

From Symbolic Sustainability to Behavioural Transformation: Introducing Mall-Based Eco hubs and the Eco-Infrastructure Transformation Model (EITM) in Sustainable Retail

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ABSTRACT

Scepticism about green marketing claims on the part of consumers is increasingly common, which highlights the major drawbacks associated with symbolic green marketing when it comes to fostering authenticity in terms of sustainability. While there exists a considerable amount of research literature dealing with sustainability in retailing, no construct has been identified that integrates all four important factors at once. In response, this study proposes the construct of Mall-Based Eco hubs as well as the Eco-Infrastructure Transformation Model (EITM), a conceptual model which considers the interplay among these four factors. Using signalling theory, Stimulus-Organism-Response model, and self-perception theory, the EITM postulates that Eco hubs can be viewed as observable, irreversible signals of sustainability-related authenticity within the everyday context of consumption behaviours. Seven hypotheses investigate the effect of Eco hub attributes on perceived authenticity, perceived consumer effectiveness, pro-environmental self-identity, and sustainable behavioural spill-over, moderated by institutional legitimacy and fit between firms and environmental causes. A quantitative analysis approach using PLS-SEM methodology and 400 participants in Malaysia's retail market will be applied. Most importantly, the model highlights a green washing paradox: the more visible the infrastructure becomes, the stronger its effect on authenticity when organizational fit is high, and the weaker on suspicion when low.

Keywords: Mall-Based Eco hubs, Sustainable Retail Infrastructure, Costly Signalling Theory, Green washing Amplification, Perceived Consumer Effectiveness, Pro-Environmental Self-Identity, Behavioural Spill over, Firm-Cause Fit, Institutional Legitimacy, Sustainable Consumer Transformation

INTRODUCTION

Globally, sustainability is no longer a marginal corporate responsibility issue but a core strategy issue for multinational retail companies (Yilmaz & Gürlü, 2025). Companies are trying to project themselves as environmentally responsible by using eco-labeling, sustainability reports, carbon neutrality initiatives, ethical sourcing claims and digital green branding (Santos et al., 2023). On the other hand, consumers demand a commitment to the environment and nature. However, consumer confidence in such claims made in green marketing has waned due to practices like green washing and symbolic environmentalism (Khan et al., 2022; Şen, 2025). There are a credibility and notable crisis that has arisen due to green washing with regard to sustainability retailing (Vadakkapatt et al., 2020). Therefore, consumer perceptions of misleading or exaggerated environmental claims lead to a loss of trust and reduce purchase intention (Poulis et al., 2026). Regulatory bodies in Europe and Asia have increased their efforts in investigating environmental claims not backed by any evidence (Alsaggaf, 2025). Recent findings indicate that a significant portion of products claiming to be “sustainable” or “natural” are based on unsubstantiated environmental claims (Khan & Hinterhuber, 2025).

Furthermore, another burning issue that needs addressing in studies on sustainable consumption is the intention-behaviour gap (Mahwechi, 2025). Particularly while consumers have positive attitudes towards the environment, their intentions do not always result in actions due to issues such as convenience, friction, uncertainty and low personal relevance (Winkelmeier et al., 2023). Sustainable transformation thus involves more than just communication whereas it involves the creation of behaviour-supporting infrastructure within the context of consumer activities (Reppmann et al., 2024). As a result, the concept of sustainability in the retail sector is

moving away from communication to becoming material (Vadakkappatt et al., 2020). The most advanced developers are constructing sustainability systems that are tangible, visible and enable sustainable behavior through the creation of such infrastructure in retail spaces and building (Karthikeyan & Nagaprakash, 2023). One notable example of this trend is the establishment of the first-ever shopping Centre Eco hub in Malaysia, which was unveiled in May 2026 by Pavilion Kuala Lumpur in collaboration with SWCorp Malaysia that including such components as reverse vending, textile recovery, recycling technology, sustainability workshops, and partnerships (Shina et al., 2026).

However, despite progress in practice, there is still an element of fragmentation in the literature. The concepts of green services cape, experiential corporate social responsibility, sustainability pop-up stores and recycling infrastructure each describe only one aspect of the phenomenon (Wang et al., 2024). The concept of green services cape is concerned with environmental atmospherics rather than enabling behaviours (Guyader et al., 2019). Experiential corporate social responsibility research investigates temporary campaigns rather than long-term investments (White et al., 2022). The study of recycling infrastructure neglects the sustainability system integrated into branded retail stores and legitimized institutionally (Auld et al., 2007; Vadakkappatt et al., 2020). There is no such concept that combines all three elements described above.

Furthermore, in order to fill this gap, the current research paper introduces the concept of Mall-based Eco hubs and also the Eco-Infrastructure Transformation Model (EITM). Using the insights of signalling theory and the Stimulus-Organism-Response (S-O-R) model and also it is proposed that Eco hubs act as costly signals that add to the perception of authenticity and minimize the behaviour gap that keeps consumers trapped between intention and action (Taghikhah et al., 2019). Repeated exposure to sustainability infrastructure through Eco hubs will lead to increased PCE and pro-environmental self-identity. However, more importantly, this paper advances a critical theoretical argument that is currently under-theorized in the context of the sustainability literature. Specifically, sustainability infrastructure can be seen as an authenticity tool that cuts both ways, meaning that while Eco hubs could serve to enhance perceptions of authenticity, when combined with poor firm-cause fit, Eco hubs could also enhance perceptions of hypocrisy and green washing (Chu & Yuan, 2025). This is a theoretically significant boundary condition since visibility means heightened scrutiny and does not ensure legitimacy (Akbar et al., 2025). In this regard, the present research shifts its focus from sustainability infrastructure as a sustainability tool to an inherently risky signalling device.

Furthermore, the research paper aims to achieve three things. First, to define and theoretically ground the concept of Mall-based Eco hub as a retail sustainability construct. Second, to create an explanatory model known as EITM that captures the effects of Eco hubs on sustainable consumer change by means of authentic signalling, PCE, and pro-environmental self-identity and In **Figure 1** Eco-Infrastructure Transformation Model (EITM) visualize. Third, to recognize the boundary conditions for the positive or negative effect of Eco hub visibility on consumers' authenticity perception.

