) is an expansion of the general linear model (GLM) that helps the researcher to test a set of regression equations simultaneously. In SEM, independent variables are called exogenous variables which are assumed to be measured without error and dependent or mediating variables called endogenous variables. *endogenous* or *downstream* variables.

SEM users represent relationships among observed and unobserved variables using path diagrams. Ovals or circles represent latent variables, while rectangles or squares represent measured variables. Residuals are always unobserved, so they are represented by ovals or circles. The single arrow in the diagram indicates path and the double arrow indicates covariances among the variables. The model used in SEM is a recursive model.

In the diagram shown below, correlations and covariances are represented by bidirectional arrows, which represent relationships without a clearly defined causal direction.

The dependent variable for this study is

Adoption of Eco-labelled Building Materials [AD]

The independent variables or exogenous variables for this study are as follows:

IV is a latent variable consists of

Awareness of Eco-labelled Products [AW]

Cost Benefits of Eco-labelled Products [CB]

Availability of Eco-labelled Products [AV]

The moderating variables for this study are as follows:

MV is a moderating variable consists of

Professional Experience and Expertise [PE]

Government Regulatory Policies and Incentives [GR]

Marketing Strategies [MS]

The error variances for this study are as follows:

1. The error variances(e) are necessary for creating the model of the study.
2. The error variance of Adoption of Eco-labelled Building Materials [AD] is e1.
3. The error variance of latent variable [IV] is e2.
4. The error variances of Awareness of Eco-labelled Products [AW], Cost Benefits of Eco-labelled Products [CB] and Availability of Eco-labelled Products [AV] are from e4 to e6.
5. The error variance of moderating variable [MV] is e3
6. The error variances of Professional Experience and Expertise [PE], Government Regulatory Policies and Incentives [GR] and Marketing Strategies [MS] are from e7 to e9.

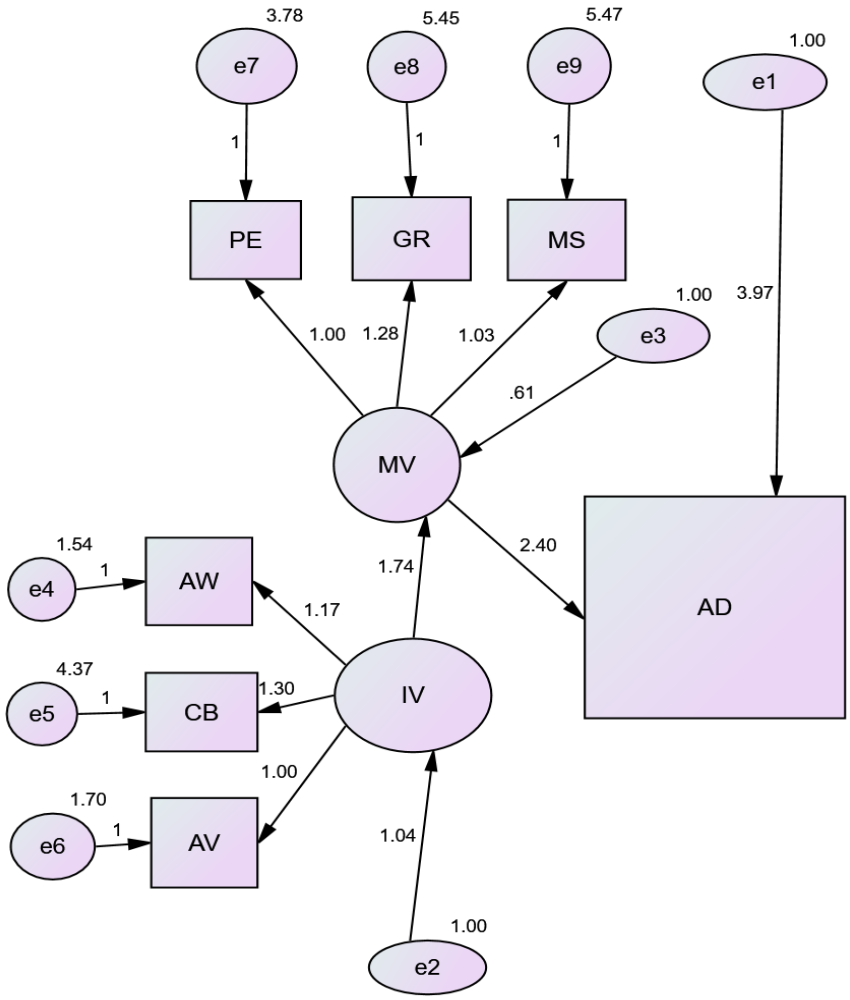


Figure 4.1: UNSTANDARDISED ESTIMATES for Adoption of Eco-labelled Building Materials

Inference for unstandardised estimates for Adoption of Eco-labelled Building Materials

The values AW, CB, AV, PE, GR and MS are the unstandardised estimates which indicates Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies respectively.

To estimate the influence of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing

Strategies on Adoption of Eco-labelled Building Materials, standardised coefficients are taken into consideration."

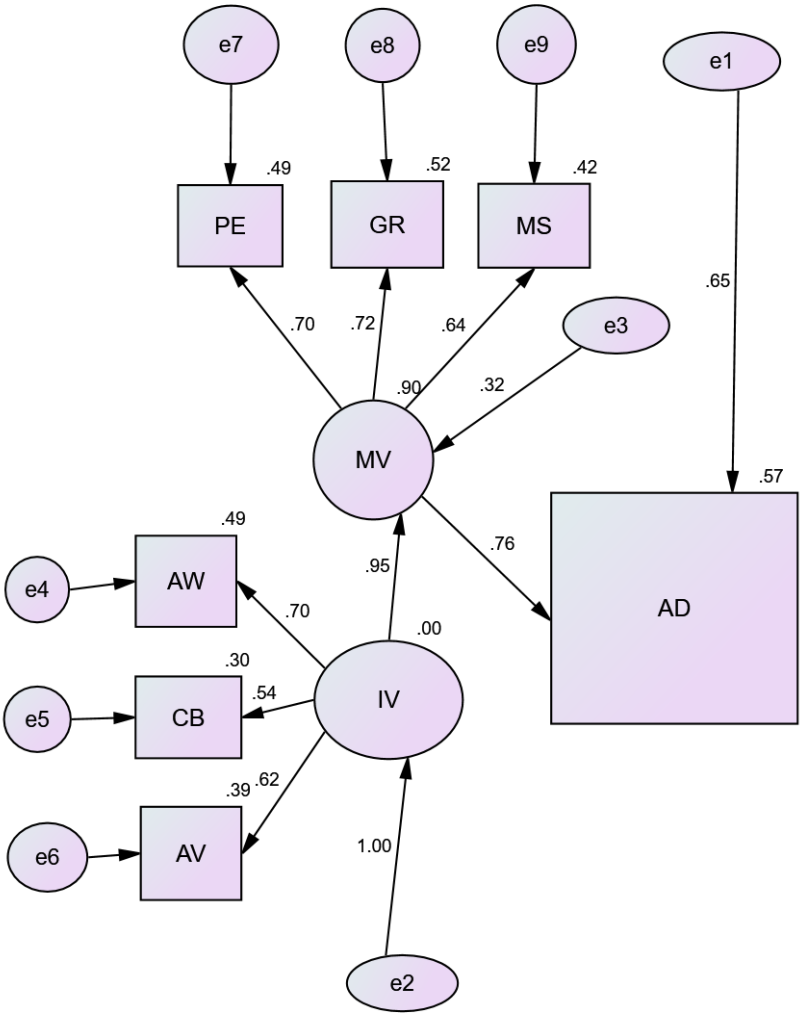


Figure 4.2 : STANDARDISED ESTIMATES for Adoption of Eco-labelled Building Materials

Inference for standardised estimates for Adoption of Eco-labelled Building Materials

The values AW(.70), CB(.54), AV(.62), PE(.70), GR(.72) and MS(.64) are the standardised estimates which indicates Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies respectively.

The highest values of standardised estimates have been observed for AW(.70), AV(.62) and CB(.54) in the latent variable [IV]. It shows that Awareness of Eco-labelled Products is highly influential followed by Availability of Eco-labelled Products and Cost Benefits of Eco-labelled Products.

The highest values of standardised estimates have been observed for GR(.72), PE(.70), and MS(.64) in the moderating variable [MV]. It shows that Government Regulatory Policies and Incentives, is highly influential followed by Professional Experience and Expertise and Marketing Strategies.

The value on AD (.57) indicates the variance of the dependent variable Adoption of Eco-labelled Building Materials. It shows that 57% of the total variance in the dependent variable has been explained by all the independent variables[Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products] and moderating variables Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies].

4.5.1 Interpretation for Model Fit estimates for Adoption of Eco-labelled Building Materials.

4.5.1.1. Absolute model fit

Minimum was achieved
Chi-square = 21.168
Degrees of freedom = 5
Probability level = .000
If the probability level of the is less than 5%, then it can be inferred as the model is fit.

4.5.1.2 RMSEA(Root Mean Square Error of Approximation)

The value should be 0.05 to 0.08
The achieved value is 0.053 which can be considered as a model fit as it is > 0.08.

4.5.1.3 Goodness of Fit Index(GFI)

It should be minimum 0.9. The achieved value is .985 which can be considered as a model fit.

4.5.2 - Incremental fit

4.5.2.1 Normalised Fit Index (NFI)

It should be > 0.90. The achieved value through SEM model is 0.980 can also be considered for the model fit.

4.5.2.2 Comparative Fit Index (CFI)

It should be > 0.90. The achieved value through SEM model is 0.985 which indicates the perfect fit of the model.

4.5.2.3 Tucker Lewis Index (TLI)

It should be ≥ 0.90. The achieved value through SEM model is 0.936 which is close to 0.90 indicates the perfect fit of the model.

4.5.2.4 Incremental Fit Index (IFI)

It should be > 0.90. The achieved value through SEM model is 0.985 which indicates the perfect fit of the model.

As per the SEM model, any three model fit estimates indicate the utility of the model."

4.5.3 Parsimonous fit

4.5.3.1 Adjusted Goodness-of-Fit Index (AGFI)

It should be ≥ 0.80. The achieved value through SEM model is 0. 918 which indicates the perfect fit of the model.

4.5.3.2 Chi –square/d.f < 5

d.f stands for degrees of freedom

21.168/5 = 4.234 which indicates the perfect fit of the model

Hence from all the model estimates like Absolute fit, Incremental fit and Parsimonous fit, it can be revealed that SEM model is suitable for predicting the influence of independent variables[Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products] and moderating variables

[Professional Experience, Expertise, Government Regulatory Policies and Incentives and Marketing Strategies] to determine Adoption of Eco-labelled Building Materials.

4.6 Hypotheses testing

4.6.1 - Hypothesis 1

The following hypothesis is tested by using Chi-Square Test

Null Hypothesis ($H1_0$): The adoption of Eco-labelled products does not depend upon the level of awareness among Architects, Builders, and Contractors in the Mumbai

Alternative Hypothesis($H1_A$): The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai

Table 4.66 Chi-Square values for adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai

Item description	Chi Square Value	Sig. Level
Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.	499.575	<.001
Public outreach through marketing campaigns influences the adoption of eco-labelled materials.	628.375	<.001
Effective demand-supply management enhances the availability and usage of eco-labelled products.	451.82	<.001
Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.	223.45	<.001
Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.	553.475	<.001
Technological innovations in eco-labelled products reveal substantial cost savings.	285.7	<.001

Highlighting the environmental benefits makes eco-labelled products more attractive.	551.475	<.001
Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products.	461.95	<.001
Favourable government policy promoting eco-labelled products enhances their adoption.	665.875	<.001
Mechanisms to address specification and application issues increase the adoption of eco-labelled products.	481.1	<.001
Special incentives for manufacturers can help reduce costs, enhancing the adoption.	396.475	<.001
Eco-labelled certifications for products enhance their credibility and encourage the adoption.	507.475	<.001

Inference : The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai. The highest value of Chi-Square value has been observed for Favourable government policy promoting eco-labelled products enhances their adoption as 665.875. The second highest value has been observed for Public outreach through marketing campaigns influences the adoption of eco-labelled materials as 628.375. The third highest value of Chi Square has been observed for Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials as 553.475.

It can be further analysed that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai have been summarised as Favourable government policy promoting eco-labelled products enhances their adoption, Public outreach through marketing campaigns influences the adoption of eco-labelled materials and Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.

4.6.2 - Hypothesis 2

The following hypothesis is tested by using Kolmogorov Smirnov Test

Null Hypothesis ($H2_0$): Favourable cost benefit perception about Eco-labelled products does not enhance the chances of adoption by the Architects, Builders, and Contractors in Mumbai

Alternative Hypothesis($H2_A$): Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai

Table 4.67 : Kolmogorov Smirnov Test values for Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai

Item description	Kolmogorov Smirnov Value	Sig. Level
Eco-labelled products have high initial costs.	5.39	<.001
Higher initial cost is a significant barrier to adoption of eco-labelled products.	5.702	<.001
Operational cost savings of eco-labelled products outweigh the initial costs.	6.113	<.001
Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.	6.326	<.001
Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.	5.433	<.001

Inference : The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

The highest value of Kolmogorov Smirnov Value has been observed for Overall cost savings of eco-labelled products are better compared to non-eco-labelled products as

6.326. The second highest value has been observed for Operational cost savings of eco-labelled products outweigh the initial costs as 6.113. The third highest value has been observed for Higher initial cost is a significant barrier to adoption of eco-labelled products as 5.702.

It can be further revealed that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai can be summarised as Overall cost savings of eco-labelled products are better compared to non-eco-labelled products, Operational cost savings of eco-labelled products outweigh the initial costs and Higher initial cost is a significant barrier to adoption of eco-labelled products."

4.6.3 - Hypothesis 3

The following hypothesis is tested by using Kolmogorov Smirnov Test

Null Hypothesis ($H3_0$): The ease of availability and accessibility of Eco-labelled products does not significantly influence the adoption among Architects, Builders, and Contractors

Alternative Hypothesis($H3_A$): The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors

Table 4.68 : Kolmogorov Smirnov Test values for The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors

Item description	Kolmogorov Smirnov Value	Sig. Level
Eco-labelled products are as readily available as non-eco-labelled alternatives.	4.09	<.001
Availability of eco-labelled products significantly influences my decision to specify or use them.	6.247	<.001
I am confident that eco-labelled products will be consistently available for my projects.	5.851	<.001

Improved availability of eco-labelled products would increase their adoption in my projects.	7.217	<.001

Inference : The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that the ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors.

The highest value of Kolmogorov Smirnov Value has been observed for Improved availability of eco-labelled products would increase their adoption in my projects as 7.217. The second highest value has been observed for Availability of eco-labelled products significantly influences my decision to specify or use them as 6.247. The third highest value has been observed I am confident that eco-labelled products will be consistently available for my projects as 5.851.

It can be further revealed that ease of availability and accessibility of Eco-labelled products can be summarised as Improved availability of eco-labelled products would increase their adoption in my projects, Availability of eco-labelled products significantly influences my decision to specify or use them, and I am confident that eco-labelled products will be consistently available for my projects.

4.6.4 - Hypothesis 4

The following hypothesis is tested by using Chi-Square Test

Null Hypothesis ($H4_0$): Regulatory policies and incentives deemed favourable do not have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Alternative Hypothesis($H4_A$): Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Table 4.69 : Chi-Square values for Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Item description	Chi Square Value	Sig. Level
Presence or absence of government policies influences my decision to specify or use eco-labelled products.	200.225	<.001
Supportive policies or incentives can increase the adoption of eco-labelled products.	218.34	<.001
Current Government policies are effective in promoting the adoption of eco-labelled products.	136.82	<.001
Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials.	116.46	<.001
Mandatory usage of Ecolabelled products in projects promotes their adoption.	232.34	<.001
Priority in procurement for Ecolabelled products helps increase their usage.	321.02	<.001
Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.	264.7	<.001
Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.	312.56	<.001

Inference : The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for Priority in procurement for Ecolabelled products helps increase their usage as 321.02.

The second highest value has been observed for Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products as 312.56. The third highest value of Chi Square has been observed for Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as 264.7.

It can be further analysed that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as Ecolabelled products helps increase their usage, Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products and Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.

4.6.5 - Hypothesis 5

The following hypothesis is tested by using Kolmogorov Smirnov Test

Null Hypothesis ($H5_0$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products does not lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Alternative Hypothesis($H5_A$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Table 4.70 : Chi-Square values for Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Item description	Kolmogorov Smirnov Test Value	Sig. Level
My professional background helps me make informed decisions about specifying or using eco-labelled products.	6.59	<.001

I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.	7.358	<.001
Trainings or workshops on eco-labelled products helps me specify or use them more effectively.	7.108	<.001
I actively re-evaluate new options when specifying or using new categories of eco-labelled products.	7.165	<.001
My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.	6.001	<.001

Inference : The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

The highest value of Kolmogorov Smirnov Value has been observed for I regularly collaborate or consult with other professionals before specifying or using eco-labelled products as 7.358. The second highest value has been observed for I actively re-evaluate new options when specifying or using new categories of eco-labelled products as 7.165. The third highest value has been observed for Trainings or workshops on eco-labelled products helps me specify or use them more effectively as 7.108.

It can be further revealed that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region can be summarised as I regularly collaborate or consult with other professionals before specifying or using eco-labelled products, I actively re-evaluate new options when specifying or using new categories of eco-labelled products and Trainings or workshops on eco-labelled products helps me specify or use them more effectively.

4.6.6 - Hypothesis 6

The following hypothesis is tested by using Chi-Square Test

Null Hypothesis ($H6_0$): Marketing strategies related to Eco-labelled products do not lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Alternative Hypothesis($H6_A$): Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Table 4.71 : Chi-Square values for Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Item description	Chi Square Value	Sig. Level
I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials.	221.925	<.001
I consider testimonials or reviews before specifying or using any eco-labelled products.	408.875	<.001
I have specified or used/purchased eco-labelled products because of marketing campaigns.	229.075	<.001
I am confident about the claims made by manufacturers regarding eco-labelled products.	217.66	<.001
I feel product manufacturers effectively communicate the benefits of eco-labelled products.	280.525	<.001

Inference : The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for I consider testimonials or reviews before specifying or using any eco-labelled products

as 408.875. The second highest value has been observed for I feel product manufacturers effectively communicate the benefits of eco-labelled products as 280.525. The third highest value of Chi Square has been observed for I have specified or used/purchased eco-labelled products because of marketing campaigns as 229.075.

It can be further analysed that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as I consider testimonials or reviews before specifying or using any eco-labelled products, I feel product manufacturers effectively communicate the benefits of eco-labelled products and I have specified or used/purchased eco-labelled products because of marketing campaigns."

4.7 Hypotheses Analysis

4.7.1 - Hypothesis 1

The hypothesis testing using Chi Square test found significance level less than 5% to reject the null hypothesis. It can be inferred that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai.

The highest value of Chi-Square value has been observed for Favourable government policy promoting eco-labelled products enhances their adoption as 665.875. The second highest value has been observed for Public outreach through marketing campaigns influences the adoption of eco-labelled materials as 628.375. The third highest value of Chi Square has been observed for Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials as 553.475.

It can be further analysed that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai have been summarised as Favourable government policy promoting eco-labelled products enhances their adoption, Public outreach through marketing campaigns influences the adoption of eco-labelled materials and Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.

4.7.2 - Hypothesis 2

The hypothesis testing using Kolmogorov Smirnov Test revealed significance level less than 5% to reject the null hypothesis. It can be inferred that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

The highest value of Kolmogorov Smirnov Value has been observed for Overall cost savings of eco-labelled products are better compared to non-eco-labelled products as 6.326. The second highest value has been observed for Operational cost savings of eco-labelled products outweigh the initial costs as 6.113. The third highest value has been observed for Higher initial cost is a significant barrier to adoption of eco-labelled products as 5.702.

It can be further revealed that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai can be summarised as Overall cost savings of eco-labelled products are better compared to non-eco-labelled products, Operational cost savings of eco-labelled products outweigh the initial costs and Higher initial cost is a significant barrier to adoption of eco-labelled products.

4.7.3 - Hypothesis 3

The hypothesis testing using Kolmogorov Smirnov Test revealed significance level less than 5% to reject the null hypothesis. It can be inferred that the ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors.

The highest value of Kolmogorov Smirnov Value has been observed for Improved availability of eco-labelled products would increase their adoption in my projects as 7.217. The second highest value has been observed for Availability of eco-labelled products significantly influences my decision to specify or use them as 6.247. The third highest value has been observed I am confident that eco-labelled products will be consistently available for my projects as 5.851.

It can be further revealed that ease of availability and accessibility of Eco-labelled products can be summarised as Improved availability of eco-labelled products would increase their adoption in my projects, Availability of eco-labelled products significantly influences my decision to specify or use them, and I am confident that eco-labelled products will be consistently available for my projects.

4.7.4 - Hypothesis 4

The hypothesis testing using Chi-Square Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for Priority in procurement for Ecolabelled products helps increase their usage as 321.02. The second highest value has been observed for Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products as 312.56. The third highest value of Chi Square has been observed for Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as 264.7.

It can be further analysed that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as Ecolabelled products helps increase their usage, Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products and Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.

4.7.5 - Hypothesis 5

The hypothesis testing using Kolmogorov Smirnov Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

The highest value of Kolmogorov Smirnov Value has been observed for I regularly collaborate or consult with other professionals before specifying or using eco-labelled products as 7.358. The second highest value has been observed for I actively re-evaluate new options when specifying or using new categories of eco-labelled products as 7.165.

The third highest value has been observed for Trainings or workshops on eco-labelled products helps me specify or use them more effectively as 7.108.

It can be further revealed that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region can be summarised as I regularly collaborate or consult with other professionals before specifying or using eco-labelled products, I actively re-evaluate new options when specifying or using new categories of eco-labelled products and Trainings or workshops on eco-labelled products helps me specify or use them more effectively.

4.7.6 - Hypothesis 6

The hypothesis testing using Chi-Square Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for I consider testimonials or reviews before specifying or using any eco-labelled products as 408.875.

The second highest value has been observed for I feel product manufacturers effectively communicate the benefits of eco-labelled products as 280.525. The third highest value of Chi Square has been observed for I have specified or used/purchased eco-labelled products because of marketing campaigns as 229.075.

It can be further analysed that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as I consider testimonials or reviews before specifying or using any eco-labelled products, I feel product manufacturers effectively

communicate the benefits of eco-labelled products and I have specified or used/purchased eco-labelled products because of marketing campaigns.

Table 4.72 : Summary table of Hypothesis Analysis

Hypothesis Statement	**Critical level & Statistical test Used**	**Inference**
Hypothesis 1 **Null Hypothesis** **(*$H1_o$*):** The adoption of Eco-labelled products does not depend upon the level of awareness among Architects, Builders, and Contractors in the Mumbai	The critical level or level of significance is set at 5%(0.05) Chi-Square Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai
Alternative Hypothesis **(*$H1_A$*):** The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai		
Hypothesis 2 **Null Hypothesis** **(*$H2_o$*):** Favourable cost benefit perception about Eco-labelled products does not enhance the chances of adoption by the Architects, Builders, and Contractors in Mumbai	The critical level or level of significance is set at 5%(0.05) Kolmogorov Smirnov Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects,
Alternative Hypothesis		

($H2_A$): Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai		Builders, and Contractors in Mumbai
Hypothesis 3 **Null Hypothesis** **($H3_o$):** The ease of availability and accessibility of Eco-labelled products does not significantly influence the adoption among Architects, Builders, and Contractors	The critical level or level of significance is set at 5%(0.05) Kolmogorov Smirnov Test Reliability Analysis Multiple Regression Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors
Alternative Hypothesis **($H3_A$):** The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors		
Hypothesis 4 **Null Hypothesis** **($H4_o$):** Regulatory policies and incentives deemed favourable do not have a significant impact on the adoption of Eco-labelled	The critical level or level of significance is set at 5%(0.05) Chi-Square Test Reliability Analysis Multiple Regression Analysis	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected**

products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region	Factor Analysis Structural Equation Modelling[SEM]	Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region
Alternative Hypothesis ($H4_A$): Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region		
Hypothesis 5 **Null Hypothesis ($H5_o$):** Higher levels of professional experience, expertise, and exposure to Eco-labelled products does not lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region	The critical level or level of significance is set at 5%(0.05) Kolmogorov Smirnov Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region
Alternative Hypothesis ($H5_A$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among		

Architects, Builders, and Contractors in the Mumbai Metropolitan Region		
Hypothesis 6 **Null Hypothesis (*$H6_o$*):** Marketing strategies related to Eco-labelled products do not lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region	The critical level or level of significance is set at 5%(0.05) Chi-Square Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region
Alternative Hypothesis (*$H6_A$*): Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region		

Chapter 5

Findings

Chapter 5 – Findings

5.1 Introductory Overview of Respondents

The study is based on the responses from 400 professionals from varied professional domains such as Architects, Builders and Contractors operating in the Mumbai Metropolitan Region and who are actively involved in material specifications, selection, procurement and execution.

Among the respondents, 255 nos or 64 % have more than 15 years' experience, revealing that the findings herein are shaped by inputs from a highly experienced cohort who has worked in various cycles of regulatory policies compliance, implementation, procurement and meeting customer expectations. These respondents are well informed based on practical exposure rather than relying only on theory or trends – this makes them "Gatekeepers" in mainstreaming Ecolabelled products within and outside their organisation and can influence largely the adoption depending on the situation.

The group of mid senior respondents comprises of 56 respondents (14%) with 5–10 years of experience and 67 respondents (17%) with 11–15 years. The group is almost 1/3 of the total respondents and primarily involved in day to day operations, execution and helping which materials to be used. This cohort can be looked as "Ambassadors" of the Ecolabelled products as they have a potential to influence peers with proven documented performance for future adoptions. Together, this 31% forms a middle group and often handles day-to-day project execution and helps decide which materials to use. They're in a good position to support eco-labelled products, especially if they're given solid proof of performance and examples from trusted peers.

The early career group comprised of only 22 respondents (5.5%) have less than 5 years. Although few in numbers and may not yield a direct influence over big decisions, however they can become strong supporters for sustainable procurement in the near future with the plethora of content related to the topic, as they climb the professional ladder and the sustainable procurement becoming the norm.

Overall, the mix of experience levels reveals that every group can potentially influence adoption if approached with the accordingly – Senior members with Compliance and Cost savings benefits, Mid-Levels with practical tools and new age options and the Early career team with digital content related to their domain projects.

5.2 Professional Experience and Expertise

The research found that out of 400 respondents, 16(4%) of the respondents' opinion about My professional background helps me make informed decisions about specifying or using eco-labelled products as Strongly Disagree, 32(8%) as Disagree, 43(11%) as Neutral, 109(27%) as Agree and 200(50%) as Strongly Agree. It shows the majority of the respondents' opinion about My professional background helps me make informed decisions about specifying or using eco-labelled products as Strongly Agree.

The research found that out of 400 respondents, 24(6%) of the respondents opinion about I regularly collaborate or consult with other professionals before specifying or using eco-labelled products. as Strongly Disagree, 27(7%) as Disagree, 56(14%) as Neutral, 118(29.5%) as Agree and 175(44%) as Strongly Agree. It shows the majority of the respondents' opinion about I regularly collaborate or consult with other professionals before specifying or using eco-labelled products as Strongly Agree.

The research found that out of 400 respondents, 16(4%) of the respondents opinion about Trainings or workshops on eco-labelled products helps me specify or use them more effectively as Strongly Disagree, 20(5%) as Disagree, 26(6.5%) as Neutral, 109(27%) as Agree and 229(57%) as Strongly Agree. It shows the majority of the respondents' opinion about Trainings or workshops on eco-labelled products helps me specify or use them more effectively as Strongly Agree.

The research found that out of 400 respondents, 20(5%) of the respondents opinion about I actively re-evaluate new options when specifying or using new categories of eco-labelled products as Strongly Disagree, 12(3%) as Disagree, 47(12%) as Neutral, 127(32%) as Agree and 194(48.5%) as Strongly Agree. It shows the majority of the respondents' opinion

about I actively re-evaluate new options when specifying or using new categories of eco-labelled products as Strongly Agree.

The research found that out of 400 respondents, 20(5%) of the respondents opinion about My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders as Strongly Disagree, 35(9%) as Disagree, 60(15%) as Neutral, 68(17%) as Agree and 217(54%) as Strongly Agree. It shows the majority of the respondents' opinion about My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders s as Strongly Agree.

5.2.1 Weighted average mean for Professional Experience and Expertise

The highest weighted average mean have been observed for Trainings or workshops on eco-labelled products helps me specify or use them more effectively as 4.29, I actively re-evaluate new options when specifying or using new categories of eco-labelled products as 4.16 and My professional background helps me make informed decisions about specifying or using eco-labelled products as 4.11.

From the above weighted average mean, Professional Experience and Expertise can be summarised as Trainings or workshops on eco-labelled products helps me specify or use them more effectively, I actively re-evaluate new options when specifying or using new categories of eco-labelled products and My professional background helps me make informed decisions about specifying or using eco-labelled products.

The research found that out of 400 respondents, 121(30%) of the respondents opinion about aware of any existing government policies that promote the usage of eco-labelled products as Yes, 130(32.5%) as No and 149(37%) as Not Sure. It shows the majority of the respondents opinion about aware of any existing government policies that promote the usage of eco-labelled products as Not Sure.

The research highlighted a strong alignment between professional experience and the ability to make informed decisions about eco-labelled products. Half of the respondents

(50%) strongly agreed that their professional background equips them to specify or use such products effectively, supported by a weighted average mean (WAM) of **4.11**. Additionally, 57% strongly agreed that trainings or workshops enhance their ability to use eco-labelled products, reflected in the highest WAM of **4.29**. This suggests that both experience and structured learning play a critical role in driving confident, informed adoption.

While prior studies such as Tan (2011) and Mokha (2017) emphasised awareness and knowledge as drivers of eco-friendly behaviour, the present study demonstrates that in professional settings, structured training and accumulated experience directly influence specification decisions rather than merely shaping attitudes. This highlights a shift from passive awareness to applied, decision-oriented capability, strengthening the practical relevance of eco-label adoption.

The study also found that 48.5% of respondents actively re-evaluate new options in eco-labelled categories (WAM **4.16**), indicating a mindset open to innovation and continuous improvement. Collaboration emerged as another key factor, with 44% strongly agreeing that they regularly consult peers before specifying eco-labelled products. Furthermore, 54% strongly agreed that client or stakeholder preferences influence their decisions, pointing to the importance of external drivers in shaping material choices.

However, when asked about awareness of government policies promoting eco-labelled products, the research revealed a gap: 37% of respondents were *not sure*, and only 30% responded affirmatively. This signals a need for clearer communication and outreach from regulatory bodies. To strengthen adoption, stakeholders should invest in targeted training, peer engagement platforms, and policy visibility—ensuring that professional expertise is supported by accessible knowledge and collaborative ecosystems.

Existing literature (White et al., 2019; Asawa-Amnuai, 2015) recognises social and institutional influence, but the present study refines this by showing that in project-based environments, peer consultation and client demand function as immediate decision

enablers rather than indirect influences. This highlights a more operational and time-sensitive dimension of adoption behaviour.