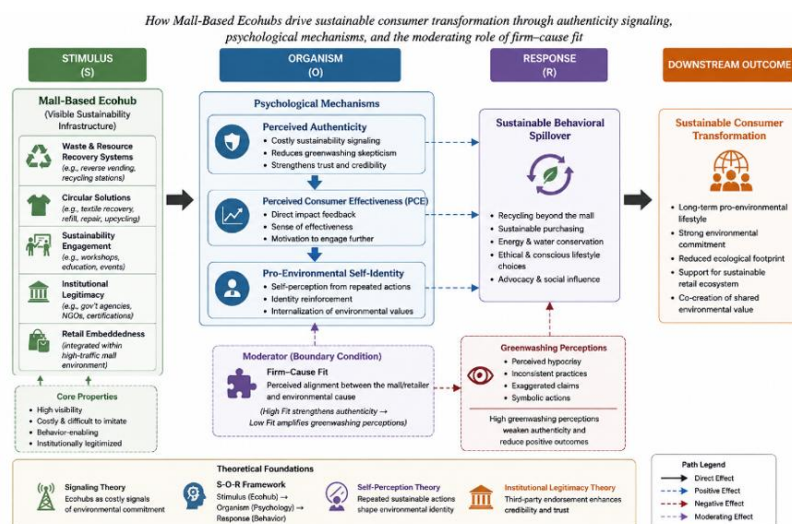


Figure 1. Eco-Infrastructure Transformation Model (EITM)

This study makes four significant contributions to the sustainable retailing and consumer behaviour literature. First, it brings together costly sustainability infrastructure, behavioural enablement, institutional legitimacy, and retail embeddedness into a single concept. Second, it builds on signalling theory by showing that physical sustainability infrastructure serves as an authentic signal because it is observable and hard to imitate. Third, it adds to the S-O-R framework by delineating the psychological processes through which infrastructure leads to behavioural change. Fourth, it contributes to green washing literature by suggesting that highly observable sustainability investments can either strengthen or weaken authenticity, depending on the organization's congruence. As the following argument will show, the success of sustainable retailing strategy will be determined not so much by what the brands say about themselves environmentally but by what consumers can see, feel, and do for themselves.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Green washing, Sustainability Scepticism, and the Decline of Symbolic Green Communication

Agarwal et al. (2025) mentioned in his study that sustainability communication has grown into a popular marketing tool in the retail sector. However, businesses use eco-labelling, carbon neutrality, sustainability reporting, ethical sourcing campaigns and environmental branding to distinguish themselves in competitive environments to get recognized (Osman et al., 2025). Green communication was initially used as a means of showing that businesses were environmentally responsible and legitimate (Alam & Islam, 2021). The widespread adoption of green communication has resulted in increased scepticism about the genuineness of environmental claims by corporations (Osman et al., 2025).

However, this doubt relates to green washing, which involves the overstatement, selective communication, or manipulation of information regarding an organization's environmental performance to create false illusions of sustainability (Persakis et al., 2025). Consumers tend to observe inconsistencies between the environmental rhetoric communicated by organizations and their actions, and environmental communication fails to be persuasive. Perceived green washing negatively impacts consumers' trust, authenticity of the brand, purchasing intentions, and loyalty (Areethai et al., 2025). Therefore, the problem is not limited to one instance but rather generalized by consumers to the entire brand.

Furthermore, signalling theory serves as the theoretical foundation. With information asymmetry, organizations use observable signals to convey unobservable attributes (Williams et al., 2023). Credibility and cost influence signal strength. Low-cost signals can be easily replicated by inferior individuals, while costly signals entail considerable effort and are hard to copy (Reichert et al., 2021). Thus, costly signals are more reliable indicators of an attribute compared to cheap signals. Sustainability communication in general, as well as advertising and green marketing in particular, represent forms of relatively low-cost signalling. As a result, consumers regard such communication as mere rhetoric (Saes et al., 2025).

Therefore, the recent research on sustainability shows that costly and observable sustainability practices create higher perceptions of authenticity compared to merely communicative activities (Yılmaz & Gürler, 2025). Consumers are more likely to believe sustainability practices if organizations make costly, non-reversible, and operational commitments to demonstrate their actual involvement (Brough et al., 2020). The effectiveness of future sustainability strategies will thus rely more on observable practices rather than communication (Giau et al., 2016).

At the same time, current research on green washing continues to focus almost exclusively on communicative issues (Bernini & Rosa, 2023). Current studies often analyse sustainability communications, advertisement credibility, labels, and green marketing, but do not investigate whether and how sustainability infrastructure can affect consumers' perceptions of authenticity in actual consumption contexts (Hina et al., 2024). This is important since according to signalling theory, costly and observable infrastructure should behave differently from standard communicative acts.

2.2 From Symbolic Sustainability to Physical Sustainability Infrastructure

In light of growing scepticism about symbolic green communication, retail sustainability strategy is shifting towards embedding sustainability in physical systems (Yılmaz & Gürler, 2025). This represents a trend in the move from communicative sustainability to experiential and infrastructural sustainability (Muschket et al., 2023).

However, some reasons for this trend are provided by the concept of sustainable servicescape in retail and hospitality literature. Servicescape theory posits that the physical environment affects consumer cognition, emotions, and behaviour via environmental stimuli (Bae & Yoo, 2026). The later application of this concept to retail settings indicated that the atmosphere in stores influences approach tendencies, satisfaction, attachment, and intention (Au-Yeung et al., 2024). Sustainable servicescape research extended this logic by arguing that environmentally themed physical settings communicate ecological values through design, layout, ambient conditions, and sustainable architectural elements (Han et al., 2020).

Sustainable servicescape theory, however, is limited for the present purposes. First, it focuses on symbolic environmental cues rather than behavioural enablement. Studies examine green décor, eco-friendly lighting, recyclable materials, and natural aesthetics; these elements communicate sustainability symbolically but do not enable consumers to act sustainably within the retail environment (Vadakkapatt et al., 2020). Second, servicescape research rarely treats sustainability infrastructure as a costly authenticity signal; the physical environment is treated as aesthetic communication rather than irreversible strategic investment (Brockhaus et al., 2017). Third, the servicescape literature inadequately addresses institutional legitimacy. Most environmental retail studies focus on retailer-generated sustainability symbolism without examining how external institutional partnerships shape authenticity perceptions (Riandita et al., 2021).

Adjoining constructs only partially narrow the gap. Experiential CSR studies demonstrate that consumer attachment increases as consumers engage physically with socially responsible brand activities (Shimul, 2022), yet such experiential CSR is usually a temporary campaign and not an infrastructural one. Sustainability pop-up events symbolize sustainability and do not involve any operation. At the same time, research on environmental behaviors indicates that the ease of engagement and convenience play significant roles in adopting sustainability practices (Anderski et al., 2023), and that sustainable behaviours do not occur due to indifference, but due to friction and inconvenience (Papagiannidis & Marikyan, 2021). In this regard, sustainability infrastructure that is incorporated into everyday retail spaces could be more effective from a behavioural standpoint than symbolic communication (Ghodkea et al., 2025). However, there is currently no theoretical construct that combines costly signalling, behavioural enablement, legitimacy, and retail infrastructure.

2.3 Mall-Based Eco hubs as a New Retail Sustainability Construct

Mall-Based Eco hubs are a notable step forward in terms of sustainability retail approaches (Wang et al., 2024). Contrary to traditional sustainability marketing, Mall-Based Eco hubs integrate permanent sustainability infrastructure, consumer engagement systems, institutional relations, and retailing into an ecosystem framework (Sharma et al., 2023).

The latest trends in the industry prove that infrastructure-based sustainability initiatives are becoming increasingly popular (Nilkant et al., 2025). Reverse vending systems, textile recovery systems, recycling technologies, circular reward ecosystems, sustainability workshops, and educational initiatives are being implemented at shopping malls (Pongpunpurt et al., 2024). The Pavilion Kuala Lumpur Eco hub is considered one of the best models of Mall-Based Eco hubs currently, which incorporates reverse vending linked to digital rewards, textile recovery, sustainability workshops, NGOs' cooperation, government backing, and tenant engagement (Shina et al., 2026).

Furthermore, the Mall-Based Eco hub is hereby defined as a branded and institutionally legitimized sustainability infrastructure located within a highly trafficked retail space that facilitates the execution of visible environmentally friendly behaviours by consumers at the point of consumption (Guyader et al., 2016). The above definition serves to distinguish the Eco hubs from related concepts along four different fronts. Firstly, Eco hubs

are defined by costly signalling infrastructure in that they consist of permanent investments, continuous operations, premium retail space, and maintenance, none of which can be faked. Secondly, Eco hubs are distinguished by behavioural enablement because they do not only expose consumers to messages but actively enable sustainable behaviours in the retail environment thereby reducing the friction underlying the intention-behaviour gap (Ghodkea et al., 2025). Thirdly, Eco hubs are characterized by institutional legitimacy in that they engage multiple partners such as governmental bodies, NGOs, scientific institutions, and environmentally oriented brands, creating layers of legitimacy that go beyond the reach of the retail centre alone (Reppmann et al., 2024; Testa et al., 2022). Lastly, Eco hubs operate within routine consumption contexts rather than standalone venues, and repeated sustainable behaviours in public consumption contexts may increase the strength of environmentally friendly self-identity through self-perception (Morais et al., 2021).

Eco hubs can be described as hybrid models that operate as authenticity signals, behavioural converters, identity rehearsal grounds, and legitimization arenas at the same time. This combination of functionalities distinguishes Eco hubs from other sustainable development concepts (Linder et al., 2021).

2.4 Theoretical Foundations of Sustainable Consumer Transformation

The behavioural mechanisms underlying the Eco hub concept are explained through the integration of signalling theory and the S-O-R framework.

2.4.1 Signalling Theory and Authenticity Formation

The signalling theory helps to understand how organizations transmit credibility amid information asymmetry (Connelly et al., 2024). As consumers cannot directly perceive organizations' environmental commitment, they depend on the signals that can be observed (Khan et al., 2025). Eco hubs can be treated as costly signals of sustainability, since they imply tangible financial costs, physical infrastructure, continuous operations, observability, and institutionalization (Williams et al., 2023). In contrast to sustainability advertisements, Eco hubs cannot be easily replicated, which means that they must convey higher levels of perceived authenticity and less consumer scepticism (Zhou et al., 2023). Yet, according to the signalling theory, signals will not work when there is inconsistency between organization's actions and its signals. The problem becomes crucial for retail settings, when the presence of sustainable infrastructure does not preclude unsustainable retailing practices (Vadakkapatt et al., 2020).

2.4.2 S-O-R Theory and Sustainable Behavioural Transformation

According to the S-O-R model, environmental stimuli trigger certain internal psychological states that determine behaviour (Razi, 2026). In the current research, Eco hub serves as a stimulus, PCE and pro-environmental self-identity represent the organism states, while sustainable behaviour is the response (Bryant & Basu, 2023). PCE is a term that represents the extent to which people perceive that their behaviour can affect environmental outcomes (Kautish et al., 2021). Being engaged in Eco hub activities can enhance PCE as people are provided with feedback on their sustainable actions through recycling programs and reward mechanisms (Meijers et al., 2022). Pro-environmental self-identity stands for the extent to which individuals see themselves as environmentally responsible (Udall et al., 2021). The concept of self-perception theory claims that engaging in public behaviour repeatedly helps develop self-identity since people base their identities on observed behaviour (Xing et al., 2022). Furthermore, identity-based mechanisms are related to behavioural spill over as well: when sustainable behaviour becomes relevant to the self, people are more likely to transfer it to home recycling, energy savings, and sustainable consumption (Frezza, 2024). Therefore, signalling theory helps explain the process of authenticity formation, S-O-R theory helps understand behavioural change, while self-perception explains spill over.

2.5 Research Gap and Conceptual Positioning

The review of the literature mentioned above provides four important insights. First, sustainability communication is becoming less effective due to the increasing scepticism about green washing. While previous sustainability literature acknowledges the significance of physical retail settings, it fails to provide a satisfactory

explanation for the role of permanent sustainability infrastructure within consumption ecosystems. Current theories of retail sustainability fail to incorporate costly signalling, behavioural enablement, institutional legitimacy, and consumer identity transformation within one theoretical framework. Finally, the behavioural effects of sustainability infrastructure (such as authenticity creation, identity reinforcement, and green washing intensification) require more thorough theorizing. This research paper attempts to fill the identified gaps in knowledge by introducing a novel sustainability concept – Mall-Based Eco hub – and developing the EITM model.

CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

3.1 Overview of the Eco-Infrastructure Transformation Model (EITM)

The EITM provides insight into the effects of Mall-Based Eco hubs on sustainable consumer transformation via authenticity signalling, psychological activation, and behavioural spill over. The theoretical model brings together signalling theory (Berger, 2019) and the S-O-R model to highlight the effect of sustainability infrastructure that is embedded in retail environments on consumer cognition and behavioural outcomes (Fella et al., 2023).

Furthermore, the main argument here is that Mall-Based Eco hubs are more than just sustainability installations. They are authenticity mechanisms that work in everyday consumption contexts (Pittman et al., 2024). While eco-labelling and corporate social responsibility initiatives are merely symbolic, Eco hubs provide tangible evidence of sustainability investments in terms of physical infrastructure, sustained operations, institutional collaborations, and active participation (Wong & Ngai, 2021). As such, Eco hubs must mitigate consumer scepticism through costly and hard-to-fake signalling while at the same time encouraging sustainable actions by reducing the cost of participation (Lashitew et al., 2021).

In the EITM framework, the Mall-Based Eco hub is the main environmental stimulus and is operationalized using three constitutive elements (Gonzalez-Arcos et al., 2021). These include costly signalling infrastructure that refers to sustainability investments that need high monetary costs, dedicated retail space, maintenance, and commitment, which serve as a credible signal since they are hard to copy (Saes et al., 2025). The second element is behavioural enablement, which refers to the ability of the Eco hub to support immediate engagement with reverse vending, textile recovery, recycling technology, and sustainability workshops in the retail environment (Otto et al., 2021). The role of this element is to solve the intention-behaviour gap through minimizing the convenience barrier and making sustainability action part of routine consumption behaviour (Vadakkapatt et al., 2020). The third element is institutional legitimacy, which involves the partnership with government institutions, environmental NGOs, scientific institutions, and sustainability-focused tenant brands (Krasikov & Legner, 2023). Partnerships with external institutions transfer legitimacy from them to the retail sustainability effort and make it more credible since external validation makes it more resistant to manipulation (Elg, 2024).

Organism level comprises PCE and pro-environmental self-identity. The Ecohub engagement will enhance PCE because consumers get instant feedback for their actions through recycling, rewards, and environmental activities (Gayathree & Samarasinghe, 2019). Public participation in sustainable activities repeatedly increases the formation of sustainable identity based on self-perception (Lauren et al., 2017): since Eco hub engagement takes place in visible settings, consumers see themselves engaging in sustainable activities and develop self-concepts that align with their identities.