5.3 Government Regulatory Policies and Incentives

The research found that out of 400 respondents, 34(8.5%) of the respondents opinion about Presence or absence of government policies influences my decision to specify or use eco-labelled products as Strongly Disagree, 25(6%) as Disagree, 44(11%) as Neutral, 75(19%) as Agree and 222(55.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Presence or absence of government policies influences my decision to specify or use eco-labelled products as Strongly Agree.

The research found that out of 400 respondents, 28(7%) of the respondents opinion about Supportive policies or incentives can increase the adoption of eco-labelled products as Strongly Disagree, 24(6%) as Disagree, 60(15%) as Neutral, 100(25%) as Agree and 188(47%) as Strongly Agree. It shows the majority of the respondents' opinion about Supportive policies or incentives can increase the adoption of eco-labelled products as Strongly Agree.

The research found that out of 400 respondents, 20(5%) of the respondents opinion about Current Government policies are effective in promoting the adoption of eco-labelled products as Strongly Disagree, 37(9%) as Disagree, 69(17%) as Neutral, 153(38%) as Agree and 121(30%) as Strongly Agree. It shows the majority of the respondents' opinion about Current Government policies are effective in promoting the adoption of eco-labelled products as Agree.

The research found that out of 400 respondents, 20(5%) of the respondents opinion about Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials as Strongly Disagree, 31(8%) as Disagree, 64(16%) as Neutral, 113(28%) as Agree and 172(43%) as Strongly Agree. It shows the majority of the respondents' opinion about Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials as Strongly Agree.

The research found that out of 400 respondents, 24(6%) of the respondents opinion about Mandatory usage of Ecolabelled products in projects promotes their adoption as Strongly Disagree, 31(8%) as Disagree, 62(15.5%) as Neutral, 143(36%) as Agree and 140(35%) as Strongly Agree. It shows the majority of the respondents' opinion about Mandatory usage of Ecolabelled products in projects promotes their adoption as Agree.

The research found that out of 400 respondents, 28(7%) of the respondents opinion about Priority in procurement for Ecolabelled products helps increase their usage as Strongly Disagree, 19(5%) as Disagree, 52(13%) as Neutral, 135(34%) as Agree and 166(41.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Priority in procurement for Ecolabelled products helps increase their usage as Strongly Agree.

The research found that out of 400 respondents, 20(5%) of the respondents opinion about Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as Strongly Disagree, 12(3%) as Disagree, 54(13.5%) as Neutral, 136(34%) as Agree and 178(44.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as Strongly Agree.

The research found that out of 400 respondents, 16(4%) of the respondents opinion about Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products as Strongly Disagree, 24(6%) as Disagree, 54(13.5%) as Neutral, 120(30%) as Agree and 186(46.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products as Strongly Agree.

5.3.1 Weighted average mean for Government Regulatory Policies and Incentives

The highest weighted average mean have been observed for Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as 4.10, Government-backed eco-label certifications enhance the credibility and

adoption of Ecolabelled products as 4.09 and Presence or absence of government policies influences my decision to specify or use eco-labelled products as 4.07.

From the above weighted average mean, Government Regulatory Policies and Incentives can be summarised as Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials, Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products and presence or absence of government policies influences my decision to specify or use eco-labelled products.

The research highlighted the pivotal role of government policies and incentives in shaping the adoption of eco-labelled products. A majority of respondents (55.5%) strongly agreed that the presence or absence of such policies directly influences their specification decisions, while 47% strongly agreed that supportive incentives can accelerate adoption. These findings underscore the need for proactive policy frameworks that not only mandate but also reward sustainable choices.

While earlier research (Asawa-Amnuai, 2015) identified institutional support as important, the present study demonstrates that policy presence acts as a decisive trigger in professional decision-making, particularly in regulated sectors like construction. This elevates the role of policy from a supportive factor to a primary determinant of adoption, especially in real-world project environments.

Further, the study found that 43% of respondents strongly agreed that price and tax subsidies influence their material choices, and 41.5% strongly agreed that procurement prioritisation helps increase usage. Mandatory usage policies also received strong support, with 36% agreeing and 35% strongly agreeing that such mandates promote adoption. These responses reflect a clear appetite for regulatory mechanisms that reduce financial barriers and institutionalise sustainability in project workflows.

While cost-related barriers have been widely discussed in prior studies (Veena & Ajith, 2020; Nair & Maram, 2015), the present study demonstrates that financial mechanisms such as subsidies, procurement prioritisation, and mandatory policies directly influence specification behaviour. This highlights cost not merely as a constraint, but as a strategic lever for accelerating adoption within professional decision frameworks.

The research also revealed that government-led awareness campaigns (44.5% strongly agree) and eco-label certifications (46.5% strongly agree) are seen as effective tools for enhancing credibility and driving uptake. However, only 30% strongly agreed that current policies are effective, suggesting room for improvement in policy design and communication. To unlock broader adoption, policymakers must focus on visibility, incentives, and enforcement—ensuring that eco-labelled products are not just available but actively preferred through regulatory support.

While prior research (Riskos et al., 2021; Sharma & Kushwaha, 2019) emphasised the role of trust and credibility, the present study demonstrates that government-backed certifications and awareness initiatives enhance credibility among professionals, but limitations in perceived effectiveness point to gaps in policy communication and implementation. This highlights a disconnect between policy intent and its practical impact at the practitioner level.

This indicates that while policy instruments exist, their effectiveness depends significantly on how well they are communicated and implemented.

5.4 Marketing Strategies

The research indicated that out of 400 respondents, 28(7%) of the respondents opinion about I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials as Strongly Disagree, 54(13.5%) as Disagree, 55(14%) as Neutral, 116(29%) as Agree and 147(37%) as Strongly Agree. It shows most the respondents' opinion about I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials as Strongly Agree.

The research indicated that out of 400 respondents, 8(2%) of the respondents opinion about I consider testimonials or reviews before specifying or using any eco-labelled products as Strongly Disagree, 12(3%) as Disagree, 34(8.5%) as Neutral, 169(42%) as Agree and 177(44%) as Strongly Agree. It shows the majority of the respondents' opinion about I am confident about the claims made by manufacturers regarding eco-labelled products as Strongly Agree.

The research indicated that out of 400 respondents, 31(8%) of the respondents opinion about I have specified or used/purchased eco-labelled products because of marketing campaigns as Strongly Disagree, 26(6.5%) as Disagree, 32(8%) as Neutral, 187(47%) as Agree and 124(31%) as Strongly Agree. It shows the majority of the respondents' opinion about I have specified or used/purchased eco-labelled products because of marketing campaigns as Agree.

The research indicated that out of 400 respondents, 28(7%) of the respondents opinion about I am confident about the claims made by manufacturers regarding eco-labelled products as Strongly Disagree, 31(8%) as Disagree, 45(11%) as Neutral, 153(38%) as Agree and 143(36%) as Strongly Agree. It shows the majority of the respondents' opinion about I am confident about the claims made by manufacturers regarding eco-labelled products as Agree.

The research indicated that out of 400 respondents, 40(10%) of the respondents opinion about I feel product manufacturers effectively communicate the benefits of eco-labelled products as Strongly Disagree, 19(5%) as Disagree, 68(17%) as Neutral, 131(33%) as Agree and 142(35.5%) as Strongly Agree. It shows the majority of the respondents' opinion about I feel product manufacturers effectively communicate the benefits of eco-labelled products as Strongly Agree.

5.4.1 Weighted average mean for Marketing Strategies

The highest weighted average mean have been observed for I consider testimonials or reviews before specifying or using any eco-labelled products as 4.24, I am confident about

the claims made by manufacturers regarding eco-labelled products. as 3.88 and I have specified or used/purchased eco-labelled products because of marketing campaigns as 3.87.

From the above weighted average mean, Marketing Strategies can be summarised as I consider testimonials or reviews before specifying or using any eco-labelled products, I am confident about the claims made by manufacturers regarding eco-labelled products. and I have specified or used/purchased eco-labelled products because of marketing campaigns.

The research indicated that out of 400 respondents, 78(19.5%) of the respondents opinion about percentage of total projects specified or used eco-labelled products as 0-10%, 100(25%) as 11-25%, 93(23%) as 26-50%, 96(24%) as 51-75% and 33(8%) as 76-100%. It shows the majority of the respondents opinion about percentage of total projects specified or used eco-labelled products as 11-25%.

The research highlighted the growing influence of marketing strategies in shaping the adoption of eco-labelled products. A significant portion of respondents (37%) strongly agreed that they consider marketing campaigns—such as advertisements, promotional offers, and industry outreach—before specifying or purchasing eco-labelled materials. Additionally, 31% strongly agreed and 47% agreed that such campaigns have directly influenced their usage decisions, indicating that promotional efforts are translating into tangible adoption behavior.

The highest weighted average mean (WAM 4.24) was observed for the statement “I consider testimonials or reviews before specifying or using any eco-labelled products”, revealing that peer validation and user feedback are powerful drivers of trust and decision-making. Confidence in manufacturer claims also scored positively (WAM 3.88), suggesting that credibility and transparency in product communication are essential.

Furthermore, 35.5% of respondents strongly agreed that manufacturers effectively communicate the benefits of eco-labelled products, reinforcing the role of messaging in market uptake.

While prior research (Mokha, 2017) primarily positions marketing as a tool for creating awareness, the present study demonstrates that marketing strategies extend beyond awareness and actively influence specification and usage decisions within professional project contexts. This highlights the evolving role of marketing from an informational function to a decision-shaping mechanism.

This indicates that trust and credibility play a critical role in reducing uncertainty and influencing professional decision-making.

Despite these positive signals, the research found that the majority of respondents (25%) specified or used eco-labelled products in only 11–25% of their total projects. This points to a gap between awareness and full-scale integration. To bridge this, stakeholders should amplify credible testimonials, invest in targeted campaigns, and ensure that marketing efforts are backed by verifiable performance data. Strategic communication—grounded in trust and relevance—can accelerate the mainstreaming of eco-labelled products across the project lifecycle.

Building on the emphasis on trust in prior research (Riskos et al., 2021), the present study shows that testimonials, peer validation, and credible claims play a critical role in reducing perceived risk in professional decision-making. This highlights trust not just as a perception, but as a practical requirement for specification and procurement.

Overall, the findings suggest that marketing strategies, when grounded in credibility and targeted communication, play a significant role in influencing the adoption of eco-labelled products among professionals.

5.5 Adoption of Eco-labelled Building Materials

The research revealed that out of 400 respondents, 12(3%) of the respondents opinion about Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products as Strongly Disagree, 24(6%) as Disagree, 34(8.5%) as Neutral,

180(45%) as Agree and 150(37.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products as Agree.

The research revealed that out of 400 respondents, 16(4%) of the respondents opinion about Public outreach through marketing campaigns influences the adoption of eco-labelled materials as Strongly Disagree, 28(7%) as Disagree, 66(16.5%) as Neutral, 116(29%) as Agree and 174(43.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Public outreach through marketing campaigns influences the adoption of eco-labelled materials as Strongly Agree.

The research revealed that out of 400 respondents, 20(5%) of the respondents opinion about Effective demand-supply management enhances the availability and usage of eco-labelled products as Strongly Disagree, 16(4%) as Disagree, 46(11.5%) as Neutral, 179(45%) as Agree and 139(35%) as Strongly Agree. It shows the majority of the respondents' opinion about Effective demand-supply management enhances the availability and usage of eco-labelled products as Agree.

The research revealed that out of 400 respondents, 32(8%) of the respondents opinion about Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials as Strongly Disagree, 27(7%) as Disagree, 67(17%) as Neutral, 96(24%) as Agree and 178(44.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials as Strongly Agree.

The research revealed that out of 400 respondents, 20(5%) of the respondents opinion about Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials as Strongly Disagree, 20(5%) as Disagree, 50(12.5%) as Neutral, 194(48.5%) as Agree and 116(29%) as Strongly Agree. It shows the majority of the respondents' opinion about Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials as Agree.

The research revealed that out of 400 respondents, 20(5%) of the respondents opinion about Technological innovations in eco-labelled products reveal substantial cost savings as Strongly Disagree, 14(3.5%) as Disagree, 66(16.5%) as Neutral, 103(26%) as Agree and 197(49%) as Strongly Agree. It shows the majority of the respondents' opinion about Technological innovations in eco-labelled products reveal substantial cost savings as Strongly Agree.

The research revealed that out of 400 respondents, 20(5%) of the respondents opinion about Highlighting the environmental benefits makes eco-labelled products more attractive as Strongly Disagree, 16(4%) as Disagree, 46(11.5%) as Neutral, 241(60%) as Agree and 77(19%) as Strongly Agree. It shows the majority of the respondents' opinion about Highlighting the environmental benefits makes eco-labelled products more attractive as Agree.

The research revealed that out of 400 respondents, 40(10%) of the respondents opinion about Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products as Strongly Disagree, 35(9%) as Disagree, 73(18%) as Neutral, 77(19%) as Agree and 175(44%) as Strongly Agree. It shows the majority of the respondents' opinion about Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products as Strongly Agree.

The research revealed that out of 400 respondents, 20(5%) of the respondents opinion about Favourable government policy promoting eco-labelled products enhances their adoption as Strongly Disagree, 24(6%) as Disagree, 34(8.5%) as Neutral, 94(23.5%) as Agree and 228(57%) as Strongly Agree. It shows the majority of the respondents' opinion about Favourable government policy promoting eco-labelled products enhances their adoption as Strongly Agree.

The research revealed that out of 400 respondents, 28(7%) of the respondents opinion about Mechanisms to address specification and application issues increase the adoption of eco-

labelled products as Strongly Disagree, 16(4%) as Disagree, 66(16.5%) as Neutral, 116(29%) as Agree and 174(43.5%) as Strongly Agree. It shows the majority of the respondents' opinion about Mechanisms to address specification and application issues increase the adoption of eco-labelled products as Agree.

The research revealed that out of 400 respondents, 28(7%) of the respondents opinion about Special incentives for manufacturers can help reduce costs, enhancing the adoption as Strongly Disagree, 16(4%) as Disagree, 61(15%) as Neutral, 156(39%) as Agree and 139(35%) as Strongly Agree. It shows the majority of the respondents' opinion about Special incentives for manufacturers can help reduce costs, enhancing the adoption as Agree.

The research revealed that out of 400 respondents, 24(6%) of the respondents opinion about Eco-labelled certifications for products enhance their credibility and encourage the adoption as Strongly Disagree, 11(3%) as Disagree, 55(14%) as Neutral, 118(29.5%) as Agree and 192(48%) as Strongly Agree. It shows the majority of the respondents' opinion about Eco-labelled certifications for products enhance their credibility and encourage the adoption as Strongly Agree.

5.5.1 Weighted average mean for Adoption of Eco-labelled Building Materials

The highest weighted average mean have been observed for Favourable government policy promoting eco-labelled products enhances their adoption as 4.22, Technological innovations in eco-labelled products reveal substantial cost savings as 4.11, Eco-labelled certifications for products enhance their credibility and encourage the adoption as 4.11 and Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products as 4.08.

From the above weighted average mean, Continuance usage can be summarised as Favourable government policy promoting eco-labelled products enhances their adoption, Technological innovations in eco-labelled products reveal substantial cost savings, Eco-labelled certifications for products enhance their credibility and encourage the adoption

and Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.

The research revealed that out of 400 respondents, 12(3%) of the respondents opinion about likely to adopt more eco-labelled products in the future as Very Unlikely, 4(1%) as Unlikely, 39(10%) as Neutral, 194(48.5%) as Likely and 151(38%) as Very Likely. It shows the majority of the respondents opinion about likely to adopt more eco-labelled products in the future as Likely.

The research revealed strong support for multiple drivers that influence the adoption of eco-labelled building materials. The highest weighted average mean (WAM 4.22) was recorded for "Favourable government policy promoting eco-labelled products enhances their adoption", indicating that policy-level interventions are seen as the most powerful enabler. Technological innovations and eco-label certifications followed closely (both WAM 4.11), suggesting that cost-saving breakthroughs and credibility mechanisms are also critical to driving uptake. Specialised training programs for specifiers, buyers, and users (WAM 4.08) were also positively rated, reinforcing the role of capacity-building in adoption.

Beyond these top-ranked factors, the research highlighted widespread agreement on the influence of marketing outreach, celebrity testimonials, and manufacturer communication. Respondents also supported mechanisms such as rating manufacturers based on promotional efforts, addressing specification challenges, and offering incentives to reduce costs—all of which contribute to a more adoption-friendly ecosystem. Notably, 48.5% of respondents indicated they are "Likely" to adopt more eco-labelled products in future projects, with an additional 38% stating "Very Likely," pointing to strong forward momentum.

These findings underscore the need for a multi-pronged strategy: combining policy support, technological innovation, credible certification, and targeted training with

effective communication and incentive structures. Stakeholders should focus on aligning these levers to convert intent into consistent adoption across the building lifecycle.

While existing literature (Sharma et al., 2022) recognises the multi-dimensional nature of green adoption, the present study contributes by providing empirical evidence from industry professionals in the Mumbai Metropolitan Region, thereby offering context-specific insights into how these factors operate in real-world project environments. This strengthens the applicability of existing theories within a professional and region-specific framework.

5.6 Weighted average mean for Awareness of Eco-labelled Products

The highest weighted average mean has been observed for Specifying or using eco-labelled products provides a competitive advantage to my organisation as 4.21, Eco-labelled products are essential for achieving my project's sustainability goals as 4.17 and Eco-labelled products improve my project's sustainability profile as 3.98.

The research indicates a strong awareness among professionals about the strategic value of eco-labelled products. The highest weighted average mean (4.21) reflects broad agreement that using such products offers a competitive advantage to their organisation. Similarly, respondents view eco-labelled materials as essential for achieving sustainability goals (WAM 4.17) and improving project profiles (WAM 3.98).

These findings suggest that eco-labelled products are not just compliance tools—they're seen as enablers of business value and environmental credibility. To build on this momentum, stakeholders should position eco-labelled products as both performance-driven and market-relevant, supported by case studies, client success stories, and certification visibility. Its thus vital to integrate eco-labelled products into strategic messaging, project planning, and client engagement to reinforce their dual role in sustainability and competitive positioning.

Consistent with the observations of Agarwal and Dixit (2021), who noted that awareness does not automatically translate into behavioural change, the present study extends this

understanding by showing that even when awareness is strategically aligned, its translation into consistent adoption is contingent upon factors such as cost feasibility, policy support, and product availability. This underscores the conditional nature of awareness in professional decision-making contexts, where multiple practical considerations influence final outcomes.

To build on this awareness, stakeholders should position eco-labelled products as both performance-driven and market-relevant, supported by case studies, client success stories, and visible certification frameworks. It is thus essential to integrate eco-labelled products into strategic messaging, project planning, and client engagement processes to reinforce their dual role in sustainability and competitive positioning.

5.7 Weighted average mean for Cost Benefits of Eco-labelled Products

The highest weighted average mean have been observed for Eco-labelled products have high initial costs as 4.00, Operational cost savings of eco-labelled products outweigh the initial costs as 3.88 and Higher initial cost is a significant barrier to adoption of eco-labelled products as 3.85.

The research highlights a nuanced understanding among professionals regarding the cost dynamics of eco-labelled products. The highest weighted average mean (WAM 4.00) reflects strong agreement that these products carry high initial costs, while a slightly lower score (WAM 3.88) indicates that many respondents believe operational savings can offset these upfront expenses. Additionally, the WAM of 3.85 suggests that higher initial cost remains a notable barrier to adoption, even among those who recognise long-term value.

These findings point to a cost-benefit tension: while professionals acknowledge the financial hurdles, there is also recognition of long-term economic gains. This duality underscores the need for clearer ROI narratives, lifecycle cost comparisons, and performance data that validate savings over time.

To accelerate adoption, stakeholders should proactively address cost concerns by showcasing total cost of ownership models, offering financing or incentive mechanisms, and equipping decision-makers with tools that demonstrate both economic and environmental returns. Positioning eco-labelled products as smart investments—not just sustainable ones—will be key to overcoming price-based resistance.

On similar lines to Sharma et al. (2022), who highlighted the importance of economic feasibility in green adoption, the present study extends this understanding by showing that even when long-term benefits are recognised, adoption is constrained unless cost structures are aligned with project-level financial realities and budgeting practices. This underscores the need to bridge the gap between perceived value and financial viability in real-world applications.

To accelerate adoption, stakeholders should address cost concerns by emphasising total cost of ownership models, providing lifecycle cost comparisons, and offering financial incentives or support mechanisms. Equipping decision-makers with clear, evidence-based ROI frameworks will help position eco-labelled products as strategic investments rather than cost burdens, thereby reducing resistance driven by initial price perceptions.

5.8 Weighted average mean for Availability of Eco-labelled Products

The research indicated a high level of confidence among professionals regarding the availability of eco-labelled products. The highest weighted average mean (WAM 4.11) was observed for the statement “Eco-labelled products are as readily available as non-eco-labelled alternatives”, suggesting that respondents no longer view availability as a limiting factor. A closely aligned score (WAM 4.10) for “Availability significantly influences my decision to specify or use them” reinforces the role of access in driving adoption. Additionally, the WAM of 4.03 for “I am confident that eco-labelled products will be consistently available for my projects” highlights growing trust in supply chain reliability.

These findings reveal that availability is transitioning from a perceived barrier to an enabler of adoption. Professionals are increasingly confident that eco-labelled products can be

sourced reliably, and that availability directly impacts specification decisions. This shift underscores the importance of maintaining visible stock levels and dependable distribution channels.

To sustain this momentum, stakeholders should invest in supply chain transparency, vendor outreach, and procurement support. Ensuring consistent access and communicating availability clearly will help normalise eco-labelled products as default choices in mainstream construction workflows.

This shift highlights an important contribution of the study: once availability reaches a threshold of reliability, it transitions from being a barrier to becoming an enabling factor that normalises adoption behaviour. In this context, availability supports not just access but also decision confidence and continuity in project execution.

To sustain this momentum, stakeholders should invest in supply chain transparency, vendor network expansion, and procurement support systems. Ensuring consistent access, real-time availability information, and streamlined sourcing processes will help position eco-labelled products as default and dependable choices within mainstream construction practices.

5.9 Inferential Analysis

5.9.1 Reliability Analysis

The reliability analysis is an effective instrument for testing the internal consistency among the research variables included in the research process. It places more significance in maintaining and developing an upper limit on its validity. A measurement that lacks reliability will also lack validity. If the scale of reliability is close to 1, then it can be concluded that the variables are having high internal consistency and hence they are suitable for conducting factor analysis.

Table 5.1 - Summary of Reliability Statistics for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

Variables	Cronbach's Alpha (α)
Awareness of Eco-labelled Products	0.810
Cost Benefits of Eco-labelled Products	0.808
Availability of Eco-labelled Products	0.808
Professional Experience and Expertise	0.815
Government Regulatory Policies and Incentives	0.821
Marketing Strategies	0.824
Adoption of Eco-labelled Building Materials	0.820

Conclusion

Based on the summary of reliability, it can be inferred that the value of Cronbach's Alpha (α) found to be more than 0.8 which shows the internal consistency for all the variables included in the research consisting of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies and Adoption of Eco-labelled Building Materials, which validates the coherence of each construct and supports their use in further statistical analysis.

5.9.2 Test of Validity

Multiple Regression Analysis for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

In the present study, Multiple Regression Analysis of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies and has been tested as a tool of validity. Collinearity has been used an inbuilt measure to determine the effect of independent variables called as predictors on dependent variable called as criterion. The unstandardised (B) coefficients are the coefficients of the estimated regression model.

The beta coefficient tells you how strongly the independent variables is associated with the dependent variable. It is equal to the correlation between the two variables.

The significance levels less than 5% of the independent variables [Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies] are influential on Adoption of Eco-labelled Building Materials.

Table 5.2 Multiple Regression Analysis of Factors Influencing Adoption of Eco-labelled Products

Variables	**Unstandardised Coefficients**	**Std. Error**	**Standardised Coefficients**	**t**	**Sig.**	**Tolerance**	**VIF**
	B		**Beta**				
(Constant)	8.192	2.163		3.788	<.001		
Awareness of Eco-labelled Products	1.488	0.145	0.426	10.243	<.001	0.631	1.584
Cost Benefits of Eco-labelled Products	-0.068	0.095	-0.028	-0.722	0.031	0.724	1.382
Availability of	-0.727	0.153	-0.2	-4.741	<.001	0.616	1.624

Eco-labelled Products							
Professional Experience and Expertise	0.565	0.094	0.254	6.011	<.001	0.612	1.635
Government Regulatory Policies and Incentives	0.525	0.081	0.292	6.473	<.001	0.536	1.866
Marketing Strategies	0.312	0.087	0.157	3.61	<.001	0.577	1.734

The tolerance of more than 5% and Variance Inflation Factor(VIF) less than 10 indicates that the effect of independent variables on dependent variable can be determined effectively. VIF is a measure of multicollinearity in the set of multiple regression variables. When VIF less than 10, It can be further revealed as there is no multicollinearity.

5.10 Factor Analysis to determine Cost Benefits of Eco-labelled Products

Factor Analysis has been used to classify the components determine Cost Benefits of Eco-labelled Products. Factor analysis was employed to summarise the components that determine Cost Benefits of Eco-labelled Products.

5.10.1 Factor Analysis to determine Cost Benefits of Eco-labelled Products classified two factors as follows:

Factor 1 :

- Higher initial cost is a significant barrier to adoption of eco-labelled products.
- Eco-labelled products have high initial costs..

Factor 2

- Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.
- Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.
- Operational cost savings of eco-labelled products outweigh the initial costs..

The factors are renamed determine Cost Benefits of Eco-labelled Products as follows:

Factor 1 – Initial Cost Factors

Factor 2 – Savings Factors

From the Factor analysis it states that Initial Cost Factors and Savings Factors are highly significant in contributing to determine Cost Benefits of Eco-labelled Products.

5.10.2 Factor Analysis to determine Professional Experience and Expertise

Factor Analysis has been used to classify the components determine Professional Experience and Expertise. Factor analysis was employed to summarise the components that determine Professional Experience and Expertise.

Factor Analysis to determine Professional Experience and Expertise classified two factors as follows:

Factor 1 :

- My professional background helps me make informed decisions about specifying or using eco-labelled products.
- Trainings or workshops on eco-labelled products helps me specify or use them

more effectively.

- I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.

Factor 2

- My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.
- I actively re-evaluate new options when specifying or using new categories of eco-labelled products..

The factors are renamed determine Professional Experience and Expertise as follows:

Factor 1 – Usage Factors

Factor 2 – Stakeholders Factors

From the Factor analysis it states that Usage Factors and Stakeholders Factors are highly significant in contributing to determine Professional Experience and Expertise.

5.10.3 Factor Analysis to determine Government Regulatory Policies and Incentives

Factor Analysis has been used to classify the components determine Government Regulatory Policies and Incentives. Factor analysis was employed to summarise the components that determine Government Regulatory Policies and Incentives.

Factor Analysis to determine Government Regulatory Policies and Incentives classified two factors as follows:

Factor 1 :

- Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials.
- Presence or absence of government policies influences my decision to specify or use eco-labelled products.
- Supportive policies or incentives can increase the adoption of eco-labelled products.
- Current Government policies are effective in promoting the adoption of eco-labelled products.

Factor 2

- Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.
- Priority in procurement for Ecolabelled products helps increase their usage.
- Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.
- Mandatory usage of Ecolabelled products in projects promotes their adoption.

The factors are renamed determine Government Regulatory Policies and Incentives as follows:

Factor 1 – Subsidy Factors

Factor 2 – Awareness Factors

From the Factor analysis it states that Subsidy Factors and Awareness Factors are highly significant in contributing to determine Government Regulatory Policies and Incentives.

5.10.4 Factor Analysis to determine Marketing Strategies

Factor Analysis has been used to classify the components determine Marketing Strategies. By using Factor Analysis, Factor analysis was employed to summarise the components that determine Marketing Strategies.

Factor Analysis to determine Marketing Strategies classified two factors as follows:

Factor 1 :

- I consider testimonials or reviews before specifying or using any eco-labelled products.
- I have specified or used/purchased eco-labelled products because of marketing campaigns.
- I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials..

Factor 2

- I feel product manufacturers effectively communicate the benefits of eco-labelled

products.

- I am confident about the claims made by manufacturers regarding eco-labelled products..

The factors are renamed determine Marketing Strategies as follows:

Factor 1 – Testimonials Factors

Factor 2 – Benefits Factors

From the Factor analysis it states that Testimonials Factors and Benefits Factors are highly significant in contributing to determine Marketing Strategies.

5.10.5 Factor Analysis for Adoption of Eco-labelled Building Materials and effectiveness

Factor Analysis has been used to classify the components for Adoption of Eco-labelled Building Materials and effectiveness. Factor analysis was employed to summarise the components that determine Adoption of Eco-labelled Building Materials and effectiveness.

Factor Analysis to determine Adoption of Eco-labelled Building Materials and effectiveness classified two factors as follows:

Factor 1 :

- Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.
- Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.
- Technological innovations in eco-labelled products reveal substantial cost savings.
- Effective demand-supply management enhances the availability and usage of eco-labelled products.
- Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.
- Public outreach through marketing campaigns influences the adoption of eco-labelled materials.

Factor 2

- Highlighting the environmental benefits makes eco-labelled products more attractive.

- Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products.
- Eco-labelled certifications for products enhance their credibility and encourage the adoption.
- Special incentives for manufacturers can help reduce costs, enhancing the adoption.
- Mechanisms to address specification and application issues increase the adoption of eco-labelled products.
- Favourable government policy promoting eco-labelled products enhances their adoption.

The factors are renamed for Adoption of Eco-labelled Building Materials and effectiveness as follows:

Factor 1 – Training Factors

Factor 2 – Environmental Factors

From the Factor analysis it states that Training Factors and Environmental Factors are highly significant in contributing for Adoption of Eco-labelled Building Materials and effectiveness.

Table 5.3 - Summary table of Factor Analysis for Government Regulatory Policies and Incentives and Adoption of Eco-labelled Building Materials and effectiveness

Item Description	Factor 1	Factor 2
Cost Benefits of Eco-labelled Products	Initial Cost Factors	Savings Factors
Professional Experience and Expertise	Usage Factors	Stakeholders Factors
Government Regulatory Policies and Incentives	Subsidy Factors	Awareness Factors
Marketing Strategies	Testimonials Factors	Benefits Factors
Adoption of Eco-labelled Building Materials and effectiveness	Training Factors	Environmental Factors

5.11 Hypothesis testing

5.11. 1 - Hypothesis 1

The hypothesis testing using Chi Square test found significance level less than 5% to reject the null hypothesis. It can be inferred that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai. The highest value of Chi-Square value has been observed for Favourable government policy promoting eco-labelled products enhances their adoption as 665.875. The second highest value has been observed for Public outreach through marketing campaigns influences the adoption of eco-labelled materials as 628.375. The third highest value of Chi Square has been observed for Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials as 553.475.

It can be further analysed that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai have been summarised as Favourable government policy promoting eco-labelled products enhances their adoption, Public outreach through marketing campaigns influences the adoption of eco-labelled materials and Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.

5.11.2 - Hypothesis 2

The hypothesis testing using Kolmogorov Smirnov Test revealed significance level less than 5% to reject the null hypothesis. It can be inferred that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

The highest value of Kolmogorov Smirnov Value has been observed for Overall cost savings of eco-labelled products are better compared to non-eco-labelled products as 6.326. The second highest value has been observed for Operational cost savings of eco-labelled products outweigh the initial costs as 6.113. The third highest value has been observed for Higher initial cost is a significant barrier to adoption of eco-labelled products as 5.702.

It can be further revealed that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai can be summarised as Overall cost savings of eco-labelled products are better compared to non-eco-labelled products, Operational cost savings of eco-labelled products outweigh the initial costs and Higher initial cost is a significant barrier to adoption of eco-labelled products.

5.11.3 - Hypothesis 3

The hypothesis testing using Kolmogorov Smirnov Test revealed significance level less than 5% to reject the null hypothesis. It can be inferred that the ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors.

The highest value of Kolmogorov Smirnov Value has been observed for Improved availability of eco-labelled products would increase their adoption in my projects as 7.217. The second highest value has been observed for Availability of eco-labelled products significantly influences my decision to specify or use them as 6.247. The third highest value has been observed I am confident that eco-labelled products will be consistently available for my projects as 5.851.

It can be further revealed that ease of availability and accessibility of Eco-labelled products can be summarised as Improved availability of eco-labelled products would increase their adoption in my projects, Availability of eco-labelled products significantly influences my decision to specify or use them, and I am confident that eco-labelled products will be consistently available for my projects.

5.11.4 - Hypothesis 4

The hypothesis testing using Chi-Square Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products

among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for Priority in procurement for Ecolabelled products helps increase their usage as 321.02. The second highest value has been observed for Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products as 312.56. The third highest value of Chi Square has been observed for Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as 264.7.

It can be further analysed that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as Ecolabelled products helps increase their usage, Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products and Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.

5.11.5 - Hypothesis 5

The hypothesis testing using Kolmogorov Smirnov Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

The highest value of Kolmogorov Smirnov Value has been observed for I regularly collaborate or consult with other professionals before specifying or using eco-labelled products as 7.358. The second highest value has been observed for I actively re-evaluate new options when specifying or using new categories of eco-labelled products as 7.165. The third highest value has been observed for Trainings or workshops on eco-labelled products helps me specify or use them more effectively as 7.108.

It can be further revealed that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region can be summarised as I regularly collaborate or consult with other professionals before specifying or using eco-labelled

products, I actively re-evaluate new options when specifying or using new categories of eco-labelled products and Trainings or workshops on eco-labelled products helps me specify or use them more effectively.

5.11.6 - Hypothesis 6

The hypothesis testing using Chi-Square Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for I consider testimonials or reviews before specifying or using any eco-labelled products as 408.875. The second highest value has been observed for I feel product manufacturers effectively communicate the benefits of eco-labelled products as 280.525. The third highest value of Chi Square has been observed for I have specified or used/purchased eco-labelled products because of marketing campaigns as 229.075.

It can be further analysed that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as I consider testimonials or reviews before specifying or using any eco-labelled products, I feel product manufacturers effectively communicate the benefits of eco-labelled products and I have specified or used/purchased eco-labelled products because of marketing campaigns.

5.12 Structural Equation Modelling (SEM) for Adoption of Eco-labelled Building Materials

The dependent variable for this study is

Adoption of Eco-labelled Building Materials [AD]

The independent variables or exogenous variables for this study are as follows:

IV is a latent variable consists of

Awareness of Eco-labelled Products [AW]

Cost Benefits of Eco-labelled Products [CB]

Availability of Eco-labelled Products [AV]

The moderating variables for this study are as follows:

MV is a moderating variable consists of

Professional Experience and Expertise [PE]

Government Regulatory Policies and Incentives [GR]

Marketing Strategies [MS]

5.13 Inference for unstandardised estimates for Adoption of Eco-labelled Building Materials

The values AW, CB, AV, PE, GR and MS are the unstandardised estimates which indicates Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies respectively. To estimate the influence of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies on Adoption of Eco-labelled Building Materials, standardised coefficients are taken into consideration.

5.14 Inference for standardised estimates for Adoption of Eco-labelled Building Materials

The highest values of standardised estimates have been observed for AW(.70), AV(.62) and CB(.54) in the latent variable [IV]. It shows that Awareness of Eco-labelled Products is highly influential followed by Availability of Eco-labelled Products and Cost Benefits of Eco-labelled Products.

The highest values of standardised estimates have been observed for GR(.72), PE(.70), and MS(.64) in the moderating variable [MV]. It shows that Government Regulatory Policies and Incentives, is highly influential followed by Professional Experience and Expertise and Marketing Strategies.

The value on AD (.57) indicates the variance of the dependent variable Adoption of Eco-labelled Building Materials. It shows that 57% of the total variance in the dependent variable has been explained by all the independent variables[Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products] and moderating variables Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies].

Hence from all the model estimates like Absolute fit, Incremental fit and Parsimonous fit, it can be revealed that SEM model is suitable for predicting the influence of independent variables[Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products] and moderating variables [Professional Experience, Expertise, Government Regulatory Policies and Incentives and Marketing Strategies] to determine Adoption of Eco-labelled Building Materials.

Chapter 6

Recommendations and Suggestions

Chapter 6 – Recommendations and Suggestions

Based on the insights drawn from a diverse and experienced key stake holders i.e. Architects, Builders and Contractors across the Mumbai Metropolitan Region, the findings reveal a compelling convergence of awareness, intent, and systemic gaps in the adoption of eco-labelled building materials. While the data underscores growing confidence in availability, strategic value, and long-term cost benefits, it also surfaces persistent barriers—ranging from initial cost concerns to limited policy clarity and fragmented and stakeholder engagement.

This chapter comprising of Recommendations and Suggestions, translates those empirical signals into actionable recommendations, designed not only to address current adoption challenges but to catalyse a shift in mindset, infrastructure, and institutional support.

6.1 Recommendations

The empirical insights from this study reveal that the adoption of eco-labelled building materials in the Mumbai Metropolitan Region (MMR) is hindered not only by cost and awareness but by systemic inertia, fragmented supply chains, and a lack of localised institutional support.

While global literature offers broad prescriptions—such as policy incentives, certification schemes, and consumer education—these remain insufficiently granular and largely disconnected from the realities of Indian urban construction.

The recommendations are designed to fill that void. They are not extrapolated from existing frameworks but emerge directly from the behavioural, operational, and regulatory gaps identified in this study.

The following recommendations further categorised into Awareness & Engagement, Capacity Building, Policy & Regulatory Recommendations, Institutional & Market Infrastructure, Financial Incentives are designed to accelerate mainstream acceptance while aligning environmental goals with commercial viability.

Awareness & Engagement

6.1.1 Implement Stakeholder-Specific Engagement Strategies for Eco-Labelling Adoption

This recommendation proposes differentiated engagement formats based on stakeholder type and experience level.

• Senior Architects & Engineers: Invite-only roundtables, legacy showcases, recognition platforms

• Mid-Level Project Managers & Site Engineers: Technical workshops, costing dashboards, compliance guides

• Early-Career Professionals & Gen Z Entrants: Gamified learning, fellowships, digital badges

• Contractors & Suppliers: On-site clinics, vernacular training, WhatsApp updates

• Builders: ROI calculators, testimonial campaigns, marketing toolkits

• Policy Makers & Regulators: Policy labs, co-designed briefs, regulatory mapping tools

Why it's unique: This recommendation introduces a role-specific outreach approach tailored to urban construction stakeholders—an area that remains relatively underexplored in existing studies.

6.1.2 Deploy Digital Technologies to Enhance Transparency and Traceability

Use technology to verify certification status, material provenance, and performance metrics—building trust across the value chain.

• Tools include blockchain, QR codes, and real-time dashboards

• Enables on-site verification and digital audit trails

• Supports informed decision-making for professionals and clients

Why it's unique: While digital procurement has been discussed in prior literature, the application of tech-enabled traceability specifically for eco-labelled construction materials presents a comparatively novel direction.

6.1.3 Initiate an MMR-Wide Eco-Labelling Literacy and Appreciation Campaign

Cultivate informed enthusiasm across Mumbai's construction ecosystem by showcasing the value, credibility, and long-term benefits of eco-labelled materials.

• Targets developers, contractors, and end-users

• Uses multi-format outreach: workshops, media, testimonials, and digital content

• Positions eco-labelling as a mark of excellence and future-readiness

Why it's unique: The concept of a region-specific campaign aimed at generating demand-side pull for eco-labelled materials appears to be limited in existing research, particularly within urban Indian contexts.

6.1.4 Position Eco-Labelled Buildings as Preferred Assets for Global Occupiers

Promote eco-labelled buildings as premium assets for multinational tenants and investors.

• Create a public registry of certified buildings

• Highlight certification in real estate marketing and investment platforms

• Align with ESG reporting and tenant sustainability preferences

Why it's unique: The linkage between eco-labelling visibility and global occupier preferences in urban India is not prominently addressed in the reviewed literature, offering a fresh perspective.

Capacity Building

6.1.5 Embed Eco-Label Literacy into Technical Higher Education Curriculum

Integrate eco-labelling principles into architecture, engineering, and urban planning academic syllabus / programs to build a future-ready talent pipeline.

• Covers certification logic, sustainability standards, and material evaluation

• Delivered via modules, electives, and industry-led seminars

• Aligns academic training with evolving market and regulatory expectations

Why it's unique: Although sustainability education is widely emphasised, the structured integration of eco-labelling frameworks within formal curricula remains insufficiently articulated.

6.1.6 Develop a Green Specification Fellowship for Early-Career Professionals

A fellowship program should embed young professionals into certified green projects for hands-on learning.

• One-year placements with mentorship, certification training, and publication opportunities

• Sponsored by municipal bodies and industry associations

• Fellows contribute to sustainability audits and material evaluations

Why it's unique: The proposal of immersive fellowship models contextualised for

urban construction ecosystems represents an emerging and relatively untapped approach.

6.1.7 Develop Sector-Specific Eco-Labelling Roadmaps with Prioritised Adoption Targets

Tailor eco-labelling strategies to high-impact sectors such as commercial real estate, public infrastructure, and hospitality.

• Define sector-specific benchmarks and timelines

• Align with industry associations and regulatory bodies

• Use pilot projects to demonstrate feasibility and ROI

Why it's unique: Existing literature largely treats eco-labelling as sector-neutral; the identification of targeted pathways for priority sectors adds a differentiated layer of applicability.

Policy & Regulatory Recommendations

6.1.8 Integrate Eco-Labelling Metrics into Development Control Regulations (DCR)

Mumbai's DCR governs land use, building height, and setbacks—but lacks any mandate for sustainable material usage. This recommendation proposes the inclusion of a "Green Specification Clause" that requires a minimum percentage of eco-labelled materials in new constructions above a defined threshold.

• Applies to commercial, institutional, and high-rise residential projects

• Includes exemptions for heritage and low-income housing

• Compliance tracked digitally during plan approvals

Why it's unique: The integration of eco-labelling metrics within municipal Development Control Regulations (DCR) frameworks appears to be a relatively unexplored policy intervention.

6.1.9 Mandate Sustainability Disclosure in Public Tender Documents

To normalise eco-labelled usage, public infrastructure projects should require bidders to disclose sustainability metrics in their tender submissions.

• Metrics include percentage of eco-labelled materials, lifecycle cost estimates, and certification status

• Bonus points awarded for exceeding minimum thresholds

• Post-construction audits to verify compliance

Why it's unique: Mandatory sustainability disclosures within municipal tendering processes, particularly in the Indian context, are not extensively reflected in current academic discourse.

6.1.10 Standardise Eco-Labelling Criteria Across Certifying Bodies

Develop a harmonised framework to reduce confusion, enable comparability, and streamline procurement decisions.

• Defines core sustainability benchmarks and performance metrics

• Enables cross-recognition between national and regional labels

• Facilitates integration into municipal compliance systems

Why it's unique: The recommendation for standardisation across certifying bodies to harmonise eco-labelling frameworks addresses a gap related to fragmentation, which is not comprehensively addressed in existing studies.

6.1.11 Establish a National Framework for Independent Auditing of Eco-Labelled Materials

Create a third-party audit system to validate claims, ensure compliance, and reinforce credibility.

• Audits cover certification integrity, lifecycle performance, and supplier transparency

• Managed by an independent body with regional chapters

• Findings feed into public dashboards and procurement platforms

Why it's unique: Despite concerns around greenwashing and trust deficits, the idea of a structured national audit framework for eco-labelled materials is not prominently featured in prior research.

6.1.12 Integrate Eco-Labelling into Energy Conservation and Sustainability Building Code (ECSBC)

Amend ECSBC to include material-level sustainability criteria and certification benchmarks.

• Define thresholds for eco-labelled material usage

• Align with national building performance standards

• Enable integration into compliance audits and approvals

Why it's unique: The integration of eco-labelling within ECSBC as a material-specific compliance pathway offers a relatively new lens for regulatory alignment.

6.1.13 Introduce Disincentives for Non-Green Materials via Taxation and Compliance Penalties

Use fiscal and regulatory levers to discourage use of non-certified materials.

• Higher GST rates or cess on non-compliant materials

• Mandatory reporting and penalties for false sustainability claims

• Link disincentives to lifecycle emissions and embodied carbon

Why it's unique: While incentives are commonly discussed, the introduction of a dual-track system combining both incentives and disincentives provides a more balanced and less explored policy mechanism.

Institutional & Market Infrastructure

6.1.14 Establish a Municipal Eco-Labelling Facilitation Cell (MEFC)

A localised facilitation cell embedded within BMC would provide real-time support to developers, architects, and contractors navigating eco-labelled procurement.

• Functions include material vetting, certification guidance, and compliance assistance

• Staffed by sustainability experts, urban planners, and legal advisors

• Operates as a one-stop interface between municipal regulations and market practices

Why it's unique: The concept of a city-level facilitation cell dedicated to eco-labelled materials represents a practical institutional innovation that is not widely documented..

6.1.15 Launch a Centralised Marketplace for Eco-Labelled Building Products

A digital marketplace tailored to Mumbai's construction ecosystem would streamline access, comparison, and procurement of eco-labelled products.

• Product listing by certification type, supplier verification, and lifecycle cost comparison tools

• Real-time updates on pricing, availability, certification status, and supplier ratings

• Designed for architects, contractors, developers, and procurement officers

Why it's unique: The proposal for a city-level, certification-filtered marketplace for eco-labelled materials introduces a structured procurement interface that appears to be limited in current literature.

6.1.16 Launch a Mumbai Metropolitan Region Green Materials Index (MGMI)

Inspired by financial indices, the MGMI would rank eco-labelled materials based on performance, cost-efficiency, and user feedback.

• Updated quarterly with input from certified users and third-party audits

• Includes lifecycle cost data, carbon footprint scores, and supplier transparency ratings

• Accessible via a public dashboard with search and comparison features

Why it's unique: The development of a dynamic, region-specific index for eco-labelled building materials reflects an advanced analytical approach that is not extensively covered in prior studies.

6.1.17 Launch State and Municipal Green Procurement Missions

Drive eco-labelled adoption through public procurement mandates at state and municipal levels.

• Embed eco-labelling thresholds in public works tenders

• Create procurement dashboards and compliance tracking tools

• Incentivise local sourcing of certified materials

Why it's unique: Sub-national procurement missions focused specifically on eco-labelled materials introduce a decentralised governance mechanism that remains relatively unexplored.

<u>Financial Incentives</u>

6.1.18 Integrate Green Finance Instruments to Accelerate Eco-Labelled Adoption

Establish partnerships with financial institutions from both public and private sectors to create concessional loans and sustainability-linked credit lines and green bonds which will support projects that have received certification.

• Establish financing thresholds linked to certification thresholds, lifecycle performance metrics and third-party audit results.

• Municipalities should introduce and use green bonds to finance public projects which utilise materials that are Ecolabelled certified.

• Develop ESG reporting standards to attract investment from institutional investors and real estate funds.

• Establish a green finance registry to monitor green finance activities and investor participation.

Why this is Unique : This recommendation uniquely aligns green finance instruments with urban sustainability frameworks, establishing a linkage between fiscal mechanisms, capital markets, and eco-labelling systems—thereby positioning eco-labelled construction materials within an emerging investment narrative.

6.1.19 Offer Green Transition Grants to Small and Medium Enterprises (SMEs)

A targeted grant program can support SMEs—especially contracting companies and developers—transitioning into eco-labelled materials by subsidising initial costs and offering technical assistance.

- Grants capped at ₹25 lakh per project, disbursed in phases.
- Eligibility based on turnover, project sise, and sustainability commitment.
- Includes mentorship from certified green building professionals.

Why it's unique: The focus on SME-specific grants for eco-labelled material adoption in urban India addresses a segment that has received comparatively limited targeted attention.

6.1.20 Offer Property Tax Rebates to End-Users of Eco-Labelled Construction

To incentivise adoption among homeowners and building occupants, municipal bodies should offer property tax rebates for structures that meet defined eco-labelling thresholds.

- Rebates scaled by certification level and percentage of eco-labelled materials used.
- Applicable to new constructions and verified retrofits.
- Integrated into municipal billing systems for automatic eligibility tracking.

Why it's unique: While fiscal incentives for energy efficiency exist, the linkage of property tax benefits specifically to eco-labelled material usage introduces a relatively novel demand-side incentive.

6.1.21 Mandate Corporate Green Procurement Disclosure in ESG Filings

Require companies to report eco-labelled procurement volumes and targets in sustainability reports.

- Aligns with SEBI's BRSR framework and global ESG norms.
- Encourages voluntary targets and third-party verification.
- Enables benchmarking of industry progress and investor visibility.

Why it's unique: The inclusion of procurement-level disclosures within ESG reporting frameworks for the construction sector is not yet widely articulated in Indian academic or policy discussions.

The recommendations are grouped into five categories — Awareness & Engagement, Capacity Building, Policy & Regulatory, Institutional & Market Infrastructure, and Financial Incentives.

- **Awareness & Engagement** → directly ties to Awareness of Eco-labelled Products (5.5)
- **Capacity Building** → ties to Professional Experience & Expertise (5.1)
- **Policy & Regulatory Recommendations** → ties to Government Regulatory Policies & Incentives (5.2)
- **Institutional & Market Infrastructure** → ties to Adoption Drivers (5.4) and Marketing Strategies (5.3)
- **Financial Incentives** → ties to Cost Benefits (5.6)

Table 6.1 - Recommendation Framework for Eco-Labelled Building Material Adoption in Mumbai Metropolitan Region

Recommendation Category	No.	Recommendation Title	Strategic Lever
Awareness & Engagement	6.1.1	Implement Stakeholder-Specific Engagement Strategies for Eco-Labelling Adoption	Role-based outreach
	6.1.2	Deploy Digital Technologies to Enhance Transparency and Traceability	Trust & traceability
	6.1.3	Initiate an MMR-Wide Eco-Labelling Literacy and	Public awareness

		Appreciation Campaign	
	6.1.4	Position Eco-Labelled Buildings as Preferred Assets for Global Occupiers	Market signalling
Capacity Building	6.1.5	Embed Eco-Label Literacy into Technical Higher Education Curriculum	Future workforce
	6.1.6	Develop a Green Specification Fellowship for Early-Career Professionals	Professional immersion
	6.1.7	Develop Sector-Specific Eco-Labelling Roadmaps with Prioritised Adoption Targets	Sectoral targeting
Policy & Regulatory Recommendations	6.1.8	Integrate Eco-Labelling Metrics into Development Control Regulations (DCR)	Planning compliance
	6.1.9	Mandate Sustainability Disclosure in Public Tender Documents	Procurement reform
	6.1.10	Standardise Eco-Labelling Criteria Across Certifying Bodies	Certification harmonisation

	6.1.11	Establish a National Framework for Independent Auditing of Eco-Labelled Materials	Accountability & governance
	6.1.12	Integrate Eco-Labelling into Energy Conservation Building Code (ECBC)	Code-level integration
	6.1.13	Introduce Disincentives for Non-Green Materials via Taxation and Compliance Penalties	Regulatory pressure
Institutional & Market Infrastructure	6.1.14	Establish a Municipal Eco-Labelling Facilitation Cell (MEFC)	Localised support
	6.1.15	Launch a Centralised Marketplace for Eco-Labelled Building Products	Procurement access
	6.1.16	Launch a Mumbai Metropolitan Region Green Materials Index (MGMI)	Performance benchmarking
	6.1.17	Launch State and Municipal Green Procurement Missions	Public sector leadership
Financial Incentives	6.1.18	Integrate Green Finance Instruments	Capital market alignment

		to Accelerate Eco-Labelled Adoption	
	6.1.19	Offer Green Transition Grants to Small and Medium Enterprises (SMEs)	Cost barrier removal
	6.1.20	Offer Property Tax Rebates to End-Users of Eco-Labelled Construction	Homeowner incentives
	6.1.21	Mandate Corporate Green Procurement Disclosure in ESG Filings	Private sector accountability

6.2 Suggestions

The empirical findings from this study reveal a nuanced and underexplored terrain of professional attitudes, systemic barriers, and behavioural patterns surrounding eco-labelled building materials in the Mumbai Metropolitan Region (MMR).

While global literature has extensively discussed sustainability in construction, it remains largely theoretical, policy-centric, or Western-focused. What is conspicuously absent is a set of practice-led, region-specific suggestions that emerge from the lived experiences of professionals operating in dense, regulatory-complex urban environments like Mumbai.

This section presents such suggestions—original, actionable, and grounded in the realities of MMR's construction ecosystem. The suggestions mentioned herein aim to empower stakeholders bridging regulatory ambition with market readiness and aligning sustainability with strategic advantage.

Marketing & BTL Engagement

6.2.1 Introduce "Eco-Labelling Scorecards" in Client Presentations

Professionals in the study indicated that client preferences often override sustainability considerations. Literature discusses consumer awareness but does not propose scorecards as persuasive tools during client engagement.

• A standardised visual scorecard showing environmental impact, lifecycle cost, and health benefits.

• Used during client presentations to compare conventional vs. eco-labelled options.

• Designed for non-technical audiences to facilitate informed decision-making.

Why it's unique: This recommendation introduces a behavioural intervention at the client-professional interface—an aspect that remains underrepresented yet highly relevant in developer-driven urban markets..

6.2.2 Create a "Green Materials Loyalty Program" for Repeat Specifiers

No literature reviewed proposes incentive structures for professionals who consistently specify eco-labelled materials. The study shows that peer recognition and habit formation play a role in adoption.

• Points earned for each certified specification, redeemable for training, certifications, or industry events.

• Leaderboards published monthly to foster healthy competition.

• Managed by a consortium of manufacturers and certifying bodies.

Why it's unique: The application of behavioural economics principles to reward sustainable decision-making represents an emerging approach not extensively embedded in existing sustainability frameworks.

6.2.3 Host "Green Material Hackathons" for Cross-Disciplinary Innovation

Literature discusses academic-industry collaboration but does not propose hackathons as a format for material innovation. The study highlights the need for fresh thinking and cross-functional collaboration.

• 48-hour events bringing together architects, engineers and data scientists.

• Focused on solving real-world challenges in eco-labelled material adoption.

• Winning ideas funded for pilot implementation in Mumbai projects.

Why it's unique: This participatory innovation model encourages collaborative problem-solving in sustainability, offering a perspective that extends beyond traditional top-down approaches.

6.2.4 Gamify Sustainability Through a Professional Leaderboard

Behavioural nudges can be powerful. A digital leaderboard ranking professionals based on their eco-labelled project portfolio, certifications earned, and sustainability workshops attended can foster healthy competition.

• Monthly updates with badges, rankings, and social media integration.

• Categories for architects, engineers, developers, and contractors.

• Sponsored by industry bodies and featured in trade publications.

Why it's unique: The use of gamification as a strategy for engaging professionals in sustainable construction practices appears to be relatively underexplored in current literature..

6.2.5 Launch "Green Champion" Social Media Campaigns

While literature discusses sustainability branding, it does not propose influencer-style storytelling tailored to construction professionals. The study reveals that visibility and peer validation drive adoption.

• Short-form video profiles of architects, engineers, and contractors leading eco-labelled projects.

• Distributed via LinkedIn, Instagram, and WhatsApp groups.

• Includes testimonials, project walkthroughs, and certification journeys.

Why it's unique: This visibility-driven intervention leverages social proof and aspirational positioning, introducing a behavioural dimension that is not widely emphasised in sustainability studies.

6.2.6 Showcase Eco-Labelled Projects in Developer Sales Collateral

The study reveals that sustainability credentials are rarely featured in brochures, walkthroughs, or advertisements. Literature discusses green building ratings but not their integration into marketing.

• Include eco-labelling scorecards, certification logos, and lifecycle cost benefits in sales material.

• Train sales teams to communicate sustainability value to prospective buyers.

• Use QR codes linking to certification dashboards and audit summaries.

Why it's unique: The recommendation bridges the gap between technical certification systems and consumer-facing communication, an interface that remains insufficiently developed in existing research.

Trust & Transparency Tools

6.2.7 Create a "Material Confidence Index" for Eco-Labelled Products

Existing literature discusses environmental product declarations and third-party certifications, but none propose a confidence index that quantifies trustworthiness based on user feedback, performance history, and transparency metrics. The study reveals moderate confidence in manufacturer claims, suggesting a need for a tool that bridges perception and data.

• The index would be updated quarterly based on feedback from certified professionals.

• It would include dimensions like durability, cost-effectiveness, post-installation performance, and compliance history.

• Hosted on a public dashboard, it would allow side-by-side comparison of products.

Why it's unique: The concept of a dynamic, user-informed confidence metric for eco-labelled materials emerges as a response to trust deficits and represents a relatively new evaluative approach.

6.2.8 Launch a Dedicated Eco-Labelled Products App with Embedded Certification Filters

Current literature on digital procurement overlooks the need for region-specific platforms that prioritise sustainability. The study highlights that professionals in the Mumbai Metropolitan Region often rely on informal, fragmented procurement channels. A purpose-built app exclusively showcasing eco-labelled building materials can bridge this gap.

• Embedded filters for certification type, product category, and compliance status.

• Real-time updates on pricing, availability, and certification validity.

• Push notifications for newly certified products, price drops, and regulatory changes.

Why it's unique: The proposed app transforms informal procurement practices into structured, sustainability-aligned decision-making processes, reflecting a context-specific innovation

On-Site & Localised Support

6.2.9 Establish "Green Material Clinics" in Construction Hubs

While literature advocates for workshops and training, it does not suggest on-site advisory clinics embedded within construction zones. The study shows that professionals often lack real-time support when specifying materials.

• These clinics would be staffed by sustainability experts and material scientists.

• They would offer drop-in consultations, product demos, and specification assistance.

• Located in high-density construction zones like Thane, Navi Mumbai, and Andheri.

Why it's unique: This hyper-local, service-oriented intervention addresses the need for real-time, context-sensitive guidance—an aspect not extensively captured in prior frameworks.

Capacity Building & Experimentation

6.2.10 Develop a "Specification Sandbox" for Experimentation

Professionals in the study expressed hesitation in specifying eco-labelled materials due to lack of familiarity and fear of performance failure. Literature discusses pilot projects but does not propose sandbox environments where professionals can experiment without commercial risk.

• A digital platform simulating real-world conditions for material testing.

• Includes virtual walkthroughs, cost simulations, and performance modelling.

• Allows professionals to "specify" materials in a risk-free environment before actual procurement.

Why it's unique: The integration of gamification with simulation techniques introduces a hybrid engagement model that aligns well with industry risk dynamics, yet remains relatively unexplored in sustainability discourse.

Table 6.2 Suggestions Framework for Eco-Labelled Building Material Adoption in Mumbai Metropolitan Region

Suggestion Category	No.	Suggestion Title	Strategic Lever
Marketing & BTL Engagement	6.2.1	Introduce "Eco-Labelling Scorecards" in Client Presentations	Behavioural nudge in client-professional interface

	6.2.2	Create a “Green Materials Loyalty Program” for Repeat Specifiers	Incentive structure rewarding sustainable habits
	6.2.3	Host “Green Material Hackathons” for Cross-Disciplinary Innovation	Participatory innovation and collaboration
	6.2.4	Gamify Sustainability Through a Professional Leaderboard	Professional engagement via gamification
	6.2.5	Launch “Green Champion” Social Media Campaigns	Visibility-led peer validation and storytelling
	6.2.6	Showcase Eco-Labelled Projects in Developer Sales Collateral	Integrating sustainability credentials into marketing
Trust & Transparency Tools	6.2.7	Create a “Material Confidence Index” for Eco-Labelled Products	User-informed trust and performance benchmarking
	6.2.8	Launch a Dedicated Eco-Labelled Products App with Embedded Certification Filters	Structured procurement with certification filters
On-Site & Localised Support	6.2.9	Establish “Green Material Clinics” in Construction Hubs	Hyper-local advisory and real-time support

Capacity Building & Experimentation	6.2.10	Develop a “Specification Sandbox” for Experimentation	Risk-free digital simulation for material testing

Chapter 7
Limitations of the Study

Chapter 7 - Limitations of the Study

While this study offers a pioneering exploration into the adoption of eco-labelled building materials within the Mumbai Metropolitan Region (MMR), it is essential to acknowledge the inherent limitations that frame its scope, methodology, and generalizability. These limitations do not diminish the value of the findings; rather, they contextualize the insights and underscore the need for cautious interpretation and further inquiry.

7.1 Geographic Specificity

The study is deliberately focused on MMR—a region characterized by high-density urban development, complex regulatory environments, and unique socio-economic dynamics. While this specificity allows for rich, localized insights, it also constrains the applicability of findings to other regions.

- Cities like Bengaluru, Delhi, or Chennai may exhibit different adoption behaviours due to variations in climate, governance, and market maturity.
- Rural or semi-urban areas, where construction practices are informal and eco-labelling awareness is minimal, fall outside the purview of this research.

The findings should not be generalized to the national level without further comparative studies. This limitation also highlights the absence of region-specific literature in India, which the study begins to address.

7.2 Sample Composition and Professional Predisposition

The study primarily surveyed architects, engineers, and developers—professionals who are directly involved in material specification and procurement. While this focus is intentional, it introduces a bias by excluding other stakeholders such as:

- Contractors and site supervisors who influence on-ground material choices.
- Clients and end-users whose preferences often override professional recommendations.
- Manufacturers and suppliers who shape availability and pricing.

The perspectives captured may reflect aspirational or idealized views rather than the full spectrum of decision-making dynamics. This limitation also underscores the need for multi-stakeholder studies in future research.

7.3 Absence of Longitudinal Data

The study captures a snapshot of current attitudes and practices but does not track changes over time. Given that sustainability adoption is often gradual and influenced by evolving regulations, market trends, and technological advancements, a longitudinal approach would provide deeper insights.

- For example, the impact of upcoming green building mandates or shifts in material pricing could significantly alter adoption patterns.
- Behavioural change among professionals may take years to manifest, especially in legacy-driven sectors like construction.

The study offers a static view, which limits its ability to predict future trends or assess the long-term impact of interventions.

7.4 Limited Engagement with Policy Makers and Certifying Bodies

While the study references existing policies and certification frameworks, it does not include direct input from government officials or representatives of eco-labelling agencies. This omission is due to access constraints and the study's focus on practitioner perspectives.

- As a result, the analysis of regulatory gaps and policy visibility is based on secondary data and professional perceptions.
- The absence of institutional voices may lead to incomplete understanding of policy intent and implementation challenges.