The reaction component entails instant actions carried out within the Eco hub (recycling, clothing donations, attending workshops, green purchasing), as well as secondary spill-over effects to non-retail settings through recycling, sustainable buying, energy conservation, and other environmentally friendly behaviours (Dermody et al., 2021). Hence, the model views Eco hubs as agents of change in transforming consumers sustainably rather than viewing them as stand-alone solutions.

The EITM further includes an important boundary condition through the influence of perceived fit between firm and cause (McCullough et al., 2022). Perceived firm-cause fit refers to the perceived match between the Eco hub's sustainability orientation and overall business practices of the hosting retail centre (Carrillat et al., 2024).

If organizational sustainability fit is high, then Eco hubs increase perceptions of authenticity. However, when organizational sustainability fit is low, the same visibility could actually increase perceptions of hypocrisy and green washing (Chu & Yuan, 2025). Visibility thus offers both opportunities and threats, and visibility of sustainable investment is not equivalent to authenticity. **Figure 1** depicts the entire EITM research framework model.

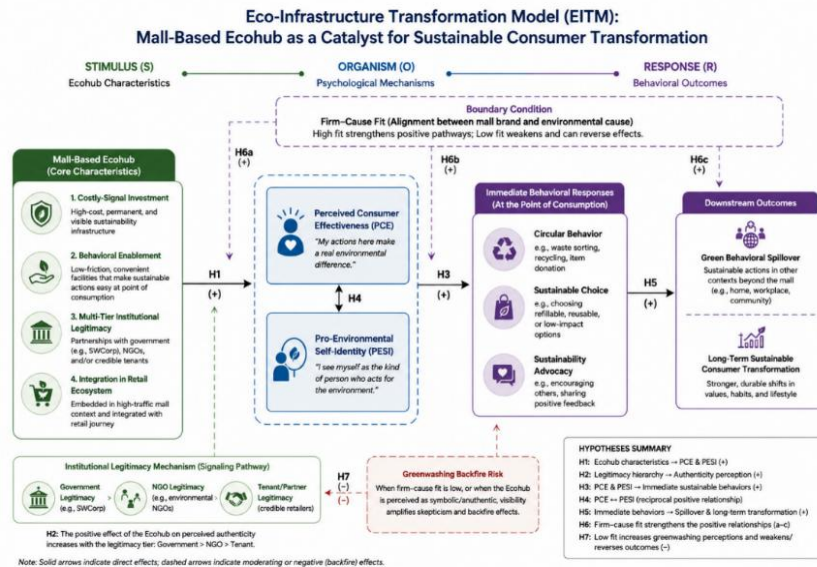


Figure 1. Proposed Research Framework of Eco-Infrastructure Transformation Model (EITM)

3.2 Mall-Based Eco hubs and Authenticity Signalling

One of the important propositions of the EITM is that Mall-Based Eco hubs serve as authenticity-generating sustainability signals in modern retailing (Yılmaz & Gürler, 2025). This proposition is built upon signalling theory, which describes how organizations convey their unobservable traits through observable and interpretable signals due to informational asymmetry (Connelly et al., 2024). In the case of sustainability, consumers do not have means for evaluating the organization's commitment to the environment and must use market signals to determine the nature of the claims.

Moreover, green marketing traditionally uses cheap signalling. Eco-labelling, sustainability slogans, carbon-neutral messages, CSR reports, and environmental branding all cost little to develop and are replicable even by companies that perform poorly (Hà, 2022). Green marketing signals have lost their ability to persuade consumers because of their impression management nature (Kim, 2025).

On the other hand, signal credibility increases as a function of the cost of the signal. Signals that are costly can be considered credible because they involve considerable resource expenditure and are hard to mimic by lower quality individuals (Bove & Benoit, 2020). Costly signals within sustainability contexts would involve organizational restructuring, infrastructural investment, changes within the supply chain, and a long-term commitment to the environment that involves some form of sacrifice (McGuicken & Palomo-Vélez, 2021).

Mall-Based Eco hubs are an example of just such a signal. Reverse vending systems, fabric recovery schemes, sustainability information centres, recycling technologies, and reward systems need significant money, physical space within the retail environment, continued operation, maintenance, and technological integration (Bui et al., 2021). Mall-Based Eco hubs are also highly visible within the public retail context: consumers experience their existence, size, and continued operation while shopping (Upadhyay et al., 2021). Visibility is essential to signal theory because costly investments act as signals only if consumers understand them (Connelly et al., 2024) ; otherwise, they remain hidden within organizational operations and cannot affect authenticity perceptions. Being physically located within the consumption context, the signal takes on a material dimension.

Moreover, Eco hubs also require some degree of partially irreversible commitments (Ünal et al., 2018). When recycling systems, sustainability facilities, and partnerships are put into place within a busy retail complex, it is difficult for organizations to withdraw from them without suffering serious reputational costs that will be visible to all (Grabs, 2023). This results in what is known in signalling theory as bonded credibility, where visibility and irreversibility increase perceived reliability. The credibility effect is further enhanced if Eco hubs create opportunities for consumer engagement (Williams et al., 2023). Eco hubs can allow consumers to participate in activities such as dropping off their recyclable products, participating in textile collection, attending sustainability workshops, and receiving sustainability-related rewards (Vadakkepatt et al., 2020). Therefore, Mall-Based Eco hubs should create higher perceptions of brand authenticity compared to traditional sustainability communication due to their infrastructure-based nature.

H1: Mall-Based Eco hub characteristics positively influence perceived authenticity of the host retail centre through costly sustainability signalling.

Signal strength is also contingent upon legitimacy and third-party verification (Lanzolla & Frankort, 2015). The greater effectiveness of signals can be achieved when they are verified by third parties that are independent of the signaller itself (Bove & Benoit, 2020). In the case of sustainability, institutional legitimacy is essential since consumers tend not to trust environmental signals issued purely for reputation enhancement purposes. Institutional legitimacy is defined as the degree of social credibility, external validation, and congruence with environmental norms of the sustainability initiative (Zhang et al., 2022). Legitimacy transfer takes place when environmental legitimacy is transferred to the focal firm.

One of the strengths of Mall-Based Eco hubs in this regard is that they are usually characterized by multi-layered institutional partnerships between government bodies, environmental NGOs, scientific organizations, recycling organizations, and sustainable tenants (Valbuena-Hernandez & Ortiz-de-Mandojana, 2021). These provide multiple layers of legitimacy which cannot be achieved alone by the retail center itself. Government partnerships, in particular, are significant as regulation institutions are considered authoritative, and any sustainability infrastructure that receives support from government organizations, such as SWCorp Malaysia, can be inferred to be credible and not merely symbolic (Mustaffa et al., 2022). Environmental NGO and scientific partnerships provide an additional layer of legitimacy based on their expertise and credibility (Latip et al., 2022). The former is known to be mission-driven institutions, while the latter brings the credibility of science to the table. Tenant sustainability partnerships constitute yet another layer, though one that is relatively weak due to the commercial nature of the partnering institution (Miller et al., 2021).