The policy-related findings should be interpreted as practitioner-facing rather than institutionally validated. This limitation also points to a broader disconnect between policy formulation and on-ground adoption—a theme that the study uniquely surfaces.

7.5 Underrepresentation of Informal Construction Sector

Mumbai's construction landscape includes a significant informal sector, especially in slum redevelopment, small-scale housing, and peri-urban expansion. These segments often operate outside formal procurement channels and regulatory oversight.

- The study's sample does not include informal builders or contractors.
- Eco-labelling is virtually absent in these contexts, making them difficult to study using conventional methods.

The findings may overrepresent formal sector dynamics and understate the challenges of mainstreaming eco-labelled materials in informal settings. This limitation also highlights a critical research gap in sustainability studies.

7.6 Temporal Constraints and Market Fluidity

The study was conducted during a specific time window, and the construction market is subject to rapid changes due to:

- Fluctuations in raw material prices.
- Shifts in government policy (e.g., budget allocations, urban renewal schemes).
- Technological disruptions (e.g., AI-based procurement tools, modular construction).

Some findings may become outdated as market conditions evolve. This limitation reinforces the need for periodic updates and adaptive research methodologies.

7.7 Final Reflection

These limitations are boundaries that define the scope of a pioneering inquiry. By acknowledging them, the study maintains academic integrity and sets the stage for future research. More importantly, these limitations reveal the unmapped terrain of eco-labelled material adoption in Indian cities—a space where the study makes a first-of-its-kind contribution.

Chapter 8

Scope for Further Study

Chapter 8 - Further Scope of Studies

The present study offers a regionally grounded, practice-led exploration into the adoption of eco-labelled building materials within the Mumbai Metropolitan Region (MMR). It reveals a complex interplay of professional attitudes, systemic constraints, and behavioural patterns that shape sustainability decisions in urban construction. While the findings and recommendations provide actionable insights for policy and industry, they also expose several underexplored areas that merit deeper investigation to support broader transformation across India's built environment.

To guide future inquiry, the scope of studies may be organised across five strategic dimensions: cross-geography, cross-background, cross-experience, behavioural decision-making, and policy design and implementation. These lenses enable comparative, inclusive, and longitudinal research—capturing regional diversity, stakeholder complexity, and evolving professional mindsets. They also offer pathways to decode how sustainability choices are made and how institutional frameworks can better support adoption, thereby strengthening the evidence base for scalable, context-sensitive interventions.

8.1 Cross-Geography: Expanding Beyond Mumbai

The current study focuses exclusively on MMR—a dense, regulation-heavy, and professionally mature urban cluster. However, India's urban landscape is highly diverse, with cities and regions exhibiting distinct governance models, market dynamics, climatic conditions, and professional cultures. Future studies should explore eco-labelled material adoption across geographies to:

- Compare adoption drivers and barriers in Tier 1, Tier 2, and peri-urban contexts.
- Analyse the influence of state-level building codes, procurement norms, and incentive schemes.
- Map regional variations in supply chain maturity, certification awareness, and material availability.
- Study the role of climate-responsive design and vernacular architecture in shaping sustainability choices.

Such cross-geographic inquiry would enable the development of scalable yet locally adaptable frameworks—positioning Mumbai as a reference model while allowing for contextual customisation across India's metropolitan clusters.

8.2 Cross-Background: Diversifying Stakeholder Perspectives

The present study primarily engages with architects, builders, and contractors operating in formal construction settings. The material specification process which organisations use to select materials requires multiple organisations to participate in the process.

Future studies should expand the stakeholder lens to include:

- Informal builders and contractors who work on slum redevelopment and low-income housing projects.
- Site supervisors and procurement officers and project managers who make decisions during project implementation.
- Clients and end-users whose preferences often override professional recommendations.
- Manufacturers and suppliers and certifying bodies who control product availability and pricing and market distribution.
- Educators and students and early-career professionals who study and practice sustainability.

The study will achieve its goals by combining the experiences of the stakeholders from diverse backgrounds to discover new research insights, test current ecosystems dynamics and thereby create a complete framework for adoption of Ecolabelled products.

8.3 Cross-Experience: Capturing Temporal and Generational Shifts

Sustainability transitions are not static—they evolve over time, shaped by regulatory changes, market trends, technological innovations, and generational shifts in professional values. The current study offers a snapshot of attitudes and behaviours, but future research should explore:

- Longitudinal tracking of adoption behavior across different career stages.
- Comparative studies of early-career professionals vs mid-career and senior practitioners.

- Analysis of how exposure to sustainability education influences specification choices over time.
- Monitoring the impact of new policies, certifications, and incentive schemes on professional practices.
- Studying the role of mentorship, peer networks, and professional recognition in shaping norms.

This cross-experience lens would provide a dynamic understanding of how sustainability mindsets are formed, reinforced, or challenged across time and career trajectories.

8.4 Behavioural Economics in Construction Decision-Making

The study surfaces hesitation, trust deficits, and peer influence as key behavioural factors—but these remain under-theorised. Future research can build on this by exploring:

- How cognitive biases like risk aversion, status quo bias, and decision fatigue affect specification behavior.
- The role of social proof, testimonials, and peer validation in shaping professional norms.
- Effectiveness of behavioural nudges such as loyalty programs, scorecards, and gamified leaderboards.
- Impact of framing—whether sustainability is positioned as a burden or a strategic advantage—on client persuasion and team alignment.
- Generational shifts in mindset, and how mentorship accelerates sustainability adoption among younger professionals.

By decoding the psychology of specification, future research can move beyond technical and regulatory levers—toward interventions that are emotionally resonant, behaviourally intelligent, and professionally relevant.

8.5 Eco-Labelling Governance and Regulatory Design

The study highlights the importance of policy frameworks in shaping adoption—but also reveals gaps in integration, enforcement, and institutional capacity. Future research can explore:

- Comparative analysis of India's eco-labelling systems (e.g., GREENPRO, ECOMARK,GREEN GUARD) in terms of credibility, effectiveness, and alignment with municipal priorities.
- Integration of eco-labelling metrics into Development Control Regulations (DCR), building codes, and public tendering processes.
- Design and modelling of incentive schemes such as property tax rebates, transition grants, and procurement mandates.
- Institutional readiness of municipal bodies to implement green mandates, provide technical assistance, and monitor compliance.
- Creation of iterative policy models that incorporate practitioner feedback, pilot learnings, and adaptive governance mechanisms.

By examining eco-labelling through a regulatory lens, future research can help build frameworks that are not only well-intentioned but also implementable, scalable, and responsive to market and professional realities.

The current study lays a strong foundation for understanding eco-labelled material adoption in Mumbai. Yet, it also reveals the vastness of the terrain—geographically, professionally, behaviourally, and institutionally. The further scope of studies outlined above is not just an academic roadmap; it is a strategic invitation to deepen inquiry, design smarter interventions, and build bridges between policy ambition and market readiness.

By embracing cross-geography, cross-background, and cross-experience lenses—alongside behavioural and regulatory insights—future research can move beyond isolated pilots and fragmented policies toward a cohesive, evidence-based framework for sustainable construction in India. The journey from awareness to adoption is complex, but with structured inquiry and collaborative effort, it can be accelerated, mainstreamed, and made irreversible.

Chapter 9
Conclusion

Chapter 9: Conclusion

9.1 Introduction

This study investigated the perceptions of Architects, Builders, and Contractors regarding the adoption of eco-labelled products in the Mumbai Metropolitan Region (MMR). The construction sector is central to India's economic development but also contributes significantly to environmental degradation. Eco-labelled products provide an important pathway for embedding sustainability. Their adoption, however, depends not only on technical feasibility but also on how stakeholders perceive their value, relevance, and role in practice.

This chapter synthesises the study's findings, connects them to six key perceptual and behavioural theories, and reflects on implications for individuals, firms, society, and India's broader sustainability commitments.

9.2 Why This Study Was Essential

The relevance of this study lies at three levels:

1. Academic contribution – Most eco-label research has focused on consumer goods. By applying six perceptual theories to the construction sector, this study extends understanding into B2B contexts, where decision-making is complex and multi-stakeholder.

2. Practical urgency – India's commitment to Net Zero 2070 requires transformative shifts across all sectors. Construction will play a decisive role. Eco-labelled products are central to aligning projects with sustainable outcomes. The Government of India's proposed Climate/Green Finance Taxonomy will classify activities as Tier 1 (directly climate-supportive, e.g., insulation, waterproofing, energy-efficient products) and Tier 2 (indirectly supportive, e.g., adhesives, finishes, coatings). This framework will shape procurement and finance, underscoring why stakeholder readiness is essential.

3. Societal importance – Construction choices today will impact future generations. Without a clear understanding of perceptions and adoption barriers, India risks delaying its transition towards sustainable development pathways.

9.3 Theoretical Integration

The study drew upon six perceptual and behavioural theories, which collectively illuminate ecolabel adoption in MMR:

Theory Principle Relevance in Findings

1. Gestalt Theory (Koffka, 1935) Perception is holistic; people interpret patterns, not isolated details. Stakeholders viewed ecolabels as overall quality and trust signals rather than narrow technical features.
2. Perceptual Defense (Postman et al., 1948) People resist information that threatens existing priorities. Contractors often downplayed ecolabel relevance when deadlines and costs dominated.
3. Signal Theory (Spence, 1973) Labels reduce information asymmetry by acting as credible signals. Builders used recognised ecolabels as selling points, especially in premium projects.
4. Information Processing Theory (Bettman, 1979) Decisions depend on awareness, recall, and comprehension. Architects exposed to seminars and supplier campaigns showed stronger adoption intent.
5. Theory of Planned Behaviour (Ajzen, 1991) Behaviour depends on attitudes, norms, and perceived control. Architects held positive attitudes, norms increasingly favoured sustainability, but contractors perceived limited control.
6. Social Perception Theory (Heider, 1958; Bruner, 1957) Perceptions are shaped by roles and interactions. Architects acted as sustainability champions, influencing builders and contractors to adopt eco-labelled products.

These perspectives confirm that challenges are perceptual and systemic rather than technological.

9.4 Stakeholder Realities: Divergent Priorities

The study revealed that while awareness of ecolabels is growing, priorities diverge:

1. Architects acted as torchbearers of sustainability, driving the push for eco-labelled products and guiding builders and contractors.

2. Builders and developers balanced reputation and cost, using ecolabels strategically for premium positioning but prioritising affordability in mass-market projects.

3. Contractors focused on deadlines and efficiency, generally complying with directives but rarely initiating ecolabel use on their own.

This divergence underscores that ecolabel adoption is influenced by hierarchies, incentives, and market dynamics across the construction ecosystem.

9.5 Silver Linings: Pathways to Progress

Despite challenges, several positive signals were observed:

1. Younger architects and professionals showed stronger ecological awareness and commitment.
2. Builders in premium projects increasingly recognised ecolabels as tools for differentiation and reputation-building.
3. Contractors indicated willingness to adopt eco-labelled products when guided by architects or supported by incentives.
4. Importantly, mainstreaming ecolabel adoption directly supports India's Net Zero 2070 vision and complements long-term strategies like Viksit Bharat.

These silver linings demonstrate that while adoption is currently uneven, the potential for acceleration is substantial under supportive institutional and professional conditions.

9.6 Broader Contributions and Generational Imperative

This study makes contributions at multiple levels:

1.Individuals and firms: It shows how ignoring ecolabels in favour of short-term cost savings can compromise competitiveness and credibility.

2.Future generations: It frames ecolabel adoption as an ethical and intergenerational responsibility, ensuring that ecological debt is not passed forward.

3. India as a nation: By aligning micro-level perceptions with macro-level frameworks such as Net Zero 2070, Viksit Bharat, and the Green Finance Taxonomy (Tier 1 and Tier 2 classification), this study underscores how ecolabel adoption integrates local practices with global commitments.

Ecolabelling is thus not peripheral but a strategic national imperative.

9.7 Validation of Recommendations

The recommendations in the preceding chapter are validated by this study's findings. They are practical, evidence-based, and commensurate with stakeholder realities, offering actionable strategies for policymakers, manufacturers, and practitioners.

9.8 Final Reflections

This research has shown that ecolabel adoption in MMR is constrained less by availability of technology and more by perceptions, competing priorities, and systemic incentives. Yet it has also revealed how architects are leading adoption, builders selectively engage and contractors follow professional guidance.

By applying six perceptual theories, grounding findings in empirical realities, and linking them with India's sustainability commitments, this study provides a robust academic and practical framework.

Ultimately, eco-labelling must be recognised not as an administrative formality but as a strategic compass for sustainable development—a tool to harmonise economic growth, ecological stewardship, and intergenerational responsibility, while advancing India's Net Zero 2070 and Viksit Bharat vision.

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Annexures

Questionnaire

Questionnaire on Ecolabelled Products

Personal Information

Name :

Designation :

Organisation Name :

Email ID :

Professional Role : □ Architect / Specifier □ Builder / Building Owner □ Contractor

Professional Experience : □ Less than 5 years □ 5-10 years □ 10-15 years □ More than 15 years

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1. What is your primary source for getting information on eco-labelled products? (Select all that apply)

☐ Industry Exhibitions & Events ☐ Training conducted by Rating agencies ☐ Online resources ☐ Colleagues & Peers ☐ Manufacturers Marketing Campaign

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Q2. Have you specified or used eco-labelled products in your projects?

☐ Yes ☐ No ☐ Not Sure

Q3. Indicate your opinion or agreement on the following statements

[1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree]

Question / Statement	**1**	**2**	**3**	**4**	**5**
Specifying or using eco-labelled products provides a competitive advantage to my organisation.					
Eco-labelled products improve my project's sustainability profile.					
Eco-labelled products are essential for achieving my project's sustainability goals.					

Q4. Indicate your opinion or agreement on the following statements

[1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree]

Question / Statement	1	2	3	4	5
Eco-labelled products have high initial costs.					
Higher initial cost is a significant barrier to adoption of eco-labelled products.					
Operational cost savings of eco-labelled products outweigh the initial costs.					
Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.					
Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.					

Q5. Indicate your opinion or agreement on the following statements

[1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree]

Question / Statement	1	2	3	4	5
Eco-labelled products are as readily available as non-eco-labelled alternatives.					
Availability of eco-labelled products significantly influences my decision to specify or use them.					
I am confident that eco-labelled products will be consistently available for my projects.					
Improved availability of eco-labelled products would increase their adoption in my projects.					

Q6. Which measures do you take to ensure that supply disruptions do not hamper your projects? (Select all that apply)

☐ Maintain buffer stock ☐ Source from multiple suppliers

☐ Establish long-term supplier contracts ☐ Use alternative brands

☐ Use non-eco-labelled products ☐ Request timeline extensions with clients

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Q7. Indicate your opinion or agreement on the following statements

[1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree]

Question / Statement	1	2	3	4	5
My professional background helps me make informed decisions about specifying or using eco-labelled products.					
I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.					
Trainings or workshops on eco-labelled products helps me specify or use them more effectively.					
I actively re-evaluate new options when specifying or using new categories of eco-labelled products.					
My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.					

Q8**.** Are you aware of any existing government policies that promote the usage of eco-labelled products?

☐ Yes ☐ No ☐ Not Sure

Q9**.** Indicate your opinion or agreement on the following statements

[1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree]

Question / Statement	1	2	3	4	5
Presence or absence of government policies influences my decision to specify or use eco-labelled products.					
Supportive policies or incentives can increase the adoption of eco-labelled products.					
Current Government policies are effective in promoting the adoption of eco-labelled products.					
Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials.					
Mandatory usage of Ecolabelled products in projects promotes their adoption.					
Priority in procurement for Ecolabelled products helps increase their usage.					

Question / Statement	1	2	3	4	5
Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.					
Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.					

Q10. Indicate your opinion or agreement on the following statements

[1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree]

Question / Statement	1	2	3	4	5
I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials.					
I consider testimonials or reviews before specifying or using any eco-labelled products.					
I have specified or used/purchased eco-labelled products because of marketing campaigns.					
I am confident about the claims made by manufacturers regarding eco-labelled products.					
I feel product manufacturers effectively communicate the benefits of eco-labelled products.					

Q11. What percentage of your total projects have you specified or used eco-labelled products?

☐ 0-10% ☐ 11-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

Q12. Indicate your opinion or agreement on the following statements

[1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree]

Question / Statement	1	2	3	4	5
Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.					
Public outreach through marketing campaigns influences the adoption of eco-labelled materials.					

Question / Statement	1	2	3	4	5
Effective demand-supply management enhances the availability and usage of eco-labelled products.					
Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.					
Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.					
Technological innovations in eco-labelled products reveal substantial cost savings.					
Highlighting the environmental benefits makes eco-labelled products more attractive.					
Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products.					
Favourable government policy promoting eco-labelled products enhances their adoption.					
Mechanisms to address specification and application issues increase the adoption of eco-labelled products.					
Special incentives for manufacturers can help reduce costs, enhancing the adoption.					
Eco-labelled certifications for products enhance their credibility and encourage the adoption.					

Q13. How likely are you to adopt more eco-labelled products in the future?

☐ Very Unlikely ☐ Unlikely ☐ Neutral ☐ Likely ☐ Very Likely

Q14. What motivates you to adopt eco-labelled products in your projects? (Select all that apply)

☐ Client Demand ☐ Cost Savings ☐ Rating Compliance ☐ Environmental Benefits

☐ Competitive Advantage ☐ Internal Sustainable Guidelines / Policy

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Green Buildings: Importance to the Key Stakeholders

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Abstract: The Green Building can be defined as a structure which is sensitive to the natural resources, uses less energy, has a lesser waste generation, and simultaneously provides a better and healthier environment to the occupants. Green buildings on all the above parameters are better than the orthodoxly designed buildings. Green Buildings have been quite instrumental in leading the way of Sustainable living and developing sustainable habitats.

Considering the ongoing global climate crisis, green buildings have certainly proved its mettle to reduce the negative impact on the environment. Although there are volumes spoken about the efficacy of the Green Buildings seldom important stake holders such as the occupants, (buyers), designers, developers take efforts to be fully aware of the importance the Green Buildings and about the well laid out designing process.

The paper gives important insights on) how the Green Buildings are sensible from business sense and b) how they have a positive impact on the key stake holders and, the actual reason they should either demand or construct Green Buildings, else the engagement with Sustainability will merely boil down to "Green washing".

Keywords: Green Buildings, Stakeholders, Green benefits, Green Economy.

1] Introduction

The advent of the Green Building solved multiple problems ~ made buildings more sustainable, responsible and environment friendly and at the same time retaining the modernity.

In context to India, the fist Green Building came up in Hyderabad which was the CII Sohrabji Green Business Centre. It achieved the highest Platinum rating which gave a tremendous motivation to multiple stake holders paving the way for Green Building Rating system in India.

Initially with a small area of just 2000 sq. mtr, the Green Buildings have now crossed almost 9 billion sq. ft with more than 6000 plus projects fully functional in India. This is considered as major milestone as it was achieved in a span of just over 21 years.

Various State governments and municipal corporations have further started offering sops and incentivize Green Buildings by the way of extra FAR / FSI.

Due to which multiple types of buildings have adopted the Green Building rating such as Hotels, Hospitals. Mass Transit, Industrial, Educational, and even large Exhibitions centres

2] Statement of Problem

With such an encouraging figure of 10 billion sq. ft. of Green Spaces and overall increment in penetration of the Green Building movement, there is still a lot of scope of penetration of designing buildings which are environmentally friendly or green. We are at the tip of the iceberg and if we compare the overall construction happening pan India vis a vis the buildings which are Green, we have a lot of tasks to be undertaken. The overall acceptability has to enhance, for which the concerns or drivers for adoption are fully addressed and understood.

The paper identifies the key stake holders, the role they play in the Green Buildings ecosystem and their approach / outlook towards the Green Buildings. The paper attempts to understands the inertia of these stakeholders, towards embracing the Green Buildings with more zest.

The outcomes of the paper will help prospective product suppliers / manufacturers to address the concern of the key stakeholders by knowing their drivers of adoption and position their services and products complimenting the drivers.

3] Green Building Ratings System in India

Energy Conservation Building Code (ECBC), National Building Code, and standards and guidelines set by rating programs such as Leadership in Energy and Environmental Design-India (LEED-India), Indian Green Building Council (IGBC), TERI - GRIHA, and other similar certifications and energy efficiency bureaus all combine to create India's Green Building Code (BEE). The National Building Code (NBC) provides basic and general recommendations for energy efficient buildings, but these are recommendations only.

A] Indian Green Building Council (IGBC)

The Confederation of Indian Industry (CII) launched the Green Building Campaign in 2001. The Indian Green Building Council (IGBC) was established when the CII-Sohrabji Godrej Green Business Center Building in Hyderabad became the first green building in

India to receive the prestigious and coveted LEED Platinum rating from the United States Green Building Council (USGBC) it was done. Not only that, but it also became his first LEED platinum building in the world. IGBC provides 30+ ratings to accommodate various building envelope types.

B] United States Green Building Council (USGBC)

The US Green Building Council (USGBC) developed LEED (Leadership in Energy and Environmental Design). Buildings implement strategies independently validated by LEED, an internationally recognized green building certification methodology, to improve performance on indicators such as resource use, carbon emissions reduction and indoor environmental quality. should be adopted. We use the Green LEED benchmark index adopted by over 57 countries. In India, most builders, developers, architects and end-users have accepted and approved his LEED standards for both core or shell structure construction and building interiors.

With 6 rating systems, USGBC is the foremost rating system offered in India.

C] GRIHA (Green Rating for Integrated Habitat Assessment) by TERI (The Energy and Resources Institute):

Developed jointly by the Ministry of New and Renewable Energy and TERI (The Energy and Resources Institute), the Integrated Habitat Rating Green Rating was adopted by the Government of India in 2007 as a national green building rating system. It outlines the basic requirements of green buildings in relation to the given standards.

Griha has 10 variants as a part of their portfolio offering.

D] GEM (Green & Ecofriendly Movement):

The "GEM Sustainability (Green) Certification Program" was introduced by ASSOCHAM in 2017 with the aim of promoting the design and construction of environmentally friendly green buildings. BEE ECBC 2017 and NBC 2016 form the basis of the GEM Sustainability Certification Program. We aim to address the sustainability of specific developments through design, construction, and operation.

GEM is the new entrant in the rating system and offers an easy to comprehend 7 nos. of ratings.

4] Key Stake holders and their roles.

There are 4 key stake holders in the ecosystem from concept till continued maintaining of the building envelope.

These stakeholders have their very own reasons to be affiliated with Green Buildings. It's essential to first understand the role these individuals play in the complete cycle and why the Green Buildings are relevant to them.

The key stakeholders who drive the ecosystem are as follows,

1. Building Owners or Developers

2. Specifiers (Architects / Service Consultancy firms)

3. Product Manufacturers

4. Building Occupants

1. Building Owners or Developers

These are the entities who either create habitats for their self-consumption or for other corporates or individual use. These buildings can be Residential, Commercial properties or even factories.

Typically, the driving force for BO/D is driven by Cost Economics for sustainability along with the environment, society and culture.

Drivers for adoption- The typical trigger is the commercial viability and ROI. The catalysts are incentives or concessions given either by Local Self Government or State / Central ministries.

Taking the cue for the drivers and making Cost economics as a pivotal point, we need understand the understated reason for adoption that actually should be.

Actual Reason for adoption- Research conducted across various demographics have suggested that the green buildings or buildings with better sustainability credentials enjoy increased marketability. This definitely offsets the perceived higher costs, while in reality Green Buildings do not cost more than 5-10% over conventional buildings.

2. Specifiers (Architects / Service Consultancy firms)

Specifiers which comprise of Architects and Service consultancy firms together conceive the external and internal look along with the functionality aspect of the of the building envelope.

They are very critical element in the ecosystem ~ since they design and recommend using type of functional and aesthetics materials which adds immense value to the overall marketable value of the Building Envelope.

Drivers for adoption – Practice as you preach – Since specifiers can influence the product selection, they will tend to recommend environmentally sustainable product which can offer a more holistic advantage.

3. Product Manufacturers

Product Manufacturers globally are racing to develop and offer better products which can bring in more value to their end customers. Over a period of time there have been multi-fold increase in product offering of technologically superior products which again have a limelight life till such time a new product is offered by other manufacturer. This leads to either faster obsolescence or becomes commoditise.

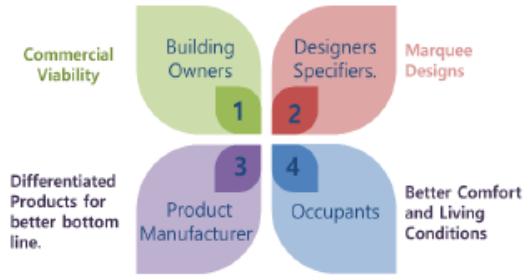
Drivers for adoption – In order to be relevant in the business and simultaneously ensure they also contribute to ESG governance, large organisation ensure they offer environmentally sustainable products or even use it.

4. Building Occupants

The litmus test of the Green Building efficacy is the level of differentiated comfort the occupants observe and feel. The occupants may not be concerned about the CAPEX financial implications, in case they are the tenants, but will would be more concerned OPEX. Green buildings clearly demonstrate:

- That they use less energy and water, lowering long-term operating and maintenance costs.
- The Design and construction methodologies result in lower running costs at higher rents, resulting in faster payback periods.
- They can have indirect benefits in terms of space renovation and retrofit costs, in addition to lower operating costs.

Drivers for adoption- The way a green building is designed has a positive impact on worker productivity and occupant health and wellbeing, resulting in improved bottom line of the businesses.



5. Conclusion

The paper took into consideration the "hard" aspect of taking into account Green Building ~ the economic aspects, which has been a major driver for most of the stakeholders.

In addition to Life Cycle Assessment costs, most literature searches focus on environmental aspects of sustainability, such as energy consumption, water impact, greenhouse gas emissions, and their technical solutions.

There exists a scope to enhance the awareness and the benefits of Green Buildings to various stake holders, with respect to Indian scenario in a structured manner, amongst the people not only in Tier 1 cities but dripping down to Tier 2 and Tier 3 cities, which are eventually getting urbanised and hence the need of the depleting resources will be straining ecologically and economically.

The process of awareness needs to start from the early stages ~ school / college level and eventually penetrated through relevant government channels to catalyse the process of awareness and the implementation of the Green Buildings.

Green buildings are no more a futuristic optional need, but looking at the current environmental situation and global warming its now a necessity. The more number green buildings come up, the lesser with the depletion of natural resources and more will be the liveability for the mankind.

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MARKETING ECOLABELLED BUILDING MATERIALS: ADDRESSING PERCEPTIONS, CHALLENGES, AND SOLUTIONS IN B2B END-BUYER DYNAMICS

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Abstract

Ecolabelled certification for materials certifies a product to meet specified environmental standards, is the most critical elements for sustainability. The paper examines marketing dynamics in the Ecolabelled building material, with regard to perception, challenges, and solutions in B2B transactions and decision-making of the end-buyer. In this study, the research method used is secondary research, wherein existing literature and industry reports with case studies have been analysed. Major topics in discussion are on definitions and types of ecolabels, marketing strategy, stakeholder perception, difficulties facing marketers, and recommended solution areas. It points to awareness campaigns as key initiative for implementation in combination with cooperation among industry groups, in tandem with marketing aimed at a more appropriate target audience.

Keywords: *Ecolabels, Sustainable Building Materials, Marketing Strategies, B2B Transactions, End-Buyer Perceptions, Environmental Benefits, Cost Sensitivity, Supply Chain Issues, Industry Collaboration, Educational Initiatives.*

1. INTRODUCTION

Ecolabelled products play a significant role in the building material industry in achieving sustainability. Ecolabels are given to products ensuring that they satisfy certain environmental conditions, thus bringing down the carbon footprint of any construction activity (Chan, Qian, & Lam, 2009). The growing sense of environmental consciousness and the need for sustainability has increased demand for Ecolabelled building materials. This paper will look into the dynamics of marketing around Ecolabelled building materials, especially focusing on perceptions, challenges, and solutions in B2B transactions and end-buyer decision-making. The methodology adopted in this study is secondary research, which deals with the analysis of literature available, industry reports, and case studies.

2. OVERVIEW OF ECOLABELLED PRODUCTS AND BUILDING MATERIALS

2.1 Definition of Ecolabels

Global Ecolabelling Network defines Ecolabelling as ~ "Ecolabelling is a voluntary method of environmental performance certification and labelling that is practised around the world. An ecolabel identifies products or services proven to be environmentally preferable within a specific category."

Ecolabels are certifications given to products that meet certain environmental criteria, indicating their sustainability. These labels are crucial in the construction industry as they help identify materials that are environmentally friendly and promote sustainable building practices (Xing, Hewitt, & Griffiths, 2011).

There are three main types of ecolabels:
ISO 14024 features the principles and procedures for selecting product categories, product-environmental criteria, product-function characteristics and for assessing and demonstrating compliance.

ISO has developed a categorisation of voluntary labels into three types are clearly mentioned in the ISO 14020 series of standards.-
-Type I: Voluntary, multiple-criteria based, third-party program that awards a license authorising the use of environmental labels on products (e.g., Green Pro, Energy Star, EU Ecolabel).
- Type II: Self-declared environmental claims made by manufacturers, importers, or distributors (e.g., recyclable or biodegradable labels).

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- Type III: Voluntary programs that provide quantified environmental data based on life cycle assessments (e.g., Environmental Product Declarations).

2.2 Examples of Ecolabelled Materials

Key examples of Ecolabelled building materials include:

1. Green Cement Green cement is low-carbon-emitting cement. It has been created with the intent to minimise the destructive impact that classical cement production generates over the environment. Green cement will use wastes that include fly ash, slag, and silica fume; their inclusion does not only lower the carbon emission that comes from making it but will also strengthen it and increase durability. (Papadopoulos, 2005).

2. Low VOC Paints. These paints emit fewer volatile organic compounds. Such paint is prepared to have a lower concentration of airborne toxins so that the indoor air quality is high with minimal adverse health effects on the occupants. Low VOC paints come in a range of colours and finishes, offering developers and homeowners much scope in terms of variety (Nguyen & Altan 2011).

3. Recycled Materials: Materials made from recycled content, such as recycled steel, plastic, and glass. Using recycled materials in construction helps conserve natural resources, reduce waste, and lower the environmental footprint of building projects. Examples include recycled concrete aggregate, reclaimed wood, and recycled metal roofing (Sandanayake, Zhang, Setunge, & Thilakaratne 2019).

4. Energy-Efficient Insulation: Energy-efficient Insulation: Materials that specifically satisfy energy efficiency criteria in buildings. It keeps the indoor temperature at suitable levels, therefore reducing heat and cooling losses, which leads to the saving of energy bills. Rigid foam insulation from recycled material is another example of this insulation. (Rauf & Crawford 2015).

2.3 Benefits

The use of Ecolabelled materials offers several benefits:

1. Environmental: Lesser carbon footprint and lesser degradation of the environment. When choosing Ecolabelled products, builders are capable of reducing the ecological impacts associated with the construction projects by maintaining the preservation of natural ecosystems as well as greenhouse gas emissions reductions. (Johnstone & Halliday 2016).

2. Economic: There is a possibility of long-term savings in costs with the improved efficiency in energy consumption. While Ecolabelled materials may be expensive upfront, they often lead to huge long-term savings as a result of reduced energy use, lower maintenance costs, and increased property value. (Ahn, Kwon, & Pearce, 2009).

3. Social: Health and wellbeing are assured for occupants through the usage of non-toxic material. Ecolabeled products are associated with lower levels of dangerous chemicals. The indoor air quality is likely to be enhanced with a decreased possibility of health concerns like respiratory conditions and allergic reactions. The usage of sustainable materials would make a house more comfortable and pleasing (Kang & Kim 2021).

3. PERCEPTIONS OF B2B STAKEHOLDERS AND END-BUYERS

Perception is a process where the individual organises sensory inputs along with relevant information to generate an internal image of his surroundings (Kenyon & Sen 2015). The cognitive process impacts how stakeholders perceive choices, which may be the decision-making or the actual behavior about various options.

It is through perception in the construction industry that sustainable practices and materials will be adopted. The likelihood of their use depends on the products being of high quality, cost-effective, and reliability. Perceptions of being technically complex and of having a high initial cost, are some factors that will deter them from their use.

B2B stakeholders, such as builders, contractors tend to evaluate Ecolabelled products on the basis of,

1. Performance : Performance comprises of meeting the laid technical and output or delivery performance. B2B buyers are particular about the product the specifications and at what level they perform. A proper demonstration of the Ecolabelled product meeting the technical parameters and performance, will help build trust and encourage adoption. (Chan et al., 2009).

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2. Price : Price in most of the cases is a decisive factor for procuring a product, especially in an B2B environment, customers take cognisance of the long term advantages wherein they get not only the initial cost saving but also a recurring saving over a period of time. Harping the long term benefits can make the proposition attractive to customer in the long term. (Xing et al., 2011). One feels that sustainable materials are expensive. The end-buyer would be more concerned about possible higher costs when taking an Ecolabelled product. Hence, by marketing and education, those misperceptions can be washed away to change the perception and encourage adoption (Johnstone & Halliday, 2016).

3. Environmental Benefits: Based on sustainability credentials and environmental implications of the materials. B2B stakeholders are increasingly moving toward sustainability in projects, so the environmental benefits of Ecolabelled products are becoming an important consideration in the decision-making process for these stakeholders (Rauf & Crawford, 2015).

4. Lack of availability : Product availability issue deters the stakeholders from adopting the product. If the Ecolabelled products are not available on time , this may increase the project cost overruns, the buyers will immediately shift to generic products. Also, if the choice of products and attributes are limited they may also look out for regular options. Thus, increasing the reach and availability alongwith multiple options, can help overcome the challenge and enhance the adoption of Ecolabelled products. (Darko et al., 2017).

Proper marketing strategies should focus on improving the perceptions related to the above, backed with complimenting education campaigns covering the benefits of the Ecolabelled products, to increase the adoption. (Luthra, Kumar, & Garg, 2015).

5. OVERCOMING PERCEPTION BARRIERS

Right marketing strategies can effectively address misconceptions about the cost and value of Ecolabelled products and help in overcoming the perceptions, which may act as barriers to adoption.

1. Highlighting Long-Term Savings: A proper campaign emphasising the long term benefits and substantiating with a proper content can help the potential stakeholders see beyond the initial costs and will find value in investing sustainable products. (Ahn et al., 2009).

2. Performance Demonstration: Performance is the key for adoption any services and product. Demonstrating key attributes such as durability, efficiency, and effectiveness may dispel doubts and increase confidence in their use (Papadopoulos, 2005).

6. CHALLENGES IN MARKETING ECOLABELLED BUILDING MATERIALS

Inspite of the increase in overall reach of sustainable practices, marketing and adoption of Ecolabelled products still is challenging. Understanding the challenges, is a vital to develop proper strategies for aggressive promotion of Ecolabelled products.

1. Cost Sensitivity: The first challenge is that Ecolabelled products are perceived to be expensive, if we consider only on initial cost basis. However, this can be easily overcome by emphasising the long-term cost savings and allied benefits (Hydes & Creech, 2000). Organisations should develop content in a manner that focuses on financial benefits of using Ecolabeled materials, including lower energy charges, maintenance costs, and tax rebates. They should also include case studies and testimonials of existing customers on why they are satisfied using Ecolabeled products.

2. Awareness Gaps: There is a significant lack of awareness about ecolabels, particularly in emerging markets or smaller businesses. Effective awareness campaigns and educational initiatives are important to bridge this gap (Kang & Kim, 2021). For promoting the benefits of Ecolabelled products , engaging with industry organisations, certification bodies and learning institutions to create information-rich content will be an effective strategy. Training and awareness workshops, webinars and sessions can also be used to increase awareness and appreciation of stakeholders.

3. Product Availability : Product non availability and delay in logistics of Ecolabelled products can be problematic. Steady supply and proper addressing of logistical issues are highly critical for the adoption of these materials on a wider scale (Sandanayake et al., 2019). The marketer should engage with suppliers and distributors to efficiently implement the supply chain so that the availability of Ecolabelled products is sorted out, through local and regional suppliers, This would help in overcoming supply chain disruption and improve overall availability of sustainable materials.

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4. Resistance to Change: Stakeholders resist change due to familiarity bias or reluctance to shift from traditional materials. The demonstration of benefits along with clear evidence of the performance of Ecolabelled materials will help overcome such resistance (Darko et al., 2017). Marketers can utilise targeted messaging to address specific concerns and highlight the advantages of sustainable materials. Showing the success of Ecolabelled products in various projects and providing concrete examples of their benefits can help marketers build trust and encourage stakeholders to adopt sustainable practices.

7. PROPOSED SOLUTIONS AND RECOMMENDATIONS

Ecolabelled marketing needs a different and focussed approach over the regular products, as they are challenging and need multi-pronged approach. The following approaches are suggested which are aimed to streamline the adoption by creating a positive perception about these products.

1. Awareness Programs and Stimulation Activity : Organising engaging and awareness creation workshops, seminars, and other formats of knowledge programs will raise the level of awareness on the advantages of Ecolabelled materials. This is because it is at such interactive events not just promotes learning but also helps them make informed decision through the lens of performance, cost, and environmental impacts of the sustainable building materials and make a choice. Other collaterals such as brochures, videos, and online courses to be created and disseminated for sensitisation and enlightenment of the products.

2. Cost Incentives and Financing Models: Green finance or subsidies can make Ecolabeled materials more attractive as well as viable in the market from the buyers' point of view. For example, government agencies and associations in the industrial sector can give incentives for people adopting sustainable materials including rebates, low-interest loans and tax credits. Furthermore, new financing mechanisms like green bonds or performance-based contracting may be created to reduce the upfront cost of Ecolabelled products and make them accessible to a larger population of consumers and businesses.

3. Strengthening Industry Collaboration : Ecolabelled material supply and credibility can be strengthened through collaboration among manufacturers, certification bodies, and other stakeholders. Collaboration will help the players in the industry develop a common framework of standardised ecolabels, accelerate the certification procedure for sustainable products while ensuring that the quality is uniform. Inter-sectoral collaboration between sectors like construction, manufacturing, and finance will help strengthen the ecosystem, which becomes better integrated and supportive of Ecolabelled material adoption.

4. Data Driven Approach - For devising an effective marketing campaign, the usage of customer data for curating personalised campaigns can help to reach a wider segment of the market. A strong use of data analytics to generate campaigns that speak specifically to the specific needs and wants of different stakeholder groups can be highly effective. For instance, messaging the economic benefits of Ecolabelled products for the eco-conscious buyer or the environmental impact for an eco-conscious consumer. Social media marketing can reach a wider audience faster and build interest in sustainable building materials like reinforced concrete products or steel structures.

8. MARKETING OF ECOLABELLED BUILDING MATERIALS

Marketing is a must for educating stakeholders and marketing the Ecolabelled products. The right marketing strategies can educate people about the benefits of using sustainable materials and increase their adoption in the construction industry. Marketers can influence B2B stakeholders and end-users to choose sustainable options over conventional materials by educating them on Ecolabelled products Manning (2018).

Key Marketing Strategies for B2B and End-Buyers
Different marketing strategies can be used to communicate with B2B stakeholders as well as end-buyers.

1. Education Programmes: Conferences and training workshops to educate stakeholders on the value of Ecolabelled products. These activities can offer very helpful information on performance, cost, and environmental aspects of sustainable building materials, therefore enabling stakeholders to make informed choices (Darko, Chan, & Ameyaw, 2017).

2. Content Marketing: Content marketing involves creating content which highlights the benefits of Ecolabelled products. The content can be in various forms such as vlogs, blogs, articles, whitepapers, research papers and even case studies, which focusses on the advantages of Ecolabelled products and how they contribute positively (Hydes & Creech, 2000)

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3. Digital Media: Digital media is an effective channel for promote a product either on social media platforms, websites, online targeted advertisements etc. Digital media have a proven to be cost effective and faster in reaching out to multitudes of people on creation of awareness and generating interest in Ecolabelled products and further catalyse the adoption (Nguyen & Altan, 2011).

4. Success Stories: Seeing is believing in marketing, is a maxim. Sharing the success stories of executed products and learnings thereof can instil a lot of confidence among the potential stakeholders. Real world success stories inspire quickly and aid in faster adoption (Sandanayake et al., 2019).

9. LIMITATIONS

Despite the many advantages, as well as potential approaches to encouraging Ecolabelled building materials, several limitations need to be considered, for this research paper.

1. Data Limitations: The study mainly relies on secondary data, which might not capture all the nuances and recent developments in the field. Future studies could benefit from primary data collection, including surveys and interviews with industry stakeholders.

2. Regional Differences: Marketing strategies and acceptance of Ecolabelled materials differ significantly between regions. General studies are primarily conducted in this paper, and specific regional studies would be required to adapt the strategy to the regional context.

3. Quickly Changing Market Dynamics: The building material market, as well as the standards in sustainability are continually changing. Findings and recommendations on this paper might call for frequent update for relevance and effectiveness in action.

4. End-User Behavior: It focuses on end-buyer perception, but its focus on the psychology and behavior of consumers is very limited. This area can be explored further by research to have a better idea about the adoption of Ecolabelled materials by end-users.

10. CONCLUSION

Marketing Ecolabelled building materials will be important to the construction industry in terms of sustainability. Challenges and perceptions that need to be overcome can be addressed through marketing strategies. There is a need for education, industry collaboration, and financial incentives to achieve the same. Future studies should focus on other strategies for improving the marketing and adoption of sustainable building materials.

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Embedding Ecolabel Literacy into Technical Higher Education: A Strategic Imperative for Sustainability-Led Transformation

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Abstract: *As sustainability becomes a core driver of regulatory compliance, market differentiation, and environmental accountability, technical education must evolve to equip future professionals with ecolabel literacy. Ecolabels—voluntary certifications denoting environmental performance—are increasingly central to procurement, design, and policy decisions in architecture, civil engineering, and sustainability domains. This paper explores the strategic rationale for integrating ecolabel education into higher education curricula, particularly in India, where regulatory frameworks like Eco-Mark and IGBC Green Pro are gaining traction. Through secondary research and curriculum mapping, the paper identifies pedagogical pathways, institutional benefits, and implementation challenges. It argues that embedding ecolabel literacy fosters regulatory fluency, market readiness, and systems thinking—transforming sustainability from a compliance checkbox into a strategic capability.*

Keywords: Ecolabels, Sustainability Education, Green Certification, Curriculum integration, Architecture Syllabus, Civil Engineering pedagogy, IGBC, Green Pro, Eco-Mark, Regulatory literacy

I. INTRODUCTION

The global shift toward sustainability is reshaping how industries design, build, and certify products and infrastructure. In India, this transformation is accelerated by regulatory mandates, ESG pressures, and consumer demand for environmentally responsible solutions. Technical professionals—architects, engineers, and sustainability consultants—are increasingly expected to navigate ecolabel frameworks such as IGBC, LEED, GRIHA, and Eco-Mark. Yet, higher education curricula remain largely disconnected from these real-world tools.

This paper examines the strategic imperative of embedding ecolabel literacy into technical education. It builds on recent reforms such as India's Eco-Mark Rules 2024, the feasibility study by CLASP, and curriculum case studies from institutions like NIT Trichy and CURAJ. By aligning pedagogy with market and regulatory realities, universities can produce graduates who are not only environmentally aware but also certification-ready and business-impact-ready.

II. ECOLABELS: DEFINITION, CLASSIFICATION, AND STRATEGIC RELEVANCE

Ecolabels are voluntary certifications awarded to products, services, or systems that meet predefined environmental performance criteria across their life cycle. According to the ISO 14020 series, ecolabels are categorized into three types: Type I (third-party verified, multi-criteria labels), Type II (self-declared environmental claims), and Type III (quantified environmental data based on life-cycle assessments) (OECD, 2020). Type I ecolabels are considered the most credible, as they involve independent verification and are based on transparent, science-based standards. These labels serve as shorthand for environmental integrity, helping consumers, regulators, and businesses identify products that minimize ecological harm. Globally recognized examples include the EU Ecolabel, Blue Angel, and Energy Star, while India has developed its own suite of Type I ecolabels to address domestic sustainability goals.

In the Indian context, three prominent Type I ecolabels stand out: Eco-Mark, CII GreenPro, and GRIHA Product Certification. Eco-Mark, administered by the Bureau of Indian Standards (BIS), was India's first ecolabel, covering categories such as packaging, appliances, and construction materials (UN PAGE, 2025). GreenPro, developed by the

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Confederation of Indian Industry (CII) and accredited by the Global Ecolabelling Network (GEN), certifies over 11,000 products across 40 categories, including paints, cement, furniture, and solar modules (CII, 2025). It is widely used in IGBC-rated green buildings and public procurement. Meanwhile, GRIHA Product Certification, managed by the GRIHA Council in collaboration with TERI, evaluates products based on their compliance with GRIHA's green building parameters—such as embodied energy, recyclability, and toxicity—and publishes them in the GRIHA Product Catalogue for use in certified projects (GRIHA Council, 2025). Together, these ecolabels form a robust ecosystem that supports sustainable procurement, regulatory compliance, and market transformation in India's built environment and manufacturing sectors.

2.1 Strategic Functions of Ecolabels

Ecolabels serve as powerful instruments for aligning environmental responsibility with regulatory compliance. In many jurisdictions, including India under the newly notified Eco-Mark Rules 2024, ecolabels are increasingly recognized as proxies for meeting sustainability mandates in public procurement, building codes, and ESG frameworks (UN PAGE, 2025). By certifying that products or processes meet specific environmental criteria—such as reduced emissions, recyclability, or resource efficiency—ecolabels simplify the compliance burden for both producers and regulators. They also help standardize expectations across sectors, enabling smoother approvals and audits. For instance, IGBC and GRIHA certifications are often prerequisites for accessing green building incentives, while Eco-Mark and GreenPro labels are gaining momentum in consumer goods and construction materials (Confederation of Indian Industry [CII], 2025; GRIHA Council, 2025). This regulatory alignment not only reduces risk but also accelerates project timelines by minimizing documentation and verification overheads (OECD, 2020).

Function	Impact Area
Regulatory Proxy	Simplifies compliance with green codes
Procurement Catalyst	Enables pre-validated material selection
Market Differentiator	Enhances brand and project credibility
Systems Thinking Enabler	Links design choices to life-cycle impact

Table 1 – Function and Impact of Ecolabels

Beyond compliance, ecolabels function as strategic market differentiators. In an increasingly sustainability-conscious economy, products and services bearing credible ecolabels enjoy enhanced brand perception, consumer trust, and competitive edge. Third-party verified labels—such as LEED, EU Ecolabel, Eco-Mark, GreenPro, and GRIHA Product Certification—carry weight in influencing procurement decisions and elevating perceived environmental integrity (Chatterjee & Shrivastava, 2021; CII, 2025). In India, the GreenPro ecolabel has seen significant adoption in building materials, enabling manufacturers to access ESG-sensitive clients and government-linked tenders. Moreover, ecolabels foster systems thinking by linking individual product decisions to broader life-cycle impacts, such as carbon footprint, resource intensity, and circularity—thus serving as catalysts for innovation and sustainable transformation (GRIHA Council, 2025; OECD, 2020).

In India, ecolabels are increasingly embedded in government tenders, building codes, and ESG reporting frameworks.

III. CURRICULUM GAP ANALYSIS: INDIA AND GLOBAL BENCHMARKS

Despite India's growing emphasis on sustainability through initiatives like the Eco-Mark Rules 2024 and the Smart Cities Mission, technical education in architecture, civil engineering, and sustainability studies remains largely disconnected from ecolabel frameworks.

One major gap lies in the absence of regulatory literacy within core syllabi. While students may be exposed to environmental science or green design principles, they rarely engage with applied tools like IGBC, GreenPro, or GRIHA Product Certification—despite these being central to real-world project approvals and procurement (UN PAGE, 2025; CII, 2025). This disconnect results in graduates who are environmentally aware but ill-equipped to navigate certification workflows, compliance documentation, or ESG-linked client expectations.

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A second gap is pedagogical fragmentation: ecolabels are often introduced as isolated case studies or electives, rather than embedded across design studios, materials courses, and project management modules. This limits interdisciplinary fluency and prevents students from understanding how ecolabels influence decisions across the building lifecycle (GRIHA Council, 2025).

A third critical gap is the lack of faculty capacity and institutional incentives to teach ecolabel frameworks. Many educators lack exposure to certification processes or industry-aligned sustainability tools, leading to theoretical instruction that fails to prepare students for market realities (Bhatia, 2020). Without structured training or curriculum mandates, ecolabels remain peripheral.

Fourth, India's curriculum design often overlooks global benchmarks where ecolabel literacy is mainstreamed. For example, Germany's vocational education integrates Blue Angel ecolabels into construction modules, while Sweden's polytechnic programs use ecolabels as scaffolds for systems thinking and procurement strategy (GEN, 2024).

In contrast, Indian institutions rarely align with ISO 14024 standards or the Global Ecolabelling Network's training frameworks. This not only hampers international mobility for graduates but also weakens India's positioning in global green supply chains. Bridging these gaps requires a systemic overhaul—embedding ecolabels into curriculum outcomes, faculty development, and accreditation standards.

IV. CURRICULUM INTEGRATION FRAMEWORK

Integrating ecolabel literacy into technical education requires a discipline-specific approach that aligns pedagogical content with real-world sustainability frameworks. In architecture, ecolabels such as IGBC and GRIHA Product Certification can be embedded into materials and building systems courses, enabling students to make design decisions grounded in certified specifications and life-cycle performance (GRIHA Council, 2025).

Civil engineering programs can incorporate ecolabel criteria into construction codes, project management, and procurement modules, preparing graduates to execute projects that meet regulatory and market expectations for sustainability (CII, 2025). Sustainability studies, often interdisciplinary by nature, offer fertile ground for ecolabel integration through policy analysis, environmental impact assessment, and ESG reporting tracks—equipping students with strategic compliance fluency and systems thinking (OECD, 2020).

This mapping ensures that ecolabels are not treated as peripheral knowledge but as embedded decision-making tools across the built environment lifecycle. Global curriculum models, such as those from Stanford's Sustainable Architecture + Engineering program and the University of Melbourne's sustainability mapping in engineering, demonstrate that such integration fosters cross-functional competencies and prepares students for leadership in sustainability-driven markets (Bury et al., 2023; Stanford University, 2025). By aligning ecolabel pedagogy with discipline-specific outcomes, institutions can produce graduates who are not only environmentally literate but also certification-ready and industry-aligned.

Discipline	Module Integration	Target Outcomes
Architecture	Materials & Building Systems	Design aligned with certified specs
Civil Engineering	Construction Codes & Project Management	Execution aligned with ecolabel benchmarks
Sustainability Studies	Policy, Impact Assessment, ESG Reporting	Strategic compliance and certification fluency

Table 2 - Mapping by Discipline

4.2 Pedagogical Tools

Effective integration of ecolabel literacy into technical education demands pedagogical strategies that go beyond rote instruction and foster experiential, interdisciplinary learning. Case-based learning is a cornerstone approach, allowing students to engage with real-world scenarios—such as IGBC-certified campuses or GreenPro-labeled products—to analyze sustainability decisions through the lens of ecolabel criteria (Herreid, 2007; Queen's University, 2025). This method cultivates critical thinking, empathy, and systems awareness by placing learners in decision-making roles.

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Simulation exercises further deepen engagement by enabling students to role-play as consultants, regulators, or procurement officers tasked with applying ecolabel standards to hypothetical projects. These immersive formats mirror industry dynamics and prepare students for ESG-linked roles in the field (Akbulut & Hill, 2020).

Capstone projects offer a culminating opportunity to apply ecolabel frameworks in design, engineering, or policy contexts—requiring students to align their final deliverables with at least one Type I ecolabel such as GreenPro or GRIHA Product Certification (CII, 2025; GRIHA Council, 2025). Additionally, digital tools like life-cycle assessment (LCA) software and ecolabel mapping platforms can be embedded into coursework to simulate certification workflows and environmental impact modeling (OECD, 2020).

These pedagogical tools not only reinforce ecolabel literacy but also foster interdisciplinary collaboration, regulatory fluency, and market-readiness—transforming sustainability education into a strategic capability.

- **Case-Based Learning**: LEED-certified buildings, IGBC-rated campuses
- **Simulation Exercises**: Role-play as auditors, consultants, regulators
- **Capstone Projects**: Mandatory alignment with at least one ecolabel
- **Digital Tools**: Use of LCA software and certification mapping platforms

V. INSTITUTIONAL AND INDUSTRY IMPACT

5.1 Benefits for Universities

Integrating ecolabel literacy into technical education offers universities a strategic opportunity to differentiate their academic brand and align with national sustainability priorities. By embedding frameworks such as GreenPro, IGBC, and GRIHA Product Certification into core syllabi, institutions signal leadership in sustainability pedagogy and responsiveness to evolving market demands (CII, 2025; GRIHA Council, 2025). This curricular innovation enhances employability by producing graduates who are certification-ready and ESG-fluent—traits increasingly sought by industry and government stakeholders.

Moreover, ecolabel integration fosters interdisciplinary collaboration, bridging architecture, engineering, and policy faculties through shared sustainability outcomes (OECD, 2020). Institutions also stand to benefit from ranking incentives, as sustainability-linked metrics gain prominence in accreditation systems like NAAC and QS Stars. According to CLASP's feasibility study, universities that adopt ecolabel-aligned curricula are better positioned to attract research funding, industry partnerships, and global recognition for green innovation (CLASP, 2021). In essence, ecolabel education transforms universities from passive knowledge providers into active enablers of India's green economy transition.

- **Curriculum Differentiation**: Signals leadership in sustainability education
- **Industry Alignment**: Produces graduates ready for ESG and compliance roles
- **Cross-Departmental Synergy**: Bridges design, engineering, and policy silos

5.2 Benefits for Industry

For industry, the integration of ecolabel literacy into higher education creates a future-ready talent pipeline equipped to navigate sustainability-linked procurement, compliance, and innovation. Companies increasingly rely on certifications like GreenPro and GRIHA Product to access government tenders, ESG-sensitive clients, and international markets (UN PAGE, 2025; CII, 2025). Graduates trained in ecolabel frameworks reduce onboarding time, minimize compliance errors, and accelerate project execution—delivering immediate operational value. Additionally, ecolabel-savvy professionals can support product innovation, helping firms design offerings that meet life-cycle performance criteria and circular economy benchmarks (OECD, 2020).

This alignment also strengthens corporate ESG narratives, as companies can credibly demonstrate environmental stewardship through certified products and processes. As ecolabels become embedded in India's regulatory and trade frameworks, industry stands to gain from a workforce that understands not just the technical specifications but the strategic implications of certification. In short, ecolabel education is not just academic—it's a business enabler.

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- **Reduced Onboarding Time**: Graduates familiar with certification workflows
- **Project Efficiency**: Fewer compliance delays and rework
- **Talent Pipeline**: Access to ecolabel-savvy professionals

According to the World Bank, integrating sustainability skills into education is key to future workforce readiness.

VI. CONCLUSION

Ecolabel literacy is no longer optional—it is a strategic necessity. By embedding ecolabel frameworks into technical education, universities can produce professionals who are not only environmentally conscious but also certification-ready and market-relevant. This integration transforms sustainability from a theoretical concept into a practical capability, aligning academia with regulatory, market, and environmental imperatives.

Universities must move beyond elective sustainability modules and embed ecolabel education as a core pedagogical pillar. This shift will position institutions as leaders in sustainability education and produce graduates equipped to drive India's green transformation.

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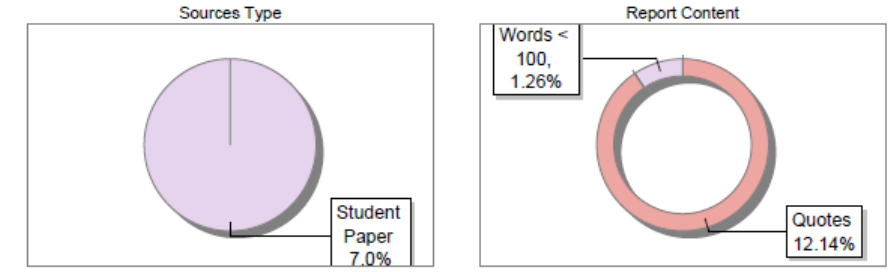

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Ph.D. SYNOPSIS

Perceptions of Architects, Builders, and Contractors about the Adoption of Ecolabelled Products in Mumbai Metropolitan Region

Submitted by:

Mr. Sachin Gupte

Under the guidance of:

Dr. Tejashree Deshmukh

Centre:

Parle Tilak Vidyalaya Association's Institute of Management

(PTVAIM), Mumbai

Submitted to:

University Of Mumbai

For

Degree of Doctor of Philosophy in

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Chapter 1 – Introduction

1. Introduction to Ecolabelling and Eco Labelled Products

Ecolabelling is a well-defined and structured process of verifying, certifying, promoting and catalysing the environmentally friendly practices across various product categories and industries, culminating into a holistic certification for the product.

Global Ecolabelling Network defines Ecolabelling as ~ "Ecolabelling is a voluntary method of environmental performance certification and labelling that is practised around the world. An ecolabel identifies products or services proven to be environmentally preferable within a specific category."

Ecolabelling of building materials offers a promising pathway towards greener construction practices, aligning with India's commitment to sustainable development. (https://www.unep.org/explore-topics/resource-efficiency/what-we-do/responsible-industry/eco-labelling, n.d.)

India, which is a rapidly growing economy, the need for sustainable building materials is paramount, given the escalating environmental challenges. Ecolabelling encourages consumers to choose materials that are more beneficial to the environment and to human wellness and adds to the Green Quotient of the built environment.

1.1 Types of Eco-Labels:

ISO 14024 features the principles and procedures for selecting product categories, product-environmental criteria, product-function characteristics and for assessing and demonstrating compliance.

ISO has developed a categorisation of voluntary labels into three types are clearly mentioned in the ISO 14020 series of standards.

- Type I environmental labelling is for eco-labelling schemes where there are clearly defined criteria for products.
- Type II self-declared environmental claims are for products and services where there are neither criteria nor labelling schemes.
- Type III environmental declarations are for specific aspects of products using a life-cycle approach.

1.2 Benefits of Eco Labelling and its contribution to the Green Buildings

Ecolabelling of building materials holds immense potential to transform the construction sector in India. By encouraging the use of sustainable materials and fostering eco-friendly production practices, ecolabelling can align construction with India's sustainable development goals. The cumulative effect will be a reduced environmental footprint, improved indoor air quality, and a positive influence on public health. As India strives to balance economic growth with environmental responsibility, ecolabelling stands out as a valuable tool for shaping a greener and more sustainable future for the nation.

Benefits of Ecolabelling:

1. Environmental Conservation
2. Consumer Awareness
3. Market Transformation
4. Catalysing Government Initiatives

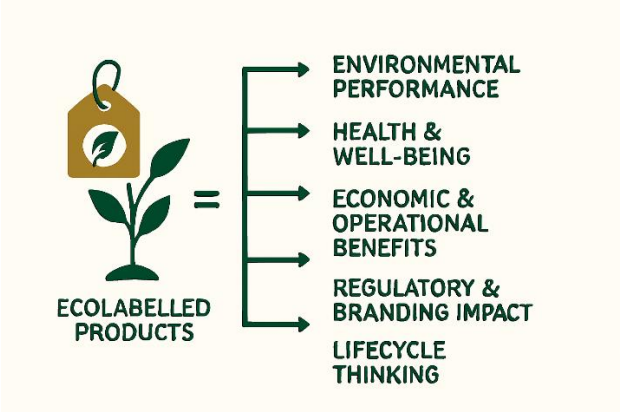

Figure 1.01 – Positive Impact of Ecolabelled Products

1.3 Various Ecolabelling Certifications in India

In India, eco-labelling of building materials focusses on promoting sustainable construction practices and reducing environmental impacts. In India there are 7 popular Ecolabels such as Green Pro, Assocham GEM, BEE, Energy Star, Green Guard, FSC etc.

Green Pro

Assocham GEM

BEE

EcoMark

FSC

Energy Star

GreenGuard

Figure 1.02 – Various Ecolabeling Certifications in India

These agencies play a pivotal role in advancing and catalysing the green quotient of the building by defining and establishing relevant certifying standards and doing a rigorous assessment for the products. The procedures laid out by these agencies are positively contributing to the drive of enhancing the Green Quotient and resource conservation.

Ecolabelled products positively contribute into making a built environment green touching all the important aspects of building in its entire Life cycle such as materials, operations and importantly occupant experience in an holistic manner, making the built environment a true Green Building from an ecosystem perspective.

Ecolabelled products contribute in a holistic way in metamorphosing built environments into Green Buildings.

1.4 Introduction to Green Buildings – Definition and Historical Perspective

"Green building is a holistic concept that starts with the understanding that the built environment can have profound effects, both positive and negative on the natural environment, as well as the people who inhabit buildings every day. Green building is

an effort to amplify the positive and mitigate the negative of these effects throughout the entire life cycle of a building", as per US Green Building Council (Kriss, 2014).

The concept of green buildings has gained significant prominence in India in recent years due to its potential to address critical environmental, economic, and social challenges. With the rapid urbanisation and industrialisation observed in the country, there is an urgent need to adopt sustainable construction and design practices. Green buildings represent a transformative approach to architecture and construction, focusing on minimising resource consumption, reducing environmental impact, and creating healthier living and working environments.

1.5 Advantages of Green Buildings

There are many benefits associated with green buildings that include social, economic, and environmental aspects. The building's environmental impact is reduced, and operational expenses are decreased due to the structural and service design principles.

It is commonly established that using non-toxic materials, biophilic design components, and better indoor air quality all help maintain building inhabitants' health and wellbeing. As a result, workers are more productive, and occupant absenteeism is reduced. To sum up, green buildings provide a comprehensive strategy for sustainable development that benefits society, the economy, and the environment while giving residents healthier and more functional places.

1.6 Green Building Rating Systems and their Footprint

India's commitment to sustainable development is evident through the growing number of environmentally friendly buildings it contains, which reflect efforts to conserve resources and use energy more efficiently.