Legitimacy does not work additively in the EITM. Instead, it acts as an amplifier of signals. It enhances the interpretability and believability of the Eco hub signal since it is more difficult to fake externally validated infrastructure (Scott et al., 2021). Legitimacy can have different impacts on different institutions, where the source of legitimacy depends on whether institutions use formal authority (regulatory bodies), moral commitment (NGOs), knowledge and expertise (scientific institutions), or brand alignment (tenant brands) (Stupak et al., 2021).

H2: Institutional legitimacy positively strengthens the relationship between Mall-Based Ecohub characteristics and perceived authenticity of the host retail centre.

3.3 Eco hub Engagement and Psychological Transformation

In addition to authenticity signalling, Mall-Based Eco hubs are also thought to serve as psychological transformation tools affecting the environmental cognition and identity formation of consumers (Gonzalez-Arcos et al., 2021). The concept of signalling theory addresses how Eco hubs enhance authenticity perceptions, whereas the S-O-R model explains how the interaction with sustainability infrastructure triggers psychological states which then guide behaviour (Vatankhah et al., 2023). Under the EITM, the organism construct entails PCE and pro-environmental self-identity, both expected to arise from interactions with Eco hubs (Tang et al., 2022).

The key problem in sustainable consumption studies is the existence of an intention-behaviour gap (Laheri et al., 2024). Although consumers might have positive attitudes towards the environment, they tend to believe that

their efforts do not have much significance since the impact of each person's actions on environmental issues is negligible (Mastria et al., 2023). Personal contribution effectiveness (PCE) is designed to tackle this problem because it means the perception of the degree to which an individual's personal actions can solve environmental issues (Kautish et al., 2021). In previous studies, PCE was found to be among the most influential factors for engaging in sustainable actions.

Traditional sustainability communication fails to enhance PCE due to the lack of an opportunity for behavioural feedback through symbolic communication (Elhoushy & Lanzini, 2020). While sustainability campaigns might create an awareness of environmental issues, they fail to give consumers a chance to witness the results of their involvement in a concrete manner because environmental responsibility is still a psychological abstraction (Reppmann et al., 2024). On the other hand, Mall-Based Eco hubs are different since they turn involvement into a behavioural act that can be observed. Reverse vending machines, textile recovery, sustainability workshops, recycling bins, and reward-based systems enable consumers to see the result of their actions right away (Hes et al., 2025). By putting recyclables into reverse vending machines and receiving rewards, consumers see the result of their behaviour.

Additionally, the use of Eco hubs eliminates any structural obstacles that might be a deterrent to sustainable participation. The convenience and accessibility of participation are vital determinants for the adoption of sustainability (Elhoushy & Lanzini, 2020). Participation via Eco hubs is integrated into everyday consumption spaces, making it easier and less complicated to engage in environmental actions. Sustainability-related activities are no longer performed separately from the regular activities of consumers (Lopes et al., 2023). Moreover, the public participation aspect of the Eco hubs is likely to reinforce the PCE since such public actions are socially acknowledged and encouraged, leading individuals to feel that their actions are part of a larger collective movement (Nash et al., 2017).

Thus, active involvement in the Eco hub system will reinforce PCE better than passive exposure to sustainable messaging and environmental atmospherics (Martiskainen et al., 2020). Consumers who are actively involved in the sustainability system will feel more environmentally influential due to their actions being observable, quantifiable, and behaviourally reinforced through interaction with the retail environment (Vadakkappatt et al., 2020).

H3: Active engagement with Mall-Based Eco hub systems positively influences perceived consumer effectiveness (PCE).

Moreover, frequent interaction with the Eco hub is likely to impact self-identity regarding pro-environmental activities, which is understood as “the degree to which individuals identify themselves as environmentally responsible” (Werff et al., 2013). Self-identity based actions are more sustainable if an individual identifies with their environmental responsibility beyond extrinsic motivation. The theoretical basis for this hypothesis is self-perception theory (Udall et al., 2021), which suggests that individuals frequently form attitudes, values, and self-identities on the basis of their own actions, especially when internal attitudes are unclear at first.

Eco hubs located in malls provide optimal conditions for this because participation is conducted in publicly observable retail settings (Linder et al., 2021). Private sustainable actions may be less reinforcing because of their non-observable nature. Participation in Eco hubs, on the other hand, takes place in socially observable settings, where the individual can continuously observe himself or herself performing environmentally responsible actions while shopping (Zhao et al., 2024). The repeated action of recycling, participating in workshops, contributing to textile recovery, or engaging with circular reward ecosystems allows one to internalize sustainability participation as part of his or her identity by observing the repeated action of oneself performing such an activity (Rowe et al., 2019). Embodied participation reinforces the process: identity development is enhanced when individuals engage in relevant actions rather than just believing in environmentalism in their minds. Socially observable actions also convey to others the values one holds about the environment, resulting in social approval of environmental beliefs (Xing et al., 2022).

Identity-related approaches have more potential in the long run compared to attitude-based approaches. While temporary campaigns can change behaviour in the short term, the identity approach can bring about a permanent

change in lifestyle since those who adopt an environmentally friendly identity tend to exhibit behavioural consistency (Fielding & Hornsey, 2016).

H4: Repeated engagement with Mall-Based Eco hub systems positively influences pro-environmental self-identity formation.

3.4 Sustainable Behavioural Responses and Spill over Effects

According to the EITM, the impact of Mall-Based Eco hubs goes beyond mere participation and helps in sustainable consumer transformation (Vijayakumar & Davidova, 2025). One of the major flaws of traditional approaches to sustainable development is that their outcomes are temporary and fragmented in nature; consumers engage in activities for a limited period of time but fail to display consistency in their behaviour (Thomas & Kayarkatte, 2025). Behavioural spill over, which refers to the degree to which participating in one environmentally responsible action makes it more likely to perform another sustainable action in other aspects, has consequently become a core focus of sustainability research (Newell et al., 2021).

Mixed results have been observed for spill over effects. Some studies have found positive spill overs, while some other studies have found either negative spill overs or moral licensing, where people put less effort into their next behaviour after engaging in their first behaviour positively (Tomić et al., 2024). The difference is due to the psychological mechanism that has been activated (Krpan et al., 2019). Positive spill overs will be more prevalent if the behaviour helps reinforce one's identity, while negative spill overs are more common when behaviour works as a means to alleviate guilt (Kroesen & Mehdizadeh, 2024).

Eco hubs in Mall-Based settings generate the proper environment for positive spill over because the process takes place in a repetitive manner and in consumption spaces that hold social significance (Clot et al., 2021). The repetition of the process allows for the normalization of sustainability practices as part of consumer behaviour, resulting in the reinforcement of habits because sustainability becomes part of the shopping experience through repetitive exposure to the concept and thus reinforces consistency in behaviour (Nilkant et al., 2025). The participation in an Eco hub involves not only convenience but also repetition, visibility, and reinforcement; reverse vending, textile recovery, recycling kiosks, and sustainability-related incentives can provide continuous feedback loops (Iacovidou et al., 2020). A pro-environmental identity is especially crucial for downstream change. Once one has internalized their environmental responsibility in terms of identity, there will be a tendency to stay consistent between their identity and future behaviour (Whitmarsh & O'Neill, 2010). In other words, the behaviours that were environmentally friendly while at Eco hubs will continue when it comes to activities such as recycling at home, conserving energy, engaging in sustainable transport, responsible consumption, and waste reduction (Nash et al., 2019). This is because the public aspect of participation encourages people to view environmentally responsible behaviour as socially expected and personally significant.