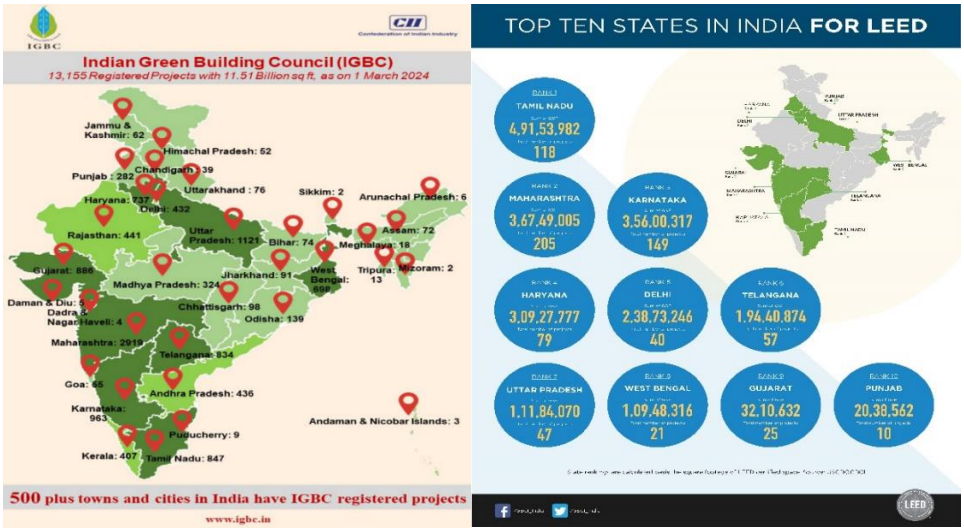

Figure 1.03 : Green Footprint in India as per GRIHA, USGBC and IGBC websites.

The total estimated Green Footprint in India has crossed 14 billion Sq. ft.

*Above figures are from the respective websites of GRIHA (GRIHA, 2016), IGBC (IGBC, 2023), USGBC (Joseph Crea, 2018)

1.7 Key Stakeholders - Definition and Roles

The Key stakeholders are indispensable to the realisation of a building or an infrastructure project. These key stakeholders are responsible for conceptualising and designing, overseeing from inception to completion with ensuring capital outflow and

, alignment with contractors in their precision and expertise to successfully transform the blueprint into an actual piece of construction.

The following section outlines the key stakeholders are and the role they play in the entire ecosystem.

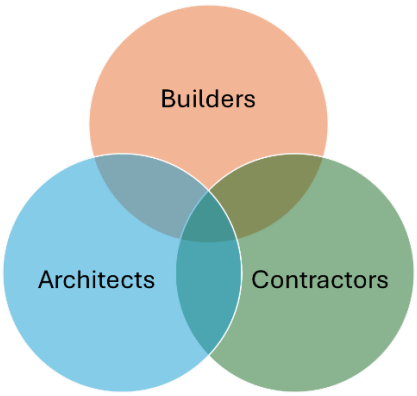

Figure 1.04 – Interconnectivity between various stakeholders

Builders : They are the investors, and typically the decisions are taken from a value for money perspective. They will always give priority to long term value creation and financial sustainability. They can influence the adoption of Eco labelled products and drive demand if they find a "value" in the proposition.

Architects : Architects have a trust from the Builders and Asset owners and play a pivotal role in laying the specifications and selection of type of the building material. The Level of awareness and the perception, influences the design, selection and adoption of Ecolabelled products in their projects. They have a sizeable ability to influence the built environment owners to use the products in the projects. Architects , often work very closely with the Green and HVAC consultants as a team, who assist them in detailed engineering of the project, and hence they are also included as part of this respondent group.

Contractors : Contractors are responsible for executing the projects in time bound manner, their responsibilities include detailed site drawings till final handing over. The procurement of Ecolabelled products is purely influenced with level of awareness and the availability and in proportion to these factors. The incorporation of Ecolabelled products significantly impact project execution efficiency and their reputation

contributing to the overall sustainability index of the built environment.. There are various types of contractors such as Civil contractors, EPC contractors, HVAC and MEP contractors, Turnkey Interior contractors etc, who are executing their works in Mumbai Metropolitan Region.

1.8 Geographical and Economical Significance and Overview of the Mumbai Metropolitan Region (MMR)

Mumbai Metropolitan Region (ISO: Muṁbaī Mahānagara Pradēśa; abbreviated to MMR and previously also known as Greater Bombay Metropolitan Area), is a metropolitan area consisting of Mumbai and its satellite towns in the northern Konkan division of Maharashtra in western India. It comprises of 9 municipal corporations such as of Greater Mumbai, Thane, Kalyan-Dombivli, Navi Mumbai, Ulhasnagar, Bhiwandi-Nizamapur, Vasai-Virar, Mira-Bhayandar, and Panvel and adjoining Municipal Councils consisting of Ambarnath, Kulgaon-Badalapur, Matheran, Karjat, Khopoli, Pen, Uran, Alibaug, and Palghar. The region has an area of 6,328 square kilometres (2,443 sq mi) and with a population of over 26 million it is among the most populous metropolitan areas in the world.

A] Geographical Significance and Overview

MMR has a tropical climate which means it is extremely hot, has wet summers and relatively mild winter months. With rainfall mostly confined between June to September, averaging 2,500 mm it frequently causes waterlogging and flood situations. Climate change has significant implications for the construction sector of MMR. Higher temperatures and increased rainfall aggravate erosion of structures as well as flooding at coasts. Furthermore, increased humidity levels speed up the degradation of materials, thereby increasing maintenance.

Figure 1.05 - Map of MMR (Picture Source – Assetzilla.com)

B] Economic Significance and Overview

The Mumbai Metropolitan Region (MMR) is a significant contributor to India's economy. As of 2015, the region's Gross Domestic Product (GDP) based on Purchasing Power Parity (PPP) was estimated at $368 billion (Wikipedia). This substantial economic output underscores MMR's role as a central hub for finance, commerce, and industry in India.

1.9 Urbanisation Trends in MMR

MMR is highly urbanising with rapid expansion of population due to economic development and infrastructure establishment. The total population of MMR has increased from 18.4 million in 2001 to 23.7 million in 2021, in which the expansion in the cities has been substantial.

Due to urbanisation, MMR has seen surge in construction activity. Here, demand for residential, commercial, and industrial space is on the rise in a constant way. The works being carried are of Mumbai Metro, Navi Mumbai International Airport, and Trans-Harbour Link. Such infrastructure development overstretches the resource and lead to environmental concerns such as deforestation, water shortage, and waste generation (TERI, 2022).

1.10 Trends in Sustainable Construction in MMR

In MMR, acceptability of green practices through IGBC, GRIHA or LEED has gained popularity. Increased awareness on environmental issues, supporting regulatory frameworks and growth in demand of ecofriendly abodes has promulgated the shift towards green construction. IGBC, GRIHA, and LEED have now become standard benchmarks in sustainable construction practice. Basis the IGBC report there are more than 15,000 green buildings in India with MMR having a staggering 20 % share, which warrants that MMR has become very important (IGBC 2023). Installation of solar panels, rainwater harvesting systems, and energy-efficient HVAC systems are likewise turning popular for existing buildings because it is one of the cost-effective ways to achieve the green building standards rating.

1.11 Significance of the Study

The study holds immense importance for both industry professionals and academic researchers. By delving into the topic revolving around the perceptions of Architects, Builders, and Contractors towards the adoption of Ecolabelled products in the Mumbai Metropolitan Region, this research addresses an important gap which has not yet been addressed by the existing literature.

This study will help manufacturers understand the key factors that influences the adoption of Ecolabelled products, by which they can improve their strategies to promote sustainable materials. The findings can help organisations to develop targeted strategies to enhance the adoption of the Ecolabelled products, thereby catalysing the sustainable practices. By addressing adoption barriers and leveraging the key enablers, organisations can enhance their sustainability efforts, reduce environmental impact, and ultimately benefiting all stakeholders involved.

From an academic perspective, the findings from the present study will be useful for future studies. The designed questionnaire can easily be adapted for use in other geographies and also sectors, thereby furnishing a firm framework for an investigation into adoption of Ecolabelled products. The outcome of the current study also presents a basis for further research about the marketing strategy, professional knowledge, and help government in creating policies for sustainable practices. Thus, this research not

only deepens academic understanding of Ecolabelled products but also delivers actionable insights and real-world solutions, driving sustainable progress within the construction industry and inspiring a greener, more responsible future.

Chapter 2 - Literature Review

The chapter covers important aspects related to the research topic undertaken and delves deep into the available literatuproblere, sourced from academic papers, books, websites, blogs etc., related to the field of study.

This literature review has explored various key aspects related to the study topic, focusing on how the perceptions of Architects , Builders and Contractors influence the adoption of ecolabeled products. The literature review has focused how these perceptions are shaped by factors such as Awareness, Cost benefit and availability of the Ecolabelled products

A total of 75 literature sources were reviewed for the study, comprising 58 nos of Academic Papers and Research, 6 nos of Blog/Media/News Article and 11 nos of Reports/Industry Document. To ensure a balanced representation, 5 sources per each variable are discussed in detail in this section, while the gist of all sources are organised and presented as per the respective variables in the tabular format.

The Literature Reviews conducted per variable are as follows,

a. Dependent Variable : 10 nos (There is one dependent variable)
b. Independent Variables : 34 nos (IV1 – 12 nos, IV 2 - 10 nos , IV3 - 12 nos)
c. Moderating Variables : 31 nos (MV1 – 10 nos, MV2 - 11 nos, MV3 - 10 nos)

2.1 Dependent Variable - Adoption of Ecolabelled Products

1. Riskos et. al., (2021), states that people's trust in the eco-label is important because it affects their attitude towards buying green products as well as involvement with eco-labels.

2. Sharma and Kushwaha (2019), explored the effects of eco-labels on consumer behaviour and trust as well as the adoption of green products using a sample that

represented 506 Indian consumers. They also briefly discussed the significance of eco-label impact in green marketing and advertisement.

3. Mohamadi, (2021), undertook a study which found out that one of the factors that affect consumer behaviour when purchasing building materials which are Ecolabelled is value attached to such goods by marketers who present them as being "green;" moreover another finding was about perception on these items where buyers feel they are more likely going to save environment through this purchase than any other type.

4. Chandak (2018,), in her research was geared towards establishing how consumers' behaviour can be influenced by what they think and know about products bearing environmental labels; she also looked into different aspects concerning this area are among them challenges faced when trying to convince people go green. She found out that majority if not all companies do not invest enough effort in making their products appear green thus leading low knowledge level among customers at end use stage.

5. White et. al., (2019), publish an article in Harvard Business Review describing problems with consumer spending patterns, sentiment indicators versus actual purchase behaviours gaps. The study also looked at whether peer pressure also contributes to consumer behaviour.

Table 2.01 – An Overview of the Literature review pertaining to Adoption of Ecolabelled products

Author	Area of Research	Gaps
Kyriakos Riskos ,Orcid,Paraskevi (Evi) Dekoulou, Naoum Mylonas And George Tsourvakas	Consumer Behaviour Ecolabel Credibility	Relationship between awareness and experience

Nagendra Kumar Sharma And Gyaneshwar Singh Kushwaha	Perception Competitive Advantage	Lack of industry specific guidelines on Ecolabelling
Mihat Mohammadi	Consumer Behaviour and Perception	Professional Background, Experience and Demographics
Anjali Chandak	Green Marketing Awareness Drives	Awareness Campaigns Green Myopia
Katherine White, David J. Hardisty and Rishad Habib	Peer Influence Pride and Guilt drives Sustainable consumerism	Intention Action gap
Srishti Agarwal	Green Marketing, Consumer Behavior	Attitude–Behavior Gap, Awareness–Knowledge Gap and India-Specific Evidence Gap
Ulva Arsyistawa, Arif Hartono	Product Attributes influencing the Ecolabel adoption	Drawbacks of Ecolabel understanding.
Kavita Sharma, Chandni Aswal, Justin Paul	Marketing Strategies for Green Purchase Behaviour	Awareness–Knowledge Gap
Booi-Chen Tan	Perceived Customer Expectations	Inconsistency in attitude and behaviour relationship
Apichart Asawa-Amnuai	Consumer Behaviour Perceived benefits	India-Specific Evidence Gap

2.2 Independent Variables

2.2.1 - IV 1 - Awareness levels about Eco-labelled Products

1. Mokha (2017), explored how eco-labels, environmental advertising and eco-branding can contribute to green marketing. The results indicate that information has a positive effect, however it was observed that people may make bad buying choices if they do not believe in eco-labels.

2. Bhattacharjee and Mukherjee in (2015), in their research study revealed findings based on their insights into green marketing in India— including consumer perceptions and challenges. The primary takeaways underscore the need for consumer faith in products (which can result in cost savings while also being environmentally beneficial).

3. Veena & Ajith (2020), in their article discuss the challenges and opportunities of green business in India, showcasing the behaviour and environmental impact of consumers. Key research topics include consumer awareness, perceptions and the future of green marketing. The gap areas reveal the customer dissatisfaction due to cost and lack of awareness.

4. Rochikashvili and Bingaerts (2018), conducted an in-depth study on the impact of ecolabeling on product development in comparison with end users and experts. The findings highlight the importance of environmental product declarations (EPDs) for transparency; however, end users find life cycle assessments (LCAs) complex, which are directly linked to a focus on customer satisfaction.

5. Nair and Maram, (2015), in their research suggests that there are certain strategies for the green consumers to promote awareness and marketing activities can also formulated to address their behavioural issues related to conservation activities, combined with lack of membership and higher cost associated with the green products and usage.

Table 2.02 – An Overview of the Literature review pertaining to Awareness Levels about Eco-labelled Products

Author	Area of Research	Gaps
Anupreet Kaur Mokha	Eco Marketing	Brand building for trust building
Dr. Soumendra Bhattacharjee, Subhadeep Mukherjee	Challenges in green product marketing	Robust segment specific study

Veena M 1 and Dr. N Ajith Kumar 2	Product Awareness	Willingness to spend inspite being green aware
Mariia Rochikashvili * ID and Jan C. Bongaerts	Environmental Product Declarations LCA	Limited Category of products studied
Suja R. Nair	Environmental Consciousness	Lack of awareness Govt Policy
TNN	Ecolabeling awareness	Manufacturers apathy due to lack of incentives
Chidiebere Emmanuel Eze, Rex Asibuodu Ugulu, Samuel Ikechukwu Egwunatum and Imoleayo Abraham Awodele	Benefits of Ecolabelled products used	Standards Implementation
Jay S. Golden, Contributors Dan Vermeer, Bob Clemen, Alexandra Michalko, / Davie Nguyen, Catherine Noyes, Anita Akella, Julia Bunting, /	Ecological Effectiveness Communication strategies	Multiple and fragmented standards
AlexandraWeniger, Pamela Del Rosario , Jana Gerta Backes and Marzia Traverso	Purchase decision criteria	Lack of holistic view of Sustainability
Aruna Singh	Perception and Product offtake	Government Policy to drive Eco consumption
Clare D'Souza,Mehdi Taghian, Peter Lamb, Roman Peretiatko	Demographic profiles and their attitudes towards Ecolabelling	Need for comprehensive understanding beyond demographics
Sheik M. Isaacs	Perception Theories	Social desirability bias

2.2.2 - IV 2 - Cost Benefits of Eco-labelled Products

1. Jain and Verma (2019), explores eco-labelling awareness and consumer behavior in Delhi NCR, India, pointing out the effect of prices on purchasing green goods. They give an idea about consumer attitude towards eco-label, awareness level about it and what motivates them.

2. Midha et. al., (2013), conducted research on consumer behavior on green buildings in Delhi-NCR, with a focus on green buildings motivation, awareness, and purchase influencing factors. Implications of choices are seen in costs, environmental advantages and health conditions. Such research studies around buyer motivations, awareness and financial barriers.

3. Aditi (2016), examined the impact of Green Marketing on consumer behavior in Telangana, India, focusing on green packaging, branding, and pricing. It finds positive correlations between these factors and consumer behavior, but notes hesitancy in purchasing green products.

4. Tulani & Dahiya (2018), investigates how eco-labelling affects consumer behavior, emphasizing its influence on purchase intentions, trust, and awareness. It highlights eco-labels as crucial for promoting green products but lacks empirical data on consumer behavior analysis and specific challenges in implementation.
5. Bonini and Oppenheim (2008,) observed that consumers demonstrate interest in eco-labelled building materials even though they experience challenges such as high costs and scepticism regarding product authenticity. Organisations must take efforts to make clear the gains of such a move as well as make quality green products so as to ensure that there is an alignment between what one intends to do and what he/she actually does.

Table 2.03 – An Overview of the Literature Review pertaining to Cost Benefits of Eco-labelled Products

Author	Area of Research	Gaps
Shruti Jain, Manisha Raj Verma	Influence of price on purchasing decisions	Demographic analysis and the need for increased consumer education.

Ms. Aditi Midha, Dr. Shuchi Midha , Ms. Sanjeela Mathur	Factors influencing purchases	Prioritization of long-term benefits
Aditi Jaju	Positive correlations between pricing and consumer behavior	Hesitancy in purchasing green products
Ms. Harsh Tullani, Dr. Richa Dahiya	Eco-labelling impact on consumer behavior	Absence of specific implementation challenges
Sheila Bonini & Jeremy Oppenheim	Consumer education, Product performance, and Market growth potential	Lack of consumer awareness and product claims
Samantak Das , Rohan Sharma	Financial advantages of green buildings	Potential gaps in addressing broader sustainability issues
Yoganandan G , G. Sivasamy	Factors influencing consumer decision on green products	Purchase rejection due to perception of products lacking eco-responsibility coming at inflated premium
Ankit Yadav et. al.,	Consumer Motivations and Perceptions, Adoption Barriers in Construction Industry	Lack of targeted strategies considering occupation and regional differences.
Sailesh Rao	Market Growth and Development Trends, Construction Industry and Consumer Demand Dynamics	Inconsistent Delivery schedules affecting the offtake
Gaydaa Al Zohbi; Shahad Al Askar; Ajay Kumar; Parveen Kumar; Mamta Dahiya; Sangeeta Rani	Sustainable practices to curb climate impact, Eco-friendly materials for responsibility, Innovative	No detailed cost-benefit quantification, Limited comparative data vs conventional materials,

	materials for efficiency & cost savings	Need for long-term economic evidence

2.2.3 - IV 3 - Availability of Eco-labelled Products

1. Gallastegui' s (2002,) study on eco-labelling literature, there were different ideas in research and opinions. Works by different researchers have been conducted on demand, supply, market effect and certification aspects. It is therefore a critical point for future research on aspects of eco-labelling that are complex.

2. Amoako et. al., (2020), in their study investigated the reactions of Ghanaian consumers on sustainable marketing strategies, focusing on its impact on purchasing behaviour and trust. The research interests include the impact of material accessibility, pricing in the green economy, the role of equity in pricing strategies, and implications for policy and strategic marketing.

3. Aristyo R Rais (2018), explored what encourages companies to make their products Ecolabel-certified, focusing on value gain and image enhancement strategies. Toward sustainable development objectives, Indonesian rules were created. Approaches used include SEM, TOPSIS and IPA. Ensuing investigations might consider diversity towards greater coverage and sample size to study participants.

4. Silintowe and Sukresna (2023), mentions about the factors affecting the awareness on green issues improves environmentally friendly purchasing and product availability trajectories. Experienced customers who know the ins and outs of their buying habits are stopped short by consumer behavior and the absence of green products. Nonetheless, teaching people about how things affect the planet and increasing how much of such goods are available will stimulate environmentally responsible procurement practices.

5. Kumaim et. al., (2021), inferred that the purchase intent has a direct impact on the ecological behaviour of consumers with regard to the Ecolabel. Government support and environmental concerns are equally significant in this matter as inferred by these experts.

Table 2.04 – An Overview of the Literature Review pertaining to Availability of Eco-labelled Products.

Author	Area of Research	Gaps
Ibon Galarraga Gallastegui*	Supply Chain & Consumer behaviour	Research inadequacy
George Amoako, Robert Dzogbenuku, Joshua Doe and Geoffrey Kwasi Adjaison	Material Accessibility influence on purchase	Pricing and Marketing strategies role in driving demand
Aristyo R Rais and Amalia Suzianti	FAB penetration drives the consumption	Low number of certified Ecolabelled Products
Yunita Budi Rahayu Silintowe, I Made Sukresna	Lack of availibility inhibits the purchase	Insufficient knowledge undermines the offtakes
Nabil Hasan Al-Kumaim , Muhammad Salman Shabbir, Salman Alfarisi, Siti Hasnah Hassan, Abdulsalam K. Alhazmi, Sanil S. Hishan, Samer Al-Shami, Nadhmi A. Gazem, Fathey Mohammed and Hussein Mohammed Abu Al-Rejal	Accessibility to knowledge and products influences the purchase decision	Inflation and Dynamism in preferences affect the purchase intent
Abhishek Mojumder, Amol Singh, Ashwani Kumar, Yang Liu	Supply chain constraints	Limited procurement channels and weak supply chains restrict consistent availability of eco-labelled products.
Emadeldin Abuamer, Mehraz Boolaky	Minute attributes of Green building resulting into positive consumption	Continuity on campaigns for reiterating the benefits

Mojumder, A., Singh, A., Kumar, A., & Liu, Y.	Green procurement adoption in construction	Limited supply and perceived high costs restrict eco-labelled product adoption
Eze, E. C., Sofolahan, O., & Omoboye, O. G.	Sustainable building materials adoption	Weak supply chains and limited availability of certified products
Zhang, H., Li, Q., & Jiang, J.	Supply chain strategy and eco-labels	Lack of coordinated eco-label strategies reduces product availability
Sui, T., Zhang, H., & He, Q.	Building material supply chain	Limited demand information sharing reduces eco-labelled product availability
Erizaputri, S., & Bechauf, R.	Green public procurement	Limited market penetration and availability of certified products

2.3 Moderating Variables

2.3.1 MV 1 - Government Regulatory Policies and Incentives

1. Dhingra (2020), in her study measures the possible impacts of the Air conditioners ecolabeling criteria on consumer behavior up to market transformation where she recommends for more standardization and financial assistance.

2. Mattsson (2009), outlines the problem of environmental labels in UN procurement and the necessity of rendering consumer demand more appropriate and conscious of environmental consequences. The principal difficulties here revolve around the conversion of labels into technical specifications on account of their great quantity that makes them determine for consumers as well as UNSM to promote eco-friendly practices.

3. Simi (2001), in his research talks about the double-edged nature of eco-labels concerning trade within the World Trade Organization (WTO) and major controversies involving them: protectionist measures and trade facilitation. The detrimental reason for adoption of ecolabels by developing nations, in the lack of long-term value benefits that ecolabels bring.

4. Patel, (2013), is his study comments that Eco-labelling introduced green consumerism to a sustainable development with success since 1970s, but with major challenges related to costs and discomforts associated with adherence to industrial standards. WTO deals with key environmental trade issues that advance sustainability and use of market-oriented instruments.

5. Aasmäe (2021), trust in eco-labels and its relation to the way people buy things has been underlined her recent study. The research paper found out the reasons that influences the consumer needs and will employ different methods for data analysis. The results from this study stress that more information about ecolabels is needed to make informed decisions.

Table 2.05 – An Overview of the Literature Review pertaining to Government Regulatory Policies and Incentives

Author	Area of Research	Gaps
Neha Dhingra	Ecolabeling criteria	Transition to mandatory participation
Jan Mattsson UNOPS Executive Director	Role of environmental labels in UN procurement	Label translation into technical specs
Simi T B	Trade Barriers and Trade Facilitators,	Adverse effects due to lack of knowledge about eco-label programs
DR V G Patel	Eco-labelling and Green Consumerism, Sustainable Development and Trade Policy, Cost and Industrial Standards Challenges	Integration of trade and environmental policies

Sandra Aasmäe	Developing Countries	Effects of green washing
Zhenling Chen, Xiaoyan Niu, Xiaofang Gao and Huihui Chen	Government regulations	Lack of explanation on regulatory impact
Pengwei Yuan , 1 Xiaoqing Dong , 1 Jia Xu , 2 and Xiaofei Lin	Environmental regulations' impact on green innovation	Narrow focus on the mechanism between regulations and green innovation
Morris Cohen1 , Shiliang Cui2 , and Fei Gao3	Government support effects	Inconsistent impacts of government support
Daniele Ponzi, Jeffry Bowyer	Policy effectiveness	Political resistance
George Atalla, Meghan Mills, Julie Mc Queen	Government policies for green transition	Challenges in realizing sustainability ambitions

2.3.2 MV 2 Professional Experience and Expertise

1. Saini, K. K., Sankhla, S. S., & Saini, P. (2017). Historical perspective and concept of green building in India – A review. The study traces the evolution of green building principles in India, emphasizing energy efficiency, material availability, and sustainability. It highlights the role of architects, builders, and contractors in adopting regional methods, integrating eco-labelled materials, and advancing professional expertise for green building design.

2. Sagheb et. al., (2011), carried out research which looked at some important factors, encompassing embodied energy, CO2 emissions, and the need to cut down on carbon footprint. His paper areas delve into the use of materials that are friendly to the environment over time (sustainable materials), saving energy in ways which conserve it as well as traditional methods of construction.

3. Samarasinghe's (2011), research focuses on the attitude towards green product development in Sri Lanka looking at variables such as top management's endorsement as well as environmental education among others. In essence, key problems faced here are denial of use of green concepts because of poor technology

application and absence of appropriate training among many others. For example, areas of interest include identification of forces that influence perception and practice of green product development.

4. Abraham (2018), in his paper identified the barriers of green building adoption in India and then ranked them with Analytic Hierarchy Process (AHP) . In this case, lack of knowledge, information about ecolabelling and infrastructure rank as key examples of such barriers. To reduce the lack of expertise, training on life cycle costs to barriers involve policy, finance, data and management aspects.

5. Ng & Wong (2015), explored a scheme where green building products were labelled in Hong Kong in order to improve its environmental credentials, they discussed three things such as how construction materials are classified which are essential issues or requirements; distinguishing levels of greenness; as well as having everything covered correctly or thoroughly enough. Some of the outcomes they wanted to achieve involved undertaking studies regarding how structures affect nature; making distinctions among various kinds of commodities; and coming up with strategies that would help in putting things into practice.

Table 2.06 – An Overview of the Literature Review pertaining to Professional Experience and Expertise

Author	Area of Research	Gaps
Krishna Kumar Saini, Suresh Singh , Pankaj Saini	Professional expertise and role of architects, builders, and contractors in adopting eco-labelled/green materials	Awareness of principles, lack of cost baselines, shortage of professional expertise/service providers.
Azadeh Sagheb , Ehsan Vafaeihosseini ,Pradeep Kumar Ramancharla	Substantiator for Architects to use Ecolabelled products	Strategy for knowledge dissemination

Rohini Samarasinghe	Impact of specifiers & top management role and support	Reluctance to implement green initiatives
Pleasa Serin Abraham , Haripriya Gundimeda	Role of specifiers to enhance the green building and ecofriendly products adoption.	Lack of expertise and information leading to lower adoption
S. T. Ng1 & C. T. C. Wong2	Environmental Performance impact assessment done by experts	Lack of guidelines for statutory adoption.
K.I. Vatalis, O. Manoliadisb, G. Charalampidesa, S. Platiasa, S. Savvidisa	Sustainability components influencing green building decisions	Lack of explicit mention of limitations
Harshita Srivastava, A. Bhatnagar	Designers' awareness of eco-friendly materials	Potential gender disparity in the architect profession
Kofi Agyekum, Emmanuel Adinyira, B.K. Baiden, Godslove Ampratwum	Adoption of green building certification in developing countries, Professional expertise and perceptions of built environment practitioners	Information Gap - Lack of accessible databases and baseline knowledge on existing certified green buildings. Awareness Gap - Limited professional and public awareness of benefits of certification. Capacity Gap - Inadequate trained human resources among architects, builders, and contractors to implement certification.
Mojumder, A., Singh, A., Kumar, A., & Liu, Y.	Green procurement adoption in construction industry	Limited supply and perceived high costs

		restrict eco-labelled product adoption
Eze, E. C., Sofolahan, O., & Omoboye, O. G.	Sustainable building materials adoption	Weak supply chains and limited availability of certified products
Agyekum, K., Adinyira, E., Baiden, B., Ampratwum, G., & Duah, D.	Green building certification adoption	Lack of information, incentives, awareness, human resources, and legal backing
De Beer, Y., & Kajimo-Shakantu, K.	Green building adoption barriers	Lack of professional expertise, training, and incentives

2.3.3 MV 3 Marketing Strategies by Product Manufacturers

1 Samarasinghe's (2011), research focuses on the attitude towards green product development in Sri Lanka looking at variables such as top management's endorsement as well as environmental education among others. In essence, key problems faced here are denial of use of green concepts because of poor technology application and absence of appropriate training among many others. For example, areas of interest include identification of forces that influence perception and practice of green product development.

2 Song (2020), examined the impact of eco-labelling on consumer behavior of Gen Z by looking at product attributes as well as environmental awareness and perceived consumer effectiveness. Nonetheless, gaps remain regarding how eco-labels affect older customers and other demographic categories.

3 Mohanasundaram (2023), delves into consumer behaviour and challenges that hinder the embracement of Ecolabelled items; it sheds light on motivations, views, and impediments. The findings indicated a favourable correlation between adoption competition and interventions— with downstream ramifications for moral sway on the determination.

4 Kumar & Kumar (2014), discussed areas of green marketing challenges, consumer perception, and factors affecting buying behaviour.

5 Sehgal & Singh (2010), examined eco-labelled materials purchase decisions and post-purchase behaviour for building materials and explored pattern identification in green consumer decision-making, and the impact of environmental labelling on the purchase and post-purchase behaviour towards building materials. The present study further elaborates on this gap area by delving deeper into post-purchase behaviours and investigating the measures effective in marketing for its brand equity.

Table 2.07 – An Overview of the Literature Review pertaining to Marketing Strategies by Product Manufacturers

Author	Area of Research	Gaps
Rohini Samarasinghe	Impact of specifiers & top management role and support	Reluctance to implement green initiatives
Yao Song, Zhenzhen Qin and Zihao Qin	Eco-label impact on Gen Z consumer behavior	Lack of research on eco-label impact across diverse demographic groups
Rajendra P. Mohanasundaram T	Perception and Consumer behaviour linkage	Lack of focus on specific variables
Sunil Kumar , Krishan Kumar	Build up of consumer sensitivity towards environment	Low awareness on Ecolabels resulting on demand
Ms. Preeti Sehgal, Ms. Neha Singh	Understanding the Halo effect which leads to altruistic purchase behaviour	Post buying behaviour

Nidhi Gopal, Palak Bhandari, Smita Mehendale	Ecolabels as tool for marketing	Competition & Green finance
Martin L. Bhoompag, Dr. Smitha Sambrani, Prof. A. Prabhukumar,	Organisational reasons to promote green and the challenges	Maturity in green marketings execution
Kumal Bhardwaj	Green Marketing practices	Green myopia and constant efforts for consumer conviction
Harsimran Singh	Acceptance penetration criteria for green products	Strategies for B2B products
Emma Rex, Henrikke Baumann	Characteristics of green customer	Methods in conventional marketing which are overlooked

2.8 Review of Perception Theories

This section of Literature Review explores key perception theories - Gestalt Theory, Perceptual Defence Theory, Signal Theory, Information Processing Theory, Theory of Planned Behavior, Elaboration Likelihood Model (ELM), and Social Perception Theory, to understand how they influence the adoption of Ecolabelled products, purely from a perception perspective.

The above theories address in detail the perceptions among Architects Builders and Contractors related to Ecolabelled products. Every theory gives us a vivid and different view and interpretation of how preferences are formed for the Ecolabelled products over the course of time over conventional materials.

2.8.1 Gestalt Theory

Gestalt Theory harps upon the fact that, individuals look at activity, event or a product in a holistic manner and not in bits and pieces. When architects, builders, and contractors look at eco-labelled products, they consider the entire package—right from the design till the message about sustainability. The first that is noticed is the product packaging and the contents thereof.

2.8.2 Perceptual Defence Theory

The Perpetual Defence Theory, revolves around the concept that individuals seldom accept information and knowledge other than what is their belief. They tend to subconsciously block it. In respect to Ecolabelled products the blocking of information, inertia on accepting stems out from greenwashing, doubts on the product efficacy or simply going on what is time tested or is traditional in nature. The perception defence thus acts as a psychological barrier in adoption.

Gifford (2011) found multiple psychological barriers to the adoption of the Ecolabelled products such as perceived high costs, limited awareness and overall lack of trust on the certifications itself. The findings indicate that the Architects, Builders and Contractors may These findings suggest that architects, builders, and contractors may ignore or detest the ecolabels as they perceive it to be either irrelevant to their projects or overhyped. unconsciously ignore or devalue eco-labels that they perceive as irrelevant or ambiguous.

2.8.3 Signal Theory

Signal Theory mentions that the ecolabels are light house of the products environment benefit, quality and compliance to the prescribed sustainability standard. The adoption of ecolabels depends upon the credibility and the clarity of the labels (Connelly et al., 2011).

For the Architects, Builders, and Contractors, eco-labels like Green Pro, GRIHA, Green Gurad serves as quick guide for evaluating environmental performance, reducing uncertainty (Delmas & Grant, 2014). A strong eco-label can even affect pricing and make people more likely to choose it. But if there are too many similar certifications out there, it can confuse people and weaken trust. To be more effective, eco-labels need to be standardised, concise, clear , verified and should have a simple and direct communication.

2.8.4 Information Processing Theory (IPT)

Information Processing Theory (IPT) describes how architects, builders, and contractors perceive and act on information from eco-labels. Decisions are the

processes of encoding, storing, and retrieving information that influence perceptions. Eco-labelled products typically involve complex information regarding sustainability that should be processed within competing demands.

Clear and well-structured eco-labels improve cognitive efficiency, making these details easier to understand and allowing decision-makers to focus on core attributes. Research shows that well-designed labelling systems increase adoption by reducing cognitive overload (Henderson et al., 2004; Zeithaml et al., 2002).

2.8.5. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) focuses on attitudes, subjective norms, and perceived behavioural control in forming intentions and behaviours. Positive attitudes toward environmental and economic benefits enhance the probability of adoption of eco-labelled products by architects, builders, and contractors

Subjective norms are also important for decisions, influenced by peer influence and professional networks. If industry leaders and clients promote the use of eco-labelled products, stakeholders will do the same.

2.8.6 Social Perception Theory

This theory analyses the formation of impressions and judgments on the basis of social cues, peer behavior, and past experiences. It discusses the influence of social norms, industry standards, and reputational factors in building perceptions (Malle, 2008). In the construction industry, stakeholder perceptions regarding eco-labelled products are shaped by the practices of the leading developers, regulatory guidelines, and expectations from the client. For instance, if major developers persistently use eco-friendly materials, others perceive the practice as normal in the industry, leading to wider acceptance.

Most often, the perception of eco-labelled products arises from societal influence and industry promotion. Builders and contractors observe their peers and competitors to gauge industry trends. The developer promotes his projects with green certificates to convey to other stakeholders, that materials labelled as "eco-friendly" are essentials for competitiveness in the marketplace. Social proof from the influential players, coupled

with the client demand for sustainable buildings, strengthens positive perceptions and drives adoption.

Table 2.08 - Overview of Psychological Theories Related to Eco-Labelled Products

Theory	Focus	Relevance to Eco-labelled Products
Gestalt Theory	Holistic perception and the role of design coherence	Critical in evaluating eco-labels as unified visual and informational entities
Perceptual Defense Theory	Psychological resistance and biases	Addresses common barriers to the acceptance of sustainable innovations in traditional industries like construction
Signal Theory	Indicators of product quality, environmental compliance, and credibility	Explores how eco-labels act as signals conveying important product information
Information Processing Theory	Managing cognitive load of interpreting complex information	Examines how stakeholders handle sustainability information
Theory of Planned Behavior	Attitudinal and behavioural shifts based on motivation and persuasion	Pivotal for understanding the motivation behind adopting eco-labelled products
Social Perception Theory	Influence of cultural norms, professional networks, and societal expectations	Captures the macro-level understanding of collective decision-making processes

2.9 Research Gaps

The review of existing literature has revealed four critical research gaps concerning adoption of Ecolabelled products in the Mumbai Metropolitan Region. These gaps highlight the need for targeted, context-specific research to inform both academic inquiry and practical implementation.

1. Adoption Factors studied in Silo : Existing studies have studied factors such as role of awareness, cost benefit and availability separately. However, how they influence each other, in a combined manner remains unexplored and empirically untested.

2. MMR centric stakeholders focus remain unexplored : Existing studies have not factored in the role, the key stakeholders such as Architects, Builders and Contractors play on the adoption of Ecolabelled products, considering the importance and uniqueness of MMR built landscape.

3. Profession specific awareness and their role in adoption is under studied : The key stakeholders look at every aspect of the built environment, in their unique perspective and may certain perceptions. Currently, there are no empirical evidence of any studies conducted for understanding the perceptions and their intra-professional influence and diversity that affect the awareness and further the adoption.

4. Perception Theories are under applied : Established perception theories, such Gestalt, Signal, Theory of Planned behaviour, which are used extensively across marketing research remain under applied in context to adoption of Ecolabelled products, thus limiting the theoretical and practical integration.

This study aims to address these gaps through a structured, questionnaire-based methodology focused on stakeholder perceptions and adoption behavior. The findings will contribute to both academic discourse and sustainability advancement in Mumbai's construction sector.

2.10 Statement of Problem

The construction industry in Mumbai Metropolitan Region is growing at unprecedented levels and there is an emphasis on the sustainability and environmental stewardship. Ecolabelled products play a significant role in enhancing the Green & sustainability quotient of a building.

Green buildings are sustainable only to the extent products that used to build them. Ecolabelled products remain unrecognised and misread, which opens up the opportunity to study the reasons thereof.

However, despite the increase in emphasis, existing literature and preliminary surveys, indicate a limited awareness and understanding about Ecolabelling, the relationship between Ecolabelled products and the potential environmental and commercial benefits they offer in long term.

The type of perception about various factors, may have implications for the adoption of the Ecolabelled products, which can potentially affect the market demand, influence the regulatory compliance, and overall sustainability and environmental performance of the construction sector.

2.11 Conceptual Framework

The conceptual framework, built using Structural Equation Modelling (SEM), maps the relationships between independent, moderating, and dependent variables to explain the adoption of eco-labelled building materials in Mumbai. SEM provides an integrated view of how awareness, cost-benefit perception, and availability interact with policy, expertise, and marketing strategies—highlighting the multi-variable nature of adoption behavior in the construction sector.

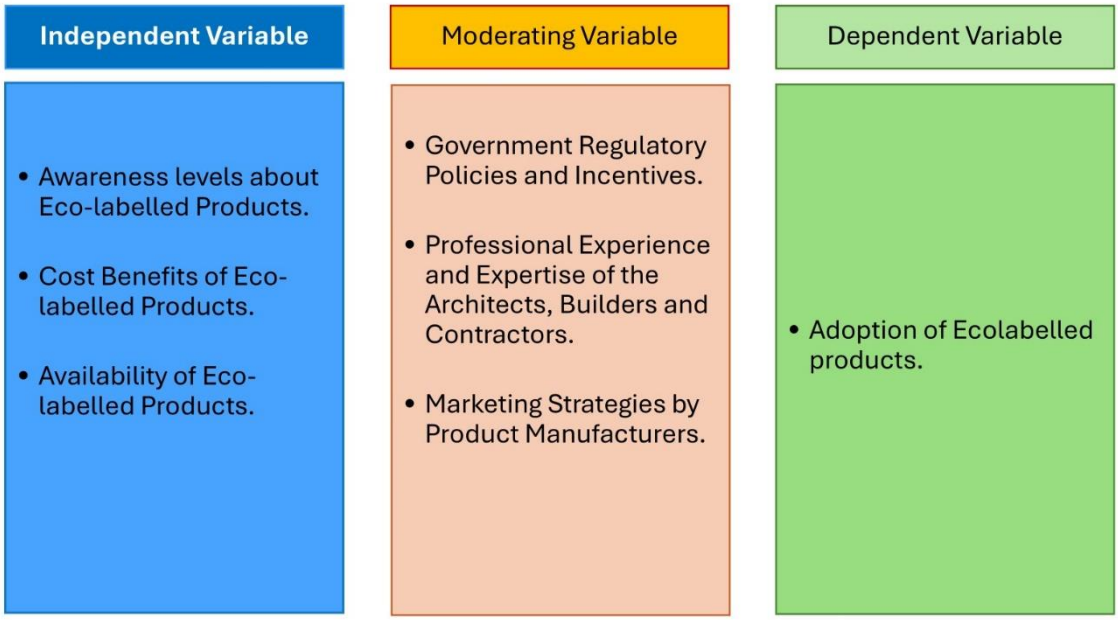

Figure – 2.01- Conceptual Framework for the study

2.12 Need for the Study

The primary aim of the study, is to study the perceptions architects, builders and contractors have about the eco-labelled products within the Mumbai Metropolitan Region and how do these perceptions influence the adoption.

The study will work towards identifying the primary motivators and deterrents for adoption and, assessing the understanding of/knowledge levels of the architects, builders, and contractors, by getting insights, which can lead to enhanced adoption of the Ecolabelled products.

Chapter 3 - Research Methodology

In research methodology, the elements of the research process like research design, data collection methods, questionnaire design, sampling design and statistical tools have been discussed.

3.1 Research Design

The research design used in this study included both Exploratory Research Design and Descriptive Research Design.

Exploratory Research Design

Exploratory research design is used in problem identification, defining the research variables and formulating the hypothesis. The data collection methods used in Exploratory Research Design are Literature Survey and Pilot Survey.

3.2 Development of research variables for "Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products in the Mumbai Metropolitan Region"

The dependent variable for this study is

1. Adoption of Eco-labelled Building Materials

The independent variables or exogenous variables for this study are as follows:

1. Awareness of Eco-labelled Products
2. Cost Benefits of Eco-labelled Products
3. Availability of Eco-labelled Products

The moderating variables for this study are as follows:

1. Professional Experience and Expertise
2. Government Regulatory Policies and Incentives
3. Marketing Strategies

Literature has been reviewed from various sources like journals, newspapers, magazines, websites which provided deep insights to the study of aspects related to Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials.

3.3 Objectives

Based on the variables and the Literature review, the following objectives have been developed for the study.

1. To examine whether the adoption of Eco-labelled products depends on the level of awareness among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

2. To study whether a favourable cost-benefit perception of Eco-labelled products enhances the chances of adoption by Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

3. To study whether the ease of availability and accessibility of Eco-labelled products significantly influences their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

4. To examine the impact of regulatory policies and incentives deemed favourable on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

5. To explore whether higher levels of professional experience, expertise and exposure to Eco-labelled products leads to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.
6. To determine if the marketing strategies related to Eco-labelled products leads to the adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

3.4 Formulation of Hypothesis

The following statements have been formulated to determine the Adoption of Eco-labelled Products in the Mumbai Metropolitan Region :

Hypothesis 1

Null Hypothesis ($H1_0$): The adoption of Eco-labelled products does not depend upon the level of awareness among Architects, Builders, and Contractors in the Mumbai.

Alternative Hypothesis($H1_A$): The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai.

Hypothesis 2

Null Hypothesis ($H2_0$): Favourable cost benefit perception about Eco-labelled products does not enhance the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

Alternative Hypothesis($H2_A$): Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

Hypothesis 3

Null Hypothesis ($H3_0$): The ease of availability and accessibility of Eco-labelled products does not significantly influence the adoption among Architects, Builders, and Contractors.

Alternative Hypothesis($H3_A$): The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors.

Hypothesis 4

Null Hypothesis ($H4_0$): Regulatory policies and incentives deemed favourable do not have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Alternative Hypothesis($H4_A$): Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Hypothesis 5

Null Hypothesis ($H5_0$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products does not lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Alternative Hypothesis($H5_A$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Hypothesis 6

Null Hypothesis ($H6_0$): Marketing strategies related to Eco-labelled products do not lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

Alternative Hypothesis($H6_A$): Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

3.5 Descriptive Research Design

Descriptive research design is used to describe the Characteristics/attributes for the respondents with reference to demographic factors like [Professional Experience, Source for getting information on eco-labelled products, Specified or used eco-labelled products in your projects, Aware of any existing government policies, Supportive policies or incentives and Percentage of your total projects have you specified or used eco-labelled products] for Adoption of Eco-labelled Building Materials have been assessed.

Cross sectional research design has been used as the type of descriptive research design as the research was conducted only once regarding the Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials.

3.6 Data Collection

Primary Data

The primary data required for the research was collected using the survey method with a detailed self-administered questionnaire among the respondents to study the influence of [Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials].

Secondary Data

Sources of secondary data for the study included the national and international journals, research articles, books, newspapers, research reports by reputed agencies and online data sources related to Adoption of Eco-labelled Building Materials] have been reviewed.

3.7 Questionnaire Design

The questionnaire has been designed by using both measurement and rating scales. The measurement scales include Nominal scale, Interval Scale and Likert rating scale in this study. Likert rating scale has been used as a type of rating scale. Nominal scale has been used to understand the profile of the respondents like Professional Experience, Source for getting information on eco-labelled products, Specified or used eco-labelled products in your projects, Aware of any existing government policies, Supportive policies or incentives and Percentage of your total projects have you specified or used eco-labelled products.

3.8 Pilot Testing of the Questionnaire

The pilot study was conducted from 60 respondents each through questionnaire to obtain their responses influencing the [Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies to determine Adoption of Eco-labelled Building Materials]. During the pilot study , reliability has been tested for using Cronbach Alpha(α) found to 0.8 for all the research variables included in the research.

Table 3.1 Summary of Pilot Study - Reliability Statistics for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

Variables	Cronbach's Alpha (α)
Awareness of Eco-labelled Products	0.826
Cost Benefits of Eco-labelled Products	0.838
Availability of Eco-labelled Products	0.838
Professional Experience and Expertise	0.831

Government Regulatory Policies and Incentives	0.879
Marketing Strategies	0.877
Adoption of Eco-labelled Building Materials	0.873

Conclusion

Based on the summary of reliability, it can be inferred that the value of Cronbach's Alpha (α) found to be more than 0.8 which shows the internal consistency for all the variables included in the research consisting of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies and Adoption of Eco-labelled Building Materials.

After the pilot study, questionnaire has been designed and the reliability and validity for the statements related to Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies to determine Adoption of Eco-labelled Building Materials] have been evaluated for internal consistency and accuracy among the variables included in the research.

3.9 Sampling Design

The components like Sample Universe, Sampling Unit, Sample, Sample Size and Sampling Method have been covered under Sampling Design.

3.9.1 Sample Universe: It constitutes the Architects, Builders, and Contractors in the Mumbai Metropolitan Region towards Adoption of Eco-labelled Building Materials.

3.9.2 Sampling Unit

It is the basic unit consisting of all the elements of the sample universe. The sampling unit included the Architects, Builders, and Contractors in the Mumbai Metropolitan Region towards Adoption of Eco-labelled Building Materials. The Geographical area covered is from Mumbai Metropolitan Region, which comprises of 9 municipal corporations such as Municipal Corporation of Greater Mumbai, Thane, Kalyan-

Dombivli, Navi Mumbai, Ulhasnagar, Bhiwandi-Nizamapur, Vasai-Virar, Mira-Bhayandar and Panvel.

3.9.3 Sample

The sample includes a proportion of the Architects, Builders, and Contractors in the Mumbai Metropolitan Region, it is the subgroup of the universe who either specify, buy or use the ecolabeled products are only included in the study.

3.9.4 Sample Size

The target population is the Architects, Builders, and Contractors in the Mumbai Metropolitan Region towards Adoption of Eco-labelled Building Materials, which has been selected by using Cochran's (1977) formula of variability.

3.9.5 Determination of Sample Size

The professional universe of Architects, Builders, and Contractors in the Mumbai Metropolitan Region is sizeable and engages at varying levels—either as specifiers, buyers, or users—with eco-labelled building products. Given this situation of non-definitive size and varied composition, Cochran's (1977) formula of variability was applied to determine the required sample size.

The following formula has been used to determine the sample size when the population is having high degree of variability:

$n = [z^2pq]/[e^2]$

where, n is the sample size, z is the selected critical value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, $q = 1- p$ and e is the desired level of precision or tolerable error

For example, suppose we want to calculate a sample size of a large population whose degree of variability is not known. Assuming the maximum variability, which is equal to 50% (p =0.5) and taking 95% confidence level with ±5% precision, the calculation for required sample size will be as follows:

p = 0.5 and hence q =1-0.5 = 0.5; e = 0.05; z =1.96

$n = [z^2pq]/[e^2]$

$n = [(1.96)^2 (0.5) (0.5)]/[(0.05)^2]$

$n = [(3.8416) (0.25)/[0.025]$

$n = [0.9604] / [0.025]$

$n = 384.16$

The sample size of 400 has been classified as follows.

Table 3.2 Summary of Sample Size

Sampling Unit	No. of Respondents
Architects	125
Builders	75
Contractors	200

3.9.6 Sampling Method

The sampling Method used to select the sample of 400 Architects, Builders, and Contractors in the Mumbai Metropolitan Region to determine the impact of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies on Adoption of Eco-labelled Building Materials by using Snowball Sampling and Convenience sampling method. Both are the types of Non-Probability sampling.

By using Snowball sampling or referral sampling, a sample of 400 Architects, Builders, and Contractors in the Mumbai Metropolitan Region from the available references. After referral sampling, convenience sampling methods have been used for selecting 400 Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

By using convenience sampling methods, the most accessible population can be identified. Based on the willingness, availability and their readiness, the information was collected. The consumers derive the influence of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies on Adoption of Eco-labelled Building Materials

from Mumbai Metropolitan Region have been easily obtained through convenience sampling.

The information has been collected from those respondents who are knowledgeable and ready to share information about the effect of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies on Adoption of Eco-labelled Building Materials. Convenience sampling minimizes the non-response errors.

3.10 Type of Statistics used

The present research work is to test the effect of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies on Adoption of Eco-labelled Building Materials. Both Descriptive Statistics & Inferential Statistics have been used for data analysis and interpretation.

Descriptive Statistics and Inferential Statistics are used in data analysis.

Descriptive Statistics

Descriptive Statistics are used to tabulate the data, calculating the frequencies and generating the summary tables in the form of both bar chart and pie chart.

Inferential analysis

Inferential analysis has been used to derive the logical conclusions of the samples.

The following techniques have been used in the inferential analysis:

Simple percentage method, Chi-Square test, Kolmogorov Smirnov Test, Reliability Analysis, Multiple Regression, Factor Analysis and Structural Equation Modelling [SEM].

Chapter 4 - Data Analysis And Interpretation/Results

Data analysis has been classified into Descriptive analysis & Inferential Analysis. The data has been analysed by using IBM SPSS Statistics 30.

4.1 Descriptive Analysis for "Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products in the Mumbai Metropolitan Region"

For doing the descriptive analysis, the simple percentage method has been used to calculate the frequencies and has been represented by using both Bar Chart and Pie Chart.

Table 4.01: Professional Experience of Respondents

Professional Experience	**Frequency**	**Percent**
Less than 5 years	22	5.5
5-10 years	56	14.0
11-15 years	67	16.8
More than 15 years	255	63.7
Total	400	100.0
Specified	**Frequency**	**Percent**
Yes	286	71.5
No	35	8.8
Not Sure	79	19.8
Total	400	100.0

Table 4.02 : Classification of respondents who are Aware and Likely to adopt percentage

Aware	**Frequency**	**Percent**
Yes	121	30.3
No	130	32.5
Not Sure	149	37.3
Total	400	100.0
Percentage	**Frequency**	**Percent**
0-10%	78	19.5
11-25%	100	25.0
26-50%	93	23.3
51-75%	96	24.0
76-100%	33	8.3
Total	400	100.0
Likely to adopt	**Frequency**	**Percent**
Very Unlikely	12	3.0
Unlikely	4	1.0

Neutral	39	9.8
Likely	194	48.5
Very Likely	151	37.8
Total	400	100.0

4.2 Inferential Analysis

Inferential analysis has been used to derive the logical conclusions of the samples. The following techniques has been used in the inferential analysis.

- Chi-Square test, Kolmogorov Smirnov Test, Reliability Analysis, Factor Analysis and Structural Equation Modelling(SEM)

4.3 Data Analysis And Interpretation/Results

Data analysis has been classified into Descriptive analysis & Inferential Analysis. The data has been analysed by using IBM SPSS Statistics 29.

Inferential analysis

Inferential analysis has been used to derive the logical conclusions of the samples.
The following techniques has been used in the inferential analysis

- Kolmogorov Smirnov Test, Chi-Square test, Reliability Analysis, Multiple Regression, Factor Analysis and Structural Equation Modelling(SEM).

4.4 Reliability Analysis

The reliability analysis is an effective instrument for testing the internal consistency among the research variables included in the research process. It places more significance in maintaining and developing an upper limit on its validity. A measurement that lacks reliability will also lack validity. If the scale of reliability is close to 1, then it can be concluded that the variables are having high internal consistency and hence they are suitable for conducting factor analysis.

Table 4.03 - Summary of Reliability Statistics for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

Variables	Cronbach's Alpha (α)
Awareness of Eco-labelled Products	0.810
Cost Benefits of Eco-labelled Products	0.808
Availability of Eco-labelled Products	0.808

Professional Experience and Expertise	0.815
Government Regulatory Policies and Incentives	0.821
Marketing Strategies	0.824
Adoption of Eco-labelled Building Materials	0.820

Conclusion

Based on the summary of reliability, it can be inferred that the value of Cronbach's Alpha (α) found to be more than 0.8 which shows the internal consistency for all the variables included in the research consisting of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies and Adoption of Eco-labelled Building Materials.

4.4 Summary of Findings

Based on the summary of reliability, it can be inferred that the value of Cronbach's Alpha (α) found to be more than 0.8 which shows the internal consistency for all the variables included in the research consisting of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives, Marketing Strategies and Adoption of Eco-labelled Building Materials.

4.5 Factor Analysis

Factor analysis was used to simplify the data, identify the key dimensions, classify them it into simple yet meaningful categories and thus highlight which of these factors are important in shaping perception and thereby the adoption.

4.5.1 Factor Analysis to determine Cost Benefits of Eco-labelled Products

Factor Analysis has been used to classify the components determine Cost Benefits of Eco-labelled Products. By using Factor Analysis, we can summarise the components determine Cost Benefits of Eco-labelled Products.

From the Factor analysis it states that Initial Cost Factors and Savings Factors are highly significant in contributing to determine Cost Benefits of Eco-labelled Products.

4.5.2 Factor Analysis to determine Professional Experience and Expertise

Factor Analysis has been used to classify the components determine Professional Experience and Expertise. By using Factor Analysis, we can summarise the components determine Professional Experience and Expertise.

From the Factor analysis it states that Usage Factors and Stakeholders Factors are highly significant in contributing to determine Professional Experience and Expertise.

4.5.3 Factor Analysis to determine Government Regulatory Policies and Incentives

Factor Analysis has been used to classify the components determine Government Regulatory Policies and Incentives. By using Factor Analysis, we can summarise the components determine Government Regulatory Policies and Incentives.

From the Factor analysis it states that Subsidy Factors and Awareness Factors are highly significant in contributing to determine Government Regulatory Policies and Incentives.

4.5.4 Factor Analysis to determine Marketing Strategies

Factor Analysis has been used to classify the components determine Marketing Strategies. By using Factor Analysis, we can summarise the components determine Marketing Strategies. From the Factor analysis it states that Testimonials Factors and Benefits Factors are highly significant in contributing to determine Marketing Strategies.

4.5.5 Factor Analysis for Adoption of Eco-labelled Building Materials and effectiveness

Factor Analysis has been used to classify the components for Adoption of Eco-labelled Building Materials and effectiveness. By using Factor Analysis, we can summarise the components for Adoption of Eco-labelled Building Materials and effectiveness.

From the Factor analysis it states that Training Factors and Environmental Factors are highly significant in contributing for Adoption of Eco-labelled Building Materials and effectiveness.

Table 4.04 : Summary Table of Factor Analysis for Cost Benefits, Professional Experience, Government Policies, Marketing Strategies, and Adoption of Eco-labelled Building Materials.

Item Description	Factor 1	Factor 2
Cost Benefits of Eco-labelled Products	Initial Cost Factors	Savings Factors
Professional Experience and Expertise	Usage Factors	Stakeholders Factors
Government Regulatory Policies and Incentives	Subsidy Factors	Awareness Factors
Marketing Strategies	Testimonials Factors	Benefits Factors
Adoption of Eco-labelled Building Materials and effectiveness	Training Factors	Environmental Factors

4.6 Test of Validity

Multiple Regression Analysis for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

In the present study, Multiple Regression Analysis of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies and has been tested as a tool of validity. Collinearity has been used an inbuilt measure to determine the effect of independent variables called as predictors on dependent variable called as criterion.

Table 4.05 : Standardised and Unstandardised Regression Coefficients

	Unstandardised Coefficients		**Standardised Coefficients**				
Variables	**B**	**Std. Error**	**Beta**	**t**	**Sig.**	**Tolerance**	**VIF**
(Constant)	8.192	2.163		3.788	<.001		

Awareness of Eco-labelled Products	1.488	0.145	0.426	10.243	<.001	0.631	1.584
Cost Benefits of Eco-labelled Products	-0.068	0.095	-0.028	-0.722	0.031	0.724	1.382
Availability of Eco-labelled Products	-0.727	0.153	-0.2	-4.741	<.001	0.616	1.624
Professional Experience and Expertise	0.565	0.094	0.254	6.011	<.001	0.612	1.635
Government Regulatory Policies and Incentives	0.525	0.081	0.292	6.473	<.001	0.536	1.866
Marketing Strategies	0.312	0.087	0.157	3.61	<.001	0.577	1.734

Inference:

The significance levels less than 5% of the independent variables [Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies] are influential on Adoption of Eco-labelled Building Materials.

The tolerance more than 5% and Variance Inflation Factor(VIF) less than 10 indicates that the effect of independent variables on dependent variable can be determined effectively. VIF is a measure of multicollinearity in the set of multiple regression

variables. When VIF less than 10, It can be further revealed as there is no multicollinearity.

4.7 – Structural Equation Modelling (SEM)

The model estimates like Absolute fit, Incremental fit and Parsimonous fit, it can be revealed that SEM model is suitable for predicting the influence of independent variables[Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products] and moderating variables [Professional Experience, Expertise, Government Regulatory Policies and Incentives and Marketing Strategies] to determine Adoption of Eco-labelled Building Materials.

Structural Equation Modelling (SEM) for Adoption of Eco-labelled Building Materials

The dependent variable for this study is

Adoption of Eco-labelled Building Materials [AD]

The independent variables or exogenous variables for this study are as follows:

IV is a latent variable consists of

Awareness of Eco-labelled Products [AW]

Cost Benefits of Eco-labelled Products [CB]

Availability of Eco-labelled Products [AV]

The moderating variables for this study are as follows:

MV is a moderating variable consists of

Professional Experience and Expertise [PE]

Government Regulatory Policies and Incentives [GR]

Marketing Strategies [MS]

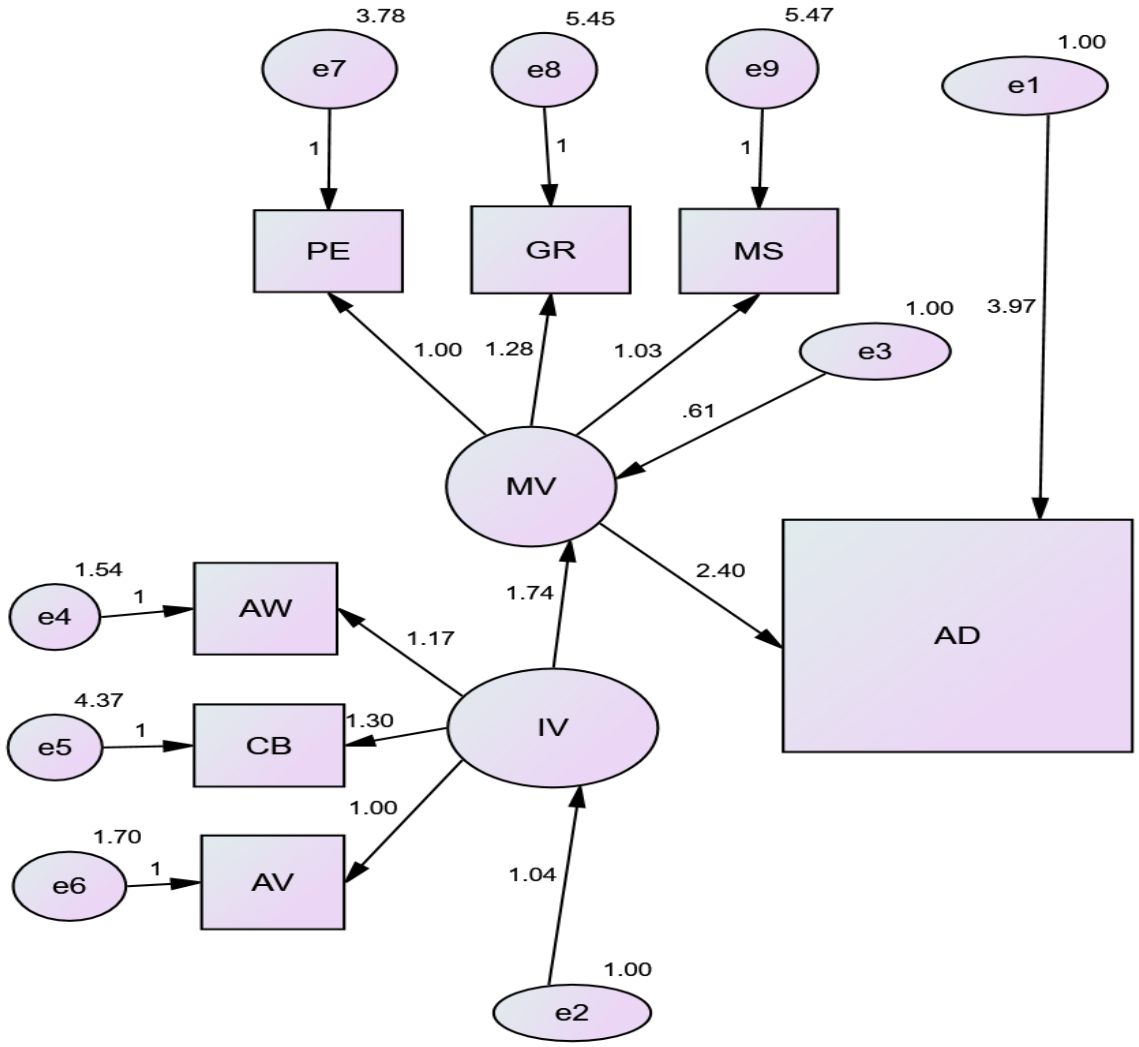

Figure 4.01: Unstandardised Estimates For Adoption Of Eco-Labelled Building Materials

4.7.1 Inference for unstandardised estimates for Adoption of Eco-labelled Building Materials

The values AW, CB, AV, PE, GR and MS are the unstandardised estimates which indicates Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies respectively. To estimate the influence of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies on Adoption of Eco-labelled Building Materials, standardised coefficients are taken into consideration.