Mall-Based Eco hubs are thus viewed by EITM as incubators for behaviour change that lead to more widespread transformation of one's environment-oriented lifestyle (Constantino et al., 2022). This transformation does not happen instantly but occurs gradually as a result of reinforcement and internalization.

H5: Engagement with Mall-Based Eco hub systems positively influences sustainable behavioural spill over into non-retail environmental behaviours.

PCE and pro-environmental self-identity act as mediating variables as well (Capasso et al., 2024). According to the EITM, Eco hubs have no direct impact on sustainability-related outcomes; change is achieved via psychological reinforcement (Grilli & Curtis, 2020). PCE acts as the first psychological reinforcement variable and people who perceive their behaviours as relevant to sustainability will be more likely to participate in sustainability activities (Ertz et al., 2021). Over time, PCE increases the strength of one's pro-environmental self-identity, which results in environmental responsibility becoming increasingly a part of one's self-concept (Truelove et al., 2021). When responsibility becomes a part of the individual's self-concept, sustainable behaviours become self-reinforcing as individuals try to be consistent with their self-concept (Gil et al., 2025).

PCE increases the perception of the relevance of one's behaviours, while identity development increases the motivation for consistency.

H6: Perceived consumer effectiveness and pro-environmental self-identity mediate the relationship between Mall-Based Eco hub engagement and downstream sustainable consumer transformation.

3.5 Boundary Condition: Firm–Cause Fit and Green washing Amplification

Whereas the EITM predicts that Mall-Based Eco hubs serve as costly signals of authenticity, signalling theory also indicates that visibility of sustainability infrastructure can result in undesirable outcomes due to organizational inconsistency (Connelly et al., 2024). The condition presents the researcher with a paradox that is seldom acknowledged by the current body of knowledge related to sustainability and retail infrastructure: visibility of sustainability investment does not necessarily lead to authenticity, and in some cases, it may increase the impression of hypocrisy, opportunism, and green washing (Vadakkepatt et al., 2020). This paradox is grounded in signalling theory. According to Akbor et al. (2015), the strength of a signal relies not only on its visibility and costliness but also on its congruence and interpretive consistency. The inconsistency between the communicated quality and the actions of the signalling entity leads to decreased credibility of the signal (Vergne et al., 2018). Consumers tend to judge environmental initiatives based on the firm's entire performance, retail infrastructure, tenant selection, and past history with sustainability projects, rather than evaluating each one independently (Jensen et al., 2022).

Firm-cause fit is used to measure this, which refers to how well the sustainability program implemented by the company is perceived to be consistent with the firm's overall identity, behaviour, and practices (McCullough et al., 2022). In cases where the sustainability program is consistent with the company's identity, behaviour, and practices, then there will be a firm-cause fit. Otherwise, when the sustainability program is inconsistent, opportunistic, and unrelated to other activities of the business, there will be low firm-cause fit (Carrillat et al., 2024). Consumers will consider not just the infrastructure of the Mall-Based Eco hubs but also their entire sustainability program (Maon et al., 2019). When consumers see a very prominent Eco hub but the same mall is promoting extravagant lifestyles, excessive fashion retailing, and unsustainable business practices, the infrastructure will not be seen as proof of commitment (Vadakkepatt et al., 2020).

It creates a very important theoretical dilemma. The same visibility that enhances costly signalling in case of a good fit between firms and causes will enhance scepticism in case of poor fit (Shapira, 2020). Previous green washing research confirms this: consumers perceive negative signals from sustainability communication that seems to be inconsistent with business operations (Parguel et al., 2011), and the highest level of scepticism occurs when firms promote their sustainability through highly visible marketing activities but still use environmentally dubious practices (Azmi et al., 2025). The EITM advances previous research in the sense that sustainability infrastructure, rather than traditional sustainability communication, poses even greater risks of backlash, precisely because the claims made through infrastructure are more tangible and public (Villarino & Font, 2015). The paradox becomes especially salient in the context of luxury retailing and high-consumption retailing (Vadakkepatt et al., 2020). Shopping malls often emphasize aspirational consumption, quick turnarounds, and aggressive consumerism, which means that sustainability signalling built into these spaces may send contradictory messages to consumers who may understand that the Eco hub represents a sustainable and environmentally-friendly space but wonder if the entire retail environment is committed to sustainable consumption (Davies et al., 2020). From the perspective of signalling theory, this is a matter of signal fragility (Connelly et al., 2024). The costly signalling will work only as long as the audience sees consistency between the signal itself and the organizational form being signalled; if the audience perceives inconsistency, the signal becomes void (Broschak et al., 2019).

The EITM does not contend that all Eco hubs necessarily lead to perceptions of green washing (Khan et al., 2026). Rather, the EITM argues that the success of Eco hubs is contingent on sustainability infrastructure congruence, where high firm-cause fit leads to the Eco hub being part of a sustainable strategy, whereas low firm-cause fit means that the Eco hub is merely isolated symbolic compensation that is divorced from any other organizational actions (Tran et al., 2019). This boundary condition reinterprets sustainability infrastructure as a contingent measure for organizational authenticity and contributes directly to anti-green washing research by

arguing that future sustainability strategies need to focus on holistic alignment within the organization rather than isolated symbolic actions (Montgomery et al., 2023). Retail firms cannot rely solely on their sustainability infrastructure if there is misalignment between their sustainability strategies and their actions overall.

H7: Firm–cause fit positively moderates the relationship between Mall-Based Eco hub characteristics and perceived authenticity, such that high firm–cause fit strengthens authenticity perceptions, whereas low firm–cause fit amplifies green washing perceptions and weakens the positive effects of Eco hub signalling.

Table 1 Construct Comparison between Mall-Based Eco hub and Adjacent Sustainability Constructs

Construct	CSI	BE	IL	PI	EWRRC	PF	Key Limitation
Mall-Based Eco hub (<i>This Study</i>)	High	High	High (multi-tier partnerships)	Permanent	Yes	Authenticity signaling, sustainability participation, and behavioral transformation	Requires strong firm–cause fit to avoid green washing amplification
Green Services cape	Moderate	Low	Limited	Permanent	Yes	Communicates environmental atmosphere and ecological values	Focuses mainly on symbolic environmental cues rather than active sustainability participation
Experiential CSR Initiatives	Low to Moderate	Moderate	Moderate	Temporary or campaign-based	Partial	Enhances emotional engagement through sustainability experiences	Lacks long-term infrastructural continuity and embedded behavioral systems
Sustainability Pop-Up Installations	Low	Moderate	Variable	Temporary	Yes	Creates short-term sustainability awareness and engagement	Limited operational permanence and weak long-term signaling capability
Standalone Recycling Infrastructure	Low to Moderate	High	Limited	Permanent	No	Facilitates recycling convenience and waste management	Operates outside branded retail ecosystems and lacks integrated authenticity signaling
Traditional Green Marketing Communication	Low	None	Limited	Campaign-based	Indirect	Promotes environmental positioning through communication	Highly vulnerable to consumer skepticism and green washing perceptions