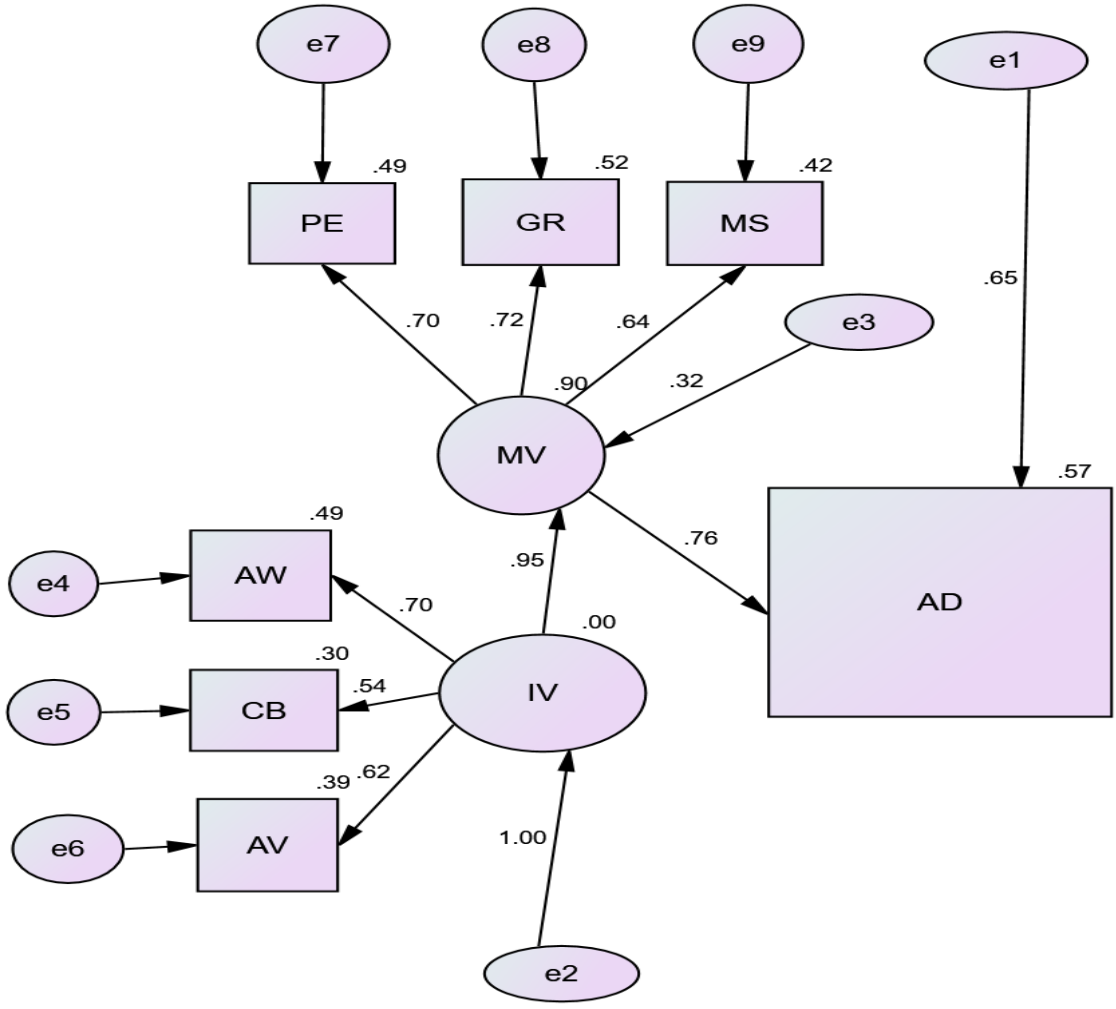

Figure 4.02 : Standardised Estimates For Adoption Of Eco-Labelled Building Materials

4.7.2 Inference for standardised estimates for Adoption of Eco-labelled Building Materials

The values AW(.70), CB(.54), AV(.62), PE(.70), GR(.72) and MS(.64) are the standardised estimates which indicates Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies respectively.

The highest values of standardised estimates have been observed for AW(.70), AV(.62) and CB(.54) in the latent variable [IV]. It shows that Awareness of Eco-labelled

Products is highly influential followed by Availability of Eco-labelled Products and Cost Benefits of Eco-labelled Products.

The highest values of standardised estimates have been observed for GR(.72), PE(.70), and MS(.64) in the moderating variable [MV]. It shows that Government Regulatory Policies and Incentives, is highly influential followed by Professional Experience and Expertise and Marketing Strategies.

The value on AD (.57) indicates the variance of the dependent variable Adoption of Eco-labelled Building Materials. It shows that 57% of the total variance in the dependent variable has been explained by all the independent variables[Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products] and moderating variables Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies].

4.7.3 Interpretation for Model Fit estimates for Adoption of Eco-labelled Building Materials

Hence from all the model estimates like Absolute fit, Incremental fit and Parsimonous fit, it can be revealed that SEM model is suitable for predicting the influence of independent variables[Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products] and moderating variables [Professional Experience, Expertise, Government Regulatory Policies and Incentives and Marketing Strategies] to determine Adoption of Eco-labelled Building Materials.

4.8 Hypothesis testing

4.8.1 - Hypothesis 1

The following hypothesis is tested by using Chi-Square Test

Null Hypothesis ($H1_0$): The adoption of Eco-labelled products does not depend upon the level of awareness among Architects, Builders, and Contractors in the Mumbai

Alternative Hypothesis($H1_A$): The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai

Table 4.06 Chi-Square values for adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai

Item description	Chi Square Value	Sig. Level
Specialised training programs for specifiers, buyers and users improves the rate of adoption of eco-labelled products.	499.575	<.001
Public outreach through marketing campaigns influences the adoption of eco-labelled materials.	628.375	<.001
Effective demand-supply management enhances the availability and usage of eco-labelled products.	451.82	<.001
Testimonials from celebrities creates awareness and increases the purchasing frequency of eco-labelled materials.	223.45	<.001
Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.	553.475	<.001
Technological innovations in eco-labelled products reveal substantial cost savings.	285.7	<.001
Highlighting the environmental benefits makes eco-labelled products more attractive.	551.475	<.001
Rating of product manufacturers based on their promotion efforts increases the adoption of eco-labelled products.	461.95	<.001
Favourable government policy promoting eco-labelled products enhances their adoption.	665.875	<.001
Mechanisms to address specification and application issues increase the adoption of eco-labelled products.	481.1	<.001

Special incentives for manufacturers can help reduce costs, enhancing the adoption.	396.475	<.001
Eco-labelled certifications for products enhance their credibility and encourage the adoption.	507.475	<.001

Inference :

The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai. The highest value of Chi-Square value has been observed for Favourable government policy promoting eco-labelled products enhances their adoption as 665.875. The second highest value has been observed for Public outreach through marketing campaigns influences the adoption of eco-labelled materials as 628.375. The third highest value of Chi Square has been observed for Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials as 553.475.

It can be further analysed that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai have been summarised as Favourable government policy promoting eco-labelled products enhances their adoption, Public outreach through marketing campaigns influences the adoption of eco-labelled materials and Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.

4.8.2 - Hypothesis 2

The following hypothesis is tested by using Kolmogorov Smirnov Test

Null Hypothesis ($H2_0$): Favourable cost benefit perception about Eco-labelled products does not enhance the chances of adoption by the Architects, Builders, and Contractors in Mumbai

Alternative Hypothesis($H2_A$): Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai

Table 4.07 : Kolmogorov Smirnov Test values for Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai

Item description	Kolmogorov Smirnov Value	Sig. Level
Eco-labelled products have high initial costs.	5.39	<.001
Higher initial cost is a significant barrier to adoption of eco-labelled products.	5.702	<.001
Operational cost savings of eco-labelled products outweigh the initial costs.	6.113	<.001
Overall cost savings of eco-labelled products are better compared to non-eco-labelled products.	6.326	<.001
Eco-labelled products offer better cost benefits compared to non-eco-labelled materials.	5.433	<.001

Inference :

The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

The highest value of Kolmogorov Smirnov Value has been observed for Overall cost savings of eco-labelled products are better compared to non-eco-labelled products as 6.326. The second highest value has been observed for Operational cost savings of eco-labelled products outweigh the initial costs as 6.113. The third highest value has been observed for Higher initial cost is a significant barrier to adoption of eco-labelled products as 5.702.

It can be further revealed that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai can be summarised as Overall cost savings of eco-labelled products are

better compared to non-eco-labelled products, Operational cost savings of eco-labelled products outweigh the initial costs and Higher initial cost is a significant barrier to adoption of eco-labelled products.

4.8.3 - Hypothesis 3

The following hypothesis is tested by using Kolmogorov Smirnov Test

Null Hypothesis ($H3_0$): The ease of availability and accessibility of Eco-labelled products does not significantly influence the adoption among Architects, Builders, and Contractors

Alternative Hypothesis($H3_A$): The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors

Table 4.08 : Kolmogorov Smirnov Test values for The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors

Item description	Kolmogorov Smirnov Value	Sig. Level
Eco-labelled products are as readily available as non-eco-labelled alternatives.	4.09	<.001
Availability of eco-labelled products significantly influences my decision to specify or use them.	6.247	<.001
I am confident that eco-labelled products will be consistently available for my projects.	5.851	<.001
Improved availability of eco-labelled products would increase their adoption in my projects.	7.217	<.001

Inference :

The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that the ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors.

The highest value of Kolmogorov Smirnov Value has been observed for Improved availability of eco-labelled products would increase their adoption in my projects as 7.217. The second highest value has been observed for Availability of eco-labelled

products significantly influences my decision to specify or use them as 6.247. The third highest value has been observed I am confident that eco-labelled products will be consistently available for my projects as 5.851.

It can be further revealed that ease of availability and accessibility of Eco-labelled products can be summarised as Improved availability of eco-labelled products would increase their adoption in my projects, Availability of eco-labelled products significantly influences my decision to specify or use them and I am confident that eco-labelled products will be consistently available for my projects.

4.8.4 - Hypothesis 4

The following hypothesis is tested by using Chi-Square Test

Null Hypothesis ($H4_0$): Regulatory policies and incentives deemed favourable do not have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Alternative Hypothesis($H4_A$): Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Table 4.09 : Chi-Square values for Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Item description	Chi Square Value	Sig. Level
Presence or absence of government policies influences my decision to specify or use eco-labelled products.	200.225	<.001
Supportive policies or incentives can increase the adoption of eco-labelled products.	218.34	<.001
Current Government policies are effective in promoting the adoption of eco-labelled products.	136.82	<.001

Presence or absence of price and tax subsidies influences my decision to specify or use eco-friendly building materials.	116.46	<.001
Mandatory usage of Ecolabelled products in projects promotes their adoption.	232.34	<.001
Priority in procurement for Ecolabelled products helps increase their usage.	321.02	<.001
Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.	264.7	<.001
Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products.	312.56	<.001

Inference :

The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for Priority in procurement for Ecolabelled products helps increase their usage as 321.02.

The second highest value has been observed for Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products as 312.56. The third highest value of Chi Square has been observed for Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as 264.7.

It can be further analysed that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as Ecolabelled products helps increase their usage, Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products and

Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.

4.8.5 - Hypothesis 5

The following hypothesis is tested by using Kolmogorov Smirnov Test

Null Hypothesis ($H5_0$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products does not lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Alternative Hypothesis($H5_A$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Table 4.10 : Chi-Square values for Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Item description	Kolmogorov Smirnov Test Value	Sig. Level
My professional background helps me make informed decisions about specifying or using eco-labelled products.	6.59	<.001
I regularly collaborate or consult with other professionals before specifying or using eco-labelled products.	7.358	<.001
Trainings or workshops on eco-labelled products helps me specify or use them more effectively.	7.108	<.001
I actively re-evaluate new options when specifying or using new categories of eco-labelled products.	7.165	<.001
My decisions to specify or use eco-labelled materials are influenced by end-client preferences or other stakeholders.	6.001	<.001

Inference :

The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

The highest value of Kolmogorov Smirnov Value has been observed for I regularly collaborate or consult with other professionals before specifying or using eco-labelled products as 7.358. The second highest value has been observed for I actively re-evaluate new options when specifying or using new categories of eco-labelled products as 7.165. The third highest value has been observed for Trainings or workshops on eco-labelled products helps me specify or use them more effectively as 7.108.

It can be further revealed that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region can be summarised as I regularly collaborate or consult with other professionals before specifying or using eco-labelled products, I actively re-evaluate new options when specifying or using new categories of eco-labelled products and Trainings or workshops on eco-labelled products helps me specify or use them more effectively.

4.8.6 - Hypothesis 6

The following hypothesis is tested by using Chi-Square Test

Null Hypothesis ($H6_0$): Marketing strategies related to Eco-labelled products do not lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Alternative Hypothesis($H6_A$): Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Table 4.11 : Chi-Square values for Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region

Item description	Chi Square Value	Sig. Level
I consider marketing campaigns (advertisements, promotional offers, industry outreach, etc.) before deciding to specify, use, or purchase eco-labelled materials.	221.925	<.001
I consider testimonials or reviews before specifying or using any eco-labelled products.	408.875	<.001
I have specified or used/purchased eco-labelled products because of marketing campaigns.	229.075	<.001
I am confident about the claims made by manufacturers regarding eco-labelled products.	217.66	<.001
I feel product manufacturers effectively communicate the benefits of eco-labelled products.	280.525	<.001

Inference :

The significance value less than 5% reveals that null hypothesis can be rejected. It can be inferred that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for I consider testimonials or reviews before specifying or using any eco-labelled products as 408.875. The second highest value has been observed for I feel product manufacturers effectively communicate the benefits of eco-labelled products as 280.525. The third highest value of Chi Square has been observed for I have specified or used/purchased eco-labelled products because of marketing campaigns as 229.075.

It can be further analysed that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as I consider testimonials or reviews before specifying or using any eco-labelled products, I feel product manufacturers effectively communicate the benefits of eco-labelled products and I have specified or used/purchased eco-labelled products because of marketing campaigns.

4.9 Test of Validity

Multiple Regression Analysis for Perceptions of Architects, Builders, and Contractors about the Adoption of Eco-labelled Products

In the present study, Multiple Regression Analysis of Awareness of Eco-labelled Products, Cost Benefits of Eco-labelled Products, Availability of Eco-labelled Products, Professional Experience and Expertise, Government Regulatory Policies and Incentives and Marketing Strategies and has been tested as a tool of validity. Collinearity has been used an inbuilt measure to determine the effect of independent variables called as predictors on dependent variable called as criterion. The unstandardised (B) coefficients are the coefficients of the estimated regression model.

4.10 Hypotheses Analysis

Hypothesis 1

The hypothesis testing using Chi Square test found significance level less than 5% to reject the null hypothesis. It can be inferred that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai.

The highest value of Chi-Square value has been observed for Favourable government policy promoting eco-labelled products enhances their adoption as 665.875. The second highest value has been observed for Public outreach through marketing campaigns influences the adoption of eco-labelled materials as 628.375. The third highest value of Chi Square has been observed for Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials as 553.475.

It can be further analysed that the adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai have been summarised as Favourable government policy promoting eco-labelled products enhances their adoption, Public outreach through marketing campaigns influences the adoption of eco-labelled materials and Communication of the benefits by product manufacturers enhances the adoption of eco-labelled materials.

Hypothesis 2

The hypothesis testing using Kolmogorov Smirnov Test revealed significance level less than 5% to reject the null hypothesis. It can be inferred that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai.

The highest value of Kolmogorov Smirnov Value has been observed for Overall cost savings of eco-labelled products are better compared to non-eco-labelled products as 6.326. The second highest value has been observed for Operational cost savings of eco-labelled products outweigh the initial costs as 6.113. The third highest value has been observed for Higher initial cost is a significant barrier to adoption of eco-labelled products as 5.702.

It can be further revealed that Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai can be summarised as Overall cost savings of eco-labelled products are better compared to non-eco-labelled products, Operational cost savings of eco-labelled products outweigh the initial costs and Higher initial cost is a significant barrier to adoption of eco-labelled products.

Hypothesis 3

The hypothesis testing using Kolmogorov Smirnov Test revealed significance level less than 5% to reject the null hypothesis. It can be inferred that the ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors.

The highest value of Kolmogorov Smirnov Value has been observed for Improved availability of eco-labelled products would increase their adoption in my projects as 7.217. The second highest value has been observed for Availability of eco-labelled products significantly influences my decision to specify or use them as 6.247. The third highest value has been observed I am confident that eco-labelled products will be consistently available for my projects as 5.851.

It can be further revealed that ease of availability and accessibility of Eco-labelled products can be summarised as Improved availability of eco-labelled products would increase their adoption in my projects, Availability of eco-labelled products significantly influences my decision to specify or use them and I am confident that eco-labelled products will be consistently available for my projects.

Hypothesis 4

The hypothesis testing using Chi-Square Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for Priority in procurement for Ecolabelled products helps increase their usage as 321.02. The second highest value has been observed for Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products as 312.56. The third highest value of Chi Square has been observed for Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials as 264.7.

It can be further analysed that Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as Ecolabelled products helps increase their usage, Government-backed eco-label certifications enhance the credibility and adoption of Ecolabelled products and Government-led public awareness campaigns /drives catalyse the promotion of the benefits of Ecolabelled materials.

Hypothesis 5

The hypothesis testing using Kolmogorov Smirnov Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region.

The highest value of Kolmogorov Smirnov Value has been observed for I regularly collaborate or consult with other professionals before specifying or using eco-labelled products as 7.358. The second highest value has been observed for I actively re-evaluate new options when specifying or using new categories of eco-labelled products as 7.165.

The third highest value has been observed for Trainings or workshops on eco-labelled products helps me specify or use them more effectively as 7.108.

It can be further revealed that Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region can be summarised as I regularly collaborate or consult with other professionals before specifying or using eco-labelled products, I actively re-evaluate new options when specifying or using new categories of eco-labelled products and Trainings or workshops on eco-labelled products helps me specify or use them more effectively.

Hypothesis 6

The hypothesis testing using Chi-Square Test highlighted significance level less than 5% to reject the null hypothesis. It can be inferred that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region. The highest value of Chi-Square value has been observed for I consider testimonials or reviews before specifying or using any eco-labelled products as 408.875.

The second highest value has been observed for I feel product manufacturers effectively communicate the benefits of eco-labelled products as 280.525. The third highest value of Chi Square has been observed for I have specified or used/purchased eco-labelled products because of marketing campaigns as 229.075.

It can be further analysed that Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region have been summarised as I consider testimonials or reviews before specifying or using any eco-labelled products, I feel product manufacturers effectively

communicate the benefits of eco-labelled products and I have specified or used/purchased eco-labelled products because of marketing campaigns.

Table 4.12 : Summary table of Hypothesis Analysis

Hypothesis Statement	**Critical level & Statistical test Used**	**Inference**
Hypothesis 1 **Null Hypothesis** **(*$H1_o$*):** The adoption of Eco-labelled products does not depend upon the level of awareness among Architects, Builders, and Contractors in the Mumbai	The critical level or level of significance is set at 5%(0.05) Chi-Square Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai
Alternative Hypothesis (*$H1_A$*): The adoption of Eco-labelled products depends upon the level of awareness among Architects, Builders, and Contractors in the Mumbai		
Hypothesis 2 **Null Hypothesis** **(*$H2_o$*):** Favourable cost benefit perception about Eco-labelled products does not enhance the chances of adoption by the Architects, Builders, and Contractors in Mumbai	The critical level or level of significance is set at 5%(0.05) Kolmogorov Smirnov Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** Favourable cost benefit perception about Eco-labelled products enhances the chances of

Alternative Hypothesis (*$H2_A$*): Favourable cost benefit perception about Eco-labelled products enhances the chances of adoption by the Architects, Builders, and Contractors in Mumbai		adoption by the Architects, Builders, and Contractors in Mumbai
Hypothesis 3 **Null Hypothesis (*$H3_o$*):** The ease of availability and accessibility of Eco-labelled products does not significantly influence the adoption among Architects, Builders, and Contractors	The critical level or level of significance is set at 5%(0.05) Kolmogorov Smirnov Test Reliability Analysis Multiple Regression Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors
Alternative Hypothesis (*$H3_A$*): The ease of availability and accessibility of Eco-labelled products does significantly influence the adoption among Architects, Builders, and Contractors		
Hypothesis 4 **Null Hypothesis (*$H4_o$*):** Regulatory policies and incentives deemed favourable do not have a significant impact on the	The critical level or level of significance is set at 5%(0.05) Chi-Square Test Reliability Analysis	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected**

adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region	Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region
Alternative Hypothesis ($H4_A$): Regulatory policies and incentives deemed favourable have a significant impact on the adoption of Eco-labelled products among Architects, Builders, and Contractors in the Mumbai Metropolitan Region		
Hypothesis 5 **Null Hypothesis ($H5_o$):** Higher levels of professional experience, expertise, and exposure to Eco-labelled products does not lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region	The critical level or level of significance is set at 5%(0.05) Kolmogorov Smirnov Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the

Alternative Hypothesis ($H5_A$): Higher levels of professional experience, expertise, and exposure to Eco-labelled products lead to their adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region		Mumbai Metropolitan Region
Hypothesis 6 **Null Hypothesis ($H6_o$):** Marketing strategies related to Eco-labelled products do not lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region	The critical level or level of significance is set at 5%(0.05) Chi-Square Test Reliability Analysis Multiple Regression Analysis Factor Analysis Structural Equation Modelling[SEM]	If the critical level or level of significance is less than 5%(0.05), null hypothesis is rejected **Null hypothesis is rejected** Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region
Alternative Hypothesis ($H6_A$): Marketing strategies related to Eco-labelled products lead to adoption among Architects, Builders, and Contractors in the Mumbai Metropolitan Region		

Chapter 5 – Findings

The findings of this study offer a comprehensive view of the factors influencing the adoption of eco-labelled building materials in the Mumbai Metropolitan Region. The responses from 400 professionals, who are either Architects, Builders and Contractors, reveal that majority of them are having an experience of 15 years and above, which makes them influential in their respective field and play the role of information Gate Keepers.

The study revolved around seven core variables - awareness, cost-benefit perception, availability, professional expertise, government policy, marketing strategies, and actual adoption behavior. The variables had high internal reliability , with Cronbach's Alpha value exceeding 0.8. Weighted average means (WAMs) suggest that professional expertise (4.29), marketing strategies (4.24), and adoption drivers (4.22) were perceived most strongly by respondents, followed closely by awareness (4.21) and availability (4.11). Cost-benefit perception (4.00) and government policy (4.10) also showed significant influence, though with slightly lower emphasis.

Regression analysis further validated the predictive strength of independent variable ~ Awareness, Availability and Cost Benefit, and of the moderating variables comprising of Government Regulatory Policies and Incentives, Professional Experience and Expertise and the Marketing Strategies by Product Manufacturers. Cumulatively, these factors explained 57% variance in the Adoption of Ecolabelled products.

Strategically, the findings underscore that adoption is not driven by a single factor but emerges from a multi-variable interplay of perception, access, policy support, and market activation. Experienced professionals respond to compliance and cost logic, mid-level actors seek performance validation, and early-career stakeholders are influenced by digital content and training. The study highlights the need for integrated approaches / interventions - combining certification, marketing, training, and incentives—to accelerate sustainable procurement and mainstream eco-labelled products in urban construction.

Chapter 6 – Suggestions and Recommendations

The study identifies a set of strategic recommendations to enhance the adoption of eco-labelled building materials in the Mumbai Metropolitan Region. The suggestions are based on the data shared by the respondents in the study, which reveals the rationale behind the adoption of Ecolabelled products revolving around awareness, ease of availability, guiding or mandatory policies, professional background and marketing strategies.

The recommendations given herewith will help the stakeholders adopt Ecolabeled products faster by devising a proper support ecosystem.

1. **Awareness Campaigns** should be structured in a way which can connect easily with the respective stakeholders using aids such as case studies, visual storytelling and not just technical messaging.
2. **Training and Capacity Building** for enhancing the technical familiarity of the key stakeholder i.e. Architects, Builders and Contractors and the confidence in specifying the ecolabeled products, leading to building a sustainability led practice, should be offered either through professional bodies of academic institutions.
3. **Government Policy and Incentives** play a pivotal role in adoption. A clear policy, properly defined framework and financial incentives can legitimise and increase the adoption of Ecolabelled products. A transparent regulatory framework is the key factor that will build trust around the Ecolabelled products.
4. **Product Availability and Access** have to be ramped up. The improved supply chains and assured regional access coupled with ease of procurement can enable the adoption even at the specification stage and thereby the usage.
5. **Marketing Strategies by Manufacturers** should focus on building credibility and engagement. Transparent product claims, third-party endorsements, and targeted campaigns—especially those using testimonials and influencer outreach—can activate market pull and shape stakeholder perception.
6. **Professional Experience and Peer Influence** should be leveraged to drive behavioural change. Senior professionals can act as sustainability champions, while mid-level and early-career practitioners can be engaged through collaborative platforms, digital content, and mentorship.

In conclusion, the adoption of eco-labelled building materials requires an integrated ecosystem approach. By aligning policy, market infrastructure, professional capacity, and marketing activation, these recommendations offer a pathway to move from isolated adoption to systemic transformation across urban India's construction sector.

Chapter 7 - Limitations

This study, while offering valuable insights into the adoption of eco-labelled building materials in the Mumbai Metropolitan Region, is subject to several limitations that must be acknowledged.

First, the scope of the research was geographically restricted to Mumbai, which may limit the generalisability of findings to other urban or rural contexts across India. Regional variations in policy enforcement, market maturity, and professional practices could yield different adoption dynamics elsewhere.

Second, the study relied on self-reported data from architects, builders, and contractors, which may be influenced by personal biases, social desirability, or limited recall. Although efforts were made to ensure respondent diversity and experience, the sample may not fully capture the perspectives of emerging professionals or smaller-scale practitioners.

Third, the study focused primarily on seven variables—awareness, cost-benefit perception, availability, professional expertise, government policy, marketing strategies, and adoption behavior—while other potentially influential factors such as client demand, environmental attitudes, or project typologies were not explored. This narrowed scope, while methodologically deliberate, may overlook broader systemic or behavioural influences.

Fourth, the use of structured questionnaires, though statistically robust, may constrain the depth of qualitative insights. Nuanced motivations, contextual barriers, and emotional drivers of adoption might be better captured through interviews or ethnographic methods.

Finally, while Structural Equation Modelling (SEM) provided a powerful framework for analysing variable relationships, it is inherently dependent on the quality of input data and model assumptions. Any limitations in construct validity or measurement precision could affect the interpretation of results. Despite these constraints, the study offers a strong foundation for future research and policy dialogue, and its findings remain relevant for stakeholders seeking to scale sustainable construction practices in urban India.

Chapter 8 - Scope for Further Studies

This study lays a strong foundation for understanding the adoption of eco-labelled building materials in the Mumbai Metropolitan Region, but it also opens up several promising avenues for future research. Given the complexity of sustainable construction and the evolving nature of market and policy dynamics, further studies can deepen, broaden, and diversify the insights generated here.

Geographic Expansion is a natural next step. Extending the research to other metropolitan clusters and peri-urban regions across India would allow for comparative analysis and help identify region-specific drivers and barriers. Such studies could reveal how local governance, infrastructure maturity, and cultural factors shape adoption differently.

Stakeholder Variance : The current study focusses on Architects, Builders and Contractors. The future research may include other stakeholders such as government officials and importantly end consumers. Their perspective can further help deep dive on finer nuances and help understand dynamics behind the adoption.

Exploring Cultural insights : The current study has been conducted using a structured questionnaire which has captured the data in a proper manner suitable for generating data patterns. However, a softer aspect of Culture can also be captured in a separate study to understand any correlation between the cultural background of the stakeholders and adoption of Ecolabelled products.

Technology Amalgamation : A future study can be undertaken to understand if the benefits of incorporating Ecolabelled products in a project, give a technology or

commercial advantage and how we can quantify the same. The results may reveal new dimensions and help the manufacturers to generate the required data.

Marketing Communication and Channels : A study to find out which channels are relevant and are effective to which set of Stakeholders can give the manufacturers a guideline on devising relevant marketing strategies, which will further catalyse the adoption and penetration of the Ecolabelled products.

Thus, the scope for further studies sets the tone for newer perspectives which can contribute and enhance the adoption of Ecolabelled products in India.

Chapter 9 – Conclusion

This study has explored the multifaceted dynamics influencing the adoption of eco-labelled building materials in the Mumbai Metropolitan Region, offering both empirical insights and strategic implications. Through a structured analysis of seven core variables—awareness, cost-benefit perception, availability, professional expertise, government policy, marketing strategies, and adoption behavior—the research has demonstrated that sustainable procurement is shaped by a complex interplay of perception, access, regulation, and influence.

Relevance of the study

The relevance of this study and the outcomes, lies at three levels:

1. Academic contribution – Most eco-label research has focused on consumer goods. By applying six perceptual theories to the construction sector, this study extends understanding into B2B contexts, where decision-making is complex and multi-stakeholder.

2. Practical urgency – India's commitment to Net Zero 2070 requires transformative shifts across all sectors. Construction will play a decisive role. Eco-labelled products are central to aligning projects with sustainable outcomes. The Government of India's proposed Climate/Green Finance Taxonomy will classify activities as Tier 1 (directly climate-supportive, e.g., insulation, waterproofing, energy-efficient products) and Tier 2 (indirectly supportive, e.g., adhesives,

finishes, coatings). This framework will shape procurement and finance, underscoring why stakeholder readiness is essential.

3. Societal importance – Construction choices today will impact future generations. Without a clear understanding of perceptions and adoption barriers, India risks delaying its transition towards sustainable development pathways.

The use of Structural Equation Modelling (SEM) has enabled a nuanced understanding of how these variables interact, revealing that both independent and moderating factors significantly affect adoption outcomes.

The findings underscore the importance of aligning technical knowledge with market activation and policy support. Experienced professionals act as gatekeepers, while mid-level and early-career stakeholders respond to performance validation and training.

Marketing strategies and certification frameworks emerge as trust-building mechanisms, while government incentives and clear mandates serve as systemic enablers. The study also highlights the need for integrated interventions—where awareness, availability, and behavioural nudges converge to create a conducive environment for sustainable construction.

In conclusion, the adoption of eco-labelled building materials is not a linear process but a multi-variable journey that requires coordinated efforts across policy, market, and professional domains. By identifying key drivers and barriers, this research provides a foundation for future action—whether in policy formulation, industry engagement, or academic inquiry—to mainstream sustainability in India's urban construction landscape.

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