* Costly Sustainability Infrastructure (CSI), * Behavioural Enablement (BE), * Institutional Legitimacy (IL). * Permanence of Infrastructure (PI), * Embedded Within Routine Retail Consumption (EWRRC), * Primary Function (PF)

Methodology

4.1 Research Design

A quantitative cross-sectional research design is employed in order to establish the validity of the EITM through empirical analysis. The research will investigate the impact of Mall-Based Eco hubs on perceptions of authenticity, PCE, pro-environmental self-identity, sustainable behavioural spill over, and sustainable consumer transformation. Given that there are several latent constructs, mediator variables, and moderator variables in the EITM, Partial Least Squares Structural Equation Modelling (PLS-SEM) will be employed as the main research method. PLS-SEM is suitable for both exploratory and predictive research (Hair et al., 2019).

4.2 Population and Sampling

Target population refers to adult retail customers frequenting major shopping malls in the Klang Valley area of Malaysia. Purposive intercept sampling will be used to obtain participants who have first-hand experience with sustainable environments in the malls. Eligibility criteria include being an individual above the age of 18, having visited the chosen mall within the past three months, and having engaged with at least one element of Eco hub for the Eco hub group (reverse vending machines, recycling stations, and sustainability workshops). The number of valid responses to be obtained is estimated at 400, split equally between customers from Pavilion Kuala Lumpur Eco hub and customers from another mall without Eco hub facilities. This sample size surpasses the minimum needed for PLS-SEM analysis (Hair et al., 2019).

4.3 Instrument Development

The data will be gathered using an adapted structured questionnaire based on already existing scales on sustainability, consumer behaviour, and environmental psychology. The survey tool evaluates the characteristics of Mall-Based Eco hubs, authenticity, PCE, pro-environmental self-identity, sustainable behavioural spill over, firm-cause fit, and green washing. The items are rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A bilingual version of the questionnaire in English and Bahasa Malaysia will be constructed using back-translation, and a pilot study will be conducted with 30 participants.

4.4 Data Collection Procedure

The primary Data gathering would be done using mall intercept interviews at Pavilion Kuala Lumpur and another shopping mall which is not part of Eco hub. Respondents would answer the screening questions before proceeding to voluntary participation. Informed consent, anonymity, and confidentiality would be ensured.

4.5 Data Analysis Technique

Analysis of the data will be done using Smart PLS based on the two-step PLS-SEM approach (Hair et al., 2019). Evaluation of the measurement model will involve the use of Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), and heterotrait-monotrait ratio (HTMT). The structural model will be tested using path coefficient, t-value, p-value, R^2 , Q^2 , and effect size (f^2). The bootstrapping process will involve 5,000 replications to establish the significance of the direct, indirect, and moderating effects. Mediation testing will explore the indirect effect of PCE and pro-environmental self-identity.

CONTRIBUTIONS OF THE STUDY

This research makes a contribution to the fields of sustainable retailing, consumer behaviour, green marketing, and environmental psychology through the presentation of an integrative theoretical framework for understanding the role that visual sustainability infrastructure plays in authentic experience and sustainable behavioural transformation. The transition from the symbolic nature of communication to the material nature of sustainability systems that are observed in everyday consumption environments reflects changes in consumer assessment of environmental commitment.

The first contribution made by this study lies in the definition of the Mall-Based Eco hub as a sustainability construct in its own right. While existing constructs such as green servicescape, experiential CSR, sustainability pop-ups, and recycling infrastructure provide separate explanations for aspects of the engagement process, none provides an explanation that combines costly sustainability infrastructure, behavioural facilitation, institutional legitimacy, and embedded retail consumption. The definition of the Mall-Based Eco hub as a unique sustainability infrastructure in high-traffic retail environments adds value to theory and practice.

The second contribution is related to extending signalling theory to sustainability infrastructure. The existing studies on signalling have largely revolved around communication mechanisms, such as branding, certification, advertising, and disclosure (Connelly et al., 2024). In this paper, it is contended that infrastructure itself can be used as an authenticity signal as it involves observable, costly, and partly irreversible investments made by the

organization in sustainability, which are available for observation in consumption settings. The signal fragility claim adds additional weight to the theory. While existing research on sustainability takes for granted that visibility enhances legitimacy, this paper demonstrates that visibility may actually increase doubt about sustainability initiatives where organizational practices diverge from expectations.

Thirdly, the contribution is made to the green washing literature. The existing literature concentrates on misleading communication, misleading advertisements, and false claims. This study highlights that sustainable infrastructure can be subject to green washing even if the organization does not engage in misleading communication due to poor organizational congruence.

The fourth contribution extends the S-O-R model by providing insight into the psychological process through which sustainability infrastructure affects subsequent behaviour. The EITM model incorporates the processes of PCE and pro-environmental self-identity in that order as sequential processes linking Eco hub usage to sustainable behavioural diffusion. The inclusion of self-perception theory makes this contribution more valid since consumers develop their environmental self-identity from participating in sustainability systems repeatedly since they derive their values from their repetitive public behaviours in retail settings (Dermody et al., 2021).

The fifth contribution is made to the sustainable behaviour and spill over literature. The majority of sustainability initiatives target one particular behaviour, such as recycling or eco-friendly buying practices. This research views Eco hubs as behavioural incubators that have the potential to create identity-based spill overs to other behaviours beyond retail purchases, such as recycling at home, energy savings, ethical buying, and adopting sustainable lifestyles. As the spill over literature is rather scattered, the current theoretical argument contributes to this field by suggesting that Eco hubs will generate more spill overs since their participation involves consistent identity-building interactions and not simply guilt alleviation (Verfuerth & Gregory-Smith, 2018).

Methodologically, EITM can be described as a testable model that employs signalling theory, institutional legitimacy, S-O-R theory, self-perception theory, and behavioural spill over effects to build a multi-dimensional testing framework employing PLS-SEM and other forms of predictive models. Moreover, the paper presents contextual novelty by studying the topic of Mall-Based Eco hubs in the context of Southeast Asia through the example of the Pavilion Kuala Lumpur project. So far, sustainability infrastructure studies have taken place in a Western environment, and introducing the model into the Asian retail landscape makes the model geographically relevant.

MANAGERIAL IMPLICATIONS

There are multiple implications for the design of shopping malls, retail management, sustainability strategies, policy makers, and brand tenants that arise from the study conducted. In summary, the message is obvious: the effectiveness of any sustainability strategy has more to do with behaviour-enabled infrastructure than symbolic communication.

Sustainability strategies cantered on communications require a rethinking within retail organizations. Sustainability slogans, CSR programs, environmental labels, and digital environmental branding can be viewed as insufficient tools for creating authenticity perceptions due to the connection between communicative practices and impression management (Rehman, 2025). According to the theory, trust will be created if the environmental commitment is made material through the creation of infrastructure. The managers must invest in tangible sustainability measures that customers will experience, not increase communication spending. Tangible sustainability infrastructure works as an authenticity indicator, as well as an instrument for customer engagement and reputation management. Eco hub systems have visible investment, continuity, and commitment.

Sustainability systems must be constructed in such a way that the emphasis is on behavioural enablement and not on awareness generation. Retail sustainability efforts often miss the mark since they tend to convey their concerns but do little to eliminate the barriers that make it difficult for consumers to engage in sustainable behaviours. Behavioural enablement occurs much more easily when sustainability behaviours are easy, integrated into shopping activities, and reinforced through immediate behavioural feedback (Echegaray &

Hansstein, 2017). Malls can foster ecosystems that enable consumers to behave sustainably within the retail environment.

Legitimacy of institutional sources is strategically vital. Programs or projects that receive support from government agencies, environmental non-governmental organizations (NGOs), recycling groups, and research organizations have higher levels of legitimacy than programs initiated within organizations since consumers view initiatives backed by outside sources as legitimate, not biased towards business interests (Suchman, 1995). Retail developers must therefore create multi-level partnerships with government environmental organizations, accredited recycling groups, sustainability-oriented NGOs, environmental researchers, and sustainable brands.

Consumer identity construction is also worthy of consideration. Eco hubs can operate as sites of consumer participation where consumers build their pro-environmental identity by consistently taking visible action, thus infrastructures should not only serve as waste management facilities but as psychologically stimulating environments. Managers should ensure that visibility, interaction, participation, and behaviour reinforcement are key considerations; gratified recycling, sustainability tracking, reward programs, public acknowledgment, and experiential learning contribute to identity-driven participation.

First and foremost, the significance of the implication lies in the danger of the green washing paradox that emerges due to the increased visibility of sustainability infrastructure. Sustainability infrastructure becomes more credible when it is complemented by other aspects of organizational practices in line with the environmental positioning. In the case of weak fit between the firm and the cause, the increased visibility contributes to the increase in consumer scepticism towards the environmental claims of the company. A shopping centre cannot base its sustainability efforts on the implementation of Eco hub if it continues implementing operations contradicting the principles of environmental sustainability. Consumers perceive sustainability as an integral part of all aspects of shopping experience, such as tenant selection, waste generation, packaging practices, electricity use, the share of fast-fashion retailers, and consumer culture in general. Sustainability infrastructure must be embedded in the organizational strategy.

For tenant brands, engaging in Eco hub activities enables a connection with tangible sustainability infrastructure, which may be hard to afford independently. Tenant brands that engage in recycling, sustainability training, circular incentives, or environmental learning may enhance their legitimacy through co-association with sustainable ecosystems that have institutional validation. Engagement must be consistent; brands that are seen as environmentally inconsistent may be punished for such an engagement.

Shopping centres could serve as strategic urban sustainability platforms for policy makers and urban sustainability planners due to the nature of the traffic that comes through them and the degree to which they play a role in people's lives. Policy makers who seek to boost urban participation in recycling, circular economy activities, and sustainability efforts in general might consider working with retail developers to build such infrastructure. Shopping centres would thus be transformed from purely commercial structures into behavioural transformation spaces where sustainable participation can be promoted in larger numbers. In the future, retail competitiveness will hinge on sustainability credibility rather than communication strength.

CONCLUSION AND LIMITATIONS

This current study used the Eco-Infrastructure Transformation Model (EITM) to explore the impact of Mall-Based Eco hubs on consumers' perceptions of authenticity, psychological transformation, and sustainable consumption behaviour in modern retail settings. Based on the theory of signalling, the S-O-R approach, and self-perception theory, the study posited that the sustainability infrastructure existing in the ecosystem of shopping malls is not merely an environmental utility but also a costly signal of authenticity, behavioural facilitator, institutional legitimacy tool, and environment for participation in sustainability.

In terms of contributing to sustainable retailing literature, this research provides a definition for the Mall-Based Eco hubs as a new sustainability construct comprising visible infrastructure, participation behaviour, institutional legitimacy, and retail engagement. In contrast to existing sustainability communication approaches, Eco hubs

materialize sustainability through actions, rather than discourse; this is important since modern consumers measure the credibility of sustainability through operational visibility.

The conceptual framework implies a number of interrelated mechanisms. Visible infrastructure acts as a costly signal that can enhance authenticity and decrease scepticism about green washing. Direct involvement enhances PCE by enabling customers to see the immediate environmental impacts of their decisions. Repeated participation in such visible sustainability initiatives fosters pro-environmental identity via self-perception. Combined, all these mechanisms raise the probability of behavioural spill overs of sustainability to contexts outside the retail setting.

The inclusion of fit between firm and cause as a boundary condition makes the model more robust. High visibility of sustainability systems may simultaneously generate both opportunities for authenticity and risks for reputation, enhancing legitimacy in case of alignment between the organization and its sustainability systems, while at the same time increasing perceptions of hypocrisy and green washing in case of lack of consistency between operations and environmental stance. This paradox makes sustainability visibility a conditional and risky process instead of being necessarily positive, and it enriches the green washing literature by indicating that sustainability infrastructure is not enough to ensure authenticity. In order to achieve sustainability legitimacy, retail organizations need to coordinate their communications, operations, tenant systems, environmental management, and high visibility.

Several limitations can be identified with respect to the study. Firstly, the study is conceptual, meaning that while drawing on well-established theories and recent developments in sustainability, the linkages that are suggested in the EITM framework have not been tested in practice. Future research would need to validate the propositions made in this study in order for the hypotheses to be confirmed or disconfirmed. Secondly, the study deals mostly with shopping malls, using Pavilion Kuala Lumpur Eco hub as a case study example. The findings of the study might not necessarily be applicable to smaller retail facilities, suburban areas, or commercial environments. Third, the model presupposes that multiple Eco hub engagements result in positive spill over effects mediated by identity formation, but both negative spill overs and moral licensing are recognized in the literature (Truelove et al., 2021). The former phenomenon implies that some consumers might view their early sustainability engagement as enough for further participation, and it remains unknown whether engagement results in sustainable transformations or mere short-term involvement. Fourth, legitimacy in the current framework is defined with regard to governmental organizations, non-governmental organizations, and sustainability-focused partnerships, while legitimacy perception may differ depending on political trust, culture, environmental consciousness, and institutional trust; cross-cultural research is needed to explore this topic. Fifth, the current study focuses on consumers; yet future research may concentrate on operational sustainability effects, financial consequences, sustainability performance at the tenant level, and economic viability of Eco hub systems. Sixth, the field of sustainability practice is developing, and future retail sustainability ecosystems may include artificial intelligence, smart waste management, sustainability monitoring via digital technologies, block chain-based environmental certification, and personalized sustainability participation technologies. Consequently, further development and expansion of the Eco hub concept will become necessary.

Regardless of these limitations, however, the research offers a theoretical framework through which to examine how visual sustainability infrastructure might impact the next stage of sustainable retail evolution. The success of future sustainability initiatives is likely to be less about the way in which organizations are able to convince people that they are environmentally responsible and more about the ability of consumers to experience sustainability first-hand.

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